12th Annual Scientific Conference (ASCON XII)

Abstracts

Health Systems Research: People's Needs First

9-12 February 2009
ICDDR,B, Dhaka, Bangladesh

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PREFACE

As a long-time supporter of health systems development and health systems research, I am delighted to chair the 12th Annual Scientific Conference (ASCON XII). The theme "Health Systems Research: People's Needs First" promises the opportunity to both share and generate new ideas for appropriate strategies towards developing equitable health systems throughout Bangladesh, the region, and possibly in low- and middle-countries everywhere.

In response to our call for abstracts, we received high-quality responses from prominent researchers based in Australia, Canada, USA, Germany, Thailand, the Philippines, India, Iran, Pakistan, Ethiopia, Uganda, Nepal, and Nigeria. The high number of responses from within ICDDR,B and Bangladesh highlights the amount of health systems research taking place within the nation across all six building blocks of the WHO Framework for Action for health systems research. It is my sincere hope that the discussion generated during the four days of the conference will lead to further collaboration and future directions and innovation in all areas of the health system.

I extend my warm welcome to all participants and wish them a lively and comfortable stay in Dhaka. I also would like to acknowledge the hard work of my colleagues in the Scientific, Publications, Fund Raising, and Logistics Support Committees and Scientific Topic Sub-Committees for making this a well-organized and meaningful event.

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

ACKNOWLEDGEMENTS

Professor Alejandro Cravioto
Chair, Scientific Committee, ASCON XII

Dr. Tracey Pérez Koehlmoos
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CONTENTS

TECHNICAL SESSIONS   001*(228)†

Day 1: Tuesday, 10 February 2009
08:45 am-10:00 am (Venue: Windy Town-First Floor)
Plenary for Service Delivery

Delivering Health Services in the 21st Century: Challenge and Innovation

Hilary Standing (H.Standing@ids.ac.uk)

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Service-delivery models are currently undergoing major changes in many countries. This talk will focus on changes that are particularly affecting low- and middle-income countries. Chief among these is the widespread marketization of services and associated increasing resort to self-treatment (such as through pharmacies) and to providers in the non-state sector. This poses major questions about access, quality of services, and regulation of care providers, especially where health markets are largely unregulated. Alongside this are changes in access to health-related knowledge through media, Internet, and spread of knowledge outside the professions through new information and techniques which change the relationship between clients and care providers and make possible new ways of providing services. Demographic and epidemiological changes, including the rising burden of non-communicable or chronic diseases, are also challenging the established paradigms of primary healthcare and of selective service packages. In developing countries, these still tend to be focused on limited curative care for communicable diseases. Human resources for healthcare remain inadequate, poorly distributed, and often with inappropriate skills for present needs. There is uncertainty over what service-delivery models should look like in the face of these changes and challenges. This presentation will argue that major challenges faced by these countries in delivering services to the poor in particular are beginning to produce new service-delivery responses and that developing countries are responsible for much of the current global innovation in healthcare delivery.

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

Plenary Speaker 2 : Dr. Faruque Ahmed, Director,
BRAC Health Programme, Mohakhali, Dhaka 1212,
Bangladesh

[Title and contents to be available during the presentation]

10:30 am-11:30 am (Venue: Windy Town-First Floor)　　　　　003 (037)
Scientific Session 1: Service Delivery

Equity Analysis of Healthcare-use and Outcomes in Nepal

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Background: The Government of Nepal is committed to providing free essential healthcare to all district facilities. Results of a recent study showed that some castes or ethnicities, together comprising 28% of the population, performed poorly as measured by indicators of health, nutrition, family planning, education, media exposure, women's empowerment, and poverty level. It is unclear if the abolition of user-fees will attract the poor and marginalized groups to essential healthcare services.

Objective: Determine the trends in healthcare-use and outcomes by caste or ethnicity and wealth, and recommend cost-effective targeted interventions to achieve reductions in disparities in use and health outcomes.

Methodology: Secondary analysis of the Nepal Demographic and Health Surveys, 1996, 2001, and 2006 was conducted to determine the trends in health service-use and health outcomes, such as family planning, maternal and child health, birthweight, and under-5, infant and neonatal mortality. The trends were analyzed among 7 castes or ethnicities and wealth quintiles to determine the disparities between them.

Results: Inequalities between castes and ethnicities persist in the use of government health services and in the health of Nepal's people, just as inequities lingered between the poor and those who were better-off. The results showed that significant progress was made in reducing these differences. Poor families from the marginalized castes and ethnicities were benefited from family-planning services, control of diarrhoeal diseases, treatment for acute respiratory infection, and childhood immunizations. At the same time, small size of babies at birth and infant and under-five mortality decreased markedly. However, poor and marginalized women were not benefitted from antenatal care and skilled birth attendance as were wealthier and more privileged women. Disparities in rates of neonatal mortality also increased slightly over the decade.

Conclusion: The study revealed that there are persistent barriers to use for marginalized castes and ethnicities unrelated to wealth. Therefore, targeted interventions or incentives may be needed to complement the abolition of user-fees to achieve an equitable access to services, increased use by the marginalized, and health-related MDGs.

Counselling and Testing Facility at Government Health Facility: A Public-Civil Society Partnership Model to Replicate Linkage Development between the Community and the National Health Programmers

Rajni Kant Singh (leprabihar@gmail.com), Farhad Ali, and Alpana Singh

LEPRA Society, House 1, Road 1, New Patliputra Colony, Patna 800013, Bihar, India

Background: The Bihar Health in Action Project functions at two levels. One is the community to empower them to identify and manage their health issues, and the other one is at service providers' level to help the Government deliver health services to the community. LEPRA Society developed a partnership with the Government for starting 4 defunct primary health centres in 4 different districts of Bihar. In the centres, the Government provided a medical officer with 12 medicines for outpatient department (OPD), and the LEPRA Society provided a counsellor for HIV/AIDS pre-test counselling, counselling for tuberculosis (TB) cases, and morbidity management for leprosy and filariasis cases. The society also provided a trained laboratory technician for testing of sputum and blood sugar.

Objective: Evaluate the effectiveness of the model in operationalizing the government health facility on a sustainable basis and also evaluate the model in developing linkages between the national health programmes and the community.

Methodology: The effectiveness of the model was examined based on 3 criteria: (a) functional capacity over the year; (b) ability to deliver basic health services, and (c) ability of the model to develop the linkages of the community with that of the National Health Programmes.

Results: All the 4 centres have been functioning from the dates the services were started, were providing basic health services, and have developed linkages with the district and block-level health centres where the complicated cases are referred for treatment. These centres are also becoming the centres for diagnosis, care, support, and treatment for filariasis, leprosy and TB cases. The centres brought 116 TB cases to the RNTCP, 667 cases on multidrug therapy for leprosy, and 176 filariasis cases on morbidity-management practices over a one-year period in a population of 56,000 in 4 blocks of 4 different districts. The general attendance of OPD has increased 85% over a one-year period.

Conclusion: This effective model of service delivery through the government health system has been developing linkages between the community and the National Health Programmes.

Strategies to Improve Low Coverage of Child Immunization in Urban Slums of Dhaka, Bangladesh

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A.I. Khan[3], M.A. Quaiyum[4], Nirod Chandra Saha[1], and Iqbal Ansary Khan[5]

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Background: Although the Expanded Programme on Immunization (EPI) has been successful in Bangladesh, the coverage of child immunization in urban slums still remains low.

Objective: Assess the impact of an EPI intervention package implemented within the existing service-delivery system to improve the coverage of child immunization in urban slums.

Methodology: This intervention trial used a pre- and post-test design. An intervention package was tested for 12 months from September 2006 to August 2007 in 2 purposively-selected urban slums in Dhaka city. The intervention package included: (a) an extended EPI service schedule, (b) training of service providers on valid doses and management of side-effects, (c) a screening tool to identify immunization needs among clinic attendants, and (d) an EPI support group for social mobilization. Data were obtained from 3 main sources: random sample surveys to assess immunization coverage, service statistics, and qualitative interviews. Analysis of quantitative data was based on a before and after assessment of selected immunization-coverage indicators. Qualitative data were analyzed using content analysis.

Results: 99% of children (n=526) were fully immunized after the implementation of the interventions compared to only 43% before their implementation. Antigen-wise coverage after the implementation of the interventions was also significantly higher compared to before their implementation. Only 1% drop-out was observed after the implementation of the interventions while it was 33% before their implementation. Not a single invalid dose was found after the implementation of the interventions while 22% of the children had invalid doses before their implementation. At baseline, a significantly higher proportion of children of non-working mothers (75%) was fully immunized compared to children of working mothers (14%). Although the proportion of fully-immunized children of both non-working and working mothers was significantly higher at endline, fully-immunized children of working mothers were dramatically improved at endline (99%) compared to baseline (14%).

Conclusion: The findings clearly indicate the impact of a 'package of interventions' in improving the coverage of child immunization in urban slums. Therefore, the policy-makers should implement the package of interventions in all slums of Bangladesh.

Quality of Health Service for Brothel-based Female Sex Workers: Exploration from a Peer-education Programme

Nafisa Lira Huq (lira@icddrb.org) and Mahbub Elahi Chowdhury

ICDDR,B, GPO Box 128, Dhaka 1000, Bangladesh

Background: The integrated peer-education and health service approach is effective in preventing transmission of HIV among female sex workers (FSWs). Since 2004, an NGO consortium has introduced such an integrated intervention for FSWs in selected brothels in Bangladesh. Therefore, there is a need to evaluate the intervention to understand whether the current context influences FSWs in using health services for prevention of HIV.

Objective: Explore the factors that enhance or hinder healthcare-seeking behaviour of FSWs from a targeted health facility intervention.

Methodology: Focus-group discussions (FGDs) (4), in-depth interviews (8), and interviews with key informants (4) were conducted in 4 brothels during August-October 2008. For each FGD and in-depth interview, the subjects were purposively selected from bonded and free young FSWs, elderly active FSWs, and 'Madams'. Information was collected from FSWs on factors influencing their access to health clinics and on satisfaction in terms of counselling, treatment, and environment at the clinic. Key informants (programme manager, care provider) were asked about the context and environment that influenced healthcare of FSWs. Content, contextual and thematic analysis strategies were followed.

Results: Many FSWs reported that clinical services, which include regular screening, coupled with prevention messages, influenced their increased condom-use and reduced sexually transmitted infection-related symptoms. Their preference for the intervention clinic over a referral centre was due to friendly services, respectful attitude, closer location of clinics to brothels, and suitable service hours. However, one of the major criticisms was limited service provision. Expanding services for maternal and child health from their desired outlet was suggested. The FSWs felt that peer educators played an important role for facilitating their access to the clinic. The access to health services was hindered by restricted mobility of bonded FSWs outside the brothel. The key informants were deeply concerned about programme sustainability and expressed that withdrawal of existing free services might limit care-seeking pattern of FSWs.

Conclusion: The findings suggest that healthcare-seeking behaviour of FSWs was enhanced through conducive health services. Therefore, a sustainable government policy for this high-risk group is needed for preventing HIV epidemic in Bangladesh.

10:30 am-11:30 am (Venue: Media Bazar-Ground Floor)   007 (090)
Scientific Session 1: Health Workforce

Are Village Doctors a Curse or a Blessing?

Shehrin Shaila Mahmood (Shaila@icddrb.org), Abbas Bhuiya, Tania Wahed, and S.M.A. Hanifi

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Background: Bangladesh has been identified as one of the countries with crisis in health workforce. The formal sector is not adequate in meeting the health needs of the people. Thus, it is important to identify and understand the source of healthcare for the 150 million people of the country, especially for those living in rural areas as they constitute 70% of the population.

Objective: Investigate the healthcare-seeking behaviour of villagers in Chakaria and determine the role of healthcare providers, especially the village doctors in healthcare provision.

Methodology: A survey was carried out during February 2007 among 1,000 randomly-selected households of Chakaria. Information was collected from households having at least one member who fell sick during the 14 days preceding the survey. For households having more than one sick member, one was randomly selected. This resulted in a total of 767 respondents.

Results: In Chakaria, 43.5% of the villagers reported suffering from illness during the 14 days preceding the survey, and 47% of them sought treatment. 40% of those not seeking treatment mentioned shortage of money as the deterring factor. A clear gender differential against females was observed in treatment-seeking. Village doctors, whose quality of services are questionable, were identified as key actors in the provision of healthcare in the area. They provided 65% of the services, irrespective of type of disease. The use of qualified health services (i.e. MBBS doctors) was as low as 14%. Moreover, the village doctors were the first-line care providers for the majority of patients. Home remedy was also commonly practised for all types of diseases, and this was the second most frequently-used treatment option.

Conclusion: These findings reiterate the need to recognize the role of village doctors in the provision of healthcare in rural areas. Where delay and difficulty in access to healthcare is a reality in the health system of Bangladesh, taking advantage of the wider availability of village doctors would be an efficient and cost-effective solution. Interventions targeted towards improving the quality of services of village doctors have a greater potential to benefit the rural masses in general and the poor in particular.

Academic Detailing of Medical Representatives on STI Counselling: A Positive Impact on STI Services of Non-formal Private Practitioners in Bangladesh

Elizabeth Oliveras (eoliveras@icddrb.org) and Haribondhu Sarma

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Background: A nationwide survey showed that about one-third of Bangladeshi youths with STI symptoms sought treatment from non-formal private practitioners (NPPs). However, an assessment of the knowledge and skills of NPPs showed deficiencies in their STI practices. Academic detailing by medical representatives (MRs) has been used successfully to improve practices of formal care providers.

Objective: Assess the impact of STI counselling guideline dissemination and detailing by MRs on STI services of NPPs.

Methodology: An evidence-based STI counselling guideline was developed with key stakeholders and experts and adapted through a feasibility assessment. In total, 26 MRs from 2 pharmaceutical companies were trained to disseminate the guideline to NPPs in their working areas. To assess the impact of this process on NPP's practices, 67 mystery client-visits were conducted by youth 'clients' (36 in intervention areas, 31 in control areas) in the 2 weeks following the initial detailing. Intervention and control areas were similar, except for the implementation of this intervention. Following each mystery client-visit, the mystery clients were debriefed about the 'services' they received. Indicators of quality and youth-friendly services were compared between visits in the intervention and the control areas.

Results: While less than half (n=14) of care providers in the control areas exhibited youth-friendly behaviours with mystery clients, over 80% of care providers in the intervention areas did so. Similar results were observed with regard to taking medical histories, response to causes of illness, maintaining confidentiality, instruction on treatment, and adequate time for consultation. In addition, almost half of the NPPs in the intervention areas advised their clients to use condoms during treatment compared to none in the non-intervention areas. However, no difference was observed in encouraging partners' treatment or discussing the relationship between STIs and HIV.

Conclusion: Academic detailing to NPPs can improve providers' behaviours, even for sensitive issues like STIs. The immediate improvements observed in this study suggest the strong potential of using academic detailing as a training tool for non-formal care providers.

Human Resource Strategies for Safe Delivery in Nepal

Riitta-Liisa Kolehmainen-Aitken[1] and **Ishwar Bahadur Shrestha[2]** (ishwarbshrestha@yahoo.com)

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Background: Nepal faces serious challenges to providing safe delivery services nationwide. Only 18% of deliveries take place in health facilities. The managers of the government safe motherhood programme recognize that the current government health workforce is inadequate to achieve desired levels of use.

Objective: Determine the extent and causes of health workforce problems affecting the provision of safe delivery services by the Government and recommend strategies to alleviate them.

Methodology: Data were collected from all regional health directorates and regional, subregional and zonal hospitals. Validation data were gathered from facilities in 15 districts, sampled purposively from all 3 ecological zones and 5 development regions. Two peripheral facilities in each sampled district were visited, and health managers and staff involved in safe delivery were interviewed. Data were collected on delivery services, skills of staff, and factors contributing to retention of staff. Ten private and NGO facilities were visited, and students in private training institutions were interviewed.

Results: The root cause of safe delivery staffing shortages in the government facilities was not lack of trained staff but the inability of the Government to attract and retain them. Specialist doctors, however, were inadequate. District hospitals particularly lacked doctors with caesarean-section skills and had a poor capability in anaesthetics. They also lacked nurses. Higher-level hospitals had acute shortages of obstetricians/gynaecologists and anaesthesia staff. Poor career prospects and lack of sanctioned posts were serious demotivators for retaining family practice specialists (MDGPs) in district hospitals. Anaesthesia assistants were not clear on the conditions under which they were allowed to provide anaesthesia. Limited staff housing, few opportunities for continuing education, and poor communications were demotivating factors for all rural health workers. Students in training were reluctant to consider government employment for these reasons.

