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ASCON 13th Annual Scientific Conference of ICDDR,B

SCIENCE TO ACCELERATE UNIVERSAL HEALTH COVERAGE

14 -17 March 2011, Dhaka, Bangladesh

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ABSTRACTS BOOK

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Science to Accelerate Universal Health Coverage

14-17 March 2011, ICDDR,B, Dhaka, Bangladesh
Venue: Pan Pacific Sonargaon Dhaka

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Preface

I am delighted to chair ICDDR,B's 13th Annual Scientific Conference (ASCON XIII). The theme 'Science to Accelerate Universal Health Coverage' provides us with an opportunity to share and generate new ideas and strategies that can help deliver health coverage throughout Bangladesh and beyond, to low- and middle-income countries everywhere.

Having a deep personal commitment to this issue, I was greatly encouraged by the high quality abstracts we received from prominent researchers around the globe. In addition, the huge response from our own researchers at ICDDR,B and our colleagues within Bangladesh is a powerful reminder of our shared commitment to this important theme.

It is my sincere hope that this conference will create an opportunity, away from the rigours of daily research, to reflect, consider and discuss with researchers from a wide range of disciplines. My hope is that new collaborations, directions, and innovations will emerge from our time together.

I would like to take this opportunity to acknowledge the hard work of the various committees, and of my two co-chairs, for making this conference such a well-organised and meaningful event.

I extend a very warm welcome to all participants and hope that you will find the conference stimulating and informative. I want to thank the renowned speakers, chairs, and co-chairs for taking the time to enhance the profile of the event. Last but not the least, my gratitude to our donors and sponsors, including the Government of the People's Republic of Bangladesh, whose generous support has made ASCON XIII possible.

Alejandro Cravioto
Executive Director, ICDDR,B
and Chair, Scientific Committee
ASCON XIII

Acknowledgements

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The Centre's core and project activities are supported by countries and agencies which share its concern for the health and population problems of developing countries. Current donors providing unrestricted support to ICDDR,B include: Australian Agency for International Development (AusAID), Government of the People's Republic of Bangladesh (GoB), Canadian International Development Agency (CIDA), Swedish International Development Cooperation Agency (Sida), and UKAID.

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Professor K. Srinath Reddy
President, Public Health Foundation of India, New Delhi, India

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Dr. Sania Nishtar
President, Heartfile, Islamabad, Pakistan

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Scientific Session 1: The costs of scaling up services to achieve the MDGs

Costs of Manoshi Delivery Centres in Slums of Dhaka City, Bangladesh

Ziaul Islam[1] (zia@icddrb.org), Jahangir Khan[1], Khurshid Alam[1], Tamjida Sohni Hanfi[2], and Solaiman Sarker[2]

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[2]BRAC, BRAC Centre, 75 Mohakhali, Dhaka 1212, Bangladesh

Background: Since 2007, BRAC has been implementing the Manoshi programme for maternal, neonatal and child survival in urban slums of Bangladesh. One of the unique features of the programme lies in its 'Delivery Centres' located in slums. In 2009, the management requested for an estimation of supply-side costs of Manoshi Delivery Centres for assessing its efficiency and future sustainability.

Objective: Estimate the total cost of operating Manoshi Delivery Centres and average cost of providing normal delivery care, antenatal and postnatal care.

Methodology: A combination of bottom-up and top-down costing approach was applied. Seven delivery centres of Kamrangirchar slum in Dhaka city were purposively chosen, and data were collected during January-July 2010. All supply-side inputs mobilized during 2008-2009 were identified, quantified, and valued through facility-level inventory, record-review, and key-informant interview. Input costs were categorized into fixed and variable costs. Annualization of capital costs was done following standard procedure. Joint costs were apportioned using allocation factors. Cost of individual input was calculated multiplying quantity by price. The total cost of Delivery Centres was calculated adding fixed and variable costs of 2008 and 2009 separately. The average cost of conducting normal delivery was estimated dividing the total cost of delivery-related inputs by the number of corresponding outcome of the reference years. Marginal cost of normal delivery was calculated for 2009. Based on proportionate total cost and total number of enrollments, the overall average cost of antenatal care (ANC) and postnatal care (PNC) was calculated.

Results: The total cost of operating selected delivery centres in 2008 and 2009 was Tk 29,70,001 and Tk 31,46,562 respectively. The average cost per centre in 2008 was Tk 35,357 per month and Tk 1,179 per day. Similarly, in 2009, it was Tk 37,459 per month and Tk 1,249 per day. The total number of normal deliveries conducted during 2008-2009 was 745 and 968 respectively. The proportionate total cost of delivery-related inputs in 2008 was Tk 9,65,312 and that of 2009 was Tk 10,33,967. The average cost of normal delivery at the centre during 2008 was Tk 1,296 and Tk 1,068 during 2009. The marginal cost of normal delivery in 2009 was Tk 307. Overall, the average cost of ANC and PNC was Tk 141 and Tk 145 respectively.

Conclusion: Normal delivery was safely conducted by Manoshi Delivery Centres at low cost. Marginal cost less than average cost indicates that the average cost of normal delivery care would decline further in future.

Acknowledgements: The authors thank the Bill & Melinda Gates Foundation for funding the study through BRAC.

*Indicates the sequential number of abstract in this book
†Indicates the number originally assigned to the abstract

002 (044)

Coping with Costs of Maternal Healthcare in Rural Bangladesh

Mohammad Enamul Hoque[1] (ehoque@icddrb.org), Timothy Powell-Jackson[2], Sushil Kanta Dasgupta[1], Mahbub Elahi Chowdhury[1,3], and Marge Koblinsky[4]

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Background: While the high costs of maternal healthcare-seeking in low-income countries have been documented in the literature, how households cope with these costs is less-understood.

Objective: Estimate the economic consequences of maternal ill-health in rural Bangladesh where there is limited access to formal insurance markets, using data on household expenditure combined with information on maternal health and its complications from medical records of health facilities.

Methodology: This prospective cohort study was conducted in Matlab, a rural area of Bangladesh. All pregnant women who gave birth during January 2007–December 2008 were targeted. Women selected for the study were contacted at their home at two points in time: 6 weeks after delivery and 6 months postpartum. In total, 810 households were contacted for interview. Of 773 households that were successfully interviewed in the first wave, 729 were re-interviewed in the second wave. Complete data for both waves of the survey were available for 706 households.

Results: The findings suggest that, despite the high cost of care associated with maternal health and its complications, the large majority (73%) of families (n=729) were able to protect household expenditure on non-health items. Around 65% of the households with a maternal illness spent more than 10% of their total household budget for healthcare. However, less than 20% of the families displaced more than 10% of current consumption with the healthcare expenditure. The households had surprisingly good access to informal sources of finance which they used for protecting current consumption.

Conclusion: Households with a maternal complication were able to finance around two-thirds of health expenditure with transfers from relatives, borrowing from local money-lenders, and selling assets. Those who were poorer and had severe maternal complications resorted to coping strategies that are likely to leave families particularly vulnerable to future economic shocks. The results suggest that the main benefit of health insurance or tax-based funding for households in such a setting is likely to be the improvement in financial protection against longer-term economic consequences of maternal ill-health.

Acknowledgments: The authors thank the USAID, Washington, DC, for funding the project.

003 (122)

Household Costs of Obtaining Obstetric Care in Rural Bangladesh

Mohammad Nasir Uddin Khan[1] (nasir.uk@brac.net), Zahidul Quayyum[2], Hashima-e-Nasreen[1], and Tim Ensor[2]

[1]Research and Evaluation Division, BRAC, Mohakhali, Dhaka 1212, Bangladesh and
[2]University of Aberdeen, Aberdeen AB25 2ZD, Scotland, UK

Background: Cost of skilled obstetric care is a major obstacle to access in low-income countries, including Bangladesh. Since cost of health services is a major determinant in demand-side for maternity care, it is important to examine the extent of financial barriers faced by households in seeking obstetric care.

Objective: Analyze costs that a household incurred for seeking obstetric care in rural Bangladesh.

Methodology: This was a cross-sectional quantitative survey on cost pattern of maternal obstetric care of 1,200 married women in 4 northern districts of Bangladesh where BRAC provides an extensive maternal, neonatal and child health services, with a special emphasis on skilled delivery care. Univariate and bivariate analyses assessed the level and determinants of household costs.

Results: Deliveries at home dominated in all areas where unskilled birth attendants were the major care providers. Most commonly-cited reasons for not seeking skilled obstetric care included higher estimated costs. Costs of delivery care varied considerably by type of treatment and place of delivery. The use of unskilled care providers for deliveries in the home was pro-poor while public and private facilities were largely used by richer households. Out-of-pocket payment and borrowing were two important sources in paying for obstetric care. In the pilot intervention area, expenditure from programme-induced savings was encouraging. The average days lost by mothers for delivery care comprised 35, 44, and 57 in pilot Nilphamari, baseline intervention, and comparison areas.

Conclusion: Attempts should be made to encourage able mothers to save for obstetric care, which may reduce the burden of borrowing. Mothers should be informed about the right cost of skilled obstetric care during pregnancy, which might help her take preparation and right decision for obstetric care. Reducing costs of obtaining obstetric care, particularly for the poor, will be an appropriate measure to increase the use of skilled care.

Acknowledgements: The authors thank the Department for International Development (DFID), UK, the Royal Netherlands Embassy (RNE), and the Australian Agency for International Development (AusAID) for support through the BRAC Rural MNCH project.

004 (127)

Costs of Integrating Demand-based Reproductive Health Commodity Model into the Government and NGO Health and Family-planning Service-delivery Systems

Ziaul Islam (zia@icddrb.org), **Shahela Anwar**, Humayun Kabir, and Rukhsana Gazi

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Background: An economic evaluation was conducted to estimate the additional cost requirement for integrating the demand-based reproductive health commodity (DBRHC) model into the existing set-ups of the government and NGO's health and family-planning service-delivery systems at the field level, considering the supply-side perspectives only.

Objective: Estimate the total additional cost of implementing the demand-based reproductive health commodity model at selected service-delivery points and estimate additional cost by components with respect to the existing government-NGO service-delivery systems.

Methodology: Bottom-up or micro-costing approach was applied to identify, quantify, and value all additional inputs mobilized at the selected field sites of Nabiganj and Raipur upazilas and urban slums located in Ward 25 and 26 (Khilgaon), and 47 (Mohammadpur) of the Dhaka City Corporation during 2006-2008. For calculation of additional costs, the supply-side costs exclusively related to field activities were considered. For gathering necessary cost-information, the project databases of RTM International and Population Council were used, and key-informants of partner organizations were interviewed.

Results: Results showed that the estimated total additional cost of implementing the model over 3 years at the 3 field sites was Tk 1,86,67,634 (US$ 274,524). The capital cost as proportion of the total cost was higher (59%) compared to the recurrent cost (41%). Overall, development of behaviour change communication (BCC) material and BCC activities consumed the highest share (US$ 51,435 and US$ 44,801) of the total cost, followed by local travel and basic training. Overall, an additional unit cost of US$ 3.38 per beneficiary was estimated for implementing the model at the selected field sites.

Conclusion: The results of this cost analysis suggest that the built-in interventions of the DBRHC model are doable in the existing government-NGO settings at the grassroots level at an additional unit cost of US$ 3.38 per beneficiary. Given the appropriate use of available technical functionaries of the Government and NGOs, cost of integrating the model into the existing systems is affordable through cost adjustment.

Acknowledgements: The authors thank the CIDA for funding the project through the UNFPA.

005 (045)

Willingness-to-pay for 4% Chlorhexidine among Target Population in Selected Rural Areas of Bangladesh

Ziaul Islam[1] (zia@icddrb.org), Shahela Anwar[1], Tracey Pérez Koehlmoos[1], Nirod C. Saha[1], Rukhsana Gazi[1], Humayun Kabir[1], Patricia Coffey[2], and Meltzer Mutsumi[2]

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Background: Results of recent trials in Bangladesh, Nepal, and Pakistan showed that 4% chlorhexidine is a cheap and effective agent in preventing newborn's umbilical cord infection that can contribute to reducing neonatal morbidity and mortality, especially in home-delivery setting. However, it is unclear whether the potential end-users would be willing to pay if chlorhexidine is marketed through private channel in rural Bangladesh.

Objective: Assess willingness-to-pay (WTP) for 4% chlorhexidine among the target population at different price-points in selected rural areas of Bangladesh.

Methodology: Based on contingent valuation method, a household survey was conducted with 1,768 respondents. The respondents included pregnant women, women with first-born child aged <6 months, and their husbands living in Abhoynagar and Mirsarai subdistricts during April-July 2010. A hypothetical scenario was presented to each respondent beginning with a clear product description, followed by questions on interest in the product, bidding game with 4 prefixed prices, and independently-reported maximum WTP. The start-up prices for single, multi-dose solution, and gel were estimated by a local manufacturer while the remaining 3 prices were based on the market price of alternative products. Positive responses to prefixed prices were cross-matched with the respondent's independently-reported maximum WTP. Thus, the proportion of respondents willing to pay prefixed prices, less or more than that were identified. Information was collected on the respondent's socioeconomic profile, experience of cord-care, and coping mechanism to higher price. Approval from the Research Review Committee of ICDDR,B was obtained before the survey.

Results: All the respondents expressed keen interest in buying the product. Forty percent and 33% of independently-reported WTP responses matched exactly with the prefixed prices of Tk 27-35 and Tk 45-60 for single-dose and multi-dose solution respectively. For gel, 31% of independently-reported WTP matched with the prefixed prices of Tk 45-60. The remaining all wanted to pay less. In the case of deficit to pay, the majority (60%) of the respondents opined that they would borrow money or would take it on credit.

Conclusion: The majority of the respondents were willing to pay less than the prefixed prices but none was unwilling to pay.

Acknowledgements: The authors thank the USAID for funding the project through PATH.

006 (092)

Community-based Health Insurance Scheme in Rural Africa: Can Premium Subsidies Increase Adverse Selection?

Divya Parmar[1] (Parmar@uni-heidelberg.de), Aurélia Souares[1], Manuela De Allegri[1], Germain Savadogo[2], and Rainer Sauerborn[1]

[1]Institute of Public Health, Heidelberg University, Germany and
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Background: Community-based health insurance (CBHI) is popular in many low- and middle-income countries. Due to voluntary enrollment, these schemes are gullible to the problem of adverse selection. However, very few have analyzed adverse selection and have rarely used longitudinal data to study the change in adverse selection overtime. Moreover, many CBHI schemes offer subsidized premiums but no one has explicitly studied the effect of subsidized premiums on adverse selection.

Objective: Investigate adverse selection in a CBHI scheme in Burkina Faso.

Methodology: First, the change in adverse selection was studied over 4 years. Second, the effect of subsidized premiums on adverse selection was studied. The study area, covering 41 villages and one town, was divided into 33 clusters, and CBHI was randomly offered to these clusters during 2004-2006. In 2007, premium subsidies were offered to the poor households. Data came from the household panel survey 2004-2007 that collected primary data from randomly-selected households in these 33 clusters (n=6,795). Endogeneity of CBHI was controlled using fixed effect models.

Results: No evidence of adverse selection was found during 2004-2006. In 2007, it was found that premium subsidies increased enrollment but also introduced adverse selection.

Conclusion: The result was surprising as premium subsidies should theoretically reduce adverse selection. This result can be explained by the method applied to identify the poor households that were offered subsidy. A community participatory method was used, and the community described health status and capacity to pay for medical costs as criteria to differentiate the poor from the rich. Hence, the poor households identified were likely to be of poor health and unable to pay for medical expenses; offering subsidy to these households resulted in adverse selection. If adverse selection is not controlled, it can threaten the financial sustainability of the scheme. Based on these results, several policy implications are discussed.

11:00 am–12:30 pm (Venue: Ball Room 3) 007 (074)

Scientific Session 2: Non-communicable diseases and lifestyle factors

Anaemia Interventions in Bangladesh Should Consider Iron in Groundwater and Thalassaemia

R.D. Merrill[1] (rmerrill@jhsph.edu), A.A. Shamim[2], H. Ali[2], A. Labrique[1], K. Schulze[1], P. Christian[1], and K.P. West, Jr.[1]

[1]Center for Human Nutrition, Department of International Health, Johns Hopkins University, Baltimore, MD, USA and [2]JiVitA Maternal and Child Health Research Project, Gaibandha and Johns Hopkins Bangladesh, Ltd, Dhaka, Bangladesh

Background: Anaemia was common (57%) among women in rural northwestern Bangladesh despite non-existence of iron deficiency which is considered the most common cause of anaemia, suggesting a role for environmental and disease factors.

Objective: Explore the influence of diet, thalassaemia, and groundwater minerals on the risk of anaemia among women of reproductive age in rural Bangladesh.

Methodology: In 2 seasons of 2008, 207 participants were visited to collect information on 7-day food frequency, 7-day morbidity history, 24-hour drinking-water intake, rice-preparation methods, and anthropometry and to measure groundwater mineral concentrations. Blood was collected to assess the iron, infection, and thalassaemia status. The JiVitA study was approved by the Bangladesh Medical Research Council and the Institutional Review Board at the Johns Hopkins Bloomberg School of Public Health.

Results: Iron intake from groundwater [mean (standard deviation) 46 (34) mg/day] contributed to iron status such that plasma ferritin increased by 6.2% [95% confidence interval (CI) 3.9-8.5] for every 10 mg increase in iron intake from water ($p<0.0001$). Diet and groundwater arsenic concentrations were unrelated to anaemia ($p>0.17$ and 0.50 respectively). In adjusted analyses, thalassaemia (28% prevalence), low body mass index (<18.5 kg/m^2), and parity (2 or more vs 1 offspring) were associated with anaemia [(odds ratio (OR) (95% CI): 2.5 (1.3, 5.0), 2.0 (1.1-3.8), and 2.7 (1.2, 5.9) respectively)].

Conclusion: Thalassaemia, not iron deficiency, contributed to the risk of anaemia among this women population in rural Bangladesh. Iron sufficiency was likely attributable to consumption of groundwater iron. In such settings, iron supplementation of women may be an ineffective and inappropriate, presumptive public-health response to control anaemia.

Acknowledgements: The study was supported by the Bill & Melinda Gates Foundation, USAID, Washington, DC, and the Sight and Life Research Institute, with additional funding provided by a Proctor & Gamble Fellowship.

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Hypertension: Adherence to Treatment in Rural Bangladesh—Findings from a Population-based Study

Masuma Akter Khanam (masuma@icddrb.org), Wietze Lindeboom, and Tracey Pérez Koehlmoos

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Background: High blood pressure is a leading cause of the global burden of disease and a major risk factor for ischaemic heart disease, stroke, and kidney failure. Results of studies showed that only 26% of hypertensive patients took medication, and only 26% had control of their blood pressure. There is a lack of data regarding current care practices for hypertension in rural Bangladesh.

Objective: Describe hypertension and the factors affecting adherence to treatment among hypertensive persons in rural Bangladesh.

Methodology: Data were from the 'Risk Factors and Chronic Diseases Study' conducted in 2009. The study population included 29,960 individuals from 3 rural demographic surveillance sites—Matlab, Abhaynagar, and Mirsarai and limited to men and women aged 25 years and above. Data were collected by a structured questionnaire on diagnosis, initial treatment, and discontinuation of treatment of chronic conditions. Non-adherence was defined as: when patients were not under any treatment at the time of interview, and when they had received treatment initially.

Results: The prevalence of hypertension was 12%, and it was higher among women (14.8%) than among men (8.9%). Fifty-eight percent of men (n=9,667) and 51.1% of women (n=20,293) were diagnosed by qualified care providers. Among the unqualified care providers, village doctors diagnosed 37% of the men and 42.7% of the women. Age, sex, education, wealth, and type of care provider were independently associated with non-adherence to anti-hypertensive medication. Significantly more men than women discontinued the treatment [odds ratio (OR)=1.74, 95% confidence interval (CI) 1.48-2.04]. Non-adherence to medication was greater when hypertension was diagnosed by unqualified care providers (OR=1.52, 95% CI 1.31-1.77). Hypertensive patients with older age and higher education were less likely to be non-adherent. Those who reported cardiovascular co-morbidity were also less likely to be non-adherent to anti-hypertensive medication (OR=0.79, 95% CI 0.64-0.97).

Conclusion: Although village doctors made 40% of diagnoses for hypertension, their treatment were associated with a higher rate of non-adherence to treatment. The hypertension-care practices of the village doctors should be explored by further research. The reasons for non-adherence to treatment among men, young people, and people with low education needs investigation.

Acknowledgements: The primary research was funded by the United Health Group (Grant No. GR00632). Data analysis was supported by the National Institutes of Health Office of the Director, Fogarty International Center through the International Clinical Research Fellows Program at Vanderbilt University (R24 TW007988).

009 (129)

Current Pattern of Tobacco-use in Bangladesh: Findings from a Population-based Study

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Background: One of the main behavioural health risks for a host of chronic illnesses is the use of tobacco and related products. According to the World Health Organization report on the Global Tobacco Epidemic 2008, nearly two-thirds of the world's smokers live in 10 countries including Bangladesh. Some 35% of men in developed countries and 50% of men in developing countries are daily smokers. Tobacco-use is a widespread phenomenon in Bangladesh. The Government has taken steps towards discouraging smoking through signing the Framework Convention on Tobacco Control, thus, restricting advertising and smoking in public places.

Objective: Describe the current pattern of tobacco-use in Bangladesh.

Methodology: The 'Risk Factors and Chronic Diseases Study' is a cross-sectional study of 39,038 men and women aged 25 years and above, residing in 3 rural (Matlab, Abhaynagar, and Mirsarai) and one urban (Kamalapur) demographic surveillance sites of ICDDR,B conducted in 2009. Information was collected on the current and previous use of tobacco and related products, which included duration and frequency of use. Tobacco-use was divided into smoking and non-smoking. Non-smoking included the use with betel leaf; however, it is a common practice in Bangladesh to use a combination of betel, tobacco leaf, and betel nut.

Results: More than 50% of men (n=13,584), compared to 1% of women (n=25,454), reported smoking at the time of interview. The prevalence of current smoking peaked at the end of the 4th decade and beginning of the 5th decade. The use of smokeless tobacco among women was higher compared to men (28% vs 21%). The results of multivariate analysis showed that male sex, poverty, lower levels of education, and urban residence were all independently and positively associated with the increased prevalence of smoking. Independent predictors of smokeless tobacco consumption were: female sex, increasing age, lower levels of education, poverty, and urban residence.

Conclusion: As confirmed before, smoking is mainly a male vice whereas women dominate in consuming smokeless tobacco. Interventions to reduce or stop smoking should be directed towards the poor, young, and people with lower education, and women should be targeted for prevention of the use of smokeless tobacco products. Reasons for rural-urban variation in the prevalence of smoking should be investigated with the feasibility of implementing proven anti-smoking measures.

Acknowledgements: The primary research was funded by the United Health Group (Grant No. GR00632) as was the participation of Tracey Pérez Koehlmoos, Masuma Akter Khanam, and Wietze Lindeboom who conducted the primary research. Data analysis was supported by the National Institutes of Health Office of the Director, Fogarty International Center through the International Clinical Research Fellows Program at Vanderbilt University (R24 TW007988), and the American Relief and Recovery Act.

010 (211)

Helping to Form Club of Diabetic and Hypertensive Patients for Engaging in Walking and Changing Lifestyle: An Experience from Chakaria

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Background: Diabetes and hypertension are among the 5 leading risks for mortality in the world. The prevalence of diabetes (6.9%) and hypertension (12%) is alarming in Bangladesh and increasing with changing age-structure. Changing lifestyles, taking non-pharmaceutical, biomedical measures may prevent the rapid increase of disease and subsequent risks of mortality. Absence of effective community-based behaviour change intervention in this region warrants a model to be tested.

Objective: Study the possibility of mobilizing people aged 40 years and above to screen for diabetes and hypertension through village health posts (VHPs), unite them under a club/organization to discuss life-experiences, observe behavioural practices, and arrange regular meetings among them.

Methodology: The study has been continuing since December 2009 at Chakaria. There are 7 VHPs established by local community by their own initiatives. Two VHPs are selected where there are 3 (old) wards; one ward selected from each union, and all the households of the ward covered for listing, screening people aged 40 years and above. All belonging to selected age-group in 3,334 households are invited to participate in the screening sessions. Community paramedics and midwives are responsible for measuring blood pressure and fasting blood glucose. The screened persons mobilized to form a club/organization in respective areas. Collaborating with VHPs, regular meetings facilitated to discuss life-experiences, measure blood glucose/pressure, and respond appropriately. Narratives of club meetings are recorded and manually analyzed to identify activities and initiatives taken. Their health behavioural practices have been observed. A format was used for recording blood glucose, blood pressure, and socioeconomic conditions of the participants.

Results: By November 2010, 17 (female 10, male 7) clubs of diabetic and hypertensive patients have been formed. Ninety-nine meetings of these clubs were held. Most meetings discussed about walking and lifestyle modification. All members (n=426) are checking their blood glucose and blood pressure at the meeting, consulting graduate physicians with mobile phones when needed; 46% of club members walk together with fellow members. In total, 3,350 people aged 40 years and above are listed; more than half participated in screening.

Conclusion: It is possible to mobilize the aged people under a common platform for taking collective initiative and work together to reduce the risks of chronic disease condition with meaningful participation through local organizations. More research is needed to observe and link these organizations of aged people to government services.

Acknowledgements: The authors acknowledge the contribution of Kaiyerbil; Shaharbil village health posts and ICDDR,B for supporting the programme.

011 (255)

Rickets: Emerging As a Public-health Problem in Bangladesh

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Background: Rickets is among the most-frequent childhood diseases in many developing countries. The predominant cause is vitamin D deficiency but lack of adequate calcium in the diet may also lead to rickets. The national scenario of such disability in Bangladesh was not known until now.

Objective: Determine the prevalence of rickets in children aged 1-15 years and examine its association with their nutritional status and dietary intakes of calcium and other nutrients.

Methodology: The study is part of the National Rickets Prevalence Survey 2008. A sample of 16,000 children, belonging to all socioeconomic groups of either sex in rural areas and 4,000 children in urban areas were randomly selected from 32 districts of 6 administrative divisions of Bangladesh. The subjects were examined for existence of features of rickets. If features of rickets were present, parents were asked about current and past feeding practices of the child. Additionally, assessment of calcium content in sampled representative foods was done. New cases were identified through case-finding strategy among their family members. The results were analyzed to determine the relationship of rickets with nutritional status of the children.

Results: The national survey showed that the prevalence of rachitic children was 0.99%. Ninety-eight percent of the incidences of rickets were associated with vitamin D deficiency while 47% had association with calcium deficiency. Despite having sufficient sunlight in coastal areas, the highest proportion (76.6%) of rickets was found in Chittagong division. In Moheshkhali upazila, at least one patient in every household was found where houses were completely dark—light could not pass through the houses.

Conclusion: Calcium plays a key role in the formation of healthy bones, and deficiencies of calcium can lead to rickets. According to the results, exposure to sunlight is necessary to activate vitamin D, which is essential for absorption of calcium.

Acknowledgements: The successful completion of the National Rickets Survey was accomplished by the generous contributions of a number of organizations and individuals.

012 (293)

Undiagnosed Diabetes and Pre-diabetes among Adults in Urban Dhaka and Rural Matlab: An Urgent Issue for Intervention

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Background: Diabetes and pre-diabetic conditions (impaired fasting glucose or impaired glucose tolerance) affect a significant proportion of the adult population in developed and developing countries. However, a large proportion of those affected remains undiagnosed for a long time, which has implications for both treatment and prevention.

Objective: Identify diabetes and pre-diabetes in adults aged 20 years and above living in urban and rural settings.

Methodology: The study was conducted in Mirpur, an urban middle-class area in Dhaka and in 2 rural areas of Matlab in Chandpur district. Participants were adult males and females aged 20 years and above. Data were collected using a structured questionnaire. Glucose metabolic status was measured at fasting and 2 hours after the administration of 75-g oral glucose using a HemoCueTM glucometer. Standard cut-off values were used for identifying diabetic and pre-diabetic individuals.

Results: In total, 1,243 individuals—517 from urban Mirpur and 726 from rural Matlab—participated in the study. In both the settings, over two-thirds of the participants were female. The average age was 41 years, and the average body mass index (BMI) was 23 kg/m^2, with the urban participants being heavier than the rural ones (BMI 26 vs 21 kg/m^2 respectively). The prevalence of diabetes was significantly higher among urban than rural participants (12.0% vs 2.7%, $p<0.001$) but no difference was observed between males and females in both the areas. The pre-diabetes rates were also higher in the urban population (19.1% vs 12.7%, $p<0.05$). Urban and rural differences in diabetes and pre-diabetes largely disappeared after adjustment for the BMI. However, the highest prevalence of both diabetes and pre-diabetes was observed in individuals who had high BMI and high waist-circumference combined.

Conclusion: The prevalence of diabetes and pre-diabetes is alarmingly high in urban middle-class population. This unexpected rate of diabetes and pre-diabetes in people who otherwise consider themselves normal and healthy requires immediate attention and should be considered in any diabetes primary prevention programme in Bangladesh. Weight-reduction intervention among overweight individuals needs to be undertaken more intensively for people with abdominal obesity.

Acknowledgments: The study was funded by ICDDR,B which receives unrestricted support from its core donors for operations and research.

01:30 pm–03:00 pm (Venue: Ball Room 1)

Symposium 2: Demand-side financing: placebo or panacea for more equitable access

Speakers

Dr. Shakil Ahmed
Nosal Institute for Global Health, University of Melbourne, Melbourne, Australia

Mr. Prasanta Bhushan Barua
Joint Chief, Health Economics Unit, Ministry of Health and Family Welfare, Dhaka, Bangladesh

Dr. Ubaidur Rob
Senior Associate and Country Director, Reproductive Health Program, Population Council, Dhaka, Bangladesh

01:30 pm–03:00 pm (Venue: Ball Room 2) 013 (073)

Scientific Session 3: Experience in financing universal health coverage in Asia and Bangladesh

Willingness-to-pay for Health Insurance among the Urban Poor: Evidence from Mumbai Slum in India

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Background: The urban populations in cities are not a homogeneous group and suffer from inequality in income. The urban poor population in cities forms a vulnerable group due to interaction of their social, economic and environmental factors together, and these conditions make them fall into the trap of ill-health, leading to catastrophic expenditure and impoverishments. In absence of any subsidized scheme to cover the population, it is imperative to know their willingness-to-pay (WTP) for a health-insurance scheme to cover for them as a protective mechanism and prevent falling in trap of impoverishments.

Objective: Assess the demand for health insurance, gather evidence of willingness of the 'urban poor' to join insurance scheme, and explore various other factors that determine their willingness.

Methodology: The chosen study area was a slum in Navi Mumbai. Multistage sampling was used for identifying 300 households and 1,502 individuals. Data were collected regarding socioeconomic profile, morbidity profile, healthcare expenditure of households and sources of healthcare financing, and the WTP among households. For the estimation of WTP, guidelines and methodology of contingent evaluation were used, and double dichotomous choice elicitation was used for estimating the willingness. The benefit scheme offered was adapted from the Rashtriya Swasthya Bima Yojana (RSBY, a benefit scheme for families at below-poverty line). Data collected were subjected to bivariate and multivariate analyses using the SPSS software (version 15).

Results: The demand for insurance was expressed by one-third of the population. Results of multivariate regression model showed that households with prior experience of inpatient admissions ($p<0.001$) were more likely to join the insurance scheme than who had not experienced any hospitalization. The presence of morbid conditions also affected the household significantly. Within the urban poor, the better-off households expressed higher willingness ($p<0.1$). The need for insurance was also influenced by self-rated health status of the household ($p<0.1$) as people who rated their health as good or fair and relatively free from diseases were less likely to join the scheme.

Conclusion: The results indicate a need for a state-subsidized insurance scheme as only 60% of the people expressing their willingness to join said that they have the capacity to purchase such a scheme whereas the remaining 40% were willing but incapacitated to pay. These outcomes strengthen the fact that a large number of willing households cannot join the scheme due to financial crunches.

014 (083)

Good Health at Low Cost 2010—Bangladesh Scenario: What Factors within Health Systems and the Wider Context Promote Better Health Outcomes towards Universal Coverage?

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Background: In 1985, the Rockefeller Foundation published a seminal study titled "Good Health at Low Cost", identifying the importance of factors outside the health system, such as political mobilization, female empowerment, literacy, and strong leadership by governments, in addition to the recognized role of social and economic development. Twenty-five years on, a team led by the London School of Hygiene & Tropical Medicine has revisited this concept, in partnership with a team from Bangladesh and 4 other countries.

Objective: Examine the factors relating to the development and relative success of the health system (implementation of primary healthcare, coverage by key interventions, etc.) and to other sectors (education, gender, community development, etc.) and broader economic and political factors with a particular interest in the relationship between health systems and other factors (economic, political, governance, etc.) in promoting good health in Bangladesh.

Methodology: Using a triangulation of a systematic search of literature, key-informant interviews, and focus-group discussions, a case study of the development and major achievements in health and population in Bangladesh from the end of the War of Liberation through November 2010 was designed.

Results: Three overarching themes emerged: (a) Political commitment to health in Bangladesh has transcended the transition of political parties; (b) Community health workers have played an important role in bringing innovative, low-cost, low-technology healthcare to the people; and (c) The non-state sector has played a key role in innovation and outreach. Bangladesh has experienced dramatic improvements in child health, life expectancy, and maternal mortality. Bangladesh has been a leader in adopting innovative policies and approaches to health service-delivery to include the adoption of the pharmaceutical policy, the widespread scale-up of oral rehydration solution and the implementation of using community health workers in family planning and health. There have also been successful efforts to improve female literacy and implement linked microfinance and health programmes that have enhanced access to care for poor populations and reduced financial and information barriers to care.

Conclusion: Achievement of universal health coverage will require concerted regulatory and political efforts and implementing multifaceted solutions, especially as the country deals with urbanization, increasing burden of non-communicable diseases, and climate change.

Acknowledgements: The authors acknowledge the funding and support of the Rockefeller Foundation and of the London School of Hygiene & Tropical Medicine.

015 (173)

Out-of-pocket Payments for Health Services in Rural Bangladesh

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Background: Out-of-pocket payments (OPPs) severely affect the consumption of poor households during major illnesses. The coping mechanisms have also implications. There is little research on the level, determinants, and coping mechanisms of OPPs in Bangladesh.

Objective: Estimate the level, determinants, and coping mechanisms of OPPs in Bangladesh.

Methodology: Data from a survey conducted on 4,011 stratified randomly-selected households from 120 villages were used. Data regarding OPPs on consultations, drugs, diagnostic tests, surgical operations, bed charge, and related aspects were collected for all the diseased persons in the household during the last 12 months preceding the survey. Information on the coping mechanisms of OPPs was also sought. Catastrophic payments were defined when OPP exceeded 10% of total consumption. In the multivariate analysis, logit models were specified, and *svy* family of commands in the Stata software was used.

Results: The total OPP per household for the last 12 months was Tk 4,374, which was about 5% of total household consumption and 11% of food consumption. Drugs accounted for about 60% of direct OPP. Although absolute OPP showed a definite progressive trend across the expenditure quintiles, its share against total household consumption showed a regressive trend. About one-third of the households incurred catastrophic payments, and there was a regressive trend. The incidence of catastrophic payments was likely to increase with the severity of disease and decrease with increase in ability to pay and total number of formal care providers in the village. Inpatient care was more likely to increase the incidence of catastrophic payments, and acute conditions were less likely. In addition, visiting a formal healthcare provider was more likely to give rise to the incidence of catastrophic payments. About 34% of the households financed OPPs for inpatient care from expensive sources, such as borrowing and asset depletion. There was a significantly higher reliance on these sources in financing catastrophic payments.

Conclusions: Given the importance of high incidence of catastrophic payments and the use of expensive sources for financing OPPs for inpatient care by a large proportion of households, Bangladesh needs some innovative ways such as micro-health insurance to raise funds to provide healthcare in rural areas.

Acknowledgements: The authors are grateful to DFID's PROSPER (Promoting Financial Services for Poverty Reduction Program) project for providing funds for the study.

016 (229)

Is Resource Allocation in Health a Priority in Low-income Countries: An Econometric Analysis of National Health Accounts 2010

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Background: It is theoretically expected that the expenditure on health increases with higher income. National Health Accounts (NHA) 2010 has accumulated data on health expenditure of 193 countries. Expenditure for private healthcare is generally higher than that for healthcare in the government facilities in low-income countries. Expenditure for private care is mostly made through out-of-pocket payments. Secondary data from the NHA give opportunity to analyze the relationship between economic growth and health-related expenditure in the country level, disaggregated into government and private sources.

Objective: Analyze if economic growth can explain changes in health-related expenditure for government and private healthcare to understand if resource allocation in health is a priority in low-income countries.

Methodology: Total health-related expenditure as a percentage of gross domestic product (GDP), disaggregated into government and private sources, was predicted by GDP growth. Multiple regression analysis was employed using fixed and random-effect models. The regression models control for variations in demographic structure (proportion of female and people at 65 years of age and above in total population), economic level (GDP per capita), urbanization (proportion of people living in urban areas), economic openness (trade as a percentage of GDP), and health (life-expectancy) of the countries. Unbalanced panel-data on health-related expenditure from 37 low-income countries over the 1995-2008 period were used. Data on control variables were taken from the World Development Indicators database of the World Bank.

Results: Total health-related expenditure as a percentage of GDP in low-income countries ranged from 1.69% to 13.9%, with a mean of 5.19%. The mean expenditure for private care (3.04%) was higher than expenditure for care in government facilities (2.15%). About 82% of health-related expenditure for private care was made through out-of-pocket payment. Both fixed and random-effect models showed that GDP growth did not have any significant impact on total health-related expenditure as a percentage of GDP. Disaggregated health-related expenditure in government and private sources showed that GDP growth did not influence expenditure for government healthcare but it influenced expenditure for private healthcare significantly and positively at 1% risk level. It implies that expenditure for private healthcare increased with increased economic growth.

Conclusion: The governments in low-income countries generally do not prioritize resource allocation to the health sector in connection with economic betterment of the country. However, with higher economic growth, citizens privately allocate more resources to their healthcare.

017 (238)

Experiences of and Cost-recovery by User-fees and Micro-health Insurance Schemes in Bangladesh

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Background: The gap between the existing and the required level of financing in Bangladesh is crucial for ensuring effective provision of services, thereby improving the performance in the existing health sector. In developing countries, two most important alternative financing methods are user-fees and micro-health insurance schemes (MHISs). Both the approaches have been tried in Bangladesh since the 1980s.

Objective: Examine the performance of these alternative financing models in Bangladesh and assess the determinants of willingness to pay for healthcare.

Methodology: An extensive literature review was conducted to analyze the financing models used by the Government and not-for-profit private organizations with user-fees and MHISs. The study conducted key-informant interviews to examine the existing programmes. The study also used dataset, including information on 2,400 respondents collected in 1999 under the Thana Functional Improvement Pilot Project (TFIPP), to assess perceptions of clients regarding the cost-recovery schemes.

Results: Experience with the cost-recovery schemes has been mixed. The operating cost-recovery rate of the NGOs under the National Strategic Development Plan (NSDP) ranged from 10% to 30%. There was less than 15% cost-recovery under the TFIPP. However, the cost-recovery under the MHISs was considerably higher, ranging from 50% to 90% of the variable costs. Micro-health insurance is a relatively new concept, and the implemented models are a mixture of social equity, service provision, and financing with some sort of risk pooling. Most members of the health-insurance schemes are also members of micro-credit programmes, and it could be an important reason for higher cost-recovery under the MHIS. Willingness to pay user-fees was positively associated with economic status, education, and perceived quality of care. A significant proportion of clients felt that the cost-recovery scheme would not adversely affect the use of healthcare.

Conclusion: Both user-fees and MHISs have been somewhat successful in generating revenue in the health sector. Effective execution of these models linking both public and not-for-profit private sectors will enhance efficiency, improve quality, and reduce financial burden of the Government of Bangladesh.

018 (113)

Universal Health Coverage in Six Asian Countries: A Review of Two Key Health Financing Strategies

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Background: The World Health Report 2010—Health Systems Financing: The Path to Universal Coverage—and the Health Financing Strategy for the Asia-Pacific Region (2010-2015) of the World Health Organization (WHO) identified universal coverage as the most important objective in health systems financing. Increasing the use of pre-payment schemes and raising sufficient resources for healthcare have been proposed as key health financing strategies on the path to universal health coverage.

Objective: Assess the health financing strategies in 6 Asian countries—Cambodia, China, Lao, Mongolia, the Philippines, and Viet Nam—and identify key health financing policy issues for universal coverage.

Methodology: The review is based on secondary analysis of health-expenditure data using reports and databases from the WHO, the World Bank, the Asian Development Bank, the International Monetary Fund, and the results of a preliminary survey carried out in preparation for drafting the Asia-Pacific Health Financing Strategy (2010-2015).

Results: While there are national differences, progress in improving the composition of health financing has been relatively modest in all the 6 countries. Total health expenditure (THE) is more than the targeted 5% of gross domestic product (GDP) only in Cambodia, Mongolia, and Viet Nam. Five of the countries have limited government funding for health and experience out-of-pocket payments greater than 30% of THE; only Mongolia (30.3%) has achieved the target. In Cambodia and Laos, external sources of funding are high (66% of government budget in Laos and 54% in Cambodia in 2007). With the highest level of public financing (69% of THE), Mongolia is furthest along the path to universal coverage.

Conclusion: The findings, which serve as a baseline for designing a strategy to move along the path to universal coverage, are used for generating recommendations for action by country health financing policy-makers. Health financing strategies have been proposed for each country to reach the proposed targets of raising public financing to at least 5% of GDP, reducing dependence on donor funding, and reducing out-of-pocket payments to no more than 30% of THE in line with global data, suggesting that these achievements are essential for advancing towards universal health coverage.

Acknowledgements: The support received from Ministries of Health, Ministries of Finance, WHO Country Offices, and WHO Regional Offices is acknowledged.

01:30 pm–03:00 pm (Venue: Ball Room 3) 019 (018)

Scientific Session 4: Reproductive and newborn health

Recognition of and Response to Birth Asphyxia during Delivery at Home in Matlab, Bangladesh

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Background: Addressing high neonatal mortality is considered a priority action to achieve the target of Millennium Development Goals (MDGs). Globally, 29% of all neonatal deaths are caused by birth asphyxia while the proportion is 21% in Bangladesh. ICDDR,B is implementing a maternal, neonatal and child health (MNCH) programme in Matlab since 1987. Home-based life-saving skills (HBLSS) have been added to the programme in 2007. Although facility-based delivery is increasing in the ICDDR,B service area in Matlab, 40% of births still take place at home by traditional birth attendants (TBAs) and relatives who might not have requisite skills to diagnose and manage (or refer) birth asphyxia cases.

Objective: Explore how women, family members, and TBAs recognize and respond to birth asphyxia in home-settings.

Methodology: The study was conducted in the ICDDR,B service area in Matlab, Bangladesh, during September-December 2008 with 6 birth asphyxia cases where deliveries at home were done during June 2007–October 2008. Six group discussions were organized with mothers, family members, and birth attendants using qualitative guidelines to elicit the cases.

Results: Usual responses by the respondents included stimulation, wiping the body, mouth-to-mouth breathing, placenta soaking, placenta fomentation, shaking the baby, seeking care (from formal or informal care provider), pouring water on baby's body/head, wrapping the baby, and pouring water on baby's navel (bellybutton). All the 6 cases received modern treatment that they learned from training on HBLSS while 3 cases received traditional care, in addition to modern treatment. The care-givers failed to adhere to modern treatment due to their firm belief in traditional treatment. The respondents mentioned the following signs and symptoms of birth asphyxia: no cry, no movement, no breath, colour change, eye closed, lethargy, unconsciousness, and coldness of body. The perceived causes of birth asphyxia were evil spirit, prolonged labour, big head/baby, and intrauterine trauma.

Conclusion: Traditional beliefs and practices are firm and strong that is difficult to give up by home-based caregivers. They believe that both medical and non-medical practices have some appropriateness for recovering from birth asphyxia; they also believe that both medical and non-medical causes are responsible for birth asphyxia.

Acknowledgements: The authors thank the Global Health Institute of Emory University for funding the study.

020 (072)

Labour Events and Breastfeeding Initiation in Rural Bangladesh as Recorded by Families in Home-based Delivery Cards

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Background: In rural Bangladesh, the majority of births take place in the home often without the help of trained birth attendants or health professionals. Collecting accurate information about delivery-related complications and breastfeeding initiation is challenging.

Objective: Describe labour events based on information recorded by family members at the time of delivery.

Methodology: In rural northwestern Bangladesh, data on labour events were collected from participants of a large, community-based, maternal vitamin A and beta-carotene trial (JiVitA-1, 2001 to 2007). Participants received a home-based delivery card (HDC) at 28-week gestation to be completed by a literate family member with access to a timepiece present at the time of birth. Similar birth-related information was collected by recall during a 3-month postpartum maternal interview. These cards were collected, processed, and analyzed for completion, data-quality, and timing/spacing of key intrapartum events. The JiVitA study was approved by the Bangladesh Medical Research Council and the Institutional Review Board at the Johns Hopkins Bloomberg School of Public Health, USA.

Results: Data being presented will cover description of labour events, including duration of labour, time from the water-breaking until birth, time until the placenta came out, and length of time from delivery to initiation of breastfeeding, as reported on the HDC. Maternal and socioeconomic characteristics associated with completion of the card will also be examined.

Conclusion: When completed, an HDC may provide valuable labour and delivery-related information, difficult to collect by recall, as a resource for healthcare providers or research activities. Furthermore, this type of a tool, in combination with a partogram, may be useful to develop novel strategies to prevent adverse pregnancy outcomes.

Acknowledgements: Support from by the Bill & Melinda Gates Foundation and the US Agency for International Development (USAID), is acknowledged.

021 (154)

Scaling up of Public-Private Mix DOTS: BRAC Experience in Tuberculosis Control

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Background: BRAC, in collaboration with the National TB Control Programme (NTP), has been covering a population of approximately 91 million. To strengthen the NTP, BRAC has been engaging different care providers to enhance the TB control programme. The recommended public-private mix (PPM) strategy of the World Health Organization is implemented to link the resources of public and private healthcare providers to achieve targets of the national TB control strategy.

Objective: Establish a mechanism for strengthening collaboration between the NTP and the public and private sectors, such as private practitioners, internees of medical colleges, private hospitals and clinics, non-graduate medical practitioners, e.g. village doctors, pharmacists for increasing referral of TB suspects, raising awareness on TB, and provision of DOTS.

Methodology: With the support of NTP, BRAC conducted orientation on TB for registered private practitioners, internee doctors, non-graduate private practitioners, such as village doctors and drug-sellers at pharmacies, as they are the first point of contact by suspects in the community in different areas. Graduate doctors diagnose cases and refer to DOTS centres. Non-graduate care providers refer cases for diagnosis and to counsel patients, and some of them also act as DOTS providers. The case-finding reporting format with referral information was introduced in January 2010.

Results: During July 2009–June 2010, 14,377 village doctors, 633 internee doctors, 763 pharmacists, and 182 graduate doctors were oriented on TB. During January-September 2010, 4,799 (5%) TB patients were referred by the village doctors, 1,975 (2%) by other non-graduate medical care providers, 8,283 by the government hospitals (9%), and 3,2063 (34%) by the graduate private practitioners.

Conclusion: The involvement of all care providers enhanced the TB case detection and outcome. Scaling up of public-private mix activities is needed through compliance with the national guidelines. Successes achieved are to be sustained through the partnership approach. Resource mobilization, human resources, and capacity-building are crucial to sustain and scale up the PPM approach. Strengthening the linkage and regular follow-up mechanism between public and private medical care providers is essential in PPM DOTS intervention.

Acknowledgements: The support of GFATM and NTP is acknowledged.

022 (193)

Near-miss Maternal Death in Comprehensive Emergency Obstetric Care Facility in Bangladesh

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Background: Near-miss maternal death is defined as a woman who nearly died but survived a complication during pregnancy. These cases are much more common than maternal deaths. These women can help understand the conditions and preventable factors that contribute to the burden of maternal death.

Objective: Describe the implementation and initial results of pilot monitoring near-miss maternal death in the busy low-resource comprehensive emergency obstetric care setting in rural Bangladesh.

Methodology: Diagnosis of near-miss death is made by a discharging obstetric physician. Criteria were defined, including disease, intervention, and organ system dysfunction to diagnose near-miss death. Selected cases were presented at the monthly perinatal mortality meetings to discover learning points to improve clinical management by the hospital team.

Results: During January 2009–August 2010, 6,148 women were admitted to the obstetric department and 944 women to the gynaecology department of the LAMB Hospital, a rural general hospital. In the obstetric department, 5,095 mothers delivered, with a caesarean section rate of 25%. From these total 7,092 patients, 106 (1.5%) near-miss maternal deaths were identified, a rate of 20.8 near-miss deaths per 1,000 deliveries. There were 21 maternal deaths in the unit over the same period. The maternal death to near-miss death ratio was 1:5. Leading causes of near-miss deaths were hypovolaemic shock (46%), severe anaemia (10%), septic abortion (5.7%), coma (3.8%), and septic shock (3.8%).

Conclusion: Including near-miss maternal death audit in existing perinatal and maternal death audit meeting can significantly contribute to the learning of clinical case management. Understanding common criteria that diagnosed near-miss death can refocus healthcare priorities in the limited-resource setting.

023 (245)

Evaluation of a Home-based Life-saving Skill Programme in Rural Bangladesh

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Background: Millennium Development Goal 5 was set for three-fourth reduction of maternal mortality by 2015. However, it is difficult to achieve in Bangladesh. Birth-preparedness and complication readiness (BPCR) during pregnancy and around delivery can play an important role to avert numbers of maternal deaths. Home-based life-saving skill is a new component (based on BPCR) introduced in the ICDDR,B research area which can deal with this.

Objective: Evaluate the home-based life-saving skills (HBLSS) programme at rural Matlab, Bangladesh.

Methodology: The study was conducted in rural Matlab, Bangladesh where ICDDR,B has been providing basic maternal, child health and family-planning (MCH-FP) services since 1977. MCH-FP services were redesigned to a new maternal, neonatal and child health programme that was initiated in March 2007 to reduce high maternal and neonatal mortality prevailing in the area. Under this programme, a new component—HBLSS—was added to strengthen the current services. The HBLSS is a community-based, family-centred programme developed with the aim of reducing maternal and newborn deaths. This is done through a participatory, skill-based approach to BPCR. The community health research workers (CHRWs) conduct 4 scheduled sessions for each pregnant woman, along with their supporting persons in CHRW houses. In this analysis, 5,303 pregnant women, who delivered during 2008-2009 in the study area, were included.

Results: The coverage of HBLSS among those who attended all the 4 sessions from 1 through 4 were 78% (4,117 of 5,303), 79% (4,196 of 5,303), 83% (4,394 of 5,303), and 81% (4,275 of 5,303) respectively. The adjusted perinatal death rate was 40% [odds ratio (OR)=0.60, 95% confidence interval (CI) 0.41-0.88] and 65% less (OR=0.35, 95% CI 0.25-0.49) among pregnant women who attended the HBLSS session 3 and 4 training on birth asphyxia and postpartum haemorrhage (recognition and response) respectively compared to those who did not attend these sessions. Moreover, they were 43% (OR=0.57, 95% CI 0.34-0.95) and 64% (OR=0.36, 95% CI 0.22-0.58) less likely to experience a neonatal death during the time of the intervention respectively than whose who did not attend the sessions, after adjustment of potential confounders.

Conclusion: The programme should continue HBLSS-3 and HBLSS-4 training sessions in the study area and also look for scaling it up in other parts of the country.

Acknowledgements: The study was funded by ICDDR,B core fund.

024 (273)

Protecting Women Who Deliver at Home from Postpartum Haemorrhage: Use of Clean Delivery-kits in Northwestern Bangladesh

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Background: New strategies to prevent postpartum haemorrhage (PPH) for women who deliver at home are urgently needed in low-resource settings. Adding misoprostol and a blood-collection mat to clean delivery-kits (CDKs) and distributing these during antenatal care (ANC) and through trained traditional birth attendants (TTBAs) has the potential to reach women who deliver at home in Bangladesh.

Objective: Assess the feasibility, safety, programme effectiveness, and acceptability of adding misoprostol and blood-collection mat to the CDK currently distributed by RDRS Bangladesh by community health workers (CHWs) at ANC visits among women for use at home-births if they cannot visit a health facility for delivery or at delivery with a TTBA.

Methodology: A study was conducted during May 2009-September 2010 in 29 upazilas where RDRS runs a reproductive health programme. The CHWs conducted community meetings on birth preparedness and PPH awareness. During routine ANC, the CHWs emphasized delivery in the facility but also educated women on using misoprostol for PPH prevention, and they dispensed CDKs, including misoprostol and mat to women at >32 weeks gestation. The TTBAs were trained to distribute CDKs to women at delivery, assist women in taking misoprostol, and measure blood loss with the mat. Postpartum interviews were conducted with every 20th woman enrolled to collect information on delivery outcome and women's perspectives on misoprostol.

Results: In total, 118,594 women enrolled in the study, and 3,097 interviews were conducted. Over half (59%) of the enrolled women received a CDK with misoprostol. Most (85%) women who received a CDK used misoprostol at delivery. In total, 112 maternal deaths were reported during the project, translating to an estimated maternal mortality ratio of 137 per 100,000 livebirths—much lower than the national figure of 338 per 100,000 livebirths reported in 2008.

Conclusion: The study demonstrated that distribution of misoprostol to pregnant women by CHWs during ANC and by TTBAs at delivery was safe, feasible, and effective to prevent PPH at home-deliveries. Policy-makers should scale up misoprostol distribution through community-level channels, such as CHWs and TTBAs, to reach women who deliver at home with this life-saving technology.

Acknowledgements: Venture Strategies Innovations funded the study.

03:30 pm–05:00 pm (Venue: Ball Room 1) 025 (019)

Scientific Session 5: Mobilizing human resources for universal health coverage

Improving the Use of Emergency Obstetric Care Services in Narsingdi, Bangladesh

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Background: The 5-year safe motherhood pilot project in Narsingdi is designed to improve the accessibility and use of emergency obstetric care (EmOC) services through the government health facility and community-level interventions. The hospital interventions include needs assessment, minor renovation, supply and maintenance of equipment, and capacity-building of staff for quality EmOC services at 8 hospitals. The community-based interventions include development of intervention plans in 9 selected unions and community support system, involvement of local government, and social and community mobilization.

Objective: Evaluate the effectiveness of interventions on the use of EmOC services and progress in the EmOC process indicators.

Methodology: Data from 2006 to 2009 on the number of deliveries, obstetric complications, caesarean sections, and maternal deaths were collected from all the government EmOC hospitals of Narsingdi and from 3 neighbouring districts. The population-size of the districts was taken from the Civil Surgeon's Office. The number of births in the district was estimated based on the national crude birth rate. Data were analyzed to determine the trend in the use of services and UN process indicators. The trends were compared between 2006 and 2009.

Results: Of the 8 facilities, 6 were providing comprehensive and 2 basic EmOC services in 2009 compared to 3 comprehensive and 4 basic facilities in 2006. The use of EmOC services increased in 2009 for delivery (2.5-fold), complications (4.7-fold), and cesaerian-sections (7.2-fold) compared to 2006 and 3 neighbouring districts. The proportion of all expected births at the EmOC facilities, met need, and caesarian section rate of all expected births were 7.4%, 26.6%, and 2.1% respectively while the case-fatality rate was 0.2% in 2009.

Conclusion: Facility, along with community-based interventions, is more effective for improving the use of EmOC services and could be considered an effective model for the improvement of process indicators, leading to the reduction in maternal mortality.

Acknowledgements: The authors thank JICA for funding the study.

026 (049)

Universal Coverage and Payment to Care Providers: Experience from Thailand

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Background: Thailand has been achieving the universal coverage for healthcare under a national policy for Thai people under the slogan "30 Baht to cure every disease" in 2002.

Objective: Overview the process of universal coverage and healthcare payment to providers, in terms of the reform contents, the universal coverage system design, implementing, and challenges.

Methodology: Mixed research methods were applied, including review of literature and analysis of secondary data from the National Health Security Office (NHSO).

Results: The coverage of the health security system has increased to 99% of the population in 2010. The social protection is divided into 3 main schemes: (a) Civil Servant Medical Benefit Scheme, covering 7% of the population, (b) Social Security Scheme for private employees, covering 15% of the population, and (c) Universal Coverage Scheme for all other Thai people, covering 75% of the population. As a result, the public-health protection schemes now cover most Thai citizens. The use of healthcare has increased for both outpatient and inpatient services. A series of satisfaction surveys conducted by research institutions showed that most eligible people were satisfied with services. A survey conducted by the National Statistic Office, together with academic institutions, showed that Thai households were protected from spending on catastrophic illness. Different payment mechanisms were used for specific types of services. Capitations were used for outpatient care and prevention and promotion services. Inpatient services were reimbursed using the case-mixed system with ceiling. Other reimbursed expenditure based on capital-replacement cost in contracted hospitals, pay per performance, etc. All-provider payment was close-end system which could control the budget and manage efficiency.

Conclusion: Thailand extended the public insurance coverage to all uninsured people, achieved the universal health coverage, and helped the impoverished people gain access to health services. Also, Thailand has shown that the provider payment system improves healthcare service more efficiency.

Acknowledgements: Contributions of various partners—IHPP, HSRI, and MoPH—are acknowledged.

027 (079)

Voice and Accountability of Maternal, Neonatal and Child Health Committee in Rural Settings of Bangladesh

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Background: The voice and accountability of both community members and health service staff are important to improve health services. To ensure community participation, BRAC, a leading non-government organization, introduced a committee in 2005 under the maternal, neonatal and child health (MNCH) programme. The main responsibilities of these committees were to raise awareness about MNCH healthcare services in the community and local hospitals and motivate community members to use improved healthcare services.

Objective: Explore how the MNCH committee encouraged community participation and how its communication activities empowered the community people to ensure the healthcare needs of the poor and disadvantaged people.

Methodology: A range of qualitative method was used in the study. In-depth interviews with committee members, focus-group discussions with community people, informal discussion with MNCH care providers, and observation of one committee meeting were conducted in 2 sub-districts of Nilphamari and Mymensingh districts of Bangladesh during February-April 2010. Respondents were asked about composition of committee, activities, participation, strength, and weakness of the committee. Thematic content analysis technique was followed.

Results: Committee members took necessary steps to solve the maternal complication by referral, follow-up of referred cases, and providing financial support to the extreme poor if needed, and the committee helped increase the availability of healthcare service providers and improve the nature of services accessible to the community people. However, the capacity of the committees to raise the voice of poor people was fairly limited due to lack of adequate orientation of the committee members and also for lack of publicity about their roles. Besides, the committee could not run properly due to disagreement between power and literacy among the committee members.

Conclusion: The MNCH committee has potential as it allowed the people's voice and could, thus, serve as a pathway through which ordinary people could hold local health authorities and local service providers to account. The findings informed the further development of an enabling environment in which the voices of MNCH committee members and community people would be stronger.

Acknowledgements: The authors thank UNICEF, DFID, the Royal Netherlands Embassy (RNE), and AusAID for financial support to the project.

028 (138)

Improving Maternal Health through Community-based Intervention in Bangladesh

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Background: Bangladesh is distinct among developing countries in achieving Millennium Development Goal (MDG) 5 despite the very low (18%) use of skilled care at delivery. Results of studies showed that community-based interventions could be an effective approach to achieve the desired results for MDG 5 by 2015. ICDDR,B, in collaboration with the Ministry of Health and Family Welfare and other stakeholders in Bangladesh, has initiated a project in this endeavour.

Objective: Describe the major findings from the baseline assessment of the project area to understand the care-seeking patterns and complications during pregnancy, delivery, and postpartum period, along with recommendations for strengthening the intervention to ensure its contribution to universal coverage of maternal health interventions.

Methodology: A community-based survey was conducted among 3,158 women who delivered in the past 6 months before the date of interview in Shahjadpur subdistrict during November 2008–January 2009.

Results: In Shahjadpur subdistrict, the rate of facility delivery was 17.3%, and skilled attendance at home-delivery was 8.7%. The rich-poor disparity was more pronounced in the use of skilled care at delivery (44% vs 16%) and caesarean section (17% vs 2%). Nearly one-third (31.4%) of the mothers experienced having symptoms of severe obstetric complications during antepartum, intrapartum and postpartum periods, and 44.5% of these women sought care for such complications. Under the current project, initiatives have been taken to ensure one community skilled birth attendant (CSBA) for ~10,000 people, training the CSBAs on management of haemorrhage (misoprostol for home-delivery) and eclampsia (administration of $MgSO_4$) and on appropriate referral to health facilities. After training (by December 2009), 32 new CSBAs of NGOs were deployed in their locality to work with the 30 existing government CSBAs to deliver home-based basic obstetric and essential newborn care. These 62 CSBAs, covering the entire subdistrict, will contribute to providing quality maternal and neonatal health services.

Conclusion: There is a gap in access to skilled attendence at delivery and effective emergency obstetric care. The performance of the health system to address the need for universal coverage of maternal health interventions to achieve MDG 5 in Bangladesh after the community-based interventions need to be assessed before scale-up.

Acknowledgements: The study was funded by AusAID.

029 (208)

Community-Government Cooperation to Provide 24-hour Obstetric Services in Health Facilities

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Background: The Ministry of Health and Family Welfare, Government of Bangladesh, maintains an excellent infrastructure of rural clinic buildings but staffing of these clinics is less consistent. Provision of 24-hour obstetric care in these facilities requires adequately-committed and trained staff and community awareness of the strengths and limitations of such services. LAMB, an integrated rural health and development NGO in northwest Bangladesh, has facilitated the development of a community-government partnership to support 24-hour obstetric services.

Objective: Describe history and current situation of a community-government partnership facilitated by a small international NGO.

Methodology: This case study illustrates facilitation of a pilot working group to support a Government of Bangladesh-NGO partnership designed to overcome barriers to the provision of 24-hour obstetric services under government management in one rural union of Badarganj upazila in Rangpur district of Bangladesh. Information from document reviews and material for an annual general meeting of December 2010 assessed strengths and weaknesses of the community-government partnership.

Results: The Modhupur Task Force was established in 2008, bringing together representatives of a health-related community-based organization (CBO, that received advocacy training and included local informal practitioners as members) and local subdistrict health officials, facilitated by LAMB health system managers. The largest barrier to 24-hour obstetric services was confident midwifery staff. The CBO directly worked with LAMB to employ and supervise a trained nurse-midwife to provide on-site 24-hour delivery service with antenatal and postpartum care in the Union Health and Family Welfare Centre alongside the government family welfare visitor (FWV). Service quality and usage were monitored by the NGO and government staff and were regularly reported to the CBO.

Conclusion: A technically-qualified NGO can provide supportive supervision to the government clinic based on local relationships among relevant staff. However, this is only possible when community members are directly involved in holding authorities accountable for provision of delivery services. The local CBO was able, through advocacy training, to press their desire for obstetric services to the government facility. So, a 'three-legged stool' of community members (including informal medical practitioners), authorities, and outside facilitation (NGO) is necessary to achieve an improved health system.

Acknowledgements: LAMB's community work in Modhupur was supported by DFID and LAMB Heath Care Foundation, UK.

030 (219)

Achieving Universal Coverage of Maternal, Newborn and Child Health through Building Public-Private Partnerships in a High-mortality District: Findings from a Baseline Survey in Netrokona, Bangladesh

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Background: A five-year child-survival project—SUSOMA—has been undertaken in 2 subdistricts of Netrokona to implement an innovative 'People's Institution' (PI) model to help communities form independent, self-sustaining community-based organizations (CBOs). The PI model will build sustainable public-private partnerships to increase the coverage of evidence-based interventions and will reduce maternal, newborn and childhood morbidity and mortality especially among the most marginalized populations.

Objective: Explore the baseline coverage of selected maternal, newborn and child-health indicators in the study area to help plan the implementation of interventions.

Methodology: A quasi-experimental design was planned, and 20 clusters from 2 intervention upazilas and 20 clusters from nearby 2 comparison upazilas were selected. In total, 4,088 households were surveyed from February to May 2010. The respondents were women who had a birth in the 2 years preceding the survey.

Results: The study found a higher national coverage for tetanus toxoid (68% vs 60%), exclusive breastfeeding (48% vs 42%), early initiation of breastfeeding (53% vs 43%), and measles immunization (90% vs 77%). Lower than national averages were found for antenatal care (39% vs 52%), skilled birth attendant at delivery (11% vs 18%), postnatal care for mothers (10% vs 21%), and essential newborn care. The use of oral rehydration therapy for diarrhoea in children was lower than national averages (51% vs 77%). Inequalities were observed in appropriate healthcare-seeking by wealth and education of mothers.

Conclusion: The baseline survey identified areas that need careful attention by the SUSOMA project to overcome the implementation bottlenecks. Learning from the interventions that have reached a high coverage in such high mortality areas, e.g. immunization and childhood feeding, will be important to improve the coverage of other interventions. Improving the linkage between government services and the community, improving the quality of services and referral linkages, and encouraging appropriate healthcare-seeking are priority ways to achieve the universal coverage.

Acknowledgements: The study was funded by the Christian Reformed World Relief Committee through USAID.

03:30 pm–05:00 pm (Venue: Ball Room 2)

Symposium 3: Round Table on micro-insurance in Bangladesh: prospects and challenges

Speakers

Building micro-insurance capacity in Bangladesh
Dr. Atiqun Nabi
INAFI Asia and Bangladesh

Micro health insurance: scale, delivery, and regulatory challenges
Professor Syed M. Ahsan
Team Leader, Microinsurance, Institute of Microfinace (InM), Dhaka, Bangladesh

Employer-based insurance opportunities
Dr. Shaikh Ahmed
World Bank, Dhaka, Bangladesh

Experience of PKSF on micro-insurance in Bangladesh
Dr. Fazlul Kader
General Manager (Operation), PKSF, Dhaka, Bangladesh

Experience of Delta-Life insurance as a commercial health insurance in Bangladesh
Dr. Ashraf Uddin
Executive Vice President, Delta-Life Insurance Company Limited, Dhaka, Bangladesh

Experience of SAJIDA Foundation as a health insurance provider in Bangladesh
Dr. Shamsher Ali
Advisor (Development programme), SAJIDA Foundation, Dhaka, Bangladesh

Experience of Gono Shasthya Kendra on micro health insurance in Bangladesh
Dr. Manjur Kader
Senior Director, Health Programme, Gono Shasthya Kendra, Dhaka, Bangladesh

The role of the public sector in healthcare financing for the informal sector: an innovative micro-insurance scheme for rickshaw-pullers in Rajshahi
Mr. Asheque Parvez
Senior Advisor, GIZ, Dhaka, Bangladesh

03:30 pm–05:00 pm (Venue: Ball Room 2) 031 (025)

Scientific Session 6: Infectious diseases and the environment

Lead Poisoning in Young Children in Bangladesh: Need for Educational Intervention

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Background: Since the adoption of a policy to ban the sale of leaded gasoline in Bangladesh in 1999, data are limited to assess the risk of lead poisoning among young children; furthermore, data regarding this problem are nearly non-existent from rural Bangladesh.

Objective: Determine the extent of the problem due to elevated blood lead level (BLL) problem among school and preschool children in urban Dhaka and one rural area in Bangladesh and correlate BLLs with sociodemographic and anthropometric measurements to assess risk factors.

Methodology: A cross-sectional study was conducted among 919 children, recruited from 6 urban locations in Dhaka and one rural area of Chirirbandar, Dinajpur, from September 2007 to July 2009. The independent variables included age, gender, income, body mass index (BMI), haemoglobin, and iron. Possible sources of lead poisoning in children investigated in the study included type of house, proximity from highways and industries, use of pesticides, water source, type of water-tap, type of food-plate used, and indigenous treatments.

Results: The mean BLL was 12.13 (range 0.50-64) µg/dL. Fifty-four percent of the children had a high level of BLL (>10 µg/dL), with the highest BLL observed among children aged less than 6 years (mean 13.56±9.83 µg/dL) when compared with older children ($p<0.001$). The BLL among children in urban Dhaka was significantly higher compared to that among rural children (13.45±8.21 µg/dL vs 7.29±6.25 µg/dL, $p<0.001$). A high BLL correlated with low BMI ($r=-0.23$, $p<0.001$) and low haemoglobin status ($r=-0.10$, $p=0.02$). Proximity to industries ($p<0.001$), drinking-water from a municipal supply or tubewell compared to home filter ($p<0.001$), water-taps made of brass or lead ($p<0.001$), use of melamine plates ($p=0.001$), and *kobiraji* treatments ($p=0.004$) were significantly associated with higher BLLs.

Conclusion: The study identified the problem of high BLLs among young children in Bangladesh. The study also identified several risk factors that can be applied in future educational interventions to prevent exposure to lead poisoning.

Acknowledgements: The study was funded by the University of Southern Mississippi and the Fulbright Scholar Grant program.

032 (106)

Universal Rotavirus Vaccine Introduction in Bangladesh Could Accelerate Achievement of Millennium Development Goal 4

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Background: Millennium Development Goal (MDG) 4 calls for reducing by two-thirds the mortality rate of children aged <5 years within 2015. Rotavirus is responsible for nearly 5% of all deaths and 16% of potentially vaccine-preventable deaths in children aged <5 years and accounts for about 20,000 deaths each year in Bangladesh. Widespread use of safe and effective rotavirus vaccines could reduce this enormous public-health burden. Two oral, live rotavirus vaccines—Rotarix by GlaxoSmithKline and RotaTeq by Merck—have been developed. The World Health Organization recommends the inclusion of rotavirus vaccine in all national immunization programmes, and several countries have demonstrated a substantial reduction of hospital visits/mortality showing public-health benefit after nationwide introduction of the vaccines.

Objective: Describe the general findings from several studies characterizing the epidemiology of rotavirus infections and demonstrating the safety, immunogenicity, and efficacy of rotavirus vaccines in Bangladesh and highlight the potential impact of the vaccines in reducing child mortality.

Methodology: ICDDR,B has conducted several rotavirus vaccine studies ranging from Phase I to licensure and post-marketing evaluations. An immunogenicity study with Rotarix was recently conducted in urban Dhaka, and an efficacy study with RotaTeq was conducted in rural Matlab. An effectiveness trial of Rotarix with a cluster-randomized design is ongoing at Matlab using the routine government EPI system to distribute vaccines.

Results: Both rotavirus vaccines were found to be safe, immunogenic in Bangladesh. Rotarix did not interfere with the immunogenicity of polio vaccine when administered concomitantly and vice-versa. Recently-conducted studies with RotaTeq demonstrated 43% efficacy against severe rotavirus gastroenteritis, with 3.5 severe rotavirus cases prevented per 100 person-years, indicating that if widely distributed, rotavirus vaccines could have great potential in reducing childhood deaths. Rotavirus vaccine coverage in the ongoing vaccine effectiveness study has reached nearly 90% using the government EPI system, which demonstrates the feasibility of providing rotavirus vaccine through the existing systems.

Conclusion: To achieve the MDG 4 target in Bangladesh, child mortality will need to be reduced from the existing 65 deaths to targeted 50 per 1,000 livebirths by 2015. The inclusion of rotavirus vaccine in the national EPI in Bangladesh could contribute to reducing child mortality due to rotavirus-associated disease and, thus, help achieve MDG 4.

Acknowledgements: The study was funded by PATH, WHO, and NVPO and supported by ICDDR,B; Merck, GSK, and the Government of Bangladesh.

033 (149)

Impact of Community-based Tuberculosis Programme: Experience of BRAC

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Background: BRAC started the tuberculosis (TB) control programme as a pilot project in 1984 in one subdistrict and scaled up in 10 subdistricts by 1992. Currently, the national Tuberculosis Control Programme (NTP) and BRAC jointly expanded DOTS services to cover a population of 89.5 million. In this total community-based programme, the services are mainly provided by community health volunteers (CHVs). They identify persons with TB symptoms and treat TB in their own villages. The approach of using CHVs in the DOTS strategy is less expensive and more cost-effective.

Objective: Develop a model of cost-effective community-based TB control programme to enhance case-detection and treatment success.

Methodology: CHVs are selected from members of the BRAC microcredit village organization following some selection criteria. They receive basic training before starting work and one-day refresher training every month. Each CHV provides essential healthcare services to an average of 250 households. They disseminate TB-related knowledge during household visits and health forums, identify and refer TB suspects for sputum examination, ensure daily intake of medicine (DOTS) and also refer patients for side-effects. The CHV receives US$ 2.2 (Tk 150) as an incentive for treating a patient.

Results: Currently, about 80,000 Shebikas are working in Bangladesh. In 2009, 96,427 patients were diagnosed in the BRAC-supported areas. Of them, 71,946 were new sputum-positive, and the case-detection rate was 80.32.%. The treatment success rate in 2008 was 93.22% among new smear-positive patients. The implementation of DOTS with CHV is a cost-effective model, which provides low-treatment cost for TB patient (US$ 64 per patient in Shebika programme areas compared to US$ 96 in other programme areas).

Conclusion: The CHVs are filling critical gaps in human resource at the community level and increasing accessibility to services and patient compliances by establishing linkage between the community and services. They serve at the entry-point into the larger sociocultural, environmental and economic factors that affect health. They reduce delays in diagnosis as they bring DOTS service to the door-step and also increase case-detection and cure rates.

Acknowledgements: The support of GFATM and NTP is acknowledged.

034 (047)

Community-based Strategies to Improve Maternal and Newborn-care Coverage in Rural India

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Background: Sahibganj district of Jharkhand, India, is a tribal-dominated area with high maternal and infant morbidity and mortality. The present study examined community-based interventions designed to improve antenatal, perinatal and postpartum care in Sahibganj district.

Objective: Determine whether community-based delivery of maternal and newborn-care (MNC) services through a public-private partnership model can improve coverage in a high-burden district in rural India.

Methodology: National project staff worked with the Government and local communities to mobilize and build capacity of an existing network of primary health centres, community health workers, and village health committees. Training and technical support was given for community-based provision of essential services for mothers and newborns that were integrated with the health programmes of the Government of India. Interventions focused on minimum activities for mothers and newborns and were implemented using dialogue education, behaviour change communication, and supportive supervision. A cluster sample of 300 mothers of children aged less than 2 years were interviewed at baseline (January 2008) and 2 years later (June 2010) using a 76-item knowledge, practices and coverage survey questionnaire. Percentages and confidence intervals were calculated using the design effect to adjust for cluster sampling.

Results: Significant improvements occurred in all MNC coverage indicators ($p<0.05$). The proportion of women receiving 3 or more antenatal visits increased from 23% to 54% and a postpartum visit by trained health workers from 26% to 41%. Eighty-six percent (69% at baseline) received 2 doses of tetanus toxoid during the antenatal period, and 75% (49 at baseline) received iron supplements. Thirty-eight percent (27% at baseline) of births (n=300) were attended by a skilled birth attendant, and 28% (15 at baseline) occurred in a facility. Clean cord-care occurred in 96% (89 at baseline) of births, newborn thermal care in 85% (69 at baseline), and immediate breastfeeding in 38% (19 at baseline). Gains of 17-88% occurred in mothers' knowledge of pregnancy, postpartum, and newborn danger-signs.

Conclusion: The improvements observed in the MNC coverage demonstrate the feasibility of using public-private collaborations to deliver MNC services in underserved communities in rural India. Trained community health workers created demand for services at public facilities. The success of the interventions has enhanced public commitment to the provision of essential community health services.

Acknowledgements: The authors thank USAID and CRWRC—the funding agencies, the Evangelical Fellowship of India Commission on Relief (EFICOR), Ministry of Health and Family Welfare and Ministry of Women and Child Development of India, and the Government of Jharkhand.

035 (188)

An Intervention to Increase Detection of Childhood Tuberculosis in Rural Bangladesh

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Background: Despite a well-functioning adult tuberculosis (TB) control programme, children with TB remain grossly under-detected in Bangladesh. It is conservatively estimated that, annually, around 21,000 children with TB remain undetected. This is due to an almost exclusive focus on sputum smear-positive TB and the absence of childhood TB training or paediatric guidelines.

Objective: Attempt to double the detection of childhood TB by increasing general awareness and training of healthcare workers at microscopy centres supported by the Damien Foundation Bangladesh.

Methodology: A cluster-randomized trial was carried out with the provision of childhood TB guidelines, training, and logistics support to the staff from 18 microscopy centres while 18 non-adjacent microscopy centres continued their usual practice and served as controls. Paediatric data on suspect referral and TB treatment were collected at baseline (12 months pre-intervention, 2007-2008) and during the intervention (12-month study duration, 2008-2009).

Results: Detection of childhood TB increased in both intervention and control microscopy centres but the increase was 3 times the baseline figure in the intervention centres (from 3.8% to 12%) compared to less than double the baseline figure in the control centres (from 4.3% to 7%, p=0.001).

Conclusion: Simple guidelines, training, and logistics on childhood TB can easily be integrated with the existing NTP services and reduce the burden of childhood TB in Bangladesh.

Acknowledgements: The Bangladesh NTP funded this project as part of their operations research, and the WHO Bangladesh provided financial support towards validating the study.

036 (235)

Predictors of Death of 0-59-month Old Children Admitted to a Critical Care Ward in an Urban Diarrhoea Treatment Centre in a Developing Country

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Background: Of the 8.8 million global deaths in under-5 children in 2008, 15% occurred due to diarrhoea. Most of these deaths occur in hospitals in developing countries and are usually associated with complications of diarrhoea and/or other associated problems, such as pneumonia, malnutrition, and sepsis, and the support of the paediatric critical care medicine (PCCM) team is often needed. Little data are available on predictive factors of death in under-5 children with diarrhoea, who need treatment from the PCCM.

Objective: Identify the predictive factors that might help initiate prompt and appropriate management and reduce deaths in children with diarrhoea and associated problems, especially in resource-poor settings.

Methodology: This cohort study prospectively enrolled all children aged 0-59 months with diarrhoea admitted to the Special Care Ward (SCW) of the Dhaka Hospital of ICDDR,B during September 2007–December 2007. Comparison was made between children with (n=29) and without a fatal outcome (n=229). Relevant clinical information was collected soon after a child was identified and enrolled into the study subject to consent of respective parents/guardians. Clinical management of children was done according to standard management guidelines of the Hospital.

Results: Children with a fatal outcome more often received IV fluid after admission at the Hospital (76% vs 46%, p=0.007), more often had leucocytosis (median IQR) [15,050 (11,250, 31,125) vs 13,200 (9,050, 18,575), p=0.032], and immature neutrophil (median IQR) [00 (00, 2.00) vs 00 (00, 00), p=0.015] on admission compared to the children without a fatal outcome. After adjusting for potential confounders, such as IV fluid and immature neutrophil, by logistic regression analysis, absent peripheral pulses even after full rehydration [odds ratio (OR)=10.9, 95% confidence interval (CI) 2.1-56.8, p<0.01), severe malnutrition (OR=7.9, 95% CI 1.8-34.8, p<0.01), hypoxaemia (OR=8.5, 95% CI 1.0-75.0, p=0.05), lobar pneumonia (OR=17.8, 95% CI 3.7-84.5, p<0.01), and hypernatraemia (OR=15.8, 95% CI 3.0-81.8, p<0.01) were independently associated with children with a fatal outcome.

Conclusion: The results suggest that absent peripheral pulses even after full rehydration, severe malnutrition, hypoxaemia, lobar pneumonia, and hypernatraemia are independent predictors of death among under-5 children with diarrhoea, who present to a critical care ward in a limited-resource setting in a developing country.

Acknowledgements: This research protocol was funded by ICDDR,B and its donors that provide unrestricted support for operations and research.

DAY 2: 16 March 2011, Wednesday
09:30 am–10:30 am (Venue: Grand Ball Room)
Plenary Session 2: Defining the essential package of services and organizing its effective delivery at scale

Speakers

Identifying priority interventions for universal coverage in the HNPSP 2011 in Bangladesh
Mr. Md. Humayun Kabir
Secretary, Ministry of Health and Family Welfare, Government of Bangladesh, Dhaka, Bangladesh (HNPSP representative)

Opportunities for achieving the MDG 4+5 targets in Bangladesh
Dr. Birthe Locatelli-Rossi
Chief, Health and Nutrition Section, UNICEF, Dhaka, Bangladesh

Non-communicable diseases: opportunities for bringing emerging challenges to the agenda
Dr. Richard S.W. Smith
United Health Care, Ovations Initiative, London, UK

Best practices to get health workers where they are needed
Dr. Carmen Dolea
Coordinator, Human Resources for Health Department, World Health Organization, Geneva, Switzerland

11:00 am–12:30 pm (Venue: Ball Room 1)

Symposium 4: Universal coverage in low- and middle-income countries for non-communicable diseases

Speakers

Good examples of universal coverage in Argentina
Professor Adolfo Rubinstein
Institute for Clinical Effectiveness and Health Policy, Buenos Aires, Argentina

Are most people too poor to treat non-communicable diseases?
Professor David Dror
Chairman and Managing Director, Micro Insurance Academy, New Delhi, India and Institute of Health Policy and Management, Erasmus University, Rotterdam, The Netherlands

Burden of non-communicable diseases in Bangladesh, with special reference to diabetes mellitus
Dr. Hajera Mahtab
Professor of Medicine and Endocrinology, BIRDEM, Dhaka, Bangladesh

11:00 am–12:30 pm (Venue: Ball Room 2)

Symposium 5: Round Table discussion on health coverage in Bangladesh: managing quantity and quality in urban and rural areas

11:00 am–12:30 pm (Venue: Ball Room 3)

Symposium 6: Scaling-up health worker training in Bangladesh

Speakers

Finding from the Global Commission on Health Professional Leadership for the 21st century
Dr. Tim Evans
Dean, James P Grant School of Public Health, BRAC University, Dhaka, Bangladesh

Prospects for scaling-up nursing and midwifery training
Dr. Khaled Shamsul Islam
Human Resource Development Unit, Ministry of Health and Family Welfare, Government of Bangladesh, Dhaka, Bangladesh

How does experience in Bangladesh and elsewhere inform strategy for scaling-up community health worker training?
Dr. Laura Reichenbach
Social Scientist and Head, Reproductive Health Unit, ICDDR,B, Dhaka, Bangladesh

The future of medical education training in Bangladesh
Professor Ismail Khan
Vice Dean, Dhaka Medical College, Dhaka, Bangladesh

01:30 pm–03:00 pm (Venue: Ball Room 1)

Symposium 7: Fish bowl session on implementation of non-communicable disease programmes in low-resource settings

Speakers

The South Africa experience
Professor Naomi (Dinky) Levitt
Chronic Diseases Initiative in Africa and Division of Diabetic Medicine and Endocrinology, University of Cape Town, Cape Town, South Africa

Self-sustainable comprehensive healthcare delivery in a developing country: the Health Care Development Project
Professor Liaquat Ali
Director, Bangladesh Institute of Health Sciences and Executive Director, Health Care Development Project, Dhaka, Bangladesh

Lifestyle-related diseases and interventions
Dr. Dewan Shamsul Alam
Head, Chronic Non-communicable Diseases Unit, ICDDR,B, Dhaka, Bangladesh

The role of the private sector in public healthcare delivery: a public-private mix approach—Western Marine Shipyard and Ministry of Health and Family Welfare
Dr. Andrea Knigge
Principle Advisor, GIZ, Dhaka, Bangladesh

01:30 pm–03:00 pm (Venue: Ball Room 2) 037 (321)

Scientific Session 7: Defining the essential package: disease burden and cost considerations

Global Health and the 'Power of Sharing'

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Despite the major advances in biotechnology, genomic and biomedical research, the health concerns in low-income and developing countries continue to be largely ignored and go unmet. The reasons for this unfortunate situation are many and varied. Whether it is a risk-adverse Food and Drug Administration (FDA), monopolizing patents or business models that do not interface well with the small and fragile economies of developing nations, the net result is that healthcare is more costly than ever and targeted primarily to those who can afford to pay the most. The Global HealthShare® Initiative (GHSI) is a new programme in the Center of Excellence in Nutritional Genomics at the University of California–Davis, USA, designed to explore and develop novel approaches to address global health disparities through the power of sharing. By leveraging the collective assets of its members (e.g. their expertise, experience, intellectual property, materials, infrastructure, research, and production capacity), the GHSI plans to tackle the problems of malnutrition, communicable and non-communicable diseases by delivering nutritional and immunity-based health solutions that are safe, effective, and affordable.

Alleviating some of the health, social and economic burden of diarrhoeal disease among children and the severely malnourished is a top priority for the GHSI and the basis for collaboration with ICDDR,B. As an accelerator of translational research and innovation, the GHSI is using an operational strategy that integrates academic researchers, philanthropic organizations, local social entrepreneurs, and private-sector partners to help bridge the healthcare gap between the developed and the developing world. This 'hybrid value chain' will promote positive and sustainable social change for many of the 4 billion people who are not currently part of the global economy. It is the desire of all GHSI members that everyone, particularly the young, the poor, and the malnourished, enjoy health, well-being, and productive lives.

Acknowledgments: Author thanks all the internationally-renowned members of the GHSI (http://nutrigenomics.ucdavis.edu/?page=GHSI/Members) for their contributions and commitment to this programme.

038 (068)

Healthcare Choice in Pre- and Post-*Aila* Sundarbans, India: Need for Tailor-made Healthcare Interventions

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Background: The 3-tier systems of public healthcare often proves to be inadequate to meet the unique health needs of the Sundarbans delta region in India, primarily due to access constraints. Realizing the fact, the concerned state Department of Health, West Bengal, implemented several healthcare initiatives under public-private partnership schemes. Notwithstanding such efforts, healthcare-seekers in the Sundarbans, to a large extent, use services from unqualified/semi-qualified rural health practitioners (RMPs), increasing their health risks. Intermittent surge of pre-monsoon cyclones makes the situation further worse by devastating the existing health infrastructure and compelling higher use of alternative sources.

Objective: Understand the trend in healthcare-seeking behaviour before and one year after colossal cyclonic disaster in the Sundarbans.

Methodology: Data for study were drawn from 2 independent cross-sectional household surveys, covering 180 households in each of the surveys, conducted in 3 administrative blocks of the Sundarbans that had experienced extreme damage because of the cyclone *Aila* in May 2009. Observations on outpatient healthcare-seeking behaviour were made based on a standard approach of inquiry into recent illnesses that occurred among the household members anytime within a month preceding the date of the survey. Damages on health and other infrastructure that existed in the villages before cyclones were inquired through community-level interviews with key stakeholders.

Results: The results showed that, to a large extent, the proportion of untreated morbidity declined during the later survey compared to the scenario observed before the climate shock (i.e. 4% compared to 14%). This happened despite the fact that the health infrastructure was severely damaged by the effects of the cyclone. Most (82%) sought treatment from RMPs. The phenomenon increased many folds in the post-*Aila* period, since the health infrastructure was severely damaged.

Conclusion: Unique healthcare service-delivery interventions are needed to enhance the quality of healthcare-seeking in the Sundarbans. Local-level initiatives are needed to facilitate access to public healthcare services. Use of appropriate technology in healthcare service provision is still untapped, which possesses a wide scope.

Acknowledgments: The financial support of DFID is acknowledged.

039 (085)

Community-based Newborn-care Programme: Can the Health System Deliver Neonatal Interventions Effectively in Nepal?

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Background: In Nepal, the national neonatal morality rate is 33 per 1,000 livebirths, which accounts for 54% of mortality of children aged less than 5 years; 81% of mothers give birth at home without the presence of skilled attendants; and only 31% of mothers and 2% of newborns receive postnatal care within 3 days after birth. The Government of Nepal developed the community-based newborn care package (CB-NCP) in 2007 to reach most mothers and newborns with effective health interventions for them.

Objective: Assess whether community-based newborn-care package can improve the coverage of neonatal interventions in Bardiya district, Nepal.

Methodology: In the study district, a baseline survey and a follow-up survey with 600 recently-delivering women (RDW) (6-12 months) were conducted to measure the change in intervention coverage in 2008 and 2010 respectively. The RDW were selected based on a 3-stage cluster-sampling approach with ward(s) as the Primary Sampling Unit (PSU). Thirty clusters were chosen following method of probability proportional to size (PPS), and 20 respondents were surveyed from each cluster. A cross-sectional survey was conducted among health workers and female community health volunteers (FCHVs) to measure their competency in neonatal interventions. Eighty percent of health workers (n=95) and 10% of FCHVs (n=92) were randomly chosen from the study district. Data were analyzed using the SPSS software.

Results: The use of services significantly improved in both antenatal and postnatal periods. The recommended 4 focused antenatal care visits at facility level significantly increased from 58% to 80% ($p<0.001$). Institutional delivery and skilled attendants at birth significantly increased from 34% to 66% ($p<0.01$) and from 30% to 66% ($p<0.001$) respectively. Similarly, postnatal home-visit to newborns by FCHVs within 3 days after birth significantly increased from 36% to 94% ($p<0.05$). Eighty percent of the health workers (n=95) and FCHVs (n=92) had knowledge and skills in clean-delivery practice, essential newborn care, postnatal care, assessment, identification, and management of newborn infection, and low birthweight.

Conclusion: Implementation of CB-NCP within the existing health system of Nepal is feasible and can substantially increase the coverage of key health interventions for newborns in antenatal, intrapartum, and postpartum periods. The results of this pilot project evaluation indicate that CB-NCP, delivered through government health workers, may have a significant impact in improving survival of newborns in Nepal by improving the coverage and quality of newborn care.

Acknowledgements: The authors thank the Bill & Melinda Gates Foundation which funded the piloting through Saving Newborn Lives programme of Save the Children-USA.

040 (088)

Primary Healthcare Providers Now More than Ever in Achieving Universal Health Coverage in China

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Background: While the health reform on universal coverage is egalitarian, the historical and political accomplishment in China with respect to its current initiative and the eventual success need to rely on the key change agent—health service providers—to be advocates. However, an unequal distribution of human resources for health (HRH), especially the shortage of primary healthcare providers with high qualifications in rural areas, impairs the progress towards the ultimate goal of improving the health of people through universal health coverage.

Objective: Examine the determinant factors on practice-location choice of primary healthcare providers in China, particularly the impact of the location of medical schools under the planned economy to assist in policy that can help leverage location choice by HRH.

Methodology: A county-level multivariate analysis of data was conducted among 1,880 rural counties in China. The relationship between the distribution of rural HRH measured by densities of doctors/nurses per 1,000 people and a set of independent variables (demographic, socioeconomic, health infrastructure, local-specific, and medical school factors) was examined. The distance variable (a map distance and a road distance) for examining the effect of location of medical schools was created using the ArcGIS software. The distance to either tertiary or secondary schools and the proximity to both types of schools were analyzed. The interactive effect of 2-level training on the distribution of HRH was also tested.

Results: Results of analysis showed that the proximity to medical schools negatively affected the supply of rural HRH (doctors: beta=-0.46, $p<0.05$; nurses: beta=-0.55, $p<0.05$ for nurses). The distribution of rural healthcare providers also significantly correlated with the size of population aged below 5 years and over 65 years, gross domestic product per capita, degree of urbanization, medical service capacity, etc. at $p<0.05$.

Conclusion: The results suggest a planning mechanism on geographically locating medical schools in a country. Training locally has been advocated to cope with the shortage of HRH in underserved areas. The significant associations between distribution of HRH and influencing factors provide a reference for policy-makers in planning medical education in rural areas and effective incentive policies to attract/retain people to/in rural areas and in implementing an integrated change.

041 (116)

Contextual Influence on the Use of Maternal Healthcare Services in Rural Bangladesh: A Multilevel Analysis

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Background: Studies on the determinants of healthcare behaviour have focused predominately on individual and household characteristics, neglecting community influence. Contextual analysis provides an opportunity to examine the role of health service availability on its use.

Objective: Examine the individual, family and community-level factors for the use of skilled maternal healthcare services for three indicators in rural Bangladesh: at least 4 antenatal care (ANC), delivery care, and at least one postnatal care (PNC).

Methodology: Data for the study came from a cross-sectional survey, conducted during November 2008–March 2009 among 3,158 mothers who delivered in the past 6 months before the survey in one subdistrict of Bangladesh. Individual-level data collected by trained female interviewers through household interview of women were linked to contextual data on community and health service provisions. For each maternal healthcare-use indicators, multilevel random-effects logistic regression models were fitted with the individual, family and community-level factors to assess the likelihood of the use of skilled care.

Results: In the fully-adjusted 2-level model, in addition to several individual and family-level factors, strong contextual influence on the use of skilled maternal healthcare services was found. For each of the three indicators, distance to the subdistrict comprehensive emergency obstetric care facility was negatively associated with its use. Having a health subcentre in the community, however, did not have any effect on its use. Although not statistically significant, the presence of the increased number of community skilled birth attendants (CSBAs) also had no effect on the use of their services. However, a provision of the increased availability of satellite clinics had an effect on the improved use of maternal care. Health voucher, though increased skilled delivery care, had no effect on ANC and PNC.

Conclusion: In Bangladesh, the role of contextual factors in the use of maternal healthcare services is complex. In one hand, distance is a barrier to access health facility at the subdistrict level; on the other hand, service provisions, such as health subcentre and CSBAs at close proximity of the women's households remained under-used. There is a call for further investigation of low use of these service provisions in the grassroots level.

Acknowledgements: The study was funded by the Australian Agency for International Development (Grant No. 00597).

042 (139)

Present and Future of Radiotherapy in Developing Countries: Pakistan as an Example

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Background: Incidence of cancer has been projected to rise worldwide in the next 20 years, most of which will be in developing countries, including Pakistan. Ensuring that these patients receive standard radiotherapy is a major challenge.

Objective: Assess the existing radiotherapy services in Pakistan and suggest strategy to assist in the planning of future radiotherapy services for cancer patients.

Methodology: Different technical personnel from 22 radiotherapy centres were contacted through phone calls and emails. They were asked about the number of available therapy machines, simulators, technical staff, and radiotherapy technologists in 2009. Inconsistencies in data collection were resolved through phone calls. The main outcome measure was current radiotherapy services per million population.

Results: Each radiotherapy centre covered a mean population of 1.96 million (range 3.54-19.63), with more access of cancer patients to the public sector due to low costs of radiotherapy treatment. There were only 56 radiation oncologists, 55 medical physicists, and 145 radiotherapy technologists. Further, only 20 Cobalt-60, 17 linear accelerators, 12 fluoroscopic simulators, and 4 CT simulators were available. The majority of modern equipment and treatment delivery was available in the private sector. An estimated 55-60% of all new cases of cancer were currently being referred for radiotherapy each year, and the existing services were inadequate.

Conclusion: The increased need of radiotherapy services demands unified, better, and effective measures to deliver the state of art radiotherapy to each patient to improve the outcomes of treatment.

01:30 pm–03:00 pm (Venue: Ball Room 3) 043 (010)

Scientific Session 8: Universal coverage of the health workforce

Health System Bottlenecks in Achieving Maternal and Child Health-related Millennium Development Goals: Preliminary Findings from the District Level in Bangladesh

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Background: The quality of service-delivery in the overall public-health sector in Bangladesh is poor. There is widespread absenteeism of doctors and paramedics at the government health centres and subcentres. The availability of drugs and medical supplies at the public-health facilities is very limited. Despite the encouraging trend in infant and child mortality rates, the achievement of Millennium Development Goal (MDG) 4 is far from guaranteed. The progress in preventing neonatal deaths has been slow. Child health and survival is closely related to the health and survival of mothers throughout the lifecycle. Experts agree that maternal deaths are unacceptably common.

Objective: Identify the health system bottlenecks at the district level in achieving maternal and child health-related MDGs and cost out the marginal financial resources required to address these in 3 districts of Bangladesh.

Methodology: The study, conducted exclusively on public-sector health service providers at the district level, adopted a mixed method approach. Using the Tanahashi model, the quantitative part involved identifying the extent of health system bottlenecks on human resources, accessibility, logistics and use of services in selected districts. The qualitative part used focus-group discussion and in-depth interviews with government health personnel to better understand and analyze the bottlenecks.

Results: The study identified human resource constraints—inadequate numbers, poor expertise, grossly uneven geographical distribution, and lack of awareness—as the most critical bottlenecks affecting the health systems at the district level. Inequity in the availability of and accessibility to healthcare services was pronounced and manifested in different dimensions—geographical set-up, socioeconomic status, and gender. The marginal costs of addressing these bottlenecks were significant in the context of total health expenditure in Bangladesh.

Conclusion: The existing human resource policy needs to be revised to improve the overall quality of services. Allocation of additional resources and interventions should be district-specific. Awareness programmes need to be strengthened using effective behavioural change and communication strategies. Moreover, special efforts are required to address the equity issue.

044 (038)

Involvement of the Private Sector in Delivery of Reproductive Health Services

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Background: According to the Bangladesh Demographic and Health Survey (BDHS) 2007, institutional delivery is 15%; 1 in 10 births is either unwanted or unplanned; 17% of married women have an unmet need for family planning; and contribution of private medical sectors in long-acting and permanent methods (LA/PM) of family planning is 20.3% (3.9% IUD, 5.6% implant, and 10.8% tubectomy). The private sector remains a major under-used asset for wide range of reproductive health service, such as family planning. During June-July 2010, the Mayer Hashi project undertook a mapping exercise of health facilities in 21 districts under Barisal, Sylhet, and Chittagong divisions on a programmatic purpose.

Objective: Explore the potential for involving the private sector more in LA/PM service-delivery.

Methodology: Data-collection methodology captured all potential LA/PM service-providing facilities located in 21 districts. Data were collected on location of facility, type of facility, manpower, contact information, training status, skill status, and training need of service providers using a set of forms administered by trained enumerators.

Results: Data revealed that 10% of the facilities belonged to the private sector. Of 1,851 private-sector facilities, 1% had approval of the Planning Unit of the Directorate General of Family Planning about family-planning methods. Except tubectomy with caesarean section, provisions of delivering LA/PM methods were low. On average, there were about 4 physicians and 4 nurses and paramedics in the private facilities, and one-fifth of all physicians were skilled in tubectomy.

Conclusion: Involvement of the private sector in the delivery of reproductive health services is critical not only in responding to the growing market demand but also expanding consumer choices and ensuring equity in contraceptive market. An appropriate policy needs to be in place to mobilize the private-sector service providers for enhancing access to and use of family planning by clients and to go closer to meet the Millennium Development Goal 5.

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045 (084)

Public Health Infrastructure, Human Resources, and Health Coverage in India

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Background: India, a signatory to the Alma Ata Declaration (1978), is committed to attain "Health for All" through primary healthcare approach, which started with the establishment of Primary Health Centres (PHCs) in 1952. The emphasis of the Central Government shifted from expansion of the healthcare establishment to consolidation of the existing healthcare infrastructure. The National Health Policy highlighted the importance of provision of preventive, promotive and rehabilitative health services to the people.

Objective: Assess the current situation in terms of healthcare infrastructure at the government health establishments at different levels, such as district hospitals, first referral units, community health centres, and primary health centres (PHCs), in India and its states in terms of physical infrastructure, human resources, supply, and equipment, and also examine the role played by the health infrastructure in universal health coverage.

Methodology: Data for the study were drawn from two rounds of the Facility Survey commissioned by the Government of India (2003 and 2007-2008). Besides providing the situational analysis at the national level, the study presents the state-level differentials and changes during 2003-2007.

Results: The results indicated a higher population coverage (than the norm) by the subcentres (n=8,372) and PHCs (n=49,193). About 90% of the subcentres had auxiliary nurse midwife in position while 84% had 60% of required instruments and facilities. In the context of the initiatives taken up as part of the National Rural Health Mission, four-fifths of the villages had village health and sanitation committees, and four-fifths of the subcentres received the untied funds. The analysis showed the gaps in human resources and infrastructure available at facilities of various levels.

Conclusion: The thrust has to be qualitative improvement in health services through the provision of essential equipment, supply of essential drugs and consumables, construction of buildings, filling of vacant posts of medical and paramedical staff, and training of staff.

046 (108)

Training Traditional Birth Attendants to Prevent Postpartum Haemorrhage in Rajshahi, Bangladesh

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Background: A study on the feasibility, safety, acceptability, and programme effectiveness of misoprotol and a blood-collection mat distribution in safe delivery-kits to be used in deliveries at home is being conducted in Rajshahi. About 600 traditional birth attendants (TBAs) were trained to participate in the study that enrolled over 100,000 pregnant women.

Objective: Assess the TBAs' knowledge acquisition, retention, and changes in practice relating to management of postpartum haemorrhage (PPH) deliveries at home.

Methodology: Some 588 TBAs employed by Rangpur Dinajpur Rural Service (RDRS) participated in a 2-day training in 2009 conducted by ICDDR,B on home-based use of misoprostol and a blood-collection mat to manage PPH. Their knowledge, attitudes, and practices were measured before training, immediately after training, at 6 months, and 1 year after implementation. McNemar chi-square tests were used for assessing significance in knowledge acquisition and retention over time.

Results: Only 11% of the TBAs before the training knew of a way to prevent excessive blood loss following delivery. Immediately after the training and 6 months after the training, 94% and 99% respectively reported knowing how to prevent excessive blood loss. After the training, nearly 100% of the TBAs knew the correct dosage, and at the 6-month assessment of knowledge retention, 96% of the TBAs still responded correctly. All the TBAs knew how to administer misoprostol orally, both at the post-training and 6-month assessment. Regarding the timing of administration, 100% of the women at the 6-month follow-up knew not to give misoprostol before delivery, and over 80% responded spontaneously that they must confirm that the baby is out and that there is no twin before administration of misoprostol. In addition, 92% and 98% of the TBAs reported using the soaking status of the mat to determine how much blood a woman has lost following the training and at 6 months.

Conclusion: Trained and well-supported TBAs can acquire new knowledge, retain it over time, and effectively apply this knowledge to serve their clients. In settings where most women deliver at home assisted by TBAs, training TBAs to use effective technology in managing PPH has the potential to reduce PPH-associated morbidity and mortality in births at home.

Acknowledgements: Funding was provided by the Bixby Center for Population, Health and Sustainability, University of California-Berkeley, and ICDDR,B.

047 (214)

Making National Community Healthcare Programmes Effective—Surprising Lessons from Pakistan

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Background: Community health worker programmes have long promised a low-cost, high-impact solution to maternal and child health problems. Few countries have been able to sustain community healthcare programmes with national coverage. Pakistan is the most significant exception—90 million people are now covered by the Lady Health Worker Programme (LHWP). Knowing how this success has been achieved and what the challenges are that it faces in sustaining this achievement is of interest.

Objective: Determine the performance and impact of the lady health worker cadre and determine the underlying causes.

Methodology: A nationally-representative service-delivery survey was designed comprising 6 individual surveys. These surveys included served and unserved populations, community interviews, Lady Health Workers, supervisors of health facilities, and district administrations. Nearly 6,000 households and 550 Lady Health Workers were interviewed. An organizational review, a system evaluation, and an expenditure review were also done. A range of quasi-experimental techniques, i.e. propensity score matching, to determine impact were used.

Results: The results of the impact analysis suggest that the LHWP has had a substantial positive impact on a number of health indicators. There was statistically significant ($p<0.05$) evidence of an impact on: family planning (with served households 11 percentage points more likely to be using a modern family-planning method), antenatal care (13 percentage points more likely to have had tetanus toxoid vaccination), neonatal check-ups (15 percentage points more likely to have occurred within the first 24 hours from birth), and immunization (children aged below 3 years were 15 percentage points more likely to be fully immunized).

Conclusion: The LHWP has steadily expanded its coverage since its inception in the mid-1990s. More than 90 million people in Pakistan are now covered by the programme, and the programme has been shown to have an impact.

Acknowledgements: The authors thank CIDA and the World Bank for financing and oversight.

048 (220)

Understanding Rural Service: Results of a Discrete Choice Experiment in Cambodia

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Background: Many countries including Bangladesh struggle with geographical imbalance of health workers. Policies of the 'command and control' type to redress this situation have had limited success. Recent policy interventions are grounded in a micro-economic understanding of health worker behaviour and combine extrinsic and intrinsic incentives with monitoring regimes to increase rural job uptake.

Objective: Identify job attributes and their relative weight, in health workers' decision between rural and urban jobs.

Methodology: A discreet choice experiment (DCE) was applied with a qualitative and a quantitative phase. Twenty-seven nurses and midwives, workers and students, were surveyed in the qualitative pre-research; 7 job attributes driving rural job uptake and the value levels for each attribute that would trigger a change in job choice were identified. The DCE questionnaire was administered to 406 final-year students. The relative importance of each job attribute in rural/urban job choice was quantified and econometric modelling was done to explain choice behaviour. Data were collected from December 2009 to February 2010. Clearance from the Ministry of Health and the participating medical schools was received to conduct the study.

Results: For nurses and midwives, salary increase had the most important effect on rural job uptake; distance between workplace and home had the second largest effect. Other job attributes determining rural service uptake included adequate medical equipment, housing provision, transportation allowance, faster promotion, and increased access to training. Salary was the most important job attribute for doctors as well but non-financial attributes differed from those of nurses and midwives. Socioeconomic characteristics explained rural service choice behaviour, including rural background and training institution located in rural areas. Possible policy interventions were modelled, and corresponding rural job uptake for all health worker cadres was predicted.

Conclusion: Both financial and non-financial incentives had an impact on rural job uptake. Besides salary, the Government of Cambodia has various other levers to boost rural service. These findings suggest that effective policy interventions to tackle geographical imbalance of the health workforce can be developed.

Acknowledgements: Funding from DFID (UK) and CDRI (Cambodia) is acknowledged.

03:30 pm–05:00 pm (Venue: Ball Room 1) 049 (020)
Scientific Session 9: Universal coverage and maternal and child health

Increasing Uterotonic Coverage for Prevention of Postpartum with Injection Oxytocin and Tablet Misoprostol

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Background: Postpartum haemorrhage (PPH) remains a major cause of maternal deaths. Maternal mortality is unacceptably high in Nepal, and the principal cause is PPH. Active management of the third stage of labour (AMTSL) is a proven approach for preventing PPH; however, geographical and resource constraints limit this approach in Nepal. Seventy-one percent of deliveries occur at home without assistance from skilled birth attendants (SBAs), and injection oxytocin is not available. Community-based distribution of oral misoprostol (600 mg) is the answer to widely expanding uterotonic coverage if AMTSL is not possible.

Objective: Expand the coverage of misoprostol distribution at community-level nationwide by female community health volunteers for the prevention of PPH at home-birth.

Methodology: Female Community Health Workers (FCHVs), well-known community-level volunteers, and front-line healthcare providers distributed misoprostol (600 mg) to pregnant women, provided counselling on timing of use, dose, side-effects, and prompt care-seeking in case of heavy bleeding. Distribution of misoprostol was first piloted in one rural district—Banke (of 75 districts) with a total population of nearly 450,000. Programme performance was monitored through pre- and post-surveys of households in 30X30 clusters and project monitoring system to test the feasibility of distribution of misoprostol at the community level, with close monitoring from central-level technical working groups.

Results: The results of the Banke pilot study (2005-2009) showed a significant increase *in* uterotonic coverage. The uterotonic coverage was considered if the clients received injection oxytocin by health workers both at health facility and home, or misoprostol. If the health workers were absent at home-delivery, the women took 3 tablets of misoprsotol. The results showed only 11% uterotonic coverage at baseline (2005) to 96% (35% health facility delivery and 61% took misoprostol) in 2009. Distribution of misoprostol by the FCHVs was found to be feasible, safe, and acceptable to women. PPH education achieved a high degree of correct use and safety.

Conclusion: With the promising results of Banke in 2010, the Government of Nepal approved national-level expansion of the distribution of misoprostol by the FCHVs for the prevention of PPH at home-birth if AMTSL or SBA-assisted delivery was not possible. The programme, at present, has expanded to 11 of 75 remote districts.

Acknowledgements: The programme was funded by the USAID through the Nepal Family Health Program II, implemented by the Government of Nepal. Misoprostol was provided by Venture Strategies Innovations.

050 (027)

Very Low Coverage of Postnatal Care Despite High Acceptance of Antenatal Care among the Urban Poor in Dhaka

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Background: Postnatal care (PNC) is important not only for the safety of mothers' health but also for the survival of newborns. High neonatal mortality is attributed to many factors, including lack of PNC in Bangladesh

Objective: Estimate the coverage and explore service-seeking behaviour and identify the determinants of PNC service-use in urban poor areas of Dhaka where the Urban Primary Health Care Project is implemented by the Government of Bangladesh.

Methodology: Data from the baseline survey for monitoring and evaluation of the Second Urban Primary Health Care Project was analyzed to estimate the coverage and determinants of PNC. There are 10 partnership areas (PAs) in the Dhaka City Corporation. In total, 47 clusters (each having 150 households) were randomly selected to cover a sample of 2,350 eligible ever-married women in a PA. From each cluster, 50 eligible women were selected using systematic random technique. In total, 2,808 mothers who had delivery in the preceding year were interviewed for information on PNC with many other information relating to the wider objectives of the study.

Results: Only one-third (32.2%) of the recently-delivering mothers from the urban poor and slum areas received PNC whereas more than 83% of them had at least one ANC. Almost half of them visited the Urban Primary Health Care Centre, and about a quarter visited the government hospitals for PNC. Eighty-two percent of the mothers received vitamin A capsules during PNC. Mothers' education for more than 6 years ($p<0.001$) and lower age ($p<0.001$) positively correlated with PNC. The poor with free service entitlement cards received more PNC ($p<0.01$) than others.

Conclusion: Almost 2 of 3 mothers did not have any PNC in the urban poor setting in Dhaka. It is also evident that opportunity was missed to provide vitamin A during PNC. One of the proven strategies for preventing maternal and newborn morbidity and mortality is ensuring PNC. It is essential to identify the cause for not receiving PNC, and behaviour change communication activities should focus on the importance of PNC.

Acknowledgements: The authors express their gratitude to the Project Management Unit of Second Urban Primary Health Care Project (UPHCP), Ministry of Local Government, Rural Development & Co-operatives, Government of Bangladesh, ADB, DFID, UNFPA, and SIDA. HLSP, UK-based health consulting organization executed the survey for UPHCP II.

051 (057)

Access of the Rural Poor to Primary Healthcare in India

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Background: The 11th Five-Year Plan of India emphasizes the wider and better coverage of services, such as primary healthcare for the majority of population. Traditionally, for this purpose, various healthcare-related programmes were aimed at the vulnerable population based on the social criteria, namely the SC (schedule caste) and ST (schedule tribe) populations. However, this population has better health outcomes compared to the nation as a whole. It is, hence, relevant to undertake such programmes considering the vulnerable population on the economics criteria, i.e. the below-poverty line (BPL) population.

Objective: Examine the status of coverage of basic primary healthcare services among the BPL population in rural areas of India and provide empirical evidence for the same.

Methodology: Data used for the study were from a primary household survey of BPL rural families of 6 states in India. The methodology involved the survey of selected households from a BPL census conducted across India. These households were provided ranks depending upon various criteria indicating the vulnerability of their economics.

Results: The results of the survey showed that the coverage of primary healthcare services, such as antenatal care, institutional deliveries, and immunization was quite poor among the BPL population. Moreover, results of a comparison of the SC and ST and non-SC and ST population within the sample of selected households showed that the former had a relatively poorer coverage compared to the later.

Conclusion: The focus of improving coverage of primary healthcare services should be given on the BPL population. If it is done, it would result in the improvement of coverage among the SC and ST population. Merely focusing on the SC and ST population will leave the poor ignored and unattended.

052 (087)

Urban Primary Healthcare Services through Private-Public Partnership and Lessons Learnt

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Background: Lessons learnt from the private-public partnership (PPP) model of healthcare services could be reflected in different areas to ensure participation of local bodies and provide services to the poor as significant intervention.

Objective: Highlight the success of interventions taken under the Urban Primary Health Care Project II (UPHCP) through the PPP model that might encourage others to provide primary healthcare, sexual and reproductive healthcare services under the partnership with NGOs accepting it as a model.

Methodology: The methods involved consulting the quarterly performance report of the Urban Primary Health Care Project II, interview of service providers at the Comprehensive Reproductive Health Care Centres and Primary Health Care Centres, discussion with members of the User's Forum, interviewing programme managers, and consulting reports of the partner NGOs and Asian Development Bank.

Results: The results revealed that the involvement of NGOs can ensure participation of city corporations, municipalities, and ward commissioners more intensively with the project. In urban areas, influence of community leadership and peer groups is not prominent and visible as in rural areas and, therefore, participation of NGOs can easily fill in the gap and render services by generating awareness. The distribution of Red Cards to 30% of the poor can successfully provide services to make changes in healthcare at urban slums and scatters. The results further revealed that the extensive behaviour change communication and marketing approaches adopted by NGOs through interpersonal communication could successfully reach and educate the urban poor about reproductive healthcare, child-healthcare, and control of communicable diseases and make an impact on the empowerment of women and then motivate the community to refrain from violence against women. Formation of user's groups and deployment of outreach workers can increase the acceptance of family planning and generate consciousness about the targets of Millennium Development Goal 4 and 5 and also help the poor to engage in gainful employment, thereby, promoting the process of poverty reduction.

Conclusion: The Local Government Division under the existing law of the country is authorized to ensure primary healthcare services in urban areas while the Ministry of Health and Family Welfare (MoHFW) has inadequate presence in service-delivery and cooperation with technical and logistics support. UPHCP II, Smiling Sun Franchise Project, BRAC, and some other NGOs provide urban healthcare services in 6 city corporations and 309 municipalities in cooperation with local bodies. There is a need to find its effectiveness and capability to provide and take care of curative, promotive and preventive public-heath issues. The study gives an indication of the need for collaboration of the MoHFW and Local Government Division in providing public and environmental health services in urban areas and for working together to frame an urban health strategy with immediate implementation in view of the rapid growth of urban population.

Acknowledgements: The support of the Urban Primary Health Care Project II and Asian Development Bank is acknowledged.

053 (212)

Mainstreaming Traditional Medicines: Potential Role for Universal Health Coverage in the Indian Context

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Background: Importance of health services of all systems and the people's role in their own health-care are internationally well-recognized. India has a rich and mature indigenous health heritage with legal status to 7 traditional health systems other than modern medicines. Traditional medicine in India includes these forms of systematized health knowledge that have their own texts and formally-trained practitioners, i.e. Ayurveda, Yoga, and Naturopathy, Unani, Siddha, Sowa Rigpa, and Homeopathy (officially known by the acronym AYUSH), and the local folk practices that are transmitted orally. Under the National Rural Health Mission launched by the Indian Government to strengthen the public-health system of the country, "Mainstreaming AYUSH and revitalizing local health traditions" was one of the strategies adopted.

Objective: Assess the status and role of traditional health systems and delineate implications of this strategy in terms of coverage and quality of services as assessed by public-health management criteria, by traditional medicine criteria, and by the demand for services.

Methodology: The study included 18 states of India and covered AYUSH services in the public system (260 institutions) where both stand-alone services and those co-located with modern medicines were studied. Exit-interviews with patients (n=1,291) and household interviews (n=1,375) were also conducted in villages of selected blocks to capture the community's perspective. Quality of AYUSH services was assessed using a grading system incorporating indicators for infrastructure, human resources, drug supplies, and record-keeping.

Results: The major finding showed high use of AYUSH services and the local health traditions that are an integral part of the large sections of the population across the states even in the present time. Results of interstate analysis showed that the quality of AYUSH services was the prime determinant of use, irrespective of access to services of modern medicines. A validation exercise using the principles and texts of AYUSH systems verified the scientificity of community knowledge and AYUSH providers' prescriptions.

Conclusion: The study throws light on the importance of the role of systems other than modern medicines in ensuring universal health coverage whereby 'health coverage' must include the entire continuum from valid selfcare practices at home to the service institutions at primary, secondary and tertiary levels of care.

Acknowledgements: The authors thank the National Health Systems Resource Centre where the study was conceptualized, funded, and conducted.

Evaluation of the Janani Suraksha Yojana Scheme in India

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Background: India has seen a gradual decline in maternal mortality to 254 per 100,000 livebirths. However, the decline is inadequate to reach the Millennium Development Goal.

Objective: Evaluate the Janani Suraksha Yojana (JSY), involving a conditional cash-transfer mechanism to promote institutional deliveries and assess the trends in institutional delivery; the availability and quality of healthcare provided to pregnant women; the capability of health institutions and quality of services provided; and the role of the community health worker called ASHA.

Methodology: Three districts in each of 8 EAG (Empowered Action Group) states were selected as high-performing, poor-performing and tribal districts, based on the number of institutional deliveries during 2008-2009, JSY's fund–flow, and the proportion of scheduled caste (SC)/tribe populations. Quantitative and qualitative data were used for mapping the contexts, mechanisms, and outcomes as evidenced from primary and secondary data. In each district, 3 blocks were visited to sample public-health institutions at primary and secondary levels of care and the private sector.

Results: The conditional cash-transfer has seen an increase in institutional deliveries, with 46.3% of women delivering in public-sector institutions; 13.2% of estimated births occurred at First Referral Units (providing comprehensive emergency care)—mostly in district hospitals; 0.1% deliveries occurred at 24x7 primary healthcare centres (providing basic emergency obstetric care) while 33%, which was the bulk of deliveries, were delivered by skilled birth attendants in facilities that did not provide life-saving services, and by definition, did not meet the criteria for institutional delivery. Less than 1% of all births in districts were delivered by caesarean section, which was well below the norm of 5-15%, indicating acute shortfall in life-saving services.

Conclusion: While so-called 'institutional deliveries' have increased, the availability and quality of maternal and newborn health services and emergency obstetric and newborn services in particular was inadequate in most districts visited, irrespective of whether they were tribal/SC, poor-, or high-performing. No major differences were found between tribal/SC, poor- and high-performing districts to explain the differences in performance, except for greater availability of human resources.

03:30 pm–05:00 pm (Venue: Ball Room 2)

Symposium 8: Monitoring coverage and equity in the new HPNSP: prospects for improving access

Speakers

The strengths and shortfalls of the Bangladesh Health Information System
Professor A.K. Azad
Director, MIS, Directorate General of Health Services, Ministry of Health and Family Welfare, Government of Bangladesh, Dhaka, Bangladesh

Fertility and reproductive health indicators
Dr. Ahmed Al-Sabir
Former Director of Research, National Institute of Population Research and Training, Dhaka, Bangladesh

Mortality, nutrition, and immunization indicators
Professor Dr. M. Kabir
Jahangirnagar University, Savar, Bangladesh

Opportunities to enhance equity monitoring
Dr. A. Mushtaque R. Chowdhury
Associate Director, Rockefeller Foundation, Bangkok, Thailand

Improving quality of service-delivery at primary care level: a case study in Sylhet
Mr. Jonathan Cushing
Technical Advisor, GIZ, Dhaka, Bangladesh

03:30 pm–05:00 pm (Venue: Ball Room 3) 055 (052)

Scientific Session 10: Experience in improving access to services

Experience in Universal Health Coverage in Rwanda: A Case of Burera District

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Background: In 2005, Rwanda experienced a health crisis for lack of appropriate human resources (1 doctor per 50,000 inhabitants and 1 nurse per 3,900 inhabitants). The Government of Rwanda, in collaboration with its partners, has implemented significant innovative reforms (a nationwide community-based health insurance, performance-based financing, and fiscal decentralization were introduced in health sector) and interventions (address the shortage of health staff, inequity of access to healthcare, and poor quality of care in health facilities) in the health sector over the last few years for achieving the universal health coverage.

Objective: Share the lessons learnt that have been derived from the outcome of health-sector reforms and interventions using the example of Burera district.

Methodology: The study was based on review of literature, key-informant interviews, and principal author's observations during conducting a maternal healthcare-seeking behaviour study in Burera. Place of last delivery during the past 3 years, number of antenatal care (ANC) visits, and use of contraceptives were considered proxy indicators for measuring the outcome of health-sector reforms and interventions.

Results: In Burera, 72% of deliveries (n=793) took place at health facilities—either in health centres or in district hospitals, 4% on the way to health facilities, and another 5% had intention to go to a health facility but could not manage transportation. Sixty-three percent of the mothers (n=793) had undergone at least 4 ANC visits, and 29% made 3 visits. The contraceptive prevalence rate (CPR) in Burera in 2009 was 62%, of which 59% used modern method, and 75% of them used injectables. The corresponding national figures for 2005 were 4 and more ANC visits (13%), facility-delivery (30%), and CPR (17%).

Conclusion: Burera has progressed substantially in a short period. Three factors seemed to have facilitated this development: (a) overall government policy on health-sector reforms (including decentralization and autonomy and result-based financing); (b) introduction of universal community-based health insurance 'mutuelle'; and (c) emphasis on facilities, services, and providers. The Government's interventions, focused on awareness-building, also had a tremendous role.

056 (046)

Expanding the Coverage of Institutional Childbirths: A Case Study of Institutional Delivery Centres in the Sundarbans Delta, India

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Background: Restricted access to healthcare facilities is often regarded as an influencing factor for the overwhelming proportion of domiciliary childbirth in India's hard-to-reach regions of the Sundarbans delta. Through an innovative healthcare initiative under public-private-partnership, i.e. Institutional Delivery Centres (IDCs), the State Department of Health of West Bengal attempted to increase the level of safe institutional births and facilitate access to neonatal care in some remote pockets of the Sundarbans since early 2008.

Objective: Understand the influence of proximity of IDCs on decision-making for institutional childbirth from 16 villages of a remote administrative block of the Sundarbans.

Methodology: Data on service-records maintained by a participating NGO were employed for analyzing monthly trends in the performance of 3 IDCs since inception. Service statistics on pregnant women, maintained by outreach health workers in catchment villages of the IDCs were used for understanding the choice-pattern of the place of delivery during the similar time period. Case study method was followed to document the unique cases on decision-making in favour or against institutional delivery.

Results: The service statistics showed the steadily increasing trend of childbirths in all the 3 IDCs over the last two and half years since March 2008, reflecting the consistent performances of these centres. However, the proximity of delivery centres at the community level could not ensure the universal use of services during delivery. Understanding the hindrances towards institutional childbirth indicates a much broader set of reasons than only issues relating to the availability of affordable services within proximity.

Conclusion: The results showed that the higher coverage of institutional care through the IDCs was partly successful in enhancing the level of institutional births in a geophysically-challenged area having significant barriers to physical access. However, family dynamics and prevalent cultural notions relating to childbirth need special understanding and support to exploit the untapped potentials of these community-based centres to achieve the universal coverage of delivery care in the remote pockets of the Sundarbans.

057 (097)

Vitamin A Supplementation in India: Who Are Reached and Who are Missed?

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Background: India has the largest percentage and the largest absolute number of vitamin A-deficient children in the world. The *Lancet* child-survival series in 2003 listed vitamin A supplementation among the key interventions achievable at a large scale that have proven potential to reduce the number of preventable childhood deaths each year. Moreover, vitamin A supplementation is recognized as one of the most cost-effective interventions for improving child survival. Thus, vitamin A programming is a prerequisite for achieving Millennium Development Goal 4, particularly in countries with high mortality of children aged less than 5 years and/or vitamin A deficiency rates, such as India.

Objective: Examine the association between socioeconomic and demographic characteristics of children in all the states of India and assess the social and economic status of vitamin A supplementation coverage to identify who are reached and who are missed.

Methodology: Data were mainly retrieved from India's recent National Family Health Survey conducted during 2005-2006. In this study, 20,802 children aged 12-35 months were considered for analysis. An association between children receiving vitamin A supplementation and the underlying factors was examined through unadjusted and adjusted binary logistic regression models.

Results: In India, a wide differential in vitamin A supplementation coverage was observed across the states of India (<10% to >45%), indicating a poor coverage. Children aged 12-23 months were reached more whereas children aged 24-35 months were missed more. Rural children were covered more [odds ratio (OR)=1.20, 95% confidence interval (CI) 1.10-1.30, p<0.0001) than urban children. Children whose mothers were educated were 2.4 times more likely (OR=2.40,95% CI 2.04-2.83, p<0.0001) whereas children in higher birth-order (6+) (OR=0.54,95% CI 0.46-0.63, p<0.0001) and residing in states with low SSES (OR=0.51,95% CI 0.46-0.57, p<0.0001) were almost half time less likely to receive vitamin A supplementation.

Conclusion: The state's social and economic status and mother's education rather than household wealth largely determine children receiving vitamin A supplementation in India. There is an urgent need for continued efforts to improve vitamin A status of the population through better management and coverage of the programme.

058 (141)

BRAC Community-based Interventions and Maternity Care in Dhaka City Slums

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Background: Health indicators of the urban poor are worse than of the rural poor, despite being in close proximity to skilled care providers. For improving maternal, newborn and childcare practices of the urban poor in slums, BRAC has been implementing a community-based comprehensive package of essential services (called Manoshi) in phases in Dhaka city since 2007 and in other cities since 2009.

Objective: Assess the maternal and newborn-care practices in the intervention and comparison areas of the Manoshi project.

Methodology: A 4-cell (pre- and post-intervention and their comparison) study design was followed. The baseline survey in 2007 randomly selected 100 slum clusters (67 in intervention area and 33 in comparison area) and interviewed 2,400 mothers of infants for maternity and newborn care. The midline survey in 2009 interviewed 3,200 mothers of infants selected randomly from 100 slum clusters. Both bivariate and logistic regression were used for assessing differences in maternity and newborn care between the intervention and the comparison group and attributing these to the effects of the Manoshi interventions.

Results: Any antenatal care (ANC) visit and the Government-recommended 4 or more ANC visits for births in the last 12 months were higher in the intervention area in 2009 than in 2007 and the comparison area in 2009 and so were the advice on pregnancy care. Half of deliveries took place in the health facilities in the intervention area in 2009 compared to 15% in 2007 and 24% in the comparison area in 2009. The coverage of postnatal care (PNC) after delivery was 55% in the intervention area in 2009 compared to 28% in 2007 and 32% in the comparison area in 2009 but the coverage of 4 or more PNC visits was low (5-7%) in all the areas. Self-reported pregnancy-related complications were lower—19% in the intervention area in 2009—compared to 26% in 2007 and 28% in the comparison area in 2009. Newborn-care practices, feeding colostrums immediately after birth, delay of bathing just after birth, and health check-up of neonates were higher in the intervention area compared to those in the comparison area.

Conclusion: The Manoshi intervention project has brought significant improvements in maternity and newborn care. However, there are rooms to improve the low coverage of 4 or more ANC and PNC visits by urban slum residents.

Acknowledgements: The authors thank the Bill & Milenda Gates Foundation for financial support.

059 (147)

Universal Access to Malaria Treatment for Under-five Children: The Experience of Rural Burkina Faso

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Background: Universal access to effective treatment of malaria represents an essential malaria-control strategy in sub-Saharan Africa. The World Health Organization recommends presumptive treatment of febrile children with artemisinin-based combination therapy (ACT) within 24 hours of onset of symptoms. To facilitate universal access to artemisinin-based combination therapy (ACT) for under-5 children, the Government of Burkina Faso heavily subsidizes the drug, making it available at US$ 0.20 (per course of treatment) in public-health facilities.

Objective: Assess the access to ACT for febrile under-5 children given the presence of subsidy; identify inequities and excluded groups; and also explore the individual, household, and community factors associated with such access.

Methodology: The study was conducted in Nouna health district, rural Burkina Faso, in February-March 2010. Data were obtained through a cross-sectional survey conducted on 1,130 households, selected using 2-stage cluster-sampling procedures. From each household, information was collected on every child reporting a malaria episode in the 4 weeks preceding the interview. Questions assessed the choices of treatment made, including the use of formal healthcare facilities and drugs used. Household demographic and socioeconomic information was also recorded. Multivariate logistic regression was used for assessing the factors associated with access to ACT. Ethical clearance was granted by both Ethical Committee of the Medical Faculty in Heidelberg University and National Ethical Committee in Burkina Faso.

Results: In total, 247 cases of malaria in under-five children were reported. Only 15% of the ill children received ACT within 24 hours of onset of symptoms. The percentage of children treated with ACT increased to 34%, including children who received the drug up to 4 days later. Ninety percent of the children treated with ACT obtained the drug from a government health facility. Only socioeconomic status, Bwaba ethnicity, and ownership of a radio were significantly associated with receiving ACT.

Conclusion: Current subsidies and current distribution strategies focused on formal health facilities fall short of ensuring universal and equitable access to ACT in rural Burkina Faso. Additional measures, such as removal of user-fee for under-5 children and distribution of ACT through community health workers, are urgently needed to ensure universal and equitable access to care.

Acknowledgements: The study was supported by the German Research Society (DFG) through its SFB 544 "Control of Tropical Infectious Diseases" D4 project.

060 (185)

Improving Coverage of Neonatal Jaundice Management in the Limited-resource Setting

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Background: Timely use of phototherapy for neonatal jaundice can prevent kernicterus. Phototherapy is one of the most frequently-prescribed interventions in the neonatal setting in the hospital. Modern phototherapy machines can be prohibitively expensive in the low-resource setting. Poor-quality phototherapy prolongs both length of treatment and hospital stay and also increases the need for exchange transfusion.

Objective: Describe programmatic practical experience of the burden of disease and design interventions for neonatal jaundice in a busy neonatal unit to improve the coverage and efficiency of neonatal phototherapy for jaundice-affected babies

Methodology: A case study describing 2 low-cost interventions is presented. First, a low-cost bedside pictorial assessment job-aid was designed to identify significant neonatal jaundice requiring measurement of serum bilirubin. Second, a low-cost, large-volume effective phototherapy unit was designed using locally-available materials. Intensity of light was measured using a photometer to determine the quality of light and frequency of bulb change needed.

Results: During January 2006–December 2009, 6,046 neonates were admitted to the neonatal unit of a busy general hospital. Neonates identified as requiring phototherapy rose from 106 (6.3%) in 2006 to 196 (14.3%) in 2009. Over this time period, 10 neonates (0.2%) had exchanged transfusion. The modified phototherapy unit had higher light-intensity compared to the existing units (7.5 vs 4 microW/cmsquared/nm). Light-intensity decreased after 40 days of bulb-use.

Conclusion: The coverage of neonatal phototherapy intervention can be increased with the implementation of a job-aid to improve diagnosis of treatment levels of neonatal jaundice. The revised design of the phototherapy unit improved the availability and efficiency of this intervention.

DAY 3: 17 March 2011, Thursday
09:30 am–10:30 am (Venue: Grand Ball Room)
Plenary Session 3: Tracking progress towards universal health coverage with equity

Speakers

The current status of National Health Accounts in Bangladesh
Ms Tahmina Begum
GIZ, Dhaka, Bangladesh

Making equity considerations more central in universal health coverage
Dr. Jeannette Vega
Director, Centre for Public Health Policy, Universidad del Desarrollo de Chile, Santiago, Chile

Mobilizing civil society to monitor progress towards universal health coverage
Dr. A. Mushtaque R. Chowdhury
Associate Director, Rockefeller Foundation, Bangkok, Thailand

Revitalizing information systems for monitoring universal health coverage through IT
Mr. A.K.M. Nazrul Haider
Consultant, Information Technology, ICDDR,B, Dhaka, Bangladesh

11:00 am–12:30 pm (Venue: Ball Room 1)

Symposium 9: Can information technologies accelerate coverage of services?

Speakers

Information technology to transform Health Management Information Systems
Professor A.K. Azad
Director, HMIS, Directorate General of Health Services, Ministry of Health and Family Welfare, Government of Bangladesh, Dhaka, Bangladesh

Improving maternal and child health coverage in urban slums with *m*-health
Mr. Mridul Chowdhury
President, Click Diagnostics, Dhaka, Bangladesh

Telemedicine to enhance universal health coverage
Mr. Sikder Zakir
Managing Director, Telemedicine Reference Centre Ltd., Dhaka, Bangladesh

Universal registration of mothers and children in Bangladesh
Dr. Tim Evans
Dean, James P Grant School of Public Health, BRAC University, Dhaka, Bangladesh

11:00 am–12:30 pm (Venue: Ball Room 2) 061 (058)

Scientific Session 11: Equity in health systems

Addressing Equity Gaps in Bangladesh through Community Mobilization: The People's Institution Model

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Background: Netrokona district of Bangladesh is populated by Garo, Koch, and Hajong tribal people who experience economic and geographic marginalization and have many unmet health needs compared to average Bangladeshis. Community participation in the provision of health services can narrow equity gaps by empowering isolated groups who otherwise would not have coverage.

Objective: Describe a sustainable model for community mobilization and its effectiveness in reducing health disparities in Bangladesh.

Methodology: National staff worked with local communities to build the People's Institution (PI) community mobilization model to enhance the coverage of basic quality of services for mothers and newborns in Kolmakanda and Durgapur upazilas, Netrokona. The PI became a self-governing community-based organization registered with the Government serving as an institutional link to health facilities and local authorities. Its health subcommittee oversaw the identification and training of community health volunteers and traditional birth attendants who provided health promotion, care, and linkages with the existing government facilities. A cluster sample of 300 mothers of children aged less than 2 years were interviewed at baseline (March 2005) and 4 years later (May 2009) using an 87-item knowledge practices and coverage survey. The sample-size is 300 based on the USAID's recommended survey—the Knowledge, Practice and Coverage survey using the 30-cluster random-sampling method. Results were compared with the Bangladesh Demographic Health Survey (BDHS) 2007. The results comprised health outcomes at the individual (caregiver) level in the households and different from the service outcomes at the health system level. The focus is on individual behaviour change to reflect the project's objectives and activities. Results of the Health Facility Assessment Survey were not included in this study.

Results: Significant improvements occurred in health outcomes ($p<0.05$) that surpassed most national averages. Delivery by skilled/trained birth attendants increased from 21% to 95% (BDHS 29%). The proportion of mothers receiving 4 prenatal visits increased from 6% to 86% (21%) and 2 doses of tetanus toxoid from 62% to 98% (90%). Mothers' knowledge of danger-signs of pregnancy rose from 31% to 100% (50%) while the use of zinc in the treatment of diarrhoea in children rose from 11% to 87% (23%). Appropriate complementary infant-feeding improved from 14% to 80% (81%), vitamin A coverage from 61% to 76% (88%), and complete immunization rates from 32% to 96% (82%).

Conclusion: The People's Institution is a feasible community-based equalization model that shows promise for increasing healthcare coverage, reducing inequities, and improving maternal and child health in underserved communities.

Acknowledgements: The authors thank the USAID and CRWRC—the project's funding agencies, and PARI, SATHI, Government of Bangladesh, and the project's implementing partners.

062 (112)

Is Demand-side Financing Equity Enhancing? Effect of the Voucher Scheme on Maternal Healthcare Use by the Poor in Bangladesh

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Background: The Government of Bangladesh initiated the Maternal Health Voucher Scheme to reduce the financial barriers faced by poor pregnant women. Increasing the demand for maternal health services was one of the principal objectives of the pilot programme.

Objective: Analyze the short-term effects of the voucher scheme on the use of maternal health services in rural Bangladesh.

Methodology: A household survey was conducted in and around the voucher-scheme area during May-June 2008, exactly a year after the initiation of the scheme. Women who delivered within a year before the survey were interviewed. The sample-sizes were 600 and 3,000 in the intervention and the comparison area respectively. Data were collected on the use of maternal healthcare services. The rich-poor ratio and inequality indices were calculated for maternal health services. Logistic regressions were run to estimate the effect of vouchers on service-use.

Results: The rich-poor ratios of use-rates were significantly lower in the intervention area than in the comparison area for antenatal care, delivery assisted by skilled personnel, institutional delivery, and postnatal care (PNC). The concentration indices were also higher for the comparison area. Poor voucher recipients were 4.3 times more likely to deliver in a health facility than non-poor voucher recipients. Odds of delivery assisted by skilled health personnel and PNC-use were more than 2 times for poor voucher recipients compared to non-poor recipients. The only indicator of maternal health that remained problematic after the introduction of vouchers is the access to care for obstetric complications.

Conclusion: The voucher programme increased skilled personnel-assisted delivery, facility-based delivery, and PNC-use for all women, especially for the poor women. The vouchers show much stronger demand-increasing effects on the poor even in the very short-run. Reduction in financial barriers to healthcare-seeking through vouchers could not improve the use of services of the poor for pregnancy-related complications. It is important to determine if non-financial barriers are limiting access of poor women to maternal health services relating to pregnancy complications. Comprehensive system-wide approach, including supply-side strengthening, will be needed to adequately address maternal health concerns in poor developing countries of the world.

Acknowledgements: The survey was funded by DFID and EC through Joint UN Maternal and Neonatal Health Initiative in Bangladesh.

063 (148)

Access to HIV Testing among Men in Rural Burkina Faso: A Question of Equity?

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Background: Antiretroviral treatment (ART) programmes are currently rolled out on a large scale in sub-Saharan Africa. Enabling people to know their HIV status represents the essential gateway to ensuring universal coverage of ART. There is still a paucity of information on coverage with HIV testing and on factors associated with such testing among men in rural West Africa.

Objective: Assess the coverage of HIV testing among men in rural Burkina Faso; identify inequities in access; and explore the individual, household and community factors associated with male HIV testing.

Methodology: The study was conducted in Nouna health district during February-March 2009. Data were obtained through a cross-sectional survey conducted on 1,130 households, selected using 2-stage cluster-sampling procedures. In each household, information on HIV testing was collected from all male heads of households (n=1,059). Demographic and socioeconomic information about households was also recorded. Multivariate logistic regression was used for assessing factors associated with HIV testing. Ethical clearance was granted by both Ethical Committee of the Medical Faculty in Heidelberg University and National Ethical Committee in Burkina Faso.

Results: Only 10% of men had ever tested for HIV. Of those who tested, 76% had received their test results. Household wealth [odds ratio (OR)=2.4)], higher literacy (OR=2.2), and living within 5 km from a health facility (OR=4.0) were significantly associated with participation in HIV testing.

Conclusion: The coverage of HIV testing is very low among men in rural Burkina Faso. Its association with socioeconomic status, literacy, and distance to health facilities is a clear indication of existing inequities in access. To promote equitable access to HIV testing among men in rural Burkina Faso, additional strategies, such as home-based service provision, outreach programme for free HIV testing, and education campaigns, should be promoted. These community-based approaches have the potential to reduce existing inequities in coverage by reaching the most vulnerable segments of the population.

Acknowledgements: The financial support of the German Research Foundation within the framework of the research grant SFB 544 “Control of tropical infectious diseases”, University Clinic Heidelberg, Heidelberg, Germany, is acknowledged.

064 (157)

Achieving Universal Healthcare: State of Community Empowerment in Bangladesh

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Background: Evidences from different countries suggest that initial attempts of universal healthcare (UHC) encounter resistance from different quarters, such as professional association of physicians and financial experts of the country. Therefore, it is important that people themselves must come forward to claim their right to healthcare which can be ensured through UHC. For this, people must be empowered and be informed about their entitlements to healthcare.

Objective: Understand the status of community empowerment in Bangladesh and explore suggestions from the community for empowering them.

Methodology: Two villages—one from near the capital city of Dhaka (Kashipur) and the other one from a distant island called Mehendiganj under Barisal district (Char Lata) were selected. Five percent of households were selected from each village through systematic random sampling. One participant from each household was selected by Kish method. In-depth interview and participatory rapid appraisal (PRA) were conducted to allow the community people to suggest in favour of their own empowerment. Community empowerment was evaluated across 4 parameters: access to information, participation in decision-making, ability to demand accountability from decision-makers, and capacity to work in partnership with the Government.

Results: Ninety percent of the people had some sort of information source in both the villages. However, the main source of information in Kashipur was television (100%) while in Char Lata it was radio (95%) ($p<0.001$). There was almost absolute lack of empowerment in terms of participation in decision-making, demanding accountability, and scope of partnership with the Government. However, the PRA and qualitative study revealed demand for empowerment among the community and for innovative ways to achieve that.

Conclusion: The findings and suggestions emerged from the study will inform about different modalities of community empowerment which, in turn, will help empower the people.

Acknowledgements: The study was funded through 'The Teasdale-Corti Global Health Research Partnership Program' by the International Development Research Centre, Canada.

065 (181)

Inequity in the Use of Maternal Health Services in Bangladesh: A Barrier to Achieving Millennium Development Goal 5

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Background: Bangladesh has made a significant progress in improving maternal health status during the last decade. During 1990-2001, the maternal mortality ratio (MMR) decreased from 570 to 322 per 100,000 livebirths. However, inequity in the MMR and other maternal health indicators needs to be analyzed carefully to make further progress towards achieving Millennium Development Goal (MDG) 5 in Bangladesh.

Objective: Report the trends of inequity in the use of maternal health services and MMR in Bangladesh.

Methodology: Secondary analysis of the Bangladesh Demographic and Health Survey (BDHS) data from 1993 to 2007 was performed.

Results: The coverage of antenatal care (ANC) increased from 28% in 1993-1994 to 60% in 2007. In 2007, 31% of women in the poorest socioeconomic quintile (SEQ) received ANC compared to 84% in the richest SEQ. The rural-urban gap in terms of ANC coverage was 28% in 2004 and 20% in 2007. In 2007, 89% of childbirths occurred at home in the rural area compared to 69% in the urban area. Although the proportion of deliveries at home is declining in both rural and urban areas, the rural-urban gap remained static. In the case of the lowest SEQ in the rural area, there was a 2% decline in the proportion of deliveries at home between 2004 and 2007 compared to 12% decline in the highest SEQ in the urban area. The gap between the lowest and the highest SEQ in terms of delivery by trained care providers was 36%, which increased to 46% in 2007. The similar trend was observed in the case of postnatal care. The MMR in 2001 was 343 in the lowest SEQ and 208 in the highest SEQ.

Conclusion: Inequity in the use of maternal health services is either remaining static or increasing in Bangladesh. The rate of improvement is more visible in the urban areas and in the highest SEQ. There is a huge gap between MMR in the poorest and richest SEQ. Maternal health services should be made available to the rural poor to achieve MDG 5 in Bangladesh.

Acknowledgements: The authors are thankful to ICDDR,B for support.

066 (272)

Inequality in Healthcare-use and Health in Rural Bangladesh

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Background: The Government of Bangladesh has invested substantially for increasing access to and use of formal healthcare in rural areas. There are also substantial efforts by not-for-profit organizations for expanding formal healthcare in rural Bangladesh. The main goal of these efforts is overall improvement of population health. The progress may be uneven among different socioeconomic strata. Existing literature has little focus on this issue.

Objective: Examine the socioeconomic inequality in the use of formal healthcare for both curative and maternal conditions and health status.

Methodology: Data from a survey conducted on 4,011 stratified randomly-selected households from 120 villages were used. Formal care for curative conditions is defined as those sought from any qualified provider, and for maternal condition (child delivery) as those attended by a qualified birth attendant. Self-reported morbidity, self-assessed health in a 5-point scale (excellent, good, average, bad, and very bad), and an index of physical functioning [(activities of daily living (ADL)] were used for measuring the health status. Both bivariate and multivariate tools were used for analyzing data.

Results: There is a positive trend in the use of formal care for both curative and maternal conditions across the consumption quintiles. A significant difference (p=0.05) was found in the use of formal care between the poorest and the richest quintiles for both conditions. In the self-reported general health status measure, a positive trend across the quintiles was found in good health and a negative trend in bad health. However, the proportional difference in these outcomes was not significant between the poorest and the richest quintiles. Any difference in morbidity and ADL index between the poorest and the richest quintiles was also not found. The multivariate results showed that the socioeconomic factors had a significant positive association with the use of formal healthcare and self-reported general health status. However, these factors did not have any significant association with self-reported morbidity and ADL measure.

Conclusion: There is socioeconomic inequality in the use of formal care for both curative and maternal conditions in rural Bangladesh. Self-assessed (general) health measure shows socioeconomic inequality in health. However, more objective measures do not provide any evidence of socioeconomic inequality in health.

Acknowledgements: The financial support from the DFID's PROSPER is gratefully acknowledged.

11:00 am–12:30 pm (Venue: Ball Room 3) 067 (126)

Scientific Session 12: What information is needed for universal health coverage?

Treatment-seeking Behaviour of Unmarried Adolescent Girls for Selected Reproductive Health Problems in Two Rural Areas and One Urban Slum Area of Bangladesh

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Background: In Bangladesh, adolescents constitute 24% of the total population. It is important to know the coverage of adolescents' treatment-seeking behaviour for selected reproductive health problems. This paper presents the results of a collaborative study of ICDDR,B with the Government of Bangladesh, Population Council, and RTM International.

Objective: Explore treatment-seeking behaviour of unmarried adolescent girls for selected reproductive health problems in 3 areas of Bangladesh.

Methodology: A cross-sectional survey was conducted in 2 rural sites (Raipur and Nabiganj) and one urban slum area (Dhaka) from November 2008 to mid-March 2009. The study population included unmarried adolescent girls aged 13-19 years. From the 3 study areas, 2,400 (800 from each) unmarried adolescent girls, selected through systematic random sampling, were interviewed using a structured questionnaire.

Results: About 20% of the female unmarried adolescents who experienced menstrual problems, such as lower abdominal pain, pain in the back, irregular menstruation, and excessive bleeding, sought treatment from qualified persons. Higher proportions of adolescents in Nabiganj and Raipur sought treatment from village doctors (43% and 32% respectively) compared to the urban slum area (6%). In general, over 10% of the adolescents obtained treatment from *kobiraj*. About 21% of the urban slum adolescents sought treatment from pharmacies whereas less than 1% of the adolescents in Raipur and Nabiganj obtained treatment from the same source. In Raipur, a higher proportion (21.9%) of the adolescents had sexually transmitted infection (STI)-related problems during the last year compared to those from the urban slum area (8.8%) and in Nabiganj (2.9%). Self-treatment was the most commonly-reported care for those who had experienced any STI problem (60%). About 20% of the adolescents in all the areas sought treatment from qualified health professionals for the last STI problem.

Conclusion: Most adolescents relied on qualified persons for reported menstrual problems. On the other hand, self-treatment was the commonest care for STI problems. Adolescent-friendly reproductive healthcare facilities should be established to enable adolescent girls for obtaining treatment for reproductive health problems with confidentiality and comfort.

Acknowledgements: The authors acknowledge the funding support of CIDA through the United Nations Population Fund. The project was implemented through the National Institute of Population Research and Training.

068 (131)

Determinants of the Use of Antenatal Care Services in Rural Bangladesh

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Background: In Bangladesh, the rural-urban differential in antenatal care (ANC) coverage is quite large. There is also disparity in ANC-use among divisions—in Khulna, the ANC-use rate is 71%, and it is 52% in Barisal.

Objective: Examine the factors affecting the use of ANC service by rural women.

Methodology: Data for this cross-sectional study were collected from the project area of the National Nutrition Programme (NNP). Under the NNP, the Government of Bangladesh provides free nutrition packets, ANC check-ups, health messages on danger-signs, preventive care, postnatal check-ups, and referral services. The study was conducted during April-May 2008 in 2 rural upazilas of Barisal division, namely Barisal Sadar under Barisal district and Nolsity upazila of Jhalokathi district. Under each upazila, one union was purposively selected and, finally, 3 villages from each union were randomly selected. In total, 415 ever-married women who had experienced at least one pregnancy in 3 years preceding the survey and those aged 15-49 years were randomly selected for interview.

Results: The findings showed that 90% of the women visited at least once for ANC service, and 26% received 4 visits either from a trained or an untrained provider. Fifty percent of the respondents received care from a professional doctor, 12% from a nurse or a paramedic, 6% from family welfare visitors (FWVs), 50% received ANC from the Community Nutrition Promoter. In the case of quality of ANC services, most (80%) women received height and weight measurements, tetanus toxoid vaccine, and iron tablets compared to blood pressure measurement, urine test, blood test, and ultrasonogram. Education, age, mass-media exposure, family income, number of living children, and number of total pregnancies were significant determinants of ANC-use. The women having adverse reproductive history, such as still-birth or neonatal deaths tended to receive more ANC services from qualified doctors. Women having better knowledge on ANC service and who were rich were found more likely to receive ANC service.

Conclusion: It is evident from the study that the availability and accessibility of ANC services through the NNP support increased the use of ANC services.

Acknowledgements: The authors thank the United Nations Population Fund for funding the study.

069 (190)

Programmatic Experience of Facility-based IMCI Implementation in Rural Bangladesh

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Background: IMCI strategy launched by the World Health Organization (WHO) and United Nations Children's Fund (UNICEF) aimed to reduce deaths of children aged less than 5 years (under-5 children) from 5 diseases. Facility-based IMCI in the research setting has demonstrated positive changes in quality of care and health and nutrition outcome indicators of under-5 children. Challenges to widespread implementation in the low-resource setting have included limited clinic time for the health workforce to manage patients and perceived increased workload of IMCI.

Objective: Describe successful programmatic implementation of facility-based IMCI using novel adapted tools in the outpatient department of a rural hospital and describe main classifications identified.

Methodology: Medical Assistants working in the outpatient department received training on facility-based IMCI. Two novel job-aids were developed from IMCI materials: (a) Revised recording forms using IMCI traffic light colour system included the steps 'Assessment' and 'Classification' and (b) Revised chart booklet included the steps—'Identify treatment', 'Treat the child', 'Counsel the mother', and 'Follow up'. Every under-5 sick child who presented to the paediatric clinic was assessed by IMCI. Focus-group discussions (FGDs) were performed with the Medical Assistants to identify their perceptions of the IMCI system.

Results: During September 2009–November 2010, 6,369 under-5 children—2,453 (39%) girls, 3,733 (59%) boys, and 183 (3%) not documented—were assessed by IMCI. The IMCI age-bracket '2 months to 5 years' included 5,617 (88%) sick infants, and the age-bracket '0-2 months' included 706 (11%) sick infants. Using the revised tools, paramedics could quickly assess these patients. Top 5 most-frequent classifications of illness/disorder identified were: (a) cough and cold (56%), (b) feeding issues (35%), (c) fever (malaria unlikely) (35%), (d) incomplete immunization (18%), and (e) low weight-for-age and severe malnutrition (11%). FGDs positively identified saving time of health workers, improving feeding assessments, focusing health teaching, and ensuring completeness of assessment and appropriate use of medicine. Concerns expressed included not using a stethoscope.

Conclusion: Effective rigorous implementation of facility-based IMCI in the outpatient setting demonstrates the elegant design of this strategy to identify classifications of illness, nutrition, immunization, and prevention of other diseases. Facility-based IMCI is an efficient intervention to increase the universal health coverage of under-5 children.

Acknowledgements: The support of LAMB Health Care Foundation-managed DFID Civil Society Challenge Fund Grant is acknowledged.

070 (196)

Use of the Community-based Skilled Birth Attendant Programme in a Rural Area of Bangladesh

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Background: Child delivery with a skilled birth attendant (SBA) is the widely-agreed health intervention for reducing maternal and neonatal deaths. The Government of Bangladesh introduced the community-based SBA (CSBA) programme in 2003 to ensure safe motherhood. However, little is known about the impact of the programme in Bangladesh.

Objective: Measure the impact of the CSBA programme in terms of receiving delivery assistance over time and examine whether this intervention is uniform for all socioeconomic groups.

Methodology: Assistance during delivery from SBAs of 5,687 pregnant women were observed in the Chakaria Health and Demographic Surveillance System (HDSS) area during 2005-2009. The percentage of births attended by the SBAs was compared between 2005 and 2009, and the asset quintile was used for examining the socioeconomic differentials in receiving services of SBAs.

Results: The percentage of births attended by the SBAs remained almost same between 2005 and 2009 (10.3% vs 10.9%). Receiving delivery assistance from the SBAs for women from the highest quintile was about 5 times of the women from the lowest quintile, and this inequality remained similar between the years.

Conclusion: No significant change was observed after the introduction of CSBA programme in Chakaria. Interventions to increase the use of SBAs during delivery need to be designed in such a way that they are effective and contribute to reduce the socioeconomic differentials in service-use.

Acknowledgements: The authors acknowledge the contribution of ICDDR,B and its core donors for supporting the Chakaria HDSS.

071 (230)

Determinants of Functionality and Effectiveness of Community Health Workers: Results from an Evaluation of India's ASHA Programme

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Background: In 2005, India launched a female community health workers programme (called ASHA) as part of a larger national programme to address key health indicators for women and children. A study was undertaken in 8 states to assess its effectiveness.

Objective: Understand the functionality of the ASHA in terms of the tasks that she undertakes, relate the functionality of an ASHA to her effectiveness in bringing about health outcomes, and assess the ability of ASHA to reach marginalized communities and secure health entitlements.

Methodology: The evaluation used a mixed approach, with Phase 1 using qualitative methods and Phase 2 using quantitative methods. Eight states were chosen purposively to yield maximum insight in divergent mechanisms, contexts, and outcomes. Within each state, 2 districts were chosen on the criteria of high and moderate performance in terms of institutional deliveries. The sample-size for each district included: 100 ASHAs, 600 service-users, 25 Auxiliary Nurse Midwives, 100 Anganwadi Workers, and 100 Panchayati Raj institution members from 100 villages.

Results: The use of ASHA's services—a key indicator of functionality—showed that the programmatic emphasis on care for pregnant women resulted in almost 75% of pregnant women (n=13,516) across the states receiving services from the ASHAs, with some divergences. For care of the sick child, despite lower programmatic attention, this was about 70% of 10,182 mothers. About 70% of 5,861 beneficiaries reported more than 3 visits during the antenatal period. Over 71% of the beneficiaries contacted the ASHAs for complication, and, in most states, over 70% of the service-users who went for institutional delivery were escorted by the ASHAs at the time of delivery. The ASHA emerged as an important player in facilitating cash entitlements for institutional deliveries; 75% of the beneficiaries reported counselling on early initiation of breastfeeding but this was up to 60% for other aspects, such as keeping the baby warm, postpartum care, and contraception.

Conclusion: The vast majority of the ASHAs are functional, irrespective of contextual factors. The key determinants of effectiveness appeared to be the support and training structures, the programmatic focus on selected components, and supply-side components, including functioning healthcare services.

072 (313)

Feasibility and Outcomes of a Community-based Approach to Severe Acute Malnutrition in an Urban Slum in Dhaka, Bangladesh

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Background: The World Health Organization recommends an ambulatory community-based approach for the management of severe acute malnutrition (CMAM) in low-income countries. However, CMAM experience has so far been based on emergencies and famine in Africa, and there is limited experience on its feasibility and effectiveness in Asia.

Objective: Report the feasibility of CMAM and the nutritional outcomes among children aged <5 years in Kamrangirchar, an urban slum in Dhaka, Bangladesh.

Methodology: Kamrangirchar has about 400,000 inhabitants living within a 3.1-sq km area. Active screening for malnutrition is done through door-to-door visits by community health workers and at a primary healthcare centre (PHC). The entry-criteria include severe acute malnutrition (SAM) and moderate malnutrition with medical complications (MAM). SAM is defined as mid-upper arm-circumference (MUAC) of <115 mm and/or weight-for-height z-score (WHZ) of <-3 standard deviation (SD), or bilateral pitting oedema. MAM is defined as WHZ of <-2 SD with medical conditions, such as anorexia, lower respiratory tract infection, high fever, severe dehydration, severe anaemia. Therapeutic feeding involves a ready-to-use therapeutic food (Plumpy-nut) given on ambulatory basis, according to a standard guideline. Follow-up is home-based or through the 'outreach fixed sites'. Children are discharged on reaching WHZ of >-2 SD on 2 consecutive occasions one week apart.

Results: During the 8-month period (May-December 2010), 193 children were included, of whom 159 (82.4%) were SAM (114 WHZ<-3SD, 18 had MUAC <115 mm, 23 had WHZ <-3SD and MUAC <115 mm, 4 oedema), and 34 (17.6%) were MAM. In total, 151 (78%) children were detected through the PHC and 42 (22%) through door-to-door screening. Morbidity on admission included 49 (25%) cases of vomiting/diarrhoea, 61 (32%) cough, 79 (41%) fever, and 56 (29%) anorexia. Twenty-four (12%) children required day-care, and 15 (8%) inpatients needed therapeutic feeding. The cohort outcomes included 169 (88%) cured, 21 (11%) lost-to-follow-up, 2 (1%) deaths, and 1 (1%) non-responding. The average duration of stay and weight gain was 39 days [95% confidence interval 21-58] and 3.95 g/kg/day respectively. In 18 (11.3%) cases of SAM, the use of MUAC as a community-measurement tools was not applicable due to chronic growth stunting (height <65 cm).

Conclusion: The preliminary results are encouraging with acceptable outcomes. Anthropometric admission criteria, however, need further investigation.

01:30 pm–03:00 pm (Venue: Ball Room 1)

Symposium 10: How can equity inform and evaluate health policy and programmes?

Speakers

UNICEF's new focus on equity—what it changes in practice
Dr. Michel Saint-Lot
Deputy Representative, UNICEF, Dhaka, Bangladesh

How Chile has implemented and monitored equity-oriented health reforms
Dr. Jeanette Vega
Director, Centre for Public Health Policy, Universidad del Desarrollo de Chile, Santiago, Chile

Overcoming inequities in HIV diagnosis in West Africa
Dr. Malabika Sarker
Institute of Public Health, University of Heidelberg, Heidelberg, Germany

Taking maternal health services to slum dwellers, the MANOSHI experience in Bangladesh
Dr. Kaosoar Afsana
Associate Director, Health Programme, BRAC, Dhaka, Bangladesh

01:30 pm–03:00 pm (Venue: Ball Room 2) 073 (222)

Scientific Session 13: Cost and coverage in maternal and childcare

Performance-based Payment: A Strategy to Retain Health Workers in Urban Slums to Improve IYCF Practices

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Background: Dhaka is a city of 3.4 million slum-dwellers with health indicators worse compared to the rural poor. Results of research indicated that feeding mismanagement was the most important underlying cause of death for infants, and household food security was not enough to ensure improvement in infant and young child-feeding (IYCF) indicators. Further, in the context of urban slums, strategies were needed to retain health workers so that programmes could be successfully implemented.

Objective: Test whether performance-based payment to the Community Nutrition Volunteers could enhance IYCF-related knowledge and practices in urban slums.

Methodology: A slum of Dhaka was selected, and cross-sectional data were collected from randomly-selected 325 households with children aged less than 2 years from April to May 2010 as baseline. After 3 months of programme implementation, 128 children aged less than 1 year were selected for monitoring the IYCF indicators during October-November 2010. Sociodemographic and infant-feeding data were collected. Data on nutrition volunteer retention was also collected from the programme.

Results: There was not much change in terms of initiation of colostrum-feeding and breastfeeding within one hour after birth. However, the rate of no prelacteal feeding decreased by 16%. The rates of exclusive breastfeeding (EBF) at 2-4 months increased from 54.5% to 81% and at 4-6 months increased from 58% to 83%. Among 6-8 months old infants, consumption of vegetables, animal-source food, legumes, and fruits increased by 35.5%, 64.5%, 45%, and 10.9% respectively. Similar patterns, although less pronounced, existed among older children. Seventy-five percent of the health workers remained in the programme.

Conclusion: Performance-based payment to community nutrition volunteers can be used for improving EBF and complementary feeding in urban slums.

Acknowledgements: The project was funded by the World Bank and implemented by ICDDR,B.

074 (227)

Emergency First-aid Services through Community-based Volunteers in Rural Bangladesh

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Background: Emergency first-aid service (EFAS) is an important part of healthcare system. It can not only stop the progress of severity of a case but also can save life. EFAS is unfortunately ignored in many low-income countries. In this paper, EFAS provided by trained community-based volunteers in rural areas of Bangladesh was accessed.

Objective: Access the emergency first aid services provided by community volunteer in rural community of Bangladesh.

Methodology: In 2008, community volunteers were trained to deliver EFAS in limited areas, such as school compound and 150-200 households surrounding the volunteer's house. A special EFAS manual was developed with support from some emergency medical specialists. A training was arranged for some doctors who will train the community volunteers. Volunteers were selected from the community and were trained intensively for 3 days. After the training, all the volunteers were provided with a first-aid box with fully-equipped medicines and materials. They were also provided with manuals and record-books for documentation of services they provided. Data relating to the medical services provided during the first 1-3 months were collected from them.

Results: In total, 136 volunteers worked, and EFAS was provided to 1362 patients. After burn injury, all the patients were treated first with water. Clean-water was used for 72 patients mostly injured with cut and fall before starting any other treatments. Some 1,171 patients received antiseptic wash; of them, 68% had cut injury and 14% fall injury. Of all the patients, 59% were provided with bandage, and these patients mostly had cut injury. The volunteers treated 3 patients with cardiopulmonary resuscitation. Analgesia was mostly given to cut (28 %), fall (33%), and road traffic injury (45%). About 246 (18%) patients were referred for better treatment; of them, 32 (13%) were referred to a doctor; 71 were (29 %) referred to a hospital, and 143 (58%) were referred to paramedics.

Conclusion: Bangladesh is a disaster-prone area; so, expanding EFAS through community volunteers will be very effective in reducing mortality, morbidity, and progression of any complications after injury in Bangladesh.

075 (243)

Adopting Global Agenda to Improve Human Resource in Health in 57 Countries with Critical Shortage of Health Workforce and Bangladesh Perspective

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Background: In 2008, the first Global Forum in Human Resource in Health (HRH) in Kampala declared agenda for global action to improve the HRH situation in 57 countries including Bangladesh, with critical shortage in health workforce (less than 2.3 per 1,000 people). In 2010, a set of indicators was generated, and countries were reviewed to see the progress in implementing the HRH agenda.

Objective: Illustrate achievement in targeted milestones of Kampala Declaration in 57 countries and critically assess the performance and challenges of Bangladesh's HRH situation.

Methodology: To quantify the progress, a questionnaire designed in 4 languages was sent to HRH focal persons of the ministries of health in 57 countries. Secondary data were gathered for demographic, macroeconomic, health systems and HRH density statistics. Data from Bangladesh were submitted by the HRH focal point in the Ministry of Health and Family Welfare of the Government of Bangladesh. The outcome measures were the composite scores in 9 progress indicators.

Results: The 57 countries constitute 40% of the global population. Sixty-eight percent and 21% are from African and Asian countries respectively belonging to low-income (63%) or lower-middle income (33%) economies. Fifty-one (89%) countries including Bangladesh participated in the survey, and data are being presented for all 9 progress indicators for these countries. The progress of Bangladesh between 2008 and 2010 in terms of different progress indicators were 60% in HRH planning, 100% in intersectoral coordination, 0% in mechanism to inform policy-making, 73% in HRH information system, 100% in increased production of health workforce, 100% in retaining workforce in under-served areas, 0% in in-country retention of health workforce, 100% in allocating additional funds in HRH, and 0% in securing donor support.

Conclusion: The results showed a steady progress in the majority of the countries with critical shortage in health workforce in achieving the Kampala Declaration. Bangladesh made significant success in production of health workforce and retaining healthcare providers in under-served areas. A national mechanism to inform policy-makers and suggest measures to retain the workforce within the country is still outstanding.

Acknowledgements: Support from the Global Health Workforce Alliance of the World Health Organization is acknowledged.