Conclusion: Tackling the identified human resource problems requires a multi-pronged approach. Promotional opportunities and career-ladders must be considered before developing new training curricula and courses. A team approach should be used for posting staff to district hospitals to ensure a complete caesarean-section team. Pre-service and in-service training are required to improve skill levels. A legal framework for anaesthesia assistants should be established.

Enabling Environment and Scope of Nurses in Maternal and Neonatal Healthcare Programmes in Bangladesh

Shahana Parveen (shahana@icddrb.org), M.A. Quaiyum, and Iqbal Anwar

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Background: Nurses in Bangladesh are a skilled workforce in the field of maternal and neonatal healthcare (MNH) services having a one-year extensive midwifery training in diploma course. This skilled workforce is still under-used as skilled birth attendant (SBA) in existing government initiatives in MNH.

Objective: Explore the current practices of nurses in MNH services, enabling environment, and scope for nurses in the public-sector hospitals to maximize their contribution as SBAs in achieving Millennium Development Goal 5 of reducing maternal mortality.

Methodology: This exploratory qualitative study is part of a big project containing 3 other components to understand the entire nursing situation, i.e. quantitative survey, evaluation of diploma training curriculum, and skill-knowledge test. The study was conducted in 6 government hospitals from tertiary to subdistrict level in Khulna and Sylhet districts of Bangladesh. Methods included in-depth interviews of nurses, doctors, and support staff, observations on nursing activities, and group discussions with community leaders. The study was conducted during 1 July 2007–31 December 2008. It was approved by the Ethical Review Committee of ICDDR,B.

Results: Nurses were mostly designated in clerical jobs and some basic nursing care. They got very little chance to conduct normal vaginal deliveries (NVD) in tertiary and secondary-level facilities but mostly did conduct NVDs even with episiotomy in the subdistrict-level hospitals. Nurses developed their midwifery skills mainly through in-service experiences rather than academic training. Staff nurses were able to provide primary care for some maternal complications, such as postpartum haemorrhage and eclampsia. These indicated the potential of using nurses' midwifery skills for better maternal health services. Training curriculum for the diploma nursing course was not followed properly, especially in the practical sessions. Nurses faced difficulties in attaining midwifery skills from doctors (also intern doctors) and hardly got chance to conduct NVDs, practically during studentship due to the existing system.

Conclusion: The policy-planners and programme managers in Bangladesh should give attention to explore services of nurses as under-used resources. Active steps are needed to decentralize nurses by deploying them below subdistrict level with refreshing midwifery training to test their effectiveness in reducing maternal mortality. For operationalizing, primary legislation as midwife is a prerequisite.

10:30 am-11:30 am (Venue: Green View 1-First Floor)   011 (031)
Scientific Session 1: Maternal Health

Situational Analysis of Recording and Reporting Maternal Deaths in Gandhinagar District of Gujarat State, India

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Background: India has the largest number of maternal deaths, accounting for 22% of all maternal deaths in the world. Death registration in India is patchy, and the number of maternal deaths is under-reported in the country. To know the correct estimates of maternal mortality, it is important to understand the current maternal death-registration system and why and how systems under-report.

Objective: Undertake a situational analysis of recording and reporting maternal deaths in Gandhinagar district, Gujarat, India.

Methodology: This qualitative study was conducted during June-August 2008 and analyzed maternal deaths occurred during April 2007–March 2008. To understand the current reporting system of maternal deaths, unstructured interviews were conducted with all the concerned officials and offices. Forms, formats, and registers relating to death registration were studied. Verbal autopsy method was used for understanding the circumstances and issues relating to 2 maternal deaths occurred during the study period. A group meeting was conducted with Anganwadi workers to understand the reporting of maternal deaths.

Results: The District Health Office reported 32,073 livebirths and 15 maternal deaths for 2007-2008. It was estimated that a minimum of 55 maternal deaths would have occurred during the same period in the district. Five maternal deaths were not reported by the district but were reported by the block health offices, showing the lack of coordination. The District Health Office had no readily-available list of maternal deaths; none was appointed as a nodal person to collect and analyze data on maternal deaths. Only one maternal death was reported from an urban area having 13,702 livebirths for the same year. One maternal death from one urban area was reported by the civil registration system but was not reported by the district health department, showing lack of coordination between the two systems. Private doctors contacted were not aware of their responsibility to report maternal deaths as per the Birth and Death Registration Act of India. Discussion with Anganwadi workers revealed pressure from higher officials for not reporting maternal deaths.

Conclusion: The results indicate that there is an urgent need to have a nodal person at the district level for documenting and reporting maternal healths, including maternal mortality. This will improve coordination and enumeration of data on maternal deaths. There is also an urgent need for creating awareness for registration of maternal deaths at the community and private doctor levels. Health centres should be encouraged to report correct numbers of maternal deaths.

Impact of Nutrition Education on Weight Gain and Birth Outcome of Pregnant Women in Dhaka City

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Background: In Bangladesh, women having less weight gain during pregnancy give birth to low-birthweight (LBW) babies. About 35% of LBW babies lead to high infant mortality and malnutrition in the country. Nutrition education is an effective tool to improve weight gain during pregnancy.

Objective: Assess the effect of a short–term nutrition counselling on weight gain during pregnancy, birth outcome, improvement in exclusive breastfeeding practice, and behaviour change.

Methodology: A longitudinal study, with intervention and control groups, was conducted in the Maternal Care and Health Training Institute (MCHTI), Azimpur and Marie Stopes Clincs, Bashbari, Dhaka. In the intervention group, 150 women and in the control group, 150 pregnant women were recuited. The intervention group was given monthly nutrition education for 3 months before delivery while the comparison group was only observed during this period. After the delivery, birthweights were measured within 24 hours, and exclusive breastfeeding practice and changes in behaviour were observed for one month.

Results: The mean weight gain of pregnant mothers was 8.58 kg and 6.08 kg in the intervention and the control group respectively (p<0.001). The prevalence of LBW was 53.3% in the control group compared to none in the intervention group (p<0.001). About 71% of the mothers in the intervention group initiated breastfeeding within one hour after birth compared to 7.3% in the control group. The prevalence of prelacteal feeding after birth was 4.0% and 30.7% in the intervention group and the control group respectively. The prevalence of exclusive breastfeeding among one month old infants was 84.0% and 69.3% in the intervention and the control group respectively (p=0.002).

Conclusion: The study made a close look into weight gain during pregnancy, birthweight, and breastfeeding practices, which were improved by nutrition counselling. The improvements could have been possible due to correct and specific nutrition education to the pregnant women.

Prevention of Postpartum Haemorrhage in Bangladesh: Save Mothers' Lives First

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Background: In Bangladesh, an unexpectedly high level of maternal mortality ratio (MMR) has continued (6.5/1,000 in 1986 to 2.9/1000 in 2006) for a decade. Postpartum haemorrhage (PPH) accounts for 22% of all maternal deaths, mainly due to uterine atony (80%). To prevent PPH by managing the third stage of labour actively, active management of third stage of labour (AMTSL) is the best option for facility delivery where skilled delivery service providers are available, and tablet misoprostol is effective at the community level where most deliveries (82%) occur at home assisted by unskilled birth attendants.

Objective: Increase AMTSL practised by trained service providers at the facility level and ensure proper use of misoprostol at the community level.

Methodology: Since 2007, EngenderHealth, in collaboration with Directorate General of Health Services and Directorate General of Family Planning, conducted AMTSL training for doctors, nurses, and family welfare visitors (FWVs), having midwifery training, of the 25 districts. AMTSL orientation has been provided to community skilled birth attendants (CSBAs) of 15 districts. Based on the approved misoprostol-use policy adopted in May 2008, a comprehensive community-based intervention was started in Tangail on a pilot basis, using health and family-planning field workers before scaling-up.

Results: In total, 160 trainers from government and non-government organizations attended TOT on AMTSL, 2,779 doctors, nurses, and FWVs from 25 districts were trained, and 1,225 CSBAs from 15 districts were oriented. During follow-up, markedly-increased AMTSL practices were found among the trained service providers. The field workers were oriented on misoprostol-use, behaviour change communications materials were distributed among pregnant mothers and community people, and the proper use of misoprostol was being ensured by collection of used strips during follow-up visit by the existing government and NGO health and family-planning service-delivery systems.

Conclusion: The integration of facility and community-based interventions is indispensable in attaining Millennium Development Goal 5 by reducing PPH-related maternal mortality in Bangladesh.

Low Maternal Nutritional Status in Bangladesh: Solid Fuels and Rural Residence Matters but NGO Membership Does Not

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Background: It has long been recognized that maternal nutritional status is quite low in the developing world. However, little is known about the sociodemographic determinants of this situation.

Objective: Explore the sociodemographic determinants of low maternal body mass index (BMI).

Methodology: The study used a large nationally-representative dataset from the Bangladesh Demographic and Health Survey 2004. A sample of 10,109 ever-married women was used for the study. A woman was considered malnourished if her BMI was less than 18.

Results: The results of analysis (binary logistic regression adjusting for clustering) showed that a number of factors in a fully-adjusted model increased the risk of low maternal BMI <18). Some results were intuitive: more interestingly, the use of solid fuels for cooking (a marker of environmental pollution) remained the biggest predictor of low maternal BMI (odds ratio [OR]: 2.21, 95% confidence interval [CI] 1.628-2.999). Other results were household poverty defined here as being in the bottom 60% of the households (n=6,178) (OR: 1.67, 95% CI 1.457-1.921), lower level of education (OR: 1.34, CI 1.167-1.540), and lower age of the respondents (n=1,381) (OR: 1.3, CI 1.091-1.56) also remained the important risk factor of low BMI. This warranted further exploration as did the disadvantage of being a rural resident (OR: 1.26, 95% CI 1.034-1.545). In a cumulative sense, each additional birth significantly lowered maternal BMI (OR: 1.07, 95% CI 1.046-1.099) underscoring the need for lower numbers of births. The NGO membership status which is often claimed as being beneficial to maternal health and nutrition had no statistically significant impact (OR: 0.94, 95% CI 0.84-1.05) on maternal nutritional status.

Conclusion: The results suggest that much more attention needs to be placed on reducing the use of solid fuels for cooking, reducing household poverty, increasing rural nutritional resources, and increasing family-planning services.

Preventing HIV among Youths through Peer-based LSE Programmes: Findings from a Rapid Assessment Study in Bangladesh

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Background: Information, education, and access to services contribute to the development of life-skills that can help reduce young people's vulnerability to HIV. To address the vulnerability of youths to HIV, the Ministry of Health and Family Welfare launched a programme— Prevention of HIV/AIDS among Young People of Bangladesh—in 2003 with funding from the Global Fund to Fight AIDS, Tuberculosis and Malaria. Under this programme, two organizations—HASAB and Population Council (PC)—are providing life-skills education (LSE) through youth clubs. Despite some differences in approaches, the LSE programmes implemented by these 2 organizations have some common components, and both the organizations need information about specific aspects of programme implementation to improve their work in the future.

Objective: Explore the views of the LSE programme participants about the programme and seek suggestions for future improvement of the programme.

Methodology: The study was conducted during September-December 2008 in 4 purposively-selected youth clubs in Mymensingh district. Two of the clubs were participants in an LSE intervention conducted by HASAB, and the other 2 were participants in an intervention conducted by PC. The study employed qualitative methods, such as in-depth interviews and observations. In total, 36 in-depth interviews were conducted with young participants, peer educators, master trainers, and club owners. The delivery of 2 LSE sessions was also observed.

Results: The preliminary findings suggest that the LSE programmes were useful in providing HIV/AIDS information and improving life-skills among youths. The peer-based approach to LSE seemed to be acceptable to the programme participants to receive HIV/AIDS information. Some limitations that were identified included: limited funds for the programmes, lack of incentives for the programme participants, and lack of recreational facilities to attract the participants to the programmes. Suggestions were made to expand the LSE programmes to include most at-risk population groups.

Conclusion: Despite some limitations, a peer-based approach to providing information on HIV through the LSE programmes seems to be a feasible option to provide HIV/AIDS-related information to young people.

Met and Unmet Needs of Reproductive Healthcare of Poor Women: Experience from Demand-based Reproductive Health Commodity Project

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Background: The paper presents results from a baseline study done under a Demand-based Reproductive Health Commodity Project (DBRHCP) conducted in 2 rural and one urban study sites. Intension of the study was to assess status of selected indicators at the beginning of the project that can be compared at the end of the project period.

Objective: Assess the met and unmet reproductive healthcare needs of married women of reproductive age (MWRA) under the DBRHCP project areas.

Methodology: Household enumeration was done in all households. A cross-sectional survey was done among 19,671 MWRA in 3 study areas which were selected using a systematic random-sampling procedure and interview through a structured questionnaire.

Results: The overall contraceptive prevalence (CPR) was markedly different in the 3 study areas. Urban slums had the highest CPR (58.7%), followed by 49.9% in Raipur and 22.3% in Nabiganj. Oral pills were the commonest method in all areas. About 70% of the women reported that service providers informed about other available contraceptive methods during the last service provision. Over half of the women mentioned that the service providers discussed about possible side-effects. Only a few women reported that BCC materials had been used during service provision. Unmet need for family planning was higher in rural areas compared to urban slums, with the highest in Nabiganj (67.8%). In general, a considerably large proportion of women wanted either to space their next birth or to limit childbirth. The commonest cause of not using any method was that the woman considered herself to be in fecundity (71.4%). About 13% mentioned that they did not use any method because of side-effects or fear of side-effects. Overall, 30% of the women visited any satellite clinic during the last 3 months. 10% received any household visits by any outreach worker in the last 6 months.

Conclusion: The study women have unmet needs of reproductive health services. It is challenging to reduce such unmet needs through interventions nested under the DBRHCP and achieve positive changes over the project period.

Intrapartum Indicators of Quality of Care in a Rural Hospital at Matlab, Bangladesh

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Background: Monitoring the quality of care indicators for maternal and newborn's health is important to evaluate new interventions and to assess the performance of a facility over time and progress both locally and regionally. Maintaining quality of intrapartum care is essential to improve birth outcomes which, in turn, could contribute substantially to achieving Millennium Development Goal 4 and 5.

Objective: Evaluate intrapartum care indicators among pregnant women who gave birth in a basic emergency obstetric and neonatal care facility after introduction of a new integrated maternal, neonatal and child health (MNCH) programme in rural Matlab, Bangladesh.

Methodology: The study area is located in rural Matlab in the district of Chandpur, Bangladesh. A new MNCH project was initiated in March 2007 to address the continued high rates of neonatal mortality. Evidence-based antenatal, intrapartum and postpartum preventive and curative care at home and in facility were provided. Indicators of intrapartum care relating to neonatal health, such as stillbirth (macerated and fresh), foetal death within 24 hours, and birth-asphyxia (APGAR score at 1st minutes <7) were monitored, following the standard guideline, from September 2007 to October 2008. Similar data for the July 2006–June 2007 period were also retrieved from the hospital-records for comparison. Intrapartum case-fatality rate was defined as the number of deaths due to fresh stillbirth plus the neonatal death within 48 hours of delivery out of total delivery that took place in the hospital.

Results: The intrapartum case-fatality rate was 24/899 (2.7%) and 15/1,124 (1.5%), respectively, before and after the implementation of the new programme ($p<0.05$). Among all deliveries, the proportion of birth asphyxia was approximately 14% and 11% ($p<0.05$) in the pre- and post-intervention period respectively.

Conclusion: The new programme seems to have improved the quality of intrapartum care in the Matlab hospital. However, as retrospective data were used as comparison, further evaluation over a longer period is needed prior to making recommendations for the future MNCH programme.

City Slums and Challenges for Community Health Nurse: A Critical Perspective for Community-based Programmes

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Background: The Community Health Sciences Department at Aga Khan University, through its primary healthcare programme, introduced a new cadre of health workers called Community Health Nurse (CHN). She is a registered nurse with experience in community health. She acts as a Field Director of a primary healthcare (PHC) module with 10-15 thousand population. The role of CHN is diverse, directed towards the individual, families, and the community at large for health and social development activities for the marginalized communities.