076 (286)

Manoshi: A Community-based Solution to Avert Maternal Death

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Background: The deprivation of women and children is often reflected in their health. Improvement of their health status has been a pressing agendum for health-planners and policy-makers around the world. Substantial changes have been made in maternal, neonatal and child health (MNCH) worldwide since the declaration of Millennium Development Goal in 1990 but many countries are still lagging behind, particularly in reduction of maternal mortality ratio (MMR). Despite significant achievements in health and family planning, the MMR is still at 320 per 100,000 livebirths in Bangladesh. Multisectoral efforts, such as skilled human resources, access to and availability of appropriate services, and functioning support system, are essential to achieve considerable improvements. BRAC has been running Manoshi, a community-based MNCH initiative in the slums of 6 city corporation areas of Bangladesh. Manoshi is providing antenatal care during delivery and postnatal care by trained community health workers to mothers living in slums. Unique features of Manoshi are delivery centres and referral system. The delivery centres provide clean, hygienic and safe delivery-care by urban birth attendants (UBAs). The UBAs are trained to quickly diagnose maternal and neonatal complications and to refer cases for higher management timely. The Manoshi referral system consists of a unique 'referral mobile number' and placement of Manoshi Referral Programme Organizers (R-PO) at referral hospital to facilitate patient admission into different departments without loss of time.

Objective: Find out if Manoshi initiative has been able to exert a significant impact in reducing maternal deaths.

Methodology: Information used here was obtained from the routine management information system (MIS) data of Manoshi.

Results: A clear shift from delivery at home to delivery centres and hospitals was observed in Manoshi catchment areas. In initiatives, such as Manoshi, this shifting noticeably contributed to quick identification and timely referral of maternal complication and, thus, played a significant role in the reduction of maternal mortality. Manoshi MIS data showed that concerted services at household, timely referral, and coordinated support at referral facilities contributed to the reduction of MMR from 236 per 100,000 livebirths in 2008 to 141 livebirths in 2010.

Conclusion: Manoshi has been able to avert maternal mortalities and can also be a replicable example for improving maternal health.

Acknowledgements: The authors thank the Bill & Melinda Gates Foundation for their financial support for Manoshi.

077 (318)

Use of Disaggregated Data for District Programme Planning and Implementation

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Background: The USAID-funded Nepal Family Health Program (NFHP) II is supporting the Ministry of Health and Population to strengthen the health system in Nepal. Most district health offices use service-data from the health management information system (HMIS) mainly for the purpose of reporting. Analysis and use of district-level service-data are essential to address the programmatic gaps in disadvantaged areas. The Public Health Analytics (PHA) intervention conducted by the National Health Training Center and Management Division/HMIS Section with support from the NFHP II, was launched in 2 districts to address the issues of social inclusion and other programmatic gaps.

Objective: Strengthen the performance of district health systems by strengthening analytical techniques among district health managers to identify problems, plan and manage programmes, and evaluate programmatic responses.

Methodology: Two districts—Surkhet and Kanchanpur—were selected for the PHA intervention after doing performance need assessments. The health facility (HF)-level service-data were available in these 2 districts for disaggregated analysis. Five persons from each district health office were involved in the intervention. The intervention has 4 phases: pre-course work, an intensive workshop (5+2 days), worksite-based problem identification, and a culminating workshop. In the first phase, participants analyzed data of their own district by health facility. The second phase (5 days offsite) consisted of intensive analysis, presentations, and interpretation, and problem identification based on data. The further 2-day workshop in the district finalized the action-plan based on the problem identification using the performance improvement approach. The fourth phase consisted of a culminating workshop which evaluated the PHA process.

Results: The district teams were able to analyze the data by the HF level and identify programmatic gaps in the different areas of the district. The participants made action-plans on a priority basis and have started implementing activities using the district funds. The effect of the PHA intervention was observed in various forums. The PHA districts presented data differently in the regional review meeting disaggregating by the HF level instead of a simple aggregated district figure. They have started to use their analytical techniques for micro-planning for different programmes in the district.

Conclusion: The disaggregation of service-data is helpful for addressing various programmatic gaps to strengthen the district health systems. This type of intervention is useful to move away from blanket programme implementation towards an evidence-driven need-based approach.

078 (320)

Fostering Local Health Governance of Public Health Facilities: An Experience from Nepal

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Background: The Government of Nepal has recognized decentralization of health services as one of the overarching sector-reform strategies and a key approach to achieving the Millennium Development Goals. Decentralized health governance helps achieve equitable and quality health services with increased levels of downward accountability, community ownership, and wider coverage, giving better access to local people, especially the poor and excluded groups. As per the Local Self-Governance Act 1999, 1,433 peripheral government health facilities (HFs) of 28 districts were handed over to local bodies. As per the Act, the Health Facility Operation and Management Committee (HFOMC), a legitimate local health body, is supposed to govern all the affairs relating to the management of local public HFs. However, to effectively manage the HFs, capacity-building of the committee was deemed necessary.

Objective: Strengthen the local health governance of public HFs through active engagement and capacity-building of the HFOMCs.

Methodology: The Government of Nepal, with the technical assistance from the USAID/Nepal Family Health Program II, has been supporting the strengthening of HFs in 14 districts of Nepal to strengthen the governance of public HFs. The programme aims to improve the organizational capacity of the HFOMC, strengthen the management and governance of the HFs, mobilize local resources for health, and increase service-use by marginalized communities. The programme involves a 2-year support to the HFOMC (one year intensive implementation and one year limited technical support), including a 3-day interaction session, periodical review-workshops, regular follow-up visits, and promotional activities. A pilot intervention with full devolution of funds, functions, and functionaries has also been initiated in 2 districts. The progress made so far, based on routine monitoring data, is presented here.

Results: Regularity of monthly meetings of the HFOMC increased from 32% to 80%. The effectiveness of these meetings also increased from 0% to 46% as measured by presence of a *dalit* and a female member in meetings, sharing responsibility, and preparing action-plan. More than 80% of the HFOMCs executed their action-plan. The priorities of the HFOMC shifted from basic infrastructure/medicine issues to programme-related issues. Within one year, the HFOMCs mobilized more than 20 million Nepalese rupees in the programme—VDCs. Similarly, 75% of the HFOMCs provided dress and snacks to health volunteers. The proportion of *dalit* clients vs their proportion in population increased (1.35 from 0.70).

Conclusion: Strengthening the local health governance can result in better access and use of health services, especially for marginalized populations.

Acknowledgements: The authors thank the USAID-Nepal/NFHP II for funding the activity.

01:30 pm–03:00 pm (Venue: Ball Room 3) 079 (011)

Scientific Session 14: Measurement and monitoring in health systems

PDA Technology: Cost-effective Method of Data Collection Compared to Paper-based Data Collection—Matlab HDSS Piloting

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Background: The Personal Digital Assistant (PDA) has proven time-saving ability and quality assurance of data against normal human error in paper-based data collection and compilation.

Objective: Discuss the use of PDA for recording demographic events and quick report generation and explore its potential compared to the paper-based system.

Methodology: The Basic4ppc 6.8 software was used in the data-collection tool loaded onto iPaq Pocket PC hp212 series of processor Intel® MARVEL® PXA310 with 121.43 MB RAM and Windows Mobile-2006 Classic. Four outreach workers and 4 Field Research Assistants (FRAs) with secondary-level education and without any prior computer experience received a one-week training on PDA handling, 2 months each for field piloting, one month for recording first in paper, then PDA, and feedback training for programme update and updating their misconceptions. The front-end was designed with range checks and skip patterns during data-entry and correction of errors. Back-up support at the end of every interview onto storage cards in the PDA and collected data were downloaded to PCs every week, and feedback reports were used for evaluating accuracy.

Results: The PDAs were well-accepted by both outreach workers and supervisors. No major PDA-related problems or loss of data were encountered. Overall, the completeness of data from 1,200 events from January to June 2009 was over 99%. A team from the head office observed the time and errors at the time of recording events in the PDA and paper. Sixty-five percent less time was required for recording of each event. Errors occurred in paper rather than in PDA.

Conclusion: Evidence of time-consuming and error-prone process of data-entry and compilation, and of improvement in data quality demonstrates the potential for the use of PDA in a large scale. The front-line supervisors of the Health and Demographic Surveillance System can easily monitor the workers' field activities and data quality. Validated data can be used for analysis to improve the quality of data and performance of outreach workers. Quality demographic data would be readily available within the shortest period of time and can support other studies providing most recent data.

Acknowledgements: The authors thank ICDDR,B and its core donors for supporting the health and demographic surveillance in Matlab.

080 (121)

Monitoring Progression of 2009 Pandemic Influenza A (H1N1) in Bangladesh

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Background: During 2007, the Institute of Epidemiology, Disease Control and Research, ICDDR,B, and Centers for Disease Control and Prevention established a national hospital influenza surveillance system throughout the country to determine the burden of influenza, aiming at identifying emerging strains so as to provide accurate and timely data. On 19 June 2009, following the influenza pandemic declaration by the World Health Organization, the Government of Bangladesh identified the first case of the 2009 pandemic influenza A (H1N1) (pH1N1) through the existing surveillance systems.

Objective: Monitor the progression and severity of the H1N1 pandemic and prioritize interventions.

Methodology: Through the event-based surveillance, the outcome of the confirmed (pH1N1) cases was monitored. The national surveillance system and community-based surveillance systems were also enhanced from the monthly reporting to the weekly reporting system to identify new cases, monitor the spread of the pandemic throughout the country, and also to monitor outcomes of the confirmed cases. Daily coordination meetings were conducted to update the national data and to address prevention and control strategies. All the confirmed pH1N1 case-patients were telephoned 30 days after onset of illness to assess the survival rate.

Results: During June-November 2009, 175 confirmed pH1N1 cases were identified through the event-based surveillance, 252 pH1N1 cases through the national surveillance system, and 356 pH1N1 cases through the community-based surveillance. The event-based surveillance identified the first confirmed pH1N1 case-patients and triggered the pandemic response plan before the widespread circulation of the virus among the general population. In late July, identification of pH1N1 case-patients by sentinel sites signaled the spread of pH1N1 among the general population. Subsequently, the Government of Bangladesh adopted national treatment guidelines, mobilized oseltamivir stockpile to the district hospitals, and disseminated risk-related communication messages across the country. In total, 783 patients were followed up, and 6 decedents (3 from event-based and 3 from sentinel site surveillance) who died within 30 days after illness onset were indentified.

Conclusion: The event-based and sentinel influenza surveillance systems alerted the health authorities about the emergence and progression of the pandemic in Bangladesh. Effective collaboration with the Government helped in initiating timely pandemic-response activities in Bangladesh.

Acknowledgements: The support of CDC, USA and the Government of Bangladesh is acknowledged.

081 (175)

Implementation of an Integrated Hospital Information System in Limited-resource Setting in Rural Bangladesh

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Background: In the busy, limited-resource hospital setting, monitoring the quality of healthcare coverage is challenging but essential.

Objective: Describe programmatic experience in the rural hospital setting of the implementation of an integrated hospital information system—including the monitoring of indicators of quality of care in the context of serving the poor.

Methodology: A case study of the ongoing development of a responsive health information system at the LAMB Hospital is described. The key quality indicator variables were identified from clinicians and nursing staff. An efficient paper-based information recording system was designed, and a customized computer database was written. Pilot indicator reports were produced.

Results: During 2008-2010, the hospital information system enabled more efficient provision of activity-reporting needs of hospital managers, government surveillance, and donor partners. The burden of disease, using the ICD 3 digit coding system, was monitored. Quality indicators of patient-safety included hospital-acquired infection: urinary tract infection for 1,478 gynaecology patients of 1.1%, and for 10,247 obstetric patients of 0.2%; and wound infection rates for 213 elective caesarean-section patients was 0.9% and for 1,861 emergency caesarean-section patients was 3.5%. The rate of hospital-acquired diarrhoea in 10,009 discharged patients, overall, was 1.6% but an outbreak was documented on the neonatal ward in 2009 of 13%, reducing to 5% in 2010 after several preventative measures were instigated. Reporting of patients' socioeconomic status and the proportion receiving subsidies facilitated the understanding of accessibility of the poor to LAMB Hospital services. Perinatal death, maternal death, and maternal near-miss death case identification facilitated ongoing perinatal and maternal death audit to improve clinical case management. Key patient outcomes identified by individual specialty departments were reported. Task shifting of information collation away from clinical staff to trained MIS staff increased the availability of clinical time and the quality of information recorded. Challenges faced are described.

Conclusion: A comprehensive, efficient and low-cost information system is an important tool in a hospital which is seeking to provide high quality of care with limited resources for the poor.

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082 (176)

Modified Roemer Model of Health System: A Guiding Framework to Better Understand and Compare Health Systems

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Background: In 1984, Milton I. Roemer proposed a model of healthcare system comprising 5 interlinking components: economic support, resource production, management, organization of programmes, and delivery of services. The authors of this abstract proposed a modified model that merged organization of programmes and delivery of services together and incorporated 2 more components, i.e. use of health services and impact.

Objective: Investigate whether the modified Roemer model gives a better understanding of health and health system of a country and facilitate comparison between countries.

Methodology: Data from the World Health Statistics 2009 of the World Health Organization were used. The 79 indicators in the database were reorganized according to the 6 components of the modified Roemer model. Summary statistics from the data were generated. To explore comparability, 10 counties (Australia, Austria, Canada, Denmark, France, Germany, The Netherlands, Sweden, Switzerland, and the USA) having a population of more than 5 million and higher per-capita health expenditure were selected.

Results: The USA had the highest per-capita expenditure for health (US$ 6,719). The USA also spent the highest percentage of GDP (15.3%) for health. The highest number of doctors, nurses, and hospital beds per 10,000 people was in Switzerland (40), The Netherlands (146), and Germany (83) respectively. The highest and the lowest percentage of births by caesarean section were in Australia (31%) and the Netherlands (14%) respectively. The highest life-expectancy at birth was in Australia and Switzerland (82 years). Sweden had the lowest under-5 mortality rate (3 per 1,000 livebirths).

Conclusion: Currently-available data can be reorganized according to the components of the modified Roemer model. The addition of two components to the original model makes it more comprehensive. The modified Roemer model can be used for better understanding the health system of a country and comparing health and healthcare indicators between countries.

Acknowledgements: The authors thank the World Health Organization for data support.

083 (213)

Engaging Local Community Volunteers in Data Collection: An Experience from Chakaria, Bangladesh

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Background: A health and demographic surveillance system (HDSS) has been working in Chakaria, a rural area of Bangladesh, since 1999 and collecting sociodemographic information for policy and monitoring the programmes periodically through qualified and field-trained data collectors. Questions came in whether data on some major demographic events could be collected through local and community-nominated volunteers as the Chakaria Community Health Project was based on community empowerment and believed in their ownership of information.

Objective: Examine the consistency in registering demographic events collected through volunteers and HDSS.

Methodology: The study has been continuing since October 2009 at Chakaria in Cox's Bazar district located at the southeast of Bangladesh where ICDDR,B has been engaged in community development-oriented health and research activities from 1994. Twenty-two volunteers were nominated for 4 villages with 713 households. They recorded birth, death, migration and marriage events from their designated households with an interval of 15 days. The project staff updated these events from the volunteers through mobile phone. These events were compared with the events collected through the Chakaria HDSS.

Results: The performance of the volunteers in collecting data was consistent with that by the HDSS staff from 71 households. When the total events (n=206) covered by the volunteers through home-visitations were checked, it was found that 98% of data on the events were recorded correctly.

Conclusion: It is possible to collect data using the local community volunteers. This strategy may empower the local people for local-level planning and implementation of programmes. A formal and thorough training to untrained local volunteers for the collection of HDSS data and use of mobile phones may give rise to a new and innovative health information system with minimum cost and efforts.

Acknowledgements: The authors acknowledge the contribution of ICDDR,B and its core donors for supporting the HDSS-Chakaria.

084 (288)

Incorporation of *m*-Health to Address Millennium Development Goal 4 and 5: BRAC's Experience in Urban Slums

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Background: Manoshi is a community-based health programme of BRAC to address the reduction of maternal and child mortality in urban slums of Bangladesh. The programme is focusing on community-based maternal, neonatal and child health service-delivery and runs an effective system of regular household-based data collection through trained health workers. The programme has a huge impact on service-use at the community level, contributing enormously in maternal and child health.

Objective: Assess the effectiveness of a mobile-based data-collection tool in achieving the targets of Millennium Development Goal 4 and 5.

Methodology: In mid-2009, Manoshi partnered with ClickDiagnostics to develop and pilot a mobile-based data-collection and service-delivery system for health workers. These data are the biggest source of individual case-records with pregnancy-related concerns. These are used for quick risk identification, providing medical assistance, and advices to high-risk groups, prompt actions for effective and timely referral to minimize maternal and neonatal casualties.

Results: The mobile-based data-collection system was found to be efficient, reducing data-collection time by 50%, with 100% elimination of data-transfer time-lag, rejecting incomplete records, strengthening monitoring and potentially reducing error. Being user-friendly, the mobile phone as a data-collection and health service-delivery tool was acceptable to all the frontier partners.

Conclusion: The success of this pilot within its parameters suggests the tremendous potential for radical improvement of the existing health service-delivery system of Manoshi through *m*-Health enablers. The applicability of these solutions can perhaps be envisaged to be even greater in the context of IMNCS (the rural version of Manoshi) where distance and lack of infrastructure are major challenges and real-time preventive interventions with remote consultation is unfavourable.

DAY 1: 15 March 2011, Tuesday
12:30 pm-01:30 pm (Venue: Grand Ball Room Lobby)

085 (001)

Urban Malaria and Associated Risk Factors in Jimma Town, Southwest Ethiopia

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Background: Malaria kills millions around the globe. Urban malaria is emerging as a potential but 'avertable' crisis in Africa. Malaria is also a leading public-health problem in Ethiopia where an estimated 68% of the population lives in malarious areas. Around Jimma, there is a scarcity of community-based studies which could provide recent information on the epidemiology of malaria for planning and implementation of effective prevention and control activities.

Objective: Estimate the prevalence of malaria and associated risk factors in Jimma town, an urban area in southwest Ethiopia.

Methodology: A cross-sectional study was carried out in Jimma town, southwest Ethiopia, from April to May 2010. In total, 291 households were interviewed, and 804 blood samples were collected by finger-prick; both thick and thin blood films were prepared, stained by Giemsa and examined by compound light microscope. Descriptive statistics and chi-square analysis were used for describing variables and for identifying the association between variables. All data were entered and analyzed using the SPSS-15 database program.

Results: Only 42 (5.22%) of the 804 participants from 291 households were positive for malaria parasites in which *Plasmodium vivax*, *P. falciparum*, and mixed infection accounted for 71.42%, 26.19%, and 2.38% respectively. Variation of household sociodemographic variables did not show any significant association with the prevalence of malaria. Of different risk factors assessed, only the presence of stagnant water and the use of insecticide-treated bednets (ITNs) were significantly associated with the prevalence of malaria.

Conclusion: Malaria is still a major health problem in Ethiopia, with *P. vivax* becoming a predominent species for some reasons that need to be further explored. ITN-use and presence of stagnant water near the home were the significant risk factors in Jimma town.

Acknowledgements: Jimma University and Anti Malaria Association Climate and Health Working Group of Ethiopia funded the study.

086 (003)

Therapeutic Potential of a Novel Vaccine Containing both Hepatitis B Surface Antigen and Hepatitis B Core Antigen Administered through Mucosal and Parental Route in Patients with Chronic Hepatitis B

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Background: Containment of hepatitis B virus (HBV) and control of liver damages in chronic hepatitis B (CHB) are regulated by both hepatitis B core (HBcAg) and surface antigens (HBsAg)-specific cellular and humoral immune responses.

Objective: Assess safety and efficacy of immune-therapy containing multiple HBV-related antigens administered through different routes in CHB.

Methodology: The study enrolled 18 treatment-naïve CHB patients with detectable HBV DNA and elevated alanine aminotransferase (ALT) in Bangladesh. Patients received human-consumable vaccine containing HBsAg and HBcAg (HBsAg 50 µg, HBcAg 50 µg) in phosphate-buffered solution 5 times by nasal spray and 5 times by both nasal and subcutaneous routes at 2 weekly intervals. General conditions, haematology, liver/kidney function, HBV DNA and ALT were assessed before commencement, once every 2 weeks during and once every 3 months for 12 months after the end of therapy.

Results: Immunization with HBsAg/HBcAg vaccine was safe for all patients. There was no nasal irritation during/after nasal spray. Parameters of inflammation and kidney function remained normal during therapy and follow-up. ALT flare was not detected in any patient. After 5 nasal vaccinations, HBV DNA became undetectable in 6 patients, reduced in 7 and remained unchanged in 5. ALT became normal in 13. After 10 vaccinations, HBV DNA remained undetectable in 6 patients, ALT was normal in 16. Patients received no antiviral/immune-modulator during follow-up. After follow-up, HBV DNA became undetectable in 9 and reduced in 9. Serum ALT was normal in all 18.

Conclusion: This is the first study on immune-therapy in CHB that shows sustained antiviral effect and control of liver damage during off-treatment period of 12 months. The results strongly suggest that an effective regimen of immune-therapy against CHB may be designed by immunizing CHB patients with multiple HBV-related antigens and through different routes, including mucosal routes.

087 (004)

Tele Safe Motherhood Pilot Project in Rolpa District of Nepal

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Background: Rolpa district is one of the remote districts of Nepal, with a high maternal mortality rate (MMR) of 352 per 100,000 livebirths (The national MMR being 240 per 100,000 livebirths). Although 54% of pregnant women attend hospitals for the first antenatal check-up, only 19% of the total number of pregnancies complete the fourth antenatal check-up. Institutional delivery is only 5%. Low antenatal care (ANC) during the third triemester and low institutional delivery are responsible for high maternal mortality in the district. As it is with other remote districts, the main reason behind the low institutional deliveries in Rolpa seems to be remoteness of health facilities and lack of health education among women.

Objective: Reduce maternal mortality by giving access of pregnant women to obstetric care using mobile technology.

Methodology: Female community health volunteers (FCHVs) use their cellphone to send information about pregnant women to the district hospital and use template written in their own language to send information. The district hospital collects all the data and acts to encourage pregnant women to have the last 4 ANC visits and institutional delivery. The district hospital sends health workers to pregnant women for antenatal check-up if she is not willing to come to hospital. The hospital divides pregnancies into normal and high-risk pregnancies. High-risk pregnancies are followed accordingly and, if necessary, are referred to maternity-care centre for better management.

Results: At least 90% of pregnant women will get 4 ANC visits. Institutional delivery will increase to 25% for adoption of the mobile-phone technology.

Conclusion: Incorporation of modern technology into the health service-delivery system is highly recommended, especially in remote areas, to achieve the universal goal 'Healthcare for All'.

088 (006)

Use of Pesticides in Vegetable Farms and Its Impact on Health of Farmers and the Environment

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Background: Irrational use of pesticides is increasingly threatening the ecosystem, health, and the environment. In Bangladesh, the use of pesticides, which was on average 3,850 metric tonnes annually during 1973-1990, has gradually increased to a record use of 37,712 metric tonnes in 2008.

Objective: Assess the use of pesticides in vegetable farms and its impact on farmers' health and nearby waterbodies in different agro-ecological regions of Bangladesh.

Methodology: The study was conducted in 3 contrasting sites of vegetable farm in Savar, Shibpur, and Brahmanbaria subdistricts. From each subdistrict, 60 farmers were randomly selected. Data were generated through focus-group discussion, survey, and laboratory tests of water samples. The laboratory test was conducted using gas chromatography at the Pesticides Analytical Laboratory of the Bangladesh Agricultural Research Institute, Gazipur.

Results: The findings revealed that the use of pesticides in vegetable farms was high and frequent. About 37% of the farmers, during spraying of pesticides, felt burning sensation, 28% had breathing problem, 18% felt itching, 13% felt dizziness, and 11% felt burning in the eyes. One-fifth of the farmers opined that it caused other problems, such as headache, rash, or flu-like symptoms. More than 80% of the respondents did not take any safety measures during application and preservation of pesticides. The selection of pesticides, dosage, and mode of application was influenced by the dealers' suggestions. No residue of pesticides was found in laboratory analysis of the water samples. Around 27% of the farmers perceived that fish had been reducing, and 28% opined that water pollution occurred due to wash-out of agrochemicals, such as pesticides from agricultural lands to surface-water.

Conclusion: Intensive awareness training of farmers on safety measures regarding application of pesticides and its rational use are necessary to avoid potential health and environmental hazards.

Acknowledgements: The study was supported by the National Food Policy Capacity Strengthening Programme of the Government of Bangladesh and the FAO for financial and technical support.

089 (007)

A Cholera Outbreak in Refugee Camps of Teknaf: A Case Study of Pollution, Policy, and International Organizations

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Background: An outbreak of diarrhoeal diseases was reported in Teknaf in mid-2008 among around 35,000 Myanmar refugees in Bangladesh. Interests mounted when ICDDR,B's help was sought while trained people of international humanitarian organizations (IOs) were available onsite.

Objective: Understand the probable cause of the outbreak and explore the relevant issues.

Methodology: A case study was carried out through laboratory investigation of stools (n=34) and water samples (n=5), observations of housing, water, sanitation, and treatment facilities, review of documents, and informal conversations with different stakeholders. Bacteria serogroup was identified, and antibiotic sensitivity was done in Mueller-Hinton media. Water samples were analyzed for *Vibrio cholerae*, *Aeromonas*, total coliforms, faecal coliforms, and faecal streptococci.

Results: The outbreak was initially reported from Talcamp where refugees not registered with the United Nations High Commissioner for Refugees were living. In 3-week time, 461 (64% were aged 5 years) attended the diarrhoea treatment facility of an IO which had manpower trained by and beds from ICDDR,B. The case-fatality rate was 0.3%. Laboratory examination revealed *V. cholerae* O1 El Tor Ogawa (68%) and *V. cholerae* O139 (12%) in stool isolates. The refugees had sanitation facilities from the IO but no safe water because of local policy. Water of the nearby Naf River is salty. Refugees used rain-water held in the creeks in the hilly terrain which was highly polluted (faecal streptococci 336-1,140 and faecal coliforms 4,000 cfu/100 mL). Later, another IO moved the refugees to a higher place called Lada Bazar. Water samples here were also grossly contaminated with *V. cholerae*, faecal streptococci (130,000-290,000 cfu/100 mL), and faecal coliforms (84,000-220,000 cfu/100 mL). Cholera patients were seen on the floor and managed inappropriately. The IO with enough cholera beds and trained manpower was not helping. Clear non-cooperation, interest in managing desk, and documents were evident even when human life was at risk.

090 (016)

Epstein-Barr Virus and *Helicobacter pylori* Infections in Gastroduodenal Diseases

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Background: Epstein-Barr virus (EBV) and *Helicobacter pylori* infections are common worldwide. Although *H. pylori* infection has been identified as a causative agent of gastric cancer (GC) and peptic ulcer disease (PUD), the role of EBV in association with *H. pylori* infection remains largely unknown in gastroduodenal diseases.

Objective: Study the association of *H. pylori* and DNA load of EBV in patients with gastroduodenal diseases.

Methodology: Biopsy samples were collected from 200 adult patients [non-ulcer dyspepsia (NUD)-100, PUD-50, and GC-50] undergoing upper gastrointestinal endoscopy. *H. pylori* infection was diagnosed by rapid urease test, culture, PCR, and real-time PCR. EBV infection and its DNA load were detected by non-polymorphic Epstein-Barr nuclear antigen-1 (EBNA-1) gene-based real-time PCR.

Results: In patients with GC and PUD, EBV infection was detected more frequently than NUD (GC vs NUD=90% vs 37%, $p<0.001$; PUD vs NUD=70% vs 37%, $p<0.001$). The prevalence of dual *H. pylori* and EBV infections was significantly higher in patients with GC and PUD than in those with NUD. The median DNA loads of EBV were considerably higher in GC and PUD than in NUD (GC vs NUD; 1,329.18 vs 86.79, $p<0.001$ and PUD vs NUD; 754.00 vs 86.79, $p<0.001$). The DNA load of EBV was significantly higher in *H. pylori*-infected patients ($p=0.015$). The median concentrations of EBV DNA were higher in diffuse type of GC than intestinal type but the difference was not significant.

Conclusion: EBV infection was associated with GC and PUD. The DNA load of EBV was higher in gastric biopsies of *H. pylori*-infected patients than the non-infected patients, suggesting the role of *H. pylori* infection in modulating the enhanced EBV viral load in gastric tissue. The study calls for further research to identify the mechanism of interactions between the two agents in gastric tissue.

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091 (017)

Spectrum and Drug Resistance in Respiratory Yeast Infections among HIV-Infected Patients with Tuberculosis in South Africa

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Background: Although several fungal organisms are known to infect HIV and AIDS patients, the diversity of yeast pathogens that infect individuals in South Africa is not known. Furthermore, little data are available on the role of fungal infections in the recent events on the emergence of multidrug-resistant (MDR) tuberculosis TB and extremely drug-resistant TB (XDR TB).

Objective: Identify and determine the drug resistance profiles of *Candida* and *Cryptococcus* species infecting the pulmonary tract of HIV and AIDS patients with tuberculosis (TB) attending hospitals in the Limpopo province.

Methodology: Sputum samples were collected during February-April 2009 from HIV-positive patients with TB, who presented at the hospital. The yeast species were isolated and identified by germ-tube test, CHROMagar, and urease-based agar. The production of biofilm was tested using the microtitre plate method. The activity of amphotericin B, fluconazole, and ketaconazole was tested using the standard disc-diffusion method.

Results: Of the 91 patients, 53 (58%) were female. Thirty-seven (41%) were aged 26-45 years, and 18 were aged over 45 years, and 10 were of unknown age. Identification of the yeast isolates showed that the most common organisms were *Cryptococcus neoformans* (28%) of all yeast isolates, followed by *C. parapsilopsis* (19%), *C. krusei* (16%), *C. albicans* (15%), *C. tropicalis* (13%), *C. lambica* (3%), *C. famata* (2%), *C. glabrata* (3%), and *C. guilliermondii* (1%). The different species showed high levels of drug resistance to fluconazole (74.0%), ketaconazole (74.0%), and amphotericin B (33.7%). Biofilm production was observed in 28% of all the species and was not associated with drug resistance.

Conclusion: The finding showed that HIV patients with TB are often infected with other opportunistic yeasts, such as *Cryptococcus* spp. and *Candida* spp. that might exacerbate the clinical symptoms and the severity of the disease and also might have a negative impact on the treatment. The most common isolates included *C. neoformans*, *Candida parapsilopsis*, *C. krusei*, and *C. albicans*, and amphotericin B was the most active drug against these opportunistic yeast species. Further studies are needed to determine the potential impact of these infections on the emergence of MDR TB and (XDR TB).

Acknowledgements: The present study was funded by the National Research Foundation in South Africa and the Research and Publication Committee, University of Venda.

092 (028)

Assessment of Nutritional Status among Pre-adolescents and Adolescents of Selected Areas in 24 Parganas, West Bengal, India

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Background: Malnutrition (under- or overnutrition) continues to be a problem with considerable magnitude in most developing countries. Rapid techno-economic advancement has been taking place in most developing countries but the use of full resources of manpower through improvement of human health has not yet been given much importance. According to the World Health Organization (WHO), the ultimate intention of nutritional assessment is to improve human health. Haemoglobin indices and anthropometric measurements are considered potential indicators of health, nutrition, growth, and development.

Objective: Assess the nutritional status of pre-adolescents and adolescents in selected areas of South 24 Parganas, West Bengal, India.

Methodology: The study was carried out in 4 blocks (Budge Budge, Joynagar, Mathurapur II, and Pathar Pratima) of South 24 Parganas district of West Bengal in 2010. The study included 1,568 pre-adolescents and adolescents of both sexes, aged 7-21 years, from remote rural areas. They were subjected for haematologic and anthropometric measurements. Intravenous blood samples were collected and analyzed for 7 haematologic measurements using a cell-counting machine, and trained anthropologists took 7 anthropometric measurements. All the subjects completed a pre-tested questionnaire, which contained a number of specific questions on socio-demography, health status, food patterns, etc. Data were analyzed using the MINITAB software and MS XL2007 version.

Results: Haematological indices—RBC, HCT, HB, MCV, RDW, MCH and MCHC values—reflected very low to low status among about 38% of the subjects and which was more in growing girls than in boys. The anthropometric indices revealed that nearly 36.4% suffered from stunted growth, and the overall trend appeared that both sexes shared equally. The age trends differed between boys and girls and among 4 clusters. The prevalence of obesity was almost negligible. Only 0.5-6% of obese boys (n=767) came from 2 clusters.

Conclusion: Data revealed that a considerable number of adolescents suffered from anaemia and stunted growth, which require immediate attention to improve their health status.

Acknowledgements: The authors are thankful to West Bengal Voluntary Health Association, Indian Statistical Institute, Kolkata.

093 (029)

Malnutrition Is Related to Measles Outbreak in Rural Area of West Bengal, India

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Background: Measles is a leading cause of death, accounting for 40% of 1.4 million deaths globally. On 3 May 2009, the local prodhan was informed of cases with high fever with rash in 2 villages—Bargachia and Baichgachia—in North 24 Parganas district in West Bengal, India.

Objective: Investigate to confirm the outbreak, find out the risk factors, estimate the vaccine efficacy, and suggest measures to prevent and control the outbreak of measles.

Methodology: Measles was defined as fever with rash with one of the following signs and symptoms: cough, conjunctivitis, or coryza in any age at Bargachia and Baichgachi villages of North 24 Parganas district, West Bengal, from 3 April to 3 June 2009. Patients were listed, and information on sociodemographic characteristics was collected. The outbreak was described in time, place, and person. An unmatched case-control study was conducted. The sample-size was calculated using the StatCalc software. Sixty-two case patients and 124 neighbourhood controls were recruited. The vaccine efficacy and susceptible children of the block were estimated. The immunization status was assessed by interviewing mothers and checking immunization cards. Measles was confirmed by isolation of IgM antibody. The spot map was drawn to show distribution of patients, and the epi-curve was constructed to describe the dynamics of outbreak.

Results: In total, 123 cases were identified. The overall attack rate was 2.17-2.98%—2.98% in female and 1.43% in male; maximum 21.73% in the age-group of 11-23 months; the attack rate in unimmunized children was 21% (39 of 185), immunized children 2.5% (13 of 511) [relative risk-7.02, 95% confidence interval (CI) 4.2-17.2], vaccine efficacy 88%, vaccination coverage 89%, and presence of IgM antibody in blood specimens (5 of 5). The risk factors included no immunization card [odds ratio (OR)=3.8, 95% CI 1.3-11.3], unimmunization (OR=4.5, 95% CI 2.2-9.0), malnutrition (OR=3.6, 95% CI 1.2-10.9), and below-poverty line family (OR=1.5, 95% CI 0.6-3.6).

Conclusion: Unimmunized, malnourished, poor young female children are related to measles infection. The study recommends the implementation of the supplementary nutritional programme for all malnurioushed children and strengthening of routine immunization and surveillance activities.

094 (030)

Cronobacter: A Unique Bacterial Species Identified in Bangladesh that Threatens to Increase Disease Burden

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Background: *Cronobacter* species, formerly known as *Enterobacter sakazakii*, is implicated in outbreaks of meningitis and enteritis, especially in infants, pre-term, and low-birthweight babies. Its presence in powdered infant formula (PIF) has been linked to outbreaks of disease. There is a huge market in Bangladesh for imported PIF; however, there is no information from Bangladesh regarding contamination of PIF with *Cronobacter* species.

Objective: Investigate the presence of *Cronobacter* spp. in PIF and clinical samples (blood, stool, and CSF) collected from infants aged 0-24 months admitted to 3 different hospitals (BSMMU Hospital, Mirpur Shishu Hospital, and Dhaka Medical College Hospital) in Dhaka with diarrhoea, septicaemia, and/or meningitis and in PIF samples collected from retail markets.

Methodology: All PIF and blood, stool, and CSF samples from the study infants were tested for *Cronobacter* spp. In brief, PIF samples were pre-enriched in buffered peptone water, followed by enrichment in Enterobacteriaceae enrichment broth and *Cronobacter* screening broth. Isolates of *Cronobacter* spp. were identified in chromogenic DFI agar (Oxoid Ltd., UK). All the PIF samples were tested anonymously.

Results: Of 32 PIF samples (8 brands) collected from hospitalized neonates, 16 were culture-positive but all were negative for *Cronobacter* spp. Of the 32 PIF samples (8 brands) from retail markets, 17 were culture-positive, and one was positive for *Cronobacter* spp. The isolate was confirmed with API 20E (bioMérieux, France) biochemical profile and a standardized conventional PCR targeting the alpha-glucosidase and 16S rRNA gene sequence of *Cronobacter sakazakii*. *Cronobacter* spp. were not detected in any of the blood, stool or CSF samples.

Conclusion: *Cronobacter* spp. have been detected for the first time in PIF in Bangladesh. This should caution healthcare providers about potential outbreaks of serious disease caused by these unique bacteria in neonates and young infants. An active surveillance for this emerging foodborne pathogen is warranted to prevent the increased burden of septicaemic and gastrointestinal illnesses in Bangladesh.

Acknowledgements: The study was funded by ICDDR,B and the Government of Bangladesh through IHP-HNPRP.

095 (031)

Preventive Awareness of HIV/AIDS among Rickshaw-pullers of Narayanganj Town in Bangladesh

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Background: There is no other disease condition like AIDS which could bring about so much devastation to the human civilization. It is geometrically spreading over a time. Treatment has not been defined till date; so, only preventive practice is the mainstay for interventions. Bangladesh, as one of the developing countries, is not separated from this HIV/AIDS scenario. There are several high-risk populations, and they have high prevalence of HIV/AIDS

Objective: Assess the level of preventive awareness of HIV/AIDS among rickshaw-pullers of Narayanganj town in Bangladesh.

Methodology: One of the most vulnerable groups—the rickshaw-pullers—was chosen, and a descriptive cross-sectional study was conducted. Data were gathered using a structured and semi-structured questionnaire by face-to-face interview and applying systematic random-sampling method. Two hundred respondents were selected from 2 garages in Narayanganj town.

Results: The study found that 38.5% of the respondents had good awareness regarding HIV/AIDS; 48% were aged 18-26 years; 68.5% were smokers; 62 (31%) of 200 had multiple sex partners; of the 62, 46.8% never used condom; 34% of the respondents preferred street-drama as awareness-building campaign; 34.5% knew the mode of transmission; 47% knew about prevention; and 39.5% had good awareness of contraceptive methods. There were associations between the respondent's age and education with awareness of preventive measures. As a whole, awareness level was 38.5% which was very low.

Conclusion: The study recommends increasing awareness of HIV/AIDS among rickshaw-pullers through special counselling, health education, and cultural programmes.

096 (133)

Hypertension: Care-seeking Behaviour in Bangladesh—Findings from a Population-based Study

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Background: Cardiovascular diseases (CVDs) are among the most prevalent chronic conditions in Bangladesh. Currently, 60% of deaths are related to CVDs. Hypertension is the most important risk factor for CVDs. There is very little information on healthcare-seeking practice for hypertension in Bangladesh.

Objective: Describe the distribution of hypertension and healthcare-seeking behaviour in Bangladesh.

Methodology: The 'Risk Factors and Chronic Diseases Study' is a cross-sectional study of 39,038 men and women aged 25 years and above, residing in 3 rural (Matlab, Abhaynagar, and Mirsarai) and one urban (Kamalapur) demographic surveillance sites of ICDDR,B conducted in 2009. Information on healthcare-seeking behaviour for hypertension, along with other chronic diseases, was collected.

Results: In the study population, hypertension was self-reported by 12.9% of the respondents—16.1% in the urban and 12.0% in the rural area. The prevalence of hypertension was increasing with increasing age—higher among women than among men (15.9% vs 9.7%, $p<0.0001$), higher among the least poor quintile compared to the poorest quintile (20.6% vs 6.3%, $p<0.0001$), and higher with increasing education, with no formal education (12.2%), and the highest education (16.9%) ($p<0.0001$). Of the people who reported hypertension, 53.5% in the rural area and 88.8% in the urban area were diagnosed by MBBS or specialized doctors. In the urban area, more women (71.8%) than men (68.4%) were diagnosed by MBBS, and more men (22.2%) than women (15.8%) were diagnosed by specialized doctors. In the rural area, most diagnoses were made by MBBS doctors (46.1%), followed by village doctors (40.7%); specialized doctors made only 7.4% of the diagnoses. Age, education, and wealth were independently associated with diagnoses of hypertension by the doctors—both in rural and urban areas.

Conclusion: Socioeconomic status, besides age, over-rides sex in seeking healthcare for hypertension from the doctors. Further research is needed to explore why the youths are less likely to seek healthcare from the doctors. In rural areas, unqualified healthcare providers, e.g. village doctors, are playing an important role in the diagnoses of hypertension. Their knowledge and practice regarding the management of hypertension should be further researched.

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097 (033)

Pseudomonas aeruginosa: Antibacterial Resistance and Application of Natural Honey for Treatment of Burn Infection in Palestine

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Background: *Pseudomonas aeruginosa*, a Gram-negative opportunistic pathogen, causes severe infections in immunocompromised host like burn-patients, especially in developing countries. Since this bacterium is naturally resistant to many drugs and is able to have resistance against all effective antibiotics, the infection by this organism is particularly problematic for patients.

Objective: Evaluate drug susceptibility for determination of multidrug-resistant isolates of *P. aeruginosa* and investigate the antibacterial activity of different types of natural honey against *P. aeruginosa* isolated from a burn unit.

Methodology: The study was conducted in the Department of Microbiology of the AlShifa Hospital during March 2009–February 2010.

In total, 170 isolates of *P. aeruginosa* were studied for drug susceptibility. Antimicrobial sensitivity test was done by Kirby-Bauer disc-diffusion method following the recommendations of the National Committee for Clinical Laboratory standards. The antibacterial activity of the 'Flower honey' and 'Kinia honey' was tested against 72 strains of *P. aeruginosa* that have characteristics of multidrug resistance. The agar dilution method was used for assessing the antibacterial activity of honey against these strains. Different concentrations of honey were diluted in sterile Mueller Hinton's medium at 56 ºC to give different final concentrations of 10%, 20%, and 30% (v/v).

Results: For the 170 *P. aeruginosa* isolates, the drug susceptibility tests showed a high resistance for cephalexin (100%), cefuroxime (98.8%), doxycycline (97.6%), ceftriaxone (97.1%), ceftazidime (95.9%), gentamicin (91.2%), cefotaxime (86.5%), ciprofloxacin (78.8%), and pipracillin (68%) and low resistance for amikacin (25%). A high proportion of the isolated strains showed resistance to more than 4 antibiotics. Using 'Flower honey', the growth was inhibited in all 72 (100%) *P. aeruginosa* isolates by 30% concentration, 71% inhibition by 20% concentration, and 19% inhibition by 10% concentration.

When using 'Kinia honey', the growth was inhibited in 71 (99%) *P. aeruginosa* isolates by 30% concentration, 53% inhibition by 20% concentration, and 13% inhibition by 10% concentration.

Conclusion: Antimicrobial resistance has reached a troubling point and an alarming point in *P. aeruginosa* isolated from burn-patients in Palestine. The beneficial effects of honey and its lack of adverse effects on wounds, considered along with the findings of the present study, indicate that honey with standardized antibacterial activity has the potential to be a very useful treatment option for burns infected by or at risk of infection with *P. aeruginosa*.

098 (034)

Treatment Needs of Active Drug-users

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Background: Drug treatment is known to be an effective HIV-prevention intervention. Nevertheless, many drug-users do not use necessary health services.

Objective: Lower HIV and related health risk and disease transmission among active street drug-users, sex partners of drug-users, commercial sex workers, men who have sex with men, hidden populations of women drug-users, and adolescents.

Methodology: To measure the treatment of HIV among active drug-users, 465 individuals in Hartford, Connecticut (CT), were asked to complete the survey instrument. Generally, this instrument asked the participants about their demographic characteristics, substance-abuse history, sexual behaviour, medical status, drug-treatment history, and psychosocial items.

Results: Preliminary analysis with 465 active drug-users from Hartford, CT, indicated that the participants exhibited high risk for HIV (42.6% were injecting drug-users, 9.2% shared needle and syringe, and 27.4% never used condom while they had any type of sex). Despite their high risk behaviour, only 33.5% used any medical services in the past 3 months, and 73.5% did not have a primary physician. Although 87% acknowledged that they needed drug treatment, they identified several barriers to obtaining treatment, including unavailability of hospital-beds (17.2%) and lack of transportation (8.0%).

Conclusion: Improvements in access to healthcare reduce HIV among active drug-users.

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099 (042)

Awareness about Reproductive Health Issues among Unmarried Adolescent Girls in a Selected Slum of Dhaka City, Bangladesh

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Background: In Bangladesh, data are scarce on the degree of knowledge among unmarried adolescents about reproductive health. The prevailing sociocultural norms inhibit the disclosure of information about their sexual activity. This prevents them from getting accurate information on reproductive health.

Objective: Assess the level of knowledge of adolescent girls regarding different reproductive health issues, which will help in needs assessment and form the platform for formulating policies and appropriate programmes to deal with their reproductive health.

Methodology: During January-June 2008, a cross-sectional, descriptive study was carried out among 150 unmarried adolescent girls of the Vashantek slum in Dhaka city, Bangladesh using a semi-structured questionnaire. Knowledge on different aspects of reproductive health, such as menstruation and menstrual hygiene, early marriage, family planning, AIDS, and HIV, was assessed. Before the starting of the actual study, pre-testing was done on 5 samples with a prepared questionnaire. Data were collected by interviewing the girls face-to-face at the place of study. After filling up the questionnaire, data-entry was done in a computer for analysis. Data were presented by tables, graphs, and cross-tables. Analysis of data was done using the SPSS software (version 11.5).

Results: The girls had average knowledge regarding menstruation and menstrual hygiene. The correct knowledge was high among the adolescents pursuing secondary level of education compared to those who had completed SSC, HSC and above or primary level of education, and the difference was significant ($p<0.05$). The large majority (72.70%) of the girls could mention the legal age of marriage. Most (82%) of them could mention some demerits of early marriage but not all. Most (81.30%) of them had no knowledge about methods of family planning. More than two-fifths had no knowledge on the mode of transmission of AIDS, and three-fifths had no knowledge on its prevention.

Conclusion: Formal, informal, and special educational programmes may be taken to educate unmarried adolescent girls on reproductive health issues, and the Government should be more concerned about it.

100 (051)

Prevalence of Post-stroke Depression: A Study among Stroke Survivors in Occupational Therapy Outpatient Unit at CRP, Savar, Dhaka, Bangladesh

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Background: Post-stroke depression (PSD) and occupational therapy are relatively new concepts in Bangladesh. It is a burning question—how often depression is suffered by stroke survivors who are receiving occupational therapy service in Bangladesh.

Objective: Find out the prevalence of patients with post-stroke depression (PSD) among clients who receive occupational therapy at the Centre for the Rehabilitation of the Paralysed (CRP), Savar, Dhaka.

Methodology: Forty stroke survivors were included as samples in this study at the Occupational Therapy Outpatient Unit of CRP. They were selected purposively and comprehensively under retrospective survey design within one-month timeframe. Data were collected using the Bangla format of BDI-II self-rating scale, modified rankin scale, and information checklist in a face-to-face interview. Data were analyzed using descriptive statistical method.

Results: Seventy-five percent of the patients were affected by PSD. Age was a factor as PSD worsened with advancing age. Males were more likely to be depressed compared to females. Long-time stroke survivors faced a higher degree of depression than those who were recently attacked by stroke. PSD varied according to the level of dependency of clients. Different roles in the family were a factor to have different degrees of PSD.

Conclusion: The results clearly indicate that stroke survivors suffer from a higher degree of depression in the context of Bangladesh. The results will help occupational therapists who largely deal with cerebrovascular accident and organizations which work for stroke victims as it is important to know the prevalence of PSD to take measures to solve the problem.

110 (054)

Risk factors for Mortality in *P. falciparum* Malaria among Young Children in a District in Jharkhand, India: A Case-control Study

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Background: This study is located in the context of a child-survival project aimed at improving child health status in Sahibganj district, Jharkhand state, India. Malaria is an important contributor to morbidity and mortality among children in the district. The findings of the study will help refine the malaria-control strategy of the projects.

Objective: Assess the risk factors for mortality due to *Plasmodium falciparum* malaria in children aged less than 6 years residing in Sahibganj district.

Methodology: A case-control study was conducted during May–September 2010. Cases were defined as children aged less than 6 years who died of documented slide-positive *P. falciparum* malaria in 18 months before the study. Cases were compared with age, gender, and locality-matched controls who had documented slide-positive *P. falciparum* malaria in the same period and survived. The cases and controls were identified in the community based on records of the Government District Malaria Office and of laboratories and other private health facilities. An interviewer-administered questionnaire was developed, translated, pretested, and modified suitably before its administration in the field. Data were collected from caregivers of the identified case and control children over a 3-month period by trained data collectors. Data were analyzed using the EpiInfo software (version 3.5.1) at univariate and multivariate level. Significance was assumed at the p value of ≤0.05 levels.

Results: Forty cases were compared with 120 matched controls. The odds of mortality were lower if the household possessed mosquito-nets [odds ratio (OR)=0.32, p=0.03], if the children slept under the net at the time of illness [OR=0.27, 95% CI 0.1-0.71], and if the children accessed healthcare at a facility less than 5 km from their residence (OR=0.3, 95% CI 0.16-0.84). The odds of mortality were higher if children were admitted to a hospital (OR=10.52, 95% CI 4.27-26.37). The symptoms of loss of consciousness (OR=9.19, 95% CI 3.79-22.6) and passage of dark-coloured urine (OR=2.57, 95% CI 1.14-5.82) were associated with mortality.

Conclusion: Promotion of bednet and accessibility to a health facility are important malaria-control strategies.

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111 (055)

Modelling of Infectious Diseases for Providing Signal of Epidemics: A Measles Case Study in Bangladesh

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Background: The detection of unusual patterns in the occurrence of diseases presents an important challenge to health workers interested in early identification of epidemics. Early identification of infectious disease epidemics is of critical importance since this is an important first step towards reducing mortality and morbidity in human populations.

Objective: Provide an early signal of infectious disease epidemics by analyzing the disease dynamics.

Methodology: A 2-stage monitoring system was applied, which consists of univariate Box-Jenkins model or autoregressive integrated moving average (ARIMA) model and subsequent tracking signals from three statistical process control charts (Shewhart, moving average, and exponentially-weighted moving average control chart). The analyses were illustrated on national measles data for the January 2000–August 2009 period reported monthly to the Expanded Programme on Immunization (EPI), Bangladesh.

Results: The empirical study revealed that the most adequate model for occurrences of measles in Bangladesh was SARIMA (3, 1, 0) (0, 1, 1) 12. None of the 3 statistical process control charts detected any statistically significant deviation from the expected values of measles counts from September 2007 to August 2009 and, thus, no measles epidemics were identified for those 24 months in Bangladesh.

Conclusion: The findings can be used for identifying any aberration from the historical pattern of diseases over time and for providing a signal of epidemics so that public-health practitioners can undertake timely action to prevent further cases and to get the disease under control.

112 (059)

Spontaneous and Induced Abortions and Their Psychological and Social Impact on Rural Women in Bangladesh

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Background: Spontaneous and induced abortions cause significant psychological distress among affected women. Little is known about the sociodemographic characteristics and social consequences associated with such abortions in Bangladesh.

Objective: Compare the sociodemographic and reproductive profiles of women with spontaneous and induced abortions, measure the prevalence of depression among affected women 3 months after the event, and describe familial and social consequences 9 months after the termination of pregnancy.

Methodology: The study was conducted in the intervention (MCH-FP project) area of ICDDR,B in Matlab, Bangladesh, in 2008. Validated local version of Edinburgh Depression Scale (EPDS-B) was used for assessing mental health status among women 3 months after the termination of pregnancy. A structured questionnaire was also used for collecting sociodemographic and reproductive health information. A follow-up visit was made 9 months after termination to assess social adjustment of the women after the loss of pregnancy.

Results: Women with induced abortions were significantly likely to be older, less-educated, employed in small income-generation activities, have greater parity, and have previous experience of early pregnancy loss than women with spontaneous abortions. Although non-significant, the rate of depression was higher among women with induced abortions [25%; 95% confidence interval (CI) 16.4-36.0] than those with spontaneous abortions (19%; 95% CI 13.9-25.6). Overall, reported negative experiences relating to termination of pregnancy marked a decline from 63% at 3 months to 7% at 9 months among women with induced abortions compared to 74% and 20% respectively among women with spontaneous abortions. Among social consequences, women with induced abortions were significantly more likely to be humiliated by their husbands and marital family members compared to those with spontaneous abortions.

Conclusions: Spontaneous and induced abortions carry similar mental health risks for women. However, there are significant levels of adverse social consequences for affected women, more so for those with induced abortions. These results indicate an unmet need for family-planning services and educational programmes to sensitize family members and the community regarding induced abortions.

113 (060)

Prevalence of Asthma and Healthcare-seeking Behaviour in Rural and Urban Bangladesh

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Background: Globally, 150 million people suffer from asthma, mostly in the wealthiest countries. Shifting epidemiology of the burden of diseases in Bangladesh makes diseases such as asthma increasingly important. Although 2 major studies on the prevalence of asthma in Bangladesh were conducted, neither study thoroughly investigated healthcare-seeking in terms of all available care providers. Data on the current prevalence of asthma and healthcare-seeking are needed to assess asthma-related healthcare needs of the population of Bangladesh.

Objective: Describe self-reported prevalence of asthma among urban and rural people in Bangladesh and also describe their care-seeking behaviour.

Methodology: Secondary analysis of cross-sectional descriptive survey data from ICDDR,B's urban (Kamalapur) and rural (Abhoynagar, Mirasarai, and Matlab) surveillance populations was done. For 2 months in 2009, a semi-structured, pretested questionnaire elicited information on self-reported asthma and diagnosing provider status. Four categories were used for defining providers by their licensing and medical practice: MBBS doctors, semi-qualified allopathic practitioners (SAPs) (nurses, health workers, paramedics), unqualified allopathic practitioners (UAPs) (village doctors, drug-sellers), and non-allopathic practitioners (NAPs) (homeopaths, *kobiraj*/spiritual healers).

Results: Of the respondents (n=39,038) surveyed, 1,838 (4.1%) self-reported diagnosis of asthma. The prevalence of asthma among urban population was higher (5.0%) compared to rural population (3.9%). The highest proportion of diagnoses was made by MBBS doctors (70.9% urban and 55.5% rural). UAPs were the second highest proportion (35.9%) in the rural areas, and NAPs were the second highest proportion (18.6%) in the urban area. Care-seeking by rural asthma patients from MBBS doctors and UAPs differed significantly by education and poverty. Care-seeking by urban asthma patients from MBBS doctors and NAPs differed significantly only by poverty. Care-seeking by asthma patients from UAPs and NAPs also differed by age and education.

Conclusion: NAPs play a significant role in diagnosing and treating asthma in urban Bangladesh. In this study of chronic disease, asthma is the only disease where NAPs played a major role as care providers. Qualitative research is needed to better understand the role of homeopaths and spiritual healers in respiratory diseases such as asthma and to determine the quality of care for patients with asthma that these NAPs provide.

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114 (064)

Risk Factors for Visceral Leishmaniasis in Urban Residents in Dharan Town of Eastern Nepal

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Background: Kala-azar in Nepal predominantly affects rural populations. However, since 1997, kala-azar cases have been reported from urban and semi-urban areas of Dharan town located in Eastern Nepal at the foothills of the mountains.

Objective: Assess the sand-fly vector density and explore the risk factors for kala-azar transmission in the households of Dharan town.

Methodology: A case-control design was used. visceral leishmaniasis (VL) cases from Dharan presenting from 1997 till 2008 to the B.P. Koirala Institute of Health Sciences were identified from the records. For each case, 4 random controls were selected from households with no previous history of VL, using updated Dharan municipality records. Cases and controls were visited in their homes and subjected to a structured interview. Geographical coordinates of all study households and district boundaries were plotted on a map. For data analyses, a multilevel model was used with district as random effect.

Results: In total, 158 cases and 448 controls were enrolled. The distribution of cases was highly clustered with 70% of cases vs 32% of controls residing in 3 of 19 wards. Proximity to other cases was a strong risk factor, with an odds ratio (OR) of 4.8 [95% confidence interval (CI) 2.6-8.6]. Other factors associated with VL were: blood transfusion [odds ratio (OR)=3.6, 95% CI 1.4-9.1], regular forest visits (OR=2.9, 95%CI 1.7-5.1), daily wage-earner (OR=2.5, 95% CI 1.4-4.4), earthen floors (OR=2.1, 95% CI 1.0-4.4), and low socioeconomic status. Sleeping on a bed rather than on the floor (OR 0.31, 95% CI 0.13-0.78) and ownership of cattle (OR=0.11 95% CI 0.01-0.92) were protective.

Conclusion: The distribution of VL in Dharan town is strongly clustered, and there is an association with housing conditions; all of these points at local transmission. On the other hand, regular forest visits also came out as a risk factor, pointing at transmission outside town. The apparent association between VL and blood transfusion requires further investigation.

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115 (166)

Situation of Maternal and Perinatal Death in Bangladesh: A Case Study of Social and Medical Errors

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Background: Although Bangladesh has achieved a significant reduction in child mortality, maternal and perinatal mortality is still high. Most maternal and perinatal deaths occur at home or way to facilities mostly due to absence of skilled care during pregnancy, childbirth and postnatal period, and poor healthcare-seeking behaviour.

Objective: Identify and analyze the social and medical errors at the community level responsible for maternal and perinatal deaths in rural Bangladesh.

Methodology: In the case study, in-depth interviews were performed on a maternal death, 2 stillbirths, and 2 neonatal deaths. The nearest family members or relatives of the deceased who witnessed or attended the death or knew about the event were interviewed.

Results: In maternal death, it was found that the mother had severe postpartum bleeding at midnight; husband called the village doctor who treated the patient for rest of the night; and patient was not referred to the hospital. In stillbirth, it was identified that the delivery was conducted by untrained birth attendant who tried to deliver the foetus in an obstructed labour. In neonatal death, it was explored that the community people depended on treatment from local pharmacy in respiratory distress of newborns and did not think of bringing the neonate for facility care. Perhaps, the unavailability of transport at night was also a cause accompanied with delay in decision-making.

Conclusion: Maternal and perinatal deaths occur due to lack of awareness, knowledge, and education in the community, which needs special attention.

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116 (067)

Comparative Study of Health, Nutrition, and Hygiene among the Jaunsari Tribe of Uttarakhand State and the Nicobarese of Tsunami- affected Car Nicobar Island in India

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Background: Health and nutritional aspects cannot be ignored for holistic development of an individual, with the objective of attaining social justice and equality. Hence, the study was undertaken to develop a comparative database for the Jaunsari and Nicobari tribals.

Objective: Present the status of health, hygiene, nutrition, and various healthcare practices prevailing among studied populations, with special reference to indigenous medicine; study various health and demographic indicators and socioeconomic factors affecting the tribal health and the impact of various health programmes and services on the tribes and endeavours to explore factors responsible for acceptance and non-acceptance of these services.

Methodology: First-hand information, collected directly from the field study area, included 15 Jaunsari villages of Uttarakhand state and 15 Nicobari villages of tsunami-affected Car Nicobar island of India. The author resorted to holistic approach and anthropological fieldwork methods, such as pilot study, detailed interview schedule, observation, case study, focus-group discussion (FGD), content analysis, photography, and SPSS. In total, 450 Jaunsari and 200 Nicobari subjects (male and female) were selected using purposive and random-sampling techniques. The study was conducted for 2 years among the Jaunsarese and 6 months among the Nicobarese in both pre-tsunami and post-tsunami phases. Anthropometric measurements of children aged 6-12 years were also taken for nutritional assessment.

Results: Generally, the Jaunsari and post-tsunami Nicobari villages are devoid of various amenities, and in those villages that have certain amenities, the picture was very grim. The status of health indicators, such as fertility, mortality, morbidity, immunization, maternal and child health, and access to health amenities was not satisfactory. Although modern health facilities were available, quite often these were not used. Witchcraft and magico-logical performances, along with animal sacrifices, were popularly practised to propitiate the evil spirits to get rid of diseases. Ethno-medicine and local healers were given preference due to various cultural and ecological factors. The use of alcohol, intoxicating drinks, and drugs and smoking was a common phenomenon among both males and females. The villagers developed an addiction for both home-made liquor and modern types of drink.

Conclusion: The health, hygiene, and nutritional status of Jaunsarese and Nicobarese was not satisfactory, and the target of "Health for All by 2000 AD" is still beyond reach. Tackling cultural constraints and improper implementation of health and nutrition programmes has to be seriously dealt with. Periodical nutrition and health assessment and also evaluation studies on both are urgently needed. Reproductive and child-health programmes need to be augmented effectively with a constant monitoring of reproductive health status. Concrete efforts should be made to improve the quality of health (both maternal and child health), birth-control measures, and family-planning programmes and to increase their acceptability and effectiveness. Preservation, perpetuation, and revival of traditional knowledge with due encouragement and overhauling and redesigning of the prevailing health infrastructure as per the needs and grievances of Jaunsarese and Nicobarese are also urgently needed.

117 (069)

A Pilot Study of a Novel Common Food-plant Extract Used with Oral Rehydration Therapy for Short-term Diarrhoea in Children and Adolescents

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Background: Natural plant solutions to support gastrointestinal health have a long history of use. This study evaluated a new approach using common food-plant extracts which, due to a unique extraction process, preserve damage-limiting, restorative chemistry from living plant-cells and apply these mechanisms to infected and/or damaged cells of the human digestive tract. This novel botanical approach uses metabolites found in common food-plants with broad evidence of safe human consumption at concentrations far above those used in the study. Extensive tests in swine demonstrated safe use and positive outcomes.

Objective: Evaluate the effects of a novel extract from common food-plants on short-term diarrhoea in children and adolescents.

Methodology: Fifty-eight children and adolescents, aged 2-17 years, with acute short-term diarrhoea were evaluated in a double-blind randomized cross-over study to compare the botanical extract under test against placebo. Subjects with parasites, high fever, vomiting, or bloody stools were excluded. Forty-three subjects who met the study criteria were included in the analysis. Following examination, the subjects received a single liquid dose of either botanical extract or placebo with oral rehydration solution (ORS) on Day 1 and the reverse on Day 2. All the subjects were given sufficient ORS in the last 3 days. Outcome measures were: time to cessation of symptom defined as the elapsed time between initial administration of the study solution and the last loose stool rated 4 or higher on the Bristol Stool Scale and the number of stools during the 2-day observation period following initial administration of the study solution.

Results: The subjects who were given the botanical extract with ORS on Day 1 reported shorter time to cessation of symptoms than controls (6 hours 32 minutes vs 16 hours 21 minutes, $p<0.01$) and a lesser number of loose stools (3.8 vs 5.9, $p<0.015$). Nine (38%) of 23 subjects who were given the active compound on Day 1 reported immediate cessation of symptoms while 3 (15%) of 20 subjects who were given placebo on Day 1 reported similar results.

Conclusion: The results indicate that a novel solution extracted from common food-plant used with ORS may support the rapid resolution of short-term diarrhoea in children and adolescents. A study in a larger sample is underway to replicate these results.

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Husband-dominated Violence-related Injuries among Slum-dwelling Married Adolescent Girls of Bangladesh

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Background: Violence frequently creates injuries and disabilities; both are caused by husbands, mothers-in-law, sisters-in-law, and other members of families. In the slum community of Bangladesh, numerous married adolescent females are brutally tortured everyday, resulting in physical, mental and psychological vulnerability and disabilities. Other reasons include marriage at tender age, physical and mental immaturity, dowry-greediness, poverty, illiteracy, social norms, and taboos.

Objective: Identify the principal factor responsible for violence-related injuries and disabilities among married adolescent girls, identify preventive and protective measures through community-led initiatives, and deign effective intervention by the state.

Methodology: The study was conducted during July-December 2009 in Bowniabad slum of Dhaka city. In total, 300 married adolescent girls aged 13-18 years were studied. Quantitative and qualitative data were collected through a structured questionnaire, observations, in-depth key-informant and interviews, case studies, and participatory learning for action sessions. Data were analyzed using the SPSS software and Anthropac software.

Results: The results showed that 64% of the 300 married adolescent girls were victimized by violence and injury for domestic violence. Of them, 84% were injured by their husbands, 11% by their mothers-in-law, and 5% by their sisters-in-law and others. Thirty-five percent were injured physically, 38% mentally, and 27% both physically and mentally. The severity of violence and injuries caused by husbands was: beating from 1 to 5 times and above, including ill-behaviour (30%), filthy words (26%), blowing (24%), pulling hair (11%), kicking out (5%), and starvation (4%) during the last 3 months of the study.

Conclusion: Husband-dominated violence-related injuries are a serious offence against married adolescent girls in the slum community, which destroy lives of young mothers and their children. To prevent these, the Government, donors, and NGOs should take immediate community-managed participatory interventions to adapt anti-violence approaches.

119 (075)

Causes and Timing of Infant Death in Rural Northwestern Bangladesh

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Background: Most neonatal and infant deaths in Bangladesh occur at home, creating a challenge for assigning causes of death. Updated knowledge on the causes of death during this vulnerable period is necessary to develop sustainable interventions for improving infant survival.

Objective: Describe the timing and causes of neonatal and infant mortality in rural Bangladesh

Methodology: Within a community-based trial on vitamin A and beta-carotene supplementation to mothers and infants in rural northwestern Bangladesh (JiVitA-1), a study was carried out from 2001 to 2007. Trained female interviewers conducted verbal autopsies for all deceased infants. The autopsy, completed by interview with a parent or close family member, included a structured questionnaire and a verbatim description about morbidity before death. Two physicians independently reviewed each autopsy and made a consensus assignment of cause(s) of death. A third physician was called upon to perform an independent review when consensus could not be reached. The JiVitA study was approved by the Bangladesh Medical Research Council and the Institutional Review Board at the Johns Hopkins Bloomberg School of Public Health, USA.

Results: Of 41,956 livebirths, there were 3,412 deaths of infants, 70% (n=2,404) of whom died within the first month. The major causes of infant mortality were infection, collectively defined as septicaemia and acute respiratory infection (46%) and birth asphyxia (22%), followed by prematurity (17%). Birth asphyxia was the major direct cause for early death and infection for late neonatal death.

Conclusion: The study has described the causes of infant and neonatal death in a rural Bangladeshi setting where families often delay in seeking medical care for illness of infants. This information can be used for guiding programmes aimed at further reducing mortality within the first year of life.

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120 (076)

Analysis of an Expensive Antibiotic for Managing Extremely Drug-resistant Bacterial Infections: Reducing Burden on Healthcare System

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Background: *Acinetobacter baumannii* is now established as a very common and difficult-to-treat nosocomial pathogen. Tigecycline, a new antibiotic introduced recently, is acclaimed to be an effective medicine against infections caused by multidrug-resistant (MDR) *A. baumannii*. Treatment with tigecycline costs around US$ 90 per day compared to minocycline that costs around US$ 0.12 per day. The costs of newer antibiotics showing some promise are prohibitive in a developing country like Pakistan.

Objective: Find out the efficacy of tigecycline against MDR *Acinetobacter* isolated from a tertiary-care hospital and compare it with minocycline in treating resistant infections caused by MDR *Acinetobacter*.

Methodology: Routine clinical specimens were received from various wards. *A. baumannii* was identified using standard microbiological procedures. Minimum inhibitory concentration was performed using E-strips (AB-Biodisk) of tigecycline and minocycline for each isolate.

Results: Resistance against tigecycline was observed; 80% of the isolates were susceptible to tigecycline. Minocyline showed excellent activity against MDR *Acinetobacter*. Ninety-six percent of the multidrug resistant *A. baumannii* isolates were inhibited by 4 mg/L of minocycline.

Conclusion: Minocycline exhibits excellent activity against clinical isolates of *A. baumannii* compared to tigecycline. Tigecyline marketed recently has not proved to be a good option in its efficacy against MDR *Acinetobacter*. Its high cost, a burden on healthcare system, hinders its use as the first choice. Minocyline, a cost-effective drug, may be considered as a promising therapeutic option for the treatment of nosocomial infections due to this resistant pathogen.

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Pseudomonas aeruginosa Infections and Antibiotic Susceptibility Profiles in Malaysia

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Background: *Pseudomonas aeruginosa* is an important pathogen causing severe and life-threatening infections in immunocompromised hosts. It is a leading cause of nosocomial infections and is associated with a high mortality rate due to notable resistance to many currently-available antibiotics. Comparative analyses of the emergence of resistance associated with different classes of antipseudomonal drugs are lacking.

Objective: Determine the prevalence of the site of *P. aeruginosa* infections, antibiotic susceptibility profiles of *P. aeruginosa* isolates, and multidrug resistance among the *P. aeruginosa* isolates.

Methodology: Fifty-four clinical isolates of *P. aeruginosa* were collected from Selayang hospital, Selangor, Malaysia, during January-June 2010. All clinically-isolated samples were identified as *P. aeruginosa* by the conventional biochemical tests, i.e. Gram-staining, catalase test, oxidase test, motility test, Triple Sugar Iron assay, citrate test, urease test, and indole test. The Kirby-Bauer disc-diffusion method was used for determining the antibiotic susceptibility. Results of disc-diffusion method were interpreted in accordance to the Clinical and Laboratory Standards Institute (CLSI, 2009).

Results: Thirty-six percent of the isolates were identified from pus, followed by respiratory tract (22%) and urine (18.51%). Ciprofloxacin was found to be the most active antimicrobial agent with 83.34% susceptibility, followed by imipenem (81.49%), aminoglycosides (amikacin 74.08%, gentamicin 72.23%), and the beta-lactams (cefepime 62.97%, ceftazidime 35.19%). Piperacillin showed the maximum resistance (25%), followed by ceftazidime (15%) and amikacin (14%). Twenty-nine percent of the *P. aeruginosa* strains were resistant to one antibiotic, 20% of the strains were resistant to 2 antibiotics, and 51% of the strains were multidrug-resistant. *P. aeruginosa* isolated from blood, urine, and sputum showed the highest rate of multidrug resistance.

Conclusion: Ciprofloxacin can be widely used for the treatment of *Pseudomonas* infections as this antibiotic showed maximum susceptibility. It can be suggested not to use piperacillin widely. Antibiotic sensitivity profiles need to be carried out before prescribing for *Pseudomonas* infection as the organism is gaining higher rate of multidrug resistance.

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122 (089)

Reduction of Carcinogenic Chromium by Chromium-resistant Bacteria Isolated from Garments Dye-water Effluent

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Background: Hexavalent chromium is one of the toxic heavy metals with high mobility in soil and groundwater which can produce harmful effects, such as cancer and various dermatological complicacies.

Objective: Evaluate the prospect of chromium-resistant reducing bacteria as an agent for bioremediation of carcinogenic chromium and the potential source of chromium reductase enzyme.

Methodology: Samples were collected from the effluent sites of industrial areas of Narayanganj district of Bangladesh, using nutrient agar medium supplemented with chromium (VI) as K_2CrO_4. Five isolates obtained by purification on NB-agar plates containing different concentrations of chromium [1 mM, 10 mM(I), 10 mM(II), 20 mM(I), and 20 mM(II)] were further studied. Two isolates were successfully grown in chromium (10 mM) containing nutrient agar supplemented with ampicillin to find out some clues whether there was any correlation between the chromium-reducing property and antibiotic susceptibility. The isolated microorganisms were studied for chromium (VI)-reduction ability using diphenyl carbazide assay method. Later on, separate antibiotic susceptibility tests of the isolated microorganisms against different antibiotics were done to correlate antibiotic susceptibility with the chromium-reduction property. Minimum inhibitory concentration of chromium to prevent the growth of chromium-resistant bacteria was also done. Later on, cultural and biochemical tests of the isolates were carried out for the identification of bacteria.

Results: After the evaluation of chromium-reduction profile of all the isolates, approximately 80-95% of chromium (VI) was reduced in the culture media by 6 strains of isolated microorganisms within 24 hours where one isolate [20 mM(I)] showed no reduction property. The microorganisms showed a significant tolerance to the chromium in the MIC test. Three isolates showed remarkable tolerance ranging from 35 mM to 40 mM chromium (VI) whereas other 4 isolates exhibited moderate tolerance ranging from 25 mM to 30 mM chromium. These chromium-resistant bacteria also showed a wide range of resistance towards different conventional antibiotics. After conducting biochemical tests later on, the strains showed similarities with bacteria belonging to *Enterobacter*, *Vibrio*, and *Streptococus* genus.

Conclusion: Chromium-reducers could have a great potential for chromium bioreduction. Further studies with respect to cell-free extract will help in elucidation of mechanisms involved in chromium reduction. The isolates could also serve as a potential source of chromium reductase enzyme which, in turn, could be developed and used as chemotherapeutic agents.

123 (093)

Knowledge of Oral Cancer among Medical Internee Doctors

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Background: Doctors trained to advise proactively against tobacco, alcohol, and other substance-abuse could make a real impact on prevention of oral cancer. Patients often consult their general medical practitioners rather than their general dental practitioners regarding oral lesions. Early detection of oral cancers makes them more amenable to treatment and allows the greatest chance of cure. Delay in presentation or referral has a significant effect on associated morbidity and mortality.

Objective: Assess the knowledge of oral cancer among medical internee doctors.

Methodology: This cross-sectional study on the knowledge of oral cancer among medical internee doctors was conducted during April-June 2009. During this period, 15 days were spent for data collection. The study was carried on all medical internee doctors of Dhaka Medical College and Sir Salimullah Medical College Hospital, who were willing to respond to interview. Medical internee doctors were interviewed using a structured questionnaire with 2 sections. The sample-size for the study was 104. The respondents were selected purposively, who were willing to give interview. The first section was for collecting information on sociodemographic variables, e.g. age, sex, religion, marital status, seminar or workshop, income, and smoking or chewing tobacco. The second section was for collecting specific information regarding the knowledge about risk factors, common site, signs and symptoms, potentially-malignant lesions and conditions, referring of a patient, treatment and prevention of oral cancer. Data, collected through face-to-face interview, were analyzed using the SPSS software (version 14).

Results: Smoking tobacco as a risk factor was identified by the internee doctors well (96.15%); alcohol-use was identified poorly (5.76%); and none could identify the presence of potentially-malignant oral lessions and conditions. Erythroplakia was identified poorly as potentially-malignant lessions. None could identify potentially-malignant oral conditions. National Institute of Cancer Research and Hospital was mentioned by 53.8% and radiotherapy was identified by 92.3% of the study subjects.

Conclusion: The medical internee doctors had poor knowledge on oral cancer. This study highlights the need for improved education and training of medical internee doctors towards raising the level of knowledge regarding oral cancer.

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Waterborne Diseases among Slum Children in Dhaka City, Bangladesh: A GIS-based Analysis

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Background: The poor in Dhaka city are compelled to live in an environmentally-hazardous low-lying flood-prone area. The slum poor, especially children, are at high risk of health problems. Factors influencing health status are not only natural phenomena such as flood but also other difficult conditions, such as poor housing, lack of sanitation, etc. It is necessary to investigate what causes children's suffering from such diseases. Investigation of factors, spatial variation, and comparison of occurrence of diseases using statistical and GIS techniques are increasingly drawing attention of researchers and becoming a challenge to the development authority.

Objective: Explore the factors that influence the occurrence of waterborne diseases among slum children and investigate spatial variation in the occurrence of disease considering situational opportunities such as availability of facilities and stressors such as low-lying flood-prone area.

Methodology: A descriptive study was conducted on 385 systematically-selected households in *Beri Badh* area of Mohammadpur in Dhaka city. The interested respondent was the mother of household who had at least one child aged up to 16 years. Cluster analysis technique was used for identifying different groups of households that vary with respect to demographic, socioeconomic, physical environment, and health behaviour characteristics and for investigating children's health status in terms of household characteristics of identified groups.

Results: The findings showed some variations in health status of children when variables of the physical environment were considered. Comparison with health status in terms of variables, such as housing structure, types of latrine, and source of drinking-water, showed a tendency of influencing health status, although the differences were not significant in the sampled area indicating that slum populations are poor and relatively homogeneous. In the case of spatial variation in the occurrence of diseases, significant variations were observed in the flood-controlled and uncontrolled area. As the area is low-lying everywhere, the variations can be determined in terms of availability of facilities, such as schools and health centres.

Conclusion: A high percentage of households' negative perceptions regarding the situation indicates that the socioeconomic and physical environments need to be improved substantially to reduce child morbidity in urban slums.

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16S rRNA Gene-targeted Metagenomic TTGE in Determining Diversity of Gut Microbiota during Acute Diarrhoea and Convalescence

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Background: The diverse gut microbiotas that play a very vital role in healthy living of human and other animals may be lost during diarrhoea due to high purging rate and colonization of the intestine by pathogens.

Objective: Determine the changes in diversity of gut microbiota during and after acute diarrhoea in children, using molecular methods based on 16S rRNA gene.

Methodology: Serial faecal samples were collected from 21 children during acute diarrhoea, convulsion period, and after recovery. Faecal samples were also collected from 9 children without diarrhoea. Polymerase chain reaction, using universal primers for 16S rRNA gene, was performed on chromosomal DNA extracted from the faecal samples, and the products were separated by temporal temperature gradient gel electrophoresis (TTGE).

Results: A significant decrease in the numbers of gut microbiota occurred due to acute diarrhoea on Day 0 as indicated by the number of TTGE bands (11±0.9 vs healthy 21.8±1.1, mean±standard error, $p<0.01$) when compared with their healthy siblings. However, the restoration of the gut microbiota occurred during convalescence as the number of 16S rDNA bands, each representing diverse bacteria, increased starting from Day 1 and continued as was observed up to Day 7. Maximum restoration of the microbiota was recorded on Day 7 (15±0.9, $p<0.01$), although the number of bands remained significantly less than their healthy siblings ($p<0.01$).

Conclusion: Since the restoration of the lost gut microbiota is crucial for acute diarrhoeal children to return to normalcy, it is proposed that appropriate therapeutic and nutritional intervention might be of help in achieving required higher diversity within the shortest possible time.

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Novel Insights in *Vibrio cholerae* Evolution Revealed by Fluorescence-Labelled Gene Cassette PCR and Pulsed-Field Gel Electrophoresis: An Australian Perspective

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Background: The bacterial genus *Vibrio* has a far wider distribution than the disease cholera. This suggests a role for environmental factors in the disease. To better understand the relationship between environment and disease, the relationship between *Vibrio* strains from a non-endemic cholera region and those from cholera-endemic region was explored. Sydney, Australia, is an example of a region where cholera is non-endemic but *Vibrio* species are present.

Objesctive: Determine the pathogenic potential and compare genomic relatedness of *Vibrio cholerae* strains isolated from Sydney, with known pandemic and non-pandemic strains of *V. cholerae* of cholera-endemic regions.

Methodology: Eleven of 2,520 Sydney isolates were confirmed as *V. cholerae* by analyzing 77 samples using standard cultural and molecular techniques from 4 different sites of Sydney, from August 2009 to December 2010. The relatedness of Sydney cohort to pathogenic strains was assessed at 2 different evolutionary scales by profiling of gene cassette array composition in the integron and by pulsed-field gel electrophoresis.

Results: *Vibrio cholerae* strains with pandemic potential with different levels of virulence genes from the aquatic environment of Sydney were isolated. Dendogram and multidimensional scaling both formed a very tight cluster of Australian cohort, which suggests that these are unique from other *V. cholerae* strains of endemic regions. However, strain S-29 showed genomic relatedness with 'extinct' classical biotype. This type of novel genome was never found from a cholera non-endemic region and from environmental sources. Dendogram analysis constructed by gene cassette PCR which provides higher resolution over single locus or multilocus phylogeny grouped those strains with altered, classical, and El Tor *V. cholerae* strains.

Conclusion: The gene cassette PCR targets the most dynamic part of the genome in genus *Vibrio*—that are associated with integron cassette arrays. Data suggest that the environment serves as the common gene pool for pathogenic organisms, including *V. cholerae*. Therefore, change in the environmental factors might have direct inference in the recent *V. cholerae* evolution which might have far-reaching implication in vaccine development.

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A Novel Low-cost Approach to Estimate Incidence of Japanese Encephalitis in the Catchment Area of Three Hospitals in Bangladesh

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Background: Japanese encephalitis (JE), a mosquito-borne virus, is the most common cause of vaccine-preventable viral encephalitis in Asia. The introduction of a life-saving vaccine in a low-income country such as Bangladesh depends on the cost-effectiveness, which, in turn, depends on the incidence of disease. In Bangladesh, acute meningoencephalitis surveillance is being conducted in 3 tertiary-level hospitals where patients admitted with meningoencephalitis symptoms were tested for JE. However, hospital surveillance underestimates the real burden of a disease because many ill persons do not seek care at surveillance hospitals.

Objective: Estimate JE incidence in the catchment areas of surveillance hospitals using a novel low-cost approach.

Methodology: The primary catchment area of a surveillance hospital was defined as the districts where more than 50% of the admitted meningoencephalitis patients resided. From the catchment area of each hospital, 20 unions, the lowest administrative area, were selected for the community-based survey. Instead of a traditional house-to-house survey, meningoencephalitis cases were identified by approaching healthcare providers, individuals, and groups in the community, and they were asked if they knew anyone who had developed fever with altered mental state or new onset seizures within the last 12 months. Those households were then visited, and the symptoms were confirmed. The incidence of JE was calculated by adjusting the hospital-confirmed JE incidence by the proportion of suspected meningoencephalitis cases in the catchment area, who were admitted to the surveillance hospitals.

Results: During October 2007–December 2008, of the admitted acute meningoencephalitis patients in the surveillance hospitals, 24 JE-positive cases were found in Rajshahi, 8 in Khulna, and 6 in Chittagong. Of the suspected menigoencephalitis cases in the hospital catchment area, 29 (11%) in Rajshahi, 11 (4%) in Khulna, and 38 (9%) cases in Chittagong visited the surveillance hospitals during their illness. The estimated incidence of JE was 2.7 in Rajshahi, 1.4 in Khulna, and 0.6 in Chittagong per 100,000 people.

Conclusion: The study provides a credible estimate of JE incidence in 3 wide geographic areas in Bangladesh that can be used as a rationale for policy-makers for taking effective control measures.

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Lymphocytic Esophagitis in Children with Coeliac Disease: A Novel Finding

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Background: Lymphocytic esophagitis (LE) and coeliac disease (CD) are distinct gastrointestinal disorders.

Objective: Highlight the possible co-existence of CD and LE.

Methodology: In total, 312 children who had upper endoscopy and concurrent biopsy between January and December 2009 were identified. Of this cohort, 178 had concurrent esophageal biopsies performed, and those with histology consistent with LE were identified. The slides of all these cases were reviewed. Demographic details of the children with LE were retrieved.

Results: Of the 178 patients, 17 (9.6%) were diagnosed with LE. The mean age of children with LE (M:F::10:7) at presentation was 8.71±3.04 years (range 3-16 years). Fifteen of the 17 (88.2%) patients affected by LE also had a diagnosis of CD. Most (13 of 15) children presented with anaemia and diarrhoea. None had dysphagia. Each patient had abnormal coeliac screening tests. All but one children with LE and concurrent CD showed classic (type 3) duodenal mucosal histologic lesion. A gluten-free diet was instituted in every patient. The other 2 children affected by LE had associated with achalasia cardia and cyclical vomiting.

Conclusion: This is the first reported cohort of children with an association between CD and LE. To date, it is not possible to exclude that, in a subgroup of children with CD, the esophageal lymphocytic infiltration could be caused by CD itself. Awareness of the potential co-existence of LE and CD should promote optimal diagnosis of these conditions. Routine esophageal biopsies may be warranted when investigating for CD.

Comparison between Age-groups in Immune Response to Cholera Infection

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Background: Young children have high hospitalization rates for cholera infection. While children are able to mount adequate immune responses after natural infection, vaccine trials have demonstrated lower protective efficacy in the youngest age-groups compared to older children and adults.

Objective: Characterize and compare antigen-specific B cell responses following wild-type cholera infection in different age-groups.

Methodology: After informed consent, blood samples were obtained from patients with culture-confirmed *Vibrio cholerae* infection presenting to the Dhaka Hospital of ICDDR,B. Antigen-specific antibody-secreting cells (ASC) to LPS and CTB were assessed by ELISPOT method after isolation of peripheral blood mononuclear cells at acute and convalescent stages of infection (Day 2, 7, and 30). Antigen-specific memory B cells (MBCs) were similarly assessed after 6-day stimulation with polyclonal mitogens. Serum antibody and vibriocidal responses were assayed by standard ELISA technique. The study protocol was approved by the Ethical and Research Review Committees of ICDDR,B and Institutional Review Board of Massachusetts General Hospital. Statistical analysis was performed using the SPSS software (version 17).

Results: Baseline characteristics were not significantly different between younger children (age 2-5 years, n=15), older children (age 6-14 years, n=18), and adults (age 15-60 years, n=60). Younger children had larger increases in CTB IgG MBC response between Day 2 and Day 30 than older children (p=0.074) and adults (p=0.019); there was a trend towards older children having higher LPS MBC levels at Day 30 than other age-groups. Younger children were also more likely to have lower LPS ASC response at Day 7 than adults (p=0.002 for IgA, p=0.065 for IgG). ASC levels at Day 7 correlated with antibody titres for LPS IgA (p<0.001), LPS IgG (p<0.001), and CTB IgA (p=0.005) at Day 30. Vibriocidal changes between Day 2 and 7 were greater in young children compared to adults (p=0.047).

Conclusion: The findings suggest that, while young children may have a weaker initial plasma cell response, they are still able to generate a significant memory response to wild-type infection. The implications for vaccination need to be further elucidated.

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Physical Activity in Bangladesh: Findings from a Population-based Study

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Background: Cardiovascular diseases (CVDs) and diabetes are main drivers of the current chronic disease epidemic worldwide. Physical inactivity represents an independent vascular risk factor, and exercise is recommended to prevent CVDs and diabetes and promote and maintain health. Levels of physical activity were inversely associated with body mass index, waist-circumference, and glucose and insulin levels in the South Asians. Information regarding physical activity is still scarce in Bangladesh.

Objective: Describe the prevalence and determinants of insufficient physical activity among adults in Bangladesh.

Methodology: The 'Risk Factors and Chronic Diseases Study' is a cross-sectional study of 39,038 men and women aged 25 years and above, residing in 3 rural (Matlab, Abhaynagar, and Mirsarai) and one urban (Kamalapur) demographic surveillance sites of ICDDR,B conducted in 2009. The classification of physical activity was based on a validated instrument, adapted to fit the context of Bangladesh. Daily household chores and related activities were used as benchmark to classify physical activities.

Results: Twenty-five percent of the rural respondents (n=29,960) and 44% of the urban respondents (n=9,078) from the surveillance sites had reportedly insufficient physical activity. Urban men (53%) were significantly more insufficiently active than rural men (21%), which were more pronounced in the younger age-groups. The differences between urban and rural women were significant but less-pronounced (35% vs 29%). Female sex [odds ratio (OR)=1.26], older age (OR=7.64), higher education (OR=2.25), more wealth (OR=1.86), and urban residence (OR=2.97) were independently associated with insufficient physical activity.

Conclusion: Urban better-off respondents, in particular younger men, with higher education, are most likely to lead a life with insufficient physical activities, and hence, increase the risk for diabetes and CVDs. Health programmes should adopt a holistic approach. Gym culture is yet to be a part of life in Bangladesh; jogging and exercising outside are compromised by small space, hot environment, and crowd. Interventions should be developed for such a life with less physical activity accompanied with a diet that suits such a life.

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Fruit and Vegetable Consumption in Bangladesh: Findings from a Population-based Study

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Background: There is an increasing awareness of the role of diet in the aetiology of chronic diseases. At present, only a small and negligible minority of the world's population consumes the recommended quantities of fruits and vegetables. A low consumption of fruits and vegetables is a persistent phenomenon in many regions of the developing world. There is only limited knowledge on the levels of fruit and vegetable consumption and its determinants in Bangladesh.

Objective: Describe the patterns and determinants of fruit and vegetable consumption in Bangladesh.

Methodology: The 'Risk Factors and Chronic Diseases Study' is a cross-sectional study of 39,038 men and women aged 25 years and above, residing in 3 rural (Matlab, Abhaynagar, and Mirsarai) and one urban (Kamalapur) demographic surveillance sites of ICDDR,B conducted in 2009. Data on daily fruit and vegetable consumption were collected. For fruits, consumption rate of different items was collected and then converted to cups, equivalent to 30-40 g, the recommended daily intake. One cup (approximately 200 g cooked) was defined as the daily sufficient vegetable requirement.

Results: In the urban area, 23% of men (n=3,917) and 21% of women (n=5,161) consumed an adequate daily amount of fruits. In rural areas, this was 18% and 13% respectively. Male sex [odds ratio (OR)=1.32], young age (OR=1.31), higher education (OR=1.52), more wealth (OR=1.71), and urban residence (OR=1.41) were independently associated with sufficient fruit consumption. The urban respondents less frequently consumed adequate quantities of vegetables compared to the rural respondents (62% vs 93%). An independent association of male gender (OR=1.14), higher education (OR=1.23), and rural residence (OR=8.06) with daily sufficient vegetable consumption was found.

Conclusion: A sufficient amount of fruits was consumed daily by only 16% of the study population. Knowledge on the role of fruits in health and barriers to inclusion of fruits and vegetables into daily consumption patterns, such as availability and price, needs to be explored. Likewise, rural-urban variation in vegetable consumption should also be explored.

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Perceptual Obstacles Is a Significant Barrier to Optimal IYCF during Childhood Diarrhoea

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Background: Despite significant progress in medical and nutritional sciences, diarrhoea and malnutrition continue to be among major health crisis throughout the developing world, mostly affecting those from lower socioeconomic levels. Results of studies showed that beliefs and cultural practices influence people's knowledge on health and healthcare-seeking behaviour.

Objective: Explore perception of caregivers on nutrition and feeding patterns and its impact during diarrhoeal episodes in young children, aged less than 3 years, from the population of lower socioeconomic status.

Methodology: The study was conducted at the Dhaka Hospital of ICDDR,B. Qualitative data were collected through focus-group discussions and in-depth interviews of caregivers and health professionals. Information on feeding practices and perception on nutrition was obtained from 104 caregivers (all female and mostly mothers of patients) and 7 health professionals during a 6-month period. Ethical clearance was obtained from the Bangladesh Medical Research Council.

Results: The results of the study showed that childhood diarrhoea patients are often underfed. Three basic causes were found for which infant patients were deprived of breastmilk. These include: disease-induced anorexia, reluctance of mothers to feed a fidgeting child, and, to a lesser extent, the misconception that 'consumption of milk aggravates diarrhoea'. Caregivers had adequate knowledge on basic nutrition. However, cultural practices, reliance on expensive foods (infant formula, meat, costly fruits, etc.) and belief in 'supernatural spirits causing illness' were even stronger in many caregivers. Mother and child were sometimes forced by their relatives to avoid certain 'forbidden' foods, sometimes pushing them to semi-starvation. Generally, fish and other high-protein foods for the mother and milk and all complimentary foods for the child were considered to aggravate diarrhoea. The caregivers had mixed and confused idea about ideal consistency of diet of the patient and its importance in nourishment. The elderly people in a family played an important role in feeding since they are the ultimate 'decision-makers'. However, hospital counselling helped some caregivers overcome some of these prejudices.

Conclusion: Due to deep-rooted beliefs and cultural practices widespread in the society, feeding practices do not necessarily conform to knowledge. Appropriate counselling would help improve caregivers' knowledge, attitude, and practices.

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Care-seeking Behaviour for Chronic Disease: Choosing a Provider

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Background: A rising epidemic of chronic disease threatens the healthcare system and economy of Bangladesh. Little information exists on chronic disease in Bangladesh, particularly on care-seeking behaviour.

Objective: Describe care-seeking behaviour of chronic disease patients by analyzing which providers diagnose these diseases.

Methodology: During the 2-month period in 2009, cross-sectional descriptive self-reported data were gathered on chronic disease and providers who diagnosed from ICDDR,B surveillance populations (Abhoynagar, Mirasarai, and Kamalapur) using a semi-structured, pre-tested questionnaire. During the 2-month period, the maximum number of respondents (aged over 25 years) who reported having ever been diagnosed with chronic disease determined the sample-size. Chronic disease was defined as hypertension, diabetes, hyperlipidaemia, overweight, chronic bronchitis, heart attack, angina, stroke, asthma, and oral or lung cancer. Four provider-categories were used: MBBS doctors, other qualified allopathic practitioners (QAP) (nurse, health worker, paramedic), unqualified allopathic practitioners (UAPs) (village doctor, drug-seller), and non-allopathic providers (NAPs) (homeopath, *kobiraj*, traditional healer). Using the Stata software (version 10.0), univariate and multivariate regression analyses were preformed on related sociodemographic factors.

Results: Of the 32,665 survey respondents, 8,591 self-reported chronic cases were included in the study population. Of chronically-ill respondents, 56.4% were female, and 63.4% were rural residents; their mean age was 48.7 years [standard deviation (SD) 14.0], and mean education was 4.8 years (SD 4.6); 37.5% had no education, and 12.1% had more than secondary education (>10 years). Most prevalent diseases were hypertension (22.7%), angina (8.6%), and diabetes (7.6%). Diagnoses were made by MBBS doctors (72.2%), UAPs (23.0%), NAPs (2.7%), and other QAPs (2.2%). The greatest factor influencing care-seeking behaviour was urban residence [odds ratio (OR)=4.76, 95% confidence interval (CI) 4.17-5.13]. When examined across age, education, and poverty, rural areas revealed to have clear gender gaps (disfavouring women) in care-seeking from MBBS doctors. Urban areas showed much smaller gaps in this regard, some disfavouring men.

Conclusion: UAPs play important roles in the care of chronic disease, particularly in rural areas. Input and cooperation from UAPs are needed if rural health disparities are to be minimized. More research on knowledge, attitudes, and practices of UAPs regarding chronic disease is necessary before they can be fully used for combating this oncoming epidemic.

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134 (035)

Improving Reproductive and Maternal Healthcare Services among Street Women in Dhaka, Bangladesh

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Background: Studies have found an increased number of people living in streets and in public places in Dhaka city due to increasing pressures of rural-urban migration and rapid urbanization. There is no reproductive and maternal healthcare service-delivery mechanism targeting women living in streets.

Objective: Assess the use of reproductive and maternal healthcare services among street-women in Dhaka city.

Methodology: Data used for this analysis were drawn from a pre-post study conducted during February 2009–April April 2010. The interventions of the study included: (a) providing essential healthcare services to street-dwellers through static and satellite clinics in the evening by paramedics in 3 locations of Dhaka city, and (b) establishing referral linkage with public and non-government (NGO) healthcare facilities. The study population included ever-married females aged 15-49 years. Data for the study collected through a survey (before and after the implementation of interventions) included service statistics and qualitative components. Data were analyzed based on pre- and post-implementation of interventions to compare changes in the use of reproductive and maternal healthcare by street-women.

Results: After the implementation of interventions, the use of antenatal care by street-women increased from 9% to 75%. There was no street-delivery after the implementation of interventions while it was 65% before. Clinic-delivery increased remarkably compared to pre-implementation of interventions. Problems faced by mothers during delivery decreased significantly ($p<0.001$) after the implementation of interventions compared to pre-intervention period. Postpartum morbidity among the mothers also decreased notably. The use of modern family-planning methods among street-women increased significantly ($p<0.001$) at endline compared to baseline. The status of experience of sexually transmitted disease (STDs) decreased at endline compared to baseline, and the difference was significant ($p<0.001$). Women mostly visited the static and satellite clinics for the treatment of sexually transmitted diseases at endline while the choice was street vendor/traditional healer at baseline.

Conclusion: The interventions tested contributed substantially to improving reproductive and maternal healthcare among street-women. Therefore, the policy-makers and programme managers should come forward to implementing the interventions in all other cities of Bangladesh. The limitation of the study was that there is a clear potential for confounding from other efforts to improve reproductive and maternal healthcare but there was no evidence of other interventions in the study areas during the study period.

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135 (050)

Parenting Education in Coastal Areas and Its Influence in Disaster-preparedness Behaviour and Child Development

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Background: Coastal disasters create long-term losses. As a long-term development strategy in disaster-prone areas, now a question was raised: Can parenting education contribute to developing children and making them well-nurtured, emotionally-healthy, and capable of reaching their full potential? Accordingly, results of a study on coastal disaster in most vulnerable Barguna and relatively-low vulnerable Feni of Bangladesh had shown the success of parenting education in developing behavioural change in parents and creating family resilience with children as they grow as adolescents and teens.

Objective: Determine the development level of parenthood and child-rearing knowledge and practices and coastal disaster-preparedness skill raised through facilitation of parenting education.

Methodology: A cluster-randomized controlled trial was carried out. Data on parenting education were collected from 200 participants of targeted areas and from 200 participants in the controlled area selected from similar economic group, same geographical coastal context, religion, and education. Tools included case study, focus-group discussion (FGD), and key-informant interview. These were facilitated in 15 wards of 4 union parishads (UPs) of 2 upazilas randomly selected from 306 wards of 34 UPs under 4 upazilas. Focus-group participants were divided into 10 types: shrimp/prawn collector parents group, fishing community parents group, farmer's community parents group, general community group, traders, 5-10 years old children groups, health workers, disaster volunteers, and teachers. Eighty-six key-informant interviews were conducted with UP chairmen, government health officials, social elite, and businessmen, including eye witnesses. The survey period was 3 months.

Results: Women including teens were prepared to take the tasks of parenthood—significantly better in the intervention group than in the control group (68% vs 17%), such as health check-ups, and taking help of trained birth attendants or hospital. Parent's rough behaviour with children, like beating, snub, or showing anger, reduced among the intervention group than among the control group (81% vs 23%). Awareness of disaster was higher in the intervention group than in the control group (77% vs 34%), such as collecting early warning message, home preparedness, and taking safe shelter.

Conclusion: The results indicate that parenting education can develop behavioural change in child-rearing and increase family resilience skills, including disaster-preparedness skill.

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136 (095)

Impact of Mass Media on Behaviour Change among Caregivers in Slum Areas of Dhaka City towards Using Zinc As a Treatment for Childhood Diarrhoea

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Background: Zinc has been introduced as an adjuvant treatment with oral rehydration solution (ORS) to reduce mortality and morbidity due to acute childhood diarrhoea in Bangladesh. ICDDR,B carried out a mass-media campaign nationwide promoting benefit of zinc for under-5 diarrhoea patients. This study was conducted in urban slums after 2 and a half years of the implementation of the zinc scale-up campaign to explore the impact of mass media in the people's health-related behaviour.

Objective: Assess the impact of mass media in changing behaviour for using zinc in the treatment of childhood diarrhoea in Dhaka slum areas.

Methodology: The study population included the caregivers of 2 slum areas in Dhaka city—Mirpur and Mohammadpur—whose under-5 children had suffered from diarrhoea within the past 3 weeks or had been suffering till date. In this community-based cross-sectional study, 404 caregivers were interviewed. Data were collected from April to May 2009.

Results: The results showed that the respondents had access to mass media, and 99.5% watched television. Of them, 55.2% knew about the new treatment of zinc for diarrhoea among under-5 children whereas 44.8% did not know. Of the study population, 35.6% learned about zinc from mass media, and only 26.1% gave zinc to their children whereas 92% gave ORS to their children. Of 105 respondents who gave zinc to their children, 40 gave it by themselves getting informed through mass media (television), and this group comprised 10% of the study population. Of the zinc users, 92.5% gave dispersible tablet form of zinc.

Conclusion: The results showed that mass media can have an impact on behaviour change but in a limited scale. In this study, slum-dwelling caregivers were aware of giving zinc to their children to fight against diarrhoea, and mass media pose a positive change among them to give zinc to their children. So, there is behaviour change but with slower progress. Although all the messages disseminated through mass media were not followed, the trend showed that mass media can make a change.

137 (104)

Coping Strategies of Older Rural Bangladeshi Women when Dealing with Health Problems

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Background: Many local studies in Banlgadesh confirm that women, especially the older women, continue to receive fewer health services than men despite the fact that they suffer from more health problems.

Objective: Explore the strategies used by older women to cope with their ill-health.

Methodology: Qualitative methods were used for collecting data from 17 older women living in Bibirchar union, Sherpur district, Bangladesh, in June 2006.

Results: A phenomenological analysis revealed that the participants used both emotion-focused and problem-focused strategies and that many of these were faith-based.

Conclusion: Health policy-makers and development agencies in rural Bangladesh and in other countries where faith-based practices are pervasive need to acknowledge these beliefs and practices and incorporate them into the healthcare-delivery system if better health outcomes are to be achieved for older women.

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138 (008)

Out-of-pocket Payment for Healthcare, the Insured and Uninsured: Barrier to Universal Healthcare Coverage in the Global South

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Background: All healthcare insurance systems are aimed at achieving the main financing functions of raising revenues, pooling resources for risk-sharing. Out-of-packet payment for healthcare pushes many households into poverty, especially in the Global South where there are insufficient funds for healthcare financing.

Objective: Estimate the level of health-insurance coverage among the population and the socio-economic and demographic determinants and the barriers to the use of health insurance in a developing country.

Methodology: Cross-sectional logistic regression and analysis of variance were carried out on data from the nationally-representative population sample survey—the 2008 Ghana Demographic and Health Survey (GDHS)—that covered 9,484 eligible individuals from 11,778 households to arrive at the results. The sampling technique for the 2008 GDHS involved a 2-stage probability sampling design. In total, 412 clusters were selected at the first stage using systematic sampling with probability proportional to size and 30 households selected in each cluster using systematic sampling technique.

Results: About half (47.4%) of the households had no members insured, representing about a sixth (59.2%) of the 46,536 household members, with family and friends paying insurance premium for about 48% of insured individuals. The proportion insured decreased with the increasing household-size. One in 5 insured persons made out-of-pocket payment for healthcare. There was a significant association between the mean number of household members insured and the household-size, type of place of residence, and wealth status. Education and wealth status were the significant predictors of individuals being insured confirming the diffusion of innovation theory.

Conclusion: The relatively-low health-insurance coverage at the household level and high dependence on family and friends for the payment of insurance premium will not only push more households into poverty and widen the already existing health inequality within the country but will also be a barrier to universal healthcare coverage.

139 (021)

Impact of Village Theatre on Unsafe Abortion Leading to Maternal Death in Rural Bangladesh

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Background: Complications of pregnancy and childbirth are still the leading causes of death and illness for women around the world. The five major causes of maternal death are bleeding, infection, unsafe abortion, eclampsia, and prolonged/obstructed labour. According to the World Health Organization, 14% of maternal deaths occour due to unsafe abortion in Bangladesh. Yearly, more than 4 million women become pregnant in Bangladesh; of them, 1.3 million are unwanted.

Objective: Compare the level of knowledge on unsafe abortion in terms of its consequences, problems, and care-seeking patterns among rural mothers before and after playing village theatre.

Methodology: This operations research adopted a quasi-experimental survey design which included a baseline survey, intervention (village theatre), and a post-intervention survey. The study conducted village theatre on 'unsafe abortion' for around 3 months. Respondents of the study were selected almost in a similar proportion. From each selected district, 2 upazilas were selected as an intervention area and a control area. Of these, Ichapur (Shirajdikhan) and Madhaya (Chandina) were the intervention areas and Patabhog (Sreenagar) and Gunaighar (Devidwar) unions were the control area. Trained interviewers interviewed 703 mothers (337 in the control and 366 in the intervention areas) using a structured questionnaire.

Results: The survey revealed that, before the intervention, 39% of the mothers had proper knowledge regarding menstruation regulation (MR). After the intervention, 50% of the mothers improved their knowledge. As a procedure of abortion, MR was reported by 40% of the mothers after the intervention but it was almost 37% before the intervention. Because of unsafe abortion, 33% of the mothers reported before the intervention that abortion was not done in health facilities, which was almost 39% after the intervention. After the intervention, 88% of the mothers mentioned that doctor can perform safe abortion which was 78% before the intervention. About 70% of the mothers opined that unsafe abortion can be reduced by taking help from the health facilities and doctors but before the intervention only 33% of the mothers mentioned it.

Conclusion: Village theatre is found to be an effective awareness-raising programme for reproductive health issues.

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140 (022)

Knowledge, Attitudes, and Experience about Menopause of Urban Poor Women in Dhaka City

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Background: Menopause represents the stage in a woman's life when her reproductive capacity has come to an end. There are many hormonal changes that lead to the cessation of menses. The main cause is the drop in estrogen. The study explored the health needs and psychosocial status of the urban poor women towards the end of their reproductive years as the health indicators of the urban poor are worse than those of the rural poor because of poorer living conditions and limited healthcare facilities.

Objective: Determine the knowledge and attitudes of women towards menopause and investigate the symptoms experienced by post-menopausal women.

Methodology: This cross-sectional survey, based on a sample convenience, was conducted in Nakhal para railline bosti, Biman quarter bosti, Shiya madh bosti of Ward 38 in Dhaka city. Information was collected from women whose menstruation stopped 3 years preceding the survey. In total, 391 women were interviewed during April-May 2010.

Results: Nearly 40% of the women experienced menopause before the usual age (45-55 years). About 54% believed that menopause is a normal phenomenon, and around 36% stated that it occurs after the cessation of reproductive life. Regarding problems, 56.5% had poor knowledge, 23.6% had average knowledge, and 16.8% had good perception about menopause. Most (95%) women had suffered from premenstrual problem before the cessation of menstruation. A few of them had no symptoms before the cessation of menstruation. The respondents mentioned various health problems that appeared after the cessation of menstruation. Of them, 71.1% had depression, 41.4% had waist-pain, 34.0% experienced sudden warm-sensation, 22.8% reported vertigo, 10.5% had burning sensation in hand/feet, and 7.2% had palpitation. Others had hot flash in face (1.3%), pain in breast (1.3%), and eye problem (1.0%). Only 20% got family support for the treatment of the post-menopausal problem

Conclusion: The majority of the women were unaware of menopausal symptoms and their effects. Most of them considered it a natural process of ageing, although bothered by symptoms, they did not go for consultation due to lack of awareness and because of poverty.

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141 (023)

Assessment of Attitudes and Beliefs of Religious Leaders about Family Planning, Maternal and Child Healthcare Services and Acceptance of Services by Themselves

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Background: Religion holds unique importance in people's lives and has been cited as an important factor in reproductive health. Bangladesh has a Muslim majority, and the cultural character of the country is strongly marked by Islam. In rural Bangladesh, religious leaders are considered opinion makers. Muslim religious leaders are often assumed to hold more conservative attitudes than the general population about family planning.

Objective: Explore the attitudes, beliefs, and acceptability of religious leaders (*Imam*, *Moajjem*, *Mawlana*, *Purohit*, and Father) about family planning, maternal and child healthcare (MCH) services.

Methodology: A community-based cross-sectional survey was carried out among a representative sample of 3,199 religious leaders of Bangladesh in the greater 4 divisions of Bangladesh during February-March 2010. Well-trained male interviewers interviewed them using a structured questionnaire. Collected data were analyzed using the SPSS software (11.0 version).

Results: Most religious leaders had knowledge about oral pill (98.3%) and condom (90.8%) as contraceptive methods. About 60% of the religious leaders used contraceptive methods. Nearly two-thirds had positive attitude towards the use of family-planning methods. However, 16% opined that contraceptive-use is forbidden in the religion, and a few of them did not use family-planning method due to religious restriction. Regarding the type of advice on family planning and MCH care the religious leaders preach, 74.4% advised to take treatment from doctor/clinic/health facility, 17.5% gave advice on contraceptive-use, and 10.7% advised to keep the family-size small. 56.4% faced no problem to receive healthcare; 35.0% stated that women should receive healthcare within religious custom; 7.1% replied that there was no binding according to the Holy Quran/religion.

Conclusion: Muslim religious leaders are often viewed as a real or potential hindering factor to family planning. The findings are expected to help the policy-maker to make the family-planning programme more effective by involving religious leaders to preach family planning in the light of Islam.

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142 (024)

Knowledge, Attitudes, and Practices of Newly-married Couples Relating to Emergency Contraceptive-use

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Background: The unmet need of family-planning method is still high among newly-weds, and the number of unexpected pregnancies is soaring among them. The options are only either to continue the pregnancies or undertake life-threatening measures to terminate the pregnancies. In this perspective, emergency contraception can be an alternative option for them.

Objective: Access the knowledge, attitudes, practice, and perceptions about emergency contraceptive among newly-married couples in Bangladesh.

Methodology: This cross-sectional survey was conducted among newly-married couples. Data were collected from 36 unions of 12 upazilas under 6 districts of 6 administrative divisions of Bangladesh. In total, 2,293 newly-married women and 1,635 husbands were interviewed by trained interviewers using a structured questionnaire. Data collected during January-March 2009 were analyzed using the SPSS software (version 11.0).

Results: The majority (61%) of the women were aged 15-19 years, and most (84.2%) of the husbands were aged 20-29 years. Positive knowledge of the respondents about emergency contraception was comparatively higher in Barisal (36%), Chittagong (34.3%), Dhaka (29.8%), Rajshahi (22.7%), and Sylhet (17.2%). Women (14%) had a little bit higher knowledge on emergency contraceptive pill (ECP) than their spouses (12%). The husbands (26%) had a little higher knowledge than the women (22.9%) regarding knowledge about unprotected sex to prevent contraception. The majority (58.1%) of the wives heard about ECP from family welfare assistants; the majority (59.1%) of the husbands heard about it from newspapers/books; and 27.8% heard about it from television/radio. A very negligible number (1.3%) used ECP. Six percent used postinor-2 as ECP, and 20% of them collected it from family welfare visitors and 63.3% collected it from pharmacy. The use of ECP was apparently higher among the women of non-Sadar upazila than among the women of Sadar upazila, although it was not statistically significant ($p>0.05$).

Conclusion: Information on ECP is not yet accessible to couples. Effort for its easy availability is highly recommended.

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143 (037)

Non-financial Barriers and Access of the Chronic Poor to Healthcare in Dhaka

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Background: The chronic poor are the group of people stuck in poverty for an extended period of time. The public healthcare system is designed to serve this downtrodden segment—the chronic poor. Problems relating to infrastructure and management have widely been reported for the public healthcare system. This small-scale study aims to explore the non-financial barriers that the chronic poor face to access healthcare service in the context of Dhaka.

Objective: Explore the non-financial barriers for the chronic poor to access health service in Dhaka city.

Methodology: This is a qualitative and exploratory research. The authors deploy a convenient sampling technique to reach a sample-size of 100 chronic poor in Dhaka. For the purpose of this study, 30 unskilled male day-labourers, who migrated to Dhaka from villages, earn an average of US$ 2-3 daily, and were compelled to start a living at their early teens, qualified to be the respondents. Since the study focuses on qualitative first-degree exploration of information with respect to having a generalized understanding on the nature and typology of the non-financial barriers, in-depth interview appeared to suit to this purpose.

Results: Around 68% of the respondents were found to be the earning members of the family. On top of this, with an average of 5 family members dependent on their earning for households and other domesticities, invariably every family had a monthly deficit, which amounted to US$ 20 or around. Persons in the study sample were mostly engaged in hard labour. With an average of 5 to 10 hours of laborious daily work and lack of sufficient nourishment, they became prone to frequent attacks by common cold-related diseases; other commonly-found medical disorders were: musculoskeletal pain, ENT-related diseases, visual disorders, and maternity problems. The study observed long queuing time, insufficient time given to a patient, middlemen's interference to access the doctors, insufficient attention given to a patient—culmination of what leads to dissatisfaction and leaves a feeling of being 'neglected'.

Conclusion: Generalization of these findings does not appear practical given the size of the sample. A more elaborative quantitative study is imperative to draw a set of guidelines to overcome these barriers.

144 (077)

Stillbirths in Urban Slums of Dhaka, Bangladesh

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Background: In Bangladesh, stillbirth continues to be a large public-health concern as it contributes largely to perinatal mortality and remain uncounted in most national statistics and research. A better understanding of the risk factors of stillbirth is essential for adequate healthcare planning and intervention and decrease the rate of stillbirth.

Objective: Identify the risk factors of stillbirths among women in urban slums of Dhaka city in Bangladesh.

Methodology: A case-control study, including 232 cases (stillbirths) and 464 controls (livebirths) who were born during November 2008–April 2009, was conducted in slums of Dhaka City Corporation area where BRAC has implemented a maternal, neonatal and child health programme named Manoshi. T-test, Mann Whitney, chi-square, and Fishers exact test were performed as descriptive statistics. Multiple logistic regression models were employed to identify the predictors of stillbirths.

Results: The rate of stillbirth was 25.78 per 1,000 births per year. Of 232 stillbirths, 61.9% were fresh, and 38.1% were macerated. The proportion of stillbirths was lower at the Manoshi Delivery Centres (17.0%) compared to women who delivered at home (33.0%). The identified predictors for stillbirths included maternal illiteracy [odds ratio (OR)=1.57, 95% confidence interval (CI) 1.06-2.2], maternal age (≥35 years) (OR=2.87, 95% CI 1.5-5.5), preterm delivery (OR=5.25, 95% CI 3.2-8.5), foetal malpresentation (OR=4.1, 95% CI 2.02-8.47), less foetal movement (OR=25.5, 95% CI 5.7-113.2), foetal distress (OR=7.3, 95% CI 1.3-42.4), prolonged labour (≥12 hours) (OR=2.8, 95% CI 1.6-4.6), and obstructed labour (OR=2.4, 95% CI 1.08-5.50).

Conclusion: The study provides evidence that stillbirths are predominantly associated with intrapartum risk factors which is often preventable. Policies aimed at improving antepartum services, including adequate antenatal care, timely referral of high-risk cases, and prompt emergency obstetric care, may act as important measures in the prevention of stillbirths in Bangladesh.

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145 (090)

Building Evidence Base to Address Social Determinants of Health for Improving Healthcare Coverage for Mothers, Newborns, and Children in Bangladesh

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Background: There is a growing body of empirical evidence produced by randomized controlled trials or quasi-experimental research on "What work?", i.e. efficacy of specific health interventions to improve the situation of maternal, neonatal and child health (MNCH) in developing countries. However, little is known about how to tackle socioeconomic or contextual bottlenecks which hamper the long-term improvement of MNCH at a large scale.

Objective: Build the evidence base to address social determinants of health (SDH) for improving the healthcare coverage for MNCH by applying econometric methods for the Bangladesh demographic and health surveys.

Methodology: An econometric analysis was conducted to identify the socioeconomic determinants of MNCH in Bangladesh and combine the estimated results with existing empirical evidence on SDH in developing countries. A prototype of the evidence base was then built, which addresses SDH for MNCH in developing countries.

Results: Estimated results suggest that socioeconomic factors, such as education, sanitation, water, and infrastructure, are the statistically significant predators of MNCH in Bangladesh. The evidence base that is built upon these results is confirmed to provide important policy implications to address SDH in Bangladesh.

Conclusion: Since addressing SDH is a key to achieving long-term MNCH outcomes in developing countries, the evidence base that has been proposed helps policy-makers facilitate priority setting in policy development towards the progress of Millennium Development Goals 4 and 5.

146 (099)

Infection-control Audit for Solid Wastes at an Urban Diarrhoeal Disease Hospital in Bangladesh

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Background: Huge amounts of medical wastes are produced from healthcare facilities in Bangladesh each year, including the Dhaka Hospital of ICDDR,B, and its effective management is a major challenge. One tool to assess solid waste management in hospital is the waste-management audit. However, many institutions in the country do not use this tool in a systematic fashion.

Objective: Conduct an audit of the generation, segregation, and disposal of solid wastes at the Dhaka Hospital of ICDDR,B.

Methodology: The audit incorporated a review of the physical layout, protocols and policies, and workplace practice of collection, identification, characterization, segregation, weighing, disposal, and incineration of solid medical wastes for 2009 and 2010. The audit team used the hospital-records on disposal of various wastes, in-depth interviews, meetings, discussions with concerned staff, and site inspections to assess the effectiveness of the systems.

Results: Hospital staff, familiar with the guidelines, practised identification and segregation of wastes. Potentially-infectious solid wastes and recycling wastes were weighed regularly before disposal, and the general household wastes were occasionally weighed every month. The daily volumes of different types of wastes produced varied, depending mostly on the number of patient-visits. The average generation rate of solid clinical waste was 533 kg per month (approximately 18 kg per day) and that of waste for recycling (empty plastic bags of intravenous fluids and infusion sets and empty plastic containers) was 675 kg per month (approximately 23 kg per day). The generation rate of general household wastes varied from 740 to 1,225 kg per day. Sharps and other potentially-infectious solid wastes were incinerated daily at the ICDDR,B's own facility while the general household wastes, such as kitchen wastes, were disposed of at the Dhaka City Corporation's collection sites for dumping.

Conclusion: The waste-management audit is an opportunity to implement changes and to introduce remedial measures in collaboration with various departments and services. A standardized approach to the audit allows benchmarking of practices across the hospital and enhances standards of management.

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147 (101)

Case Management Strategy for Patients with Influenza-like Illness at an Urban Diarrhoeal Diseases Hospital during the First Wave of Pandemic (H1N1) 2009 in Bangladesh

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Background: In Bangladesh, the first confirmed human case of pandemic (H1N1) 2009 influenza A virus infection was identified at ICDDR,B in June 2009. In response to a rising number of cases in the country, ICDDR,B quickly established a new respiratory ward which started functioning on 6 September 2009 at its Dhaka Hospital.

Objective: Review the clinical profile of patients with influenza-like illness (ILI), infrastructure, and activities of the new respiratory unit.

Methodology: The infrastructure, case-management protocols, and relevant data on patient-records from the computerized hospital management system (HMS) of the Dhaka Hospital of ICDDR,B were reviewed for the September-November 2009 period. An isolation ward was established in a well-ventilated tent divided into 3 compartments: a reception-cum-triage, a holding area for observation of suspected patients, and an H1N1 area for the management of confirmed cases of H1N1 infections. A scoring system, case-management protocols, and infection-control manual were developed to deliver efficient treatment to all patients with ILI. Adequate staff with prior training were assigned to work in 8-hour shifts. The facility was supplied with adequate quantities of personnel-protection equipment (PPE), disinfectants, and medications, a portable x-ray machine, Ambu bags, large oxygen cylinders, pulse oxymeters, and nebulizers.

Results: In total, 24,890 patients presented to the Dhaka Hospital of ICDDR,B for care from September to November 2009, of whom 1,041 with ILI were referred to the respiratory triage. Of them, 97 were admitted, and the remaining patients were treated as outpatients. Eleven admitted patients tested positive for pandemic (H1N1) 2009 influenza A virus. Oseltamivir was prescribed for suspected or confirmed H1N1 cases and antibiotics to treat pneumonia. The patients were discharged on improvement. Expenditure per patient was considerably low. No transmission of H1N1 infection to staff or other patients was observed.

Conclusion: This temporary unit, constructed over a few days and potentially replicable, has been efficient in terms of providing appropriate care and treatment with low expenditure and, thus, could serve as a model to meet the emerging pandemic (H1N1) 2009 influenza A virus situation in poor areas.

Acknowledgements: The financial assistance of the DFID, UK to support ICDDR,B for the establishment of the new respiratory ward during the first wave of pandemic (H1N1) 2009 in Bangladesh is acknowledged.

Treatment of Type II Diabetes Mellitus with Indigenous Plants in Bangladesh: An Assessment

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Background: Death due to chronic diseases is increasing in an alarming rate in Bangladesh. The prevalence of diabetes is significantly higher in the urban than in the rural community of Bangladesh. Plants have always been an exemplary source of drugs, and ethnobotanical information reports about 800 plants that may possess antidiabetic potential. Thus, a study was initiated, in collaboration with the Department of Nutritional Medicine, Technical University of Munich and Eminence to assess the status of treating type II diabetes using traditional plants in Bangladesh.

Objective: Assess the use of indigenous plants for the treatment of type II diabetes in Bangladesh.

Methodology: The study followed cross-sectional design using qualitative method for data collection. It covered both rural and urban areas and conducted 65 interviews with relevant stakeholders, i.e. diabetic patients, traditional healers, representatives from indigenous/herbal medicine companies, private indigenous/herbal healing centres, indigenous medical graduates (passed from Unani and Ayurvedic Medical College and Hospitals), and doctors providing modern medicine. The study also reviewed relevant literature from national and international journals and used search engines, i.e. PubMed.

Results: The findings revealed that the use of traditional plants was a widespread phenomenon in both urban and rural areas in Bangladesh. Diabetic patients already taking modern drugs prescribed by qualified and specialized doctors also look for some kind of home-made remedies and herbal plants. Plants prescribed by street-healers, private practitioners, and qualified indigenous medical graduates were similar to some extent. Some most-used plants were Swietenia mahagoni (popularly known as mehogony), *Tinospora cordifolia* Hook (popularly known as gulancha lota), *Syzygium cumini* Linn (Black Berry or kalo jaam), *Coccinia indica* Cogn (Ivy Grourd or telekucha), *Azadirachta indica* A Juss (neem). Plants and medicines that these practitioners were using also matched with studies from China, India, and other developed countries.

Conclusion: The use of traditional plants seems to be a widespread practice in Bangladesh, and many practices match with those from developed world.

Acknowledgements: The support of the Department of Nutritional Medicine, Technical University of Munich, Germany, is acknowledged.

149 (063)

Can Health Financing Choices Be Simple?—Towards a Practical Tool for Matching Health Financing Tools and Policy Objectives

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Background: Domestic health financing choices have seldom been so complex. While the ideal health financing approach may be a nuanced mix of tools appropriate to a given economic, social, political and epidemiological context, this philosophy can create confusion and policy paralysis, frequently resulting in a 'one-size-fits-all' approach to financing. The development of a matrix is proposed to assist countries in selecting a health financing tool.

Objective: Review the evidence on health financing tools systematically, extract the main variables that determine the success or failure of a financing tool, summarize the main policy objectives of health financing, develop a model that shows the extent to which a particular tool will meet policy objectives, and pilot the tool on a selection of case studies.

Methodology: This study combines two methods—literature review and mathematical modelling. The methods used in the literature review were adopted from the EPPI-Centre, the Cochrane Collaboration. Two independent reviewers and a comprehensive data-extraction form aimed to make the appraisal process transparent and reliable. The mathematical modelling involved assigning a measure of 'impact on a given objective' to the data from each paper extracted. The data were segmented by a range of criteria including, for example, GDP per capita and geographic region. The segmentation allows the model to report findings-comparable contexts.

Results: This paper highlights the tools that may be better at reducing poverty, lowering inequity, and increasing revenue generation given the available evidence. The output has also resulted in the creation of a web-based model that policy-makers can think of when weighing health financing choices.

Conclusion: More research is needed on the impact of health financing mechanisms, particularly taxation and private health insurance. Policy-makers should take stock of the available literature when making health financing decisions.

150 (009)

Ignored Nursing Staff to Deliver Better Healthcare Services in Bangladesh

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Background: Bangladesh, like many other developing countries, is challenged with an acute shortage of human resources for healthcare. Most importantly, the scarcity of nurses and midwives threatens the country's efforts in reaching Millennium Development Goal (MDG) 5. Bangladesh had a total public-health workforce of 135,291 persons till 2005. Currently, there are estimated 38,537 doctors and 15,023 nurses. Nurses are also in high demand in Bangladesh due to newly-built private-sector hospitals.

Objective: Look into the current challenges faced by the nursing staff in Bangladesh and their impact on public health and come up with recommendations that may help develop strategies to improve the current scenario.

Methodology: The study was based on critical analysis of secondary data and review of relevant literature checking journal articles on human resources for health, especially nursing staff in Bangladesh from varied recourses. To find suitable articles, multiple databases were chosen, such as CINAHL, EMBASE, MEDLINE/PubMed, British Nursing Index, DH-DATA and PsycINFO. Besides, relevant articles were searched manually.

Results: There are significantly fewer nurses than the country needs to ensure a reasonable level of healthcare. Results of studies suggest that 200,000 more nurses are required by 2015 to ensure healthcare. There is hardly any comprehensive plan to address this crisis of nursing staff. Moreover, the available human resources are heavily concentrated in urban areas—primarily in and around Dhaka—leaving the vast rural regions of Bangladesh seriously underserved. Bangladesh has an acute scarcity of quality nursing institutions. Apart from those based in Dhaka, other nursing institutions can hardly produce efficient nurses. A country of almost 160 million people has only 4 public nursing colleges with basic BSc courses and one college for post-basic BSc.

Conclusion: Issues of effectively addressing the nursing staff would require not only a log-term planning for the increased production of trained nurses but also understanding the need of geographical distribution of such resources.

151 (026)

Practice and Costing of Waste-management System in Healthcare Facilities of a Selected Pouroshova in Bangladesh

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Background: Hospital wastes need to be properly managed to ensure the health and safety of healthcare providers, waste handlers, and community people.

Objective: Explore the current practice and cost of management of hospital wastes in a selected pouroshova in Bangladesh.

Methodology: The survey was conducted in May 2008 on all the healthcare facilities (HCFs), such as hospitals, clinics, and diagnostic centres, in Bogra pouroshova. All wastes generated from these facilities in the study area within the study period were measured by weighing daily wastes. The provider's cost was calculated in spreadsheet using the simplified system costing of the World Health Organization after collecting data from administrative records and observations.

Results: Bogra pouroshova has 71 HCFs. Different types of wastes were generated from these facilities. Of these, Shahid Ziaur Rahman Medical College Hospital (500-bedded) was the largest, Mohammad Ali Hospital (250-bedded) was the second largest, and Bogra Christian Mission Hospital (135-bedded) was the third largest hospital. An average of 1,930 kg of wastes was generated each day by the facilities. Of these, 1,711 kg was general waste, 154 kg was infectious waste, and 25 kg was sharp waste, and 40 kg recyclable waste. Mohammad Ali Hospital generated the largest amount of wastes compared to other hospitals/clinics, and Shahid Ziaur Rahman Medical College Hospital was the second largest waste-generator. The overall hospital waste management (HWM) in Bogra pouroshova was found to be operating in a progressive way. The total cost per kilo of healthcare waste (HCW) treated in the small HCFs was 1.40 taka; the total cost per kilo of HCW treated in the medium HCFs was 0.80 taka; the total cost per kilo of HCW treated in the large HCFs was 0.90 taka; and the grand total cost per kilo of HCW treated in Bogra municipality amounted to 1.30 taka.

Conclusion: There is no standardized practice and cost protocol regarding the healthcare waste-management system in the healthcare facilities of the pouroshova. Advanced studies, along with policy research activities in this neglected field, can yield a cost-effective strategy.

152 (036)

Patient Satisfaction with Physiotherapy in Two Settings in Dhaka

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Background: Patient satisfaction has not been closely monitored in physiotherapy; limited studies exist in this area of allied health services.

Objective: Determine the level of satisfaction of patients at the government and private hospitals in Dhaka with regard to some selected sociodemographic aspects of hospital-care at the outdoor of physiotherapy department and also compare between the government and the private facilities.

Methodology: This descriptive type of cross-sectional study was carried out with patients who sought physiotherapy care at the outdoor of Physical Medicine Department of the Dhaka Medical College Hospital and at the outdoor of the Centre for Rehabilitation of Paralyzed (CRP), Mirpur, Dhaka. In total, 150 patients—75 from each setting—were interviewed in the study. Appropriate research instruments comprising a structured and semi-structured questionnaire developed by the American Physical Therapy Association (APTA) were administered by interviewers to collect data. Some questions of the APTA questionnaire relating to patient satisfaction were excluded, and some questions were included with the help of the Department of Health Education, National Institute of Preventive and Social Medicine, Dhaka, to make these feasible in the context of Bangladesh. To find out any association among the sociodemographic characterstics, chi-squire test was applied, and the level of satisfaction was measured in percentages to compare between the 2 settings (government and private).

Results: The results showed that the sociodemographic characterstics—age, sex, and location of physical health problem (hip, neck, lower back, shoulder, foot, hand, elbow, knee, and others) among government and private facility had an association with the attendance of patients at the outdoor ($p<0.05$). Location of the hospital, privacy of patients, behaviour of staff members, physical qualities of hospitals (cleanliness, light, ventilation, etc.) had more than 10% variation in the level of satisfaction between the 2 settings.

Conclusion: Patient satisfaction with physiotherapy is higher in private setting than that in government setting in Dhaka.

Acknowledgements: The authors thank the Department of Health Education and Department of Occupational and Environmental Health, National Institute of Preventive and Social Medicine, Dhaka, Bangladesh.

153 (039)

Impact of Drop-out among Volunteer Community Health Workers in Urban Slums of Dhaka

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Background: Volunteer community health workers (CHWs) are one approach to serving the poor community in developing countries. BRAC, a pioneer in this area, uses female CHWs as core workers in its community-based health programmes. After 25 years of implementing the CHW model in rural areas, BRAC has begun using female CHWs in urban slums through a community-based maternal health intervention. However, high drop-out rates among CHWs suggested a need to better understand the impact of their drop-out which will help reduce drop-out and increase programme sustainability.

Objective: Estimate the impact of drop-out of volunteer CHWs from both BRAC and community perspectives, also estimate the cost of possible strategies to reduce drop-out, and compare whether they are more or less than the cost borne by BRAC and/or the community.

Methodology: The 'ingredient approach' was used for estimating the cost of recruiting and training of CHWs and the so-called 'friction cost approach' for estimating the cost of replacement of CHWs after adaptation. Finally, the 'human capital method' was employed to estimate forgone services in the community.

Results: In 2009, cost per regular CHW was US$ 59.28 which was US$ 60.04 for ad-hoc CHW, if a CHW went through recruitment, had a 3-week basic training, a one-day refresher training, and one incentive day, and worked for a month in the community. One-month absence of a CHW with standard average performance in the community means forgone health services, such as health education, antenatal care visits, deliveries, a referral of complicated cases, and distribution of drugs and health commodities. However, cost of strategies reducing the drop-out recommended by CHWs was US$ 121.28, which was close to the sum of the cost of regular and ad-hoc CHW.

Conclusion: Although CHWs work as volunteers in urban slums of Dhaka, the impact of their drop-out was immense both in financial term and forgone services. High cost of drop-out makes the programme less sustainable. However, cost-effective strategies may improve its sustainability. Acknowledgements: The study was funded by Bill & Melinda Gates Foundation through the Manoshi Project in partnership with BRAC.

154 (040)

Improving Early Postnatal Care Coverage through Existing Health Systems in Asia

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Background: Achieving Millennium Development Goal for child survival urges improving newborn survival in developing countries. The majority of newborns die during the first few days of life. Results of a community-based trial showed that first postnatal home-visit within 48 hours of birth was associated with two-thirds reduction of neonatal deaths. UN joint statement underscored the need for countries to ensure early postnatal visits.

Objective: Assess the delivery of immediate and early postnatal care through the existing health systems in 3 Asian countries.

Methodology: As part of the Saving Newborn Lives programme of Save the Children, community-based packages were developed in Bangladesh, Nepal, and Indonesia to introduce evidence-based essential interventions for newborn survival into the government's existing health service-delivery systems. Strategies to integrate early postnatal home-visits included advocacy at national and local levels, counselling on preparedness and birth notification, and postnatal home-visits by trained community health workers using appropriate job-aids. Trained female community health volunteers in Nepal and government community health workers in Bangladesh made postnatal home-visits, examined both mothers and newborns, and promoted preventive care. In Indonesia, community midwives (*Bidan di desa*) provided postnatal care during home-visits. The visit schedule within the first 7 days of birth varied from country to country. Data from pre- and post-intervention surveys from Bangladesh and Indonesia and mid-term survey data from Nepal were analyzed to assess changes in the practices influencing newborn survival.

Results: In Indonesia, the involvement of the local government has intensified the efforts to deliver integrated postnatal home-visits and improved the recording system. First postnatal check-up within a day increased from 47% to 95% in Nepal. In 51.4% of cases, government health workers who were informed of the delivery immediately in Bangladesh could make a home-visit within 24 hours.

Conclusion: Reaching mothers and newborns during the most critical period is vital. Postnatal interventions are 'time-sensitive'. Improving quality postnatal care and increasing newborn-care coverage require a multi-pronged approach that includes motivation and building capacity of health workers to provide services and the demand from the families/communities in accessing the services and enabling policy.

Acknowledgements: The support of the Bill & Melinda Gates Foundation to Saving Newborn Lives programme of Save the Children is acknowledged. The authors also thank the Ministries of Health in Bangladesh, Indonesia, and Nepal for their support in implementation.

155 (043)

Factors Affecting Willingness to Accept Fixed Income of Female Volunteer Community Health Workers: Evidence from Urban Slums in Dhaka

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Background: After 25 years of implementing the female community health worker (CHW) model in rural areas, BRAC has begun using CHWs in urban slums of Dhaka through its community-based health interventions. The financial incentives for CHWs are very low and erratic, and the programne experiences high drop-outs and sub-optimal performance of CHWs. This suggests a need to better understand the equilibrium-fixed income for maximum level of performance and the associated factors.

Objective: Find out the equilibrium-fixed income for maximum level of performance of a CHW and investigate the factors affecting their willingness to accept a minimum fixed income for optimal performance.

Methodology: The 'bidding game' technique was applied to reach an equilibrium income which reflects the willingness of CHWs to accept a fixed income for their optimal performance. An ordered logit model was used for investigating the factors affecting the willingness to accept minimum fixed income for maximum level of performance. The model used the equilibrium income level as the dependent variable divided into 3 groups: Group 1: US$ 3-18 per month, Group 2: US$ 19-28, and Group 3: US$ 29 and above. Socioeconomic, demographic indicators and income were used as explanatory variables. A random sample of 510 current CHWs was selected from the BRAC maternal health project in Dhaka urban slums.

Results: Most (94%) CHWs emphasized on fixed income, and the average equilibrium was US$ 24. Of the CHWs, 37% belonged to Group 1, 25% to Group 2, and 37% to Group 3. Odds of asking for a fixed income were almost 2 times higher among CHWs who started work with the expectation of any income. Similarly, odds were higher for CHWs who had higher monthly income, who were BRAC microfinance members, who were performing better, and who had health-related training outside BRAC. However, CHWs facing competition with other health-service providers and CHWs with household loan were less likely to ask for fixed income.

Conclusion: The role of fixed income is critical to the optimal performance of CHWs, which is also an important step towards achieving universal health coverage in urban slums. However, socio-economic conditions of CHWs also affect their motivation to perform optimally.

Acknowledgements: The study was funded by the Bill & Melinda Gates Foundation through the Manoshi Project in partnership with BRAC. ICDDR,B acknowledges with gratitude the commitment of the Bill & Melinda Gates Foundation to research efforts.

156 (056)

Implementing ISO 15189 Standard (Medical Laboratories—Particular Requirements for Quality and Competence) in Clinical Laboratory Services, Laboratory Sciences Divission, ICDDR,B, Bangladesh

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Background: Laboratory services are the cornerstone of public-health programmes, and the importance of quality medical laboratory services is recognized globally. Poor-quality laboratory services often lead to inappropriate or delayed patient management. The International Organization for Standardization (ISO) has developed quality systems to assess laboratory services, and many medical laboratories are now working towards ISO 15189 accreditation. Bangladesh lacks national standards for laboratory services, and this discourages laboratories to implement the quality-management system. Family Health International (FHI) and Laboratory Sciences Division (LSD) of ICDDR,B partnered to implement the ISO 15189 standard in Clinical Laboratory Services (CLS) and gain ISO 15189 accreditation.

Objective: Document the ISO 15189 standard implementation process at clinical laboratories of ICDDR,B.

Methodology: FHI, CLS, and Biosafety and Quality Assurance (QA) Unit of LSD, initiated the programme with the assessment of CLS laboratories (microbiology, haematology, biochemistry, serodiagnostics, and blood-bank services) against the ISO 15189 standard to identify gaps and areas for improvement. The programme supported the laboratories with generic version of quality manual, management procedures, and technical documents. The programme provided (a) customized training to laboratory staff, (b) onsite technical support, and (c) necessary guidance for implementing the standard.

Results: During January 2009–October 2010, 6 training programmes were organized for clinical laboratory staff on different aspects of ISO 15189 standard. The QA unit and the laboratories developed (a) 134 management documents and forms, (b) revised and updated technical procedures for 250 tests, and (c) customized documentation of the laboratory information management system (LIMS) in compliance with Code of Federal Regulations Part 11. All instruments of the laboratories were calibrated and maintained as recommended by the manufacturers. Internal quality control and External Quality Assessment Scheme (EQAS) and/or inter-laboratory comparison were ensured for all tests. The laboratories also conducted internal audit, management review, and customer satisfaction survey and developed the key performance indicators system. A continuous quality improvement and quality monitoring programme was implemented with defined quality indicators. In October 2010, the accreditations body—Bureau of Laboratory Quality Standard, Thailand—conducted assessment of CLS laboratories against the ISO 15189 standard.

Conclusion: CLS of LSD at ICDDR,B is the first laboratory in Bangladesh to implement and gain ISO 15189 accreditation. The ISO 15189 standard implementation model developed by FHI and the technical support from FHI in implementing the standards were effective. With adequate resources and support, ISO 15189 compliance is an achievable and sustainable goal for medical laboratories.

Acknowledgements: The authors thank ICDDR,B for supporting the programme and Thai BLQS for conducting the assessment of laboratories.

157 (071)

Evaluation of Feeding-education Programme for Children with Cerebral Palsy at a Paediatric Inpatient Unit of CRP, Savar, Dhaka, Bangladesh: From Caregivers' Perception

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Background: Feeding-education programme is a very important session for caregivers of children with cerebral palsy. Its aim is to educate caregivers about the feeding problem of their children and its intervention. The feeding-education programme is arranged at the Paediatric Inpatient Unit, Centre for the Rehabilitation of the Paralysed (CRP), Savar, Dhaka, as a part of occupational therapy interventions. Evaluation of the programme is, therefore, necessary from their perceptions to make it more effective.

Objective: Evaluate the feeding-education programme of the Paediatric Inpatient Unit of CRP, Savar, Dhaka, from perceptions of caregivers of children with cerebral palsy, who are attending the feeding-education programme.

Methodology: The study was conducted using phenomenological method in qualitative approach. Caregivers of children with cerebral palsy were the study participants who stay with their children in the Paediatric Inpatient Unit of CRP and attend the feeding-education programme. Nineteen participants were selected using purposive sample. Data were generated through 7 individual interviews and 3 focus-group discussions and observations within 2 months. Each focus group consisted of 4 participants. Face-to-face interviews were conducted using a semi-structured questionnaire. Data were analyzed using content analysis under category, code and preparing theme for result.

Results: The results indicate that the caregivers of children with cerebral palsy felt that the feeding-education programme was very important for them and their children. They mentioned that this programme improved the feeding performance of their children and enhanced their learning.

Conclusion: The results suggest that the feeding-education programme has the potential to make a valuable contribution to education. Caregivers were very satisfied with occupational therapists for their way of teaching, demonstration, and repetition of information for better understanding, which directly help caregivers manage their children's feeding and reduce their stress.

DAY 2: 16 March 2011, Wednesday
12:30 pm-01:30 pm (Venue: Grand Ball Room Lobby)

158 (130)

Metabolic Syndrome: Prevalence, Associated Factors, and Impact on Survival among Older Persons in Rural Bangladesh

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Background: The metabolic syndrome (MetS), as a driver of current epidemics of diabetes and cardiovascular diseases (CVDs), has become a major challenge to public health around the world. CVDs are the major cause of death in the developing world. About 80% of the global burden of CVD-related deaths occur in low- and middle-income countries. The detection, prevention, and treatment of the MetS components should become an important approach for the reduction of the burden of CVDs among the general population. The identification of the population at risk is, thus, of utmost importance.

Objective: Describe the prevalence of MetS among older persons in rural Bangladesh, investigate whether its prevalence varies by age, sex, literacy, marital status, nutritional status, and socioeconomic status, and assess the impact of MetS on survival.

Methodology: This cross-sectional study, consisting of 456 persons aged ≥60 years, was conducted in a rural area of Bangladesh during July 2003–March 2004. The MetS was defined following the NCEP ATP III criteria, with minor modifications, i.e. presence of any 3 of the following: hypertension (BP 130/85 mm Hg), random blood glucose (RBG) level (7.0 mmol/L), hyper-triglyceridaemia (2.28 mmol/L), low level of HDL-cholesterol (<1.04 mmol/L), and body mass index (25.0 kg/m^2). Data were analyzed with logistic regression for the detection of influential factors of MetS and with Cox models for the estimation of survival associated with the MetS.

Results: The overall prevalence of MetS was 19.5–20.8% in women and 18.0% in men. The asset index and nutritional status were independently associated with MetS. During 4.93 years of follow-up, 18.2% died. The results of Cox regression analyses suggested that the hazard ratio of death relating to MetS was 1.17 [95% confidence interval (CI) 0.70-1.98]. In the presence of high RBG, the MetS was marginally associated with an increased hazard ratio of death (7.67, 95% CI 0.99-59.43, p=0.051).

Conclusion: The study highlights the importance of the MetS in rural Bangladesh. The findings suggest that there is a need for screening programmes involving the MetS to prevent diabetes and CVDs.

Acknowledgements: The "Poverty and Health in Ageing" project was funded by DFID, UK, SIDA, and the Swedish Research Council.

159 (132)

Transcutaneous Immunization with Vi and Vi-DT Conjugate Typhoid Vaccines

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Background: *Salmonella enterica* serotype Typhi is the cause of typhoid fever. Transcutaneous immunization is an effective way to induce both mucosal and systemic immune responses and may be an attractive option for non-parenteral immunization in resource-limited areas of the world.

Objective: Evaluate whether transcutaneous immunization with Vi and a Vi-conjugate vaccine (Vi-DT) could induce anti-Vi responses in mice and compare with parenteral immunization.

Methodology: Mice were immunized 4 times with purified Vi polysaccharide (10 µg), or Vi in conjugated Vi polysaccharide (Vi-DT) (10 µg sugar), with and without cholera toxin (CT) (25 µg) as an immune-adjuvant, either subcutaneously and transcutaneously, at 2-week intervals and then boosted mice on Day 72. Blood and stool samples were collected on Day 0, 14, 28, 42, 56, 72, and 87 and spleen and intestineal samples harvested at the time of sacrifice 30 days following the last immunization. Anti-Vi, anti-CT, and anti-KLH (keyhole limpet haemocyanin) responses were assessed. Splenic and lamina proprial lymphocytes (LPL) were immediately harvested. Antigen-specific splenic and LPL antibody-secreting cell (ASC) responses and antigen-specific splenic memory B cell responses were assessed using an ELISPOT. Serum and stool antibody responses were also assessed using ELISA.

Results: Transcutaneous and parenteral immunization with Vi and Vi-DT induced serum anti-Vi IgG and IgA responses. As expected, parenteral administration of the conjugate gave more prominent systemic responses than the use of polysaccharide alone. Systemic immune responses following transcutaneous immunization were the highest when Vi and Vi-DT vaccines were administered with immune-adjuvantative CT. Stool and lamina proprial lymphocyte (LPL) anti-Vi IgA responses were the highest following transcutaneous immunization. Splenic antibody-secreting-cell (ASC) anti-Vi IgG responses were induced by parenteral immunization with Vi or Vi-DT and by transcutaneous immunization with Vi/CT or Vi-DT/CT. Splenic ASC anti-Vi IgA responses were only induced following transcutaneous immunization. Splenic memory B cell IgG responses were induced by parenteral immunization with Vi-DT but not Vi but were induced following transcutaneous with Vi-DT/CT and Vi/CT.

Conclusion: The results suggest that transcutaneous immunization of Vi or Vi-DT in the presence of immune-adjuvantative CT induces systemic, mucosal and memory anti-Vi responses. Whether this broader immunity would improve the protective efficacy and/or duration of protection following typhoid vaccination in humans is currently unknown.

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Awareness of Preventive Practices against Malaria among Women of Reproductive Age

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Background: Malaria is a major public-health problem in Nepal, and no study has ever been conducted on awareness of this disease in the past year(s).

Objective: Assess the level of awareness on preventive practices against malaria among women of reproductive age in Nepal.

Methodology: A descriptive cross-sectional study was done among 160 respondents by face-to-face interview using a pretested semi-structured questionnaire in Chilahi Village Development Committee, Dang district in Nepal. The respondents were selected by purposive sampling technique

Results: Of the 160 respondents, 43% were aged 15-19 years, and 41.87% were housewives. Slightly among less than half of the respondents, the family-income was Rs 5,000-10,000. Most (90.62%) respondents had known mosquito to be the vector of malarial parasite; 86.25% knew fever as the main symptom of malaria; and 91.87% knew that malaria is transmitted by mosquito-biting. Only 24% of the respondents knew chloroquine as the medicine for malaria. Nearly half knew that malaria can lead to maternal anaemia, and the majority (66.25%) did not know that this led to foetal loss, and 97.5% knew that using bednet is a preventive measure for malaria. Seventy-two percent had positive attitude towards spraying insecticides to control mosquito; 53% heard about malaria from TV/radio; and 72% did not receive any health education on malaria from health workers. There was a significant association between age and education of the respondents with the level of awareness with p value 0.05 and 0.01 respectively. The respondents had a high level of awareness (88%) on preventive practices against malaria.

Conclusion: Although the level of awareness was high, it is further recommended to focus on behaviour change communication activities from both Government and NGOs regarding consequences of malaria in pregnant women and foetuses. Health workers should increase their activities on malaria-related issues.

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High Incidence of Guillain-Barré Syndrome in Bangladeshi Children

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Background: No patients with poliomyelitis have been reported from Bangladesh since 2000. However, the incidence rate of acute flaccid paralysis (AFP) in children remains 3.25 per 100,000 children per year. Guillain-Barré syndrome (GBS) is a post-infectious AFP caused by immune-mediated polyradiculoneuropathy. GBS in Bangladesh is frequently preceded by an enteric infection caused by *Campylobacter jejuni*. It was hypothesized by the authors that frequent exposure to enteric pathogens at an early age may increase the incidence of GBS in children.

Objective: Determine the crude incidence rate of GBS among children in Bangladesh and explore the underlying cause.

Methodology: An active surveillance for AFP in children aged <15 years is conducted by the Government of Bangladesh in collaboration with the World Health Organization (WHO). Data on the number of reported AFP cases in Bangladesh in 2006 and 2007 were obtained. A presumptive diagnose of GBS was made based on the following criteria: an acute flaccid (hypotonic) paralysis; presence of symmetrical weakness; and absence of injury and birth trauma. Crude incidence data of GBS were calculated per division and district.

Results: The total number of reported AFP cases in children aged <15 years in 2006 and 2007 was 1619 and 1844 respectively. Of them, the number of cases that fulfilled the case definition of GBS was 608 (37%) and 855 (46%) respectively. The crude incidence of GBS in children aged <15 years varied from 1.5 to 1.7 per 100,000 people in the 3 northern divisions—Dhaka, Rajshahi, and Sylhet—and from 2.1 to 2.5 per 100,000 people in the three southern divisions Khulna, Barisal, and Chittagong. Overall, the crude incidence rate of GBS in children aged <15 years varied from 1.5 to 2.5 per 100,000 people per year in the 3 divisions of Bangladesh. There was a seasonal fluctuation in the frequency of patients with GBS; the highest number of cases was found in May (n=159) and the lowest in February (n=84). GBS was predominant among boys (59%).

Conclusion: The findings indicates that the burden of GBS in Bangladesh is substantial and suggest that data obtained through the ongoing global AFP surveillance can be used for obtaining crude incidence data of GBS worldwide.

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Needs Assessment for Healthcare-seeking by Young Clients of Hotel-based Female Sex Workers in Dhaka City

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Background: A significant number of youths visit hotel-based female sex workers (HFSWs) in Dhaka city. They are at risk for sexually transmitted infection (STI) because of their low rate of condom-use and high prevalence of STIs among HFSWs. Results of a study conducted with young clients of HFSWs showed that 13% of clients (n=1,012) were positive for Herpes Simplex virus 2. There is no sexually transmitted infection (STI) intervention, targeting needs of young clients of HFSWs in Bangladesh.

Objective: Assess the needs for STI services among young clients of HFSWs in Dhaka city.

Methodology: Data were collected during May-August in 2008 from 7 residential hotels in Dhaka city where the sex trade took place. A cross-sectional survey was done with 472 young clients. In-depth and key-informant interviews with purposively selected sub-sample of young clients (n=32) and hotel staff (n=20) were also conducted. The survey data were entered and cleaned using Fox Pro (FPW 26) and analyzed using the SPSS software (version 11.5), and descriptive analysis was done. Content analysis was done with identification of theme and sub-theme, and data were triangulated.

Results: Only one-third of the young clients heard about STIs before while 11% could name syphilis. About 21% had experienced STIs; of them, only 22% sought treatment from formal doctors, and about one-third did nothing. Qualitative analysis showed that the young clients were unaware of facilities where treatment for STI was available. They felt helpless and feared when they faced STI-related problems, and most of them consulted their peers, hotel-boys, and known medicine seller.

Conclusion: The young clients have very limited access to services for STI-related diseases. A need-based comprehensive STI intervention should be assessed and developed for targeting young clients of HFSWs in Bangladesh.

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Effect of Arsenic Contamination on Rice Production and Human Health: Results from a Farm-level Survey

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Background: Much of the shallow groundwater in southeastern and southwestern parts of Bangladesh is naturally contaminated with arsenic, exposing more than 40 million people to unsafe levels of arsenic in drinking-water and potentially threatening rice production and food security as well. This vast population may be at some health risks due to the ingestion of this contaminated water.

Objective: Assess the level of arsenic contamination in rice production, determine the level of changes in intake of rice in the arsenic-overwhelmed population, and find out the possible effect of arsenic contamination on human health.

Methodology: A sample survey was carried out in 2 arsenic-contaminated villages under Faridpur and Chandpur districts. One hundred households under each village were selected following random-sampling technique. Required primary data were generated by directly interviewing farming households using a structured questionnaire. The survey was accomplished during January-June 2010. Data were processed using the appropriate computer software (MS Excel and SPSS). Mainly descriptive statistics were employed in analyzing the data.

Results: The yield of modern rice in arsenic-contaminated plots was substantially low compared to that in less-contaminated plots. Almost 100% sample households (n=200) used hand-operated tubewell-water for drinking and daily household purposes. The proportion of arsenic-affected patients was higher in Kachua (14%) than that in Bhanga. About 37% and 30% of the household heads in Kachua and Bhanga [under Chandpur and Faridpur district respectively] opined that consumption of contaminated rice was another cause of arsenicosis. Women were more exposed to arsenic contamination since the proportions of female patients in both locations were higher compared to their male counterparts. No children, aged below 5 years, were suffering from arsenic problems, indicating that arsenicosis is expressed after long-term intake of arsenic through water and food.

Conclusion: The findings indicate that the study subjects have inadequate access to arsenic-free water and, consequently, people are suffering from arsenicosis. Due to the excessive use of arsenic-contaminated irrigation water and chemical fertilizers, soil health might have been deteriorated substantially. The Government should undertake various action programmes to make people aware of the arsenic problem.

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Th1 and Th17 Responses to *Helicobacter pylori* in Bangladeshi Children and Adults

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Background: *Helicobacter pylori* infection is often acquired during early childhood. Both Th1 and Th17 cells have been suggested to be important components of the immune response to *H. pylori* in adults but little is known about T-cell responses to *H. pylori* in young kids or about the general capacity of cells from this age-group to produce Th17 cytokines.

Objective: Determine if both Th1 and Th17 cells may contribute to the immune response to *H. pylori* infection in children and adults and characterize the general cytokine profile of T-cells from young children.

Methodology: Peripheral blood mononuclear cells (PBMCs) were isolated from infants (6-12 months), children (3-5 years), and adults (>19 years) in Bangladesh.

Results: Isolated PBMCs from all age-groups produced IL-17 and IFN-γ in response to stimulation with an *H. pylori* membrane preparation (MP) but little IL-13, IL-4, or IL-5 as determined by analysis of cytokine levels in culture supernatants by ELISA and cytometric bead array. The IL-17 secretion was significantly higher in infants than in adults whereas similar levels of the other cytokines were produced by cells from the different age-groups. PBMCs depleted of CD4+ T-cells produced reduced amounts of IL-17 and IFN-γ, demonstrating that these cytokines were primarily produced by CD4+ T-cells. IL-17 and IFN-γ mRNA expression was detected in *H. pylori*-infected gastric mucosa from Bangladeshi adults, supporting that the cytokine profile of the circulating cells reflect the mucosal responses. In contrast to the responses induced by MP stimulation, polyclonal stimulation with phytohaemagglutinin or beads coated with anti-CD3/CD28 antibodies induced higher IL-17 and IFN-γ secretion in cells from adults than in cells from infants or children. However, CD4+ T-cells from infants produced higher levels of IL-5 and IL-13 than cells from adults after bead stimulation.

Conclusion: The results suggest that both Th1 and Th17 responses may contribute to the T-cell response to *H. pylori* during childhood as well as adult life despite a general predisposition of cells from infants to produce Th2 cytokines.

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Efficacy of Partially-hydrolyzed Guar Gum-supplemented Modified Oral Rehydration Solution in the Treatment of Severely-malnourished Children with Watery Diarrhoea

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Background: Partially-hydrolyzed guar gum (PHGG), a soluble fibre added to oral rehydration solution (ORS), is fermented in the colon liberating short-chain fatty acids (SCFAs). SCFAs stimulate sodium and water absorption from colon and enhance recovery from acute diarrhoea and malnutrition in children.

Objective: Examine whether PHGG, if added to ORS, reduces stool output, duration of diarrhoea, and the time to recovery from malnutrition.

Methodology: In a double-blind, randomized, controlled clinical trial, 126 severely-malnourished children (weight for length <70% of NCHS median with/without pedal oedema), aged 6-60 months, with acute watery diarrhoea of <48 hours' duration, were studied in 2 treatment groups: 63 received modified ORS (Na 75, K 40 Cl 65, citrate 10, glucose 75 mmol/L) with PHGG 15 g/L (study group) and 63 received modified ORS without PHGG (control). Other treatments were similar in both the groups. The study was carried out at the Dhaka Hospital of ICDDR,B after the approval of its Ethical Review Committee.

Results: Baseline characteristics were comparable between the groups. The mean duration (h) of diarrhoea was significantly lower in children of the study group compared to children of the control group (study vs control, mean±SD, 57±31 vs 75±39, p=0.01). Also, the mean time (day) to attain weight-for-length, 80% of NCHS median without oedema was lower in the study group compared to the control group (mean±SD, 4.5±2.5 vs 5.7±2.8, p=0.027). There was also reduction in stool weight among children receiving ORS with PHGG (stool weight (g) 1st 24 hours, mean±SD, 854±532 vs 949±544, p=0.32; 2nd 24 hours, 579±421 vs 761±589, p=0.048); the difference was statistically significant in the 2nd 24 hours.

Conclusion: PHGG added to ORS substantially reduces the duration of diarrhoea and stool weight. It also enhances recovery from malnutrition.

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Mucosal Immunologic Responses in Cholera Patients in Bangladesh

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Background: *Vibrio cholerae* O1 causes dehydrating diarrhoea with a high mortality rate if untreated. The infection also elicits long-term protective immunity. Since *V. cholerae* is non-invasive, mucosal immunity is likely important for protection.

Objective: Compare humoral immune responses in the duodenal mucosa and in blood of cholera patients at different time-points after onset of disease and compare these with healthy controls (HC).

Methodology: Immune responses to lipopolysaccharide (LPS) and the recombinant cholera toxin B subunit (rCTB) were assessed by ELISA and ELISPOT. The correlation between the magnitude of the peak in *V. cholerae* antigen-specific ASC response on Day 7 and the subsequent levels of antibody-secreting cells (ASC) and IgA antibody in gut mucosa were evaluated. Phenotypic alteration of B-cell, gut-homing B-cell and their memory-cell populations were also observed on different study days by flow-cytometry.

Results: Significant increases in *V. cholerae* LPS-specific IgA and IgG antibody levels were observed in duodenal extracts on Day 30 but the levels decreased to baseline by Day 180; plasma LPS-specific IgA remained elevated. Mucosal CTB antibodies also peaked on Day 30 but the increase did not reach statistical significance. A significant correlation was observed between the CTB-specific ASC response on Day 7 in circulation with the CTB-specific IgA in duodenal extracts on Day 30 or the CTB-specific IgA ASC in duodenal tissue on Day 180. The proportion (0.07%) of mucosal *V. cholerae* LPS IgA ASCs also peaked on Day 30 and remained elevated through Day 180 compared to HC (p=0.03).

Conclusion: The results suggest that protective immunity against *V. cholerae* may not only be mediated by the constitutive secretion of antibodies at the mucosal surface but also anamnestic immune responses of mucosal immunocytes may play a major role in protection against cholera. The findings are consistent with those from other studies.

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A Validation Study of Maternal Self-reports of Postpartum Morbidities: Implications for Health Programmes

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Background: Very few studies validated self-report of gynaecological morbidities by clinical examination. One validation study in Egypt found very low sensitivity of self-reported morbidity which ranged from 8% to 28%. A review article observed that self-reported morbidity and clinically-diagnosed morbidity measures different phenomena and, thus, different aspects of illness.

Objective: Determine the validity of women's self-report which is commonly used for the estimation of prevalence of morbidities.

Methodology: This prospective cohort study examined self-reported and clinically-diagnosed postpartum morbidities (short- and long-term) at 9 weeks postpartum. From among all the women in the ICDDR,B service area in Matlab, who delivered during January 2007–December 2008, 1,162 women were recruited. One of the study physicians conducted interview using a structured questionnaire for symptomatic events of morbidities and, on the same day, medical examinations were conducted by another physician using standard criteria for clinical diagnosis. Sensitivity, specificity, predictive values, false-positive, and false-negative findings were obtained for morbidities.

Results: Ninety-one percent of the women who reported for urinary incontinence were not diagnosed as incontinence clinically. For prolapse, haemorrhoids, and urinary tract infection (UTI), 59%, 69%, and 86% of cases of self-reports respectively became negative after clinical diagnosis. There were self-perceptions of having rectal incontinence/fistula and foot-drop but no case of such morbidities was diagnosed. It was also found that women did not complain of sufferings, although they had diseases during examination; 30% of clinically-diagnosed incontinence, 62% prolapse, 29% haemorrhoids, and 87% of diagnosed UTI did not report complaints for their sufferings (false-negative). Sensitivity was low and ranged from 13% to 70%.

Conclusion: It appears that interview data do not represent that these are clinically valid for measuring the prevalence for sequelae of pregnancy and delivery-related complications. On the other hand, women in developing countries with low socioeconomic level do not perceive their sufferings and think these physical changes to be normal. Postpartum follow-up is essential to reduce further morbidities that can arise from pregnancy- and delivery-related complications and from poor management.

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High-throughput Gene Expression Profiling of *Salmonella enterica* in the Blood of Bacteraemic Patients in Bangladesh

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Background: Enteric fever is caused by *Salmonella enterica*, including serotype Typhi (*S.* Typhi) and serotype Paratyphi (*S.* Paratyphi). Not much is known about the gene expression profiles of these human-restricted bacterial pathogens during infection.

Objective: Evaluate bacterial gene expression during human infection, applying the microarray technology in blood specimens from patients with Paratyphi A and Typhi bacteraemia.

Methodology: Selective Capture of Transcribed Sequences (SCOTS) is a capturing and amplification technique that permits bacterial gene expression profiling in samples containing very low numbers of pathogens. Detectable gene expression was assessed using SCOTS-microarray analysis and quantitated mRNA using RT-PCR. Briefly, RNA was extracted from Trizol-preserved blood samples from patients, produced cDNA, and applied SCOTS in both in *vivo* and in *vitro* samples. Comparative gene expression of in *vivo* and *in vitro*-recovered organisms was analyzed using microarrays.

Results: SCOTS-microarray technique was applied on 3 *S.* Paratyphi A and 5 *S.* Typhi bactaerimic patients. In total, transcripts of 1,798 *S.* Paratyphi A genes (43.9% ORFs) and 2,046 *S.* Typhi genes (44% of ORFs) were detected in the blood of infected humans. Of the *S.* Paratyphi A genome, 868 transcripts were detected in at least 2 patients and 315 in all the 3 patients. Of the *S.* Typhi A genome, 1,100 transcripts were detected in at least 4 patients and 912 in all the 5 patients. When considering genes whose expression was detected by SCOTS-microarray in both *in vivo* and *in vitro* samples, transcripts of 910 genes (22.3% of ORFs) were identified in Paratyphi A and 1,320 genes (28% of ORFs) in Typhi with significant and at least 2-fold difference in signal detection between *in vivo* versus *in vitro* samples. Differential gene expression was confirmed for a subset of detected genes by quantitative RT-PCR.

Conclusion: This is the first report of high-throughput comparative transcriptome profiling for a pathogen in the blood of bactaeremic humans, suggesting that such an approach may be useful in identifying pathogen-host interactions during infection in humans. The findings give insight into gene expression profiles in infected humans.

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A Pilot Study of a Novel Common Food-plant Extract Used with Oral Rehydration Therapy for Short-term Diarrohea in Adults

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Background: Natural plant solutions to support gastrointestinal health have a long history of use. This study evaluated a new approach using common food-plant extracts which, due to a unique extraction process, preserve damage-limiting, restorative chemistry from living plant-cells and apply these mechanisms to infected and/or damaged cells of the human digestive tract. This novel botanical approach uses metabolites found in common food-plants with broad evidence of safe human consumption at concentrations far above those used in the study. Extensive tests in swine demonstrated safe use and positive outcomes.

Objective: Evaluate the effects of a novel extract from common food-plants on short-term diarrhoea in adults.

Methodology: Fifty-four adults, aged 18-60 years, with acute short-term diarrhoea were evaluated in a double-blind randomized cross-over study to compare the botanical extract under test against placebo. Subjects with parasites, high fever, vomiting, or bloody stools were excluded. Fourty-three subjects who met the study criteria were included in the analysis. Following examination, the subjects received a single liquid dose of either botanical extract or placebo with oral rehydration solution (ORS) on Day 1 and the reverse on Day 2. All the subjects were given sufficient ORS in the last 3 days. Outcome measures were: time to cessation of symptom defined as the elapsed time between initial administration of the study solution and the last loose stool rated 4 or higher on the Bristol Stool Scale and the number of stools during the 2-day observation period following initial administration of the study solution.

Results: The subjects who were given the botanical extract with ORS on Day 1 reported shorter time to cessation of symptoms compared to those given placebo with ORS (7 hours 30 minutes vs 23 hours 49 minutes, $p<0.001$) and a lesser number of loose stools (3.6 vs 6.2, $p<0.05$). Furthermore, 11 (52%) of 21 subjects who were given the botanical extract on Day 1 reported immediate cessation of symptoms while none (0%) who was given placebo on Day 1 reported similar results.

Conclusion: The results indicate that a novel solution extracted from common food-plant used with ORS may support the rapid resolution of short-term diarrhoea in adults. A study in a larger sample is underway to replicate these results.

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Involvement of Drivers in Accidents: A Major Health Burden for Bangladesh

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Background: The trend of road accidents in Bangladesh is geometrically increasing compared to international situation. Most fatal accidents occur due to behaviour and inadequate skill of heavy-vehicle drivers. Mechanism of licensing, police harassments, job insecurity, and frustration over income need special attention.

Objective: Identify the drivers' behaviour and other principal factors in the driving-mechanism to understand the reasons for higher incidence of road accidents in Bangladesh.