Objective: Share the challenges faced by CHNs while working in urban slums and their effectiveness.

Methodology: The job descriptions of CHNs were reviewed; interviews with present and former CHNs, programme managers, and community leaders were conducted; and the records and reports of the PHC prototypes were examined.

Results: The CHN works in the PHC centres of city slums for the betterment of health and socioeconomic conditions of the community people by involving various stakeholders. They have to deal as a partner with different stakeholders coming from various background, social class, language, education, norms, value system, and religious perspectives. She enhances the capacity of diverse group of people, such as volunteers, lady health workers, management committees, groups of medical, nursing and social sciences students. These students rotate through the PHC centres for placement in their community to obtain experience in community health and socioeconomic development. All these activities are carried out in an environment which is, at times, not very supportive to CHNs. At times, it becomes very hard for CHNs to perform and sustain. Their role is, however, very much appreciated by all the stakeholders.

Conclusion: The experience of CHNs has shown that it is a very important cadre for consolidating community-based healthcare activities. There is a need to give CHN an official recognition. Hence, it is recommended that the Government take appropriate measures to recognize this cadre. Furthermore, regulating agencies and policy-makers should take actions to strengthen the role of CHNs.

Identifying Non-state Sector Research Priorities in Developing Countries: A Participatory Approach

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Background: The non-state sector (NSS) plays a very significant role in the delivery of health services, and the provision of health and health-related commodities in developing countries. Despite concerns regarding the quality of NSS providers, governments and donors have increasingly recognized that the health-related Millennium Development Goals (MDGs) are unlikely to be achieved without active engagement of these service providers. Donor funding for NSS health policy and systems research is inadequate and is often poorly aligned with national priorities.

Objective: Identify the NSS policy concerns and research priorities in developing countries, find out the existing NSS research, and generate consensus about a core set of research issues through a participatory approach that urgently require attention to facilitate policy development.

Methodology: There were 3 key inputs into the priority setting process: key-informant interviews with health policy-makers, researchers, community and civil society representatives across 24 low- and middle-income countries in 4 regions (Latin America and Caribbean (LAC), East Africa, South-East Asia, and Middle East/North Africa); an overview of relevant literature reviews to identify research completed to date, and inputs from 9 key informants (largely researchers) at a con-sultative workshop.

Results: Eighteen priority research questions emerged from key-informant interviews across the 24 low- and middle-income countries. While each broad research topic was common to several countries or regions, the more specific 'sub-topics' of interest varied considerably. The overview of systematic reviews was instructive in showing which NSS topics have had comparatively little written about them, despite being identified as important by key informants. At the consultative workshop, 9 researchers refined and ranked the priority research questions. The potentialities and methods to carry out those researches were discussed.

Conclusion: This work on NSS research priorities will complement calls for increased health system research and evaluation by providing concrete, specific suggestions as to where new and existing research resources can best be invested.

Health Problems of Garment Workers in a Garment Factory in Bangladesh

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Background: Although the garment industry is one of the principal industries in Bangladesh, workers of most factories are devoid of sufficient light and ventilation, pure drinking-water, an adequate number of toilets, availability of doctors and first-aid care, maternity leave, transportation facilities, etc. As a result, they suffer from various health problems.

Objective: Explore the health problems of workers of a garment factory in Tongi, Dhaka, Bangladesh.

Methodology: This descriptive cross-sectional study was conducted with purposively-selected 148 workers of a garment factory of the Onus Group in Tongi during October-December 2006. A structured and pretested questionnaire was used for collecting data, which were analyzed using the SPSS software (version 11.5).

Results: 47.3% of the respondents suffered from headache and vertigo, followed by low back-ache and joint-pain (35.2%), and 17.5% complained of suffering from respiratory distress while working in the factory. 53.8% experienced needle-prick during their work at the machine, 44.2% had cut injuries, and 2% had burn injuries.

Conclusion: Data gathered in the study might add to the existing knowledge and help understand the health problems of garment workers of Bangladesh. Low wage, late payment of wage, mandatory overwork, and social insecurity—all added to their existing sufferings. The trade union and owners of garment factories should stand on a common ground of mutual interest in mitigating the problems and boosting the economy of Bangladesh as already done by the garment industry.

Efficacy of Health Communication in Culturally-appropriate Folk Methods over Print and Electronic Media Messages in Developing Countries

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Background: Health communication encompasses the study and use of communication strategies to inform and influence individual and community decisions that improve health. Health communication can contribute to all aspects of disease prevention and health promotion and is relevant in a number of contexts.

Objective: Compare the health communication strategy using culturally-appropriate folk methods with that using the print and electronic media in an area of India to develop and fine-tune the healthcare system.

Methodology: Surveys and research work were conducted by the Centre for Community Health and Social Medicine, JNU, National Institute of Design, Ahmedabad, and Osmania University, Hyderabad, to find out the most appropriate approach of health communication. Impact of health messages disseminated through the print and electronic media (newspapers, radio, and television) was compared with those that were disseminated through culturally-appropriate folk methods, e.g. songs, street-theatre, puppetry, and narrative visual arts.

Results: Folk and culturally-sensitive and appropriate media, such as songs, street-theatre, puppetry, and narrative visual arts, were the most effective methods of health communication. Health messages through the electronic media had little impact on raising awareness and consequent actions.

Conclusion: Compared to the amount spent on the print and electronic media, the cost of developing the folk media into an effective health communication strategy and education is negligible but the impact is greater and quicker. The folk media do not involve some components, such as printing and broadcasting that require equipment and machineries. The cost involved in their maintenance and the associated technical problems can be avoided if folk methods are used in health communication in India and similar developing countries.

Innovations in Reducing Maternal Mortality:
A Case Study of Tamil Nadu

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Background: Maternal health has been priorities for the Government of Tamil Nadu for over a decade. The Government has undertaken various initiatives and innovations for the improvement of maternal health, resulting in the reduction of maternal mortality ratio from 380 in 1993 to 90 in 2007.

Objective: Study the effects of various initiatives and innovations undertaken by the Tamil Nadu state for the improvement of maternal health.

Methodology: This case study was developed based on the personal observations of one of the authors and a review of available literature and secondary data from various national surveys and service statistics compiled by the State Government, including the 3 National Family Health Surveys (1992-1993, 1998-1999 and 2005-2006), family welfare statistics in India (2006), and other facility surveys conducted in India.

Results: The paper threw light on various initiatives in improving maternal health services carried out by the Government of Tamil Nadu. The various innovations included the establishment of maternal death registration and audit which enhanced greater accountability of service providers, establishment and certification of comprehensive emergency obstetric and newborn care centres, 24/7 delivery services through posting of 3 staff nurses at the primary healthcare centre level, and attracting medical officers to rural areas through incentives in terms of reserved seats in postgraduate studies and others. This is supported by round-the-clock emergency obstetric care facility of high quality at the first referral units and better management capacity at the state and district levels through dedicated public-health officers. To motivate staff nurses and other workers, the Government has instituted good service awards.

Conclusion: Due to political commitment and proactive administration, the indicators of maternal health have improved over the years. One of the key factors is the continuity of key top-level officers looking after maternal and child health for a long time. Efforts to improve maternal health include improvements in the availability of human resources, availability of drugs and supplies, improved management capacity and better monitoring of health services, and analysis of maternal deaths.

11:45 am-12:45 pm (Venue: Green View 1-First Floor)   023 (045)
Scientific Session 2: Chronic Disease

Non-adherence to Anti-hypertensive Treatment Is Associated with Accessibility to Treatment and Services

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Background: Bangladesh is one of the countries in early epidemiological transition where hypertension is one of the leading causes of morbidity. The control of blood pressure, along with many other factors, is dependant upon adherence to treatment.

Objective: Determine whether accessibility to treatment and services plays role in non-adherence to anti-hypertensive treatment.

Methodology: A cross-sectional study was conducted among 120 patients recruited by systemic random sampling from two sites: Rajshahi Medical College Hospital (RMCH) and a private clinic having the criteria of taking anti-hypertensive treatment for more than 6 months and aged at least 35 years or admitted with hypertensive organ damage and based on the report of having hypertension confirmed by a physician. Data regarding patient's personal information, adherence to treatment, and accessibility to treatment and services were collected.

Results: 85% of the study population was non-adherent to treatment. The clients of RMCH were more non-adherent. Approximately for 69% of the study patients, hospital was a convenient place to get medicines if these are provided free of charge or at low cost. Most patients went to the hospital by rickshaw/van (63.3%), followed by bus, on foot, train, motor-cycle or taxi. Upon reaching the hospital, one-third had to wait for the physician less than half an hour and the rest from one half to 7 hours. Since the beginning of treatment, 78.3% of the respondents were called for follow-up visit; of them, one-third missed it. 35% of the patients never received information regarding their disease from their healthcare providers. Of those who received information were mostly by physicians. 38.3% of the patients visited other facilities: quacks, homeopaths, and *Unani* care providers.

Conclusion: Since hypertension is an incurable disease, patients should be encouraged to take drugs regularly, follow the lifestyles advised, and to improve the knowledge by collective participation of all allied health personnel. Health services should be made more accessible and patients should be discouraged to go to illegal practitioners. Community-based studies should be conducted to find out the true extent of non-adherence and take necessary measures to relieve the disease burden and disability faced by patients.

Metabolic Syndrome among Newly-diagnosed Prediabetic and Diabetic Subjects

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Background: Metabolic syndrome has been a major challenging public-health issue globally. Its aetiology has not yet been fully established. Factors associated with the development of metabolic syndrome vary from region to region and from race to race.

Objective: Explore the factors associated with newly-diagnosed impaired glucose tolerance (IGT) and diabetic subjects.

Methodology: One hundred forty-four subjects were randomly selected in the present study where 38 were IGT and 102 type 2 diabetic (DM) subjects. Anthropometric indices were measured using standard techniques. Serum glucose was measured using glucose-oxidase method and lipid profile by enzymatic-colorimetric methods. Social status was collected using a pre-designed questionnaire. Results were expressed as mean±SD and median (range).

Results: Age (years), height (cm), weight (kg), and body mass index (BMI) (kg/m²) were similar in both IGT (age 40±7 years; height 156±8 cm; weight 59±10 kg; BMI 24±4) and diabetic subjects (age 40±8 years; height 156±9 cm; weight 59±12 kg; BMI 24±4). Neck circumference, waist circumference, and waist hip ratio did not differ between the IGT and the diabetic subjects; however, the values were higher than the reference limit. Glycaemic status was significantly ($p<0.05$) higher in the diabetic subjects (FPG (mmol/L) 12±5; ABF 18±6) than the IGT subjects (FPG 6±0.84; ABF 9±2). Lipid profiles and blood pressures also showed similar results. Male subjects had higher neck circumference (male 38±2; female 33±3) and WHR (male 0.91±0.11; female 0.88±0.09) than the female counterparts; however, the difference of WHR was not statistically significant. Neck circumference positively correlated with BMI (r=0.4, p=0.02) and waist circumference (r=0.25 p=0.003). About 30% of the subjects had metabolic syndrome according to the definition of the European Group for the Study of Insulin Resistance.

Conclusion: Forty years of age seems to be the alarming time for the development of prediabetic (IGT) and diabetes mellitus. Only glycaemic status seems to be changed between the newly-diagnosed prediabetic and the diabetic subjects. Glycaemic status affects at the BMI 24 and neck circumference at 33 cm. Waist hip ratio seems to be higher in both prediabetic and diabetic subjects. Neck circumference seems to be positively associated with waist hip ratio and BMI.

Causes of Adult and Elderly Deaths in Rural Bangladesh: Evidence from a Population Surveillance

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Background: A country's health system needs to be balanced with pattern of cause of death (COD) to mitigate income-erosion consequences of prolonged ill-health and premature deaths of income-earning adults. Statistics on population-based CODs are key to modify the health system but are non-existent, particularly for rural areas in developing countries.

Objective: Assess the major CODs of adult and elderly men and women and their healthcare-seeking prior to death in rural Bangladesh.

Methodology: The Health and Demographic Surveillance System (HDSS) maintained by ICDDR,B in Matlab, a rural area of Bangladesh, recoded 2,397 deaths of adults (aged 15-59 years) and elderly (aged 60 years and over) in the HDSS area visiting households monthly during 2003-2004. Trained male and female interviewers interviewed close relatives of the deceased with a modular verbal autopsy (VA) questionnaire. Two physicians independently assigned the direct and underlying CODs with disagreements resolved by a third. Specific cause was assigned to 91% of them. Rates and proportions were used for estimating the burden of disease.

Results: Non-communicable diseases (NCDs) accounted for 69% of all deaths with proportion increasing with age. The 5 leading CODs due to NCDs were diseases of the circulatory system (35%), followed by malignant neoplasms (11%), diseases of the respiratory system (10%), digestive system (6%), and diabetes (6%), totaling 68% of all deaths. Infectious and parasitic diseases were attributed to 13% of deaths with 6% to tuberculosis, and injury and other external causes to another 5%. Consultation with a medical doctor during fatal illness was 31% for the adult and 25% for the elderly deaths, and only a few died in health facilities.

Conclusion: The large majority of adult and elderly deaths in rural Bangladesh were due to chronic and NCDs and died at home. The current focus of the public-health system on infectious diseases needs a shift to be equipped to address the massive burden of NCDs in rural Bangladesh.

A community-based Study of Prevalence of Metabolic Syndrome in Rural Matlab, Bangladesh

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Background: Metabolic syndrome, a strong predictor of cardiovascular disease (CVD), is associated with an increased risk of mortality due to CVD. Population-based data on the prevalence of metabolic syndrome are rarely available for rural Bangladesh.

Objective: Examine the prevalence of metabolic syndrome in relatively younger adults, aged 27-50 years, in rural Matlab, Bangladesh.

Methodology: Waist circumference (WC), blood pressure (BP), plasma glucose (fasting and 2 hours after 75-g glucose challenge), fasting triglyceride (TG), and high-density lipoprotein cholesterol (HDL-C) were measured among randomly-selected males (n=229) and females (n=288). Each metabolic syndrome variable was defined using sex and population-specific cut-off values suggested by the International Diabetes Federation. Metabolic syndrome was defined as the presence of abdominal obesity (high WC) and any 2 of the other 4 variables (high TG, low HDL, high BP, and abnormal glucose).

Results: Overall, high WC, high TG, low HDL, high BP, and abnormal glucose were prevalent among 13.7%, 16.8%, 79.3%, 13.7%, and 19.5% of the individuals respectively. Metabolic syndrome was prevalent among 7.4% of the subjects. The females had a significantly higher prevalence of high WC (6.1% vs 19.8%, p=0.000) and low HDL (72.5% vs 84.7, p=0.005). The males, on the other hand, had a higher prevalence of TG (21.8% vs 12.8%). No difference in the prevalence of high BP or abnormal glucose was observed between gender, although abnormal glucose tended to be higher in the famales (17.5 vs 21.2, p=172). Metabolic syndrome was prevalent among 9.7% of the females compared to 4.4% of the males (p=0.014).

Conclusion: Metabolic syndrome variables are widely prevalent among relatively-younger adults in rural Matlab. Females are at a greater risk of metabolic syndrome than males, which requires further investigation for indentifying the determinants.

01:45 pm-02:30 pm (Venue: Windy Town-First Floor)   027 (231)
Plenary for Information and Evidence

Sharing Learning Is Everybody's Business

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To the World Health Organization (WHO), it is "everybody's business" to strengthen health systems—where everybody in the health system includes a mother caring for a sick child at home; private providers; behaviour change programmes; vector-control campaigns; health insurance organizations; and occupational health and safety legislation. Such an inclusive ethos echoes the Alma Ata Declaration (1978)[1] which gave communities the responsibility for finding solutions and identifying problems. The WHO research policy also focuses on the strengthening of health systems research. Taken together, these policies lead to the conclusion that health systems research is "everybody's business".

The vision of such an inclusive approach to health systems research is part of a worldwide movement for democratizing knowledge. This has implications for health systems about accessing knowledge, using knowledge, and building knowledge, whether that knowledge is based on research or direct experience.

Access to research-based knowledge is becoming more democratic with advances in information technology and e-journals. Research-based knowledge is growing rapidly—too rapidly for individuals to read everything relevant. It needs to be complemented by efforts to focus reading on summaries of the best available research.