Methodology: The study was conducted during July-December 2009 in various bus and truck terminals of Bangladesh. In total, 700 drivers were chosen randomly. Quantitative and qualitative data were collected using a structured questionnaire, observations, in-depth and key-informant interviews, case studies, and preparatory learning action sessions.

Results: The results of the investigation showed that 60% of the drivers were directly involved in fatal road accidents. The major underlying causes and factors that lead to road accidents were personal, social, administrative, driver-owner relationship, police harassment, fake licensing, job and job satisfaction, family conflicts, and frustration of drivers. About 54% of the drivers could afford rest-break in long driving due to high pressure from the owners and the overlapping of roaster duties. About 15% of incidences occurred due to driving under drunk condition. About 71% of the drivers performed overtaking to run a bit quickly to catch up another trip. Furthermore, 74% were 'not at all cautious' while driving overloaded vehicles on uncontrolled road with narrow space.

Conclusion: Behavioural change communication approaches for sustainable safe driving and overall accident-free environments are warranted. The owners and drivers associations, civil society, Government, NGOs, and donors should address the problem through appropriate, integrated preventive and remedial interventions.

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Risk Factors Identified for Problematic Behaviours in Children Who Sought Counselling and Psychotherapy in a Clinical Set-up

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Background: Children often present with a range of behavioural problems due to various psychosocial factors. Negative parenting styles and dysfunctional family systems have deleterious effects on emotional and behavioural development of children.

Objective: Identify the psychosocial risk factors responsible for various problematic behaviours of study children and evaluate the benefits of counselling and psychotherapy services for children and parents.

Methodology: A retrospective study was carried out on 100 children who received counselling and psychotherapy for neurological and non-neurological problems at the Child Development and Neurology Unit of the Dhaka Shishu Hospital during 2006-2008. Risk factors were identified through clinical interviews using a set of structured and semi-structured questionnaires as follows: Parenting Dimensions Inventory questionnaire. Organization Scale of the Family Environment Scale Self-report questionnaire, and Inter-personal relationships questionnaire, for assessing family and parenting practices. Transactional analysis (TA) techniques and other relevant techniques and therapies were applied for personal growth and change in attitudes of children and parent their family members. Improvement was categorized based on an ascending scale of stress: (0-10) which depends upon clients' emotional expression, comments, feelings, attitudes, behaviour, number of visits, and environmental changes.

Results: The risk factors identified for the problematic behaviours of children were: critical parenting (44%), parental conflict (27%), unhealthy relationships between parents (25%), various forms of child-abuse (25%), unhealthy school environment (25%), neglect (24%), and academic stress (24%). Around 50% of the clients attended more than 8 sessions; 50% had significant improvement; 41% had some improvement; and 9% had less improvement.

Conclusion: The findings indicate that the negative styles of parenting, dysfunctional family systems, and maternal stress were the most predominant causes for various behavioural problems in children with both neurological and non-neurological conditions. A safe and healthy home environment is essential for optimum emotional development of growing children. Counselling services in clinical set-ups may help many families to recognize their inner strengths and develop a healthy parent-child relationship for better psychosocial adjustment of their children.

Acknowledgements: Data were collected from the Dhaka Shishu (Children's) Hospital.

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Post-kala-azar Dermal Leishmaniasis: Prevalence and Its Risk Factor in Nepal

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Background: Post-kala-azar dermal leishmaniasis (PKDL) is an important reservoir in the anthroponotic transmission of *Leishmania donovani*. Given the limited information available on PKDL and lack of efforts to tackle it within the elimination programme in Nepal, PKDL could pose an important deterrent to achieve the targets of the elimination strategy.

Objective: Determine the proportion of PKDL and the risk factors in past-treated visceral leishmaniasis (VL) patients in Nepal .

Methodology: A cross-sectional study was conducted in the eastern region of Nepal during February-May 2010 where past-treated VL patients from 2000 to 2009 were screened for PKDL by trained health workers. Suspect PKDL patients were referred to a tertiary-care hospital for parasitological (slit skin smear (SSS)) confirmation and histopathological examination. Demographic information and information on past treatment of kala-azar are collected .

Results: In total, 680 past-treated VL patients were screened, with 37 (5.4%) suspect PKDL cases. Of 33 suspect PKDL cases presenting to the tertiary hospital, 16 (2.3%) were confirmed. All the 16 cases had received sodium stibogluconate (SSG) and developed skin lesions after a median time interval of 21 months (Q1; 15–Q3; 45). Fifteen (98%) had unsupervised treatment and 5 (33%) received less than 20 SSG injections. The risk of PKDL was 15 times higher when treatment was unsupervised [odds ratio] (OR)=11.44, 95% confidence interval (CI) 1.45-90.03) and 14 times more frequent in inadequate treatment (OR=30.5, 95% CI 6.16-150.94).

Conclusion: Though the occurance of PKDL is lower than expected in Nepal, it still constitutes an important reservoir for Leishmania transmission. Adequate and supervised treatment is essential to prevent the development of PKDL. An active surveillance for PKDL within the programme needs to be in place.

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Introduction of Maternal and Perinatal Death Review System in Bangladesh

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Background: In Bangladesh, the maternal mortality ratio is high due to pregnancy and childbirth-related complications. The slower decreases in maternal and neonatal deaths are attributed to the delivery that occurs mostly at home by unskilled attendants where the neonate receives minimum skilled care. Moreover, behind medical causes, there are gaps in social, familial or the individual's response or responsibilities for these deaths. Collection of both qualitative and quantitative information from the community is crucial to reliably determine the relationship between pregnancy and death of mother and child.

Objective: Develop a maternal and perinatal death review (MPDR) system through adapting the available tools and guidelines for improving maternal and perinatal health services.

Methodology: One district of Bangladesh—Thakurgaon—with population of 14,50,000 was selected for the study. Government health and family-planning field-level staff members were trained to notify all maternal and perinatal deaths at their community; their immediate field supervisors performed verbal autopsy (VA) in each of those deaths. The managers and clinicians (MPDR team) at the district and subdistrict levels performed analysis on these VA findings , prepared and implemented remedial actions for improvement.

Results: The MPDR system has been adopted in the project area to identify a death, notify the MPDR focal point, and perform VA to know the social and medical causes of death at the community level. Members of health staff were found to be actively involved and encouraged in implementing the process and taking remedial actions.

Conclusion: The evidences and data from the MPDR system will enrich the national-level planning for scaling up the MPDR intervention to improve maternal and perinatal mortality in Bangladesh.

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Disaster Risk Reduction: Outcome of Community-based Intervention

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Background: The geographical location and topographical features of Bangladesh expose the country to natural disasters. The community-based disaster risk reduction is a concept to improve the capacity of communities at risk to better prepare and protect people from natural disasters. With this context, Concern Universal Bangladesh initiated a project to better prepare for, mitigate, and respond adequately to, natural disasters by enhancing the people's capacity to cope and respond, thereby increasing resilience and reducing vulnerability.

Objective: Determine the effectiveness of a project at reducing disaster risk and assess the status of this issue in Bangladesh.

Methodology: Both qualitative and quantitative approaches were used for the study. Simple yet effective random-sampling techniques were used for selecting 528 respondents. A pre-structured questionnaire was developed for use in the household surveys. Focus-group discussions (FGDs), key-informant interviews, and case studies were conducted in randomly-selected unions with Community Learning Centres (CLCs) and Learning Centres (LCs) management, Union Parishad (UP) representatives, school-teachers, students, and school management committee members.

Results: After the implementation of the project, the respondents were able to recognize common hazards, patterns of, and vulnerability to, natural disaster, causes and consequences of climate change, and preparedness methods, indicating a linkage between empirical and institutional knowledge of the community. Moreover, enhanced cooperation and effectiveness before, during, and after disasters was established among the key institutions (UPs, CLCs, and schools). Through the CLCs, UPs, and student brigades, knowledge-sharing was transferred via a structured mechanism for dissemination of disaster risk reduction and climate change messages. The qualitative findings also showed that all the respondents were able to describe different warning signals and identify accurately what needs to be done during signal. It was also clear that knowledge and awareness of vulnerable groups had increased.

Conclusion: The significant progress and success of the community-based disaster risk reduction project is expected to have a positive influence on the ability of communities to cope with natural disasters through awareness, knowledge, and preparedness.

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Traditional Warfare against Parasitic Infections of Ethnic Rhishi Community in Netrakona District of Bangladesh

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Background: The Rhishi comprise an ethnic community in the eastern side of Netrakona municipality in Bangladesh. They are not financially affluent and stable to fulfill their basic needs and treatments. They depend on traditional healers and *kobiraj* for the treatment of their diseases. The healers and *kobiraj* use natural resources to medicate against their diseases and infections.

Objective: Find out the Rhishi community's struggle and traditional medication procedure against parasitic infections and also find the root of their belief and satisfaction on the traditional healing system.

Methodology: A survey was conducted among the Rhrishi community in Netrakona municipality during October–November 2010. Two groups of questions were developed—one group was meant for the healers or *kobiraj* and the other one for patients. Data were collected from 3 different *kobiraj* and from 30 different patients. Then the samples were collected from the field to identify the scientific names and store these.

Results: It was found that the ethnic people used a number of medicinal plants or plant parts and other natural resources for both treatment and prevention of parasitic infections. Twenty-four plants were collected, which they used against parasitic infections. Of the collected plants, 4 were from Apocynaceae family, 2 from Cucurbitaceae family, 2 from Meliaceae family, 2 from Zingiberaceae family, and the others from Acanthaceae, Anacardiaceae, Annonaceae, Asclepiadoideae, Bromeliaceae, Cuscutaceae, Lythraceae, Malvaceae, Menispermaceae, Musaceae, Rubiaceae, Solanaceae, Umbelliferae, and Verbenaceae family. They also used clay, fish-bile, and cow's urine against parasites.

Conclusion: The people of the Rhishi community have been using these traditional treatment materials for many years. Although they do not know the scientific explanations of their treatments, most of them got rid of parasitic infections. Pharmacological studies can examine the medicinal ingredients in the samples mentioned in this study to make potential drugs for the treatment of parasitic infections.

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Focusing the Focus: A Strategy to Control HIV Epidemic among People Who Inject Drugs in Dhaka

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Background: The 8th round national sero-surveillance data showed 7% HIV prevalence among injecting drug-users (IDUs) in Dhaka and 11% in one of the pockets of Dhaka where the estimated number of IDUs was 7,400 out of 20,00-40,000; of them, 4,000 IDUs live in old Dhaka where the prevalence of HIV and hepatitis C is 11% and 56% respectively.

Objective: Develop an effective strategy to control HIV among the most-at-risk IDUs in Dhaka.

Methodology: The HIV programme of Save the Children-USA funded by GFATM is committed to preventing HIV among the people who inject drugs in Bangladesh. The project has established 70 drop-in-centres (DICs) in 26 districts reaching 14,000 IDUs with the provision of all essential services. Based on the experience, strategies were adopted in the programme with special focus on IDUs in old Dhaka. Besides the routine activities, 3 areas have been given special attention; support to the HIV-positive persons with day-shelter that includes necessary health and counselling support; support to the female IDUs with maternal and child health and family planning in addition to harm-reduction services; and strengthening the counselling and behaviour change communication services to the IDUs focusing on effective communication. The DICs also remain open for services until the IDUs leave the station.

Results: The needle-exchange rate was 83% that indicates reduction in the use of injecting equipment among people who inject drugs. According to the programme data, 10-20% gradual use of VCT by IDUs monthly and adherence to antiretroviral therapy increased where 40 of 81 HIV-positive IDUs were provided with ART support.

Conclusion: The results indicate that focused strategy, with clear vision, is essential for the effective prevention and control of HIV among IDUs.

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Effect of Cyclone on Maternal Healthcare in Bangladesh: A Rapid Assessment

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Background: The coastal area of Bangladesh faced a devastating cyclone called Sidr on 15 November 2007. The health problems of pregnant and lactating women aggravate during any natural calamity.

Objective: Document the effect of a natural disaster on maternal healthcare and relevant coping mechanism.

Methodology: A rapid assessment was undertaken during January-February 2008. The study sites were 2 subdistricts of Barguna and Patuakhali. Research methods included focus-group discussions (FGDs) with pregnant and lactating mothers and key-informant interviews (KIIs) with formal and non-formal health service providers. In total, 43 participants took part in the 5 FGDs, and 15 KIIs were conducted for the study.

Results: Most women were found dependent on traditional birth attendants (TBAs) and local medicine-sellers for maternity care in addition to formal health service providers (HSPs). Most pregnant women preferred delivering the baby at home, and TBA was their first choice. Due to the economic problems, women adopted a few techniques, including borrowing money from relatives and neighbours, stopping regular medicines, deferring payment for buying medicines, avoiding formal HSP, and receiving care more from homeopath practitioners and non-formal HSPs. Many of them considered self-care the only option to treat their health problems.

Conclusion: Economic problems resulting from a natural disaster may force pregnant and lactating women to rely more on self-care or care from a non-formal HSP. This coping strategy can be harmful for women and children. The Government and developing partners should develop a plan to immediately address the need of mothers in the areas hit by natural disasters.

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Uptake of Hepatitis B Vaccination and Knowledge of Hepatitis B Infection among Nurses and Laboratory Technicians at a Tertiary Hospital in Dhaka

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Background: Hepatitis B is a recognized, infectious, occupational hazard for healthcare workers exposed to human blood or body-fluids. Exposure to this virus occurs typically from needle-stick injuries or contact of mucous membranes or non-intact skin with infectious blood or body-fluids. Hepatitis B vaccination has been successfully adopted by and resulted in significant decline in infection among healthcare workers in developed countries. In resource-limited countries, however, healthcare workers are not systematically vaccinated.

Objective: Investigate the knowledge of hepatitis B infection, uptake of, and barriers to, hepatitis B vaccination among healthcare workers at a tertiary hospital in Dhaka.

Methodology: A cross-sectional, descriptive study was conducted during June-November 2008 at the Bangladesh Medical College Hospital, Dhaka. In total, 108 nurses and 51 laboratory technicians were interviewed using a pre-tested, semi- structured questionnaire. Purposive sampling technique was applied. The questionnaire consisted of a knowledge and practice section. Knowledge was assessed through unprompted responses. A recall period of 3 months was allowed for information on needle-stick injuries. Data were analyzed using the SPSS software (version 11.5).

Results: Over 70% of both categories of the respondents perceived that they were at risk of contracting hepatitis B. Vaccination as a measure of prevention was mentioned by 76% of the nurses and 90% of the laboratory technicians. Accidental needle-stick injury was reported by 57% and 69% of the nurses and laboratory technicians respectively. Thirty-two percent of the nurses and 65% of the laboratory technicians had taken hepatitis B vaccination (at least one dose). None of the respondents, however, had done antibody test. The major barriers to vaccination were: high cost of the vaccine (nurses 34%; laboratory technicians 50%), not convinced of vaccine efficacy (nurses 31%; laboratory technicians 22%), and negligence (nurses 19%; laboratory technicians 44%).

Conclusion: A high proportion of the respondents perceived themselves to be at risk of hepatitis B and reported needle-stick injuries. The uptake of hepatitis B vaccination was much lower; none of the respondents had done antibody test, reflecting lack of comprehensive knowledge and practice for protection of their health. With the present advancement in knowledge and technology to protect healthcare workers from this occupational hazard, the challenge remains for them to have access to this measure.

Role of Educational Entertainment Programne in the Prevention of HIV in Enhancing Access to Information

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Background: Educational entertainment, a specific kind of mass-media strategy, is a cost-effective means to prevent HIV in resource-poor settings. It incorporates educational messages into familiar forms of entertainment to increase knowledge and change attitudes, social norms, and behaviour of the target audience by enhancing access to information. Little systematic research on such interventions was conducted before.

Objective: Determine the role of education through entertainment in HIV-prevention programme to influence the general knowledge levels, risk perception, self-efficacy, and perceptions of barriers to adopting preventive behaviour among the youths. It was also targeted to quantify the value-added discussions after viewing television (TV) drama episodes.

Methodology: This quantitative study was set up as a baseline–endline comparison of a sample of male youths drawn from 2 municipality areas. The respondents were unmarried males aged 15-20 years, completed primary school, regularly attended a youth club, and had access to a TV. The number of participants in the baseline survey was 598, and at the endline, it was 471. The baseline survey was conducted during November-December 2006 and endline during February-March 2008. The sets of the baseline and the endline survey questionnaire included sociodemographic characteristics of the respondents, TV-viewing habits, source of HIV knowledge, general knowledge of HIV and AIDS, perceived risk of HIV infection, perceived barriers to HIV-prevention behaviour, self-efficacy for HIV prevention, and both descriptive and prescriptive norms.

Results: Between the baseline and the endline survey, knowledge on HIV/AIDS improved among male youths, especially regarding the level of misconceptions that they endorsed. Knowledge on routes of HIV transmission, such as receiving HIV-infected blood and using non-sterile syringes, increased from 53% to 91% and from 77% to 96% respectively. While the proportion reporting sex without condoms as a route of transmission increased significantly, it continued to lag behind other items at about 55%. Eighty percent of youths (n=471) mentioned the use of condoms during sex as a means of HIV prevention. The results showed the limited impact of the TV series, which was not unanticipated given the long delay between the baseline and the endline survey.

Conclusion: The results reinforce the importance of mass-media interventions as a component of HIV-prevention strategies.

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Controlling Scabies in Madrasahs of Bangladesh

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Background: Scabies is hyperendemic in madrasahs of Bangladesh as found in a 2003 study in and around Dhaka city. Results of the study showed that 98% of 492 children (mean age 11.2±2.4 years) examined in 6 residential madrasahs, had scabies. This finding is significant in a country where a 2008 World Bank survey showed that madrasahs (aliyah , quomi, and others) account for 14% of all rural primary enrollment and 22% of all rural secondary enrollment, with 87% of quomi and 19% of aliyah madrasahs offering at least some residential facilities.

Objective: Assess the effectiveness of a scabies-control programme in reducing scabies relapse in madrasahs of urban Bangladesh.

Methodology: This controlled intervention trial involved 4 intervention (2,359 students) and 4 control madrasahs (total number of 2,465 students) in Dhaka metropolitan area (DMA). A scabies prevalence survey was carried out on 40-44 students of the 4 intervention and 4 control madrasahs. A further 40 students from the intervention madrasahs were administered a pre-intervention test on knowledge of scabies. This was followed by mass treatment of all students, teachers, and staff of the 8 madrasahs with topical 5% Permethrin cream. The intervention involved: daily monitoring of students for 5 key personal hygiene practices; weekly 10-minute scabies health-education classes; and supply of simple and inexpensive logistics to students to prevent cross-infestation to/from peers. After 4 months of the intervention, an assessment of scabies relapse was carried out, and the post-intervention state of knowledge of the intervention madrasahs on personal hygiene practices, and scabies was assessed in students.

Results: Before the intervention, the prevalence of scabies was 61% in the intervention and 62% in the control madrasah students (p=1.00). After mass treatment of scabies in all the 8 madrasahs and 8 months of intervention, the relapse rate for scabies was 5% in the intervention and 50% in the control madrasahs ($p<0.001$). Significant improvements were observed in all 5 personal hygiene practices in the intervention madrasahs. The mean test scores of knowledge on scabies were, on average, 40% before and 99% after the intervention in the 4 intervention madrasahs. The cost of this programme came to US$ 1.60 per student and included primarily logistics and health-education material.

Conclusion: The programme demonstrates a pragmatic and cost-effective way to control scabies relapse in a residential institutional setting, and it is recommended that it be scaled up to all residential madrasahs in Bangladesh.

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Non-fatal Machine Injury Is a Major Cause of Illness: Findings from the Largest Community-based Survey in Bangladesh

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Background: In terms of mortality, morbidity, and disability, machine injury is emerging as a major child-health problem in Bangladesh. This trend is similar to many other developing countries. To develop effective prevention programmes, information on its magnitude and determinants is necessary.

Objective: Examine the incidence and characteristics of non-fatal machine-related injury in Bangladesh.

Methodology: A population-based cross-sectional survey was conducted during January-December 2003 in Bangladesh. Nationally-representative data were collected from 171,366 rural and urban households, with a sample-size of 819,429.

Results: The incidence of non-fatal machine injury was 41.1 per 100,000 people per year. The rate was 6.95 times higher in males than in females. Those who were aged 15-19 years were the most vulnerable groups compared to others. Rural people were at more than 2.15 times higher risk of machine injury than urban people. The average number of workdays lost was 262.57. The average duration of assistance required in daily-living activities was 70.47 days. The hospitalization rate was 20.87 per 100,000 pople per year. The mean duration of hospital stay was 18.49 days. The rate of permanent disability was 6.71 per 100,000 population-years.

Conclusion: Machine injury is one of the major causes of morbidity, disability, and loss of workdays among the people of Bangladesh. Adolescent workers were at the highest risk. Factory and agricultural sectors were the most common place of machine injury. Home was also the third common place for machine injury. To reduce the devastating health issues, a national strategy and programme for machine-injury prevention must be developed.

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Is Prevalence of Extended-spectrum Beta-lactamase an Emerging Problem in Bangladesh?

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Background: Multidrug-resistant (MDR) bacteria are an emerging problem worldwide as a threat to public health. Extended-spectrum beta-lactamases (ESBLs) expressed by many MDR strains pose serious challenges to the effective management of both community- and hospital-acquired infections. Report on ESBLs in the context of Bangladesh is hardly available.

Objective: Determine the presence of ESBLs among MDR strains of *Escherichia coli* and *Klebsiella* spp. obtained from community and hospitalized cases and characterize ESBLs by molecular typing based on ESBLs-producing gene.

Methodology: One hundred MDR isolates (68 *E. coli* and 32 *Klebsiella* spp.) obtained from clinical specimens (blood, pus, and urine) of patients who attended the Dhaka Hospital of ICDDR,B during September 2008–January 2009 were screened for ESBL by double disc-diffusion method and confirmed by E-test using CT/CTL and TZ/TZL strips. Molecular characterization was done by PCR for the detection of beta-lactamase genes (*bla*CTX-M, *bla*SHV, *bla*TEM, and *bla*OXA).

Results: Of the strains, 57 *E. coli* (83.8%) and 25 (78.1%) *Klebsiella* spp. were identified to be ESBL by disc-diffusion test. Using E-test, 55% of *E. coli* and 75% of *Klebsiella* spp. were confirmed as ESBL-producing strains. PCR detection using ESBL gene-specific primers showed that 67 of 68 (98.5%) *E. coli* and all 32 (100%) *Klebsiella* isolates had ESBL-producing gene respectively. *E. coli* isolates producing the ESBL genes were as follows: 64 (94.1%) expressed *bla*TEM (Class A), 20 (29.4%) had *bla*SHV (Class A), 62 (91.2%) *bla*CTX-M (Class A), and 61 (89.7%) *bla*OXA(Class-D). Of the *Klebsiella* isolates, the following ESBL genes were found: 25 (78.1%) *bla*TEM (Class A), 16 (50%) *bla*SHV (Class A), 32 (100%) *bla*CTX (Class A), and 31 (96.9%) *bla*OXA (Class D).

Conclusion: The ESBLs were present among the MDR strains of *E. coli* and *Klebsiella* isolated from patients' blood, pus, and urine samples. The ESBL-producing bacteria are resistant to broad-range beta-lactams, including third-generation cephalosporin. This complicates treatment options and limits therapy leading to treatment failure with ultimate economic burden for developing countries, such as Bangladesh.

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Efficiency of Diagnostic Setting in Detecting Comprehensive Aetiologies of Severe Childhood Diarrhoea

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Background: Diarrhoea continues to be an important cause of morbidity and mortality among young children in developing countries. Several studies have examined the role of specific enteropathogen in childhood diarrhoea but no comprehensive aetiologies have been observed in the community.

Objective: Review the prevalence of common diarrhoeagenic bacterial species, viruses, and parasites observed in a sentinel surveillance.

Methodology: Stool samples were obtained from children, aged <5 years, who attended the diarrhoeal treatment centre of the Gates Multicentre Study (GEMS) at the Kumudini Hospital, Mirzapur, Tangail, Bangladesh, during December 2007–June 2010. Samples were processed for bacterial, viral and parasitic assay. Multiplex-PCR was used for enterotoxigenic (*est*A, *elt*B for ETEC), enteropathogenic (*bfp*A, *eae* for EPEC) and enteroaggregative (*aat*A, *aai*C for EAEC) *Escherichia coli* and for norovirus, astrovirus, and sapovirus. ELISA was performed for parasites (*Entamoeba histolytica*, *Giardia lamblia*, and *Cryptosporidia*), rotavirus, and adenovirus.

Results: In total, 3,283 samples were obtained from 1,221 cases and 2,062 controls. The overall detection rate of various pathogens was 79.0% (2,587 of 3,283). Among cases and controls, *Shigella* yielded from 42.5% and 2.3%; *Salmonella* from 2.3% and 0.9%; *Vibrio* from 3.6% and 0.7%; *Campylobacter* from 17.7% and 17.9%; and *Aeromonas* spp. from 23.5% and 14.6% while ETEC from 4.4% and 3.5%; EPEC from 7.8% and 10.3%; EAEC from 23.6% and 22.9% respectively. In cases and controls, rotavirus was from 16.0% and 3.0%; norovirus from 7.7% and 7.0%; adenovirus from 3.4% and 2.7%; sapovirus from 1.6% and 2.6%; and astrovirus from 1.4% and 1.6% respectively while *E. histolytica* from 7.5% and 3.0%; *G. lamblia* from 8.0% and 14.4%, and *Cryptosporodia* from 7.1% and 4.0% respectively. More-frequently isolated single-most pathogen was *Shigella* (12.8% vs 0.7%) and rotavirus (5.5% vs 0.8%). Noteworthy co-existence of EAEC was found among cases with *Shigella* spp. (3.4%) and *Campylobacter* spp. (1.9%) in controls whereas *Aeromonas* spp. co-existed in both cases and controls.

Conclusion: *Shigella* and rotavirus were frequently isolated from cases while parasites and viruses were commonly found in both cases and controls. EAEC, *Aeromonas*, and *Camplylobacter* spp. were detected in association with other pathogens.

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Overall Changes in Antigenic Groups of Enterotoxigenic *Escherichia coli* Isolated from Diarrhoeal Patients during 15 Years in Bangladesh

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Background: Enterotoxigenic *Escherichia coli* (ETEC) is one of the most common causes of bacterial diarrhoea in children and adults in developing countries. Over the last decade, changes in the phenotypic and genotypic characteristics of ETEC are being observed. These include changes in toxin types, colonization factors, and antigenic serogroups.

Objective: Determine the changes in different antigenic groups of ETEC during 1996-2010.

Methodology: Stool and/or rectal swab (RS) specimens were collected from diarrhoeal patients under the 2% surveillance system at ICDDR,B and screened for enteric pathogens, including ETEC, *Vibrio cholerae*, *Shigella*, and *Salmonella* spp. For detection of heat-labile (LT) and heat-stable (ST) toxin of ETEC, lactose-fermenting colonies from MacConkey agar plate were tested by multiplex PCR and ELISA. ETEC-positive colonies were tested for colonization factors (CFs) by dot-blot assay and were also serogrouped using O-antisera.

Results: From 14,296 diarrhoeal stool specimens tested, 11-14% ETEC was isolated. Over 47% of the strains were detected from children aged ≤5 years, which was 56% in 1996; 42% of LT/ST, 32% LT, and 26% ST toxin were detected. The isolation rate of ST toxin in 2010 changed significantly ($p<0.001$) compared to that in 1996. The predominant CF types were CS5+CS6, CS7, CFA/I, CS6, and CS17. CFs, including CS7 and CS17, were detected more frequently in children in 1996. However, CS7 and CS17 expressing ETEC were identified more frequently in adult patients in recent period. The most common seogroups of the CF-positive ETEC isolates were O115 (16%), O114 (15%), O6 (13%), O25 (9%), O8 (7%), and NT (13%). A correlation was found between the CFs and O serogroups of the isolates: CS5+CS6 (O115>O167), CS7 (O114), CFA/I (O78>O126), CS17 (O8>O167) and CS1/CS2+CS3 (O6). Serogroup O1 was found in the case of CS8 with or without CS6 ETEC strains.

Conclusion: The relative prevalence of commonly-expressed antigenic types of ETEC over the study period has identified requirement of additional protective antigens for inclusion in future vaccine candidates.

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Prevalence of Hepatitis C Virus Genotypes in Bangladesh

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Background: Hepatitis C virus (HCV), an infectious agent, affects the liver. The World Health Organization (WHO) estimated that about 3% of the world's population has been infected with HCV, and some 170 million are chronic carriers and at risk of developing liver cirrhosis and/or liver cancer. HCV is more prevalent in the African and Southeast Asian population. Of the 6 genotypes, 3 (genotype 1, 2, and 3) are prevalent throughout the world, and the remaining 3 being restricted to particular geographical areas. Determination of HCV genotype is of utmost clinical significance that indicates the therapy requirement, its duration, and prediction of the prognosis/outcome of the disease.

Objective: Observe the prevalence of HCV infection and its genotypes among infected patients who submitted specimens to the Clinical Laboratory Services of ICDDR,B.

Methodology: The study reviewed 5-year laboratory data and retrospectively analyzed the laboratory-records of the results of anti-HCV (T) ELISA during January 2005–November 2010 and the determination of HCV genotype. Briefly, the genotype was determined using amplified PCR product of 5'-untranslated region (5'UTR) that was subjected to sequencing and then HCV BLAST search through bioinformatics.

Results: Of 4,168 samples, 451 (10.8%) were positive for anti-HCV (T). Of 252 genotypes sampled, the genotype 3b was most-frequently prevalent (45.6%), followed by 1b (19.1%), 3a (18.7%), and 1a (12.7%) whereas 4a, 4c, 2a, and 2c were less-commonly detected. Of the 115 genotype 3b-positive cases, 72 (62.7%) were male, and 43 (47.4%) were female. Of these 252 patients, 176 (69.8%) were male and 76 (30.2%) were female. The mean age of the HCV nucleic acid-positive patients was 42.5 years, with a range of 19-74 years.

Conclusion: The overall prevalence of HCV was higher than the global estimates reported by the WHO. This finding highlighted the presence and pattern of genotypes of HCV, which might have an implication in clinical decisions. Most genotypes were prevalent with the highest frequency of genotype 3b compared to all other genotypes. However, to elucidate the actual prevalence and epidemiological pattern of HCV, a further study is required in broader settings both at hospitals and at community levels.

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Hepatitis C Virus Multisure Rapid Test: A One-stop HCV Serodiagnostic Tool

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Background: Serodiagnosis of hepatitis C virus (HCV) is predominantly based on both enzyme immuno assay (EIA) and confirmation by Western blot assays, which requires extended hours and established laboratory settings with well-trained manpower. HCV rapid test is a step forward towards the screening at all levels of healthcare settings followed by confirmation using Western blot. It, thus, necessitates the development of a diagnostic tool which could serve both screening and confirmation at all levels of healthcare settings.

Objective: Develop and evaluate one-stop multiline-based HCV rapid test using gold standard [nucleic acid test (NCV)] HCV-positive and HCV EIA and Western blot-negative samples.

Methodology: HCV structural (core protein) and non-structural proteins (NS3, NS4, and NS5) were incorporated to develop multiline HCV-MRT using reverse-flow technique. Sensitivity and specificity of the HCV assay were determined against the gold standard HCV-positive and negative serum samples. The relative sensitivity of HCV-MRT was evaluated using 13 HCV highly sero-converted and 2 low-titre panels. The applicability of the assay to determine all six genotypes was assessed. Specificity of HCV-MRT was further evaluated for cross-reactivity with serum samples obtained from patients infected with other hepatitis viruses and infectious diseases.

Results: HCV-MRT showed 99.69% [95% confidence interval (Cl) 98.30-99.95)] sensitivity against 326 HCV NAT-positive sera while 99.81% (95% Cl 98.93-99.97) specificity against 522 HCV-negative sera obtained from apparently healthy persons. Of the HCV-MRT-positive samples, 87.15%, 90.28%, 75.84%, and 66.97% showed reactivity to core, NS3, NS4, and NS5 proteins respectively whereas 44.95% sera developed bands against all the 4 proteins. The observed performance rated better than available HCV blots (MPD HCV 3.0, Wellcozyme and Ortho RIBA 3.0). HCV-MRT showed 100% positivity with all the sero-conversion panels. When compared for earliest relative performance, the average minimum number of days of detection for HCV-MRT was 31, while for Abbott EIA 3.0 and Ortho RIBA 3.0, the average minimum number of days was 35 and 36 days respectively. HCV-MRT also detected all 6 genotypes (n=100) of HCV collected worldwide.

Conclusion: The newly-developed HCV-MRT proved to be efficient in sero-diagnostic screening and for confirmation, thus paving the way for time-saving, cheap, and reliable method to be applicable at minimum healthcare settings.

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Use of Dopamine in Under-5 Children Presenting with Septic Shock

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Background: Patients presenting with diarrhoeal diseases and associated complications in large facilities are common. Despite the availability of potent antibiotics and intensive care, rates of mortality due to septic shock are 40-70%. High mortality is more depicted among severely-acute malnourished children. At the Dhaka Hospital of ICDDR,B, results of a study revealed that septic shock accounted for 39% of deaths among severely-malnourished cases. There is paucity of report on treatment outcome of children who received inotropic agent—dopamine—for septic shock. Each year, ICDDR,B provides treatment to over 110,000 patients with diarrhoeal diseases. Of them, nearly 10,000 present with associated problems. Annually, around 1,700 patients with various complications get admitted into the Special Care Unit (SCU) of the Hospital.

Objective: Evaluate the treatment outcome of dopamine among children aged less than 5 years (under-5 children) presenting with septic shock in the Special Care Unit of the Dhaka Hospital of ICDDR,B.

Methodology: In this prospective study, all under-5 children with septic shock admitted to the SCU during February 2006–June 2007 requiring support of dopamine to combat shock were included. Comparison was made among those who required dopamine with fatal outcome (n=15) or without fatal outcome (n=5); clinical and laboratory findings and treatment-response dose were also compared.

Results: During the study period, 1,257 critically-ill under-5 children were admitted to the SCU. Of the patients with septic shock, 20 had received dopamine. Of them, 35%, 40%, and 25% were aged <6 months, 6-12 months, and >12 months respectively, with almost equal sex distribution. The mean age of the study participants was 7 months. The mean responded dose of dopamine to combat septic shock was 10 µg/kg; 73% of the children developed irreversible shocks which were more evident among children aged 6-11 months. Sixty percent of the children with septic shock had pneumonia. About three-quarters of the children had different degrees of malnutrition. Severe malnutrition (73% vs 60%; p=0.61) and hypoglycaemia (75% vs 33%; p=0.24) were equally distributed among the deceased and the survivors; 25% of the death cases had hypernatraemia.

Conclusion: Diarrhoeal children with septic shock, who required dopamine, had high fatality rate, and the nutritional status did not show any impact on fatal outcome. However, further research with a large sample is imperative to consolidate the observations.

Health Hazards of Solid Waste Management Workers in Bangladesh: A Case Study of Matuail Landfill Site, Dhaka

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Background: In Bangladesh, the waste handlers, especially in the landfill sites, are exposed to various health risks as municipal solid wastes are commonly handled with bare hands and feet without using any safety equipment for protection.

Objective: Assess the health impacts of waste-pickers, waste-sellers, and landfill workers associated with handling of solid wastes at the Matuail landfill site, known as the country's first sanitary landfill site.

Methodology: A structured questionnaire was used for assessing occupational health hazards, especially the condition of people whose livelihood depends on the Matuail landfill site, including waste-pickers, waste-sellers, and landfill workers. Important information on occupational health hazards was collected by interviewing people working at the dump site.

Results: Review of occupational health hazards among waste-pickers, waste-sellers, and landfill workers showed that they have an elevated incidence of fever and stomach problems. About 55% of waste-pickers (n=16), 22% of waste-sellers (n=10), and 31% of landfill workers (n=16) were suffering from stomach problem, diarrhoea or dysentery. Fever was also a common disease among 27% of the waste-pickers, 44% of the waste-sellers, and 31% of the landfill workers. About 19% of the landfill workers suffered from body-pain, and about 13% had breathing problem. Forty-three percent of the waste-pickers and 40% of the waste-sellers told that their health hazards are chronic while 86% of the landfill workers faced temporary health hazards.

Conclusion: There is a high level of incidence of different diseases, such as fever, diarrhoea, dysentery, and so forth classifying into chronic and temporary types, although the waste-pickers were of great concern for vulnerability to diseases. These groups of people are at health risks primarily from increased exposure to hazardous materials, pathogens, and the unhealthy environment at the Matuail landfill site.

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Microbiological Investigation of Complementary Food in Bangladesh: Impact on Childhood Diarrhoea and Malnutrition

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Background: The *Lancet* Nutrition Series recommended appropriate complementary food (CF) as one of the several interventions that can reduce childhood malnutrition.

Objective: Investigate CF for bacterial contamination at points of feeding children aged up to 2 years in Mirpur slum (urban) and Mirzapur (rural) areas of Bangladesh and find out if there is an association with diarrhoeal morbidity and nutritional status of children.

Methodology: In total, 70 households having children of this age-group were randomly selected from each of the areas. Mothers/caregivers of the children were interviewed using a structured questionnaire. A standard food-frequency questionnaire (FFQ) was completed for each child, and anthropometric measurements of the child was taken. The CF samples were collected immediately before the first feed of the day and at the time of the 2nd/3rd feeds. Samples were analyzed for a number of foodborne pathogens using standard methods.

Results: Of the samples collected at the 2nd/3rd time of feeding, 49% from urban areas and 30% from rural areas were found to be contaminated with coliform bacteria at ≥100 cfu/g. Faecal coliforms (FCs) at the same level were found in 33% and 19% of the samples from the urban and rural areas, respectively. *Escherichia coli* was detected in 40% and 39% of the samples from the urban and rural area respectively. *Bacillus cereus* was isolated in 33% and 26% of the samples while *Staphylococcus aureus* was isolated from 6% and 1.4% of the urban and rural samples respectively. Of the urban and rural samples collected before the first feed of the day, only 3% were contaminated with FC. From these samples, *E. coli* was isolated from 11% and 6% of the urban and rural samples respectively. *Bacillus cereus* contamination was present in 8% and 6% of the first-fed samples from the urban and rural area respectively. A significantly high number of wasted rural children had CF with a high aerobic plate count, which was also significantly associated with diarrhoea morbidity of children ($p<0.05$).

Conclusion: Bacterial counts significantly increase over time when food is stored for >4 hours for multiple feeding. Public-health interventions to promote hygiene practice during food preparation and feeding are essential to prevent microbiological contamination of CF and its negative impact on nutritional status of children.

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Determination of Risk Factors for Pneumonia in Low-birthweight Babies in a Slum of Dhaka City

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Background: Low-birthweight (LBW) babies are generally at greater risk of morbidity and mortality from pneumonia, particularly those born in poor, disadvantaged slum areas.

Objective: Examine the risk factors for pneumonia in LBW babies aged <6 months, who were born in one of the slums of Dhaka city in Bangladesh.

Methodology: A case-control study was conducted at Madertek slum in Dhaka during November 2009–January 2010. Cases (n=10)—LBW babies with pneumonia—were obtained from an ongoing surveillance of BRAC's Manoshi project in the slum, and controls (n=47) were the LBW babies without pneumonia or other illnesses in the same slum. All the mothers of these 57 LBW babies were interviewed using a structured questionnaire which contained questions on socioeconomic and demographic characteristics, neonatal care, breastfeeding practices, handwashing, and parental smoking inside the house. Initial univariate analysis followed by multiple logistic regression were used in identifying the determinants of pneumonia.

Results: Exclusive breastfeeding and maternal handwasing with soap ≥6 times a day were significantly associated with lower risk of pneumonia [odds ratio (OR): 5.55, 95% confidence interval (CI) 1.30-23.54, p=0.013 and OR: 7.27, 95% CI 0.84-62.5, p=0.041 respectively]. However, in the multivariate logistic regression model, these two factors tended to be associated with development of pneumonia in LBW babies of the same age-group but failed to reach statistical significance (OR: 4.40, 95% CI 0.76-25.64, p=0.096 and OR: 12.34, 95% CI 0.94-166.66, p=0.056 respectively).

Conclusion: The findings suggest that, in slum population, exclusive breastfeeding and handwashing practices have protective effect against pneumonia in high-risk babies. A larger fully-powered study is needed to confirm the findings.

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Risk Factors of Overweight Adolescents in Dhaka City

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Background: Double burden of malnutrition (overweight and underweight) remains one of the major public-health problems in developing countries, including Bangladesh. Adolescents' overweight is associated with significant immediate and long-term health problems. However, there is no study in Bangladesh to identify the risk factors of overweight among adolescents in Bangladesh.

Objective: Assess the risk factors of overweight among adolescents in Dhaka city.

Methodology: This case-control study was conducted at 3 schools in Dhaka city of Bangladesh. Both adolescent boys and girls, aged 10-19 years, were selected for the study. Seventy-one overweight adolescents as cases and 109 non-overweight as controls were selected according to the classification of overweight by the World Health Organization. Chi-square test and Mantel-Haenszel analyses were used for assesing the associated factors.

Results: The results showed that overweight adolescents were 6.41 ($p<0.001$) times less likely to do regular exercise compared to normal-weight adolescents. About 89% of the normal-weight adolescents played outdoor games while only 16.9% of the overweight adolescents played outdoor games. Overweight girls aged 10-12 years, took 15% more energy than recommended dietary allowance (RDA). Overweight boys aged 12-15 years took 5% more calorie than RDA while overweight girls in the same age-group took 15% more energy than RDA. Overweight girls aged 15-19 years took 21% more calorie than RDA. 53.5% of the overweight adolescents consumed fast food 4-9 times per week compared to 30.3% of the normal-weight adolescents ($p=0.001$); 15.5% of the overweight adolescents consumed butter 3-7 times per week compared to 2.8% of the normal-weight adolescents ($p<0.001$).

Conclusion: The findings showed that high intake of energy was a risk factor while regular exercise and outdoor games were the protective factors for the overweight adolescents.

Estimation of Nutritional Status and Dietary Intake of Adult People Living with HIV/AIDS in Dhaka City

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Background: People living with HIV/AIDS (PLWHA) are vulnerable to poor nutrition status. Good nutrition can help maintain and improve their immunity and quality of life. Bangladesh is still considered a country with low prevalence of HIV/AIDS. However, no information is available on the nutrition status of PLWHA. The subjects are highly vulnerable to infection and disabilities. There are 13,000 HIV-positive people in Bangladesh but there is no adequate nutritional guidance for them.

Objective: Estimate the nutritional status of adult PLWHA in Dhaka city and their dietary intake.

Methodology: It was a descriptive cross-sectional study where data were collected directly from subjects during November-December 2009 in Dhaka. Sixty-five HIV-positive patients aged 20-50 years were selected for the study. The study was conducted in Jagori at ICDDR,B and Ashar Alo and Infectious Diseases Hospital (IDH). Body mass index (BMI) was calculated to estimate the nutritional status of adult HIV-positive/AIDS patients. Food intake, dietary habit, personal hygiene practice, and other related data were also collected to estimate their nutritional status.

Results: The study found that 54% of the subjects had normal nutritional status, and 30.8% were underweight (BMI <18). Of underweight patients (n=65), 18.5% were moderately malnourished (CED III), and 9.2% were mildly malnourished (CED I). The mean (SD) calorie intake was 1,588 (±329) kcal per day, which was 29% less than their mean energy requirement ($p<0.001$). The mean (SD) intake of carbohydrates by adult PLWHA was 225.86 (±64) g per day, and mean (SD) fat intake was 50 (±16) g per day. The mean (SD) protein intake was 65 (± 20) g per day. The protein intake by the male patients was 3.5% less than recommended dietary allowance ($p<0.001$). The subjects had various diseases, such as fever (49.2%), cough, frequent diarrhoea (29.2%), tuberculosis (12.3%), asthma (4.6%), and skin diseases (46.1%). The median income of the participants was US$ 73-147 per month, and 54% of the subjects were unemployed.

Conclusion: The funding showed an alarming picture of poor nutritional status of PLWHA with poor dietary intake. The situation demands appropriate nutritional management by those who take the responsibility of treatment.

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Exclusive Breastfeeding Rate and Related Factors in Urban Slums of Dhaka

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Background: Breastfeeding is the gold standard of infant-care and is very important for survival, growth, and development of children. It is the perfect food for the baby's first 6 months of life, benefiting children worldwide. An estimated 1.5 million lives would be saved if all babies could have exclusive breastfeeding (EBF). EBF in the early months of life is correlated strongly with increased child survival and reduced risk of morbidity, particularly from diarrhoeal diseases. EBF for 6 months, including giving colostrums is crucial for child survival, growth, and development.

Objective: Assess the rate and identify the factors which influence EBF in selected urban slums of Dhaka city in Bangladesh.

Methodology: This cross-sectional descriptive study was conducted in 6 selected slums of Dhaka city. Information was collected from 183 lactating mothers having infants aged 0-6 months using a pre-tested questionnaire. Data on age of mothers, educational status of parents, monthly household income, breastfeeding-initiation time, pre-lacteal feeding status, and breastfeeding status of the infants were collected.

Results: Early initiation of breastfeeding (EIB) rate was 32.2%. The colostrum-feeding rate was 42.6%. The rate of pre-lacteal feed was as high as 57.4%. About 50% of the mothers gave inappropriate early feeds to the infants. The EBF rate was 54%. The children who did not have any disease in the last 15 days were better associated with EBF (68.4%). Breastfeeding counselling was received by 57.4% of the mothers. Forty-three percent of the mothers received advice from doctors, nurses, and other staff of healthcare centres whereas 53% received advice from family members, relatives, or media. The EBF rate was higher (55.4%) in group having an income of less than Tk 6,000 (US$ 88) per month compared to the higher-income group (46.2%).

Conclusion: Breastfeeding practice among urban slum mothers showed an alarming picture, which needs immediate actions for improvement.

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Comparing Practices of Caregivers of Better- and Poorly-nourished 2-5-Year Old Children in Urban Slums of Dhaka

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Background: Care refers to the behaviour and practices of caregivers to provide food, healthcare, stimulation, and emotional support necessary for children's healthy survival, growth, and development. These practices translate food-security and healthcare resources into a child's wellbeing. Not only the practices themselves but also the ways these are performed, in terms of affection and responsiveness to the child, are important.

Objective: Compare the practices of caregivers of children with better and poor nutrition.

Methodology: A cross-sectional descriptive study was conducted among families having children aged 2-5 years in 3 slums of Dhaka city. Data were collected on feeding behaviour, hygiene practices, sanitation, parental role, healthcare, immunization, treatment of illness, and anthropometric measurements of children.

Results: The study showed that caregivers (n=39) of well-nourished children (n=39) gave better care compared to those (n=39) of malnourished children. Of the 78 children, 46.3% were male, and 53.8% were female. In the age-group of 7-12 months, 57.1% were given complementary food compared to 42.9% in the malnourished group. Children of the well-nourished group (66.7%) took eggs 2 times or more daily compared to the malnourished children (33%) ($p=0.05$). About 77% more mothers of the well-nourished group played with their children compared to malnourished group ($p<0.001$).

Conclusion: It was evident that the caregivers of the well-nourished children gave better care compared to the malnourished children. Caring practices of mothers directly contribute to the nutritional status of their children.

HIV Intervention, International Migrant Workers, and Health System Challenge: Situation Analysis of Bangladesh

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Background: International migration plays a significant role in HIV transmission across countries. Bangladesh has a net migration rate of 0.5 per 1,000 people with 6 million workers. While scientific evidences have positioned them as a key population for HIV in Bangladesh, feeble health system response has resulted in lack of effective HIV-prevention programme and due attention compared to the magnitude of the issue.

Objective: Explore the existing health interventions for the international migrant workers with emphasis on HIV, assess the effectiveness qualitatively by listing the strengths and challenges, and understand country's health system response for HIV vulnerability of the migrant workers.

Methodology: Data originated from an ongoing qualitative study in Dhaka and adjacent areas that started from February 2010 involving literature review, 15 key-informant interviews (Government of Bangladesh, NGOs, and recruiting agencies), 10 in-depth interviews (migrant workers, both potential and returnee), and 4 group discussions after ensuring ethical measures. Open-ended guidelines were used for data collection. Observation of various events, sessions, and settings helped in triangulation. Techniques of thematic analysis and peer-debriefing were employed for data analysis using the atlas ti software (version 5.2).

Results: Findings suggest that migrant workers are mostly inconspicuous from any HIV intervention, except for a few sporadic efforts. Lack of organized attempts, coupled with lack of institutional and individual capacity to combat HIV in this population, has led to unmonitored and unregulated approaches so far. Simultaneously, there are silos due to lack of dialogue demanding importance to intervene. In addition, the country lacks national strategy to combat HIV among this population as a priority.

Conclusion: In the current context, Bangladesh needs a 2-armed approach; (a) adequate dialogue at various stakeholders level to mainstream the issue assuring that it is not a threat to national economic gain—rather is important to help formulate national policies and (b) appropriate model based on empirical evidences on dynamics of migration to cater services to this population and continuous follow-up both at home and destination countries. The underlying assumption should be; HIV intervention is not a stigma—rather is a national marketing strategy for healthy and informed workforce.

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Infant-feeding in Slums: An Important Issue Neglected in the MNCH Programme

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Background: Dhaka is a fast-growing city with 3.4 million slum-dwellers with health indicators worse than the rural poor. Manoshi, a maternal, neonatal and child health (MNCH) programme of BRAC has been working in urban slums since 2007. Result of research indicated that feeding mismanagement was the most important underlying cause of death for infant and young children.

Objective: Understand how the existing practices compare with the recommendations and whether important foods available at the household level are offered to children aged <2 years.

Methodology: One slum in Dhaka city was selected, and cross-sectional data were collected from randomly-selected 325 households with children aged <2 years from April to May 2010. Data on sociodemographic and infant-feeding information were collected.

Results: Although giving colostrum was universal, about 50% of infants (n=325) aged 0-6 months were fed pre- and post-lacteals; 36% were put to breast within an hour; and 20% were exclusively breastfed. These indicators were significantly lower than previously reported in nationally-representative data. Among 7-12-month old infants, animal-source foods (ASFs), milk, legumes, and vegetables were less consumed (23-32%) than starches and fruits. A similar pattern existed among older children. When household availability was considered, the consumption of ASF, legume, and vegetables improved a little but a similar consumption pattern remained (37-45%), particularly among infants aged 7-12-months. Health personnel were the most important source of infant- and young child-feeding (IYCF) messages.

Conclusion: The IYCF indicators in the slum are much worse than in rural areas, and the availability of household foods does not translate into better IYCF practices. The existing MNCH services, such as Manoshi, should incorporate strategies to improve IYCF practices if they plan to improve health outcomes and prevent deaths of infants and young children.

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A Short-term Follow-up Experience of 6 Months after Treatment of Children for Severe Acute Malnutrition in Dhaka

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Background: Malnutrition is associated with 54% of deaths of children, aged less than 5 years, with severe acute malnutrition (SAM) having a case-fatality rate of 60% in the 1990s, primarily due to faulty case management. Three phases of management of children with SAM include: acute, nutrition rehabilitation (NR), and follow-up. It is possible to successfully manage SAM children with appropriate medical and nutritional management within a few weeks. However, whether this recovery is sustained over a longer period in their homes remains an unresolved question. There is lack of information to assess if recovery is sustained for longer duration.

Objective: Present the findings of a study in which SAM children were managed at a day-care centre and were followed up for 3-6 months to evaluate post-treatment failures, morbidities, and mortalities following their acute phase and NR managements.

Methodology: This was an observational, uncontrolled study, and information was recorded during follow-up after day-care treatment of severely-malnourished children in an urban setting. SAM children aged 6-23 months received protocolized management at day-care clinic and were followed for 6 months. Unscheduled extra-visits were also recorded, and the nutritional status over this period was monitored.

Results: During February 2001–November 2003, 264 children were enrolled, of whom 180 completed acute and NR phases and were advised for follow-up. The mean [standard deviation (SD)] age was 12 (5) months; 55% were infants; 53% were male, and 68% were breastfed. The compliance rates dropped from 91% to 49% at 10th visit. Major morbidities included diarrhoea (20%), cough (24%), and fever (26%). Successful completion of 7-10 follow-ups was possible in 124 (68.9%) of 180 children [95% confidence interval (CI) 61.8-75.2], while partial follow-up of 1-6 visits was done in 45 of 180 (25%) children (95% CI 19.2%-31.8%). Post-treatment failures occurred in 32 (17.8%) children (95% CI 12.9-24), and additional 5 (2.8%) children (95% CI 1.2-6.3) died. Thirty-seven (20.6%) children (95% CI 15.3-27) made additional unscheduled extra-visits during the follow-up period.

Conclusion: The findings highlight the need for follow-up as part of overall management of SAM children and recommend an effective community follow-up.

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Social Determinants of Health Influencing Low Use of Institutional Healthcare by Selected Tea-estate Workers of Sylhet, Bangladesh

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Background: Sylhet has been traditionally a low-performing area in terms of healthcare-use. Ethnic minorities, such as tea-estate workers, have even lower health status in terms of general healthcare, maternal morbidity and mortality and child immunization.

Objective: Explore the status of social determinants of the low use of healthcare services among selected tea-estate workers.

Methodology: Literature review was conducted on health status, healthcare-use by tea-estate workers and informal discussion was made with tea-estate managers and donor agencies engaged in health-promotion activities in the respective tea-estates. The search explored all available electronic health and social science libraries, including PubMed/MEDLINE, POPLINE, Web of Science (ISI), SCOPUS (Elsevier), PsycINFO (CSA), HINARI, and Google Scholar. Grey literature was excluded from the search.

Results: Available literature covered topics, such as STI/HIV, immunization, and the burden of disease among the tea-estate workers. Both group discussion and literature search revealed that morbidity due to waterborne diseases, diarrhoeal diseases, malnutrition, skin diseases, intestinal helminth infections, anaemia, malaria, and other general illnesses were common among tea-estate workers. Home-delivery assisted by unskilled attendants and low immunization coverage were common. It indicates the low use of institutional healthcare. Furthermore, literature search also revealed that more than 50% of the tea-estate workers were exposed to open defaecation. Social determinants, such as poor living condition, extreme poverty, and lack of knowledge were associated with the low use of institutional healthcare.

Conclusion: There is a dearth of published literature on the health status of the tea-estate workers in Bangladesh. There is a need for health education and communication programme to prevent and reduce mortalities from waterborne and diarrhoeal diseases. Simultaneously, the overall health situation warrants a culturally-acceptable health-promotion intervention to instigate institutionalized healthcare-use.

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Mode of Delivery by Socioeconomic Status at a Comprehensive Emergency Obstetric Care Facility

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Background: In Bangladesh, demographic health surveys suggest that there is a significant rich-poor gap in access to skilled obstetric care and in mode of delivery by caesarean section. The rich have a much higher caesarean section rate (25.7%) than the poor (1.8%). At the LAMB Hospital, comprehensive emergency obstetric care is provided at the time of need, regardless of ability to pay. A means-tested subsidy from the 'poor fund' is provided for those unable to pay their bill at discharge.

Objective: Establish the degree of equity at point of access in a comprehensive emergency care facility.

Methodology: The socioeconomic status of each inpatient at the LAMB Hospital is assessed by a skilled worker using criteria based on structured interview and asset observation. This assessment usually takes place the next working day after admission. There are 6 categories of socioeconomic status (A1, A2, A3, B, C, and D), with A1 as the poorest and D as the richest. The socioeconomic assignment is validated by home-visit when necessary, and this process had been validated in a previous study. Socioeconomic designation was then compared with the mode of delivery for singleton deliveries.

Results: During Jannuary 2008–August 2010, 8,539 mothers delivered. One hundred sixty-eight multiple pregnancies (twins and triplets) were excluded. The remaining 8,371 cases were analyzed. In total, 795 patients had unknown socioeconomic status; of them, 94% had vaginal deliveries, who were discharged before they had been assessed. Overall, the caesarean section rate was 24% for all the clients. For the poorest groups (A1 and A2, n=2,651, 32% of total), the caesarean section rate was 25.2%. For the richest groups (C and D, n=1,188, 14% of total), the caesarean section rate was 24.2%.

Conclusion: The findings showed equity in healthcare provision of caesarean delivery by socioeconomic status at the comprehensive emergency obstetric care facility. Equity in caesarean delivery in facilities could rationalize the use of resources and healthcare workforce to improve the maternal health coverage.

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Community Support System Improves Maternal Health Behaviours and Increases Equity in Narsingdi District, Bangladesh

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Background: Bangladesh has significantly reduced maternal deaths but accelerated progress is needed to achieve the targets of Millennium Development Goal (MDG). Improved maternal health behaviours and strengthened health services can reduce maternal mortality, especially for high-risk poor women.

Objective: Determine the impact of a community support system (CmSS) for pregnant women on maternal health behaviours and equity across asset quintiles.

Methodology: From 2006 to 2010, the Japan International Cooperation Agency (JICA) collaborated with the Government of Bangladesh to improve the use and quality of health services at public hospitals by equipping facilities and training healthcare workers in Narsingdi district. In 2 subdistricts, CARE implemented CmSS: community groups registered cases of pregnancy, facilitated birth-planning and antenatal care (ANC), and collected funds for emergency transport. To assess the impact of CmSS, a cluster-sample survey of women who delivered one year before the survey was conducted in CmSS (n=1,028) and non-CmSS (n=1,046) subdistricts. Results of the survey were analyzed using unconditional logistic regression adjusting for concurrent implementation of demand-side financing (DSF—a strategy that pays women who access public services for maternal health—in part of the CmSS area. Socio-economic quintiles were created based on household characteristics and assets.

Results: The respondents in the CmSS and non-CmSS areas were similar in age, parity, and asset quintile. Of the respondents in the CmSS area, 81% met with CmSS health volunteers at least once, and 7% received financial support for emergencies. CmSS was associated with reduced wealth disparities of key maternal health outcomes. In the lowest wealth quintile, the respondents in the CmSS area were more likely to receive ANC (lowest: 71%, highest 85%) compared to the non-CmSS area (lowest: 30%, highest: 80%). The respondents in the CmSS area were also significantly more likely to report birth-preparedness and knowledge of >3 maternal danger-signs.

Conclusion: In a setting of strengthened health systems, community-based support for pregnant women significantly improved maternal health behaviours and reduced wealth-based disparities. Community-led action may be critical to achieving maternal health-related MDGs.

Impact of Demand-side Financing on Trends in Maternal Service-use: Evidence from Khanshama Upazilla, Dinajpur District

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Background: The pilot testing of the demand-side financing (DSF) scheme in Bangladesh began in July 2007 with the aim of increasing access to maternity services and decreasing maternal death. Initial evaluation of the DSF scheme showed an encouraging increase in facility-based deliveries without excessive increase in caesarian sections but no ongoing surveillance data have been analyzed to compare the trends in maternal health service-use between DSF and non-DSF upazilas.

Objective: Compare trends in maternal health service-use in a DSF pilot area (Khansama) with universal access and two non-DSF upazilas (Chirirbander of Dinajpur and Joldhaka of Nilphamari district) using the same model of community-managed healthcare.

Methodology: Maternity surveillance data for unions served by the LAMB-PLAN partnership in Khansama, Chirirbander, and Joldhaka upazilas were analyzed for trends in maternal service-use from 2006 to 2009, comparing the percent changes across the 3 upazilas. Trends in the use of delivery attendants over time were also explored.

Results: Facility-based deliveries increased from 33.2% to 86.8% (an increase of 53.6%) in Khansama between 2006 and 2009 compared to 28.3% in Chirirbander (from 38.6% to 66.9%) and by 10.1% in Joldhaka (from 7.3% to 17.4%). Deliveries in Khansama increased in community safe delivery units and government hospitals and decreased significantly at NGO-run hospitals and at home. Caesarian-section rates increased by 10.5% in Khansama (from 3.6% to 14.1%) but only 4.9% in Chirirbander (from 5.3% to 10.2%) and 3.3% in Joldhaka (from 2% to 5.3%). Postnatal care by any service provider within 48 hours increased by 10.3% in Chirirbander (from 79.1% to 89.4%), was static in Joldhaka (from 94.6% to 93.1%), and decreased by 10.7% in Khanshama (from 95.1% to 84.4%). Uptake of 3 antenatal visits increased most in Joldhaka (10.3%), followed by Khansama (10.6%) and Chrirbander (3.5%).

Conclusion: Facility-based deliveries have increased substantially in the DSF area, especially at the government facilities. The large increase in caesarian section up to 2009 was concerning but preliminary data for 2010 (January-September) indicate that this trend may be leveling out. Further research is needed to assess the quality of services and ability of facilities to handle the increased workload.

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Health-related Millennium Development Goals in Bangladesh: Achievements, Challenges, and Financing Gap

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Background: Since the launching of the Millennium Development Goals (MDGs) in 2000, the MDGs have become the most widely-accepted yardstick of development programmes. Three MDGs (MDG 4, 5, and 6) directly deal with health, and the Government of Bangladesh is working to align its health-sector strategies with the MDGs. With only 5 years left, Bangladesh needs to rethink its strategies and resource needs to achieve the MDGs.

Objective: Analyze the trends in the health-related MDG indicators in Bangladesh, identify successes and challenges regarding achievements of the MDGs, and assess the financing gap.

Methodology: The study is based on secondary data available from survey reports, serological surveillance reports, studies on MDG-costing, National Health Accounts, and other relevant documents.

Results: Bangladesh has made considerable success in achieving some MDG targets, such as reduction in under-5 mortality, universal coverage in child immunization, and treatment of tuberculosis. However, the proportions of births delivered at institutional facilities and attended by medically-trained personnel are quite low. Data on the prevalence of malaria and mortality showed not a clear declining trend, and the prevalence of HIV has remained at less than 0.01% for many years. The results of the MDG-related needs assessment and costing studies showed that US$ 19 per-capita is required to achieve the health-related MDGs during 2009-2015. The total resources needed for 2011-2015 is Tk 117,746.2 crore. However, according to the latest National Health Accounts, Bangladesh spent only US$ 16 per capita in 2007 for all types of healthcare. The trend of total health expenditure in Bangladesh shows that the estimated total health expenditure will stand at Tk 237,275.67 crore during 2012-2016. In addition to inadequate funding, there is under-spending in the health sector.

Conclusion: While Bangladesh has made considerable success in achieving some MDGs, there is a long way to go insofar as achievement of other MDGs, especially reduction in maternal mortality, is concerned. The problem is further compounded by considerably high financing gap. The country has to further strengthen its healthcare-delivery system, scale up its resources for the health sector, and ensure its optimum use.

Study on the Urban Slum Context: Bangladesh Perspective

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Background: At present, over 30 million people (roughly around 24% of the total population) live in various cities in Bangladesh. This number may increase to about 68 million by 2015. About 40% of the total urban population of Bangladesh lives in slums with inadequate facilities. There are 3,500-4,000 big, medium, and small slums in Dhaka city. Dushtha Shasthya Kendra (DSK) launched an economic empowerment project titled ''Moving from extreme poverty through economic empowerment of slum-dwellers'' in March 2009 supported by the DFID and Shiree.

Objective: Develop a list of benchmarks of the socioeconomic, political and environmental conditions to understand the slum context of Bangladesh.

Methodology: This cross-sectional qualitative study was carried out at Korail and Kamrangirchar—the 2 big slums of Dhaka city during July-August 2009. A combination of 5 focus-group discussions (FGD), key-informant interviews, 5 resource-mapping, 3 social mapping, 5 wealth ranking, and SWOT analysis tools was used. A structured questionnaire was used for collection of data.

Results: The findings revealed that the very poor group of the population lives in slums in a miserable condition. They come from different parts of Bangladesh by losing home/land due to river erosions, for lack of employment at rural areas, monga, polygamy, abandonment, death, and prolonged illness/disability of main earner of the household. The beneficiaries of the project were aged 16-110 years, with an average age of 42 years. The number of family members ranged from 1 to 11, with an average of 3.26 members per household. There were some political party offices in the slums but they never helped the residents in any way. Neighbours and landlords helped them mitigate conflict. The leaders of these parties were found to activate the community in different business issues, such as house rent, electricity bill, and so on. Most NGOs did not maintain liaison with the local government structure. Some portion of space was occupied by musclemen. Most slum-dwellers built their own houses with almost no hygiene facilities. They were engaged in very irregular and part-time jobs with a very low wage. The average monthly income was Tk 1,967.39 per household, and 96.02% of households had rarely meal for more than 2 times a day. Of the slum-dwellers, 31.36% suffered from different diseases for the last 3 months. Of the households, 10.78% and 6.43% had a disabled or economically-inactive member in their family for limited scope of economic activities in Kamragirchar and Korail slums respectively. The sanitation coverage by the Dhaka City Corporation is about 83% but only 14% of the slum households have sanitation facilities. At any point in time, 30-45% of the slum people suffered from any diseases. Food insecurity and low dietary diversity were a common phenomenon. Only 2.4% of the households visited government hospitals for healthcare.

Conclusion: A comprehensive development initiative is urgently needed for improvement in the livelihood situation of the urban slum population in Bangladesh. More integration of the Government and NGO programmes and initiatives is necessary for better supporting the urban slum community in Bangladesh. There is a scope for further study on their socioeconomic and livelihood aspects.

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Clinical Audit on Childhood Pneumonia at an Urban Diarrhoeal Disease Hospital in Bangladesh

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Background: Approximately 150 million new cases of pneumonia occur annually among children aged less than 5 years (under-5 children) worldwide, accounting for approximately 10-20 million hospitalizations. Pneumonia in malnourished children having diarrhoea is a major cause of hospitalization in the Longer Stay Unit (LSU) and Special Care Unit (SCU) of the Dhaka Hospital of ICDDR,B.

Objective: Measure the current practice of procedures used for diagnosis and antimicrobial treatment at the Dhaka Hospital against recommendations in the guidance.

Methodology: A retrospective chart review was conducted in two phases among under-5 children with pneumonia. Records of patients admitted to the LSU and SCU of the Dhaka Hospital were obtained from the medical records office with prior approval from hospital administration. Patients admitted from 14 April to 14 May 2008 and from 5 October to 4 November of 2008 were included in the audit. Demographic, clinical and laboratory characteristics of patients, antimicrobial treatment, and outcome were extracted, reviewed, and analyzed.

Results: The median age of the children was 8 and 7 months in the 1st and the 2nd audit respectively, and the male dominated in both the groups. In both the groups, most (approximately 80%) of them presented with cough and fever, along with diarrhoea. Pneumonia could be documented radiologically in 84% of the cases. Total leukocyte count (109/L) was 13.7±6.4 and 12.7±5.1 in the 1st and the 2nd audit respectively. Malnutrition of the 3rd and the 2nd degree was common in both the groups (83% and 73% respectively). *Streptococcus pneumonae* and *Haemophilus influenzae* were isolated from blood culture of two children. In most (>90%) cases, patients received combination therapy with ampicillin and gentamicin or ceftriaxone and gentamicin which conformed to the hospital guidelines. A few received ceftazidime and azithromicin. The median hospital stay was 5 days in both series. The mortality rate was 1.7% in the 1st clinical audit, and no death was observed in the 2nd audit.

Conclusion: The results of the baseline audit suggest that antimicrobial practice for children with pneumonia having diarrhoea and malnutrition conformed to the hospital guidelines. A regular and more efficient clinical audit is recommended.

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Scaling up Voluntary Counselling and Testing Services in HIV Intervention Programme in Bangladesh

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Background: Voluntary counselling and testing (VCT) services are a cornerstone of HIV intervention programmes. Its early detection through VCT leads to (a) early referral for clinical care and support, (b) promoting behaviour change among HIV-positive and HIV-negative subjects, (c) prevention from mother-to-child transmission, and (d) reducing needle-sharing practices among injecting drug-users. In Bangladesh, a limited number of organizations, including FHI provides VCT services. FHI, through USAID-funded projects, has scaled up and supported VCT services in Bangladesh since 2005.

Objective: Present the scale-up process, minimum standards for establishing VCT services, key findings, and key challenges.

Methodology: A set of minimum standards for establishing VCT sites was developed before scaling up the VCT programme. This included standards for (a) setting up services (space, consumables, supplies, test-kits, and staff), (b) training of counsellors and laboratory staff, (c) communication and counselling tools, (d) testing algorithm, including standard operating procedures (SOP) for testing through validation, (e) referral services, and (f) External Quality Assessment Scheme for HIV rapid tests. Quality-monitoring tools were also developed and implemented to ensure the continuous quality of services.

Results: The first VCT centre of FHI was opened on 25 April 2006 at an HIV centre targeting female sex workers. Since then, 75 centres were established in 23 districts, of which 49 are currently supported by the FHI. All the VCT centres met the minimum standards. In total, 50,421 clients were tested, of whom 287 tested positive. All the positive clients were referred for care and support services. Some key challenges during the scale-up were frequent turn-over of staff, low demand for VCT due to stigma and fear, and management of supply-chain for diagnostic kits.

Conclusion: Scaling up effective VCT services in Bangladesh is feasible if minimum standards are established and implemented at all steps during the establishment and operation of VCT services. Implementation of quality-monitoring tools and frequent training of staff are essential for maintaining the quality of VCT services. A strong outreach programme is necessary for increasing the uptake of the programme.

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Knowledge on Sexually Transmitted Infections among Street-children of Dhaka City in Bangladesh

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Background: In 2007, Plan International Bangladesh initiated a project titled "Improving development opportunity for street children" in Dhaka city to provide basic services to children who live at the street and to make them aware of various issues, including sexually transmitted diseases.

Objective: Assess the knowledge on sexually transmitted infections (STIs) among street-children in Dhaka city.

Methodology: A cross-sectional study was carried out with 459 street-children of Dhaka city. They were randomly selected from 7 drop-in-centres and 7 night-shelters. A semi-structured questionnaire was used for collecting data from children aged up to 18 years. The survey was conducted during May-August 2010.

Results: Data showed that around 50% of the children heard about STIs. However, their knowledge of symptoms associated with STIs was poor. Around three-fourths were not aware of any specific symptom of STIs. More than 70% heard about HIV/AIDS. Children possessed the satisfactory level of knowledge on mode of transmission of HIV/AIDS. Similarly, knowledge on prevention of HIV/AIDS was satisfactory among the children. However, a portion of the children had misconception about HIV/AIDS transmission. Boys were more knowledgeable than girls. Similarly, children who had involvement with night-shelters were more knowledgeable than those who lived at drop-in-centres.

Conclusion: Although the level of knowledge on HIV/AIDs among street-children was found a bit satisfactory, they still did not have adequate knowledge on symptoms of other STIs. Girls were more unaware than boys. The findings have also been shared with concerned persons of the project and have been taken into consideration while the project components have been fine-tuned.

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Men's Knowledge about Heathcare Services and Their Use and Satisfaction on Services in Selected Areas of Bangladesh

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Background: In Bangladesh, men are the important decision-makers within the household. This is part of a collaborative study with the Government of Bangladesh and other NGO partners committed to improving the quality and delivery of health services, particularly reproductive health, appropriate to the needs of the poor men and women in selected areas.

Objective: Explore men's knowledge, service-use, and satisfaction on family planning and other selected healthcare services.

Methodology: The study is part of a baseline study under the Demand Based Reproductive Health Commodity Project. This study has been conducted in 2 rural areas (Raipur and Nabiganj upazilas) and one urban slum area (Dhaka). Enumeration was done in all the households before sample selection. In total, 3,600 (1200x3) husbands of living women were selected through systematic random sampling from the enumeration list.

Results: In both urban and rural areas, men were generally more aware of female contraceptive methods compared to male methods. In Raipur, more men knew about EPI centres (47%) than any other facilities, although 25% mentioned Health and Family Welfare Centre (HFWC) and 21% mentioned government satellite clinics. In Nabiganj HFWC, facilities were commonly mentioned (40%), although 11% of men also were aware of government satellite clinics. In contrast, the most commonly-recognized health facilities in the urban areas were NGO static clinics (50%) and pharmacies (48%). In general, about 73% of men expressed satisfaction with the facilities they visited during the last time. However, a lower proportion (56%) of men in Raipur were satisfied compared to other areas. In all the study areas, good behaviour of doctors was a leading reason for satisfaction with services. Inexpensive services, good skills of doctors, and good information about services were also associated with satisfaction.

Conclusion: Men's knowledge on health facility and satisfaction with services were poor in the study areas. Interventions should be designed to raise awareness among males so that service-use by men is increased and they, thus, ultimately play positive roles in decision-making in service-use for family healthcare.

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Non-user Women's Perception about Use of Family-planning Method in Selected Areas of Bangladesh

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Background: A qualitative study was conducted among women who did not receive services in the Demand Based Reproductive Health Commodity Project field sites to ascertain their views on reproductive health services, especially family-planning services.

Objective: Understand the knowledge, perceptions, and attitudes of female non-users of family-planning methods.

Methodology: The study is based on 36 in-depth interviews conducted among women who did not receive family-planning and reproductive health services. The study was conducted in 2 rural areas—Nabiganj and Raipur upazila—and urban slums located in Ward 25, 26 (Khilgaon), and 47 (Mohammadpur) of the Dhaka City Corporation. Selection of the sample was purposive using the family welfare assistant's area list to ensure representation of age and socioeconomic groups. A flexible guideline was used for data collection. The interviews were conducted from November 2008 to March 2009.

Results: All the participants heard of various contraceptive methods, such as pill, injection, Norplant, and condom. Most of them had heard of these contraceptive methods from NGO workers in their respective areas. When asked about the cause for not using contraceptive methods, the common reason cited by most participants was the reluctance of their husbands. A few also mentioned that perceived side-effects, such as excessive bleeding and abdominal pain, were the reason for not using contraceptive methods. Most participants mentioned that the decision for not using contraceptive was exclusively taken by the husband. However, only a few mentioned that the decision was jointly taken by the husband and wife. Most participants mentioned that the health workers advised them to use any contraceptive methods while a few received such advice. The participants pointed out pharmacies and static clinic as the most common sources for obtaining contraceptive methods. When asked about future intention of using contraceptive methods, the majority preferred pill as a method of choice. However, most participants stated that the decision of using any methods in the future would depend exclusively on their husbands, although all participants opined that a joint decision should be taken by husband and wife regarding contraceptive-use.

Conclusion: Motivation and relevant knowledge transfer through 'peer support group' or community health workers should be ensured and maintained. Men should be targeted through appropriate interventions for changing their attitudes and behaviours regarding the use of family-planning methods.

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A Need Assessment Study of HIV Voluntary Counselling and Testing Services in Bangladesh

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Background: In Bangladesh, although the overall prevalence of HIV is still less than 1%, the increasing trend of HIV/AIDS indicates that the country is on the brink of a nationwide crisis. Voluntary counselling and testing (VCT), considered an entry-point for prevention and care, is acknowledged internationally as an effective strategy for both prevention and care of HIV/AIDS.

Objective: Identify the status (type, quality, and coverage of services) of existing VCT services; analyze policy documents to identify gaps and needs; and determine the need perceived by relevant stakeholders from existing services.

Methodology: This qualitative study was conducted through 24 focus-group discussions (FGDs) with 120 males and 97 females of Dhaka city. The respondents included sex workers (male and female), male having sex with male (MSM), transgender, people living with HIV (PLWHIV), migrant workers, and youths aged 18-25 years. In addition, 30 in-depth interviews were carried out with members of government, National AIDS Committee (NAC), UN agencies, international non-government organizations (INGOs), health service providers, and experts in HIV health intervention in the country.

Results: Existing VCT services are rather peer-driven than voluntary. Neither the policy documents nor the existing intervention took into account the needs of street-children, under-aged sex workers, adolescents, and youths, leading to the unequal coverage of VCT services. Stigma and discrimination were identified as the main reasons why many most-at-risk people were not seeking services at the existing VCT centres. The national policy or existing VCT guidelines do not suggest any unique mechanism for demand-creating campaign that promotes the uptake of VCT services.

Conclusion: These results indicate that policy reformulation and separate standard operating procedure for VCT are immediately needed. Streamlining of VCT services under government ownership can be an initiative for enhancing the service-delivery regime. Healthcare providers with excellent counselling skills are required in large numbers to cope with the scaling up of VCT services in the country.

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Non-communicable Disease Prevention Intervention in Production Sector of Bangladesh: Findings and Lessons Learnt

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Background: Based on numerous studies conducted in industrial countries, it is evident that the incidence of risk factors for developing non-communicable diseases (NCDs) among the workforce obstructs the rate of production. As the ready-made garment (RMG) sector earns more than 70% of the country's total GDP, an initiative was made to implement an intervention among RMG workers in Dhaka to assess their health status regarding NCD risk factors.

Objective: Initiate intervention for preventing NCD risk factors among RMG workers in Bangladesh.

Methodology: Baseline data were collected from 1,800 RMG workers of 6 garment factories of Dhaka city. The study followed both quantitative and qualitative methods, and information was collected through 1,800 structured interviews and 12 focus-group discussions (FGDs) with the workers and 12 key-informant interviews with garments management officials. Twelve case studies were also conducted with the workers.

Results: Most respondents were aged 20-29 years, 60% of whom were female, and 23.0% earned US$ 1.5-2.5 a day. One-fourth (25.6%) of the respondents were underweight (body mass index <18.5) and another one-fourth (25.08%) were overweight and obese. The mean systolic blood pressure was 112.75 mm of Hg with the median of 111.50 mm of Hg and standard deviation (SD) of 13.51 while the mean diastolic blood pressure was 70.98 mm of Hg with the median of 70.00 mm of Hg and SD of 11.75. Around 12.1% were pre-diabetic, and 2.6% were newly-diagnosed diabetic patients, following impaired fasting glycaemia criteria.

Conclusion: The present scenario of the industrial workplaces in Bangladesh reveals the double burden of malnutrition—both overweight and underweight—in the production sector of Bangladesh. Appropriate interventions for reducing risk factors of NCDs are suggested.

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Barriers to Translation of MNCH Knowledge into Practice among the Slum Community in Bangladesh

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Background: BRAC established a maternal, neonatal and child health (MNCH) project named Manoshi in selected urban slums of Bangladesh. It has a behaviour change communication (BCC) intervention in Manoshi aimed at improving healthcare-seeking behaviour of women and for their children. The current evidence from programme data suggests that, despite an understanding of the key MNCH problems, practice of recommended behaviour is low.

Objective: Document the barriers to translation of MNCH knowledge into practice among urban slum women in Dhaka.

Methodology: A qualitative sub-study was undertaken from March to December 2010. The study sites were Kamrangir Char, Korail, and Shyampur slums of Dhaka city. Research methods included in-depth interviews with mothers and their husbands, and focus-group discussion with different community groups. In total, 67 in-depth interviews (41 with mothers and 26 with their husbands) and 7 focus-group discussion (51 participated) were done for conducting the study.

Results: Both supply- and demand-side barriers were documented. The most reported supply-side barriers were: cost of services; influence of local elites on service providers to get privilege; distance of facility from home; influence of traditional birth attendants on women; long-waiting time; inadequate supply of medicines in facility; unavailability of female doctors; and inadequate consultation time. The most reported demand-side barriers were: poverty; husbands' ignorance; lack of accompanying person; lack of trust on service providers; reliance on self-treatment or local quacks; religious faith; and misconception that non-government organizations will convert them to Christianity.

Conclusion: The supply- and demand-side barriers are hindering translation of knowledge into practice. The barriers found in the urban slums are similar to those found elsewhere. Both supply- and demand-side barriers should be addressed to improve healthcare-seeking behaviour of urban slum women.

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212 (078)

Assessment of Behaviour Change Communication Tools: Experiences from MNCH Programme in Nilphamari District of Rural Bangladesh

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Background: To reduce maternal, neonatal and child mortality and morbidity, BRAC, a non-governmental organization, has initiated a maternal, neonatal and childcare programme in rural Bangladesh in 2006. Various communication channels have been used for promoting healthy behaviour of rural mothers, family members, and community members. Evaluation of these communication tools is needed to determine whether these initiatives have an acceptance to the community people.

Objective: Evaluate the acceptability and comprehensibility of behaviour change communication (BCC) tools in the form of interpersonal communications, printed materials, and educational sessions through entertainment.

Methodology: This qualitative research was conducted from March to April 2010 in 2 unions in Nilphamari Shadar in Nilphamari district of Bangladesh. The study followed qualitative methods, such as semi-structured interview (n=50), in-depth interview (n=12), focus-group discussion (n=8), and review of documents. Respondents were selected using snowball-sampling techniques. Primary respondents included pregnant women, new mothers, and mothers of children aged below 5 years, and secondary respondents included husbands and mothers-in-law of the primary respondents. Data were analyzed using framework analysis and content analysis techniques.

Results: Interpersonal communication method has been unanimously accepted by the community members due to CHWs' accessibility, availability, and way of communication techniques. People had positive attitude towards printed materials but less comprehensibility in pictures and messages on maternal danger-signs. Local songs and street-theatre were perceived to play a strong supporting role to understand the key massages relating to all components of the strategy for maternal and child health. Despite the limited use of TV and radio, the respondents perceived TV as a useful medium to support adoption of new knowledge on maternal and childcare in certain groups of listeners and viewers, including pregnant women, lactating mothers, and the elderly people.

Conclusion: Interpersonal communication, printed materials, and educational entertainment have potential for achieving behaviour change through support, motivation, and encouragement of families and other community members to take the right decision for healthcare-seeking. Consequently, the use of well-integrated communication methods, e.g. combining interpersonal communications, mass media, and educational entertainment can help maximize the effect of a BCC programme.

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213 (048)

Strengthening Monitoring Tools for Antiretroviral Drug Adherence: The Bangladesh Context

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Background: Three organizations in Bangladesh directly provide antiretroviral (ARV) to its members (AIDS patients) but no specific tools are available to evaluate and, possibly, reinforce adherence to their ARV treatment. As a result, most patients frequently miss their doses and sometimes discontinue which is more often associated with virological failure. This issue should immediately be addressed for implementing a successful antiretroviral treatment (ART) programme.

Objective: Develop monitoring tools from the initiation of ART (antiretroviral therapy) to adhere to this treatment and set up clinical indicators to measure the physical improvement of AIDS patients.

Methodology: For the newly-started ART receivers, regular follow-up visit and proper counselling are important. Before that, patients should have ensured 3 clinical evaluations, i.e. complete history and physical examination, routine laboratory investigation, and CD4 test. Adherence may be measured by the patient's self-report, pill count, and the report of the primary-care provider. Questions to assess adherence should include: number of doses missed in the last 7 days, number of doses missed since the last visit, if dose taken at correct time (if no, ask for delay in hours/days), if correct dose taken, and specification of reasons for interruption. A visual monitoring chart can be introduced with the patient which clearly indicates clinical improvement, increase CD4 count, body-weight, and decrease opportunistic infections.

Results: In the resource-constraint country like Bangladesh, factors that are associated with poor adherence include poor patient-clinician relationship, high burden of pill, forgetfulness, mental depression, lack of patient's education, drug toxicity, and being too ill. An effective monitoring tool can identify the actual reason of drug discontinuation, and through proper adherence, a patient can reduce the viral load, improve CD4 cell count, reduce HIV-related morbidity and mortality, prevent OIs, and improve the quality of life.

Conclusion: It is time to look more seriously into ART as part of comprehensive care for people living with HIV/AIDS (PLWHIV). This is a very cost-effective programme and needs many skill resources. So, considering all the important determinants of adherence to ART, the Government of Bangladesh should give special attention for PLWHIV's care and treatment programme immediately.

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Monitoring Clinical Indications for Caesarean Section in the Limited-resource Setting

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Background: Universal health coverage of major obstetric interventions is important to improve maternal health. In the low-resource setting, there is evidence of both under-use and over-use of caesarean delivery.

Objective: Describe the clinical indication for caesarean section in a comprehensive emergency obstetric care facility in rural Bangladesh.

Methodology: An obstetric surgeon performing caesarean section at the LAMB Hospital coded the clinical indication for the operation using a coding system designed on the recommended classification: (a) absolute life-saving maternal indication (obstructed labour, major antepartum haemorrhage, malpresentation, and uterine rupture) and (b) non-absolute life-saving maternal indications that included all other indications. The indication codes were incorporated into the hospital monitoring and evaluation system to enable ongoing timely provision of data to clinicians.

Results: During January 2008-August 2010, of 8,539 women delivering at the LAMB Hospital, 2,089 (24.5%) delivered by caesarean section and/or laparotomy for ruptured uterus. During the time of data analysis, the caesarean section rate rose from 23.5% in 2008 to 26.4% in 2010. Indications were identified for 2,058 mothers (98.5%). For the main indication for their caesarean surgery, 354 (17.2%) patients had absolute maternal life-saving indications. The main indication for 1,704 patients (82.8%) were non-absolute maternal indications.

Conclusion: The monitoring of clinical indications for caesarean section is important in the limited-resource setting to ensure that this major obstetric intervention is being performed for valid clinical reasons. This information, when available routinely for clinicians, can reinforce the appropriate use of caesarean section. This could improve resource and workforce allocation and increase universal maternal health coverage.

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215 (197)

Performance Measurement for Molecular and Serodiagnostic Laboratory, Clinical Laboratory Services, ICDDR,B

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Background: Key performance indicators (KPIs) are operational measures used for monitoring and understanding the processes, predicting and improving the likely key performance outcomes of an organization. These indicators represent the criteria needed for improvement in overall service of the organization. The KPIs in medical laboratories occupy an important part in the ISO 15189: 2007 guidelines.

Objective: Measure the performance of the Molecular and Serodiagnostic Laboratory of Clinical Laboratory Services (CLS) using the KPI's trial version for validation.

Methodology: KPIs were initially adapted through a review process of the quality management system (QMS). The major indicators encompass pre-analytical, analytical and post-analytical part of the tests. The first indicator considered—turnaround time (TAT)—represents the accurate reporting of results within the specified period. Validation of the test procedure, as the second indicator, comprises external quality assurance scheme (EQAS), inter-laboratory comparison (ILC), and internal quality assurance scheme (IQAS). Reporting accuracy—the third KPI—includes the appropriate reporting of results and handling of complaints. Blind duplicate—an indicator—implies both coherence of results and personnel competency. Incidence is a measurement of any deviation occurring in QMS. Initially, a laboratory plans its own limits on the KPI and monitors the performance throughout the year.

Results: TAT concordance was around 100% when the lower threshold was set at 95% when analyzed for each test. Results of both EQAS and ILC showed 99.76% concordance against the minimum acceptance level of 98% as defined by the Laboratory Management Committee. Reporting accuracy for a randomly-selected month (November) was 100% when 1,665 tests were performed by the Molecular and Serodiagnostic Lab. On the other hand, 4 incidence reports were generated where none was considered critical. Reproducibility of blind sampling of 10 tests showed 100% concordance. Effectiveness of the test was measured using IQAS, run on an every-batch basis, whereby the performance was found to be 90.70%.

Conclusion: The KPIs are first of their kind in CLS. Initial analysis of the trial version of defined indicators validated the effectiveness of KPIs, indicating the usefulness in future measurements. However, further analysis is required before implementation in full scale considering the weight between the percentage and score-based KPIs.

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Use of a New Approach to Count and Access Diverse Groups of *Hijra* for Scaling up HIV-prevention Services in Bangladesh

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Background: Transgendered people—known as *hijra* in South Asia—are stigmatized and hard to reach for both services and surveys. Access to *hijra* for prevention of HIV in Bangladesh has been through the network of a few *hijra* who are visible and well-connected with NGOs/CBOs. Such an approach has excluded diverse groups of *hijra* who are less-networked. Therefore, an approach that allows access to most *hijra* is required for scaling up of HIV prevention under the Rolling Continuation Channel (RCC) Programme in Bangladesh. The *hijra* community follows a hierarchical system with a *guru* (teacher) who has *chela* (disciples). A *guru* strictly functions within a demarcated locality known as *birit* where she and her *chelas* collect money from markets and households.

Objective: Use the traditional hierarchical structure of *hijra* to count and reach diverse groups of *hijra*.

Methodology: A participatory situation assessment was conducted in 64 districts of Bangladesh. A modified nomination method—named *birit*-based approach—was used for counting the numbers of *hijra*. An initial list of *gurus* was developed through a series of consultation with the *hijra* community in each district. A *birit* under each *guru* was identified, and the number of *hijra* under the *guru* was listed. All the listed *hijra* within a *birit* were invited to attend a session at the *guru's* residence or were contacted over mobile phones. Direct and indirect numbers were determined based on those contacted and those not contacted but listed by *gurus* respectively. Qualitative interviews with *hijra* identified diversity within their community.

Results: The indirect number obtained was 8,882 *hijra* across the country. Dhaka had the highest number while Sylhet, Habiganj, Sunamganj, Khulna, Chittagong, and Comilla had relatively high numbers concentrated in specific areas. In other districts, *hijra* were scattered. Four categories of *hijra* were identified: exclusively *badhai* (collecting money from markets and blessing the newborn), selling sex, both *badhai* and sex work, and *randhuni* (cooks) *hijra* who may also sell sex. Accessing these diverse groups requires context-specific approaches.

Conclusion: The *Hijra* culture-sensitive *birit*-based approach allowed easy access to *hijra* and provided realistic numbers who could be accessed for services.

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217 (282)

Maternal, Newborn and Child Health Situation in Rural Nepal: Findings from the Midterm Survey of Nepal Family Health Programme II

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Background: Findings of the Nepal Demographic and Health Survey (NDHS) 2006 showed that the maternal, newborn and child health (MNCH) situation in rural Nepal was not satisfactory to achieve the Millennium Development Goals (MDGs). Considering the MNCH situation, the Nepal Family Health Programme (NFHP) II has been working to improve the family-planning/MNCH situation in selected rural areas of Nepal since December 2007. The mid-term survey for the NFHP II was envisaged.

Objective: Track the changes in 40 districts (20 NFHP II programme districts and 20 control districts) from the level of 2006.

Methodology: To have a robust monitoring framework, the sample clusters of the NDHS 2006 were taken into account for the mid-term survey 2009. The survey was conducted in rural locations of selected 40 districts since the NFHP II works in the rural areas. In total, 111 rural clusters were enumerated for the purpose of the study (62% of the total rural clusters of the NDHS 2006). In total, 3,932 households were visited and interviewed. Similarly, all eligible women (5,019) identified were successfully interviewed. The 3-year period preceding the survey was taken into account for assessing antenatal care (ANC) and its components, place (place of delivery, home, or institution) and assistance at delivery, and postnatal care to avoid possible overlaps with the 2006 value.

Results: The survey showed that significant increases were observed in the MNCH indicators. At least one ANC visit was found significantly different (87% vs 76%, $p<0.05$) from 2006. Similarly, fourth ANC visits increased from 30% to 47% ($p<0.05$). Furthermore, 27% of the women delivered in the health facility (increased from 17%, $p<0.05$), and 29% of deliveries (n=1397) were assisted by skilled birth attendants (SBAs) (increased from 17%, $p<0.05$). The surveys further showed that practices of drying newborns before the placenta was delivered and wrapping before the placenta was delivered of hypothermia protection were significantly increased from those in 2006; newborns were dried before the placenta was delivered (49% vs 39%, $p<0.05$), and newborns were wrapped before the placenta was delivered (53% vs 42%, $p<0.05$). Furthermore, 86% of one-year old children were immunized against measles (increased from 80%, $p<0.05$).

Conclusion: The findings are widely acceptable for all because of following standard DHS methodology and adequate sample-size and coverage. The MNCH situation in rural Nepal is in the progressive way to track the MDGs.

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218 (002)

Cost Analysis of Management of Malaria Using ACT in the Private Sector of Zimbabwe: A Regulatory Implication

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Backgound: Zimbabwe adopted artemisinin-based combination therapy (ACT) as first-line management of malaria, with 62% of malaria patients traditionally being managed in the private sector. The Medicines Control Authority of Zimbabwe (MCAZ) regulation can impact on access by changing the category of the regimens from prescription preparation (PP) to household remedy (HR). However, any category chosen by MCAZ has implication towards out-of-pocket expenditure per malaria case managed from a patient's perspective.

Objective: Determine the costs associated with management of a single adult case of uncomplicated malaria using ACTs, with ACTs assuming varying categories [HR, pharmacy (P), pharmacist-initiated medicine (PIM), and PP] from a patient's perspective; determine the costs associated with management of a single adult case of uncomplicated malaria using chloroquine plus pyrimethamine and sulphadoxine (CQ-SP) from a patient's perspective, and compare these costs and make appropriate recommendations from an economic perspective.

Methodology: An activity-based approach to costing was instituted. The 3 major activities involved included: consultation, diagnosis, and drug treatment. Case scenarios of private patients were developed for malarial patients in need of health services using various possible routes. These possible routes were valued using market rates in the private sector. All costs were reported in the 2010 base year. Private patients' case scenarios were developed to depict the stages of malaria service provision in this sector. The study population included all patients with susceptible malaria episodes, who access their services in the private sector (estimated to be 62% of all malaria cases in Zimbabwe). The intervention of interest was an adult case of malaria managed in the private health sector.

Results: The study determined that the decision of categorizing ACT has huge implications towards access to malarial services. Initially, there was no consultation required with the use of CQ-SP in the management of malaria as these were of HR category and could be accessed in supermarkets. Their cost per adult course was only US$ 2.67 (range US$ 2-4). However, ACTs, if categorized as HR or P, will lead to a total cost of US$ 15.98 (range US$ 12-17) per case managed. If categorized as PIM, an initial consultation at US$ 1 (range US$ 0-3) on average plus the diagnosis using RDT of approximately US$ 5 (range US$ 4-6), with additional drug-cost of US$ 13.48 on average. The cost of management of malaria if ACT were categorized as PP would increase to (a) consultation fee of US$ 20 (range US$ 15-30), (b) diagnosis-costs of US$ 5 for RDTs or US$ 12.22 for laboratory (optic microscopy), and (c) US$ 13.48 for drug treatment.

Conclusion: Making the ACTs a PP will yield an out-of-expenditure of approximately US$ 56, which is about 4 times greater than in a case with ACT categorized as an HR. This result indicates an enormous financial barrier to access. It is, therefore, extremely paramount for the regulator (MCAZ) to consider the cost implication if universal access to malaria treatment and care is to be realized.

219 (005)

Identification of the Deceased Following Natural Calamity—Forensic Approach

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Background: Climate change and natural calamity is directly related to each other. Each year, a wave of disasters, including violent tropical storms, has killed hundreds of lives all over the world. Apart from being killed, many were missing, and some of those victims were later reported alive as they were not being properly identified.

Objective: Introduce a simple, easy, cost-effective but standard identification protocol for the victims of disaster to avoid or solve doubt, if any, in future.

Methodology: In this study, collection of thumb-impression, digital photograph of face and teeth, and 4 drops of blood from all deceased of each disastrous events are being proposed. These specimens are to be preserved and or stored in a safe place for future reference. These could be compared in future if any body comes as alive and solves the mystery of previously-buried body.

Results: At the pilot phase, 2 cases were studied where the victims were initially identified by their relatives, subsequently endorsed by the police and forensic pathologist as well, and found to be wrongly identified. The mystery left behind the previously-buried bodies has gone through the current protocol and solved.

Conclusion: The result indicates that direct identification through relatives is no longer effective in all cases. Science-based identification should be employed for future reference.

220 (053)

Students Voluntary Force Towards Control of Dengue in Jeddah, Kingdom of Saudi Arabia

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Background: Spreading of dengue fever in the globe is well-known as a major public-health problem for the past several decades. Jeddah, Kingdom of Saudi Arabia, is also not an exception for the burden of dengue for the past one and half decades, with 289 dengue cases reported from 1994 onwards with different magnitudes of cases in subsequent years. The dengue crisis management and mosquito-control programme was launched by the Jeddah municipality in the mid-2006 with special emphasis on integrated vector-control methods.

Objective: Train student voluntary forces involved in door-to-door campaign towards source-reduction measures for the control of dengue vectors and assess conventional indices of *Aedes* through the trained student volunteers in operational areas.

Methodology: Health department of the municipality applied various control measures in the programme through contract system involving different agencies. Application of larvicide in permanent *Aedes*-breeding habitats includes cement-tanks and various kinds of drums with either Fendona (Alpha-cypermethrin 6% EC) or DU-DIM (Diflubenzuron 4% granules) as Insect growth regulator (IGR) and fogging operation with hand-held thermal fogging with Lambda Cyhalothrin 2.5% EC in the outskirt of operational places. Under this programme, 150 student volunteers were under practical hands-on training for the control of *Aedes aegypti* and Ae. *Albopictus*, and the volunteers had undergone pre- and post-training tests with a well-designed questionnaire. Trained student volunteers collected information on types of containers, volume of water, and *Aedes*-breeding status in a planned proforma for calculating conventional Stegomyia indices. Dengue cases recorded weekly by the Ministry of Health were transmitted to the Jeddah municipality to undertake immediate remedial measures.

Results: Systematic pre-test and post-tests were conducted on the 150 student volunteers, including 14 supervisors. About 9% of the student volunteers scored <50% in pre-test whereas they scored 3.55% in post-tests. Seventy-eight percent of the student volunteers obtained 61-80% in post-test, which showed their efficiency in participation in control of dengue vectors. Under Jeddah municipality, overall assessment of conventional indices known as House Index (HI), Container Index (CI), and Breteau Index (BI) were 7.47 (September 2007) to 15.24 (March 2008), 1.6 (July 2007) to 6.03 (March 2008) and 9.68 (June 2007) to 42.63 (March 2008) during the study period.

Conclusion: Students voluntary forces were trained for the control of *Aedes* with the most priority on source-reduction measures. Data obtained through trained individuals were found to be the most useful baseline information for this region.

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221 (062)

Systematic Reviews of Health Policy and Systems Research to Bridge the Research-to-Policy Gap: An Impact Assessment

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Background: Systematic reviews synthesize existing evidence and can be used for readily addressing high-priority issues in health-sector decision-making. In 2007, as part of a global network of 4 systematic review centres focusing on health systems and policy research, the Centre for Systematic Review (CSR) in Bangladesh was established to build capacity and produce reviews that focus on issues involving the non-state sector for healthcare in low- and middle-income countries (LMICs).

Objective: Assess the CSR in Bangladesh in terms of capacity-building and utility and impact of reviews conducted, attempting to measure the value of investment in terms of outreach, maintenance, and sustainability.

Methodology: The study was an internal assessment of the CSR conducted during April 2007–December 2010. It reviewed and enumerated the training, research and outreach activities of the CSR. Publications, training-records, activity protocols, semi-annual reports, grant contracts, and conference abstracts were reviewed. To assess the impact of reviews, partners and users of the CSR products were consulted.

Results: The CSR produced 8 protocols or reviews, of which 3 were available in the public domain at the time of assessment. The CSR team members made 6 oral presentations on systematic review work. One review in particular has been used for outlining a research agendum, engaging team members in a programme-related advisory capacity, and generating additional research funding and programmes of work. For capacity-building, in addition to the original 4 team members, the CSR has trained and included 7 other national scientists in their reviews; however, this has been with reasonably high attrition. A training seminar on how to search and screen scientific literature was developed by the team and has delivered 5 times within Bangladesh; however, there is only one trained search strategist in Bangladesh.

Conclusion: The products of the CSR at ICDDR,B are having an impact in priority setting for research and decision-making in and beyond Bangladesh. Comparisons to other CSRs are not available. More input is needed to increase the systematic review capacity for long-term maintenance and sustainability of the methodology and of the CSR. More effort should be put forth to share the findings of CSR reviews so that these can be made available and subsequently translated into action in LMICs.

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222 (066)

Role of Existing NGOs in Reproductive Health Services for Slum-dwelling Adolescent Mothers: Constraints and Limitations

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Background: Results of studies revealed that slum-dwelling adolescent mothers prefer meeting their reproductive health needs from traditional healers, including quack doctors. It was due to deep-rooted belief about the indigenous healthcare system, which had a greater influence on slum people, although on-payment modern healthcare services from NGOs and other organizations were available.

Objective: Assess the intensification and appropriateness of reproductive health services of NGOs for adolescent mothers of slum community; explore the service-related major constraints and limitations faced in providing quality services for the said beneficiaries; and address the problems through undertaking appropriate interventions in future by respective stakeholders for the welfare of slum community.

Methodology: The study was conducted in Bowniabad slum of Dhaka city during July-December 2009. Data were collected through observations, key-informant interviews, in-depth interviews, and PLA sessions that explored and identified the nature of services and difficulties, factors affecting the quality of service-delivery, constraints, and limitations.

Results: The findings showed that the performances of service deliveries by the NGOs and government organizations were appreciated but there were huge conflicts and lacking of appropriate target-oriented interventions and depletion of long-term sustainable strategy to mitigate the existing demand of the slum-dwelling adolescent mothers to improve the demand-led health services.

Conclusion: There should be longer-term sustainable environment-friendly development strategy and approaches. Programmes should be launched with participation of the community, and the execution process would be represented by the direct involvement of the poorest and most vulnerable section of the slum people. It should particularly emphasize the reproductive health issues of adolescents. A pilot project should be incorporated to address the proper needs and rights of vulnerable adolescent mothers to ensure quality reproductive health services and to reduce maternal mortality and morbidity, thereby improving the livelihood condition of slum-dwellers.

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Street-children in Development: Review of Government Policies and Alternative Strategy in Bangladesh

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Background: Street-children who face severe and chronic poverty in terms of living condition are deprived of basic human rights. About 700,000 street-children in Bangladesh have no access to medical care and education, although these are important for human resource development.

Objective: Find out (a) to what extent the current government policy incorporates the health and education of street-children in Bangladesh and (b) if alternative strategies exist for addressing their health and education?

Methodology: The study involved a qualitative discourse analysis of text. The study reviewed the documents, such as the National Health (2007-2008), Education (2010), and Child (2010) Policy of the Government of Bangladesh. The work-plans relating to street-children's health and education developed by national NGOs and major international organizations, such as UNICEF, Plan, and Save the Children, were also assessed. The documents were selected using the Internet facility. The government documents were selected from the government portal through searching by specific words, such as street-children and education/health/welfare/safety net. Similar words were used in various search engines to select documents of NGOs.

Results: Results of review of the documents showed that only 100,000 of 700,000 children were being reached through the Government, NGOs, and other organizations due to several kinds of resource-deficit. Education was more accessible to these children than healthcare. Projects, such as 'Education for All' and 'Reaching Out-of-school Children', were education-oriented; similar projects for heath care do not exist, which directly give access to healthcare.

Conclusion: Neither the health nor the education policies mentioned anything specific about how to tackle the condition of street-children. However, the Ministry of Primary and Mass Education worked on a project together with the UNICEF which target street-children. The health policy was more concerned with the poverty situation and had several targets trying to make healthcare more accessible and affordable. If poverty is seen as the main cause of migration of children from home to streets, the health policy might have indirectly incorporated street-children. Both national and international NGOs work with street-children both directly providing healthcare and education and indirectly by working against poverty.

224 (080)

Biosafety Level 2 and 3 Laboratories at ICDDR,B

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Background: Most ongoing activities in the Laboratory Sciences Division of ICDDR,B are with infectious agents that belong to Risk Group 2 or 3. Frequent outbreaks of influenza, increasing number of HIV infections, increase in mycobacterial diagnostics and research, and work with other unknown or highly- transmissible emerging diseases led to the requirement for an increased biosafety level (BSL) for research and diagnosis.

Objective: Handle infectious agents and carry out diagnosis and research with these agents ensuring better safety for researchers and protection of the environment.

Methodology: The National Institutes of Health provided the assessment and recommendation for the construction of BSL 2/3 laboratories, retrofitting the room-space on the first floor of the north wing of the library building of ICDDR,B. ICDDR,B hired technical staff with relevant expertise and input from the researchers and constructed these laboratories. A class II A2 BSC was installed in the BSL 2 facility. In the BSL 3 laboratories, a cascade of negative pressure is maintained. One pass-through autoclave, 2 Class II A2 BSCs, 2 pass boxes, and one dunk tank have been installed as an integral part of the facility. The facility is equipped with all emergency systems following the guidelines. Two facilities are under the same access control.

Results: The virology group is currently using their well-equipped BSL 2 for the rapid diagnosis and characterization of influenza strains. The BSL 3 facility was certified Biosafety Biosecurity International on 19 July 2010, which is equipped for handling and manipulation of BSL3 agents and is currently being used for research and diagnosis of tuberculosis.

Conclusion: The BSL 3 laboratory is designed to create a safe working environment for its staff. The state-of-the art BSL 3 laboratory uses modern equipment to rapidly process samples and diagnose diseases. Besides the investments needed to bridge the skills gap, more development in the infrastructure is required in the BSL facilities. This will provide place for safely identifying dangerous pathogens within the country and allow scientists in Bangladesh to conduct research safely to develop strategies to prevent spread of the relevant diseases.

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225 (091)

Community-based Strategies to Improve Child Immunization Coverage in Rural India

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Background: Sahibganj district of Jharkhand, India, is a rural and predominately tribal area with low immunization rates and poor availability of basic recommended vaccines. The present study examined interventions designed to improve the immunization coverage in this district.

Objective: Determine whether interventions for health system strengthening to improve the quality of immunization services, coupled with community mobilization to increase demand for these services, can improve immunization rates in a district in rural India.

Methodology: National project staff advocated with government health officers and UNICEF to improve cold-chain management and ensure a regular supply of vaccines to primary health centres. An information-management system was used collaboratively by the facility, community health workers, and village health committees for identifying ongoing vaccine-supply needs and monitor child immunization levels. Key immunization-related practices were integrated into timed health- promotion messages delivered by mass communication techniques and one-on-one counselling by trained community workers, using behaviour change communication strategies. A cluster sample of 300 mothers of children aged below 2 years were interviewed at baseline (January 2008) and 2 years later (June 2010) using a 76-item knowledge, practices, and coverage survey that indexed immunization services. Percentages and confidence intervals were calculated using the design effect to adjust for cluster sampling.

Results: Improvements occurred in all immunization coverage indicators at the 2-year mark. Of 130 children aged 12-23 months, 54% received a DPT 1 vaccination before 12 months of age compared 29% at baseline ($p<.05$), and 40% received a DPT 3 (21% at baseline). Measles vaccine was received by 39% of children before 12 months compared to 20% at baseline, and full primary immunization of BCG, DPT 3, OPV 3, and measles vaccines by 23% of children compared to 10% at baseline. There was a 66% increase in mothers who had vaccination cards.

Conclusion: Strengthening of the health systems to improve vaccine supply, coupled with community mobilization and training to increase demand for timely immunization services, is a promising strategy for improving the immunization coverage in rural areas. The scaling up of this strategy in the target area, with addressing barriers, should further improve the immunization coverage in the subsequent 2 years after this study.

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Sustained Success During the Last 3 Years in Reduction of Needle-stick Injuries at an Urban Diarrhoeal Disease Hospital in Bangladesh

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Background: Needle-stick injury (NSI) constitutes a major risk of transmission of hepatitis B, hepatitis C, and HIV. A recent survey conducted at the Dhaka Hospital of ICDDR,B showed that 38% of health workers (n=57) had exposure to NSI in 2007.

Objective: Evaluate the sustained impact of a programme aimed at reducing NSI among staff working at the Dhaka Hospital of ICDDR,B.

Methodology: The infection Control Committee of the Dhaka Hospital conducted an intensive awareness-building and educational programme during November 2007–February 2008 for the prevention of NSI among the staff. Lecture sessions, use of handouts, and posters were included in the educational programme. Hospital staff members were informed about the possible hazards of NSI. Specially-designed boxes with a re-usable steel-frame carrier were introduced for proper and safe disposal of sharps, and measures were taken to prevent over-filling of sharp-boxes. Recapping of needles were discouraged. Precautions were taken during administration of parenteral medications and collection of blood specimens from restless patients. Strict instruction was given to staff providing environmental services to use heavy gloves and wear leather shoes. Corrective actions were taken in the event of non-compliance; for repeated violation of the policies, the concerned staff was reminded of disciplinary actions. Also, prospective monitoring of NSI was recorded by Hospital Infection Control Officer.

Results: During January-December 2008, 17 (4.8%) of regular 350 hospital staff members reported exposure to NSI. In 2009, 11 (3.1%) of the staff members reported exposure to NSI. Fourteen (4%) of the regular staff members reported NSI in 2010.

Conclusion: This simple and practical initiative resulted in sustainable reduction in the incidence of NSI at the hospital. Continued educational and motivational programme for hospital staff and implementation of some changed management practices, along with a monitoring system, are likely to be effective measures to sustain success in the prevention of NSI.

Acknowledgements: This research was supported by ICDDR,B which is supported by countries and agencies that share its concern for the health problems of developing countries.

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HIV Subtypes and Drug Resistance Profile from a Prospective Study in Bangladesh

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Background: Bangladesh is still experiencing a concentrated HIV epidemic. Currently, antiretroviral treatment (ART) is being rolled out in Bangladesh but only limited data on primary and secondary therapy resistance are available. A prospective cohort study of HIV patients was started to establish and validate the p24-Elisa as a cost-effective and alternative viral load marker for disease progression in areas with limited resources. Nested within the study, the resistance profile of circulating strains in ART-naïve and experienced patients was assessed.

Objective: Assess the drug resistance profile based on genotyping and phenotyping (PhenoTect™) assays in the cohort study.

Methodology: In total, 263 people living with HIV/AIDS were enrolled in this cohort study since January 2007. Ten percent of ART-naïve and 66% of ART-experienced patients at baseline were randomly selected for primary and secondary drug resistance respectively based on genotype and phenotype. Ten patients with clinically-suspected treatment failure were also selected by participating NGOs at the beginning of the study.

Results: Seventy-one samples were selected for drug resistance, and data for 47 samples were so far analyzed for genotypic or phenotypic drug resistance. Nine of the 47 samples had undetectable/low viral load, and their resistance profiles could not be obtained. Based on reverse transcriptase and protease gene-sequencing, the study confirmed a high variety of HIV-1 subtypes [C (n=18), G (n=2), A/B (n=2), B (n=1), D (n=1), A/K (n=1), B/C (n=1), CRF01_AE (n=1), CRF02_AG (n=1)] in Bangladesh. Resistance mutation to zidovudine (T215Y, T69I, K70T, L210W), lamivudine (K65RN, M184IMV, L210FL, T69I), and nevarapine or efavirenz (V106MA, Y181C/I/V) was found in 10.5% (n=4) of the samples. None of the 10 cases selected on clinical grounds showed any resistance pattern.

Conclusion: This is the first prospective study to confirm two cases each of primary and secondary resistance to first-line treatment available in Bangladesh and, therefore, second line-treatment is already needed. As ART is becoming more available in Bangladesh, monitoring of ontinuous drug resistance is essential. There is an urgent need to improve the clinical skills of healthcare providers to identify clinical cases of drug resistance correctly.

Acknowledgements: Financial support was provided by the Velux-Foundation, Switzerland, Swiss Tropical and Public Health Institute, and the Commission for Research Partnerships with Developing Countries, Switzerland. The PerkinElmer and Roche Diagnostics provided subsidized reagents for the study.

DAY 3: 17 March 2011, Thursday
12:30 pm-01:30 pm (Venue: Grand Ball Room Lobby)

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Vibrios of Gangetic Delta, India: Correlation of Physico-chemical Parameters and Incidence of Cholera

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Background: Most cholera pandemics started from the Ganges-Brahmaputra delta which is considered the homeland for cholera. Epidemics of cholera can be related to seasonal cycle of physico-chemical properties of the riverine-estuarine ecosystem from where vibrios originate.

Objective: Identify the links between seasonal physico-chemical changes and abundance of *vibrio* in the Gangetic delta to better understand the impact of seasonality on the incidence of cholera.

Methodology: Sampling was conducted at 4 different sites in a 120-km stretch of the Ganges river starting from Kolkata up to its estuary. Physico-chemical, bacteriological and genomic analyses were done.

Results: Salinity and TDS of the riverine environment varied in direct proportion to the distance from the sea-mouth, being higher nearer to the sea-mouth and lower at the inland periphery. Longer the distance from the sea-mouth, less was salinity of the estuarine-riverine environment, which varied from 28.5 ppt (site 1, 10 km inland) to 0.2 ppt (site 4, 130 km inland). TDS varied from 14.5 to 1,890 mg/L. TBC ranging from 8x101 to 5x104 cfu/mL highlighted the higher prevalence of vibrios and coliforms at site 1 and 4 respectively, a fact substantiated by higher CVC (6x101–6x103 cfu/mL) at site 1. In winter, although CVC was very low (almost nil) at site 3 (80 km inland), a perceptible increase in its preponderance has been noticed in summer onwards. The abundance of vibrios could not be correlated with pH value ranging from 7.54 to 9.53, irrespective of seasons and sites. Barring a few, most *V. cholerae* isolates were non-O1. Disposition of virulence genes, viz. CTXA, TCP, ACE, RTX, TOXR, and ZOT-positive *V. cholerae* has been detected in the estuarine and inland river with the rising peak of vibrio abundance in early summer.

Conclusion: High salinity and TDS seem to influence the abundance of culturable vibrio (CV) in the estuarine region compared to the inland river, albeit elevated TDS was encountered at inland condition after occasional natural calamities, which has no effect on the distribution of CV. Seasonal rising of CVC vis-à-vis toxin-producing *V. cholerae* at the nearest point of Kolkata Metropolis may reverberate the seasonality of incidence of cholera in Kolkata through which the role of the Gangetic riverine-estuarine vibrio transmission dynamics can be established.

Universal Salt Iodization: Does the Current Salt Iodization Standard Ensure Adequate Iodine Status among Pregnant Women in Bangladesh?

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Background: A small amount of iodine, an essential micronutrient, is required to maintain adequate thyroid hormone levels in the body. It is especially important to prevent irreversible brain damage up to certain age in children. The most recent guideline of the World Health Organization/United Nations Children's Fund/International Council for the Control of Iodine Deficiency (WHO/UNICEF/ICCIDD) has set the iodine requirement for pregnant women at 250 µg per day, which tends to be difficult to achieve for most countries at the current recommended salt iodization standard.

Objective: Learn whether the current WHO recommendation for salt iodization is enough to meet the iodine requirement during pregnancy.

Methodology: Systematic review of literature using specific keywords on universal salt iodization and iodine-deficiency disorders (IDDs) was conducted.

Results: According to the current WHO/UNICEF/ICCIDD guideline, the standard salt iodization is recommended at 20-40 mg of iodine per kg of salt (20-40 ppm of iodine) at the production level and 15-40 ppm of iodine at the household level. The estimated average salt intake per person per day is 10 g, which is intended to supply 150 µg of iodine per day. This level is adequate for the adolescent and adult population, except for the pregnant and lactating women's daily iodine requirement. In addition, the WHO's recommended amount of salt intake to prevent chronic diseases is 5 g per day per person. Like many other countries in the world, the iodine status of population in Bangladesh has improved since the introduction of the nationwide salt-iodization programme. However, results of recent urinary iodine studies conducted among pregnant women in Bangladesh indicate that they are at risk of iodine deficiency, and despite having the household iodized salt coverage of >80%, this has not resulted in supplying enough iodine during pregnancy.

Conclusion: The nationwide urinary iodine and average salt iodine status should be regularly monitored. Possibilities needed to be explored to improve the iodine status among this risk-group. Further strengthening of the universal salt-iodization programme, increasing the iodine concentration in salt and iodine supplementation during pregnancy as an immediate measure may result in improved iodine status.

Fitness Scoring and Its Relationship with Body-composition and Exhaled Nitric Oxide in Healthy Adults

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Background: Obesity and malnutrition are global health problems. Both expressed as body mass index (BMI) are correlated with overall morbidity and mortality. Results of studies among the general population indicate that high values of body-fat and low values of fat-free mass are independent predictors of all-cause mortality. However, little data are available on fitness scoring and body-composition in general.

Objective: Determine body-composition distribution in healthy adults of both sexes and its correlation with fitness scoring.

Methodology: In total, 428 healthy adult Saudi subjects aged 36.91±15.22 years were studied. All the participants underwent body-composition analysis. Body-composition was assessed by bioelectrical impendance analysis, with a commercially-available body-analyzer (InBody3.0, Biospace, Korea). Measurements included body-weight, BMI, waist-hip ratio, water distribution, % of body-fat, target weight, fat control, muscle control, and fitness scoring based on the target values.

Results: The mean BMI of the study population was 27.22±5.65 (median 26.80, range 15.6-55.4). While the mean fitness score was 69.3±8.48 (median 71.0, range 29-99), 13.4%, 42.1%, and 92.9% of the subjects had fitness score of <60, 60-69.9, and 70-79.9. The prevalence of underweight, normal weight, overweight, obesity class I, obesity class II and obesity class III was 2.91%, 33.81%, 35.27%, 19.46%, 6.32%, and 2.18% respectively. 7.8% of the subjects had normal body-fats, and 10.7% showed lesser body-fats than required. The presence of extra body-fats ranging from <2 kg to more than 20 kg showed varying percentage values. BMI and % of body-fat correlated inversely with fitness scoring (r=-0.479, p=0.0001, and r=0.329, p=0.002) and exhaled nitric oxide which is a marker of airway inflammation (r=0.238, p=0.009, and r=0.3926, p=0.001) respectively. Significant gender differences were observed in BMI, fitness score, % of body-fat, and other parameters of body-composition.

Conclusion: The prevalence of obesity, % of body-fat and poor fitness is high in Saudi population, with significant gender differences. Body-composition analysis gives additional important information compared to traditional anthropometric data. Public-awareness programmes, including exercise and teaching on diet, are required at a large scale to cope with the growing burden of obesity.

Implication of National Size Estimation of Persons Living with HIV/AIDS in Bangladesh

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Background: The prevalence of HIV is still low (<1%) in Bangladesh but the vulnerability is very high due to the prevalence of all risk factors. Currently, the Global Fund-supported HIV/AIDS programme is leading in creating the national response to fight HIV/AIDS; it is unique in developing capacity of self-help group organizations and supporting these in playing a leadership role in the national response.

Objective: Direct how national size estimation facilitated to design, plan and implement a successful care and support programme in a recourse-poor country like Bangladesh.

Methodology: The methods of the study included analysis of secondary data, observation of participants, in-depth interviews, focus-group discussions, and survey on people living with HIV and AIDS (PLHIV) and service providers from different parts of the country.

Results: The results showed that 946 PLHIV were receiving services in a discrete way in 45 districts of Bangladesh. Of them, 70.8% were male, 28.9% were female, and 0.3% comprised transgender population. Age distribution was: <14 years–4.0% (n=38), 15-39 years–71.8% (n=673), and <40 years–24.2% (n=229). Of the 910 adults, 70.9% had been working previously, 64.3% worked abroad, and a large proportion became unemployed after the disclosure of their HIV status. Of the 38 children, 35 contracted HIV through mother-to-child transmission, one from spouse, and 2 from blood transfusion. Of 548 PLHIV in whom CD4 counts were measured, 486 were still alive. In 147 alive persons, CD4 counts were less than 200 cells/μL; 29.9% (n=44) of the PLHIV with CD4 count of less than 200 cells/μL were not under antiretroviral drug therapy (ART) and urgently needed ART. Using the findings, care and support programmes for the PLHIV were designed to ensure the rights and well-being of the PLHIV through comprehensive continuum of care. The programme was unique with expanding clinical services through capacity-building in both government agencies and NGOs, strengthening the government set-up, and established referral linkage with other high-risk people, such as sex workers, injecting drug-users, men having sex with men, and *hijra* high-risk group. The programme also sent any identified HIV- positive person to the care and support programme. From 2008 to 2010, an immense achievement was the provision of antiretroviral drugs to 400 PLHIV and sensitizing 38,788 community people in 51 districts; 75 PLHIV changed their economic status through vocational training and grant money.

Conclusion: Capitalizing the experience, care and support for the PLHIV contributed to rapid scaling and synergizing the national response.

Acknowledgements: The authors thank the Global Fund that provided financial support to the project and the implementing partners for successful implementation of the programme.

Report of Sociodemographic Variables, Rate of Opportunistic Infection, Immunity, and Antiretroviral Treatment Status in People Living with HIV/AIDS in Bangladesh

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Background: During 6 January 2007-5 May 2009, people living with HIV/AIDS (PLWHA) were recruited aiming at establishing and validating the p24-Elisa as a cost-effective and alternative viral load marker for disease progression in Bangladesh. Here key baseline data from this ongoing cohort study are presented.

Objective: Report sociodemographic characteristics and proportion of opportunistic infection (OI), biomarkers and antiretroviral treatment (ART) status of HIV patients.

Methodology: Analysis was done among 190 participants at baseline visits. At baseline visit, CD4+T-cell counts and viral RNA loads were measured, clinical examinations were carried out, and a pre-structured questionnaire was filled up. Data were entered and analyzed by central tendency, dispersion and chi-square tests using the SPSS software (version 17).

Results: Of the participants, 57 were injecting drug-users; the mean age was 33±8.7 years; 74% were male; 27% were illiterate; 80% were Muslim; and 55% patients lived in Dhaka district. About 43% [male vs female: 84% vs 16%] participants had a history of staying or working outside Bangladesh. Twenty-two percent (n=41) showed a CD4+ T-cell count of <200 cells/µL at baseline visit. Of them, 56% were not on ART, although the national guidelines recommend treatment initiation at this time point. Of 19 patients who were suffering from OI at baseline, 84% (n=16) showed <200 CD4+T-cells/µL whereas only 3 patients (16%) showed OI at higher CD4+ values. Of 62 ART-experienced patients, 77% showed viral load of <400 copies/mL whereas only 5% of 128 ART-naive study participants showed viral load of <400 copies/mL. High viral RNA load (>10,000 copies/mL) showed a highly significant ($p<0.01$) association with CD4+T-cell count of <200 cells. ART-naive patients showed significantly ($p<0.05$) higher viral RNA load (log10 4.9 vs 4.4 copies/mL) than the ART-experienced patients.

Conclusion: In addition to the well-characterized HIV epidemic in people injecting drugs, male migrant workers might play an important role in fueling the HIV epidemic in Bangladesh. Based on the viral RNA load measurements, adherence of patients to ART seems to be high, indicating that the PLWHA are well-informed. Further studies need to be carried out to find out what the implications of these findings are for the HIV epidemic in Bangladesh.

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Variability in Climatic Factors and Dengue in Urban Dhaka

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Background: Sensitivity of particular health outcomes (i.e. dengue) to climate-induced environmental changes is an unresolved question. It is important to examine how temperature, humidity, and rainfall affect the same population at different points in time in respect of hospitalization due to dengue.

Objective: Examine from the recent past evidence of correlation between climatic variability (in respect of temperature, humidity, and rainfall) and hospitalization due to dengue.

Methodology: This ecologic study was conducted in a highly-urbanized area in zone 10, Uttara of Dhaka City Corporation. Cases were residents of Uttara, who had been hospitalized in the recent past in any of the 3 selected hospitals of the area and discharged as a case of dengue. Data were obtained from the hospital-records using a structured questionnaire. Data on climatic variables were obtained from the meteorological department of the Government of Bangladesh. Trends and seasonality of hospitalization for dengue were analyzed during January 2008–November 2009. Spearman rank correlation was done to examine linear association between the climatic factors and the outcome. The Ethical Review Committee of James P. Grant School of Public Health, BRAC University, approved the study.

Results: Average monthly humidity, at lag of 0-12 weeks, average monthly minimum temperature at lag of 0-12 weeks, and rainfall at lag of 4-12 weeks were positively associated with monthly hospitalizations due to dengue at Uttara across the study period. Average monthly maximum temperature had a significant association with hospitalizations due to dengue at lag of 12-16 weeks. Hospitalization for dengue showed seasonality from July to December, reaching its peak in September in both 2008 and 2009.

Conclusion: The findings suggest that intensive vector-control measures taken 8-12 weeks before the anticipated outbreak of dengue can prevent its epidemics. A larger, fully-powered study is needed to confirm the findings.

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Rapid Increase of Tetracycline-resistant *Vibrio cholerae* in Dhaka, Bangladesh, during 2000-2009

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Background: Emergence of multidrug resistance (MDR) among enteric pathogens against commonly-used antimicrobials remains a major public-health problem worldwide. Resistance to newer antimicrobials is also increasing.

Objective: Review the tetracycline resistance pattern of *Vibrio cholerae* O1 isolated from diarrhoeal patients attending the Dhaka Hospital of ICDDR,B during January 2000–December 2009.

Methodology: Faecal samples were cultured in the Clinical Microbiology Laboratory of ICDDR,B for enteric pathogens, including *V. cholerae* following standard procedures. The isolates were tested for antimicrobial susceptibility following the Clinical and Laboratory Standards Institute guidelines using the disc-diffusion method to ciprofloxacin, co-trimoxazole, erythromycin, and tetracycline.

Results: Of 160,270 faecal specimens, 39,713 (25.0%) yielded various enteric pathogens during the study period. Of the major isolates, *V. cholerae* O1 was 40% (15,812 of 39,713), followed by 30% (11,960 of 39,713) of *Shigella* spp., 17.24% (6,845 of 39,713) of *Aeromonas* spp. 7.61% (3,021 of 39,713) of *Salmonella* spp. 5.19% (2,062 of 39,713) of *Plesiomonas* spp.. All the isolates of *V. cholerae* O1 were of El Tor biotype, with almost an equal number of the Inaba and Ogawa serotypes (51% vs 49%). Irrespective of the serotype of *V. cholerae* O1 isolates, none was resistant to ciprofloxacin while all were resistant to co-trimoxazole. Erythromycin resistance was 57% in 2005 for *V. cholerae* O1, which decreased gradually from 29% in 2006, 1% in 2007, and 0% in 2008. No resistance to tetracycline was observed during 2000-2003. In 2004, resistance to tetracycline was observed in 1% cases infected with Ogawa, not with Inaba. Tetracycline-resistant strains of *V. cholerae* O1 increased to 76% in 2005 and fluctuated from 47% to 51% to 69% to 86% between 2006 and 2009. Although the serotype Inaba was more frequently isolated than Ogawa, a contrasting tetracycline resistance pattern was observed between Ogawa and Inaba during 2005-2009 (95 vs 19; 98 vs 5; 95 vs 6; 94 vs 9, and 86 vs 94 percent respectively).

Conclusion: Resistance to tetracycline re-emerged in 2004 onward (1%), which increased to 87% in 2009. This rapidly-increasing resistance of *V. cholerae* O1 isolates to tetracycline is alarming and might have an implication in selecting therapeutic drug for treating cholera cases.

Acknowledgements: The study was funded by ICDDR,B and its donors which provide unrestricted support for operations and research.

Vibrio cholerae O1 Infection Induces Robust Pro-inflammatory CD4+ T-cell Responses in Blood and Intestinal Mucosa of Infected Humans

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Background: *Vibrio cholerae* O1 colonizes on the epithelial surface of the small intestine. Although symptomatic *V. cholerae* infection induces durable protection against subsequent disease, vaccination with oral cholera vaccines stimulates less long-lasting protective immunity against cholera. Unlike humoral responses, T-cell responses to *V. cholerae* infection have not been well-characterized. An earlier study of the author has shown memory CD4+ T-cell responses in acute cholera patients, which indicates that T-cell may contribute to the development of longer-lasting B-cell responses seen after natural infection.

Objective: Examine the profile of cytokine-secreting CD4+T-cells following either cholera infection or vaccination.

Methodology: *V. cholerae* O1-infected Bangladeshi adult cholera patients and Dukoral (WC-rBS) vaccine recipients were enrolled. CD4+T-cell responses were assessed by intracellular cytokine staining following stimulation of peripheral blood mononuclear cells with *V. cholerae*-specific antigens. Different cytokine responses were analyzed also in culture supernatants and lamina propia lymphocytes.

Results: The study demonstrated that natural cholera infection induces an early pro-inflammatory cellular immune response that results in Th1 and Th17-type cytokine responses after *ex vivo* antigenic stimulation, with a shift towards Th1>Th2 CD4+T-cell responses. These adaptive cellular immune responses correlated with the subsequent development of memory B-cell responses to cholera antigens. A comparable early shift in Th1 to Th2 ratio of cytokine production was not observed in subjects who received 2 doses of the Dukoral vaccine, and a previous study has shown that these latter individuals do not develop long-term memory B-cells following natural infection.

Conclusion: The findings suggest that natural cholera infection induces an early, robust pro-inflammatory cellular immune response. The failure of the WC-rBS vaccine to activate equivalent, pro-inflammatory CD4+T-cell responses may be an explanation for the shorter duration of protection following this vaccine. Detection of early T-cell-mediated events may help predict the subsequent longer-term protective efficacy. To further characterize the role of early CD4+T-cell responses in cholera, it is planned to evaluate the role of Th17 cells and regulatory T-cells and involvement of other key factors in immune responses to cholera.

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Burden of Diabetes in Bangladesh: Analysis and Hope

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Background: Recent findings demonstrate the trend of raising prevalence of chronic diseases in many low- and middle-income countries and having a significant impact on healthcare costs and economic development. The prevalence of specific chronic diseases such as diabetes is increasing in many Asian countries, such as Bangladesh, India, Sri Lanka, and China, which are also dealing with the undernutrition problem with their existing resources.

Objective: Highlight the burden of diabetes, risk factors that may explain its growing prevalence, and the inadequacy of current health system in Bangladesh to manage the disease.

Methodology: The study was mainly based on review of literature and content analysis. Relevant full articles (both academic and popular), abstracts, and reports were reviewed from relevant journals searching through PubMed during 1970-2010.

Results: The rapid escalation of the prevalence of specific chronic diseases such as diabetes has been a high incident in low-income countries such as Bangladesh. The trend of diabetes in rural areas has increased from 0.003% in 1976 to 6.8% in 2007, explaining the risk factors, i.e. trend of childhood underweight in rural areas from 57.8% to 43.0% between 1996 and 2007, trend of maternal underweight in rural areas from 53.8% in 1996 to 32.6% in 2007, trend of maternal overweight from 5.8% in 2004 to 8.2% in 2007, urban growth from 2.3% to 23.0% between 1901 and 2001, and inadequacy of the current health system to manage this problem in Bangladesh. Despite vertical focus on tackling undernutrition, a large number of Bangladeshi children and mothers are still underweight, becoming the victims of metabolic disorders. The trend of overnutrition among women is also on the rise, pushing these women under the risk of being diabetic. In addition, rapid urbanization, stress, harmful use of tobacco, modern lifestyle, and longer life-expectancy are also acting as an enabling factor to this problem.

Conclusion: To tackle this overwhelming burden of diabetes, there is still lack of prioritisation both from Government and aid agencies. Now, Bangladesh needs immediate action for prevention, screening for early detection and control of non-communicable diseases through lifestyle modification at the community level.

The First National Prevalence Survey of Mineral Deficiency Shows High Burden of Childhood Rickets in Bangladesh

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Background: Rickets is a condition of softening of bones in children, potentially leading to fractures and deformity. The National Rickets Prevalence Survey was conducted to explore the prevalence of rickets assuming that, in addition to determining the overall prevalence and determination of biochemical markers in patients with clinical rickets, the survey would help identify the factors associated with rickets.

Objective: Estimate the first national survey of rickets among children aged 1-15 years with their nutritional status and biochemical profiles.

Methodology: Twenty thousand children aged 1-15 years were randomly selected from 6 divisions of Bangladesh. Clinical diagnostic signs, radiological signs of active rickets, and anthropometric measurements (weight, height, and mid-upper arm-circumference) were recorded by direct observation. Blood samples were tested for biochemical markers.

Results: Rickets was found in every division of Bangladesh. A total of 197 rachitic cases were diagnosed with a prevalence rate of 0.99%. Radiologically, 24% were at active phase, 34% were in growing phase, and 42% were not in active phase. The prevalence of severe stunting, underweight, and wasting were 53%, 40%, and 1.4% respectively. About 98% of the children were vitamin D-deficient, and 48% were calcium-deficient. Dietary factors were significantly related with rachitic children.

Conclusion: The results of the first-ever national rickets survey estimated that about 550,000 children aged 1–15 years have been suffering from rickets in Bangladesh, who need urgent attention for treatment and prevention. An appropriate policy for treatment and prevention formulation is strongly recommended.

Acknowledgements: Successful completion of the National Rickets Survey was possible for the financial and technical support from UNICEF, CARE, NNP, BRAC, and Plan Bangladesh.

Plasmid-profiling Facilitates Detection of Invasive *Shigella* and Enteroinvasive *Escherichia coli* Directly from Enriched Stool Culture Broth of Diarrhoeal Patients

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Background: Bacillary dysentery caused by *Shigella* species is a serious public-health problem in both developing and industrialized countries. No known *Shigella* spp. could be isolated from 40% of clinical shigellosis cases. Detection of *Shigella* species is difficult due to their low infectious dose by traditional culture methods, which urges for the development and optimization of diagnostic tools.

Objective: Facilitate the detection of invasive *Shigella* and enteroinvasive *Escherichia coli* (EIEC) directly from enriched stool culture broth of diarrhoeal patients, using plasmid analysis as a diagnosis tool.

Methodology: *Shigella* species were detected, isolated, and characterized from 391 stool samples collected from clinically-invasive diarrhoeal patients from an urban area of Bangladesh during July-December 2010 using standard microbiological and molecular methods: culture method, biochemical tests, and serotyping, PCR for *ipa*H gene and plasmid-profiling analysis, and colony detection by hybridization using *ipa*H gene probe.

Results: Of the 391 stool samples, 47 (12%) strains of known *Shigella* species were isolated using conventional culture methods. *ipa*H gene, specific for all *Shigella* spp. and EIEC, and 140 MDa invasive plasmid were present in all and 42 (90%) known strains respectively. Of the 47 known strains, *Shigella flexneri* was the dominant (n=24, 51%), followed by *S. sonnei* (n=18, 39%), *S. boydii* (n=2, 4%), and *S. dysenteriae* (n=2, 4%), and novel *S. dysenteriae* (n=1, 2%). Of 344 culture-negative stool samples, both *ipa*H gene and 140 MDa plasmid were present in 18 (5%) samples, and only *ipa*H gene was positive in 35 (10%) samples. Hybridization was done in replica plates of 18 samples of both *ipa*H gene and 140 MDa-plasmid presence of enriched broth with *ipa*H probe. Nine *Shigella*-like organisms (SLO) and 2 EIEC were detected in the 18 samples. All these 9 SLOs showed biochemical properties typical of *Shigella* species. These strains might be known *Shigella* species, or new variants of *Shigella* species. Similarly, further studies for the detection and characterization of SLOs and EIEC of the remaining samples are being done.

Conclusion: Plasmid analysis is considered to be a potential tool in epidemiological studies of invasive diarrhoea.

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Mechanism of Fluoroquinolone Resistance in *Salmonella* Typhi

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Background: Typhoid fever remains a major cause of morbidity and mortality worldwide. Ciprofloxacin, a fluoroquinolone antimicrobial agent, is generally highly effective in treating typhoid fever. The emergence and characterization of ciprofloxacin resistance in Bangladesh are reported.

Objective: Characterize the molecular mechanism of fluoroquinolone resistance in *Salmonella* Typhi strains recently isolated in Bangladesh.

Methodology: In total, 765 *S.* Typhi strains were isolated at the Clinical Microbiology Laboratory of ICDDR,B during 2006-2008. Screening for susceptibility to commonly-used antibiotics, such as ampicillin, chloramphenicol, sulphamethoxazole-trimethoprim, nalidixic acid, and ciprofloxacin was done by disc-diffusion method. Minimum inhibitory concentration (MIC) was determined by E-test following the recommendations of the Clinical and Laboratory Standards Institute (CLSI). Plasmid profiling, PFGE, and sequencing analysis were performed to determine the clonal relationships and mutations in quinolone resistance-determining region (QRDR).

Results: Of the 765 *S.* Typhi strains, 474 (62%) were resistant to nalidixic acid. Of the 474 nalidixic acid-resistant strains, 402 (85%) were classified as moderately susceptible to ciprofloxacin. Resistance to ciprofloxacin increased from 18 (2.8%) in 2006 to 11 (4.5%) in 2008. The isolates classified as moderately susceptible to ciprofloxacin had MICs ranging from 0.064 to 0.25 ìg/mL opposed to those classified as ciprofloxacin-resistant that had MICs ranging from 6 to 32 ìg/mL. Antimicrobial susceptibility of *S.* Typhi showed that 60%, 61%, and 60% of the strains were resistant to ampicillin, chloramphenicol, and sulphamethoxazole-trimethoprim respectively. Sequence analysis of QRDR of resistant strains revealed that all had mutations in *gyr*A (Ser83 ® Phe) and/or (Asp87 ® Asn or Gly) and a single mutation in parC (Ser80 ® Ile) whereas none of the susceptible strains had the mutation in their QRDR region. The multidrug-resistant (Amp, Chl, Sxt, Nal) strains appeared to be clonally related as only a single pattern was observed in these strains by PFGE.

Conclusion: The present study reports the mutation in the QRDR of fluoroquinolone-resistant *S.* Typhi from Bangladesh. The decreasing susceptibility of *S.* Typhi for ciprofloxacin is a worrying phenomenon that has great impact on the emperic treatment of typhoid fever.

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Effect of Daily Intake of Prebiotic (Fructo-oligosaccharide) on Weight Gain and Reduction of Acute Diarrhoea among Children in an Urban Slum in Bangladesh: A Randomized Double-blind Placebo-controlled Trial

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Background: Fructo-oligosaccharide (FOS), a typical prebiotic agent, is useful in preventing certain diseases by stimulating growth of bifidobacteria and lactobacilli in gut.

Objective: Evaluate the effect of an FOS-containing solution on body-weight gain and reduction in diarrhoea episodes in peri-urban children in Bangladesh.

Methodology: A randomized, double-blind, placebo-controlled study was conducted on 150 children aged 25-59 months; 75 received 50 mL of isotonic solution with 2 g of FOS (FOS group), and 75 received a similar-looking solution (placebo group) once daily over 6 months. Body-weights and heights were monitored on alternate days and once every month respectively. Mothers of children were interviewed to obtain history of diarrhoea, stool consistency and contents, other morbidities, and antibiotic treatment.

Results: The number of diarrhoea episodes was less in the FOS group compared to the placebo group. However, the difference was not statistically significant. The total mean duration of diarrhoea and each episode of diarrhoea were significantly shorter in the FOS group (3.3 vs 6.3 days, p=0.039 and 2.5 vs 3.2 days, p=0.008 respectively). The body-weight gain during the 6-month period in the FOS group (0.86±0.55 kg) and the placebo group (0.89±0.48 kg) was not significantly different, and so were the height and the mid-arm circumference.

Conclusion: A daily intake of FOS shortens the duration of diarrhoea but is not useful in promoting weight gain or in preventing diarrhoea. Further studies with optimizing doses of FOS are needed to define better therapeutic effects in children.

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Role of Fertilizers in the Growth of Phytoplankton and *Vibrio cholerae* O1 in a Pond Ecosystem in Matlab, Bangladesh

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Background: Cholera, a water-borne disease, is caused by *Vibrio cholerae* O1 and O139. Fertilizers used in Bangladesh are mainly urea and triple super phosphate (TSP) which are the major sources of nitrate and phosphate for growing crops. Due to excessive use of fertilizers, the unused fertilizer finally reaches the nearby surface-water sources by a number of ways, such as run-off, leaching, etc. This unused fertilizer acts as nutrients which enhances the growth of phytoplankton, the reservoir of *V. cholerae*.

Objective: Investigate the effect of fertilizers on the growth of phytoplankton and *V. cholerae* O1 in the pond ecosystem in Matlab, a cholera-endemic area of Bangladesh.

Methodology: Sampling was done at 15-day interval from October 2008 to November 2009 from a pond situated near agricultural land at Matlab. The enumeration of viable but non-culturable (VBNC) *V. cholerae* O1 was performed following direct fluorescent antibody (DFA) technique. Nitrate-nitrogen (NO3-N) and phosphate-phosphorus (PO4-P) were measured using ultraviolet/visible spectrophotometer. Concentration of chlorophyll A was measured by fluorometric method. Phytoplanktons were counted using a light microscope. Correlation among nutrient concentrations, phytoplankton abundance, and DFA counts of *V. cholerae* O1 was analyzed using the SPSS software (version 11.5).

Results: In the studied pond, bloom of phytoplankton (106 cells/L) occurred in different periods of the year by the dominating groups of phytoplankton—Cyanophyceae and Chlorophyceae. The DFA counts in water varied from 107 to 3,836 cells/mL during the study period. Nitrate and phosphate concentrations showed an inverse relationship with total phytoplankton whereas chlorophyll A showed positive correlation with total phytoplankton. DFA counts of *V. cholerae* O1 and chlorophyll A, and Chlorophyceae counts were positively correlated.

Conclusion: The concentration of chlorophyll A correlated with phytoplankton abundance. The growth of *V. cholerae* also correlated with the growth of phytoplankton. Therefore, phytoplankton plays an important role in survival and multiplication of *V. cholerae* in the aquatic environment in Matlab, Bangladesh.

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Virulence Genes and Antibiotic Sensitivity Pattern of *Aeromonas* spp. Isolated from Environmental and Clinical Sources

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Background: *Aeromonas* spp., autochthonous to environment, are the causative agents of a number of infectious diseases, including diarrhoea. These are increasingly being reported as important emerging pathogens for humans and lower vertebrates.

Objective: Isolate and identify *Aeromonas* spp. from environmental and clinical samples and investigate the distribution of virulence genes and antibiotic sensitivity pattern of the isolated strains.

Methodology: Sampling was done at 15-day interval from August 2006 to September 2007 to collect water, phytoplankton, zooplankton, and crab from freshwater sources (pond, canal, and river) of Matlab, Bangladesh. Water samples were also collected from diverse sources (wastewater, brackish and tap-water) occasionally. *Aeromonas* spp. were isolated from insects, arthropods, fish, amphibians, reptiles, and birds. Rectal swabs were collected from patients at the ICDDR,B hospital in Dhaka. *Aeromonas* spp. were identified following conventional culture method. Virulence genes—cytotonic enterotoxin (act) and cytotoxic enterotoxin (*ast* and *alt*)—were detected using multiplex PCR. Antibiotic sensitivity pattern of tetracycline, gentamicin, ciprofloxacin, trimethoprim-sulphamethoxazole, and nalidixic acid was determined using disc-diffusion method.

Results: In total, 360 strains of *Aeromonas* spp. were isolated from various sources. PCR results showed that 102 of 252 randomly-selected strains harboured one or more virulence genes. The number of *act* gene-carrying strains were the highest (23.81%), followed by *alt* (15.87%) and *ast* (5.95%)-containing gene. All the selected virulent strains (n=91) were sensitive to ciprofloxacin but showed variable resistance to other antibiotics used.

Conclusion: Multiple virulence genes are present in environmental isolates but only a selected strain with single virulent gene causes human disease. Ciprofloxacin should be the choice of drug for the treatment of *Aeromonas* spp.-related infection. Further study needs to be conducted to find out why only the single virulent gene-harbouring strains are causing human disease.

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Phenotypic and Genotypic Characterization of *Vibrio cholerae* O1 Isolated from Patients and Water Sources in Matlab, Bangladesh

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Background: Cholera, caused by toxigenic *Vibrio cholerae* O1 and O139, is a major health problem in developing countries such as Bangladesh where outbreaks occur in a regular seasonal pattern and is related with unsafe sources of water used for drinking and household purposes.

Objective: Investigate the similarity of *V. cholerae* O1 strains isolated from clinical and environmental sources in Matlab, Bangladesh.

Methodology: Twenty suspected cholera patients of the Matlab Hospital of ICDDR,B were selected, and their rectal swab samples were collected. Patients were interviewed about water-use pattern using a structured questionnaire. Information on water used for drinking or household purposes by the patients at home was also collected. *V. cholerae* O1 was isolated from rectal swab and water samples using conventional culture method. Phenotypic and genotypic methods, including mismatch amplification mutation assay (MAMA)-PCR, were employed to characterize the isolated strains. Antibiogram was performed using commonly-used antibiotics by disc-diffusion method.

Results: All the 20 (100%) rectal swab samples and 5 (25%) water samples yielded *V. cholerae* O1 biotype El Tor serotype Ogawa. The PCR results showed that all the 25 isolates possessed *rfb*O1, *omp*W, *ctx*A, *zot*, *ace*, *tcp*A (El Tor), *hly*A, *tox*R, *rst*R2 genes, and *tcp*A (classical), *rst*R1, *rst*R3, and *rst*R4 genes were lacking. All the strains were classified as altered variant of *V. cholerae* O1 El Tor Ogawa but carrying haemolysin gene (*hly*A) for both El Tor and classical biotypes. All the isolates were sensitive to ciprofloxacin, azithromycin, ampicillin, and chloramphenicol but resistant to tetracycline, nalidixic acid, penicillin G, and trimethoprim-sulphamethoxazole.

Conclusion: *V. cholerae* O1 strains isolated from the patients and from the surrounding environmental water sources were similar in phenotypic and genotypic characteristics, which indicate that the patients acquired cholera from the environment as *V. cholerae* O1 is the autochthonous member of the environmental water.

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Enumeration and Identification of Pathogenic Bacteria from Different Water Sources of Matlab, Bangladesh

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Background: Waterborne diseases are the major cause of morbidity and mortality in developing countries like Bangladesh where disease outbreaks occur due to unsafe drinking-water, inadequate sanitation, and poor hygienic practices.

Objective: Evaluate the quality of water used for drinking and household purposes in Matlab, Bangladesh, which is a low-lying and arsenic-prone area.

Methodology: Twenty-eight water samples were collected from 18 ponds, 4 canals, 1 river, and 5 tubewells in Matlab. Physico-chemical parameters were monitored using portable meters. Total coliforms, faecal coliforms, faecal streptococci, and *Escherichia coli* were enumerated using membrane-filtration and spread-plate techniques following standard procedures. Tests for pathogenic bacteria, e.g. *E. coli*, *Vibrio cholerae*, *Salmonella* spp., and *Shigella* spp. were also performed using conventional culture method and PCR.

Results: All water sources were contaminated with total colifoms, faecal coliforms, faecal streptococci, and *E. coli*, except 2 tubewell-water samples. The physico-chemical properties of water samples varied from source to source. The highest count of total coliforms and *E. coli* was observed in inner embankment pond 1 and canal 1 where the counts were 2.7x104cfu/mL and 1.3x104 cfu/mL respectively. In the case of inner embankment pond 3, both faecal coliforms and faecal streptococci were the highest compared to other sources, which was 1.8x104 cfu/mL and 6.2x104 cfu/mL respectively. Sixty-three randomly-selected strains, 4 and 1 strain(s) were enteropathogenic and enterotoxigenic *E. coli* respectively. In total, 17 *V. cholerae* non-O1/non-O139 strains were isolated and detected using culture and PCR technique respectively. No *Salmonella* or *Shigella* spp. were detected.

Conclusion: Surface-water was contaminated by various pathogenic bacteria. Therefore, before using the surface-water for various household purposes, including drinking, must be decontaminated.

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Survival of Enterotoxigenic *Escherichia coli* in Association with *Anabaena variabilis* in Microcosms

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Background: Enterotoxigenic *Escherichia coli* (ETEC) is an important enteropathogen in children aged <5 years causing approximately 840 million diarrhoeal episodes and significant mortality annually. ETEC is autochthonous in environmental freshwater sources but its association with aquatic plant, mainly phytoplankton, is not known.

Objective: Investigate the growth and survival of ETEC in association with a blue-green alga—*Anabaena variabilis*—in microcosms.

Methodology: Survival of culturable ETEC in microcosms was assessed using MacConkey agar plate following standard procedures. Chromosomal DNA of the isolated ETEC from microcosm at different time-intervals were extracted to detect the viable but non-culturable (VBNC) ETEC using polymerase chain reaction (PCR), targeting its *elt*B and *est*A gene.

Results: In control water, culturable ETEC was observed up to 35 days whereas in both algal water samples (where *A. variabilis* was floating) and in association with *A. variabilis*, the culturable count was observed up to 56 days. ETEC count was higher in *A.* variabilis compared to algal water. VBNC state of ETEC was detected through PCR up to 60 days in *A. variabilis* and algal water samples but could not be detected in control water at Day 45.

Conclusion: Both culturable and viable but non-culturable ETEC could survive longer in association with algae than the control water where there was no algae. It indicates that ETEC in the aquatic environment prefer algal host than water. ETEC remains in culturable and VBNC state in association with *A. variabilis* for longer time without losing its pathogenic properties but the mechanism of association of the bacteria with the microscopic plant still remains a mystery which needs to be studied.

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Role of Transposons in Antibiotic Resistance among *Vibrio cholerae* O1 Isolates

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Background: Pathogenic bacteria develop antibiotic resistance due to the indiscriminate use of antibiotics, especially in developing countries. Transposons play an important role in developing antibiotic resistance.

Objective: Find out the role of transposons in spreading antibiotic resistance genes of *Vibrio cholerae* O1.

Methodology: Antibiotic susceptibility pattern of the clinical isolates of *V. cholerae* O1 from Bangladesh and Zimbabwe were investigated following standard procedures. The presence of antibiotic-resistant genes (*flo*R, *str*A, and *sul*2) and integrase gene (an integral part of transposons) were determined by PCR. Finally, integrase-positive isolates were subjected to another round of PCR to determine whether the tranposons in them belonged to SXT/R391 integrated conjugative element group which is a particular sub-group of transposons.

Results: Multidrug-resistant phenotype was observed among the isolates. Seventy-one percent of the isolates each from Zimbabwe (12 positive isolates out of 17) and Bangladesh (5 positive isolates out of 7) were positive for chloramphenicol-resistant gene (*flo*R). In the case of integrase gene, 41% and 71% of the isolates from Zimbabwe and Bangladesh respectively were positive. The majority (69%) of the isolates possessing class 1 integron had resistant genes against at least 2 antibiotics. However, none of the integron-positive isolates belonged to the group of SXT or R391.

Conclusion: There are several ways to transfer the resistant gene, and transposon is one of them. Integrating-conjugative elements should not be considered just means of transmission of resistance among *V. cholerae* clinical strains but are a potential vector for genetic information and widely distributed among bacterial strains of different origins. Therefore, further studies need to be conducted to reveal other ways of transfer of the resistant genes.

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Substance-abuse: Effects of Interventional Measures in a Selected Community in Pakistan

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Background: According to the World Health Organization (WHO), 5 million people die annually worldwide due to consumption of tobacco and related products (*pan*, *chalia*, and *gutka*), which are a risk factor of cancer, lung and cardiovascular diseases. This figure will climb to 10 million by 2025. People in the Sindhi para-community located in Golimar Karachi, Pakistan, are abusing those substances. Chewing *gutka* is a problem found in all 55 families in a community and has devastating effects on all body systems. The magnitude of this problem is high and it has a prevalence of 80% and can cause serious disease of buccal and throat cancer. A project was undertaken to address this problem.

Objective: Identify the project's planning phase, discuss the strategies to prevent the community from chronic and serious illnesses for implementation at the field level, integrate principles of primary healthcare (PHC), and discuss the nurses' role in implementation and its sustainability.

Methodology: The project is divided into 4 cycles (assessment, implementation, priority setting, and evaluation). In total, 55 families were randomly selected to identify the substance-abusers and their awareness about complication associated with substance-abuse through a questionnaire. The planned strategies included: teaching and training community volunteers group, plan to conduct session with cooperation of *qari* and counsillor, counseling session with individual participants for quiting *pan*, *chalia*, and showing video on *gutka*. For sustainability, nurses conducted training sessions for community health workers to deliver health education and donated teaching materials and CDs to community and PHC units. The Aga Khan Social Welfare Board was also involved for further follow-ups. The SPSS software download version 12 was used for data analysis. Female and males aged 15 to 20 years were targeted. They have studied till eight classes and live in Sindhi para community.

Results: At baseline, of the 55 families, 74.5% of females (n=41) and 24.5% of males (n= 14) were substance-abusers; 39.8% were aware and 60.20% were not aware of complications; 49.1% wished and 50.9% did not want to quit; and 65.5% were ready for motivation towards quitting. After the intervention, 92.7% were aware of complications; 63.6% wished to quit; 81.8% were motivated towards quitting.

Conclusion: The project followed a systemic approach. It can hypothetically be predicted that whenever there is increase in knowledge, attitude, and positive behaviour, there is a change in the practice. On the basis of evidence, it can be hypothesized that volunteers will be able to conduct sessions and identify clients suffering from withdrawal signs and send them to the nearby health facility. Continuation of intervention is recommended, and time period should be extended, with frequent follow-ups. The limitation of the study was that it was targeted to small group, and there was resistance from the community that there should be separate sessions from both male and female; we arranged separate sessions for them. On long-term basis, we were unable to follow up the targeted people.

Carotenoids and Selected Nutrient Contents of Palmyra-palm Fruit: A Monsoon Fruit of Rural Bangladesh

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Background: Micronutrient malnutrition is a widespread public-health problem in developing countries, including Bangladesh. Orange-yellow fruits are rich in provitamin A (β-carotene) and are effective in improving vitamin A status.

Objective: Promote the use of a popular indigenous fruit—palmyra-palm-fruit—of Bangladesh aiming at addressing micronutrient deficiency.

Methodology: The study was designed to analyze palmyra-palm fruit for its carotenoids, carotene profile (ß-carotene, lycopene, lutein, ß-cryptoxanthin), minerals, and proximate nutrients. Carotenoid and carotene profiles were analyzed by spectrophotometric and HPLC methods. Mineral content was estimated by wet digestion, followed by analysis with atomic absorption spectrophotometer. Proximate nutrients were analyzed by standard AOAC methods.

Results: The results showed that the total carotenoid content was 3455.48±550.87 µg/100 g while the estimated carotene profile was 438.50±99.70 µg/100 g for ß-carotene, 849.50±6.36 µg/100 g for lycopene, 98.65±5.01 µg/100 g for lutein, and 156.50±3.67 µg/100 g for ß-cryptoxanthin. Zinc, iron, sodium, potassium, calcium, magnesium, and phosphorous contents were 11.32±1.69 mg/100 g, 2.98±0.65 mg/100 g, 585.20±42.85 mg/100 g, 792.55±81.24 mg/100 g, 11.60±1.98 mg/100 g, 76.53±2.65 mg/100 g, and 56.35±3.88 mg/100 g respectively. Moisture, protein, fat, ash, crude fibre, carbohydrate, and reducing sugar contents were 78.71±2.81%, 2.05±0.28%, 1.01±0.06%, 0.95±0.23%, 0.69±0.16%, 15.75±2.33%, and 4.78±0.13% respectively.

Conclusion: The popular palmyra-palm fruit is a good source of carotenoids, ß-carotene, and minerals. It could, therefore, be promoted as a good dietary source of micronutrients as part of food-based approaches for combating micronutrient deficiencies. These data would also enrich the food-composition database.

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Prevalence and Antimicrobial Resistance Patterns of Different *Shigella boydii* Serotypes Isolated from Patients with Acute Diarrhoea in Dhaka, Bangladesh

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Background: *Shigella boydii* has recently been considered the second-most dominant species of *Shigella* associated with diarrhoeal diseases in Bangladesh. To date, no study has been carried out to elucidate the actual prevalence and antimicrobial resistance pattern of *S. boydii* in Bangladesh.

Objective: Measure the actual prevalence and antimicrobial resistance patterns of different *S. boydii* strains in Bangladesh.

Methodology: From January 1999 to October 2009, 10,225 *Shigella* species were isolated using standard microbiological and biochemical methods from diarrhoea patients attending the Dhaka Hospital of ICDDR,B. The *S. boydii* strains were confirmed and characterized using different methods, such as serotyping, antibiotic resistance, and plasmid-profile analysis.

Results: Of the10,225 *Shigella* species, *S. flexneri* was dominant (63%, n=6,441) followed by *S. boydii* (17.4%, n=1,779). Of the 1,779 *S. boydii* strains, 551 were randomly selected and serotyped, of which serotype 12 was dominant (23.85%, n=131), followed by serotype 14 (7.95%), 4 (7.18%), 5 (6.15%), 11 (5.90%), 1 (5.38%), 8 (4.87%), 13 (4.36%), 2 (3.85%), 18 (2.82%), and 15 (2.31%). A significant number of isolates (21%, n=115) agglutinated only with the polyvalent sera specific for *S. boydii* but not with the type-specific sera designated as atypical. In the previous studies from 1978 to 2001, the prevalence of most serotypes of *S. boydii* was found. Interestingly, no atypical strains were isolated. Antimicrobial susceptibility of the recent isolates showed that 34%, 42%, 18%, and 2% of the strains were resistant to ampicillin, sulphamethoxazole-trimethoprim, nalidixic acid, and mecillinam respectively. None of the strains was resistant to ciprofloxacin. All strains of *S. boydii* type 4 and 5 were susceptible to all antibiotics tested. Plasmid-profiling revealed heterogeneous pattern signifying their diversity. Most strains harboured 140-MDa plasmid, were positive for the *ipa*H gene, and had the ability to bind Congo red, and representative strains were positive for keratoconjunctivitis in the guinea pig's eye, attesting their invasive properties.

Conclusion: The study is the first one to address the prevalence and antimicrobial resistance pattern of *S. boydii* in Bangladesh, which may help in the control of diarrhoeal diseases in Bangladesh and around the world.

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Extended-spectrum β-lactamase-producing *Salmonella* Species Isolated from Diarrhoea Patients in Bangladesh: Characterization and Their Possible Routes of Transmission

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Background: Resistance of *Salmonella* to extended-spectrum cephalosporins (ESCs), especially third-generation cephalosporins (ceftriaxone), has been reported with increasing frequency worldwide. Infections with *Salmonella* resistant to ESCs threaten the efficacy of ceftriaxone, the drug of choice for treating salmonellosis in children. No systematic study has yet been carried out on molecular characterization of extended-spectrum β-lactamase (ESBL)-producing *Salmonella* species in Bangladesh.

Objective: Analyze the ESBL-producers at the phenotypic and molecular level, especially to find the relevance of plasmids to the dissemination of antimicrobial resistance in *Salmonella* species.

Methodology: In total, 2,502 *Salmonella* species were isolated and identified from children and adults with diarrhoea and typhoid cases at ICDDR,B during 1999-2007 using standard microbial and serological methods. Of 200 strains, 60 were *S.* Typhi, 42 *S.* Paratyphi A, 36 *Salmonella* Group C1, 32 *Salmonella* Group B, and 30 *Salmonella* Group G; these were randomly-selected for detailed screening of ESBL. ESBL-producers are extensively characterized using antibiogram, double disc-diffusion synergy test, plasmid profiling, PCR, conjugation experiment, and PFGE.

Results: Of the selected 200 *Salmonella* strains, 4% (n=8) were ESBL-producers. The prevalence of ESBL-producers was very high in *Salmonella* Group B (2%, n=4) and *Salmonella* Group G (2%, n=4). However, none of the *Salmonella* Typhi strains was positive for ESBLs. Most ESBL-positive strains were resistant to the 3rd- and the 4th-generation cephalosporins and monobactam. Plasmid-profiling showed that 75% (n=6) of the strains harboured 62 MDa and 25% (n=2) harboured 90-MDa plasmid. PCR analysis revealed that *bla*TEM (75%, n=6) was most prevalent, followed by *bla*OXA (50%, n=4), *bla*SHV (25%, n=2), and *bla*CTX-M-1 (25%, n=2) genes. Fifty percent (n=4) of the strains were positive for *int*1 gene. Results of a conjugation study revealed that 62-MDa plasmid was transferable, which contained *bla*TEM and *bla*CTX-M-1 genes as detected by PCR. Results of PFGE analysis revealed that the same clone was disseminated within ESBL-producer and non-producer.

Conclusion: Emergence of ESBL-producing *Salmonella* is of great concern. Horizontal gene transfer played an important role in the spread of ESBL. Appropriate monitoring in the use of these drugs for treating patients should be handled carefully.

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In vitro Drug Sensitivity Study of Nitazoxanide Oral Preparation against Clinical Isolates of *Entamoeba histolytica*

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Background: *Entamoeba histolytica*, an aetiological agent of amoebic dysentery and amoebic liver abscess associated with high morbidity and mortality, continues to be a major public-health problem throughout the world. Transmission of infection by *E. histolytica* occurs largely due to poverty, ignorance, overcrowding, poor sanitation, and malnutrition. Asymptomatic individuals account for almost 90% of the infections. Although drug resistance in *E. histolytica* is not common in asymptomatic individuals, inappropriate usage of drugs or overdosing could lead to drug resistance. The quality of medicines available in some less-developed countries is not adequate in terms of the contents of active ingredients, which can again result in drug resistance. Moreover, treatment failure among patients with amoebiasis often raises the possibility of drug resistance. The amoebic infection is primarily treated by instituting antiamoebic therapy, and nitazoxanide is one of the drugs of choice.

Objective: Evaluate *in vitro* sensitivity of nitazoxanide against clinical isolates of *E. histolytica*.

Methodology: *In vitro* drug sensitivity assay of the nitazoxanide was carried out using microtitre plates after treatment with different concentrations of the drug. The viable parasites were counted by haemocytometer.

Results: After 24 hours of incubation, the viable count of parasite was 57% when the concentration of the drug was 0.015µg/mL. The viable count of *E. hitolytica* was 52% after 48-hour incubation when the concentration of nitazoxanide was 0.015µg/mL. The results showed that the parasite counts decreased by the treatment of 0.015 µg/mL of nitazoxanide.

Conclusion: Further studies are needed with the same drug at higher concentrations to find out the *in vitro* sensitivity of nitazoxanide against *E. histolytica*. Continued surveillance for the possible emergence of resistance among clinical isolates is necessary for the ultimate prevention and control of amoebiasis.

Attribution of Improper Breastfeeding in Childhood Diarrhoea and Consequent Malnutrition

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Background: Nutritional status of children is reasonably considered critical to a country's comprehensive human development. Each year, approximately 10 million children die before they reach 5 years of age. Half of these deaths are attributable to malnutrition, and more or less 2 million die of diarrhoea. Child malnutrition is still a vexed question in Bangladesh. The Bangladesh Demographic and Health Survey report 2007 reveals: 46% under-5 children are underweight. Inappropriate feeding practice is largely responsible for this malnutrition. Children deprived of exclusive breastfeeding during the first half year of life are most vulnerable to childhood morbidity.

Objective: Work out the correlation between nutritional status and feeding pattern of diarrhoea-affected children.

Methodology: A cross-sectional study was carried out among 190 diarrhoea-affected children aged 6-36 months. The samples were selected from the Dhaka Hospital of ICDDR,B through non-probability convenient sampling. Mothers of children were interviewed using a structured questionnaire.

Results: The results revealed that 50% of the diarrhoeal children were malnourished (<-2 weight-for-age z-score); 67.8% of the children were malnourished for being deprived of exclusive breastfeeding compared to 31.4% of the malnourished children with exclusive breastfeeding ($p<0.001$); 56.9% were found malnourished for having prelacteal foods ($p=0.041$); and 58.6% were well-nourished for initiating breastmilk within one hour of birth ($p=0.058$). Children not exclusively breastfed had more diarrhoeal attacks compared to exclusively-breastfed children ($p<0.001$); 25% children were deprived of colostrums and had above 5 prior diarrhoeal attacks whereas 14.5% of the children had the same diarrhoeal attacks having colostrums ($p=0.761$); 78.6% children were malnourished, who had above 5 previous diarrhoeal attacks. ($p<0.001$).

Conclusion: It can be argued that well-nourished children had better breastfeeding practices and less diarrhoeal attacks compared to malnourished children.