A success story for increasing access to research is the Cochrane Library. The Cochrane Library (www.thecochranelibrary.com) is available with free one-click access to all residents of countries in the World Bank's list of low-income economies and through HINARI. The Cochrane Library contains high-quality, independent evidence to inform healthcare decision-making. It includes reliable evidence from Cochrane and other systematic reviews, clinical trials, and more. Co-

chrane reviews bring you the combined results of the world's best medical research studies and are recognized as the gold standard in evidence-based healthcare. However, its focus is primarily on evidence to inform the delivery of health services, although there is some growing evidence to inform the strengthening of health systems. Examples include reviews of lay health workers[2], audit and feedback[3], and mass media interventions.[4] This is an area ripe for further development.

Using research-based knowledge is becoming more democratic too, with research briefings being tailored for different audiences. In line with the WHO policy, there are initiatives worldwide for encouraging evidence-informed decision-making. For instance, EVIPNet (the Evidence Informed Policy Network) is a WHO initiative that encourages policy-makers in low- and middle-income countries to use evidence generated by research.[5] SUPPORT is an international network spanning Latin America, sub-Saharan Africa, and Europe providing training and support for both doing and using research relevant to low- and middle-income countries.[6] The Cochrane Library's response has been to construct Evidence-AID, evidence summaries for interventions relevant to healthcare in natural disasters and other healthcare emergencies, such as those following the 2004 Tsunami and more recent events in the USA and South Asia. Current titles include infectious diseases, injuries and wounds, nutrition, and mental health. This is another area ripe for development.

Building research-based knowledge is also becoming more democratic—in terms of the increasing efforts to collate the research literature asking for people's views about health and health systems and in terms of the numbers of non-researchers guiding research activity. Systematic reviews now ask not only "what is the impact of clini-

cal care?", but also questions, such as "what do people think of that clinical care?" The methods being developed for these different sorts of systematic reviews can be applied to systematically reviewing a much broader section of health systems research, enabling learning about health systems to be shared more easily.

Democratically-minded researchers also ask non-researchers what the important questions for research are. Low- and middle-income countries can be proud of their record of participative research, with countless examples filling a rich literature. It is seen as essential to ensuring the relevance of research and applicability of findings. This ap-

proach has been frequently applied when seeking solutions to local problems but only relatively recently applied to national and international research and policy-making.[7]

In undertaking such work, the EPPI-Centre (http://eppi.ioe.ac.uk/) has found that the challenge for researchers is not only how to involve policy-makers and service-users in discussions about doing research and making policy but also how to develop research methods to apply to the pressing problems they raise. This makes sharing our learning and strengthening health systems, everybody's business.

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Management Information System and Other Data Sources in the Public Sector as Evidence to Strengthen Management, Leadership, and Governance

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[Contents to be available during the presentation]

03:00 pm-04:30 pm (Venue: Windy Town-First Floor)   029 (208)
Scientific Session 3: Service Delivery

Integrating Three National Health Programmes in Pakistan: A Case Study of Health Systems Strengthening

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Background: Healthcare provision in developing countries is often implemented through various national health programmes that tend to be vertical in nature. The ministries of health recognize the need for integration; however, the concept often remains underused as a vital tool for cost-effective healthcare and to inform policy, planning, and allocation of resources.

Objective: Use eye-health as a catalyst for integration of 3 national health programmes at policy, planning and execution levels.

Methodology: An innovative health systems strengthening strategy was adopted in which integration of the national programmes in primary healthcare, eye-health, and health management information systems was undertaken at the policy, planning and execution levels. The process includes health systems research and addressing of all the 6 building blocks of health systems. The strategy was implemented through policy formulation at the federal level, coordination, and joint planning for 100,000 Lady Health Workers (primary healthcare) in 120 districts, 5,000 Basic Health Units, and eye units in 120 district hospitals with significant increase in public spending.

Results: Following successful communication of health research findings and demonstration projects, the Ministry of Health directed that the national programmes for primary healthcare, eye-health, and health management information systems be integrated with coordination to take place at key operational levels. The Ministry further agreed to allocate £ 25 million towards eye-health from 2005 to 2010.

Conclusion: The case study illustrates that integration of the national health programmes is possible using the 6 building blocks of health systems as strategic entry points.

Disparities in Access to Quality Healthcare in Uganda

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Background: While the developed world has made strides in increasing access to quality care for the majority of the population, in developing countries, access to quality healthcare remains a challenge, especially for the poorest segments of the population.

Objective: Assess the quality of outpatient care provided to patients of different socioeconomic status.

Methodology: An analytical cross-sectional study was carried out in 10 public and 10 private health facilities in eastern and western Uganda. Observations of 1,446 patient-provider interactions in the outpatients' clinics of the facilities were made. Thereafter, exit-interviews were also conducted with the 1,446 observed patients. The presence of structural components of the facilities were ascertained using observation checklists. Principal component analysis and raw scores were used for constructing indices used to assess different components of quality and the socioeconomic status of the patients. The odds ratio (OR) was used for assessing differences in quality of care received by patients of different socioeconomic status. Ethical approval for the study was sought from the relevant institutions in Uganda.

Results: The analytic framework used was based on Donabedians framework for quality care. The most poor were less likely to receive good communication quality compared to the least poor (OR=0.66, confidence intervals [CI] 0.47-0.94). They were also less likely to seek care from facilities that had adequate essential supplies compared to the rich (OR=0.68, CI 0.55-0.85). The facilities used by the least poor and the most poor had similar infrastructure, equipment for testing, and diagnosis. Measures for the general performance of health workers also showed no statistical difference in the care provided to the least poor and the most poor (OR=1.04, CI 0.41-2.64).

Conclusion: The study presented a mixed picture with disparities in access to some components of quality and equality in access to other components. Available resources in terms of skills and material inputs need to be applied in such a way that the likelihood of achieving desired health outcomes is increased not only for the rich but also for the poor.

Providing Youth-friendly Health Services: Where Are We Now?

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Background: Since the ICPD in 1994, providing appropriate sexual and reproductive health services to young people has been highlighted. The implementation of the national standards for youth-friendly health services (YFHS) in Bangladesh in 2007 provides an example of one attempt to incorporate such services into the health system. However, the impact of these guidelines is unknown.

Objective: Assess the current status of YFHS provision and assess the changes since the introduction of the national standards.

Methodology: Data for the study were drawn from 2 nationally-representative surveys of young people in which service providers from each selected cluster were interviewed to understand their attitudes towards and experience in providing YFHS. The baseline (n=875) and endline (n=723) data were collected in 2005 and 2008 respectively. Interviewed service providers included government, NGO and private doctors, government and NGO paramedics, nurses and other service providers, pharmacists, and drug-sellers. Although these surveys were not designed to assess the functioning of YFHS, certain items in the questionnaire were used as proxy measures for the standards set in the national guidelines.

Results: The preliminary results suggested no change in the provision of YFHS since the introduction of national standards for YFHS. Although the proportion of the service providers who mentioned having a signboard displaying service-hours and type of services available increased (71% to 79%), the proportion of the service providers who had received training on how to provide specialized services to youths decreased from 47% to 39% during the same period. Similarly, in 2005, 28% of the service providers had written guidelines for serving youths but it was 17% in 2008. In 2005, only 28% of the service providers thought that unmarried youths should be treated in a respectful manner if they come to a facility for condoms but it was 21% in 2008. About 40% of the service providers in both the surveys did not provide condoms to unmarried youths. Further analysis of data by type of service providers and geographic areas is underway.

Conclusion: Despite the national standards for YFHS, implementation at the service provider and facility level is weak, highlighting the obstacles to implementing changes throughout the health systems.

Disaster Healthcare Services in the Lens of Injury Care in Bangladesh: An Experiential Analysis of Tropical Cyclone SIDR

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Background: Bangladesh, a disaster-prone country, has the highest death rates from disasters due to different injuries, drowning, electrocution, snake-bites, and other mass casualties. The country is vulnerable to climate change. It is inevitable to develop the disaster healthcare-preparedness and service-delivery system to reduce injury-related mortality and morbidity and other socioeconomic burdens.

Objective: Explore (a) healthcare-seeking behaviour relating to injuries caused by SIDR, (b) explore preparedness of injury care at the upazila health complex (UHC) and community levels, and (c) identify the constraints faced by healthcare providers in providing injury care just after SIDR,

Methodology: The study was conducted during January-February 2008 in Patharghata and Zia Nagar upazilas of the same division with those affected severely by tropical cyclone SIDR. It is a cross-sectional survey where 1,200 cases as morbidity and mortality which occurred within 7 days of SIDR were recorded. Both qualitative and quantitative tools were used for understanding injury healthcare preparedness in a disaster such as SIDR. Verbal and written consents were taken from the respondents.

Results: Research revealed that, due to SIDR, there were 34 injury-related mortality cases, and 1,210 morbidity cases were found from 5,165 sample subjects. Drowning was the highest killer (67%), 11% of the injured (132 of 5,165) became permanently disabled. 43% sought injury care from allopaths, 34% bought medicines from shopkeepers, and 25% from others, which included traditional healers (16%). Some basic medico-equipment, such as gauge, bandage, cotton, needle, thread, antiseptic, emergency medicines including tetanus toxoid, and ambulance were lacking. Moreover, there was a lack of trained manpower to treat injured patients just after the SIDR in the community and upazila health complex. Most respondents did not get medical care even after 2 days.

Conclusion: Disaster injury care-preparedness must be developed in the tertiary service-delivery system to community level throughout.

Managing Sick Children by Community Health Workers: Their Quality and Resultant Changes in Use at Facilities

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Background: IMCI training has been demonstrated to improve the quality of care at first-level government facilities. The Multi-country Evaluation (MCE) of IMCI in Bangladesh introduced a new cadre of community-based health workers (CHWs) to manage sick under-5 children at the community and promotion of child health and appropriate care-seeking.

Objective: Assess the case management skills of CHWs, look at changes in care-seeking behaviour, and use at first-level GoB facilities.

Methodology: The study was conducted in the MCE-IMCI site in Matlab. In 2007, case management skills of all CHWs were assessed which included direct observation, re-examination of the sick child by gold standard physician, and exit-interviews of caretakers. Results were compared with findings from a similar assessment of service providers (paramedics) of the IMCI facilities in 2005. Periodic household-coverage surveys and routine MIS data were used for assessing the changes in care-seeking and use.

Results: The quality of care index by both cadres of providers was similar—64% (CHWs) and 65% (paramedics). Compared with gold standard physicians, sensitivity and specificity for diagnosis of pneumonia was 95.8% (n=113) and 96.5% (n=250) by the CHWs and 84.6% (n=55) and 92.1% (n=116) at the IMCI facilities respectively. More children received antibiotics correctly from the CHWs (94.2%; n=146) than at the IMCI facilities (88.1%; n=81). In 2007, coverage data showed that 15% of the sick under-5 children sought care from the CHWs and 10% from the IMCI facilities. The CHWs managed a large number of pneumonia and diarrhoea in the community, thereby decreasing the load of such cases at the IMCI facilities.

Conclusion: The CHWs have demonstrated that they could provide quality of care as good as offered at the IMCI facilities, and their services are well-used by the community.

Referral Transport System for Emergency Obstetric Care in Gujarat State: A Case Study

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Background: An effective referral system is an essential prerequisite for a well-functioning emergency obstetric care (EmOC) service. Under the recently-taken initiatives in Gujarat, well-equipped facilities in the form of First Referral Units and 24x7 operational Primary Health Centres (PHCs) are being established. The study attempts to explore the crucial link of referral transport so that the health facilities linked through it are used at the maximum level.

Objective: Study the existing referral transport for EmOC in the Gujarat state, evaluate its strengths and weaknesses, and suggest ways of improvement for providing better referral service.

Methodology: Based on the socioeconomic status and geographical location, 2 districts each were chosen from good, medium and poor districts. Primary data were collected through visits to facilities and through interviews of key informants at the state, division and district levels. Managerial issues and problems at the grassroots level were understood through interviewing health service providers and patients at facilities. The recent public-private partnership (PPP) with the Emergency Management Research Institute (EMRI) and its impact on the existing referral system were also studied by visiting the EMRI centre and interacting with their officials and staff. Secondary data were collected through the state and district health management information system. A desk review of available research literature on studies on referral system was also carried out.

Results: The study revealed a rudimentary government referral transport system. The focus was more on the number of ambulances and the number of drivers and less on the number of referrals provided. Most PHCs did not have proper ambulances; however, with the advent of EMRI, the situation is improving. The lack of standard procedure and referral protocols was, at places, overcome by individual leadership.

Conclusion: With due importance to the referral transport system and treating it as an integral part of maternal health, many more lives of mothers can be saved. The referral transport system should focus on the requirements of patients. If needed, the Government should also look into PPP for providing quality services.

03:00 pm-04:30 pm (Venue: Media Bazar-Ground Floor)   035 (041)
Scientific Session 3: Information and Evidence

Health Needs and Healthcare-seeking Behaviours of Street-dwellers in Dhaka City

Md. Jasim Uddin[1] (jasim@icddrb.org), Tracey Lynn Koehlmoos[1], Ali Ashraf1, A.I. Khan[2]
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Background: Studies in Dhaka city have found an increased number and proportion of people living on streets and in urban public places due to the increasing pressures of rural-urban migration and rapid urbanization. Their health needs and healthcare-seeking behaviours are unknown.

Objective: Ascertain the extent to which the need for primary healthcare services among street-dwellers is being met through existing facilities.

Methodology: This community-based cross-sectional study was conducted over a 12-month period during June 2007–May 2008 in Dhaka city, Bangladesh. The study population included ever-married females (n=448) and males (n=448) aged 15-49 years. Data for the study were collected through a community survey and exit interviews. Both bivariate and multivariate analyses were carried out.

Results: 72% of female (n=448) and 48% of male (n=448) street-dwellers interviewed were sick at the time of data collection. Only 28% of currently pregnant street women (n=63) sought antenatal care. Twenty-one percent of deliveries occurred during the last 12 months of data collection (n=81) were conducted on the street. Untrained personnel conducted 77% of the deliveries. Eighty-nine percent of the street-dwellers reported that their children aged <5 years had more than one symptom associated with acute respiratory infection during the last 2 weeks. Thirty-seven percent of the female and 34% of the male street-dwellers interviewed reported that their accompanied children had diarrhoea. A few street-dwellers who sought services for their health problems mostly visited the nearest pharmacy and mobile clinics run by a non-governmental organization. Eighty-eight percent of the female and 88% of the male street-dwellers used open spaces for defaecation.

Conclusion: The street-dwellers are extremely vulnerable in terms of their health needs and healthcare-seeking behaviours. There is no health service-delivery mechanism targeting this marginalized group of people. The public and private sectors should, thus, focus future programmes to meet the needs of this extreme vulnerable group of people.

Multipronged Approach to Prevent Needle-stick Injury and Its Impact at Dhaka Hospital, ICDDR,B

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Background: Needle-stick injury (NSI), common among healthcare professionals, is a very frequently-reported adverse incidence in healthcare settings. NSI constitutes a major risk for transmission of over 20 bloodborne pathogens, including hepatitis B, hepatitis C, and HIV. In a recent survey conducted at the Dhaka Hospital of ICDDR,B, 75% of 151 respondents reported a history of NSIs during their careers.

Objective: Observe the impact of a programme to reduce NSIs on staff working at the Dhaka Hospital of ICDDR,B.

Methodology: During the last two months of 2007 and the first two months of 2008, an intensive awareness and educational programme was initiated to prevent NSIs at the hospital. The educational programme included lecture sessions, use of hand-outs, and posters. Members of the hospital staff were informed about the hazards, including possible acquisition of infections due to hepatitis B, hepatitis C, and HIV. Re-capping and re-sheathing of needles were discouraged. Specially-designed boxes with 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. Assistance was provided in administering parenteral (intravenous/intramuscular) medications and collection of blood specimens from non-cooperative patients.

Members of the hospital staff providing environmental services were strictly instructed to use heavy gloves and wear leather shoes. Compliance was monitored, and corrective actions were taken in the event of non-compliance. Staff members were reminded of disciplinary actions for repeated violations of the policies.