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Predictors of Death in Under-5 Children with Clinical Sepsis Attending an Urban Diarrhoeal Treatment Centre in Bangladesh

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Background: Sepsis is one of the most important cause of death in under-5 children in developing countries. Death rate is even higher when sepsis is associated with diarrhoea. However, data are very limited on the predicting factors of death in this population. The Dhaka Hospital of ICDDR,B provides treatment to a number of diarrhoeal children with sepsis often with high fatality rate.

Objective: Evaluate the clinical and laboratory predictors of death in under-5 children with clinically-defined sepsis presenting with diarrhoea.

Methodology: All diarrhoeal children (n=151), aged 0-59 months, with clinical sepsis, admitted to the special care ward (SCW) during September 2007–December 2007 were prospectively enrolled. Comparison was made between the deceased (n=23) and the survivors (n=128).

Results: The median [interquartile range (IQR)] age of the deceased and the survivors were 1.5 (0.8, 10.0) and 4.0 (2.0, 12.0) respectively. The distribution of female and male gender was 10 (43%)::13 (57%) and 53 (41%)::75 (59%) among the deceased and the survivors respectively. In logistic regression analysis, after adjusting for confounders (total WBC count and use of IV fluid after admission), severe undernutrition odds ratio (OR)=7.57, 95% confidence interval (CI) 1.24-46.11, p=0.028)], hypoxaemia (SPO2 <90%) (OR=14.78, 95% CI 1.38-157.90, p=0.026), lobar consolidation (OR=19.9, 95% CI 2.99-132.80, p=0.002), and hypernatraemia (serum sodium >150 mmol/L) (OR=16.48, 95% CI 2.21-123.12, p=0.006) have been explored as the independent risk factors for death in children with clinical sepsis.

Conclusion: The data suggest that diarrhoeal children aged below 5 years, with clinical sepsis, who present with severe undernutrition, lobar consolidation, hypoxaemia, and hypernatraemia, are prone to death. Thus, the results would help predict death of under-5 children, which will help treat such children promptly to minimize death rates.

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Emergence and Evolution of *Vibrio cholerae* Causing Endemic Cholera in Mexico, 1991-2008

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Background: *Vibrio cholerae* O1 biotype El Tor (ET), causing the current 7th pandemic of cholera, has recently been replaced in Asia and Africa by an ET variant possessing cholera toxin (CTX) of the classical (CL) biotype, which caused the 6th cholera pandemic before becoming extinct from Asia in the 1980s. In a recent retrospective study, biotype CL, ET, and ET variants were shown to be involved in endemic cholera in Mexico during 1991-1997, although prototype ET was the circulating biotype shown in Peru until recently.

Objective: Understand the evolutionary trend of *V. cholerae* causing endemic cholera during 1991-2008 in Mexico.

Methodology: Eighty-three *V. cholerae* strains were identified by employing biochemical, serological, phenotypic and molecular methods. The virulence and related genes were detected by PCR, DNA-sequencing, and analyses by BLAST. The DNA-fingerprinting and phylogenetic relationships were determined by pulsed-field gel electrophoresis (PFGE) and cluster analysis in dendrogram.

Results: The results showed the disappearance of CL and variant ET, including a series of genetic events that precede the restoration of ET prototype in endemic cholera in Mexico. According to serobiotyping data, the diverse strains of variant ET that had shown predominance in Mexico (1991-1997) were not found after 2000. All *V. cholerae* strains isolated during 2001-2003 lacked the targeted CTX-prophage marker genes, namely *ctx*A, *ctx*B, *rst*RET, or *rst*RCL but had *tcp*A alleles of either ET or CL, or both in the same ET host, showing a unique state of *V. cholerae* of the contemporary cholera. In 2004, the ET possessing prototype CTX-prophage re-emerged, displaced the ET strains lacking CTX-prophage in 2005, and continued through 2008, displaying a rare evidence of inter- and intra-biotype competition involved in the evolution of prototype ET in Mexico. The transitional ET lacking CTX-prophage exhibited high heterogeneity in PFGE (*Not*I) patterns while the pre- and post-2005 prototype ET showed high homogeneity and resembled with the prototype ET control (N16961) as confirmed by sub-clustering in dendrogram.

Conclusion: The underlying molecular ecological basis for this clonal shift in America remains an area to be unveiled; nonetheless, the disappearance of CL and variant ET and restoration of prototype ET in contemporary cholera in Mexico may be yet another turning point in the changing epidemiology of global cholera.

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Social Autopsy—A Social Intervention to Aware Community of Maternal and Perinatal Death in Bangladesh

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Background: A social autopsy is an innovative strategy whereby a trained member leads a group within a community through a structured, standardized analysis of root causes of a death or a serious, non-fatal health event. The root causes considered encompass physical, environmental, cultural and social factors. The dialogue engaged the community to elicit the causes and suggests preventive measures that are appropriate and achievable in the community.

Objective: Scrutinise the social errors responsible for a maternal or perinatal death, facilitate and use the community strength in determining how it could be prevented in future.

Methodology: One district of Bangladesh—Thakurgaon—with a population of 14,50,000 was selected for the study. Government health and family-planning field-level staff members were trained to perform social autopsy for maternal and neonatal deaths and stillbirths to initiate some social intervention in the community.

Results: Every death in the community is unique and have a sad story. The rural community in Bangladesh is capable of exploring the social reasons behind the medical cause of the death without blaming any individual or group held responsible for the death. The social autopsy is a unique, and the most useful way to aware and set off the community to act on a maternal or perinatal death.

Conclusion: Social autopsy started to deliver some important massages to the community after a death occurred, which could play a significant role in the reduction of maternal and perinatal deaths in Bangladesh.

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Sociodemographic Determinants of Childhood Undernutrition in Nepal: Further Analysis of Nepal Demographic and Health Survey 2006

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Background: Undernutrition is one of the leading causes of morbidity and mortality in children aged less than 5 years (under-5 children) in developing countries, including Nepal. Underweight among children is an important public-health problem in Nepal. However, sufficient information on the role of different risk factors on underweight among children is not available.

Objective: Predict the effect of various socioeconomic factors on underweight among under-5 children.

Methodology: Data used in the study were drawn from the individual women's questionnaire of the Nepal Demographic and Health Survey (NDHS) 2006. In total, 5,024 under-5 children were assessed for their nutritional status based on their anthropometric measurement. Datasets were accessed from the Measure DHS website and analyzed using the Stata software (SE version 10). Underweight was defined as weight-for-age <2 standard deviation from the median of the reference population of the 2006 WHO growth standard. Bivariate and logistic regression analysis techniques were used for predicting the effect of socioeconomic determinants.

Results: Underweight was a common form [38.6%, 95% confidence interval (CI) 36.3-40.9] of undernutrition in Nepal. Underweight was statistically higher among female children ([odds ratio (OR)=1.23], rural children (OR=1.36), children from the terai region (OR=1.32), children from poorer families (OR=1.50), children whose mothers had less-frequent handwashing practices (OR=1.44), children in the third or later birth-order (OR=1.49), and children of mothers of low body mass index (OR=2.09). However, caste and ethnicity, mother's literacy, child's immunization status, birth interval, and history of sickness did not show any statistical differences in underweight status.

Conclusion: Undernutrition is an important but a relatively-neglected public-health problem. Improving the nutritional status of children is an essential step to achieve the universal health coverage. Results of analysis showed that improving the nutritional status demands multi-generational, multi-cultural, and long-term commitment and programmatic focus addressing sociocultural and health behaviours.

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Evaluation of Analgesic and Antidiarrhoeal Properties of *Crataeva nurvala* Buch. Ham (Capparidaceae) Leaves

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Background: The leaf, bark, and fruit of *Crataeva nurvala* Buch. Ham (Bangla name: *Borun, Bonna, Pithagola*; English name: Three-leaved caper) belonging to the family Capparidaceae have medicinal values. Traditional uses of the investigated species have been reported in the treatment of kidney-stone, bladder-stone, vomiting, gastric irritation, rheumatic fever, and diarrhoea.

Objective: Investigate the analgesic and antidiarrhoeal activities of the ethanolic crude extract of *C. nurvala* leaves on mice model.

Methodology: To investigate the peripherally-acting analgesic potential and antidiarrhoeal activity, acetic acid-induced writhing test and intestinal motility test using charcoal marker were performed, which included 6 mice in each group. Statistical analysis was performed using t-test and one-way ANOVA.

Results: The crude extract showed highly significant ($p<0.01$) analgesic activity at oral doses of 200 and 400 mg/kg body-weight with an inhibition of writhing 68.4% and 76.3% respectively whereas the positive control group treated with diclofenac sodium exhibited 67% of writhing reflex. In the motility test, the crude extract at the same oral doses showed significant ($p<0.05$) antidiarrhoeal activity. At 200 and 400 mg/kg body-weight, extracts showed 31.16% and 35.31% inhibition of intestinal propulsion of charcoal marker whereas the positive control group treated with loperamide exhibited 36.25% inhibition of propulsion of charcoal through the intestine.

Conclusion: The ethanolic crude extract showed the analgesic and antidiarrhoeal activities in a dose-dependent manner. These results support the use of *C. nurvala* leaves as a traditional medicine and insight into the identification of biologically-active compounds for treating pain and diarrhoeal diseases.

Perception of Caregivers on Pathology of Childhood Diarrhoea

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Background: Diarrhoea continues to be a major health crisis throughout the developing world, mostly affecting those from lower socioeconomic levels. Results of studies showed that beliefs and cultural practices influence people's knowledge on health and healthcare-seeking behaviour.

Objective: Explore caregivers' knowledge and perception on pathological factors concerning diarrhoea in young children aged below 3 years, from the population of lower socioeconomic status.

Methodology: The study was conducted at the Dhaka Hospital of ICDDR,B. Qualitative data concerning perception on causes of diarrhoea were collected through focus-group discussions and in-depth interviews of caregivers and health professionals. Information was obtained from 104 caregivers (all female and mostly mothers of patients) and 7 health professionals, during a 6-month period. Ethical clearance was obtained from the Bangladesh Medical Research Council.

Results: Most (90%) respondents expressed that their perception on childhood diarrhoea was often superfluous. Local nosology of diarrhoea varied from one place to another and did not necessarily match medical classifications. Loose motion as the symptom of diarrhoea was recognized by all the respondents. However, most (98%) of them failed to recognize critical diarrhoea-related signs of dehydration. Most (88%) of them could identify one or more scientific factors responsible for diarrhoea in children, including environmental factors and introducing new foods to a child. Nevertheless, further interviewing revealed that many (n=98, including focus-group discussion and in-depth interview) of them had deep-rooted beliefs on supernatural forces, such as '*nojor laga*', '*chokh laga*', '*batash laga*', etc. (indicating 'evil eye' or 'bad spirit') causing diarrhoea. A mother would sometimes be blamed by her in-laws or husband for her 'immoral' lifestyle, for illness episodes in children, especially if she was a nursing mother. Most (83%) respondents failed to recognize that inappropriate hygiene practices were a basic cause of diarrhoea. Visible dirt was observed on their hands and clothes in many cases.

Conclusion: Perception on a common childhood illness as diarrhoea is often wrong and misleading due to deep-rooted beliefs and cultural practices. Accurate knowledge on diarrhoea-related dehydration, including hygiene practices, is crucial for prevention and management. Appropriate counselling needs to be designed to help improve caregivers' knowledge, attitude, and practice.

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Undiagnosed and Uncontrolled Hypertension among Adults in Rural Bangladesh: Findings from a Community-based Study

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Background: High blood pressure is a leading cause of global burden of disease and a major risk factor for ischemic heart disease, stroke, and kidney failure. Prevention, detection, treatment, and control against hypertension play a crucial role in protection of these diseases. In many high-income countries, detection, treatment, and control of hypertension is considered to be inadequate, and the situation is even worse in low-income countries where awareness about hypertension is generally low.

Objective: Find the prevalence and prediction factors of undiagnosed and uncontrolled hypertension among adults in rural Bangladesh.

Methodology: A cross-sectional study on risk factors of major non-communicable diseases was conducted in rural surveillance sites (Matlab, Abhoynagar, and Mirsarai) in 2005. In addition to self-reports of individuals on risk factors, their height, weight, and blood pressure were measured using standard protocols of the World Health Organization's STEPwise Approach to Surveillance. Undiagnosed hypertension was defined as case when people reported no hypertension but found hypertensive when measured, and uncontrolled hypertension was defined as case when people reported having anti-hypertensive treatment but their blood pressure is above the normal range when measured.

Results: The prevalence of undiagnosed hypertension was 11.1%, increasing with age from 7.3% among people aged <50 years to 22.7% among those aged 60 years and above; 54.9% of the treated hypertension was found to be uncontrolled (47.1% among people aged <50 years, 56.8% among people aged 50-59 years, 67.9% among people aged 60+ years). In multivariate analysis, increasing age and higher body mass index were significantly and positively associated with undiagnosed hypertension, and smoking and chewing tobacco were significantly but negatively associated with undiagnosed hypertension. Increasing age and more wealth had a significant independent association with uncontrolled hypertension.

Conclusion: The high prevalence of undiagnosed hypertension and more than 50% of treated hypertension being uncontrolled pose a great challenge in the future. Regular health check-up or health screening, along with implementation of hypertensive guidelines, should be reinforced.

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Pre-hypertension and Its Predictors among Adults in Rural Bangladesh: Findings from a Community-based Study

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Introduction: Results of studies showed that pre-hypertension solely accounted for 9.1% of deaths, 6.5% of nursing-home admissions, and 3.4% of hospitalizations in the United States. Pre-hypertension eventually leads to hypertension which is a leading cause of the global burden of disease and a major risk factor for ischemic heart disease, stroke, and kidney failure. Pre-hypertension is now recognized as a potential candidate for intervention for cardiovascular diseases. The public-health implication of this increased burden of at-risk people in our population is worthy of serious evaluation.

Objective: Find the prevalence and prediction factors of pre-hypertension among adults in rural Bangladesh.

Methodology: A cross-sectional study on the risk factors of major non-communicable diseases (tobacco and alcohol-use, less intake of fruits and vegetables, lack of physical activity) was conducted in rural surveillance sites in 2005. In addition to self-reports of individuals on risk factors, their height, weight, and blood pressure were measured during visits to household using standard protocols of the World Health Organization's STEPwise Approach to Surveillance. Pre-hypertension was defined as a case when systolic blood pressure was between 120 and 139 mm of Hg or diastolic blood pressure was between 80 and 89 mm of Hg.

Results: The prevalence of pre-hypertension was 31.9%—30.3% in females and 33.6% in males. As with hypertension, the prevalence of pre-hypertension also increased with age. Results of multivariate analysis showed that increasing age and higher body mass index were significantly and positively associated with pre-hypertension; fruit consumption and tobacco-chewing were significantly but negatively associated with pre-hypertension. Pre-hypertension was associated with higher mortality up to 4 years of follow-up but this effect disappeared after adjusting for age and sex.

Conclusion: Approximately one-third of the adult population in rural Bangladesh is affected with pre-hypertension. This places a great challenge in the future as most of these people will convert to be hypertensive until otherwise undergo any pharmacological or lifestyle interventions. Regular monitoring of blood pressure alongside some intervention should be reinforced.

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Neonatal Bacteraemia in a Neonatal Intensive Care Unit: Analysis of Causative Organisms and Antimicrobial Susceptibility

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Background: Bangladesh has a substantially high neonatal death rate which demands urgent attention.

Objective: Determine the incidence of bacterial neonatal sepsis in Chittagong, Bangladesh, with focus on various demographic characteristics of neonates, causative organisms, and their antibiotic susceptibility.

Methodology: Blood culture was performed for all neonates (n=1,400) with risk factors or signs of suggestive sepsis. Blood samples were cultured using tryptone soya broth (TSB-blood broth) according to standard method.

Results: Of the 1,400 neonates, 104 had positive blood culture for neonatal sepsis. Of the infected children, 40 (38.46%) were born in the hospital and 64 (61.54%) at home. Of the 104 positive cases, the EONS (early onset neonatal sepsis) accounted for 68 cases (65.38%), and LONS (late onset neonatal sepsis) accounted for 36 (34.62%). Of the isolated organisms, *Klebsiella pneumoniae* accounted for 79 (75.96%), *Serratia marcescens* 19 (18.27%), *Pseudomonas aeruginosa* for 4 (3.85%), and *Staphylococcus aureus* accounted for 2 cases (1.92%). Of the isolated species, 102 were Gram-negative bacteria, and 2 were Gram-positive bacteria. Most (98%) Gram-positive bacteria showed resistance to commonly-used antibiotics, such as ampicillin, ceftriaxone, and gentamicin. All the isolates showed sensitivity to imipenem.

Conclusion: Collection of up-to-date data is mandatory for appropriate use of antibiotics.

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Shigellosis: An Overview

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Background: Shigellosis is endemic throughout the world and is responsible for cases of severe dysentery with blood and mucus in stools caused by infection of 4 *Shigella* species, including recently-isolated atypical and new variants of *Shigella*.

Objective: Monitor the prevalence of *Shigella* species, especially serotype, subserotype, atypical and new variants of *Shigella*, and their characterization at phenotypic and molecular level, including molecular mechanism of drug-resistance and pathogenesis.

Methodology: All strains included in the study were extensively characterized using standard phenotypic, genotypic and cellular methods.

Results: Studies have contributed significantly to understanding the population genetics and molecular epidemiology of *Shigella* spp., especially the identification, classification, molecular typing, and epidemiology of different *Shigella* species and their impact on human health. During the last 30 years, *Shigella flexneri* was found to be the dominant strain (63%), followed by *S. boydii* (15.5%), *S. dysenteriae* (10%), *S. sonnei* (9.5%), and *Shigella*-like organisms (3%). About 23.4% of *S. flexneri*, 8% of *S. dysenteriae*, and 23% of *S. boydii* strains were identified as atypical since these did not react with either type or group antigen-specific antisera. At least 5 new subserotypes of *Shigella* have been identified and characterized, which were validated by publications in international journals and communications with the world's leading reference laboratories. Two of these are underway to include in the latest serotyping scheme of *Shigella*. For the last 10 years, focuses have been extended from aetiology to the ecology of infections. Identification of sources of pathogens and their transmission routes to human infection received priority. Work has been ongoing on the drug-resistance mechanism of *Shigella*. Some work on basic research has also been started to study the molecular mechanism of DNA damage-induced death of mammalian cells using different cell-lines. Recently, a novel group of *S. flexneri* was isolated from dysentery patients, which lacked known toxin genes but exhibited very strong cytotoxic activity against HeLa cells. Results of preliminary studies indicate that the factor(s) present in these strains is/are likely to be a novel protein.

Conclusion: This study will lead to a better understanding of the burden of diseases caused due to major enteric pathogens in the community.

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Water-logging and Scarcity of Drinking-water and Sanitation Problems with Changing Climatic Conditions at the Kopotaksho Basin

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Background: Since 2000, the people of Jessore and Satkhira districts have been experiencing a great deal of environmental and social losses due to prolonged water-logging in the Kopotaksho Basin area. The basin is under the peril of water-logging due to the natural (changing river geometry, channel migration, and abandonment) and human interventions (construction of bridges and sluice gates, use of unsustainable fishing gear).

Objective: Represent the extent of water-logging and its impact on water supply, health, and sanitation due to climate change over the years (from 2000 to 2008); suggest the feasible options to ensure drinking-water supply and sanitation in crisis; and identify vulnerabilities, risks, and adaptation options to combat climate change-induced water-logging situation ensuring drinking-water supply and sanitation.

Methodology: The satellite images of the study area from the base year 2000 to 2008 were analyzed considering the hydro-meteorological parameters of the study area. With the participatory field survey and the outcomes of the analyzed secondary data (satellite images and hydro-meteorological), root causes of water-logging at the study area were identified. Social degradation highlighting climate change and drinking-water scarcity, health, and sanitation problems were assessed by the participatory field survey, via FGDs, TGDs, and PRA sessions. Overall participation ensures that only the local-level participation can be a sustainable way to cope with and mitigate water-logging problem at the congested area of the Kopotaksho Basin.

Results: The analysis of satellite images revealed that over the years, the water-logging problem had increased significantly. The water-logged area in 1999, 2000, 2003, 2006, and 2008 was about 865, 12,867, 12,238, 11,723, and 19,467 hectares respectively. The social life was hampered due to scarcity of freshwater (90%) of the households, and people depended on tubewell-water for drinking purposes), outbreak of waterborne diseases (about 35% of the households reported the diarrhoea problem, 30% cholera and typhoid, 20% skin diseases, and 15% other diseases at the water-logged condition), and the sanitation problem [55% people defaecated at open place and (20%) used public latrines at the water-logged situation]. The income level was also reduced as the employment opportunities subsided due to water-logging.

Conclusion: Changing climatic condition will exaggerate water-logging with changing river-flow regime, especially due to low flow at dry season, intrusion of sea-water, and backwater effect with lowering the peak discharge of river. Community-based approaches, such as the pond-sand filter, rainwater harvesting, manufacturing of low-cost filter, upliftment of tubewell and latrine platforms integrating gender issues, upliftment of river levels, mobile healthcare centre, and raising public-awareness programmes about health and sanitation can help reduce the scarcity of drinking-water and the health and sanitation problems in the water-logged area. Locally-acceptable concept—tidal river management has been identified as a feasible long-term remedial option to diminish water-logging coverage in the Kopotaksho Basin.

Study of Intestinal Protozoal Carriers among Food-handlers in Agartala City, Tripura, India

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Background: Agartala is the capital of Tripura state of India. The street food-handlers are socio-economically backward, which reflects on their personal poor hygiene.

Objective: Detect and isolate the cyst carrier group; identify the contact and convalescent carriers; assess the work factor, personal elementary hygiene status, socioeconomic and environmental conditions; correlate pathogenic protozoal infection by clinical database protocol; study the pattern of distribution by location, age, sex; and portray prophylaxis to community by health education and screening.

Methodology: One hundred fifty food-handlers from street-sides of different areas of the city were screened by the survey team of Chetana—an institute for women studies—during August 2007 and were examined by an Assistant Professor of the Department of Microbiology of the Agartala Government Medical College, Agartala. They recorded their names, age, sex, and socioeconomic status, observed the hygiene condition, and supplied clean wide-mouth pots to them to submit stool specimens. The next day it was collected and sent to the diagnostic centre for microscopic examination. Clinical data flatulence, pain in upper and lower abdomen, passing of mucoid stool with blood were also recorded to differentiate the symptomatic group to asymptomatic group. Detailed past history of taking drug, diet, antacid, etc. was recorded.

Results: The overall prevalence rate of protozoal infection among food-handlers was 29.3%; 68.18% of the positive cases were males aged 30-50 years. The personal hygiene of food-handlers was poor (52.57%) in the age-group of 40-50 years. Among the positive cases, there was a history of taking antacid (27.02%), high carbohydrate diet (54.02%), and steroid (8.10%); 61.36% were completely asymptomatic without an attack of amoebiasis, mostly with *Entamoeba histolytica*. The clinical features in all the symptomatic cases were pain in upper abdomen (76.47%), flatulence (84.47%), and loose stool (47.05%). The overall distribution pattern of the causative agents for protozoal infection was *E. hystolica* (47.22%), *Escherichia coli* (22.72%), *Endohalix nana* (4.5%), and associated *Giardia lamblia* (25.6%). No hepatomegaly or jaundice was observed among the positive cases.

Conclusion: It has been postulated that certain work condition may be risk factors in carrier state, particularly for those who deal with preparation, storage, and distribution of foods. Food-handlers are universal in the community as healthy carriers of intestinal diseases.

Acceptability and Compliance of Calcium Supplementation among Pregnant Women in South-West Nepal

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Background: While the maternal mortality ratio in Nepal has fallen in the past decade, many Nepalese women still die of preventable causes. Pre-eclampsia/eclampsia is now the second leading direct cause and accounts for 21% of maternal deaths. Now, there is growing interest in addressing pre-eclampsia/eclampsia. Antenatal calcium has been documented as effective in reducing risk of pre-eclampsia and its complications. If calcium is introduced into programmatic use, it will be important to know what formulation(s) are likely to best favour adherence.

Objective: Determine the preference of users between two different antenatal calcium formulations: powder (in a sachet) and tablets and assess compliance to both calcium supplements and iron-folate.

Methodology: The study adopted cross-over trial design in 2 village development committees (VDCs) of Banke district of Nepal. Study subjects (n=97) were pregnant women in their 2nd trimester; those in one VDC were given powder for one month and those in the other, tablets. After one month they were all switched to the other formulation for an additional month of supplementation. At the end of the 2nd month, subjects were interviewed and asked whether they would like to continue taking the supplement and, if so, which formulation they would prefer.

Results: After one month, compliance (30 days) to tablets and powder were about the same: 70% and 72% respectively reported not having missed any doses. At the end of two months, 73% of subjects reported that they would accept any form of calcium if they could not get the preferred form; however, there was a clear preference for tablets (72% vs only 17% for powder; 3% had no preference). Four in 5 (79%) women reported not having missed any of their iron doses.

Conclusion: Study subjects found the calcium supplement acceptable, and compliance was generally good both for calcium and iron. Although powder was acceptable to most subjects, there was a strong preference for tablets.

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Faecal Coliform Contamination of Unwashed Hands and Efficacy of Ethanol-based Hand-rub

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Background: Hand-hygiene is a very important factor in preventing the transmission of infectious organisms. Hand-rubbing with an alcohol-based hand-rub is a good alternative, instead of handwashing. It has excellent and rapid germicidal activity within seconds against vegetative bacteria, fungi, and many viruses. Results of more than 20 published studies showed that alcohol-based hand-rubs were more effective than either plain soap or antibacterial soaps in reducing the number of live bacteria on the hands.

Objective: Examine baseline rates of faecal coliform of unwashed hands and measure changes before and after the use of various volumes of alcohol-based hand-rub made at the Dhaka Hospital of ICDDR,B.

Methodology: Six doctors and 4 nurses participated in the study. Each hand of the participant was sampled individually by a modified bag broth method. Before sampling, dry hands were rubbed together for 30 seconds. Then, one hand was placed in a sterilized bag containing 100 mL of sterile sampling solution. While the hand was kept within the bag, the investigator rubbed the solution over all surfaces of the hand through the bag for 60 seconds, taking care to emphasize the fingernail regions and between the fingers. Bags were immediately sealed and then transferred to autoclaved bottles in the Environmental Microbiology Laboratory of ICDDR,B for faecal coliform count. Contamination of unwashed hands by faecal coliform was measured. The changes in faecal coliform recovered before and after the use of various volumes of hand-rub were also measured.

Results: On average, left hands were more contaminated with faecal coliform than right hands. Volumes for ethanol-based hand-rub from 0.5 mL to 4.0 mL were 100% effective in killing faecal coliform, with contact time of 10 seconds. Hand-rub has residual anti-microbial effects when used volume-wise and sequentially.

Conclusion: The findings of this small pilot study indicate that ethanol-based hand-rub has a very good efficacy in killing faecal coliform. Activity of this hand-rub against other pathogens should be determined with an adequate sample-size.

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Post-disaster Food Security and Nutritional Status among Under-5 Children in Barguna District, Bangladesh

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Background: Climate changes are associated with intensity of natural disasters worldwide. Such natural disasters affect the standing crops, water supplies, and plant growth leading to loss of production, food-shortage, and famine.

Objective: Assess the impact of post-disaster changes and dynamics on food security, psychosocial and nutritional status of children aged less than 5 years.

Methodology: It was a cross-sectional study. Data were collected through a structured questionnaire with 800 questions, 24 focus-group discussions (FGDs), 24 key-informant interviews, and 16 case studies conducted in 8 villages of 5 unions of Barguna Sadar upazila in Borguna district of Bangladesh before and after a cyclonic natural disaster.

Results: The respondents were aged 16-60 years. At baseline, about 70% of the households spent Tk 5,000 or less for food, which was 49% at the follow-up survey. About 97% of the households were getting drinking-water from tubewells during the baseline and 90% during the follow-up survey. The proportions of households with sanitary latrines were low both during the baseline (2.3%) and the follow-up (8.8%) survey. In contrast, 48.5% of the households used open latrine at baseline that decreased to 12.5% at follow-up. Moreover, 90% of the infants aged 0-6 months and 7-12 months were fed breastmilk. Overall, 65% of the households in the survey area were food-insecure during the follow-up survey. About 80% reported that they lacked purchasing power to buy foods for their children in the last month. Overall, 68% and 73% of the children were underweight at baseline and follow-up respectively. The rates of stunting at baseline and follow-up were 54% and 59% respectively. The rates of wasting were 54% and 53% at baseline and follow-up respectively.

Conclusion: Natural disaster is related to unhygienic sanitation and food insecurity, which led to undernutrition among children in Bangladesh.

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Availability of Baby Zinc Tablets in the Treatment of Diarrhoea among Under-5 Children in Two Rural Primary Healthcare Settings

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Background: Locally-produced blister-pack zinc tablets were extensively marketed and promoted through print and electronic media. Numerous orientation and training workshops with all stakeholders were held emphasizing its use, alongside oral rehydration solution (ORS), in the treatment of diarrhoea among under-5 children without any social discrimination. It was implemented during June 2003–October 2008 under technical directives of the Ministry of Health and Family Welfare (MoHFW) in Bangladesh. Despite growing awareness, the use of zinc tablets, alongside ORS, did not improve as intended.

Objective: Assess the use of zinc tablets dispensed for under-5 children and reduction in the duration of stay as inpatients for the treatment of diarrhoea in 2 rural primary healthcare settings.

Methodology: Under-5 children who reported as outpatients and inpatients for the treatment of diarrhoea in the public-sector health management were segmented into pre-zinc period (2004 to 2006) and post-zinc period (2007 to 2009). The availability of zinc tablets, zinc syrup, and ORS dispensed for under-5 children was matched in Abhoynagar subdistrict in the southwestern region and Mirsarai subdistrict in the southeastern region with identical health service-delivery infrastructure similar to the rest of rural Bangladesh, and review of the national coverage survey was conducted.

Results: Overall, an opportunity was missed to dispense zinc tablets for 75% of 7,275 under-5 children in Abhoynagar and 84% of 14,752 under-5 children in Mirsarai. This occurred as paramedics of the family-planning department never received any training and supply of zinc tablets. The majority (58%) of inpatient children (n=4,383) were male in both the places. No major variation in treatment-seeking by under-5 children for the treatment of diarrhoea was observed: Abhoynagar (50%) and Mirsarai (51%) during the pre-zinc period and Abhoynagar (48%) and Mirsarai (47%) during the post-zinc period. The duration of hospital stay of the majority of inpatient children between the 2 periods was almost identical: in Abhoynagar (87% vs 89%) and in Mirsarai (95% vs 97%).

Conclusion: Proven evidence of promotional methods of the past contributing to the improvement in child survival and life-expectancy should be considered in the promotion of methodology for wide use and removal of barriers to treatment compliance.

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Prevalence of Anxiety and Depression among Diabetic Patients in South-East Asian Countries

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Background: Depression frequently co-exists with diabetes and diabetes-related complications. Evidence suggests that subjects with diabetes, who have co-morbid depression, not only have poor glycaemic control but also have a higher rate of diabetes-related complications and disability. The cost and burden of diabetes are greatly increased among individuals with both diabetes and depression compared to diabetes alone.

Objective: Perform systematic literature review to determine the prevalence of depression and anxiety among diabetic patients.

Methodology: Three topics for the literature review were: (a) diabetes, (b) glucose intolerence, and (c) anxiety and depression in developing countries from 2001 to 2010. The database searched for the literature review were PubMed/Medline. Search terms used individually and in combination were: diabetes, diabetes mellitus, depression, anxiety, developing countries, and South-East Asia region. Additional literature was found by retrieving sources cited in various publications. The search was limited to only those studies published in English, and 9 studies were included to describe the status of the disease.

Results: Results of a population-based study in Bangladesh showed that 30.5% of female population with diabetes was exposed to depressive symptom whereas 14.6% had depression without diabetes. Results of a study in Pakistan showed that the prevalence of depression was 5.4% [95% confidence interval (CI) 4.2-6.6], slightly higher among women compared to men. The prevalence of depression was 14.7% (95% CI 6.6-22.8) among those with diabetes opposed to 4.9% (95% 3.7-6.1) among those without diabetes. An unexpectedly high level of unrecognized depressive symptom was found in the general diabetic population. Research demonstrated that individuals with diabetes have an increased incidence of depression across socioeconomic and racial groups, where low-income individuals have an increased prevalence of depression.

Conclusion: A common approach, including psychiatric treatment in diabetes care, may be necessary to achieve improved glycaemic control. Further research to explore the relationship of diabetes with depression in the vulnerable population is needed before effective treatment models can be developed. Longitudinal studies are also needed to determine the cause and effect between diabetes and depression among all populations.

Influence of BCC Materials in Changing MNCH Knowledge and Practices among Urban Slum Women in Bangladesh

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Background: BRAC established a maternal, neonatal and child health (MNCH) project named Manoshi in selected urban slums of Bangladesh in 2007. Manoshi has a behaviour change communication (BCC) component aimed at improving MNCH knowledge and practices in urban slum.

Objective: Assess the changes in MNCH knowledge and practices and relate the changes to BCC interventions of Manoshi.

Methodology: A quantitative study was implemented from December 2009 to December, 2010. The study sites were Kamrangir Char, Korail, and Shyampur slums of Dhaka city. A survey questionnaire was administered among 360 women who delivered babies in the last one year before interview. Data were compared with those of the Manoshi baseline survey.

Results: Increase of knowledge on maternal danger-signs (severe headache from 41% to 59%, high fever from 16% to 50%, blurring of vision from 21% to 36%, convulsion from 21% to 48%, excessive bleeding from 17% to 47%, and prolapse from 28% to 52%) between the baseline and the current survey was noticeable. Knowledge about initiation of breastfeeding after birth increased from 54% to 78% and exclusive breastfeeding from 79% to 87%. Practices were also improved (any antenatal care from 75% to 95%, delivery at home reduced from 84% to 43%, delivery attended by a doctor from 8% to 38%, any postnatal care from 24% to 74%, and colostrums-feeding from 83% to 87%). Those exposed to BCC materials had better knowledge. The mean and median of the knowledge score on MNCH was 64. A strong association was found between exposure to different BCC materials and knowledge, e.g. individual counselling ($p=0.038$), TV spot ($p<0.001$), any poster ($p=0.015$), any leaflet ($p=0.036$), and sticker ($p=0.001$). Folk songs, group counseling, and street-drama were not associated with increase in knowledge.

Conclusion: BCC interventions as a whole may be effective in improving knowledge and practices among urban slum women. However, intervention components, e.g. folk songs, group counselling, and street-drama may not contribute to change in knowledge.

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Strengthening of Health System in Rural Bangladesh: An Observational Study

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Background: Various indicators of maternal and neonatal health score are relatively very low in rural areas of Bangladesh compared to urban areas. Bangladesh is also giving emphasis on universal coverage of health service in both areas. The satellite clinics under Family Welfare Centre have been playing an important role in providing family-planning service, antenatal care, postnatal care, and newborn care at the grassroots level through family welfare visitors.

Objective: Improve the quality of healthcare services at the satellite clinics in rural Bangladesh through the existing health service providers, especially FWVs.

Methodology: As part of process documentation of the study titled "Shahjadpur Integrated Maternal and Neonatal Health (MNH) Project", satellite clinics were observed through a developed checklist. This study is being implemented in one subdistrict of Sirajganj district. Twelve FWCs are available in the subdistrict, and for this study, one satellite clinic under each FWC was observed each month. Observation was started from September 2009, and it is still continuing. Data for the 6-month period from September 2009 to February 2010 were summarized and presented here.

Results: Quarterly analysis of observations showed that there was a huge deficit in the availability of quality-service provided during ANC, to pregnant mothers and also gaps in counselling. In the first quarter, in the case of 97 pregnant mothers, service providers did not follow all the components of ANC with regard to physical examinations. Some gaps were also observed in delivering all relevant massages, the service providers did not use any counselling materials. During the observations, the study took several initiatives to improve the quality of services, such as on-the-job training for service providers, supply of some logistic and counselling materials, and the sharing of findings with health and family-planning managers during their monthly meeting. As a result, some changes occurred in the second quarter. Care providers followed all the components of ANC with regard to physical examinations in the case of almost 90% of the 94 pregnant mothers, and the providers covered most relevant massages with counselling material in 90% of the cases.

Conclusion: The satellite clinics are unique for increasing the coverage of skilled care at the community level by improving the quality of services through close monitoring, supervision, and orientation of different essential components of maternal and neonatal health. So, an early detection of high-risk mothers and referral will increase.

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Antenatal Attendance, Delivery Care-seeking Pattern, and Perinatal Outcomes: Experience from an Integrated Community and Facility-based Programme in Bangladesh

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Background: The antenatal period provides an opportunity to reach pregnant women with a number of evidence-based interventions which might have an impact on improving maternal and neonatal health. However, there is a scarcity of population-based studies on how attendance in antenatal care (ANC) service affects maternal behaviour and perinatal outcome.

Objective: Evaluate the effect of ANC on maternal behaviour for delivery care-seeking and evaluate the effect of ANC on perinatal outcome.

Methodology: The study evaluated a cohort of 5,231 pregnant women identified in a comprehensive maternal, neonatal and child health (MNCH) programme during 2008-2009 in rural Matlab, Bangladesh. The MNCH project enrolled women at the household level and followed the continuum of pregnancy, delivery, and postpartum periods. The community health workers visit each pregnant woman twice during pregnancy and identify support group, provide birth-preparedness counselling, and encourage women to attend facility for ANC. The MNCH programme offers 4 focused ANC visits at different time-spans of the gestational period. In total, 5,243 women were included in analysis.

Results: The rates of ANC coverage for at least 1, 2, and ≥3 visits were 97%, 91%, and 79% respectively. The probability of using facility-delivery care was 2 times higher among women who made ≥3 ANC visits compared to women who had <3 ANC visits [odds ratio (OR):2.25; 95% confidence interval (CI) 1.50-2.87]. The adjusted perinatal death rate was 2.4-times (OR): 2.43; 95% (CI) 1.55-3.80]) higher among births to women who made <3 ANC visits compared to the rates of those who made ANC ≥3 visits. No difference on birthweight by ANC visits was observed.

Conclusion: The new programme helped achieve almost an universal coverage of ANC. However, the positive impact of ANC on the use of facility-delivery care and perinatal health is obvious.

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Maternal, Neonatal and Child Health Initiatives: A Community-based Intervention to Reduce Maternal Mortality in Rural Bangladesh

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Background: To accelerate the progress of Millennium Development Goals, especially 4 and 5, BRAC has launched the maternal, neonatal and child health (MNCH) initiative at the end of 2005 in Nilphamari, a poverty-stricken district of Bangladesh. This community-based intervention was designed based on the existing structure and extensive network of BRAC's Health Programme and is linked to the government health system.

Objective: Assess the trend in reduction of maternal mortality in Nilphamari district.

Methodology: Data were extracted from the regular management information system (MIS) from 2007 to 2010 and baseline survey of the project and were analyzed to assess the outcome of the intervention.

Results: A significant improvement was observed in the reduction of maternal mortality over the years. The maternal mortality ratio (MMR) gradually declined from 256 in 2007 to 221 in 2008, 171 in 2009, and 156 in 2010. About 91% (n=42,900) of expected 50,329 pregnancies were covered in 2010, which was only 27% at baseline. In 2010, about 93% (n=35,926) of 38,455 delivering mothers (37.8% at baseline) received more than 4 antenatal care check-ups from the community health workers during their pregnancy, and postnatal care check-ups were provided to 87% (13% at baseline) of delivering women at their own homes within 48 hours after childbirth. Through continuous efforts and inputs, the level of knowledge of maternal danger-signs progressively improved, resulting in the increased detection rate (45%) of pregnancy-related complications (7% at baseline). Of them, about 84% were referred to the healthcare centres for better treatment. The data showed a slow progress in shifting deliveries from home to hospital—from 14% at baseline to 26% in 2010. A unique referral system (introduction of referral officer/focal persons placed at public hospitals even at the upazila level, use of referral pick-up points, and the use of cellular phone and private transport for quick emergency communication) has been developed under this intervention for quick referral of complications.

Conclusion: The findings demonstrate that the MNCH interventions have reduced the number of maternal deaths by making minimum maternal healthcare services available at the doorsteps, increasing knowledge and practices of families about maternal care and ensuring referrals of complications to appropriate functional hospitals on time.

A Systematic Review of Economic Evaluations of Health and Health-related Interventions in Bangladesh

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Background: Economic evaluation is used for effective resource allocation in the health sector. Accumulated knowledge on economic evaluation of health programmes in Bangladesh is not currently available. While a number of economic evaluation studies have been performed in Bangladesh, no systematic investigation of studies has been done.

Objective: Systematically review published articles in peer-reviewed journals on economic evaluation of health and health-related interventions in Bangladesh.

Methodology: Literature searches were carried out during November-December 2008, with a combination of keywords, MeSH terms, and other free-text terms as suitable for the purpose. The first specific interest was mapping the articles considering the areas of exploration by economic evaluation, and the second interest was scrutiny of the methodological quality of studies.

Results: Of 1,784 potential articles, 12 were accepted for inclusion. Ten articles described the competing alternatives clearly, and only 2 articles stated the perspective of their articles clearly. While all the studies included direct cost, only one study included the cost of community-donated resources and volunteer costs. Two studies calculated the incremental cost-effectiveness ratio (ICER). Six studies applied some sort of sensitivity analysis. Two articles discussed financial affordability of expected implementers, and 4 articles discussed the issue of generalizability for application in different contexts.

Conclusion: Very few studies on economic evaluation in Bangladesh are found in different areas of health and health-related interventions, which do not provide a strong basis of knowledge in the area. The most frequently-applied economic evaluation is cost-effectiveness analysis. The majority of the studies did not follow the scientific method of economic evaluation process, which consequently resulted in lack of robustness of the analyses. Capacity-building on economic evaluation of health and health-related programmes should be enhanced.

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Universal Nutrition Health Coverage in Bangladesh

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Background: Inadequate nutrition-related health services are primarily responsible for deaths of and diseases in children, women and increasingly men in Bangladesh. Inadequacies range from lack of breastfeeding support services in the community for new mothers to total neglect of the prevention of diet-related chronic diseases within the health service systems.

Objective: Analyze the gaps in nutrition services in Bangladesh and suggest evidence-based solutions.

Methodology: Recent publications, both in peer-reviewed journals and organizational reports, such as the UN body's REACH analysis, the USAID Profiles, the World Bank's Scaling Up Nutrition (SUN) framework and the Alive and Thrive net-map analysis of the infant- and young-child feeding policy landscape, were reviewed.

Results: The major gaps in nutrition services related to a lack of vision and leadership. This policy vacuum has, in the past 2 decades, resulted in nutrition programmes which have not improved nutrition parameters, such as infant-feeding and anthropometry. There are currently new attempts at forcing on the country nutrition solutions developed and workable elsewhere but culturally-inappropriate and dangerous for our people. Fortunately, the local nutrition community identifies itself as the guardian of this important aspect of human health, and it is unlikely that interventions from abroad are going to make any significant inroads in this climate of debate and questioning.

Conclusion: Bangladesh is in a much stronger position with her technical expertise in nutrition than in the past. This means that it is possible to develop policy and strategies of benefit to the people without having to compromise with 'experts' from abroad.

Barriers to Universal Access to HIV and Sexual Health Interventions for Males Having Sex with Males in Bangladesh

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Background: Males having sex with males (MSM) are stigmatized, marginalized, and vulnerable in many ways. They have no choice but to hide their sexual preferences and practices when they seek sexual and general health services from private or public health facilities. Currently, a few thousands of MSM have access to sexually transmitted infection (STI) services at drop-in-centres (DICs) operated by non-governmental organizations (NGOs)/community-based organizations (CBOs) under foreign grants.

Objective: Understand the barriers to achieve universal access to HIV and sexual health interventions for MSM in Bangladesh.

Methodology: This article is based on content and contextual analyses of secondary data from social and behavioural studies conducted by ICDDR,B among MSM population in Bangladesh.

Results: Barriers to universal access to HIV and sexual health interventions for MSM are diverse, complex, and deeply-rooted in social organization of religious, cultural, and state regulations, along with political economy of the contemporary developmental sectors. Homophobic societal norms, political safety, and religious morality have prohibited sexual expression of MSM. Judgmental attitudes of health professionals are historically constructed and rooted in medical ethics, which discourage MSM to disclose their sexual practices and related health problems at government health facilities. Inadequate information and misinformation about human sexuality at large have further contributed to pervasive silence and ignorance. Apart from STIs, other health needs of MSM have received insignificant attention from donors in the era of AIDS. Therefore, NGOs/CBOs primarily render STI services at their DICs. Such DIC-based piecemeal interventions operated outside the government health systems will have little impact in terms of ensuring universal access to HIV and sexual health coverage for MSM. Moreover, skilled human resource to work with MSM is unspoken major barrier to scaling up HIV interventions in Bangladesh.

Conclusion: The structural barriers to universal access to HIV and sexual health interventions for MSM need to be understood and addressed. Well-planned, scientifically- and politically-articulated national advocacy efforts, along with capacity-building initiatives for developing skilled human resources are essential. Moreover, DIC-based HIV and sexual health interventions for MSM should be integrated with the government health systems for ensuring sustainability.

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Co-existence of Indigenous Beliefs and Modern Treatment in Healthcare-seeking Behaviour among the Oraon of Bangladesh

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Background: A study of ethnic community's indigenous belief about diseases and medicines helps understand the change in healthcare-seeking behaviour, since these are currently affiliated with modern treatment. Such understanding will clarify the pragmatism of the local people and will also suggest policy formulation for a sound health service for indigenous people.

Objective: Throw light on the community's indigenous healthcare-seeking practices and analyze the present situation and changing circumstances by the influences of modern treatment.

Methodology: A one-month intensive fieldwork was carried out following the ethnographic approach among the *oraon adivashi* of the 2 *paras* (one was the *adi-sonatoni oraon para*, and the other one was the converted Christian *oraon para*) of Sonapur village in Joypurhat district of Bangladesh.

Results: Most uneducated *adi-sonatoni oraon* (followers of ancient *oraon* religion) do not bother about the pathological changes of a disease and identify the cause of disease as the consequence of outside forces (locally called *Bonga*, *Bau batash*). This religiously-rigid category of *oraon* consult an *angur-ojha* as if he has power to denounce a particular devil. A little portion of the educated and converted Christian group of *oraon* of the village that enjoy the economic means is very flexible in reconciling indigenous beliefs with modern treatment options, such as available pharmaceuticals but their belief in the correctness of their own system's aetiology and treatment is as strong as ever. Despite knowing about the advantages of modern health facilities, a group of *oraon* is not interested to that because of the lack of communication and transportation, lack of money, and lack of access. The modern treatment facilities available at far distance are perceived as losing a major chunk of valuable working time.

Conclusion: These results indicate that the religious beliefs, education, and economic means explain a great deal about the acceptance or rejection of any scientific facility. Accessibility to health facilities has to be understood in its geographical, economic and sociocultural perspective, taking into consideration the local knowledge and practices about health.

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Public-Private Partnerships in Healthcare Delivery in Developing Countries: Some Evidences

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Background: The private sector in many developing countries is large and diverse and has continued to expand in recent years. Given the overwhelming presence of the private sector in health, many governments have been exploring the option of involving the private sector and creating public-private partnerships (PPPs) to meet the growing healthcare needs of the population.

Objective: Review the PPP experience in selected developing countries and examine what works and what does not work.

Methodology: This study is based on an extensive review of relevant documents, including peer-reviewed journal articles, which mainly focused on 3 broad themes: (a) operational issues in the management of partnership, (b) impact of public-private partnerships on health outcome, and (c) sustainability of PPP initiatives.

Results: The PPP projects in tuberculosis (TB) control in Nepal, India, and Bangladesh show increasing trend in detection of sputum-positive cases, decrease in treatment drop-outs, and improved referral mechanism. PPP projects have brought changes in individual behaviour regarding communicable (in Bangladesh) and non-communicable (in Pakistan) diseases. However, no differences in costs and performances in hospitals were found in Ghana, Tanzania, and Zimbabwe; rather, the dual lines of accountability resulted in fragmentation and lack of coordination in district health services. The majority of the PPP initiatives have engaged not-for-profit NGOs and is common in large cities. Many PPP models have been carried out without any comprehensive policy guideline, rather on 'ad-hoc' basis. For sustainable PPP, all potential private partners should be given the option to participate, and there must be a clear understanding among all. Increased demand should be coupled with increased production or procurement strategies, and there is a need to point the industry in the direction of a market opportunity not hitherto perceived.

Conclusion: The effects of the PPP initiatives on the most vulnerable population groups should be constantly monitored, and strategy(ies) designed to ensure that this target group is effectively reached. For PPPs to be successful, there is a need for comprehensive policy supported by legal and regulatory framework, financial incentives, guidelines, and commitment by the governments.

Perceptions of Bus-drivers about Road Traffic Accidents and Their Driving Practices in Dhaka City, Bangladesh

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Background: Road traffic accidents are a leading cause of deaths and injuries worldwide. In developing countries, about 95% of the world's deaths occur globally due to road accidents. One-fifth of these fatalities take place in the South Asia region. In Bangladesh, road accidents and injuries are now a growing and serious problem. In 2000, there occurred 3,970 road accidents, causing 2,270 injuries and 162.9 deaths per 10,000 vehicles in Bangladesh. Few studies have been carried out to better understand this issue. There is, therefore, a need to explore the perceptions of bus-drivers about road traffic accidents to plan effective intervention measures to improve road safety in Bangladesh.

Objective: Explore the perceptions of bus-drivers about road traffic accidents in Dhaka, Bangladesh by observing their driving practices; explore the perceived causes of road traffic accidents by bus-drivers; know the perceived susceptible group victimized more by road traffic accidents; find out knowledge of bus drivers on major traffic rules; observe if they follow the major traffic rules; and explore the perceived ways to avoid road traffic accidents by them.

Methodology: This qualitative study was conducted in Dhaka city among bus-drivers Purposive sampling method was used. Twenty in-depth interviews were conducted with bus-drivers, and 14 bus-drivers from different categories of bus services were observed during their driving by getting on that bus as a passenger.

Results: The major themes came out from the study was the background of driver's reckless behaviour and the complex relationship of road traffic accidents with different socioeconomic and political factors, such as government policy, administrative and legal system, availability of infrastructure, management policy of transport companies, and economic status of drivers. These signify that not just the driver himself but also some other extra-driving issues were responsible for road traffic accidents.

Conclusion: The study signifies the perceptions of drivers about accidents and the relationship of road traffic accidents and driving behaviour with complex socioeconomic and political factors.

Healthcare-seeking from Village Doctors for Kala-azar in Bangladesh

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Background: Visceral leishmaniasis or kala-azar, resulting in considerable morbidity and mortality, is endemic in some parts of Bangladesh. Semi-qualified or unqualified allopathic medical practitioners called village doctors form a major portion of the first-level informal healthcare providers of the country.

Objective: Understand the role of village doctors in healthcare-seeking behaviour of kala-azar patients.

Methodology: A cross-sectional household survey was conducted in Fulbaria subdistrict (400,000 population) of Mymensingh district in Bangladesh during May-October 2009. Past kala-azar cases (since January 2004) were identified from the households sampled by multistage probability sampling and were interviewed on their healthcare-seeking behaviour for kala-azar. Someone was considered a past case of kala-azar if diagnosed by a qualified physician, treated with antileishmanial drug and got cured. Informed written consent was obtained from the respondent or his/her caretaker (if the age was below 18 years) before interviewing. The Research Review Committee and the Ethical Review Committee of ICDDR,B approved the study.

Results: Of 286 past kala-azar cases identified from 5,250 households, 59% were aged below 18 years, and 58% were male. Two hundred forty-one (84%) kala-azar cases visited village doctors, often more than once (58%) for their illnesses due to kala-azar. As the first source of care, village doctors were preferred by 73% of the respondents compared to 5% for Upazila Health Complex (UHC). Of the 241 patients, only 34 (14%) were diagnosed as kala-azar cases by village doctors, with the help of Aldehyde test (65%) or rk-39 dipstick test (15%). From onset of kala-azar symptom to diagnosis, there was a median delay of 60 days (interquartile range: 30-90 days) when village doctors were the first source of care. The median delay came down to 30 days (interquartile range: 25-45 days) when the UHC was the first source.

Conclusion: Although the first choice of contact for the majority of kala-azar cases was village doctors, they failed to diagnose most illnesses. Healthcare-seeking from the village doctors resulted in a considerable delay in diagnosing kala-azar patients. Different intervention models involving village doctors or a separate cadre of community health workers with optimal training on kala-azar case management should be tested in the kala-azar-endemic areas of Bangladesh to implement early diagnosis and treatment of kala-azar.

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Adopting Agenda to Improve Human Resource in Health: The Bangladesh Perspective

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Background: In 2008, the first Global Forum in Human Resource in Health (HRH) in Kampala declared agenda for global action to improve HRH situation in 57 countries with critical shortage in the health workforce (less than 2.3 per 1,000 people), including Bangladesh. In 2010, a set of indicators was generated, and countries were reviewed to see the progress in implementing the HRH agenda.

Objective: Illustrate achievement in targeted milestones of the Kampala Declaration in Bangladesh and critically assess the performance and challenges of the HRH situation in Bangladesh.

Methodology: To quantify the progress, a questionnaire was sent to the human resource development (HRD) institutions under the Ministry of Health and Family Welfare, Government of Bangladesh. Secondary data were gathered for demographic, macro-economic, health systems, and HRH density statistics. Data were submitted by the HRD and human resource management institutions/organizations.

Results: About 23.3% of the total available positions were vacant. Positions remained unfilled in all categories. The largest percentages of vacant positions were among dentists (62%) and doctors (26%). Thirty-five of doctors and 30% of nurses in health services were located in 4 metropolitan districts where only 14.5% of the population lives. Dhaka district had the concentration of doctors and nurses by more than 4 times and 3 times respectively compared to the national average. Of the professional categories, nurses, dentists, pharmacists, and technicians were in the lower proportion compared to other categories. There was less than one nurse per doctor in the health services, which is far less than the international standard. There are 2 other dilemmas in HRH for Bangladesh. Physicians divided their time into private category, although they were public entity, and still the majority of the rural people were served by alternative medical care providers and unrecognized rural medical practitioners which were found in the Bangladesh Health Watch Report 2007 and findings of the Bangladesh Health Labour Market Survey.

Conclusion: The results showed that Bangladesh has a critical shortage of HRH, particularly in nursing and paramedic categories, which will result in difficulty to achieving the Millennium Development Goals and the target of Kampala Declaration as well. Although there was a significant success in the production of workforces and retaining them in hard-to-reach areas, there is still a huge challenge as the competent personnel are not willing to stay in rural areas.

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Implications of Demographic Events on Household Economic Condition in Rural Bangladesh

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Background: In Bangladesh, high population growth, shortage of agricultural land, and frequent natural and man-made disasters force people to migrate in search of better livelihood. Events, such as premature death of adult household members, marriage, and dowry, put heavy economic burden on the households. Little is known about the long-term consequences of migration, death, and marriage of adults on the household economic status.

Objective: Examine the effects of demographic events, such as out-migration, death, and marriage of adults on household economic condition, controlling for confounding variables, in a rural area of Bangladesh.

Methodology: The Health and Demographic Surveillance System (HDSS) maintained by ICDDR,B in Matlab, Bangladesh, recorded possession of durable goods of each household in the surveillance area in 1996 and 2005 and computed asset scores for each household using the principal components analysis. The higher the score, the better is the long-term economic condition. Heads of 39,902 households in 1996 remained the same for 31,049 (80.3%) households in 2005, and 7,849 (19.7%) households had either split or shifted residence. HDSS data on out-migration, deaths, and marriages of adult men and women (aged 15-59 years in 1996) were linked with the household asset scores in 1996 and 2005. Households with the same head in 1996 and 2005 were considered in the analysis to examine associations of out-migration, death, and marriage of adult members during 1996-2005 with household asset score in 2005, controlling for household asset score and sex and education of household head in 1996. Bivariate and multivariate analyses were conducted to estimate the associations.

Results: Migration from rural to rural and to urban areas was not associated with increased household asset score in 2005; however, international migration was. Other factors associated with higher asset score in 2005 were marriage of men and higher education of the household head, and those associated with lower asset score were death of adult members and marriages of female members. The household asset score in 1996 was positively associated with that in 2005.

Conclusion: International migration of adults brought economic benefits to the sending households. Mortality of adults and marriage of women had lowered household asset scores. The Government should attach high priority to health, especially of adults, abolition of dowry, and vigorously tap opportunities for sending people abroad.

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Role of Local Government and Community Groups in Improving Maternal and Neonatal Health in Rural Bangladesh

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Background: Issues relating to safe motherhood are not well-addressed due to lack of governance, capacity, and quality of services by government and non-government service providers in Bangladesh. Due to inadequate knowledge, capacity, and awareness about the union health service system, Union Parishads (UPs) are not fully capable to monitor and support quality services to the population under respective constituencies. The Government of Bangladesh has begun to strengthen the capacity of UPs by restructuring and empowering the local government in rural Bangladesh.

Objective: Explore the current practices of Union Parishad Standing Committee (UPSC) and community-based organizations (CBOs) to improve maternal and neonatal health in Bangladesh.

Methodology: In-depth interviews with members of the UPSCs and CBOs were conducted in 5 unions of 5 different districts, such as Lalmonirhat, Sirajganj, Jamalpur, Bagerhat, and Chittagong, in Bangladesh. Strategies involving content, contextual and thematic analysis were followed.

Results: The results showed that the UPSCs were not working specifically on the issues of safe motherhood. They were aware neither about the policy of safe motherhood within their gazette nor about their role in improving the safe motherhood. As a result, no system was established through which the UPSCs could monitor the functional state of public-health facilities. Similarly, CBOs could not specify their role in safe motherhood service; only support from their side is referral to an appropriate facility. In response to a query on the prevailing maternal and child-health programme, the CBOs reported the existence of a few only in the respective communities. They could not mention about any established systems whereby the UPSC could held regular meetings to review the functioning of CBOs.

Conclusion: Action on safe motherhood issues is almost absent or highly irregular in the rural local government system. Future active engagement of the UPSCs and CBOs in the safe motherhood interventions needs to be emphasized that might facilitate safe motherhood activities.

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News from the Front-lines: Unqualified Allopathic Practitioners' Knowledge, Attitude, and Practice regarding Chronic Diseases

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Background: A chronic disease epidemic threatens the healthcare system, economy, and people of Bangladesh. Lack of accessible health services makes unqualified allopathic practitioners (UAPs), comprising village doctors and drug sellers, vital to combating this epidemic. Results of previous studies on acute diseases indicate inaccuracies in UAPs' level of knowledge that affects quality of care. However, little is known about knowledge, attitude, and practice among these healthcare providers for chronic diseases.

Objective: Better define the knowledge, attitude, and practice of UAPs treating chronic diseases; better identify areas conducive to collaborative educational initiatives.

Methodology: Five focus-group discussions (FGDs) [3 with village doctors and 2 with drug sellers] were conducted in Mirsarai upazila in December 2010. Participants were identified through purposive sampling. The FGDs focused on UAPs' knowledge, attitude, and practice regarding hypertension, diabetes, and asthma. Key-informant interviews followed the FGDs to better triangulate major themes and clarify FGD topics.

Results: Preliminary analysis of the first and the second FGD revealed themes consistent with those found in the allopathic, MBBS, explanatory model for chronic diseases. Village doctors tended to describe treatment of chronic diseases through a biopsychosocial framework while drug-sellers described treatment more exclusively through a pharmaceutical framework. Groups relied heavily on experiential data when attempting to define each disease. Slight variations between the FGD groups and the participants centred around proper definition of hypertension. Greater variation existed regarding when to prescribe hypertension medications and proper treatment duration. Most UAPs denied prescribing medication for diabetes patients but variations existed regarding the definition of diabetes and what caused it. The FGDs did not consider asthma to be a disease but rather a symptom. Different groups offered different terms to describe the condition.

Conclusion: Preliminary analysis showed discrepancies among UAPs in knowledge, attitude, and practice regarding selected chronic diseases and indicated key opportunities for UAPs' collaboration with NGOs and the public sector to improve the management of chronic disease. Standardized accessible practice guidelines supplemented by educational interventions are necessary to improve primary care for chronic diseases in rural Bangladesh. Further quantitative research is needed to confirm these findings and help with designing participatory educational interventions for UAPs.

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Nutrition and Infant-feeding Knowledge among Adolescent Girls in Rural Bangladesh: Potential for Future Primary-care Programming

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Background: Globally, 178 million children aged >5 years are undernourished. Suboptimal infant and young child-feeding (IYCF) practices, like early cessation of breastfeeding, non-exclusive breastfeeding, and inappropriate complementary feeding, are major causes of childhood malnutrition and deaths. In Bangladesh, 50% of rural adolescent girls are married at >15 years, and 60% become mothers before the age of 18 years. Research is, needed to understand their knowledge, attitudes, and perceptions regarding IYCF. This information can be used for the design of effective nutrition and primary healthcare of adolescents.

Objective: Explore the knowledge, attitudes, and perceptions regarding IYCF among rural adolescent girls/mothers aged 15-21 years; identify the main points of concordance with or mismatch from key international IYCF recommendations; and explore which factors influence adolescent girls most on IYCF.

Methodology: This descriptive study was conducted in Rajshahi and Pabna districts from April to June 2010. Interviews (18), focus-group discussions (6), and open discussions (12) were conducted with 116 adolescent girls, 11 female family members, and 10 BRAC programme staff. Adolescent participants were stratified into 3 groups: unmarried, married without child, and married with child. Pre-tested semi-structured interviews were conducted with adolescent girls and programme staff, and open-ended interviews were conducted with their female family members. Questionnaire was designed using the World Breast Feeding Trends Initiative (WBTI) indicators on IYCF.

Results: The results showed that the knowledge of optimal infant- and young child-feeding practices was poor among the adolescents in each of the 3 strata. Knowledge and perceptions of nutritious foods, breastfeeding, complementary feeding, gender, and generational differences among the adolescent unmarried girls were much better than the adolescent married girls with children and without children but not in proper meaning.

Conclusion: Early education of adolescent girls regarding IYCF and primary care may be an effective way to improve current situation.

Response to Health, Environment, and Sanitation: Lessons Learnt from Tangail Pouroshova, Bangladesh

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Background: This study was conducted in Tangail pouroshova to get an overview of responses of the people to health and sanitation practices and available provisions of health and sanitation.

Objective: Collect information on health and environmental situations in Tangail pouroshova and identify the existing health, sanitation and environmental problems of the area.

Methodology: Both qualitative and quantitative techniques of data collection were used in the study. Data were collected through a sample survey of households using face-to-face interview technique. Focus-group discussions (FGDs) were also conducted with health workers, pouroshova employees, and local people. The purposive sampling technique was used for including all the characteristics of respondents of different social categories with 250 household samples.

Results: The results showed that most (85%) households were used to drink underground water while 83% did not know whether their water was contaminated with arsenic or not. About 50% of the households were used to throwing their garbage in their respective home compound while only 28% used bins supplied by the Pouroshova. The existing drainage facilities and medical care facilities of the area were insufficient. The diseases suffered by the household members for the last 6 months were fever (43%), cold (10.5%), and jaundice (13.1%). Half (50%) of the household members were treated by private practitioners having MBBS degree or above, followed by over 29% at hospitals. Only 9% of the household members visited private clinic. LMF doctors and quacks treated about 10% and 7% respectively. More than 70% of the households provided alopathic treatment to their family members. The majority (60.3%) of the respondents opined that the existing medical facilities in Tangail pourashova were inadequate.

The respondents were aware enough of the importance of vaccination for preventing the 6 deadly diseases among children. Only 11% of the respondents did not have adequate knowledge on vaccination. About 76% of the pregnant women (n=190) were vaccinated during their pregnancy. Although 89% of the respondents had knowledge about vaccination, 81.7% completed immunization for their children while the remaining 18.3%of the households did not participate in the immunization programme.

Conclusion: The results indicate that, although the Pouroshova has health and sanitation facilities, these were inadequate. Waste management, development of the drainage system, creation of awareness for child and maternal health, and expansion of coverage of health services should be given priority for the strategic development of this sector which could lead to a healthy town.

Use of Mobile Technology to Strengthen Service-delivery in Rural North India

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Background: India is distinguished for having the largest working mobile sets in the world and yet increasing at the fastest rate in the world. It is estimated that almost 100% of urban families have mobile phones, with almost 45% in the rural areas. The spread of mobile phones has brought out many economic and social benefits, including in the health sector.

Objective: Explore the use of mobile phone for improving the health service-delivery system and people's willingness to pay for health information services that could be delivered to them either through SMS or voice call.

Methodology: The study was based on about 1,000 community healthcare providers (including local private providers) in rural areas of Bihar and UP and about 2,000 mobile-user community members. Besides, about 30 in-depth interviews were conducted on the use-pattern of mobile technology.

Results: The results showed that mobile phone was being used for strengthening of service-delivery by improving supervision (among ICDS staff) and the coverage of pregnant women for antenatal care and institutional delivery by identifying pregnant women using network among ANM, AWW, and ASHA or timely alert to the PHC staff about arrival of women with labour-pain or families contacting providers for care and services. A community survey on the use of mobile phone showed that mobile has penetrated significantly into the rural areas also, and 42% of the households have at least one mobile set. About two-thirds were willing to receive health messages through mobile phone, mostly in voice mode, and about 60% were willing to pay for services ranging between Rs 5 and 30 per month.

Conclusion: The study demonstrates great potential of mobile technology in strengthening health services, and the technology needs large-scale implementation.

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Journey of Clinical Laboratory Services: From Manual to Automation for Excellence and Accreditation to ISO 15189:2007

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Background: Clinical Laboratory Services (CLS) of ICDDR,B provides diagnostic services since 1985 through integration of Biochemistry, Pathology, Microbiology laboratories. Pathology Unit was reorganized into Hematology and Molecular-Serodiagnostic laboratories, and Specimen Reception Unit developed. Blood bank was recently added in CLS. Manual techniques were replaced by automation, and laboratory information and management system (LIMS) was developed. The CLS participated in external proficiency scheme with College of American Pathologists, Queen Elizabeth Medical Centre, UK, and National Serology Reference Laboratory, Australia. The overall proficiency scores was rated 'high' and similar is the customer satisfaction. The external scientific review board was also highly satisfied and suggested moving forward for achieving accreditation to International Standard, ISO 15189:2007 to excel its excellence and credibility.

Objective: Modify the existing documents to meet the process and procedures of the ISO 15189:2007 guidelines and implement these in the CLS.

Methodology: FHI was appointed to find the laps and gaps. Laboratory management committee (LMC) was formed and management review system was introduced. A quality assurance unit was created, staff members were motivated to modify the documents, and the laboratory information management system (LIMS) was updated. Staff members were trained on quality management, technical procedures, and biosafety; external proficiency and/or inter-laboratory comparisons were expanded, internal quality system was upgraded, internal audit system was introduced, all equipment and freezers were calibrated, and maintenance schedule was followed; and key performance indicators (KPI) were defined, measurement of uncertainty was calculated, staff competency was periodically assessed, incidence reporting system was strengthened, corrective actions were taken, and root-cause analysis was followed when needed. Reagents and other logistic recording systems were upgraded.

Results: The FHI assessed all laboratory units in July 2008 and provided generic format of ISO 15189:2007. The staff prepared or modified 580 documents relating to management, technical procedures, work instructions, supporting documents, etc. Following application, the Bureau of Laboratory Quality Standard, Thailand, inspected the laboratories for overall assessment and submitted reports indicating minor changes. The responses are submitted and the CLS is awaiting ISO 15189:2007 accreditation.

Conclusion: Adherence to the quality standards, staff competency, internal audit, corrective actions, assessment of KPIs, measuring uncertainty, etc. will contribute to sustainable quality improvement. Implications of accreditation will be multifold: increasing number of users and samples, international acceptability of test-results, and attracting more researchers to ICDDR,B.

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Mobile Trainer in Bangladesh: Supportive Supervision and Quality Assurance for Village Clinic Maternity Care

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Background: Midwifery staff (nurses or paramedics) of rural community clinics in low-resource settings frequently work with little ongoing supervision or in-service training. With appropriate supportive follow-up, they can provide appropriate, high-quality obstetric care in remote delivery facilities. LAMB, an integrated rural health and development NGO serving 700,000 people in northwest Bangladesh, has such a programme. In Bangladesh, 18% of births take place with skilled attendance whereas LAMB target areas showed 53-64% skilled attendance.

Objective: Describe the selection, training, preparation, and practices of the staff members supporting community obstetric services around LAMB.

Methodology: This case study reviews documents relating to and interviews staff engaged in the development of mobile trainers connecting the LAMB Hospital to rural delivery facilities.

Results: Over 2,000 deliveries took place in 2010 in 15 community 'safe-delivery units' (SDUs), with 20% of delivery cases and 4% of antenatal patients referred to the LAMB Hospital. A nurse-midwife with motorbike license and willingness to do field visits was hired as a 'mobile trainer'. Development of her skills and relationships with various staff included training as a trainer, orientation with field supervisors, and updating clinical skills with nurses and doctors at the hospital. Hospital staff are oriented to SDU work through field visits and involvement in refresher training of the field staff. The mobile trainer generates monthly reports from supportive supervision field visits guided by checklists and review of referral quality (assessed by doctors receiving referrals and collated by LAMB information systems). The reports are used by field managers, clinical support team, and trainers for work assessments and follow-up, inservice training development, and tracking of quality trends.

Conclusion: LAMB's mobile trainer received 1-2 years of training for development of skills and experience. Recognizing personnel and management limitations, the long development timeframe may not be replicable. Similar mobile trainers need to be oriented to the training skills unique to building confidence in rural paramedics. Hospital referral information helps focus on linkage with a wider health system. Technical skill and relational partnership-building should characterize mobile trainers in appropriate, relevant integrated health systems at the upazila and union levels.

Acknowledgements: LAMB's community work is supported by Plan International, DFID, and TEAR fund.

Coverage of Antenatal Care and and Its Barrier in Rural Matlab, Bangladesh

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Background: Antenatal care (ANC) is considered an essential and preventive intervention to reduce the risk of pregnancy-related complications and perinatal and maternal mortality. This service is provided free of charge, and, in selected areas, with financial incentives—Demand-side financing (DSF). DSF, a maternal health voucher scheme, covers 3 ANC visits, safe institutional delivery, one postnatal care visit, and a cash subsidy to poor and vulnerable pregnant women.

Objective: Assess the use of ANC and reasons for not attending or missed visits among pregnant women who were followed up from early pregnancy to delivery.

Methodology: The study was conducted in the government service area of the Health and Demographic Surveillance System of ICDDR,B in Matlab where DSF is being implemented. Pregnant women were actively identified by the female field workers in the community through pregnancy test. Each pregnant woman was explained about ANC and its schedule and benefits and was referred to the nearest government health facility—Family Welfare Centre (FWC). In the FWC, only one Family Welfare Visitor (FWV) is available to provide ANC, in addition to her other activities, such as providing family-planning service, conducting delivery in the clinic and community, and attending satellite clinics, tubectomy camp, and DSF project meeting outside the FWC.

Results: During October 2009–November 2010, 362 pregnant women were identified and followed up until delivery. ANC attendance by individual women gradually decreased from 62% at the first visit to 38% and 35% in the second and the third visit respectively. Only 17% of the women made all 3 ANC visits. Over a quarter of pregnant women did not receive any ANC during their pregnancy. The major reasons for lower ANC attendance were low awareness and lack of interest among the pregnant women and their family members, distance of FWC, lack of timely availability of service providers (FWVs), and unavailability of expected service.

Conclusion: The findings showed that the ANC coverage was inadequate even in a DSF-supported area where the maternal health voucher scheme was in operation. Further investigations are necessary to identify the barriers to ANC-use.

Role of Village Doctors in the Management of Childhood Illnesses: Findings from a Descriptive Study in Matlab, Bangladesh

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Background: Village doctors are the primary care providers for sick children in rural areas of Bangladesh. It is important to know what specific roles they play in managing childhood illnesses to ensure the health of children and eventually achieve the target of Millennium Development Goal 4.

Objective: Describe the role of village doctors in the management of childhood illnesses and perceptions of the community towards them.

Methodology: A cross-sectional study was conducted during September–December 2008 in Matlab upazila of Chandpur district in Bangladesh. The study employed both quantitative and qualitative research methods. A pretested structured questionnaire was used for the survey. Households with 2-week prevalence of illnesses among under-5 children were identified. High-practising village doctors were selected according to community responses. Qualitative tools used for the study were free-listing and pile-sorting, focus-group discussion, and in-depth interview.

Results: Of 264 respondents, 55% sought care for childhood illness from a care provider outside the house (n=264). Of those who sought care, 75% had it from village doctors while 19% sought care from formal care providers. Most village doctors mentioned receiving some sort of short training. Usually, they did not charge any service-fee, and their main source of income was selling medicines. Their preferred mode of treating children was through antibiotics. Parents of children had great trust in them and felt comfortable in seeking care from them opposed to care providers in the formal sector.

Conclusion: High rate of healthcare-seeking from the village doctors indicates the limitation of the formal health sector. Willingness of the village doctors to treat any and every illness they encounter is indicative of possible malpractices since their quality of care is dubious. The formal health sector should think how to involve the village doctors for the management of illnesses of under-5 children.

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Service Infrastructure and Health Workforce in Bangladesh: Experience of an NGO

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Background: Results of an action study in Bangladesh showed the success of training to community paramedics on health, family planning, communication, and counselling skills among young girls and that involving social workers and health workers is improving the health service infrastructure and health workforce in Bangladesh. Questions were raised whether the method used in the study would also be effective when applied to other countries.

Objective: Determine the efficacy of training to community paramedics in the improvement of the health workforce and that of involving social workers and health workers in improving the health service infrastructure in selected places of Bangladesh by Jatiya Tarun Sangha (JTS).

Methodology: A cluster-randomized controlled trial was carried out. Twenty-seven health centres (Smiling Sun Clinics) of the JTS were paired, and 30 randomly-selected community paramedics were given training in each batch. They comprised the intervention group, and the others to the control group. The integrated management of the community paramedic training module—'train young girls'—was used for the training and employing them in the health centres. Analysis included data from 27 health centres and 275 paramedics, mostly aged 18-24 years, recruited from neighbouring areas of these health centres after consultation with local health and social workers, and community leaders. Information on recruitment, training, and employment, feeding practices, recall of the recommendations of health and social workers, and sociodemographic variables was recorded.

Results: At the beginning, a lot of questions arose about funding and establishing a paramedic training centre and recruitment of staff and students. Similarly, a lot of questions arose about funding and establishing the own clinic buildings. The tenth batch was ongoing in 2010; 90% of trained paramedics are already employed; and 3 clinic buildings were constructed. This achievement inspired other 27 NGOs of SSFP and 233 NGOs of SANB to undertake such initiatives.

Conclusion: The results indicate that training of young girls to work as community paramedics in Bangladesh and community involvement for the health service infrastructure can make major development in health services at the grassroots level.

Acknowledgements: The author thank concerned NGOs and USAID that funded the project of SSFP.

Development of a Sustainable Telemedicine Reference Model for Bangladesh

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Background: In countries where healthcare services are inadequate and where access to medical services is restricted by distance and poor transportation, telemedicine offers a great opportunity and possibilities to deliver medical services using information and communication technology. This study mainly investigates the diffusion of *e*-health technology in Bangladesh to deliver better medical services to remote sites considering the limited resources by developing a sustainable telemedicine reference model.

Objective: Develop a telemedicine reference model especially effective for rural areas to help the under-performing and unbalanced health system in Bangladesh and identify some factors which should be assessed carefully before implementing the proposed telemedicine model.

Methodology: Before developing the telemedicine reference model, it is required to consider first the network infrastructure in Bangladesh. The goal intended to be attained is to build up a connection between remote health centres and specialized hospitals having well-equipped medical services, healthcare professionals, and a sufficient number of doctors to help remote doctors to diagnose diseases at the early stage and minimize unnecessary transfer of patients from a remote site to a large hospital in the urban area. For the current telecommunication infrastructure in Bangladesh, real-time telemedicine is possible up to the district level among large, specialized and district hospitals. Store and forward basis telemedicine support can be expanded up to the upazila and union levels. The proposed model will be implemented considering the medical facilities of specific organization, structure, and location of the health centres.

Results: Some centres in Bangladesh started offering telemedicine services, and the Government of Bangladesh has also taken initiatives to provide tele-health services to the rural people with the help of mobile phone companies. Video-conferencing among doctors up to the upazila- or union-level health centres has also begun. However, standardization of telemedicine services from different vendors is required for the portability of interoperability telemedicine equipment. Standardization of the interface between telemedicine equipment and telecommunication systems is also required. This task is performed by developing a telemedicine reference model.

Conclusion: The proposed telemedicine reference model provides a standardized platform of *e*-health services to promote universal health coverage.

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Impact of Non-ionizing Radiation on Public Health

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Background: Ten crore people of Bangladesh use the cellphone in their everyday life. Many base-stations are also seen around the country. The users and those who are living near the base-station/ tower have been affected by radiation. The high-frequency radiaton from some specific cellphones are very harmful. So, the impact of radiation and how it causes several diseases were measured.

Objective: Assess the impact relating to how such radiation makes health problem, how people can protect from it, and find easy technology for protection.

Methodology: Theory of radiation physics and medical physics was applied. Primary data were collected from the public community, and data were processed through statistical and mathematical methods. Secondary data from related journals were analyzed using physical theory.

Results: Some questionable impact was found at high-frequency microwave radiation but not at low-frequency radio-wave. People were suffering from leukaemea, blood pressure, cancer, tumor, skin disease, etc. due to these radiation.

Conclusion: Most people of Bangladesh do not know about radiation hazards from cellphones and base-station radiation. So, the users of cellphones should have much knowledge, and they should have easy technology to protect them from such kind of common radiation.

Birthing-hut: How It Improves Newborn Care among the Urban Poor in Slums of Bangladesh

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Background: Despite progress in child-survival and fertility decline in Bangladesh, the policy or plan in the country does not offer better maternal and newborn care for slum-populations. BRAC, the largest NGO in the world, introduced a 5-year community-based health programme—Manoshi—in 2007 for the urban poor in slums of 6 cities of Bangladesh. Birthing-huts, locally called delivery-centres, were established within slums to provide safe care to mothers and newborns and arrange urgent referral of emergency complications to hospitals.

Objective: Capture BRAC's lessons in improving newborn care among the slum people in Bangladesh.

Methodology: Data were extracted from the BRAC's Management and Information System (MIS) and from a baseline survey done in 2007.

Results: Manoshi has reached 5.7 million people and established 418 birthing-huts in urban slums in a phased manner. About 6,036 community health workers were trained to offer maternal and newborn care. Supervised and supported by Manoshi midwives, 848 urban birth attendants provide delivery-care at these birthing-huts. During 2010, from among 3.3 million people of the Dhaka City Corporation, over 109,025 pregnant women were identified. Ninety percent of the pregnant women received one antenatal visit by the Manoshi community health workers, and 76% received 4+ antenatal visits. Of 79,136 pregnant mothers, Manoshi covered about 66,099 mothers who delivered. A major shift in place of delivery was observed over 4 years (2007 to 2010). Births in the hospital increased from 14% to 44%, with 36% births taking place at birthing-huts. Births at home declined from 86% to 20%. Over 98% of the 66,099 mothers who delivered received postnatal visits within 24 hours, and 92% received 3+ postnatal visits. In the birthing-huts, the rate of stillbirth was lower, reflecting better quality of care. The birthing-huts also reduced the delay in referral of maternal complications compared to delivery at home. The neonatal mortality rate declined from 16 to 13 per 1,000 livebirths during 2008-2010.

Conclusion: The role of birthing-huts in enhancing skilled attendance during childbirth and referral of emergency cases to hospitals on time is crucial to improve maternal and newborn care and health among the urban poor living in slums of Bangladesh.

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Health Consequences of Exposure to Environmental Pollutants in Rural Bangladesh

15 March 2011, Tuesday
01:30 pm-02:10 pm (Venue: Meghna Room—1st Floor)
Plenary Session

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Health Consequences of Environmental Pollutants in Food and Drinking-water

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Background: Health-associated research in Bangladesh has so far largely focused on infectious diseases and malnutrition while little attention has been paid to potential environmental pollutants.

Objective: Within the ongoing AsMat and MINIMat projects, we are evaluating the exposure to arsenic and other environmental pollutants in drinking-water and food in Matlab, Bangladesh, and associated health risks and susceptibility factors. In particular, the aim is to build a large mother-child cohort for investigation of early-life exposure to toxic agents and health effects later in life.

Methodology: Toxic and essential elements are being measured in urine, blood, rice, and drinking-water from pregnant women and their children and placenta, cord-blood, and breast-milk. Metals were measured with ICP-MS and arsenic speciation with HPLC in line with ICP-MS. Health outcomes included skin lesions (AsMat), pregnancy outcomes, infant and child development and morbidity/mortality, immune function, and several biomarkers of toxicity. The susceptibility factors studied included age, nutritional status, genetic polymorphisms, and arsenic methylation via one-carbon metabolism.

Results: The pollutants of main health concern were arsenic, cadmium, manganese, and DDT. Water arsenic concentrations ranged to more than 2,000 µg/L (WHO guideline value is 10 µg/L based on cancer risk) and urine. Associations were found with skin lesions, some of which may be premalignant, increased overall mortality, increased infant mortality and infant morbidity, as well as impaired child growth, immunosuppression, and oxidative stress. Rice seems to be increasingly important as source of arsenic exposure, probably due to arsenic in both soil and irrigation-water. Another important pollutant is cadmium, known to adversely affect kidneys and bones after chronic exposure. Rice was the main source as it easily takes up cadmium from soil. The main risk groups are pregnant and malnourished women and children. Exposure to lead, a highly-neurotoxic element during early development, was fairly low on average. Elevated exposure seemed to originate from cooking-pots, tin-roof, and dust and soil (children). Elevated concentrations of fat-soluble pesticides, in particular DDT and its metabolite DDE, were detected in breast-milk. Low exposure levels were found for mercury and polychlorinated biphenyls.

Pulmonary Effects among Children Exposed to Arsenic *in utero* in Matlab

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Background: The lung is a surprising target site for health effects of exposure to arsenic in drinking-water. Although it is now known that such exposure causes lung cancer and respiratory effects in adults, health effects on lungs after early life exposure have not yet been established.

Objective: Investigate lung health endpoints among children aged 7-16 years, after arsenic exposure *in utero* and in early childhood.

Methodology: This population-based cohort study set in rural Matlab, Bangladesh, assessed the lung function and respiratory symptoms, including chronic cough and shortness of breath of children aged 7-16 years after arsenic exposure *in utero* and in the first five years of life. *In utero* arsenic exposure was assessed based on arsenic concentrations of drinking-water consumed by the mother during pregnancy. Children with *in utero* exposure to more than 500 µg/L of arsenic were compared with children exposed to less than 10 µg/L *in utero* and throughout childhood.

Results: The most notable findings to date are that the exposed children have a considerably higher prevalence of various chronic respiratory symptoms compared to the unexposed children. For example, children who had experienced *in utero* exposure to more than 500 µg/L of arsenic were more likely to report that they experienced shortness of breath when walking fast or climbing [odds ratio (OR)=3.19, 95% confidence interval (CI) 1.22-8.32, $p<0.01$)] and nearly four times more likely to report shortness of breath when walking on level ground (OR=3.86 CI 1.09-13.7, p=0.02). However, there was little evidence of effects on lung function.

Conclusion: This is the first comprehensive study of early-life exposure to arsenic in drinking-water on health effects in the lungs of children. Increased respiratory symptoms were identified but so far little measurable effect on lung function was found.

Acknowledgments: The study was funded by the National Institutes of Health (Grant No. R01-HL081520).

02:10 pm-03:00 pm (Venue: Meghna Room—1st Floor) 298 (297)

Satellite Session 1

Foetal Development and Bone-size in Arsenic Exposure

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Background: Exposure to arsenic via drinking-water is a global public-health problem. Arsenic passes the placenta, and there is an increasing evidence of adverse pregnancy outcomes.

Objective: Elucidate the critical windows and critical effects of arsenic on foetal growth among pregnant women chronically exposed to a wide range of arsenic concentrations in drinking-water.

Methodology: Exposure was assessed by concentrations of arsenic in urine of 1,929 women in early [(gestational week 8 (GW 8)] and late pregnancy (GW 30) in Matlab, Bangladesh. Pregnancy outcomes included head-circumference, biparietal diameter, occipitofrontal diameter, abdominal circumference, and femur length, assessed by ultrasonography in GWs around 14 and 30.

Results: The median concentration of arsenic in urine (U-As) was 81 µg/L (range 1.2-1211µg/L, adjusted by specific gravity) in early pregnancy and 84 µg/L (range 1.8-1435 µg/L) in late pregnancy. There was a significant negative association between arsenic in maternal urine in GW 8 (log-transformed) and head-circumference (beta=-0.217, p=0.024) and occipitofrontal diameter (beta=-0.248, p=0.004) in GW 11-19, and a significant negative association between urinary arsenic at GW 30 and femur length at GW 26-40 (beta=-0.131, p=0.018). The latter association was even more apparent using the mean of arsenic concentrations at GW 8 and 30 (beta=-0.164, p=0.003). The effect on head-circumference and femur length was most obvious at U-As of above 100 µg/L.

Conclusion: Gestational arsenic exposure in rural women in Bangladesh was associated with smaller head-circumference in early pregnancy while exposure up to the third trimester was associated with impairment of femur growth. Impairment of foetal growth was obvious at >100 µg/L in urine.

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Effects of Prenatal Arsenic Exposure on Child Immunity and Morbidity in Rural Bangladesh

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Background: Long-term exposure to arsenic (As) through drinking-water and crops is a major environmental health hazard throughout the world, particularly in Bangladesh and India, resulting in increased risk of cancer and non-cancer effects. Exposure during pregnancy has adverse pregnancy outcomes in terms of decreased birthweight, increased rate of foetal loss, preterm births, and infant mortality, particularly in infectious diseases. However, little is known about the mechanisms of As-induced developmental toxicity and early-life effects of arsenic on immunity.

Objective: Evaluate the impact of *in utero* arsenic exposure on infant immune parameters and morbidity.

Methodology: Pregnant women were enrolled at 6-10 weeks of gestation in rural Matlab, Bangladesh, extensively affected by arsenic contamination of tubewell-water. Women (n=140) delivering at local clinics were included in the study. Anthropometry and morbidity data of the pregnant women and their children and infant's thymic size by sonography were collected. Maternal urine was collected for assessment of As and placenta, cord-blood, breastmilk, and child-blood samples for evaluation of immune markers and thymic output marker, signal joint T-cell receptor excision circle (sj-TRECs).

Results: Maternal As exposure (urinary As) was significantly and positively associated with placental markers of oxidative stress, 8-oxoguanine (8-oxoG), and pro-inflammatory cytokines (interleukin-1β, tumor necrosis factor-α, and interferon-γ). Cord-blood cytokines (IL-1β, IL-8, IFNγ, TNFα) showed a U-shaped association with maternal As exposure. Arsenic exposure during pregnancy showed significant negative correlation with child's thymic index, sj-TREC and trophic factors (interleukin-7 and lactoferrin) in breastmilk. *In utero* As exposure was also positively associated with fever and diarrhoea in women during pregnancy and acute respiratory infections in infants.

Conclusion: As exposure during pregnancy appeared to enhance placental inflammatory responses partly by increasing oxidative stress and disrupting immune balance and reduce breastmilk content of trophic factors and increase maternal morbidity. Prenatal arsenic exposure impaired child's thymic development and function and enhanced morbidity, probably via immunosuppression. The findings suggest that effects of prenatal As exposure may have long-term consequences on immune function that may contribute to impaired foetal and infant's health.

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Critical Windows of Exposure for Arsenic-associated Impairment of Cognitive Function in Preschool Children: A Population-based Longitudinal Study in Rural Bangladesh

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Background: Exposure to arsenic through drinking-water has been associated with impaired cognitive function in school children as found in a few cross-sectional studies; however, there is also exposure via food. Little information is available on the most critical windows of exposure.

Objective: Assess the association of pre- and postnatal arsenic exposure on development of children at 5 years of age.

Methodology: A population-based longitudinal study was conducted in Matlab, Bangladesh, where arsenic concentrations in well-water vary considerably. It was nested into the MINIMat trial. Exposure to arsenic, based on urinary arsenic (UAs) concentrations, which reflects exposure from both water and food was assessed. UAs were measured in early and late pregnancy and at 1.5 and 5 years of age of the baby, and its association with intelligence quotient (IQ) of about 1,700 children at 5 years was assessed using Wechsler Preschool and Primary Scale of Intelligence.

Results: The median maternal UAs in pregnancy was about 81 µg/L (10-90 percentiles 24-380 µg/L) and 84 µg/L (10-90 percentiles 26-415 µg/L) in early and late pregnancy respectively. Children's urine contained 35 (12-155) µg/L and 51 (20-238) µg/L at 1.5 and 5 years respectively. Full-scale IQ (FSIQ), performance IQ (PIQ), and verbal IQ (VIQ) at 5 years decreased with increasing quartiles of UAs in mothers and children (ANOVA). Using multivariable-adjusted regression analyses, controlling for sex, all potential confounders and loss to follow-up, (log) urinary arsenic was significantly and negatively associated with VIQ ($p<0.05$ for exposure measures at early gestation and 1.5 years of age and $p<0.1$ for late gestation and 5 years) but not with FSIQ and PIQ. The analysis stratifying by sex was then repeated. In girls, the negative associations with both VIQ and FSIQ were statistically significant at all time points but somewhat stronger with concurrent arsenic exposure compared to prenatal and early childhood. In boys, all exposures showed consistently low and non-significant associations with all IQ measures.

Conclusion: In contrast to previous measures at 7 and 18 months, negative associations of arsenic exposure were found with VIQ and FSIQ at 5 years. The associations were much stronger in girls than in boys. Concurrent exposure seemed to be more influential than prenatal and early postnatal exposure.

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Effect of Arsenic Contamination on Immune Responses of Bangladeshi Children to Oral and Parenteral Vaccines

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Background: Environmental factors in developing countries strongly influence the immune responses leading to less than optimal responses and related immunodeficiencies. Together with micronutrient deficiency, arsenic contamination in groundwater may also be a factor predisposing to hypo-responsiveness to natural infections and to vaccines. Long-term exposure to inorganic arsenic may produce toxic effects including immunosuppression and may involve the innate and the adaptive responses. In Bangladesh, an estimated 40 million people are exposed to high levels of arsenic and to its toxic effects due to the consumption of contaminated groundwater which lead to long-term chronic conditions, including skin cancer. However, an analysis of the effect of arsenic to immune responses to vaccines has not been studied earlier. This study aimed to decipher the effect of exposure of arsenic to the immune response to oral cholera vaccine and to vaccines in the Expanded Programme on Immunization (EPI) in Bangladesh.

Objective: Determine whether toddlers living in a high arsenic-contaminated area in Bangladesh responded to oral cholera vaccine and so did a control group (n=60; aged 2-5 years) living in a low arsenic-contaminated area in Dhaka.

Methodology: Responses of children aged 2-5 years (n=155) living in Shahrasti upazila near Matlab where the tubewell-water is highly contaminated with arsenic were compared with responses in age-matched children living in arsenic-free area in Mirpur of Dhaka city (n=60). The oral cholera vaccine which is being considered for immunization in the near future in the Bangladeshi population was chosen as a model mucosal vaccine. Responses to the EPI-administered parenteral vaccines (diptheria and tetanus) were also evaluated in children in both the study areas. For this purpose, blood and urine samples were collected from the children for determination of arsenic levels and for immune responses respectively

Results: Arsenic toxicity was defined as levels of >50 µg/L, based on data from Bangladesh, and high levels were observed in about 89% (292 >50 µg/L) of the children in the arsenic-contaminated area. The level of arsenic in urine of the children in Mirpur was much lower (6.6 µg/L). The increase of vibriocidal antibody responses 2 weeks post-immunization was observed in the vaccine recipients in the arsenic-endemic area after the intake of 2 doses of the vaccine ($p<0.001$). About 85% of the vaccinees of the arsenic-exposed group mounted strong vibriocidal antibody responses, A 4-fold or greater increases in the vibriocidal titre was observed. No significant differences were found in antibody titres between children in the arsenic-exposed area (87%) compared to those in the non-arsenic area (75%) ($p>0.05$). Children receiving the cholera vaccine in the arsenic-endemic area showed significant increases in CTB-specific IgA and IgG responses ($p<0.001$). Similar increases were observed in children vaccinated in Mirpur. Children in Shahrasti had similar responses to tetanus and diphtheria toxiod vaccines.

Conclusion: The results demonstrate that immune responses to oral cholera vaccine and to parenteral childhood vaccines are not hampered due to arsenic contamination. This is a very encouraging finding and demonstrates that adaptive B-cell responses are not hindered due to arsenic contamination. This important finding needs to be disseminated widely for the promotion of vaccine intervention in all regions of Bangladesh with or without arsenic contamination.

Acknowledgements: The study was funded by Sida and ICDDR,B.

03:30 pm-05:00 pm (Venue: Meghna Room—1st Floor) 302 (300)

Satellite Session 2

Association of Maternal Cadmium Exposure during Pregnancy with Development in Early Childhood

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Background: Adverse health effects of cadmium, a common pollutant in cereals and vegetables, are well-documented. However, very little is known about the health consequences of early-life exposure.

Objective: Investigate the effects of maternal antenatal cadmium exposure on child development at 7 and 18 months of age.

Methodology: This prospective, population-based cohort study carried out in rural Matlab, Bangladesh assessed the development of around 1,400 children at 7 and 18 months of age (November 2007–May 2009) in relation to maternal cadmium exposure during pregnancy as assessed by concentrations in urine (ICPMS measurements). Associations were evaluated using multivariable-adjusted linear regression of ln-transformed (log-natural)-cadmium considering potential confounders, including child and maternal anthropometry, sociodemographic variables, home-stimulation, maternal intelligence and arsenic exposure. Outcome measures included 2 problem-solving tests-support and cover, and Bayley motor test at the age of 7 months. Eighteen-month assessment included full Bayley test—mental (MDI) and psychomotor (PDI) development indices, Wolke's Behavior Rating Scale, and maternal report of child's language development that assessed comprehension and expression abilities. Home observation for measurement of environment (HOME) was used for assessing the quality of psychosocial stimulation at home.

Results: Maternal urinary cadmium concentrations (median 0.62 µg/L) were slightly higher than those observed in the USA and Europe but similar to that in other countries with rice-based diet. Univariate analysis showed a linear trend of lower intelligence with higher quintiles of urinary cadmium for most 7-month and 18-month measures but was statistically significant for MDI and 2 language development tests of 18 months only ($p<0.05$). Multiple linear regression analysis with ln-transformed-cadmium values showed significant negative correlation for MDI, PDI, and 2 language tests of 18-month measure when only adjusted for age ($p<0.05$) but not for the measures of 7 months. However, after adjusting for all possible confounders, these effects were no longer significant.

Conclusion: This is the first comprehensive study of maternal low-dose cadmium exposure on the intelligence of their children during the first two years of life. No adverse effects were observed. However, adverse effects of gestational cadmium exposure may become apparent on children's cognition in older age. Therefore, follow-up of these children is on the way.

Acknowledgements: The present study was funded by EU, through its Sixth Framework Programme for RTD, Sida, Swedish Research Council, Swedish Research Council Formas, and Karolinska Institutet. The MINIMat clinical trial was funded by UNICEF, Sida, UK Medical Research Council, Swedish Research Council, DFID, ICDDR,B, Global Health Research Fund-Japan, CHNRI, Uppsala University, and USAID.

Management of Arsenicosis

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The patient of arsenicosis in Bangladesh was first officially recognized in 1993. Since then, more than 40,000 cases have been detected. Most cases are melanosis (mild to severe form) with or without keratosis. There are a few reported cases of Bowen's disease. Till now, the number of diagnosed cases of arsenic-induced skin cancer, diabetes mellitus, and cardiovascular and respiratory diseases is limited. Stopping the intake of arsenic-contaminated drinking-water reduces the symptoms of both melanosis and keratosis. Several mitigation methods were tried but none was found suitable for patients to provide arsenic-safe drinking-water. Several drugs were used for the treatment of melanosis and keratosis or for reducing body arsenic load. Among the drugs, chelators, such as DMPS and DMSA, were found to be ineffective. Supplements of vitamins and minerals, such as retinol, beta-carotene, ascorbic acid, vitamin E, folic acid, selenium, zinc, and lipoic acid were found to be effective. Topical application of salicylic acid (with or without urea) or propylene glycol for keratosis is also tried. Among the plant sources, spirulina is first recommended, followed by garlic, spinach, amaranth leaf, corn, and root of the water hyacinth. Only a few randomized double-blind trials were conducted. Duration of treatment, effectiveness of each compound, advantages and limitations of using these compounds are important. It is still far away to get an effective drug. To achieve that, it is important to understand the pathophysiology of arsenicosis.

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Enhancing Selenoproteins due to Selenium Supplementation among Arsenicosis Patients in Bangladesh

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Background: The vast population in Bangladesh is at risk of developing adverse health effects and various forms of cancer due to consumption of arsenic-laced groundwater. Selenium is believed to be an antidote for arsenic poisoning and a potential chemo-preventive agent for arsenic-related cancer. It is believed that oral selenium supplementation might help these patients combat arsenic toxicity.

Objective: Investigate the effectiveness of selenium supplementation in combating arsenic poisoning among a selected group of patients in Shahrasti, Bangladesh and also investigate the serum selenoprotein levels in the patient group.

Methodology: Patients with melanosis and diffuse melanosis were screened from 14 villages in 2 unions of Shahrasti. Patients were selected based on their daily intake of arsenic through drinking-water (100-500 ppb) and analysis of urine, hair and nail samples. A randomized, double-blind, placebo-controlled 96-week clinical trial was carried out. Patients were given 200 µg of selenium per day. Urine and serum were analyzed from all the patients at 0, 24, and 48 weeks of supplementation.

Results: Arsenic and selenium in urine and serum of the subjects and a number of selenoproteins, such as glutathione peroxidase (GPx) activity, selenoprotein P, and thioredoxin reductase (TrxR), in serum samples in a selected group of arsenic patients were measured after 0, 24 and 48 weeks of selenium supplementation. The glutathione peroxidase (GPx) is a selenoprotein, and it has been described as the body's frontline defense against reactive oxidation species and is believed to be at least partly responsible for the reported anti-cancer properties of selenium. The GPx activity, TrxR activity, and selenoprotein P significantly increased in the arsenicosis patients after selenium supplementation over 48 weeks ($p<0.001$). Evidence also exist that selenium in mammals promotes *in vivo* formation of selenobis-(S-gluthionylarsinium) ion and biliary excretion of this ion.

Conclusion: Selenium appears to be an effective antidote for combating arsenic poisoning in Bangladesh.

Acknowledgements: The work was supported by a grant from the National Institutes of Health, USA and Wagner College, New York, USA.

Reducing Risk of Childhood ALRI/Pneumonia by Improving Indoor Air Pollution due to Burning of Biomass Fuel in Rural Kitchens of Bangladesh

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Background: Indoor air pollution due to the use of biomass fuels (wood, cowdung, crop-residue, coal) has been recognized as an important risk factor for childhood pneumonia. More than 2 million children aged less than 5 years die annually due to pneumonia/acute lower respiratory infection (ALRI). Globally, about 90% of rural households use biomass as the main energy source for cooking leading to indoor air pollution which is an important risk factor for childhood pneumonia/ALRI. To improve the indoor air quality, an improved, smokeless, chimney stove was developed and tested with encouraging results.

Objective: Reduce the incidence of childhood pneumonia by controlling indoor air pollution due to biomass fuel.

Methodology: In a cluster-randomized controlled field trial, 200 improved stoves were installed—one in each kitchen of the households in the intervention area. In a distant control area, no chimney ovens were installed. Indoor air quality was monitored by measuring particulate matters ($PM_{2.5}$) and carbon monoxide (CO) concentrations for 24 hours. The number of childhood pneumonia cases were identified by a home-based rural surveillance in both the areas for 10 months.

Results: There were 379 households with 363 children, with no significant baseline differences between the intervention and the control group. Substantial improvements in indoor air quality and a significant reduction in the 24-hour levels of $PM_{2.5}$ and carbon monoxide (CO) were observed in the intervention area compared to the control area. $PM_{2.5}$ concentrations in the households with the improved stove were 60-80% lower than in those with the traditional stoves ($p<0.001$). Similarly, concentrations of CO in the intervention area were significantly ($p<0.01$) lower compared to the control area. Good correlations were observed between the concentrations of $PM_{2.5}$ and CO in both the areas ($r^2=0.76$, $r=0.79$). Reductions of $PM_{2.5}$ and CO also correlated with kitchen-size and nature of ventilation. There was a significant reduction in the numbers of overall pneumonia cases in the intervention area compared to the control area (odds ratio: 1.78, 95% confidence interval 1.20-2.66, $p<0.004$). There were significant ($p<0.05$) reductions in the instances of respiratory symptoms among the children and women in the intervention area. Instances of cough, breathing difficulty, fever, and backpain were significantly less among cooks who used the improved stoves.

Conclusion: Improved stove may be useful to reduce the burden of childhood pneumonia/ALRI by improving household air quality.

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Millennium Development Goal: Considering Environmental Health and Achievements

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Ensuring access to safe drinking-water by 2015 is a commitment for the global population set by the Millennium Development Goals. In Bangladesh, significant achievements have been made by providing safe water much earlier by installing tubewells nationwide. Environmental risk factors, especially water-pollutants, are a major source of morbidity and mortality in developing countries. However, subsequent metal contamination discovered by testing water necessitated mitigation programmes. Many communities lack access to safe drinking-water and, therefore, the risk of diseases due to consumption of contaminated drinking-water is high in many regions. There are various related health conditions. Thus, mitigation measures included: testing tubewells and replacing; use of deeper wells; preservation and treatment of surface-water; use of sanitary dug-wells, river-sand and pond-sand filters; rainwater collection and storage; household and large-scale filtration; and installation of pipelines for rural water supply. Finally, large-scale piped water supply could be arranged through the public-private partnerships in Bangladesh and elsewhere.

Malaria Control in Bangladesh: Past, Present, and New Opportunities

16 March 2011, Wednesday
09:00 am–10:30 am (Venue: Meghna Room—1st Floor)
Session 1: Malaria in Bangladesh

Malaria-control Initiatives in the Past 50 Years in Bangladesh

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Background: Geographically, the country is close to the epicentre of malaria drug-resistance in Thailand-Cambodia-Myanmar region with the existence of numerous diverse *Anopheles* species and with different biting habits, prone to severe health consequences.

Objective: Review malaria-control programme in the past 50 years in this region.

Methodology: Publications and reports on malaria from this region were reviewed.

Results: Before initiation of the Malaria Eradication Programme (MEP) in early 1960s, the disease was widespread allover the country. The Chittagong Hill Tracts were hyperendemic, and more than half of the country was mesoendemic. Following the MEP, the incidence of malaria dropped from 10.8 per 100,000 people in 1968 to 4.22 per 100,000 people in 1971, which is considered a period of waning. The MEP relied upon indoor residual spray using DDT, active surveillance for new cases, and effective drug treatment. Following the Liberation War of the country in 1971, the MEP severely slacked the 14-year scheme which resulted in the rise of malaria from 25.40 in 1972 to 60.44 per 100,000 people in 1976, a resurgence period. The MEP was formally converted to the Malaria Control Programme (MCP) in 1977, and the MEP was merged with the Primary Health Care programme. The MCP focused on vector control in limited susceptible areas without active surveillance. This trend remained static until the early 1990s when it further increased. Following the official ban and stoppage of DDT-use in 1991, the incidence of malaria peaked soon after in 1994. The 2007 cross-sectional study on malaria in the 13 malaria-endemic districts showed the overall prevalence rate of 3.97% in Bangladesh. The prevalence of malaria by rapid diagnostic test was 13% in the Chittagong Hill Tracts. About 89% of infections were caused by *Plasmodium falciparum*, 5% by *P. vivax*, and the remaining 6% by mixed infection. The asymptomatic prevalence was 40 per 1,000 people compared to 2 per 1,000 in the 5 southern and 8 northeastern districts respectively. Present control efforts rely on passive case-detection, effective treatment, and provision of indoor insecticide-treated nets.

Conclusion: High rates of asymptomatic malaria infection suggested a need for reinforced surveillance and effective vector-control measures. While most control strategies and surveillance methods are focused on symptomatic malaria, transmission of malaria occurs because of circulating gametocytes, often from asymptomatic individuals.

Current Activities of National Malaria Control Programme in Bangladesh

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Background: Thirteen of the 64 districts (95% of the total cases) in Bangladesh are malaria-endemic, of which 3 accounts for most cases. The 3 hill districts—Bandarban, Khagrachari, and Rangamati—report more than 80% of the malaria cases and >90% of deaths every year. Among the *Plasmodium* species, *Plasmodium falciparum* (~85%) and *P. vivax* (~15%) account for the major prevalence in Bangladesh. Microscopy is still the gold standard to confirm diagnosis and for monitoring antimalarial drug resistance. From 2007 onwards, the NMCP is mostly managed by the Government in concurrence with BRAC-led NGO consortium (composed of 21 NGOs) financed by the Global Fund to Fight AIDS, TB and Malaria (GFATM).

Objective: Reduce malaria morbidity and mortality until the disease is no longer a public-health problem in the country.

Methodology: Based on the revised draft strategy document (2008-2015), the NMCP expects to identify 90% of the malaria cases and to provide treatment in the 13 endemic districts, promote long-lasting insecticidal net (LLIN) (2 nets/household) in 100% households in the 3 hill districts and in 40% of the households in the remaining 10 districts, replace LLINs every 3-5 years, and arrange treatment and re-treatment of all available community nets and selective indoor residual spray to control focal (sudden) epidemics. The NMCP strategies are: disease prevention, disease management (diagnosis and treatment), surveillance, IEC (information, education, and communication) and community mobilization, research and training, strengthening district health systems, strengthening partnership in malaria control, and monitoring and evaluation. The NMCP is providing early diagnosis and prompt treatment (EDPT) with effective drugs to the malaria patients in the endemic areas through private-government partnership. Rapid diagnostic test (RDT) has been introduced to detect suspected malaria patients from the field level. LLINs have been distributed to the endemic areas. Treatment and re-treatment of ordinary mosquito-nets were also continued. Training has been provided to the different professional groups for the management of malaria from the endemic areas. Social mobilization and community awareness have also been undertaken in the endemic areas.

Results: The mortality rate reduced from 4.6 per 100,000 people in 2005 to 0.43 per 100,000 people in 2009. Although the mortality rate is decreasing, the incidence rate increased up to 2008. This is due to the increased access to diagnosis with RDT and treatment with ACT even to the community level. As of June 2010, more than one million nets were treated with insecticides, and 1.7 million LLINs were distributed. Community awareness was increased in the endemic areas with continued efforts of the NMCP. These integrated measures resulted in the decreased malaria-incidence rate from 2008 onwards.

Conclusion: The NMCP has been successful so far in achieving its goal. However, the most important issue is to sustain this low incidence even once the GFATM money is stopped. Thus, such long-term commitment is extremely essential to achieve by proper planning and implementation when the flow of money from GFATM is existing.

Acknowledgements: The NMCP is grateful to GFATM for financial and WHO for technical support to its activities.

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Evidence of Improved Diagnosis and Management of Malaria from Bangladesh

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Background: Resurgence of malaria, occurred in Bangladesh in the 1980s after the cessation of the eradication programme in 1969, was associated with development of resistance to antimalarials and insecticides against vectors. The malaria-control programme faced enormous challenge in implementing the new strategy of the World Health Organization (WHO) due to resource constraints. Country-specific evidence was necessary to adapt the new strategy for improved diagnosis and management of malaria.

Objective: Review the current evidence for the management of malaria in Bangladesh.

Methodology: Publications from key research conducted by the Malaria Research Group that appeared in peer-reviewed journals were reviewed.

Results: Case definition adopted in the national strategy using clinical diagnosis of uncomplicated malaria was found to be correct in 32% of 684 patients in 8 centres in high-risk areas requiring incorporation of parasitological diagnosis. A high degree of chloroquine failure (70%) required the change in the treatment policy of uncomplicated malaria by using artemisinin combination treatment (ACT). Uncomplicated falciparum malaria equally responded (>97%) to artemether lumefantrine or artesunate mefloquine ; non-directly-observed regimen of ACT used in Bangladesh was found to be as good as directly-observed regimen in curing UM (99% vs 100%). Injection quinine was equally effective like artemether (18% vs 19% of deaths) in the treatment of severe malaria. A large multicentre study (SEQUAMAT) comparing injection artesunate with quinine reported reduction in mortality in severe malaria by 35% using artesunate. A similar reduction in mortality (22.5%) was found in African children with severe malaria in a recently-completed large trial using artesunate (AQAMAT). Consistent high fatality and most deaths happening in the community and within the first days following admission in hospital required pre-referral treatment of severe malaria. Rectal artesunate reduced mortality by 25% among cases, particularly who were delayed in arrival to hospital. Artesunate was economical in saving lives, and cost of averting death was approximately US$ 140. The re-assurance of safety of artesunate was found to be due to absence of significant ECG changes.

Conclusion: Evidence of superiority of artesunate over quinine in treating severe malaria and efficacy of rectal artesunate as pre-referral treatment of severe malaria generated in the multicentre study in Bangladesh prompted the WHO to incorporate the findings in the current treatment guidelines. Scaling up of such evidence is urgently required to achieve the malaria-related Millennium Development Goal.

Acknowledgements: The authors thank the Tropical Disease Research and the Wellcome Trust Unit, Bangkok, for collaboration and support.

11:00 am–12:30 pm (Venue: Meghna Room—1st Floor) 310 (312)

Session 2: Current approach to control malaria in Bangladesh

Mapping Hypoendemic, Seasonal Malaria in Rural Bandarban, Bangladesh

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Background: Until recently, the Chittagong Hill tracts have been hyperendemic for malaria. A past cross-sectional survey, based on rapid diagnositic tests, in 2007, recorded rates of approximately 15%. This study was designed to understand the present epidemiology of malaria in this region, to monitor and facilitate the uptake of malaria-intervention activities of the national malaria programme, and to serve as an area for developing new and innovative control strategies for malaria.

Objective: Map hypoendemic, seasonal malaria in rural Bandarban in Bangladesh.

Methodology: This field area for research was established in 2 rural unions of Bandarban district of Bangladesh, north of Bandarban city, which is known to be endemic for malaria due to *Plasmodium falciparum*. The project included the following elements: (a) a demographic surveillance system, including an initial census with updates every 4 months, (b) periodic surveys of knowledge, attitude, and practice, (c) a geographic information system, (d) weekly active and continuous passive surveillance for malaria infections using smears, rapid tests, and PCR, (e) monthly mosquito surveillance, and (f) daily weather measures. The programme included both traditional and molecular methods for detecting malaria and laboratory methods for speciating mosquitoes and detecting mosquitoes infected with sporozoites.

Results: The demographic surveillance enumerated and mapped 20,563 people, 75% of whom were tribal non-Bengali. The monthly mosquito surveys identified 20 *Anopheles* species, 7 of which were positive by circumsporozoite ELISA. The annual rate of malaria was close to 1%, with 85% of cases in the rainy months of May-October. Definitive clustering identified in the low-transmission season persisted during the high-transmission season.

Conclusion: It is expected that this demographically- and geographically-defined area, close to the Myanmar border, which is also hypoendemic for malaria, will be useful for future studies of the epidemiology of malaria and for evaluation of strategies for malaria control, including new drugs and vaccines.

Acknowledgements: The study was supported by the Malaria Research Institute of the Johns Hopkins University, Baltimore, MD, USA.

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Involvement of Community-based Service Providers in Malaria Control

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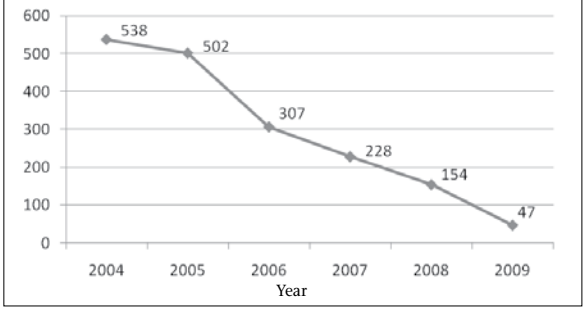
Background: Malaria is one of the major public-health concerns due to its re-emergence in Bangladesh in the 1990s. It is endemic in 13 northern, northeastern and southeastern districts bordering India and Myanmar. About 11 million people of these districts are at risk. More than 80% (n=70,281) of 84,690 reported cases in 2008 had falciparum malaria which might have turned into severe malaria and cause death. The BRAC-led 21 NGO consortium is working to scale up the Government's effort in malaria-control programme with support from the Global Fund.

Objective: Increase early access to diagnosis of malaria and treatment services by mobilizing community-based service providers for malaria control in Bangladesh.

Methodology: The NGOs have involved community-based female service providers selected from the community—health workers (shasthyo kormi) and health volunteers (shasthyo shebika)—to deliver services at the doorstep of the people. They diagnose malaria cases by rapid diagnostic test-kit (RDT), provide treatment, and refer RDT-negative malaria-suspected cases to the laboratory and patients with severe malaria symptoms to the nearest health facility. They follow up patients under treatment to ensure compliance. During their daily visit to households, they inform people about malaria-prevention and treatment services and motivate them to use insecticidal nets. They mobilize people before long-lasting insecticidal net (LLIN) distribution and net treatment session and organize and extend support in conducting behavioural change communications-related meetings, popular theatre, and folk song events.

Results: Since the beginning of the programme in 2007, the number of case detection has increased. The number of cases detected and treated by NGO health workers/volunteers contributed to more than 60% of the total reported cases. At the same time, there was a sharp decline in the number of deaths from malaria (502 in 2005; 47 in 2009) (Fig.). A recent survey showed that 54% of the population has adequate knowledge of malaria diagnostic and treatment services.

Fig. Number of deaths due to malaria in Bangladesh



Conclusion: Involvement of community-based service providers helped increase the accessibility to malaria prevention, diagnosis, and treatment services and mobilize the community for early healthcare-seeking which may reduce the number of deaths due to malaria.

Acknowledgements: The authors acknowledge the support of the Government, Global Fund, and the community in malaria-control programme in Bangladesh.

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Community-based Contribution to the Control of Malaria in 15 Upazilas of the Chittagong Hill Tracts during 2006-2010

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Background: The Chittagong Hill Tracts Development Facility (CHTDF) under United Nations Development Programme has progressively developed primary healthcare services in areas where the Ministry of Health and Family Planning (MoHFW) and non-government organizations (NGOs) did not have access to the population of remote areas: initially in 3 upazilas in 2006, then gradually increased to 9 upazilas at the end of 2008 and is currently working in 15 upazilas. The services involve 940 *para*-based Community Health Services Workers (CHSW) and one fully-staffed mobile team in each upazila. This mobile clinic works 5 days a week. Among other activities, the CHSWs diagnose malaria with rapid tests and treat with Coartem when positive. The mobile clinics diagnose and treat new malaria cases and confirm non-responsive previously-treated cases.

Objective: Review the contribution of the CHTDF programme to malaria control in the CHT during 2006-2010.

Methodology: The study includes review of the CHTDF mobile teams and CHSW's monthly malaria activities [submitted to the Civil Surgeon (CS) offices] and of the overall upazila (MoHFW) monthly malaria reports sent to the CS office. The data are presented by type of malaria, gender, age-group, ethnic origin, and specific upazila. The proportion of cases treated by the CHTDF-funded teams (versus all cases reported by the upazila) was analyzed.

Results: During 2006-2010, 57,000 cases were treated by the programme (36-46% of all malaria cases reported to the CS offices), and 87% were of *Plasmodium falciparum*. Incidence of *P. vivax* was higher (56%) in children aged 1-4 years, and severe malaria was common in people aged 15+ years. Incidence of *P. falciparum* was low in infants aged <1 years and persons aged >50 years. The incidence of malaria was the highest among Tanchangya (18%) patients and the lowest in Bangalee (1%) patients. More upazila-specific information is presented.

Conclusion: External actors (MoHFW and BRAC) are working in the field for the control of malaria in the CHT. However, the CHTDF programme is a significant contributor to its reported success, often unnoticed by the MoHFW central malaria-control programme because the CHTDF contribution is merged in the district results. The current paper will contribute to a better understanding of the nature of this contribution.

01:30 pm–03:00 pm (Venue: Meghna Room—1st Floor) 313 (309)

Session 3: GIS and Entomology

Spatial Clustering of Malaria Cases during Low-transmission Season in Kuhalong, Bangladesh

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Background: In many places throughout the world, transmission of malaria is heterogeneous in space and time even in areas where the disease is endemic. The seasonality of transmission, as influenced by annual changes in temperature and rainfall, is well-known but less well-understood is the spatial variation in risk of disease during the year. One proposed strategy for targeted interventions is to identify and locate areas where transmission of malaria is ongoing during the season of low transmission. The idea is that these foci serve as reservoirs from which malaria spreads as the rainy season begins so that, by targeting these foci, the burden of disease can be significantly reduced in later years. To develop these interventions, it is necessary to demonstrate that cases of malaria are spatially clustered during the low-transmission season and that some environmental factors that are highly associated with those conditions can be identified.

Objective: Examine the spatial pattern of human malaria cases in Kuhalong union in eastern Bangladesh.

Methodology: Malaria cases were located by a combination of passive and active surveillance and confirmed by both rapid diagnostic test (RDT) and microscopy.

Results: There was strong evidence for significant spatial clustering in the cases identified during the low-transmission season. Both social and physical/environmental correlates of infection risk were identified allowing us to locate other potential areas of transmission during the low-transmission season.

Conclusion: The results indicate that during the low season, malaria transmission is highly focal and that certain measurable features of the environment are associated with these locations. The reduced numbers of easily-identifiable locations suggest that targeted interventions during the low season may be a profitable strategy for reducing malaria disease burden in subsequent years.

Acknowledgements: The study was supported by funds from the Johns Hopkins Malaria Research Institute.

Feeding Behaviour of *Anopheles arabiensis* and Response to ITNs: Lessons to Be Learnt?

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Background: The Macha region in rural southern Zambia was formerly hyperendemic for *Plasmodium falciparum* malaria. *Anopheles arabiensis* is the primary malaria vector in this region and displays a very high preference for feeding on humans. In 2007, the national vector-control programme distributed a large number of long-lasting insecticide-treated bednets (ITNs) to the resident population and initiated an indoor residual spray (IRS) campaign.

Objective: Determine if the feeding behaviour of *Anopheles arabiensis* was altered by the vector controls implemented throughout the region.

Results: Monthly census data showed that ITNs were well-received by the community, and the use was high. However, despite these efforts, mosquito's foraging behaviour remained unchanged, and virtually all *An. arabiensis* tested attained a human blood-meal. No apparent repellant effect was induced by the ITNs, and no significant insecticide-resistance has been detected in this vector population. Paired indoor/outdoor human-landing catches (HLCs) and outdoor cattle-baited collections have confirmed that this species has remained highly anthropophilic in Macha. The findings suggest that the exophagic tendencies of *An. arabiensis* and its foraging activity from dusk to dawn may allow the vector species to circumvent the protective effects of ITNs and similarly indoor residual spraying (IRS).

Conclusion: It is unknown if similar problems will become apparent in the malaria-control programme for Bangladesh. Studies are needed to evaluate these possibilities and to devise procedures and mechanisms to maximize the effect of control efforts.

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Mapping Malaria Epidemiology in Bangladesh: Prevalence of *Anopheles* Species and Their Infection Status in an Endemic Area

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Background: Malaria is one of the major public-health problems in 13 northern and eastern districts of Bangladesh. Among 35 *Anopheles* mosquito species of Bangladesh, only seven were confirmed as vectors. Recently, 5 additional species have been implicated as vectors by indirect ELISA methods. Transmission of *Plasmodium* sp. by anopheline vector is a crucial factor in determining the epidemiology of malaria in endemic areas. An entomological study was initiated to map the burden of malaria and dynamics of disease transmission in Bandarban, one of the major malaria-endemic areas in Bangladesh.

Objective: Identify the malaria vectors and their population and infection dynamics over the seasons in Bandarban where malaria studies are ongoing.

Methodology: *Anopheles* mosquitoes were collected every month from selected houses in 2 field sites—Kuhalong (from July 2009) and Rajbila (from May 2010). CDC miniature light-traps were used for indoor collections. Each trap was deployed for at least 12 hours (6 pm to 6 am). After collection, mosquitoes were identified to species level using standard keys. Each female mosquito was dissected into 2 parts—head-thorax and abdomen, and ELISA was performed to detect *Plasmodium falciparum*, *P. vivax*-210, and *P. vivax*-247 circumsporozoite proteins (CSP).

Results: In total, 3,181 female *Anopheles* mosquitoes belonging to 22 species were collected from 789 trap-nights extending to June 2010. *An. jeyporiensis* was the predominant species (19.3%), followed by *An. vagus* (14.4%) and *An. kochi* (12.4%). Seasonal variation existed in abundance of mosquito species. Twenty-five mosquitoes belonging to 13 species tested positive for *Plasmodium* infection, with an overall infection rate of 0.9% (28 of 3,079). The highest infection rate was found in *An. maculatus* (2.9%), followed by *An. pallidus* (19%), *An. umbrosus* (1.7%), *An. willmori* (1.7%), and *An. baimaii* (1.4%). For the first time infections in *An. jeyporiensis* and *An. kochi* was found in Bangladesh. *An. maculatus* and *An. jeyporiensis* emerged as the most important vectors in terms of abundance and infection in Bandarban.

Conclusion: The findings indicate that the Bandarban region has a high diversity of anopheline species and malaria vectors. Further investigations are required to evaluate the biology and behaviour of the newly-recognized vectors to ensure the implementation of effective malaria-control in endemic areas.

Acknowledgements: The study was funded by the Johns Hopkins Bloomberg School of Public Health Malaria Research Institute.

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Session 4: Molecular approach to malaria

MARIB—Nine Years of Collaborative Research on Malaria and Tropical Diseases in Bangladesh

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With an estimated number of 243 million clinical cases and close to one million deaths per year, malaria remains one of the most deadly diseases even in the 21st century. In Bangladesh, malaria continues to be a major health threat, particularly in the remote and inaccessible regions of the Chittagong Hill Tracts. The clinical development of novel antimalarial drugs, research on drug resistance, epidemiology, and basic research are the major focuses of the investigation conducted by the Malaria Research Initiative Bandarban (MARIB) in Bangladesh. MARIB is a collaborative research effort originally established as a cooperation with ICDDR,B in 2002 and has been expanding its research efforts ever since. In 2006, the activities were moved from Chakaria to the Bandarban Sadar Hospital in the Chittagong Hill Tracts, and in 2009, the new MARIB laboratory and clinic were officially opened in Bandarban. Since 2006, MARIB has been providing diagnosis and treatment to more than 16,000 outpatients in support of the Bandarban Sadar Hospital. Originally dedicated to malaria research only, an attempt has been made to expand to wide range of diseases affecting the people of Bangladesh. Since 2003, MARIB has been conducting numerous clinical trials and also epidemiological and laboratory-based research on malaria and febrile illnesses. The aim is to make a worthwhile and significant contribution to sustainable development through research on diseases that are affecting the population of southeastern Bangladesh. The presentation provides an overview of the collaborative research conducted since 2003.

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Detection of *Plasmodium falciparum*, *P. vivax* and *P. malariae* during Low-transmission Season in the Hill Tracts of Bangladesh

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Background: A recent active cross-sectional survey by a rapid diagnostic test (RDT) in 2007 showed that the crude malaria prevalence was 11% among the 1.5 million people most at risk for malaria in Bangladesh. During the low-transmission season, many infections are asymptomatic, and RDT can misdiagnose parasitaemia.

Objective: Validate real-time PCR detection of *Plasmodium* species with microscopy and RDT for asymptomatic infections.

Methodology: An active randomized, population-based malaria surveillance was initiated by the Johns Hopkins Malaria Research Institute and ICDDR,B in Kuhalong union near hypoendemic Bandabarn in the Chittagong Hill Tracts of Bangladesh. The population of Kuhalong is 11,000, with approximately 2,000 households which were enumerated in a baseline census with GIS-mapping. Here the results are presented from weekly malariometrics microscopy, RDT, and real-time PCR during the low-transmission season (October to March) in the age-groups of less than 5 years, 5-15 years, and older than 15 years.

Results: Microscopy, RDT, and real-time PCR were performed in active surveillance showing approximately 2% positive rates by microscopy or RDT in nearly 500 individuals. A real-time PCR assay detected the prevalence of 6%. The sensitivity of the RT-PCR in the 96-well format was increased to 10-100 parasites per microlitre with a glycogen/acetate DNA precipitation at low-speed tabletop centrifugation after column extraction. *P. vivax* and *P. malariae* were detected in less than 5% of the malaria-positive patient samples by RT-PCR. All the *P. falciparum* isolates were chloroquine-resistant PfCRT K76T genotype and atovaquone-sensitive PfCYTb 268Y by fluorescent TAQman probe analysis. A reverse transcriptase real-time PCR assay from dried blood on filter papers was able to detect gametocytes. HRP2 antigen detection by RDT persisted up to 28 days in a density-dependent fashion. The geometric mean parasitaemia was 227; 1,342, 5,412, and 10,716 for RDT-positive on Day 0; Day 0 and 2; Day 0, 2, and 7; and Day 0, 2, 7, and 28 respectively. Studies on malaria seropositivity rates are in progress. Mapping the malaria-positive cases shows clustering.

Conclusion: Populations with a significant asymptomatic PCR-positive, RDT and microscopy-negative malaria exists. The role of this sub-population in contributing to continuing transmission is being evaluated. Chloroquine resistance is fixed in this geographic area but still responsive to artemisinin combination therapy.

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Molecular Epidemiology of *Plasmodium ovale* and *P. malariae* in Bangladesh

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Background: Malaria remains a major health threat throughout South and Southeast Asia. High standards in the diagnosis of the malaria-causing *Plasmodium* species are essential to control and adequately treat malaria. Despite its known limitations, microscopy remains the gold standard of malaria diagnosis in the field and frequently not even microscopy is available in resource-limited environments. Both *Plasmodium ovale* and *P. malariae* are typically found at very low prevalences in Southeast Asia. *P. ovale* is known to be endemic in sub-Saharan Africa, the Middle East, Irian Jaya, and Papua New Guinea but following the availability of PCR-based techniques for the diagnosis of malaria, this parasite has recently been reported also from a number of countries in South and Southeast Asia.

Objective: Assess the molecular epidemiology of *P. ovale* and *P. malariae* in Bangladesh.

Methodology: Standard and advanced molecular techniques, allowing for a reliable species differentiation and identification of variants, were used.

Results: The first cases of *P. ovale* malaria in Bangaldesh were identified in the course of this project. The data suggest that the proportion of malaria infections caused by *P. ovale* and *P. malariae* may previously have been underestimated.

Conclusion: There remains a significant lack of knowledge about the distribution and variations of 2 of 4 human pathogenic *Plasmodium* species endemic in South Asia.

Acknowledgements: The project was supported by the Malaria Research Initiative Bandarban.

17 March 2011, Thursday
09:00 am–10:30 am (Venue: Meghna Room—1st Floor)
Session 5: Malaria case management

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Update on Artemisinin Resistance

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Background: Artemisinin combination therapy is the World Health Organization-recommended first-line therapy for uncomplicated falciparum malaria, and parenteral artesunate is the best drug to treat severe falciparum malaria. It is, therefore, alarming that reduced sensitivity of *P. falciparum* to the artemisinins has recently been reported from Western Cambodia. This partial resistance is characterized by severely-delayed parasite clearance times *in vivo*. Conventional *ex-vivo* sensitivity testing is not a sensitive tool to identify this new phenotype in most laboratories, and a molecular marker has not been identified to date.

Objective: Give an update on our current work on better characterization of the artemisinin resistant phenotype, the development of new *ex vivo* sensitivity tests, the search for molecular markers, the geographical spread of the problem, and the containment measures that are put in place.

Methodology: Results from recent clinical trials, mathematical modelling, laboratory, molecular and pharmacologic studies will be discussed.

Results: Artemisinin resistance seems to mainly affect the ring stage parasite, as shown by mathematical modelling of individual parasite clearance curves. As a consequence, more frequent dosing of artesunate accelerates parasite clearance. A new *ex vivo* sensitivity test, a trophozoite maturation inhibition test, focusing on this ring stage, is more sensitive to identify the resistant phenotype. Although a molecular marker has not been identified, the phenotype does seem heritable, as shown by molecular studies using microsatellite markers. It is not very clear at this moment whether the problem has spread outside the Cambodian-Thai border region. Containment efforts have started. Mathematical modelling shows that eradication of falciparum malaria from the region is the only way to eradicate the resistant phenotype.

Conclusion: Artemisin resistance which has emerged on the Cambodian-Thai border is a major threat to malaria control. Containing the problem is crucial. Defining the current spread of the problem is pivotal for the further planning of containment efforts.

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Effect of Azithromycin Mass Drug Administration on Submicroscopic Malaria in Hypoendemic Tanzania

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Background: Trachoma infects 84 million people and causes blindness in 8 million people in tropical nations. To control trachoma, the World Health Organization recommends azithromycin mass drug administration (AZ MDA) when the prevalence is greater than 10%.

Objective: Assess the effect of AZ MDA on malaria in hypoendemic Tanzania.

Methodology: The effect of AZ MDA on malaria rates from January to June 2009 was followed in a cohort of 1,000 children and 1,000 adults from 8 villages after 4 villages received AZ MDA. The malaria rates were sampled from a serial cross-sectional survey of 2,000 subjects at baseline—month 1, 3, 4, and 6. Additionally, 1,000 children aged less than 5 years were followed weekly for fever, and a comparison of rapid diagnostic test (RDT), with microscopy, and real-time PCR was made.

Results: Malaria rates were approximately 3-4% by PCR in the survey group and 11% in the febrile surveillance group. Microscopy on the approximately 450 episodes of fever showed a rate of 4% for *Plasmodium falciparum* while RDT was positive in 12%. The agreement in the 3 tests improved with higher parasite densities and monthly prevalence. At baseline, approximately 4% were PCR-positive in the treated and non-treated villages. At month 1, 1.8% of the treated population had malaria while 5% in the non-treated village had malaria. At month 3, 4, and 6, the rates were equal in the 2 groups at 2.5%, 1%, and 0.5% respectively. Sequencing of the *P. falciparum* ribosomal L4 protein indicates largely no changes, indicative of drug resistance to azithromycin. A single isolate from a patient's sample contained a non-synonomous mutation in the active site of the ribosomal protein L4 while others had nonsynonomous mutations.

Conclusion: AZ MDA to eliminate trachoma has a transient effect on malaria rates and does not select for *Plasmodium* resistance.

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Azithromycin Combination Therapy for Treatment of Uncomplicated Falciparum Malaria in Bangladesh: An Open-label Randomized, Controlled Clinical Trial

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Background: Spreading multidrug resistance of *Plasmodium falciparum* and the absence of novel antimalarial compounds call for the exploration of approved agents for their potential use in combination regimens for the treatment of falciparum malaria. Azithromycin is a widely-prescribed macrolide antibiotic, and results of previous studies, by the present authors, have shown intrinsic activity against *P. falciparum in vitro* and for the treatment of malaria due to *P. falciparum*.

Objective: Determine the efficacy of azithromycin-artesunate as a potential alternative to currently-used regimens for the treatment of uncomplicated falciparum malaria in adults and children in Bangladesh.

Methodology: A randomized, controlled clinical trial was conducted to assess the efficacy of azithromycin-artesunate combination therapy. The study included 228 patients aged 8-65 years. Patients were randomized to 1 of 2 cohorts at a ratio of 2:1, receiving either azithromycin-artesunate once daily for 3 days (30 mg/kg of azithromycin plus 4 mg/kg per day of artesunate daily) or an adult dose of 80 mg of artemether plus 960 mg of lumefantrine (4 tablets Coartem or the equivalent for children weighing <35 kg) twice daily for 3 days.

Results: The 42-day cure rate by Kaplan-Meier analysis was 94.6% [(95% confidence interval (CI) 89.38-97.44]) in the azithromycin-artesunate group and 97.0% (95% CI 89.45-99.40) in the control group. Times to clearance of fever and parasites did not show any differences between the 2 groups (p=0.95 and p=0.59 respectively). No serious adverse events were observed but the percentage of patients who developed any adverse event was higher in the control group (p=0.03).

Conclusion: Data suggest that azithromycin-artesunate combination is an efficacious and well-tolerated treatment for patients with uncomplicated falciparum malaria in Bangladesh.

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Session 6: Cross-border malaria, pregnancy, and other issues

Malaria and Antimalarial Drugs in Pregnancy

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Background: Malaria is the leading cause of morbidity and mortality in many tropical developing countries, and the highest burden of disease prevails in young children aged below 5 years and pregnant women. Pregnant women are at a higher risk of acquiring infection and developing symptomatic, severe and complicated disease. Mortality-associated with falciparum malaria in pregnant women is high in areas with low and unstable malaria transmission. Asymptomatic falciparum infection in pregnant women, commonly seen in areas where malaria transmission is moderate to high, is associated with severe maternal anaemia and negative birth outcomes, such as miscarriage, stillbirths, prematurity, and low birthweight. In addition to the increased susceptibility, evidence suggests that treatment response to antimalarial drugs in pregnant women is suboptimal—likely secondary to pregnancy-associated changes in drug metabolism and decline in acquired immunity to malaria, which typically enhances drug efficacy. Antimalarial dosing regimens are typically developed based on information available from mostly male, the non-pregnant women, adult population. Dose adjustment may be necessary for the pregnant population to optimize treatment response.

Objective: Review and discuss the unique nature of adverse effects of malaria in pregnancy; pregnancy-related physiologic changes influencing drug disposition, metabolism and efficacy; clinical studies assessing antimalarial drug pharmacokinetics and pharmacodynamics in pregnant women, and further research needed.

Methodology: The study combined literature review and findings from a prospective multicentre self-matched pharmacokinetic study in African pregnant women

Results: Antimalarial drug metabolism and disposition were significantly modified during pregnancy. Antimalarial drug efficacy was compromised in association with changes in drug pharmacokinetics.

Conclusion: Pregnancy modifies pharmacokinetics of antimalarial drugs, and clinically-important changes in drug disposition may impose negative treatment outcomes. Careful and systematic evaluation of antimalarial drugs in pregnant women is urgently needed to optimize malaria-treatment response.

Acknowledgements: The SP (sulphadoxine and pyrimethamine) study was funded by the Johns Hopkins Malaria Research Institute and Bloomberg Family Foundation.

National Response to Malaria Prevention and Control in Myanmar

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Background: Malaria is one of the diseases that get management priority in Myanmar. About 68% of the population resides in malarious areas. The National Malaria Program was started in 1951. In 1953, a pilot study of the Malaria Eradication Program was implemented at 2 townships in Shan state, and the great achievement was gained. The Malaria Eradication Program was launched in 1957 aiming at eradicating malaria. Due to the limitation of resources, appearance of parasite resistance to chloroquine and vector resistance to insecticide, the name of the program was changed to Malaria Control Program in 1973. The program was integrated with other mosquito-borne diseases, such as dengue haemorrhagic fever, lymphatic filariasis, and Japanese encephalitis in 1978 to form the Vector-borne Diseases Control Program (VBDC). 'The Global Malaria Control Strategy' was adopted in 1993, and malaria-control activities are carried out in line with the global and national strategic plans.

Objective: Describe the malaria situation in Myanmar during 1989-2009 in responding to national malaria-prevention and control activities.

Methodology: Records of 1989-2009 country annual reports were reviewed.

Results: The rates of morbidity and mortality due to malaria declined in long-term trend. In 1989, the rates were 25.54 per 1,000 population and 12.27 per 100,000 population respectively. In 1999, the rates were 12.29 per 1,000 population and 7.57 per 100,000 population respectively. In 2008, the rates of morbidity and mortality due to malaria were 10.7 per 1,000 population and 1.8 per 100,000 population respectively. In 2009, the rates were 10.0 per 1,000 population and 1.64 per 100,000 population. During 1989-1999, the morbidity and mortality rates were slowly declining. After 1999, the morbidity rate fluctuated up to 2009. The mortality rates of these years were declining due to early detection and appropriate treatment following the new treatment policy. In 2002, the new malaria treatment policy was launched for the use of rapid diagnostic test and artemisinin-based combination therapy. As a result, early detection and appropriate treatment was increased, resulting in a rise of recorded morbidity rate until 2003. In early 2004, it started declining and became stable in late 2005 till 2007. The morbidity rate raised again in 2008 and 2009. It was in line with the updating of the national malaria treatment policy and the strengthening of monitoring and evaluation (ME) through the computerized data-management system.

Conclusion: Control of malaria was influenced by introducing the malaria treatment policy, strengthening of the national ME system, and capacity-building of basic health staff, and increasing access to early diagnosis and appropriate treatment. The interventions are more effective with the support of different communication strategies and activities.

Retinopathy and Microcirculation in Severe Malaria of Adults

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Background: A specific retinopathy has been described in African children with cerebral malaria but in adults this has not been extensively studied. It has great potential as a diagnostic and prognostic tool and pathogenetic marker. Since the structure and function of the retinal vasculature greatly resembles the cerebral vasculature, study of retinal changes can reveal insights into the pathogenesis of cerebral malaria. Microcirculatory obstruction is thought to be important in causing both malarial retinopathy and cerebral malaria.

Objective: Establish the prevalence, spectrum, and duration of retinal findings in malaria, their effect on visual function, and investigate the role of obstruction of microcirculatory blood-flow in its pathogenesis.

Methodology: A detailed observational study of malarial retinopathy in Bangladeshi adults with *Plasmodium falciparum* malaria was performed in Chittagong Medical College Hospital, Chittagong, Bangladesh. Control groups were febrile encephalopathy, sepsis, healthy volunteers and children with malaria. Severity of retinal findings was correlated with markers of microcirculatory blood-flow obstruction (blood lactate and rectal capillary blood-flow) and rheological factors important in microcirculatory obstruction (Pf HRP2 and red blood cell deformability). A second study of patients with falciparum and vivax malaria and healthy controls compared findings by direct and indirect ophthalmoscopy retinal examinations by non-ophthalmologists.

Results: Of 234 adults recruited, 51/60 (85%) with cerebral, 18/27 (67%) with non-cerebral, and 28/59 (47%) with uncomplicated malaria had retinal changes. 9/29 (31%) with encephalopathy, 11/28 (39%) sepsis, and 4/31 (13%) healthy volunteers had mostly mild changes. Other than papilloedema, moderate-severe retinopathy was highly specific for malaria (98%) and for cerebral malaria in comatose patients (93%). Resolution of signs took median 14 days, and visual function 3-4 days. Severity of retinopathy correlated with severity of malaria, coma-recovery time, and markers of, and rheological factors important in, microcirculatory obstruction. In 210 adults in the second study, moderate-severe retinopathy was found to be an independent predictor of mortality in malaria by both indirect and direct ophthalmoscopy.

Conclusions: Prominent retinal changes are highly suggestive of severe malaria, particularly cerebral and fatal disease. Findings in adults were very similar to those in children, both in the present study and in Africa. Retinopathy has bedside diagnostic and prognostic utility, including when assessed by direct ophthalmoscopy. Microcirculatory blood-flow obstruction is central to the pathogenesis of both malarial retinopathy and cerebral malaria.

Malaria in Border Townships of Myanmar: Current Situation and Implication for Action

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Background: Malaria is one of the priority health programmes of the Ministry of Health, Myanmar. Myanmar has border with China, Thailand, India, and Bangladesh. Along the border, there are 16 townships situated in Myanmar-Thailand border, 14 townships situated in Myanmar-China border, 8 townships situated in Myanmar-India border, and 1 township situated in Myanmar-Bangladesh border. The malaria situation of those border areas is assessed since the areas are situated in poorly-accessible locations where difficulties arise in the implementation, monitoring, and supervision of malaria-control activities.

Objective: Understand more about the malaria problem in the border areas and use the outputs in further improvement of malaria control in those areas

Methodology: Published literature, country reports, and survey data during 1999-2009 were reviewed, and strategies, population coverage, interventions, service-delivery, and capacity-building were assessed.

Results: Morbidity and mortality due to malaria are the highest in Myanmar-India border and Myanmar-Thailand border respectively. The highest morbidity rate was found in Myanmar-India border where the townships are located in hard-to-reach areas. The highest mortality rate was found in Myanmar-Thailand border where there is a strong indication of the presence of resistance of *Plasmodium falciparum* to artemisinin as well as the presence of cross-border migration between Myanmar and Thailand.

Conclusion: Further operational research is needed to identify the gaps on cross-border population dynamics, drug-quality assurance, therapeutic efficacies, and diagnostic capacity in the border townships.

Malaria Elimination: A Star Gazing

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Background: Malaria remains a challenge that consumes enormous resources of the world. Quinine is the ancient tool in use since 17th century. With the better understanding of malaria and development of many tools, global campaign for eradication of malaria began in the 1950s but that failed and ended up in malaria resurgence. Containment endeavours have been continuing but with the same categories of tools: drugs, insecticides, and barriers. The looking for newer tools is also within that box. In other areas, so many amazing tools and processes have been developed, unimaginable even a decade ago. Some star gazers imagined far ahead, and others made realities following the suit. Neilallworth's haemodailysis medicine from his own clothe-washer ushering the era of renal replacement therapy is an example. May be it is the time to come out of the box for imagining new focuses and tools and processes for malaria elimination.

Objective: Star gaze to imagine the development of beyond-the-box newer malaria-elimination tools and processes targeting new focuses based on contemporary scientific principles and capabilities.

Methodology: The method involves a star gazing for imagining new biological focuses in parasite and vectors for developing tools and processes for elimination of malaria aligning with scientific principles and fictions.

Results: New focuses are biological components of parasite and vector that should have the potential of being detectable, charged, changed, energy reception and reflection, polarization, and others. New tools may be modulators that can detect and make change in the focuses making these unendurable for the parasite and vector leading to inactivation or death. The process is through use of any modality of electromagnetic energy emission and reception principle by the modulator. The modulator may be incorporated with most frequently-used devices exploiting electromagnetic energy. By this, the modulator will intercept, document, track, kill and/or inactivate parasite and vector that should be effective and vis-a-vis safe.

Conclusion: The narrated star gazing to reality is not impossible but it will need many linked and add-on researches integrating medical, biological, physical and other sciences. This may be similar to Jules Gabriel Verne's fiction of yesterday to Space Programme reality of the day.

Poster Session 327 (322)

Survey of Knowledge, Practice, and Coverage on Malaria in a Malaria-endemic Region of Bangladesh

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Background: Risk of contracting malaria is not uniform even in population living in the same geographical areas since it relates to social and behavioural factors. The study site—Kuhalong union under Bandarban upazila—consists of approximately 25% Bengali, and the remaining inhabitants are tribals—predominately Marma and Kheyang.

Objective: Assess the knowledge, attitude, practice (KAP) and behaviour of people in malaria prevention and vector control.

Methodology: The study used data collected during the initial demographic surveillance system from 2,352 households. A structured questionnaire was used for assessing KAP and behaviour on malaria prevention and vector control. Responses were correlated with the sociodemographic characteristics of the respondents using binary logistic regression.

Results: About 69% of the respondents (n=2,352) identified 'bite of mosquito which has bitten a malaria patient' as always a perceived cause of malaria whereas 86% could associate mosquito bite as always/often a cause of malaria. The non-tribals, male, literate, and unemployed respondents were more likely to associate mosquito bite with malaria. Rainy season (79.6%) was identified as the most troublesome with mosquito, and the tribals were more likely to identify it. Sixty-one percent of the respondents asserted that mosquito bites occurred outdoors which varied significantly with the respondent's race, education, and residence. The most-practised current method of malaria prevention was the use of bednet (94%), followed by cleaning around the house (69%). The latter method varied significantly with education and employment status of the respondents. The non-tribals reported the presence of cows (61%) and goats (36%) near the house. This response was significantly higher than their tribal counterparts whereas a significantly higher proportion (34%) of the tribals reported pigs. The presence of cows, goats, and poultry was reported significantly less by the residents of cluster 5. Almost 95% and 41% of the respondents reported the presence of river/stream and ponds respectively. A significantly lower proportion of the tribals (36%) and residents (25%) of cluster 5 reported ponds. Fifty-five percent of the respondents reported cattleshed near their houses. The presence of cattle-sheds and its distance varied significantly within race and residents of cluster 5. A significant variation was observed in the characteristics of respondents of cluster 5 which might contribute to their less knowledge.

Conclusion: Newer and more effective strategies need to be developed to increase awareness about the definite cause of malaria and perception on prevention; identify malaria-associated risk factors in this region target shortcomings; and strengthen activities proven to be effective in malaria control with special emphasis on racial and socioeconomic differences.

Acknowledgements: The grant support of the Johns Hopkins Malaria Research Institute is acknowledged.

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Evaluation of Rapid Diagnostic Test for Diagnosis of *Plasmodium falciparum* and *P. vivax* Malaria in Bangladesh

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Background: More than 95% of the total malaria cases in the country are reported from the 13 high-endemic districts. *Plasmodium falciparum* and P. vivax remain the 2 most abundant malaria parasites in the country. To improve the detection and management of malaria patients, the National Malaria Control Programme (NMCP) has adapted a rapid diagnostic test (RDT) in the endemic areas. RDT is cheap and reliable and can give result within 10-15 minutes. The performance of 4 commercially-available RDTs for malaria were evaluated, and the results were compared with microscopy and real-time polymerase chain reaction (PCR).

Objective: Evaluate the performance of 4 RDTs for malaria with the classical gold standard method: microscopy and a sybr green-based real-time PCR assay.

Methodology: Blood samples were collected from 338 febrile patients who were referred for diagnosis of malaria by the attending physician at the Matiranga Upazila Health Complex (UHC) from May 2009 to August 2010. 'Paracheck' RDT and microscopy were performed at the UHC. Blood samples were preserved in EDTA tubes. Performances of the remaining three RDTs (Falcivax, Onsite Pf, and Onsite Pf/Pv) were performed using stored blood samples. A real-time PCR assay was established using sybr green method.

Results: Malaria parasites were detected in 189 (55.9%) and 171 (50.6%) samples by microscopy and real-time PCR respectively. Among the RDTs, the highest sensitivity for detection of P. falciparum (including mixed infection) was obtained by the Paracheck [98.8% (95% confidence interval (CI) 95.4-99.8)] and Falcivax [97.6% (95% CI 93.7-99.2)] compared to microscopy and real-time PCR respectively. Both Paracheck and Onsite Pf/Pv gave the highest specificity [98.8% (95% CI: 95.3-99.8)] compared to microscopy and Onsite Pf/Pv [98.8% (95% CI 95.3-99.8)] respectively compared to real-time PCR. Both Falcivax and Onsite Pf/Pv had 90% sensitivity and almost 100% specificity compared to microscopy for detection of *P. vivax*. Compared to real-time PCR, these RDTs and microscopy gave low sensitivity (71.4%), although very high (almost 100%) specificity was obtained.

Conclusion: The findings suggest that the Parachek RDT used by the NMCP and other 3 commercially-available RDTs used in the study are quite sensitive and specific for the detection of symptomatic falciparum malaria. However, the sensitivities of RDTs and microscopy for the detection of P. vivax were not satisfactory compared to real-time PCR assay.

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Addendum

Demand-side Voucher Scheme of Bangladesh: Economic Evaluation

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Demand- and supply-side incentives are increasingly adopted as a health system-strengthening mechanism to improve access to and quality of maternal health services. An example is a voucher programme recently piloted in Bangladesh. The programme provides poor women with cash incentives and free access to antenatal care, delivery with a professional attendant, and postnatal care. Cash incentives are also given to care providers. An economic evaluation of the Bangladesh Maternal Voucher Programme was conducted during 2009. This study evaluates both the demand- and supply-side impact of the government voucher programme.

A cross-sectional household survey was conducted on 2,208 women in 16 intervention and 16 matched control subdistricts, who had delivered in the prior 6 months. Women were interviewed. Econometric analyses were conducted to determine the effect of residing in voucher-covered subdistricts on seeking professional antenatal, delivery, and postnatal care, and out-of-pocket expenditure on all maternal health services.

It was found that the programme has significantly increased the use of voucher-covered maternal health services. Compared to women in control subdistricts, women in intervention areas had a more than 40 percentage point higher probability of delivering with a professional birth attendant. They also paid US$ 8.50 less on all maternal health services, a reduction equivalent to 58% of the average monthly household expenditure per capita among the study population.

However, the study further found that, with the introduction of DSF, the quality of health services did not improve, nor there were improvement in the voucher holders' awareness on the benefit of seeking maternal healthcare services. The DSF intervention rather doubled the rate of caesarian section in the DSF areas. Furthermore, the cost of each additional delivery with a qualified care provider remains high (US$ 70) and puts into question the sustainability of this programme and its ability to address equitable access to healthcare, especially its impact on effective targeting, supply-side quality, and shortages of human resources.

15 March 2011, Tuesday 330 (331)
Symposium 3: Round Table on micro-insurance in Bangladesh: prospects and challenges

Role of the Public Sector in Healthcare Financing for the Informal Sector: An Innovative Micro-insurance Scheme for Rickshaw-pullers in Rajshahi

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In December 2009, a public-private partnership was initiated by GIZ's MDHAP in collaboration with Rajshahi City Corporation (RCC) in providing the rickshaw transport-sector workers in the RCC area, with a social protection scheme in ensuring equitable, convenient and non-cash (prepayment-based) access to basic healthcare services. Around 20,000 rickshaws, 6,000 rickshaw-vans, and 3,500 battery-operated rickshaws run daily in Rajshahi city, providing the principal means of transport for many residents. The scheme aims to benefit rickshaw-owners/pullers, and 3 other members of his family (spouse and 2 children aged below 18 years) through the social protection scheme. In May 2010, a feasibility study for the scheme was conducted by Dr. David Dror of the Micro Insurance Academy (MIA), Delhi, India. The study recommended a number of measures, based on which modality of developing a health-insurance scheme was framed. It was conceived as a micro-insurance scheme to be completely owned by the community of rickshaw-pullers, that would be supported by a seed capital to be contributed jointly by GIZ and RCC amounting to Tk 2.2 million. In the course of working with the union of rickshaw-pullers to reach a sizeable membership base and to ensure pooling of contribution, the classic disadvantages of micro-insurance as in incomplete and fragmented revenue pool, incomplete and fragmented sharing of risks, less resources to pool, and institutional weakness became deterring factors to move on as planned. Obviously, benefit-package could not be planned beyond primary care and limited secondary care. Lessons thus learnt led the partnership project opt for a social health insurance that envisages linkages between top-down and bottom-up approaches. Currently, the scheme relies heavily on the City Corporation in ensuring equity and solidarity. RCC, in principle, has agreed to establish a social protection fund by enforcing differentiated (based on means) mandatory contribution in the form of levy on top of annual renewal fees from owners of manual and battery-operated rickshaws and rickshaw-pullers. In addition, it is also understood that appropriate pro-poor strategy/instrument in some form or shape of social fund transfer would be required to increase acceptance and use of health services and to gain universal coverage.

16 March 2011, Wednesday 331 (334)

Symposium 7: Fish bowl session on implementation of non-communicable disease programmes in low-resource settings

The Role of the Private Sector in Public Healthcare Delivery: A Public-Private Mix Approach (Western Marine Shipyard and MoHFW)

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In June 2009, Deutsche Gesellschaft fuer Technische Zusammenarbeit (GTZ) entered into a partnership with Western Marine Shipyard Limited (WMShL) with an immediate objective of developing provision for healthcare services targeting the workforce of the shipyard and its surrounding community. The management of Western Marine was convinced that a primary healthcare centre near the shipyard could serve dual purpose of providing health services to the workforce and the surrounding community. Besides, most workers of Western Marine lived in the surrounding villages. An integrated public-private partnership emerged in collaboration with the Ministry of Health and Family Welfare (MoHFW). The Ministry participated by making in-kind contribution in the form of appointing part-time medical professionals and ensuring supplies of drugs under its Essential Services Delivery (ESD) package. The engagement of the MoHFW has been crucial in view of sustainability of health services provision targeting the surrounding community. The partnership achieved a critical milestone on 1 June 2010 when the Primary Healthcare Centre (PHC) was launched. It created provision of primary healthcare (including emergency medical care/occupational healthcare for the workforce) for over 2,500 workers and a community of over 25,000 people since inception; the centre has been undergoing improvements by introducing new equipment and services. Although it started serving the surrounding community on designated days of every week, the facility has not yet been officially announced and its services not promoted. It is estimated that annually around 1,500 women of reproductive age, 1,200 children aged <5 years, 500 adolescents, and 300 elderly people from the surrounding community will avail of services from the healthcare centre. Aside from basic primary care services, central to the service would be information, education, and communication (IEC) campaigns targeted to the community. Making quality primary healthcare services available to the surrounding community through the healthcare centre is outside the core business of WMShL. Through this, the WMShL is assisting the MoHFW in achieving its mandate of reaching the underprivileged communities with primary healthcare. It is desired that engagement of MoHFW in the healthcare centre established and run by the WMShL will serve as a model for private sector participation in the delivery of public healthcare, particularly to reach underserved and vulnerable communities.

Symposium 8: Monitoring coverage and equity in the new HPNSP: prospects for improving access

Development and Implementation of a Data Management and Information System for the Health Sector of Bangladesh

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Background: The health sector of Bangladesh has one of the largest sector programmes worldwide involving US$ 4.5 billion for the present Health, Nutrition and Population Sector Programme (HNPSP-July 2003–June 2011) and around 20 development partners. The achievements of the programme are remarkable but the monitoring and evaluation capacity is rather weak and needs to be strengthened. The Health Information System is split into several MISs (Management Information Systems), and information is not available in one place. Data are collected but not efficiently used for planning and decision-making. Key performance indicators are monitored by survey data while timely information provided by routine data is not used for this purpose.

Objective: Improve the monitoring and evaluation capacity of the Ministry of Health and Family Welfare (MoHFW) and the availability, accessibility and usability of data and information for evidence-based decision-making.

Methodology: A central data warehouse (data repository) was created for the incorporation of data from different sources so that managers can get more integrated, timely and reliable information. The use of modern technology allows 'interoperability' of data providers without changing their present organizational structures (interference contains the risk of discontinuities in data-collection and comparability). Although the approach allows integration of data without removal or reorganization of the reporting units, it requires processes of harmonization and standardization across the data providers so that the different sources and applications can 'talk' to one another.

Results: The data warehouse is functional and, for the first time, information can be made available in a timely manner and used for indicator and performance monitoring at all levels (central, district, and subdistrict/upazila). Visualization and comparability of information has greatly improved by standardizing definitions and indicators and by using latest report tools and techniques, like multi-dimensional tables, graphs, and maps (GIS). Preconditions for the improvement of data-analysis and quality are set. Web-based, cost-effective and easy-to-maintain open source software solutions have been identified and customized for use by the data warehouse and data providers in need of new software. MIS Health and MIS Family Planning have started implementation of the software, which allows decentralization of data-entry and monitoring.

Conclusion: A comprehensive system for the integration and presentation of relevant and reliable information has been developed. To sustain this achievement and to create ownership, the institutionalization of the central data warehouse under the MoHFW is necessary. Furthermore, continuous capacity-building at all levels is required. The data warehouse approach is a great opportunity for establishing an integrated e-health architecture, which would also be able to link new developments like Human Resource Information System, Hospital Information System, and logistics and other sub-systems to a national central data warehouse for the entire health sector of Bangladesh.

Introduction of Quality Management at Primary-care Level: Case Study in Sylhet

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The Government of Bangladesh is committed to achieving the Millennium Development Goals (MDGs) by 2015, of which almost all the targets are directly related to health. The quality of health services has a direct and profound impact on progress towards these goals. In Bangladesh, healthcare in urban areas is the responsibility of individual city corporations, mandated through the Ministry of Health and Family Welfare (MoHFW) and financed through the Ministry of Local Government, Rural Development & Co-operatives (MoLGRDC). City corporations commission a range of different public, private and non-government organizations to provide primary healthcare to the urban population. Service providers traditionally have had no common set of standards governing their services, although some have their own internal set of standards. Without a reliable standard of service and clear referral lines, consumers often choose to bypass the primary-care level, heading straight to outpatient departments at secondary- and tertiary-level facilities which are already over-burdened. The majority of these patients would be treated faster and more appropriately at a primary-care facility. Under Theme 2, the MDHAP of GIZ is supporting the MoHFW and city corporations to improve the quality of urban healthcare through development, introduction and utilization of quality standards as part of a quality monitoring and quality improvement framework, starting at the primary-care level. The Draft Standards for Primary Care in Bangladesh were put together by technical experts commissioned by GIZ, based on an extensive review of available international standards, national policies and protocols. They were then reviewed and revised by the MoHFW and other key stakeholders and local government, service providers, medical colleges, and technical consultancies. Throughout 2010-2011, the 12 revised quality standards are being piloted in primary healthcare facilities in cooperation with Sylhet City Corporation, the Smiling Sun Franchise Programme, and the Urban Primary Health Care Project. A final evaluation by an external assessor will take place in June 2011. A comprehensive training curriculum has been prepared for doctors with regard to these, in line with national guidelines. Twenty-six doctors have already been trained, and further training is planned. Over the remainder of the pilot period (ending December 2011), several priorities will be addressed to maximize the benefits of the progress made so far, that include establishment of a (i) self-assessment and improvement cycle in primary healthcare facilities, (ii) increased client participation in quality management, (iii) development and utilization of Standard Operating Procedures (SOPs), and (iv) endorsement of Quality Standards by MoHFW. Achieving these four priorities would form a solid basis on which to develop a locally-specific accreditation and branding system for primary healthcare facilities, creating a strong incentive for primary healthcare facilities to improve and maintain quality services.

17 March 2011, Thursday 334 (333)

Plenary Session 3: Tracking progress towards universal health coverage with equity

The State of National Health Accounts in Bangladesh

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GIZ TC Support to HNPSP, Bangladesh

National Health Accounts (NHA) is a tool which describes the expenditure flows—both public and private—within the health sector of a country. These describe, in an integrated way, the sources of all funds utilized, the destination and use of those funds in the whole health system.

The first NHA was conducted in 1998 with financial assistance from the Asian Development Bank, and it estimated NHA for 1996-1997. The second NHA conducted in 2002 with DFID funding revised NHA-I estimates and made new estimates up to 2002. The third NHA conducted in 2008-2009, with GIZ support, made new NHA estimates for 2003-2007 and revised the earlier estimates. All three rounds were coordinated by the Health Economics Unit (HEU), Ministry of Health and Family Welfare (MoHFW).

All three rounds and particularly the third round which revised the estimates of the previous rounds showed similar findings. The trend during 1997-2007 showed:

1. continuing low levels of public spending (including donors) compared to other South Asian neighbours and other Asian countries
2. flat public including donor spending as below 1% of GDP throughout the period
3. high out-of-pocket spending (64% in 1997 and 74% in 2007)
4. high out-of-pocket (more than 70%) spending on medicines.

The implication of low public spending is that it forces households to spend more. In a country like Bangladesh where social protection is inadequate, it means impoverishment of households. Households spend a huge amount on medicines. Therefore, it implies the need for making the current spending mechanism more efficient, thereby reducing the payment burden on households.

Strengths of NHA in Bangladesh include: (a) Health Economics Unit of the MoHFW has been mandated to conduct NHA, and it so far has steered three successive rounds; (b) Bangladesh implemented a dual reporting system that meets both Bangladesh and international standards; and (c) it fully implemented international standards by following the System of Health Accounts (SHA) in the third round.

The weaknesses include: (a) conducting NHA each time on a project basis, which is costly; (b) lack of mechanism to maintain institutional memory; and (c) capacity of MoHFW to steer NHA independently.

NHA in Bangladesh can be further improved and made more useful if: (a) NHA is fully institutionalized (i.e. HEU is able to steer the NHA and supervise surveys required to complete NHA); (b) NHA is updated (using MoHFW data sources) annually or every two years ensuring comparability of data every year; and (c) NHA findings are reflected in policy decisions.

17 March 2011, Thursday 335 (330)

Plenary Session 3: Tracking progress towards universal health coverage with equity

Revitalizing Information Systems for Monitoring Universal Health Coverage through IT

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The world has been witnessing several changes in the field of science over the past few decades with rapid advances, and fast-paced innovations are happening in all areas ranging from electronics to information and communication technologies to healthcare. Two major technological developments that have transformed science since the mid-1990s are the internet and mobile phone. While the internet has been considered to be a rapid and valuable source of information to the majority of the world's population, advancements in mobile communication have made the world smaller and reachable to remote areas wirelessly. The convergence of mobile phones and computer-based technologies could impact healthcare options to provide a universal coverage with a larger extent of healthcare and associated services remotely.

The healthcare industry by itself has seen a transition from the traditional paper-based records to electronic records. There has also been a need to get fast information due to the number of healthcare regulations in place, ever escalating healthcare costs, and the rise in technology-savvy patients. Another main reason is the shortage of healthcare infrastructure in rural areas, which has raised an enormous amount of concern in the recent past. Considering all these factors, it has become pertinent for the healthcare industry to consider incorporating ICT to have a better tomorrow in addition to surviving the challenges of today.

From a global perspective, more than 50% of people live in just Africa and Asia, where there is a concentration of countries with low income, high population growth, and low standard of living and severe constraints in healthcare access for all. Illness, ignorance, and poverty are a three-headed monster when it comes to accessing health care. In many low-income settings, for every 10 patients who accesse care there are nine who remain outside the reach of the system. Telemedicine and m-health are ways to overcome isolation and exclusion and bring all patients into contact with health professionals. Further, many a time due to frivolous problems patients rush to the doctor and end up wasting time and money. This can be more judiciously managed through ICTs designed for pre-screening and remote triage.

In addition, developing countries are facing the challenges of ageing populations, shifts from infectious to chronic diseases and social changes, limited resources, lack of administrative capacity, high cost of reaching people and expensive delivery of care, huge population and geographical barriers, and limitations of the government in enhancing the GDP spending on healthcare.

In all the current limitations of skilled healthcare professionals, huge geographical barriers, rising healthcare costs, increasing burden of chronic diseases, and the availability of the modern technology present a unique opportunity. Technology is getting cheaper day by day. It is now possible to roll out not just primary care in remote places but also the advanced medical care in the remotest regions of the world. Moreover, setting up a telemedicine network is possible with minimal infrastructure. The best part of telemedicine is that we do not always require trained doctors at the point of care. The remote monitoring can be done via a trained technician who would be literate. There are 'Fool proof' and 'Idiot proof' medical devices available that do not require much handling expertise. The results can be transmitted to a doctor at the centre, and the investigation, diagnosis,

and treatment can follow; e-health or electronic health, with the support of mobile technology and ICT, can be a unique enabler for universal health coverage by enhancing health and seeking information from various stakeholders and can serve as access points to provide remote information to healthcare providers with a wide array of applications that include remote data-collection and monitoring, disease and epidemic tracking, diagnostic and treatment support among others. The only way to address the current healthcare inequity is to fuse basic healthcare with technology to cover the remotest area for accessing the healthcare needs.

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