Results: The prevalence of re-capping and over-filling of sharp boxes dramatically fell, and the use of heavy gloves and wearing of leather shoes significantly improved. During January-November 2008, 16 episodes of NSIs were reported compared to 57 episodes of reported NSIs from the 151 respondents detected before the programme in an NSI survey conducted in 2007.

Conclusion: The simple, practical and sustainable initiatives reduced the incidence of NSIs at the Dhaka Hospital within a very short period. Data indicate the further reduction of the incidence of NSIs through continued educational and motivational programme for the hospital staff and implementation of some management practices, along with a monitoring system.

Barriers to Getting Health and Nutrition Services in Urban and Rural Bangladesh

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Background: Health and nutrition services in Bangladesh are not adequate. Hospitals and clinics often fail to provide proper facilities due to absence of either policy and/or skilled persons. The government facilities are inadequate, and the quality of services is not always satisfactory.

Objective: Identify the barriers to getting quality in nutrition and health services and coverage of services and also identify the roles of service providers and recipients.

Methodology: Three types of health service facilities were selected for this cross-sectional study: hospitals and clinics, satellite clinics, and NGO facilities. A questionnaire was used for interviewing 150 consumers.

Results: 61.3% (n=46) of 75 urban recipients were satisfied with health and nutrition services provided, and 38.7% (n=28) were not satisfied. In rural area, 66% (n=48) of 76 recipients were satisfied, and 34% were not. 8.6% of the urban consumers stated that the service providers' behaviour was bad, and it was 5.5% in rural area. 11.7% of the urban and rural consumers stated that they came to take the services but the provider was absent. 10.0% of the urban consumers reported that the service providers did not give enough time to them, and it was 9.4% in rural area. 20% of the urban consumers reported that the providers suggested taking *khichuri*, and in rural area, it was 26.7%. In the case of animal protein, the consumers in urban area stated that the service providers suggested taking egg (6%) and fish (0.7%) as a complementary food, and the rates was 8% and 3.3% respectively in rural area.

Conclusion: A well-qualified nutritionist should be appointed in each service-delivery centre. The Government should make available trained service providers and prepare appropriate provider-consumer guidelines for health and nutrition services. The people of Bangladesh face barrier from care providers for nutrition and health services. The quality of services is not acceptable in most occasions. If necessary steps are not taken to improve the situation, health and nutrition are less likely to improve.

Developing a Community-based Health Management Information System for Municipal Health Services in Bangladesh

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Background: City corporations and municipalities are responsible for ensuring primary health-care services for the urban population, although there is no formal management information system for health. Concern Worldwide, Bangladesh is facilitating the implementation of a community-based health management information system (C-HMIS) led by the health departments of 7 northern municipalities.

Objective: Introduce and adapt a community-driven cost-effective information system for factual management-decisions by the municipal authorities to work for better health services of their population.

Methodology: Applying the census methodology, 3,672 trained community health volunteers (CHVs) collected data from every household by interviewing household members from April to June 2008 with a pretested format. One municipal area was divided into clusters considering the total number of CHVs. One CHV was assigned for 54 households. The initiative covered 679,311 people. Information was collected on immunization, maternal health, water and sanitation, etc. Collected data were compiled and analyzed in a participatory way by Ward Health Committee members, health staff, and CHVs and submitted to the municipal authority for endorsement. Later, the municipal health department stored the data and used those for planning and making decisions in fixing different health-related targets. A follow-up mechanism was inbuilt in the C-HMIS that allows collecting data in the same way to monitor the progress.

Results: Data are being used in planning and target-fixing, particularly in immunization, family planning, sanitation, etc. The process also made the municipalities competent to monitor health interventions. Collected data were consistent with available sources. The C-HMIS 2008 showed 98% measles and 60% vitamin A coverage of children aged 12-23 months, which were very close to the findings of the Knowledge, Practice and Coverage Survey in 2007. The survey observed 90% measles and 70% vitamin coverage in the same location among children.

Conclusion: The applied C-HMIS proved as an effective and feasible system for planning and decision-making by the municipal authority. This system could be sustained and used by other municipalities.

Designing 'Knowledge to Action' Plans for Health Science Development and Health Services-delivery

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Background: While the support for knowledge creation through advanced research in health sciences continues to grow, there is an increasing emphasis on the development of appropriate strategies for knowledge translation (KT) so that the emerging information can be gathered and applied for improving human health in a timely manner. Often, there is a disconnection between the knowledge creators and the knowledge-users because of a lack of effective plans and portals for KT, and as a result, existing or newly-developed information cannot immediately serve the human needs. Therefore, the research policy-makers, the researchers, and the funding agencies must use resources strategically to achieve the goals of KT while processing information for health services.

Objective: Illustrate different steps involved in the process of KT and how different organizations may develop strategic plans for KT suitable to their goals/activities.

Methodology: The presentation is based on reviewing literature published on the subject and its importance. The information has been synthesized in an effort to propose a specific or-
ganizational structure for transferring knowledge from a research institute to the potential users of the knowledge. Other examples will be provided to illustrate the importance of KT in the health sector.

Results: Various definitions of KT are presented to suit different institutional goals and their roles in knowledge creation and use. The most common strategies include the identification of knowledge creators and their specific users, the development of effective means for tracking knowledge, processing the information, synthesizing knowledge pertaining to specific problems, and developing effective paths/means for disseminating the knowledge properly to the knowledge users to ensure knowledge-use for specific benefits. The importance of information database, knowledge synthesis, and quality assurance for knowledge transfer and use in providing evidence-based health services will be discussed.

Conclusion: KT must be an integral part of all research policies on health and health systems to ensure immediate use of the research results to benefit the people in need of improved health.

Future Challenges of the Bangladesh Health System: Insight from Two Rural Subdistricts

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Background: The health service-delivery infrastructure of the Ministry of Health and Family Welfare (MoHFW) at the subdistrict level and below is likely to be hard-pressed in dealing with the rising burden of chronic diseases that contribute to major morbidity, disability, and mortality.

Objective: Discuss the type of self-reported chronic conditions and patterns of medical consultation.

Methodology: Data on self-reported health service use and type of medical consultation in the past 2 weeks were collected from all household members under a demographic surveillance system (DSS) administered by ICDDR,B in rural Mirsarai and Abhoynagar subdistricts since 2006. Reported data on selected chronic conditions and consultation by type of provider in the last quarter of the DSS round in 2007 have been used for identifying 2,593 males and 4,243 females in Mirsarai and 2,211 males and 2,784 females in Abhoynagar aged 20 years or more. Reported chronic conditions were grouped in line with 10th edition of International Classification of Diseases (ICD-10).

Results: Of those reported selected chronic conditions, 1,390 were males and 2,451 females in Mirsarai and 1,044 males and 1,158 females in Abhoynagar. With predominance of females in both the areas, diseases of the digestive system, respiratory system, circulatory system, and nervous system, and musculo-skeletal system and endocrine disorder were commonly-reported conditions. Non-graduate service providers were most frequently consulted in almost two-thirds of chronic conditions, and the use of graduate curative care providers in the public sector was quite low compared to the private sector in both the areas.

Conclusion: The MoHFW, in collaboration with other actors, should consider community-based intervention to educate people on risk factors for preventing chronic diseases and provide support to individuals living with chronic diseases.

03:00 pm-04:30 pm (Venue: Green View 1-First Floor)
Special Session on Future Health Systems

E-Health, the 21st Century Health Tool: Evolution or Revolution?

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Healthcare need of people, a never-ending phenomenon, is on constant increase in its complexities for fulfillment of its demand and supply requirements. The advancement of health sciences is taking place constantly. It takes massive information-sharing machinery to meet needs of the physician community only, a single part of a multi-tier and multi-segmented life-cycle of the healthcare service system.

Information technology has revolutionized the service-delivery system in many industries, even in Bangladesh but the health information technology-driven electronic healthcare service system is yet to take any form or shape here. Necessities, such as optimum use of public-health resources, diminishing errors in diagnosis and treatment, and public-health issues due to infectious diseases or emerging threat from chronic diseases, irrespective of economic status of patients or countries, dictated humans to make innovative use of health information through communication technology and led to the development of the 21st century healthcare service system—popularly known as electronic health or e-Health.

The rapid spread of communication tools, mobile, or wireless, even in the remotest areas of Bangladesh, has created the opportunity to decentralize operation and centralize the planning process. Operations include manning, supplies, and service at the point of care, either in rural health centre or at home of a patient. Planning requires evidence or field-level data, mining of data to calculate right amount of resource required for each component of the health system. Dynamic flow of data ensures efficient and optimum use of available resources for better maintenance, surveillance, and monitoring of public-health issues.

During the past century, the size of population was smaller than during this century, which is a hard truth for Bangladesh, irrespective of appreciable population-control mechanisms. However, habitable and cultivating landmass is shrinking due to global climate change; so, the density of population in Bangladesh is not likely to improve in foreseeable future. To meet public-health challenges of the new century, all aspects of healthcare spectrum need modernization and integration, which is attainable through deployment of an electronic health system. This presentation will focus on this newest technology—e-Health—keeping in view the Bangladesh healthcare landscape.

E-Health is a way to extend hospital process to a larger geography (reaching out). E-Health is an emerging field in the intersection of medical informatics, public health, and business, referring to health services and information delivered through the Internet and related technologies. It is a mature technology capable of improving the quality of service and reduce cost of service, provided a very carefully-researched, and a realistic plan is tailor-made to achieve objectives of national health plan.

E-Health requires careful attention to avoid a few misconceptions: (a) many consider that e-Health and telemedicine can replace conventional clinical practice—E-Health is not a surrogate for the clinician; (b) e-Health does not replace existing healthcare infrastructure applications; on the contrary, it magnifies capacities of existing healthcare infrastructure; (c) e-Health is not the routing hardware or the networking software but it uses those to deliver the information needed to achieve the primary goal; and (d) it is not a technology development only but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve healthcare locally, regionally, and worldwide by using information and communication technology.

Important components of e-Health include: (a)

electronic health record—may start from birth registration, (b) clinical applications—telemedicine, (c) administrative applications—enterprise resource planning, (d) supply chain—pharmacy and hospital products, and (e) communication—networking and data-sharing between stakeholders. All information within e-Health system needs to be sharable among its stakeholders. And any information to be shared through telecom must be in a suitable electronic format or standard dataset. Such data are entered into the e-Health system from every point of healthcare life-cycle. A mature e-Health system requires information-gathering tools, communication infrastructure, and trained human resources. Bangladesh is in an advantageous position because the healthcare infrastructure up to district level is complete with computer and Internet bandwidth. Further down to village level, mobile phone-based Internet is available, where there is no physical Internet connectivity. Accept for clinical consultation (telemedicine), e-Health not necessarily requires high Internet bandwidth. Although Bangladesh is rich in human resources, yet we are suffering from lack of human resources in the health sector but there are enough unemployed computer literates throughout the country. Now we need to address a public-health issue-driven user-friendly applications and tools for e-Health system integration. Mobile phones, cheaper and abundant in supply, can play a role for data input and information-sharing to ensure the patient's access to providers and vice-versa in a timely fashion for prevention and intervention to disease processes. Considering the overall scenario in Bangladesh, e-Health revolution is a demand of the present time to offer equitable healthcare to all and to achieve public-health goals within a reasonable timeframe.

Now is the right time to act as there is political commitment in the country to transform Bangladesh to Digital Bangladesh. Prudent investment and careful planning will allow Bangladesh to achieve its public-health goals by 2030, if not by 2021.

Day 2: Wednesday, 11 February 2009
08:45 am-10:00 am (Venue: Windy Town-First Floor)
Plenary for Health Workforce

042 (226)

Human Resources for Health: A Global Challenge

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To achieve the health-related Millennium Development Goals (MDGs), it is critical that there are adequate and appropriately-trained human resources for health (HRH) in a country. Results of numerous studies have shown that poorer countries, specially those in sub-Saharan Africa, lack adequate HRH and are unlikely to achieve the MDGs. Migration or brain-drain of trained health professionals from poorer to richer countries, therefore, emerged as the most debated issue. However, the debate is primarily centred on 'regulating' or 'controlling' such migration and 'compensating' developing countries for their loss. It is now imperative to demonstrate the inadequacy of these traditional ideas in explaining migration of contemporary health professionals. An analysis of secondary data from a small survey on medical students conducted in Karachi, Pakistan, was done and discussions with 2 groups of medical officers in Bangladesh were made. The discussions revealed that, in an age of globalization, such emphasis on regulating migration is misleading. Globalization makes mobility—of goods, services, and people—inevitable and invigorating. If diversity and pluralism are to be encouraged, peoples' right to be mobile cannot be denied. Moreover, the reality of migration is also complex and multidimensional. Most importantly, migration of educated middle-class professionals is tied up with 'democratic deficit', deficient work environment, and lack of opportunities in countries of 'origin', on the one hand, and demography-driven and human rights-based immigration policies of 'host' countries, on the other. Migration issues cannot be addressed without simultaneous action on tackling gross democratic deficit in most developing countries (dictatorship, lack of rule of law, violations of human rights, and poor working conditions) and generating adequate HRH in developed countries faced with increased demand of healthcare services. The complexity of the issues demands coordinated global and national action.

10:30 am-11:30 am (Venue: Windy Town-First Floor)   043 (055)
Scientific Session 1: Health Workforce

Use of Medical Representatives for Disseminating Information to Non-formal Private Practitioners in Bangladesh

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Background: As in many developing countries, non-formal private practitioners (NPPs) in Bangladesh provide approximately 80% of all health-cares. However, gaps in their knowledge and weaknesses in their practices are well-known. Current efforts to increase their services focus on short training courses that offer limited coverage and are unlikely to be cost-effective. Academic detailing through medical representatives (MRs) is an effective means of increasing knowledge and changing the practices of formal care providers in developing countries. The MR workforce, thus, represents a potential untapped resource that can be used for training of NPPs.

Objective: Understand the feasibility of using MRs to disseminate information to NPPs through academic detailing.

Methodology: Evidence-based counselling guidelines for sexually transmitted infections were developed with key stakeholders and experts. Thirty-six MRs from 2 pharmaceutical companies were trained to disseminate the guidelines in the 2-phase study. In-depth interviews were conducted with 35 MRs and NPPs, and 30 MR-NPP interactions were observed. Thematic analysis was used for assessing the feasibility of this approach based on these qualitative data.

Results: The MRs willingly participated in training and were enthusiastic about detailing the information. Within 2 weeks of training, each MR had disseminated the guidelines to an average of 15 NPPs. Given their familiarity with this model, they were able to rapidly incorporate the information and plan for its dissemination. They offered suggestions for improving the guidelines and willingly carried recommended supplemental materials with them on their detailing visits. The performance of MRs varied, depending largely on the importance given to this by their supervisors or senior officials, and a commitment to social corporate responsibility on the part of the company was important to the success of this effort. One strength of dissemination by MRs was their ability to adapt the information to different providers, but the high degree of flexibility in their delivery also resulted in an incomplete dissemination of the guidelines.

Conclusion: MRs are a suitable workforce to disseminate and detailed information to NPPs in Bangladesh. Working with private-sector pharmaceutical companies provides a potential avenue for reaching the vast number of NPPs with basic information that can improve the care they provide.

Retention and Performance of BRAC Health Volunteers: Role of Incentives and Disincentives

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Background: The use of volunteer health workers is one approach to addressing the shortage of healthcare providers in developing countries. BRAC is a pioneer in this area, using *Shasthya Shebikas* (SSs) as core workers in its community-based health interventions. However, drop-out rates are high, and many SSs are 'inactive'. Cross-sectional studies explored these issues but failed to provide an assessment of the relative importance of different incentives and disincentives. This study employed a case-control approach to understand factors influencing retention and performance of SSs in Dhaka urban slums.

Objective: Understand the incentives and disincentives that affect retention and performance of SSs.

Methodology: This mixed-method study included a nested case-control design to assess factors relating to retention and performance of SSs and focus-group discussions (FGDs) to explore solutions to these problems. The study was conducted in BRAC project areas in urban slums of Dhaka city. The primary outcome of interest was retention; active performance was a secondary outcome. In total, 542 current SSs and 146 dropped-out SSs participated in the survey. In addition, FGDs were held with both current and dropped-out SSs. Odds of retention and active performance were calculated, controlling for potential confounders, to assess the effects of different incentives and disincentives. Qualitative data were obtained to identify recommendations for changes to the programme that may help improve retention and performance of SSs.

Results: Financial incentives were the main factor linked to retention. For example, whereas 69% of the current SSs reported that running their households without SS's income was difficult, and this was true for only 17% of the dropped-out SSs. However, while disincentives, such as time conflicts, had more limited influence, social factors, such as acceptance and recognition from family and community, were important for retention given that 80% of the current SSs compared to 55% of the dropped-out SSs mentioned that their role had increased their respect in their family and community.

Conclusion: Although SSs are community health volunteers, financial incentives are the most significant factor relating to their retention and performance. At the same time, the results suggest other avenues that can be strengthened to improve both retention and performance of SSs.

Community-based Validation of Assessment of Illnesses of Newborns by Community Health Workers in Sylhet District, Bangladesh

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and Abdullah H. Baqui[2] (for the Projahnmo Study Group)

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Background: Every year, an estimated 4 million newborns die globally; 99% of these deaths occur in the developing world. Serious infections, including sepsis and pneumonia, account for up to 50% of neonatal deaths in high-mortality settings. The integrated management of childhood illness (IMCI) guidelines were designed and tested at the first-level health facilities by professional health workers. In limited-resource settings, community-based surveillance of neonatal illnesses by minimally-trained community health workers (CHWs) can decrease mortality by improving recognition of illnesses and access to medical treatment. Limited evidence from developing countries suggests that CHWs working outside formal health facilities can implement IMCI-type algorithms to identify serious illnesses.

Objective: Validate trained CHWs' recognition of signs and symptoms of neonatal illnesses and classification of illnesses using an algorithm during home-visits in rural Bangladesh.

Methodology: During August 2005–May 2006, CHWs and study physicians assessed 288 newborns independently. Based on an algorithm with 20 clinical signs, sick neonates were classified as having very severe disease (VSD), possible very severe disease (PVSD), or no disease. Physician's assessment was considered the gold standard.

Results: The CHWs correctly classified VSD in newborns with a sensitivity of 91% and a specificity of 95%. There was almost perfect agreement between CHWs' and physicians' classification of VSD (kappa 0.85, p<0.001). The CHWs' recognition showed a sensitivity of >60% for signs and symptoms and a specificity of 97-100%.

Conclusion: The data suggest that CHWs with minimal training can use a diagnostic algorithm to identify severely-ill newborns.

Quality of Informal Healthcare Providers in Rural Bangladesh: Implication in the Future Health System

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Background: One-third of 140 million people of Bangladesh live with an income below one dollar a day, and 80% live in rural areas. Informal (without formal training) healthcare providers are the dominant sources of healthcare services for rural population who are mostly poor. Thus, it is important to know about the informal healthcare providers, their background, quality of services, and presence of accountability mechanism.

Objective: Map healthcare providers by type, assess their practising patterns, including the use of drugs, assess healthcare-seeking behaviours of villagers, and estimate the extent of inappropriate and harmful use of drugs with the goal to identify areas to intervene for harm reduction.

Methodology: The study was conducted during 2006-2007. Health facilities of all 19 unions of Chakaria upazila were mapped with coordinates. All types of healthcare providers were listed and categorized. All the 325 village doctors currently practising allopathic medicine and 236 patients of 50 village doctors were interviewed to understand their common practice and knowledge on common diseases and treatments. To recognize the role of the local government in running the local health facilities, 14 chairmen and 185 members of union councils were also interviewed. To realize the healthcare-seeking behaviours of the community people, information was collected from 1,000 households to know where they went for consultation during the last episode of illness.

Data from the Chakaria Health and Demographic Surveillance System (HDSS) were used for monitoring the progress of the intervention.

Results: There were 2,502 informal healthcare providers and 112 formal healthcare providers in the upazila. 53% of the villagers who were ill during the 2 weeks preceding the survey contacted the informal healthcare providers, and 24% did not contact anyone. In total, 196 drugs were used for treating 89 patients with pneumonia, cold and fever, and diarrhoea. The appropriate drug-use was 18%, and 7% was harmful. At the present health system, there was no mechanism for monitoring the quality of services provided by the healthcare providers for infants.

Conclusion: Inappropriate use of drugs is highly prevalent among the informal healthcare providers. This has impoverishing effects and life-threatening consequences for those who use their services. There is a need for interventions to reduce harmful and inappropriate practices.

10:30 am-11:30 am (Venue: Media Bazar-Ground Floor)
Scientific Session 1: Information and Evidence

Assessment of Availability of and Accessibility to Formal Healthcare Facilities in Chakaria Upazila, Bangladesh

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Background: The density and quality of trained health workers are associated with significant gains in health. Bangladesh has a severe shortage of health workforce. It is important to understand the dynamics of availability of and accessibility to trained health workforce and healthcare facilities at the sub-national level.

Objective: Assess the availability of and accessibility to health workforce and healthcare facilities in Chakaria, a remote rural area of Bangladesh.

Methodology: All the health facilities and healthcare providers practising in Chakaria upazila were listed in 2007. Locations of the facilities and care providers were marked in the upazila map using their GPS coordinates. After completing the list, it was cross-checked with a list of healthcare facilities collected from the government and NGO offices. Information on services available and costs was obtained from the care providers and administrative offices in the case of the healthcare facilities. The members of the project staff collected information on road distance between the approximate centre-point of the union and the location of the administrative headquarters of the upazila, modes of transport available, and cost of transport.

Results: Only 110 formally-trained healthcare providers were available for health services to a population of 560,000. Adjustment for the part-time presence of guest physicians led to 1.1 physicians per 10,000 people. This density was far short of the WHO estimates of 960 needed to achieve the Millennium Development Goals by 2015. There were only 8 nurses in Chakaria, which was also far short of the recommended ratio of 3 nurses per physician. The access to trained providers and health facilities were a challenge as they were based in the upazila headquarters. The direct and indirect costs involved in visiting a healthcare provider at the upazila headquarter make the access to modern health services a major challenge for the villagers in general and the poor in particular.

Conclusion: The formal healthcare facilities in rural area are inadequate for serving the people in their catchment areas. It is important to engage healthcare providers in the private sector and informal sectors to provide access to quality health services to the rural poor.

Expectation and Satisfaction Level of Patients Attending Super-specialties Corporate Hospitals in Dhaka: A Cross-sectional Study

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Background: In response to the growing disappointment of patients towards public healthcare facilities, the number of private hospitals has increased in Bangladesh by 15% between 1996 and 2000. The inceptions of corporate hospitals occur with their impressive appearance, which prevent Bangladeshi patients from seeking overseas treatment and save around Tk 500 million per year. Unfortunately, efficiency dynamics are largely untested in private healthcare facilities in developing countries, such as Bangladesh.

Objective: Assess the level of user-satisfaction and determine the discriminating variables of expectation among patients who are attending corporate hospitals in Dhaka.

Methodology: A cross-sectional analysis was performed among randomly-chosen 370 participants attending 3 super-specialties corporate hospitals in Dhaka from April to August 2008. They were interviewed face-to-face using a structured questionnaire which tested the variables on socioeconomic parameters, expectation, and satisfaction level.

Results: Of the 370 respondents, 58% were male with a mean age of 39.18 years. Most were Muslims (87.3%); 92.4% were literate, of whom 37% were graduate. The mean family size was 4.5, and the monthly income was Tk 6,860. Patients took appointment through message (55.4%) and by phone (34.3%). The mean waiting time in the outpatient department (OPD) was 3.4 minutes which appeared to be optimum to the respondents. Existing admission procedure, hospital visiting hour, OPD working hour, and hospital administration were comfortable to 93.5%, 78.6%, 71.6%, and 77.3% of the respondents respectively. The majority (50.5%) were getting hospital information through mass media compared to community doctors (17.3%). Among the discriminating determinants, hospital reputation had the highest positive skewness (2.7), followed by attachment of reputed physicians (5.4), quality of services (2.2), amenities (2.1), and the conspicuous hospital appearance (1.1). A corporate agreement had the highest negative skewness (-2.3), followed by health insurance (-2.2).

Conclusion: The study revealed that middle and upper classes of Bangladeshi people attended the corporate hospitals with an optimum level of satisfaction. Branded hospital with attachment of reputed physicians and the quality of services, including amenities, more frequently, drive the patients towards super-specialties corporate hospitals despite more treatment cost. These results may have an implication on policy-makers for overall improvement of healthcare facilities both in private and government sectors.

Teaching Primary Healthcare to Healthcare Managers: An Innovative Approach to Meet the Needs of the Healthcare System

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Background: Primary healthcare (PHC) is an effective strategy for reducing morbidity and mortality. However, health managers need to be re-oriented with PHC to enable them to manage their programmes more effectively. A training course organized earlier for Lady Health Visitors by the Department of Community Health Sciences, Aga Khan University, had shown encouraging results. As part of continuing education programme, the department organized a course on PHC and health systems development for healthcare managers.

Objective: Describe the experiences of organizing an innovative training course for health and development managers in primary healthcare and health systems development.

Methodology: Based on the needs identified by the participants, a 4-week training course was organized. There were 8 modules on topics relating to PHC, with goals, objectives, and specific sessions within each module, and related field-based exposure. The basic learning strategy of the programme was 'Students-centred' and 'Learning by Doing', with a participatory approach. The participants were assessed through a pre- and post-test; the scores were entered into the SPSS software (Windows 14 version) and analyzed using paired *t*-test. The participants assessed classroom and field sessions and the overall training course using a structured questionnaire.

Results: Twenty-four managers from Tajikistan, Afghanistan, and Pakistan participated in the course. A highly significant (p=0.005) improvement from pre- (mean=60; standard error [SE]=2.6) to post-test scores (mean=68; SE=2.6) was observed. Moreover, 21 participants improved their results in the post-test. The assessment of the course by the participants, on the scale of 1 to 5, rated the course and its different components from 'excellent' to 'outstanding'. All the participants rejoined their respective high-profile positions.

Conclusion: The course participants assessed the course very much to their liking. The CHS Department has been instrumental in capacity-building of healthcare systems of different regional countries by strengthening knowledge and skills of managers. Based on the participants' assessment and the improvement in their knowledge and skills due to the course, the department must continue such courses to meet the needs of the healthcare system. A long-term impact assessment should be carried out.

Searching Evidences for Health Systems from Low-income Setting: Experiences and Challenges

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Background: Policy-makers, programme managers, or implementers are increasingly looking for evidence-based information from low-income setting to facilitate the policy-making process, providing decision, or implementing programmes. Search strategies are used for identifying systematic reviews on the effectiveness of interventions. However, searching in Medline or other electronic databases is problematic and remains a challenge, particularly identifying evidence from low-income setting.

Objective: Describe the experiences and challenges in searching in Medline through PubMed interface and other databases for evidence from health systems research.

Methodology: Three search strategies were developed to identify evidence on 3 different aspects of health systems, i.e. social franchising (service-delivery), research areas in non-state sector (NSS), and economic evaluation of healthcare interventions (health finance) in Bangladesh. Combinations of key words, MeSH terms, and different methodology and population filters, including the Effective Practice and Organization of Care (EPOC) filter, were used.

Results: For social franchising, searches were made on 9 major databases, including Medline, and 14 minor databases supplemented by hand-searching, and personal communications were made but no published trial could be identified. For non-state-sector research areas and economic evaluation, Medline through PubMed and other subject-related databases were searched. Eighteen articles relating to NSS review as per the study criteria were found but the search could not include 8 major papers already known in the relevant field. For the economic evaluation, 19 published articles could be identified in the initial search in the context of Bangladesh. These results did not improve much when alternate population filters and methodology filters, such as shojania or montori, were used.

Conclusion: Searching Medline through PubMed does not always yield optimum results. Published articles sometimes are not properly indexed or appropriate MeSH terms are not allocated. Constraints to searching also include lack of access or less documentation from low-income setting. Strategies are needed to access more electronic databases and searching unpublished information.

10:30 am-11:30 am (Venue: Green View 1-First Floor)   051 (129)
Scientific Session 1: Diarrhoeal Disease

Spectrum of Antecedent Infections in Guillain-Barré Syndrome in Bangladesh: A Case-Control Study

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Background: Guillain-Barré syndrome (GBS) is an acute polyneuropathy and immune-mediated flaccid paralysis usually preceded by an infection. The GBS has received a lot of attention in developed countries but there is a paucity of reports on the GBS from the developing world, including Bangladesh.

Objective: Determine the spectrum of antecedent infections in GBS patients and investigate whether their infections are associated with specific anti-ganglioside antibodies and a distinct clinical presentation.

Methodology: A prospective matched case-control study, including 100 patients fulfilling the National Institute of Neurological Disorders and Stroke (NINDS) criteria for GBS, was performed. Enzyme-linked immunosorbent assay (ELISA) was used for detecting antibodies against Campylobacter, cytomegalovirus, Epstein-Barr virus, *Mycoplasma pneumoniae*, enterovirus, and *Haemophilus influenzae* and antibodies against GM1, and GD1a gangliosides.

Results: Symptoms of preceding infection were recorded in 69% of the patients, most frequently gastroenteritis (37%) and upper respiratory tract infection (19%). Most (92%) patients had a pure motor variant of GBS, usually without cranial nerve involvement (70%). 25% required mechanical ventilation. Electrophysiological studies showed that 67% had an axonal variant of GBS. After a 6-month follow-up, 43% had either died or were unable to walk independently. Serological evidence of recent *C. jejuni*-associated infection was found in 57% of the patients compared to 3% in the OND and 8% in the FC (p<0.001). No significant association with cytomegalovirus, Epstein-Barr virus, *M. pneumoniae*, enterovirus, and *H. influenzae* was observed. Serum anti-ganglioside antibodies were more frequent among the GBS patients (56%) compared to 1% and 6% in the control groups (p<0.001) and were significantly associated with *C. jejuni*-related infection (p<0.001). Preceding *C. jejuni* infection was significantly associated with acute axonal neuropathy, and greater disability after six months follow-up.

Conclusion: The study reports an unusually high frequency of an axonal form of GBS in Bangladesh associated with preceding *Campylobacter*-associated infections, serum antibodies against GD1a and GM1, slow recovery, and severe residual disability.

Role of Probiotics in Prevention of Acute Diarrhoeal Diseases in Children

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Background: Diarrhoeal diseases are one of the leading causes of deaths among children aged less than 5 years worldwide. One possible preventive option is the use of probiotics. A preventive role of probiotics has been suggested from results of different studies.

Objective: Examine the effect of daily intake of a probiotic, with 6.5 billion probiotic *Lactobacillus casei*—Shirota—in the prevention of diarrhoea in children aged 1-5 year(s) and their nutritional impact.

Methodology: It was a double-blind randomized controlled field trial involving approximately 4,000 children aged 1-5 year(s) in an urban slum of Kolkata, India. Children in the study group received probiotic drink, and the control group received a nutrient drink daily for 12 weeks. All the children were followed up daily for 24 weeks for identification of acute diarrhoea cases. Following census, a unique number was assigned to each child, and an identity card was provided. Five health outposts manned by doctors were set up for case management and follow-up. Baseline anthropometry was conducted thrice during the study period. The surveillance of diarrhoea was through regular household-visits. Stool samples were sent to the NICED laboratory, and children were referred to the nearest health outpost.

Results: Of 3,767 eligible children, 1,894 were allocated to the probiotic group and 1,864 to the nutrient group. The baseline characteristics of the 2 groups were comparable. The incidence of diarrhoea was low in the probiotic group compared to the nutrient group (p<0.05), and the proportion of children (33.7%) who suffered from diarrhoea was significantly lower (p<0.050) in the probiotic group than that in the nutrient group (37.8%). Anthropometric indicators—weight-for-age z-score and weight-for age-percent of median—showed no significant difference between the 2 groups.

Conclusion: Probiotics have shown to have a reasonable protective effect on diarrhoea in children. However, anthropometric data did not show any difference in the 2 groups.

Effects of Local Climate Variability on Disease Transmission Dynamics

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Background: Cholera is considered a model for climate-related infectious diseases. In Bangladesh, epidemics of cholera occur during the summer and winter seasons. However, it is not known how climate variability influences the seasonality of cholera.

Objective: Find out the effect of local climate variables on the seasonality of cholera in Matlab, Bangladesh.

Methodology: Classification and regression tree and principal component analysis were used for studying the dependency and variability patterns of total monthly cases of cholera. Meteorological data were collected from the Bangladesh Meteorological Department from 1989 to 2005. Data were collected on daily temperature, humidity, sunshine-hour, and rainfall from the Chandpur meteorological station. The monthly means were calculated from the daily records. Daily cholera case data from 1989 to 2005 were collected from the records of Matlab Hospital of ICDDR,B.

Results: An average temperature of <23.25 °C corresponded to the lowest average occurrence of cholera (23 cases/month). With the temperature of >23.25 °C and the sunshine of <4.13 hours per day, the occurrence of cholera was 39 cases per month. With the increased sunshine of >4.13 hours per day and the temperature of 23.25-28.66 °C, the second highest occurrence of cholera (44 cases per month) was observed. When the sunshine was >4.13 hours per day and the temperature was >28.66 °C, the highest occurrence of cholera (53 cases per month) was observed. These results demonstrated that, in the summer and winter seasons in Bangladesh, temperature and sunshine-hour compensate each other for the higher incidence of cholera.

Conclusion: The synergistic effect of temperature and sunshine-hour creates favourable condition for multiplication of phytoplankton and *Vibrio cholerae* in the aquatic environment, and the people contract cholera from the environment.

Molecular Characterization of *Campylobacter jejuni* from Patients with Guillain-Barré Syndrome in Bangladesh

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Background: *Campylobacter jejuni* has been identified as the predominant cause of antecedent infections in Guillain-Barré syndrome (GBS). The risk of developing the GBS may be higher after infection with specific *C. jejuni* types.

Objective: Investigate the genetic variation among *C. jejuni* strains using serotyping and different genotyping methods.

Methodology: Ten *C. jejuni* strains were isolated from stools of 10 GBS patients. Forty *C. jejuni* strains from patients with enteritis only were selected for comparison. All strains were analyzed by HS serotyping (Penner), lipo-oligosaccharides (LOS) typing, restriction fragment length polymorphism analysis (RFLP) of PCR products of the *fla*A gene, amplified fragment length polymorphism analysis (AFLP), multilocus sequence typing (MLST), and pulsed-field gel electrophoresis (PFGE).

Results: Serotyping of the 10 GBS-related strains revealed 4 different HS serotypes. *C. jejuni* HS:23 was found in 50% of the strains. The serotype HS:19 was found in 2 (20%), and *C. jejuni* O:55 and *C. jejuni* O:21 were both found once. Of 32 strains from patients with enteritis without neurological disorder, 8 (26%) were HS:23. The class A/B loss locus was over-represented (9/10) in the GBS-associated strains compared to the control strains (p<0.001). The MLST profiles demonstrated that the 10 GBS-related isolates were genetically diverse, with 7 different sequence types (STs). However, 4 isolates had a new ST-3219 of existing alleles in a previously-unrecorded combination. The new ST-3219 was also common (25%) among enteritis strains. *C. jejuni* HS:23 GBS strains showed highly-related AFLP fingerprints. Cluster analysis showed no separate clustering of GBS-related strains. In this study, except LOS typing, GBS-related enteritis strains could not be separated from non-GBS-related strains using other typing methods.

Conclusion: The findings suggest an association of a clonal serotype HS:23 and a new ST 3219 frequently isolated in GBS patients. *C. jejuni* strains of A/B loss class predominate in GBS patients. The source and transmission route of these GBS-related strains have yet to be determined.

11:45 am-12:45 pm (Venue: Windy Town-First Floor)   055 (016)
Scientific Session 2: Medical Products and Technologies

Visual Inspection Aided with Acetic Acid: A Feasible Approach for Cervical Cancer Screening in Bangladesh

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Background: In Bangladesh, cervical cancer is the most common cause of deaths among women. Results of studies in resource-poor countries showed that the visual inspection aided with acetic acid (VIA) can be a low-cost and easy-to-learn screening system for making cervical cancer-prevention programmes universally accessible. To date, there has been no population-based research on screening of cervical cancer in Bangladesh.

Objective: Evaluate the strength and appropriateness of VIA as a method for screening cervical cancer in Bangladesh.

Methodology: A population-based study was conducted among 3,290 women in rural and urban locations in Bangladesh to compare VIA and Pap smear, with colposcopy and biopsy as the gold standard. Positive for VIA was the finding of at least one lesion: aceto-white lesion, white plaques, ulcer, and cauliflower-like growth in cervix. Positive for Pap smear was the finding of low-grade squamous intraepithelial lesion (LGIL) or more. The outcome measures to compare the procedures were the ratio of sensitivities, specifi-cities, and positive predictive values between the tests conducted by paramedics who received 5-day training on VIA.

Results: Sensitivity and specificity of VIA in detecting at least LGIL appeared in the study as 69% (95% confidence interval [CI] 59-76) and 61% (95% CI 57- 65) respectively. For high-grade SIL, sensitivity was 79% (95% CI 63-90), and specificity was 57.4% (95% CI 53-61). Pap smears were more specific (98%) but not sensitive (2%). The inter-observer variations of sensitivity and specificity of VIA ranged from 58.3% to 78.6% for sensitivity and from 53.8% to 71.4% for specificity.

Conclusion: Bangladesh has a well-established but under-used network of family welfare visitors (paramedics) at the grassroots level. A simple training of these paramedics will suffice to implement a screening programme.

Using Information Technology to Strengthen Physical Assets Management in Health

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Background: With difficult terrain, poor communication network, and limited resources, Nepal faces enormous challenges in maintaining the infrastructure and supplies required for quality health services. Poor planning has resulted in wastage due to lack of preventative maintenance, inappropriate allocation of equipment, and unpredictable supplies.

Objective: Establish an information system to enable efficient planning and management of construction, maintenance, and supplies for maternal health services.

Methodology: Establishment of an electronic database containing details of all health infrastructures across the country, including photographs and technical drawings, and a web-based Logistics Management Information System (LMIS), with equipment inventory, list of essential drugs, and records of drugs were ordered and supplied.

Results: The infrastructure database was used for developing a planned maintenance strategy, resulting in improved annual and long-term planning of building and maintenance, based on rigorously-identified priorities and linked to standard prototypes, scientifically designed for different levels of health facility and geographical area. The electronic LMIS enables efficient procurement of supplies to ensure health facilities to receive what they need to provide services. It supports transparency, enabling managers and auditors to track supply and use trends as indicators of local practices in service-provision.

Conclusion: Electronic systems promote equitable access to services by overcoming some communication limitations of remote areas. They provide a sound information base for scientific trend studies and research to support evidence-based planning and decision-making. The transparency promoted has encouraged other donors to invest in health. Although initiated through the safe motherhood sub-sector programme, this initiative has benefited the whole health sector.

Inventory-control System, Health-sector Strategic Plan, and Availability of Essential Medicines in Gulu and Amuru Districts in Uganda

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Background: Medicines play a pivotal role in the management of any disease and should, therefore, constantly be available in any health facility. The Ministry of Health of Uganda drew a strategic plan (the Health Sector Strategic Plan-HSSP) under which an inventory-control system (ICS) was to operate to ensure the availability of medicines. Despite this, the availability of essential medicines has been erratic, which is, hence, a concern to the Ministry.

Objective: Determine the level of implementation of the ICS under the HSSP and its influence on the availability of medicines in public-health facilities in Gulu and Amuru districts in northern Uganda.

Methodology: This descriptive and cross-sectional study incorporated both qualitative and quantitative research methods. While respondents were drawn from the district personnel concerned with the management of medicines, health workers, local leaders, and randomly-selected patients, the public-health facilities included hospitals and the various grades of the health centres. The HSSP indicator medicines were used for representing the essential medicines. Stratified random sampling and purposive selection were employed in selecting both respondents and health facilities. Data were collected using a questionnaire, through interviews, observation techniques, and document review before carrying out correlation and chi-square analyses using the SPSS software (version 12).

Results: The level of implementation of the ICS of HSSP was still low, especially in areas of documentation, quantification, and storage of medicines. Medicines had ever expired at their facilities. There were delayed deliveries from the suppliers and district stores, stock-outs at the supplier level, and inadequate support supervision of the drug-management system. Also, there was a very strong association between the implementation of the ICS and the availability of essential medicines, which was significant at 99% confidence level (r=0.316, p<0.01). In both the districts, support supervision was irregular.

Conclusion: The problem of unavailability of medicines in the public-health facilities occurred as a result of multiple factors, such as under-staffing, under-funding, logistics issues, and lack of adherence to, or a poorly-implemented ICS.

Long-term Effects of Tetanus and Measles Vaccination in Bangladesh

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Background: Previous analyses of the benefits of vaccines typically evaluated only the short-term effects on child mortality. It has been proposed that vaccination of children also reduces their morbidity, and aids their physical and cognitive development, resulting in the long-term improvements in educational outcomes, and eventally adult productivity.

Objective: Examine the effect of maternal tetanus and childhood measles vaccination on children's long-term cognitive development and educational attainment.

Methodology: Data on deaths, migration, and educational attainment were used from the Matlab Health and Demographic Surveillance System and cognitive test scores from the 1996 Matlab Health and Socioeconomic Survey, to examine the long-term effects of vaccination. The mortality and educational outcomes of 12,048 children born between 1975 and 1979 whose mothers participated in a randomized trial of a tetanus toxoid in 1974 were followed up, with an intention to treat approach to estimate the effects of the tetanus toxoid on children, both alone, and adjusting for parental covariates. The research team followed up 63,910 children born between 1980 and 1988 who where exposed to measles vaccination which was rolled out in some areas in 1983 and expanded to cover other areas in 1985, examining educational outcomes and cognitive test-scores (for a small number of children). The investigation distinguished between the effects of age-appropriate measles vaccination (at 9-12 months) from non-age-appropriate (from 1-5 years of age) by instrumenting vaccination status by time of exposure to the measles roll-out and adjust our results for parental covariates, and the introduction of other health programmes in Matlab during this period. We allowed for correlated sibling-outcomes in all our analyses.

Results: The findings confirmed previous results of the significant effect of maternal tetanus vaccination on neonatal mortality (47.5 for the treatment group, 75.0 for the control group, per 1000 births, $p<10^{-6}$) but showed no significant effect on mortality in children after 28 days. We found that, for parents with no education (about half the sample), the probability that a child completes junior high school (8 years of education) was 0.038 higher (p=0.0002), and the probability of no-schooling was correspondingly lower, if the mother received the tetanus toxoid. We found that age-appropriate measles vaccination raised the probability of any schooling by 0.143 (p=0.004) and raised average cognitive test scores by 1.4 standard deviations (p=0.047) with smaller effects if vaccination was delayed to 1 year of age. While improved educational outcomes tended to be associated with out-migration from the area, we found that vaccinated children were more likely not to leave.

Conclusion: Vaccination of mothers to prevent neonatal tetanus appeared to affect the schooling outcomes of a small number of children from households of low socioeconomic status. Age-appropriate measles vaccination appeared to have more widespread effects on educational outcomes. The results suggest potentially large economic payoffs to vaccination since schooling and high cognitive test-scores are usually associated with higher incomes.

11:45 am-12:45 pm (Venue: Media Bazar-Ground Floor)   059 (084)
Scientific Session 2: Service Delivery

Changes in Access to and Use of Health Services by the Poor in Uganda: Are Reforms Benefitting the Poor?

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Background: Uganda has implemented a series of health-sector reforms to make health services more accessible to the entire population. An empirical assessment of the likely impact of these reforms is important for informing policy decision-making.

Objective: Describe the changes in the use of health services and their determinants that have occurred among the poor and those in rural areas during 2002/2003–2005/2006.

Methodology: Secondary data on the socio-economic component of the Uganda National Household Surveys 2002/2003 and 2005/2006 were analyzed using univariate, bivariate and multivariate techniques. The poor were identified from the wealth quintiles constructed using an asset-based index derived from principal component analysis. The probability of choice of healthcare provider was assessed using multi-level statistical models.

Results: The odds of not seeking care in 2005/2006 was 1.7 times higher than in 2002/2003 [odds ratio (OR)=1.7, 95% confidence intervals (CI) 1.65-1.94)]. Unlike the most poor, the rural population experienced a 44% reduction in the risk of not seeking care because of poor geographical access (OR=0.56, CI 0.47-0.67). On the other hand, the risk of not seeking care as a result of high costs did not change significantly. Private for-profit facilities were the major providers of services in 2002/2003 and 2005/2006; however, when the choice of use in 2005/2006 was compared with 2002/2003, both rural and poor people were more likely to use private not-for-profit (PNFP) and public services compared to private services. Those who belonged to the better-off quintiles were less likely to use government services compared to private services.

Conclusion: The odds of not seeking care have increased, and cost and distance are still important barriers to seeking health services for the poor and rural residents. Although the private sector is still the major provider of services, the overall use of public and PNFP services by rural and poor populations has increased. Rather than simply continuing general subsidies, the policy-makers should consider targeting subsidies to the poor and rural populations. Public-private partnerships should be broadened to increase access to quality health services among the vulnerable.

Experience in Managing Severe Malnutrition in a Government Tertiary Treatment Facility in Bangladesh

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Background: Despite the huge burden of malnutrition, there is a lack of facilities for the management of acutely-ill severely-malnourished children, even in the medical college hospitals in Bangladesh.

Objective: Provide evidence-based results for policy-makers that management of children with severe-acute malnutrition (SAM) with complications is feasible and effective using a protocolized treatment in medical college hospitals in Bangladesh.

Methodology: Children with SAM, defined as weight-for-height <70% of the reference median or bilateral pedal oedema having complications, were managed in the Nutrition Unit (NU) of the Chittagong Medical College Hospital (CMCH) using the guidelines of the World Health Organization. In total, 171 under-5 children were admitted during June 2005–May 2006. The exit criteria from the NU were set as folows: (a) an absolute weight gain of ≥500g and ≥700 g for children aged less than 2 years and 2-5 years respectively; and for children admitted with oedema, complete loss of oedema, and weight-for-height >70% of the reference median and (b) the mother/caretaker has received specific training on appropriate feeding and was motivated to follow the advice given.

Results: Mean±SD age of the children was 23.5±15.3 months, and 84.2% belonged to households with a monthly income of <US$ 40. The main reason for bringing children by their families to the hospital was associated major illnesses: bronchopneumonia (33%), oedema (24%), diarrhoea (11%), pulmonary tuberculosis (9%), or other conditions. Parents of 7.6% of the children insisted for discharging their children early due to other urgent commitments while 11.7% simply left against medical advice. Of the 138 remaining children, 88% successfully graduated from the NU with a mean weight gain of 10.6 g/kg/day (non-oedematous children) and loss of 1.9 g/kg/day (oedematous children); 86% graduated in <3 weeks, and the case-fatality rate was 10.8%. The NU also functions as a training centre, and 82 medical students, 103 interns, and 12 nurses received hands-on training on management of severe malnutrition. The average cost of overall treatment was US$ 14.6 per child or approximately US$ 1 per child-day (excluding staff cost). Food and medicines accounted for 42% and 58% of the total cost respectively.

Conclusion: The study demonstrated the potential of addressing SAM (with complications) effectively with minimum incremental expenditure in Bangladesh. This public-private approach should be used for treating SAM in all healthcare facilities and the treatment protocol included in the medical and nursing curricula.

An Exploration of Emergency Obstetric Care Services of BRAC in Rural Bangladesh

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Background: The rural maternal, neonatal and child health (MNCH) initiative of BRAC began as a pilot in Nilphamari district in August 2005, a poverty-stricken, deprived district in northern part of Bangladesh. Facility-based studies have mostly been conducted. This study explored to what extent BRAC's emergency obstetric care EmOC intervention meets the community need during pregnancy-related complications both at community and facility levels and see the referral network.

Objective: Explore EmOC activities of BRAC implemented in the rural MNCH programme in Nilphamari district by making referral linkage with government health facilities.

Methodology: A community and facility-based study was carried out during April-September 2007 in 3 upazilas of Nilphamari district using qualitative methods. Twelve complicated pregnancies from *Sasthya Kormi*'s (health worker's) register and 30 obstetric referred cases from the office register were identified. Forty-two in-depth interviews with women, 25 informal discussions with healthcare providers, one focus-group discussion for family members, and 11 cases were studied. Analysis was completed thematically.

Results: The majority (n=31) of women and husbands (n=5) were aware of 5 life-threatening warning signs and emergency preparedness; however, the family members were not aware. The respondents were unprepared for obstetric emergency because of poverty, illiteracy, and their carelessness. The updated BRAC health centre provides comprehensive EmOC, and in Domar and Dimla, referral linkages have been developed with upazila health complex, district hospital, private clinics, and Rangpur medical college hospital. Barriers to accessing EmOC service and delays at the primary and secondary facility levels were due to insufficient doctors and other staff, lack of facilities, ill behaviour of staff, and financial burden; the approximate expense ranged from Tk 1,000 to Tk 30,000. The community healthcare providers had good knowledge about danger signs but still had gaps in judgement of fatal condition and effective referral. Deaths occurred due to ineffective or delayed referral. A substantial proportion of women was assisted by untrained birth attendants, and most commonly-referred cases had prolonged labour, followed by eclampsia, haemorrhage, retained placenta, and abortion-related complications. Early referral and management was only possible in presence of BRAC health workers by arranging transport, blood-donor, and required money.

Conclusion: The study provides more insights into the existing EmOC facilities in Nilphamari district established by BRAC to reduce maternal deaths. The programme needs to focus its efforts on bridging the identified gaps and raise community awareness.

Mass Bangladeshi Labour Migrants: Bringing This Vulnerable Section under Health Systems

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Background: Bangladesh is one of the major labour-sending countries of the world. In 2007, 900,000 semi-skilled/unskilled Bangladeshi labourers left the country to work abroad. The economy of Bangladesh is largely dependent on remittances sent by this group of population. Despite their significant contribution to the economy, there is no effective policy guideline to protect their well-being and, thus, their health status.

Objective: Identify and document health problems of mass Bangladeshi labour migrants so that they can be brought under the health systems and also suggest for a healthcare-financing scheme for the migrants.

Methodology: This cross-sectional study was conducted in 2007 in Mirsarai, a rural migration-prone area of Bangladesh. Two hundred migrant and 200 potential migrant labourers were included in the sample. Data were collected through one-on-one interviews using structured, validated questionnaire and semi-structured questionnaire. Physical and psychological health of the respondents were assessed using modules named 'SF-36' and 'Zung Depression Scale'. The standardized tools of the World Health Organization were used for assessing injuries and violence in workplaces. A set of standardized questions was asked to understand sexual behaviours, sexual perceptions, and knowledge about HIV. A set of questions on healthcare accessibility, healthcare cost, and health insurance was asked. Ethical approval for the study was obtained from the Ethical Review Committee of ICDDR,B prior to its implementation.

Results: The findings indicated that the migrants had worse physical and mental health status compared to potential migrants. 60% of the migrants experienced injuries in the workplaces while they were abroad; 34% of the migrants had physical disability. Their employers bore treatment cost of 10%. Only 6% were covered with health insurance schemes or given medical allowances.

Conclusion: According to the study findings, workplace safety, treatment cost, and compensation benefits are the 3 areas that need to be considered seriously. At the end, the study designs a guideline and a healthcare financing scheme for the migrants. The study recommends an innovative approach of using government welfare fund to design a healthcare scheme for the migrants. This would also enable to bring the migrants under a prescribed system.

11:45 am-12:45 pm (Venue: Green View 1-First Floor)   063 (177)
Scientific Session 2: Environment and Water

Pseudomonas aeruginosa in Bottled Drinking-water: Potential Health Hazard

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Background: *Pseudomonas aeruginosa* is the most studied human pathogen in the genus *Pseudomonas* with respect to their types of infection, morbidity, and mortality. Drinking water, especially bottled-water, must be devoid of *P. aeruginosa* according to the European and North American standard. Drinking- water contaminated with *P. aeruginosa* might develop severe infections in immunocompromised patients.

Objective: Examine the occurrence of *P. aeruginosa* in bottled drinkning-water.

Methodology: The microbiological quality of 238 bottled mineral water samples, purchased from local market of different manufacturing companies in Bangladesh, were investigated during July 2007–June 2008. The water samples (100 mL) were analyzed for the presence and enumeration of total coliforms (TC), faecal coliforms (FC), and *P. aeruginosa* using the membrane filter technique. Following the standard procedure, aerobic bacteria were also counted using nutrient agar and expressed as heterotrophic plate count (HPC) per mL of water. Suspected *Pseudomonas* isolates were identified as *P. aeruginosa* by biochemical tests and species-specific PCR. The isolates were then subjected to antibiogram, and genetic diversity was analyzed by ribotyping.

Results: *P. aeruginosa* was detected in 59 (25%) of 238 samples tested. Among the *P. aeruginosa*-positive samples, approximately 50% were contaminated with TC and FC. HPC were found in all the samples; however, 80% had >500 cfu per mL (maximum 105 cfu/mL). All the isolates were resistant to 9 of 15 commonly-employed antibiotics, such as tetracycline, cephalothin, ampicillin, furazolidone, penicillin-G, chloramphenicol, erythromycin, salphamethoxazole, and mecillinam but sensitive to cefotaxime, ciprofloxacin, ceftriaxone, polymyxin B, amikacin, and gentamicin with a few exceptions. Six types of clonal variation were observed among the isolates, of which 2 were more abundant.

Conclusion: Drinking of contaminated bottled-water, especially by the immunocompromised patients, may result in fatal infection by *P. aeruginosa*. The results showed that bottled mineral water could harbour *P. aeruginosa*. Therefore, manufacturers should be more cautious about the contamination of bottled-water with this notorious organism.

Evaluation of Chemical and Microbiological Qualities of Raw and Treated Wastewater in Dhaka, Bangladesh

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Background: Dhaka, the capital city of Bangladesh, is one of the mega cities in the world, with 11.3 million people living in 227.8 sq km area. The Pagla wastewater-treatment plant collects a large amount of wastewater of Dhaka city and discharge in the river Buriganga after treatment. This treatment plant is under the direct control of the Water and Sewerage Authority (WASA) of Dhaka. WASA collects water from nearby sites in Buriganga and, after treatment, supplies to consumers.

Objective: Evaluate the treatment strategy in a series of waste-stabilization ponds and monitor the quality and reduction of pollution before discharge to the river Buriganga.

Methodology: Water samples were collected once a month during January-December 2006. Chemical parameters, such as pH, electric conductivity (EC), total dissolved solids (TDS), salinity, nitrite-nitrogen (NO_2-N), nitrate-nitrogen (NO_3-N), total hardness (HT), chloride (Cl^-), total alkalinity, calcium (Ca), iron (Fe), phosphate (PO_4), sulphate (SO_4), biochemical oxygen demand (BOD), and chemical oxygen demand (COD), were measured using standard procedures. Microbiological qualities of the water samples, in terms of total coliform (TC), faecal coliform (FC), and total bacterial count (TBC), were assessed following standard procedures.

Results: All the chemical parameters of raw wastewater were beyond the acceptable limit according to the Bangladesh standard. After the final treatment, the parameters, such as pH, EC, TDS, salinity, HT, Cl^-, total alkalinity, Ca, Fe, PO_4, SO_4, BOD, and COD, were reduced to the acceptable limit but NO_2-N and NO_3-N were above the limit. A reduction of microbial counts up to 5 log was also achieved.

Conclusion: Further steps should be taken for better treatment of wastewater before discharging to the river Buriganga.

Quality Control and Validation of Method for Analysis of Melamine by Ion-pair Liquid Chromatography: Application to Milk Powder and Milk Products

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Background: Recent episodes of widespread contamination of infant formula with melamine (MM) have been linked to death of at least 3 infants and illness of about 60,000 more in China. Melamine-tainted pet food also killed thousands of cats and dogs in the USA in 2007. The cause of these deaths has been attributed to the formation of MM-cyanurate insoluble yellow crystals that can damage kidneys, destroy renal function, and even can lead to death. Traces of MM in infant formulae and milk products have now been detected in some other Asian countries, including Bangladesh, and also now in the USA. So, to ensure that protein-based foods and feeds are not tainted with MM and cyanuric acid (CA), two nitrogen-rich compounds, to increase their fake protein value, it has become necessary to develop analytical methods for rapid and accurate analysis of MM and CA in milk, milk products, and animal feeds.

Objective: Implement an ion-pair liquid chromatographic method with photodiode array detection (HPLC-PDA) for MM quantification in milk powder and milk chocolates after following the internal and external quality-control protocols, method-validation procedures, and good measurement practices (GMPs).

Methodology: The guidelines provided in the US FDA–FCC (Forensic Chemistry Center) method updated in April 2007 (HPLC-UV) have been considered in this developmental study. The analytical procedure consisted of extraction of MM with acetonitrile+0.1 M HCl (50:50), centrifugation (>5000 rpm), filtration with 0.45 micron nylon disc filter, and 2x dilution of the extract with 0.1M HCl to make the analyte extract, from a sample size of 2.0 g + 0.5 g of trichloroacetic acid. Luna C 8 (2), 5 micron (Phenomenex), and RP-C 18, 5 micron (Mightysil and Phenomenex) columns were used for separation of MM. The buffer was 10 mM citric acid and 10 mM sodium octane sulphonate, adjusted to pH 3.0, and the mobile phase was buffer + acetonitrile (91: 9). The analytical system used in the study is a Prominence Automated Binary Gradient HPLC, supported with LC solution software (version 1.12) and SPD-M20A PDA detector (Shimadzu Corporation, Japan).

Results: Two concentration calibration procedures were used: (a) direct method with pure MM compound (BDH) for identification of MM and (b) standard addition method for matrix effect correction and quantification in the linear range of concentration (0.500-2.00 mg/kg). Recovery was studied by spiking a laboratory quality-control sample with standard MM, and it varied from 79% to 102%. Triplicate injections were performed with autoinjector to measure repeatability of separation and peak area measurements, with % RSD of 0.04 in RT and 2.65 in peak area. Reproducibility of duplicate measurements agreed within 0.2-8% at different concentrations. The detection limit of the method at 0.5 mg/L of MM standard (solid) is 1.5 mg/kg. and its quantification limit is 4xLOD=6.00 mg/kg.

Conclusion: An ion-pair HPLC- PDA method was applied to analyze different milk-powder and milk-chocolate samples for MM. The results confirm that this method is rapid and reliable to analyze MM in protein sample matrix at trace concentrations down to 6.00 mg/kg, with relative standard error of ±8%. The performance of the method was further evaluated by analyzing 3 infant formula milk samples in 2 ISO-accredited independent laboratories, and the results of 2 sets of analyses agreed within ±8%. The main sources of errors and limits of the method for quantification of MM in infant formula milk are discussed.

Arsenic Crisis in Drinking-water: Focusing People's Voice of a Rural Community of Bangaldesh

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Background: Safe drinking-water is one of the priority health needs for better health. Currently, the tubewells set for providing safe drinking-water in the villages of Matlab and some other parts in Bangladesh were found to be releasing arsenic—a highly carcenogenic toxic agent which is affecting the health of millions of people of Bangladesh. According to the British Geological Survey, Matlab is located in the area to have high concentration of arsenic. The study of arsenic in Matlab began in 2001 to explore arsenic contamination in tubewell water and study its health consequences.

Objective: Explore the views and opinions of people in a rural community of Matlab, Bangladesh, towards arsenic contamination in drinking-water, idea on impact of arsenic on health, and attitude of the villagers towards mitigation options for supplying safe drinking-water in the community.

Methodology: The study was conducted in Matlab, a field site of ICDDR,B, and data for ethnographic study were collected from January to July 2004. Focus-group discussions, in-depth interviews, and key-informants interviews were conducted for collection of data. Respondents were from the population aged over 5 years. They all were examined/were screened for arsenic-related skin lesions. History on drinking-water was collected. All functioning tubewells were tested for arsenic contamination. A mitigation programme was implemented, in collaboration with BRAC, to provide safe drinking-water in the community.

Results: The findings suggested that the choice of drinking-water depended on taste and smell, easy accessibility and availability throughout the year. Lack of awareness about arsenic contamination and its effect on health, adequate information on alternative options, and financial affordability were the major factors for unwillingness to turn to alternative sources for safe drinking-water. Lack of adequate information on mitigation options from the arsenic awareness and provision of safe water and people's own perceptions about drinking-water were the main reasons for not accepting alternative safe water options.

Conclusion: More in-depth studies are needed to focus on sociocultural factors of the community and world-view of the local people before implementing any programme for solution to the problem.

01:45 pm-02:30 pm (Venue: Windy Town-First Floor)   067 (000)
Plenary for Leadership and Governance

Speaker : Dr. David Peters, Associate Professor and Deputy Director for Academic Programmes, Bloomberg School of Public Health, Johns Hopkins University, Baltimore, MD, USA

The Alma Ata Declaration and Primary Healthcare System in Bangladesh: Challenges and Opportunities

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Background: Following the Alma Ata Declaration (1978), many developing countries, including Bangladesh, adopted a comprehensive community-based/community-owned primary healthcare (PHC) system as the fundamental building block of their health systems. Declaring health as a 'basic right', the post-independence Government of Bangladesh made explicit pledge to introduce a decentralized comprehensive PHC system throughout the country. Successive governments reiterated the pledge. It is argued that, despite such repeated commitments, Bangladesh largely failed to translate the Alma Ata principles in its PHC system.

Objective: Critically review and assess the nature and overall guiding principles of the PHC system in Bangladesh to identify and better understand the discrepancy between the system and the Alma Ata declaration.

Methodology: The study was based on a critical analysis of secondary data on the historical evolution of the PHC system in Bangladesh; semi-structured interviews were conducted with a selected number of upazila health and family planning officers (UHFPOs) drawn from around the country. In total, 28 UHFPOs were interviewed who were participating in a capacity-development training programme on healthcare financing organized by James P. Grant School of Public Health around early 2008.

Results: The PHC system evolved through 2 distinct phases. During the 1980s, under a military regime, PHC was decentralized at the upazila (sub-district) level, and the elected local government enjoyed considerable leverage in setting the overall direction of PHC. However, heavy dependence on external funding kept the system donor-driven. Instead of providing comprehensive PHC services, the system primarily focused on child health, especially growth monitoring, oral rehydration, breastfeeding, and immunization or GOBI. During the 1990s, with the emergence of democratic government, the PHC system shifted its focus to maternal and child health following the Millennium Development Goals. Safe motherhood received greater attention as a stubbornly-high maternal mortality ratio that continued to haunt Bangladesh. Beds for safe delivery (and other minor curative care) were introduced in all upazila health complexes and, in some cases, emergency obstetric care was also made available. Unfortunately, with the advent of the democratic government, decentralization increasingly turned into deconcentration, the local governments were made largely ineffective and, consequently, meaningful community participation remained a myth.

Conclusion: The PHC system in Bangladesh is neither comprehensive nor community-owned. The spirit of the Alma Ata Declaration is yet to be realized.

Local Health Watch: A tool to Make the Health System Accountable to People

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Background: The services provided by the public healthcare system in Bangladesh are inadequate in terms of availability and quality. The reasons for this include poor governance and lack of accountability to the people. There were indications that accountability of the healthcare system can be improved by application of participatory research techniques which, in turn, can improve the quality of healthcare.

Objective: Develop a tool to mobilize the community and empower community members to monitor the performance and use of the healthcare system and involve community leaders and government officials in the process.

Methodology: An empowerment tool was developed to mobilize and organize the community in 3 stages. Stage one involved building a rapport with the community, needs assessment, and identification of solutions to existing health problems and weaknesses in healthcare. Stage two involved development of a monitoring plan and its implementation by the community. Stage three involved analysis (by the community) of data collected by community-monitoring teams and dissemination of results to the community members and the local leadership. The dissemination sessions were designed not only to distribute information but also receive feedback from the community and discuss solutions. Stage two and three formed the crux of the health watch activities and were repeated in 4-month cycles. Records of health facilities were analyzed to determine changes in the performance of the healthcare system.

Results: The working days of the key staff members in the family welfare centre in the study union increased by 56% during the year compared to a 12% increase in the comparison union. A successful dialogue with the local-level government officials and the community was developed during this process. Elected officials played a leadership role in the monitoring process and helped influence changes in the performance of staff in health facilities.

Conclusion: A local health watch tool can empower communities through increasing people's awareness, capacity, and understanding of a mechanism of accountability and through the community working in collaboration with leaders and elected officials. The healthcare providers are quite receptive to the new role of the community and act accordingly to improve the situation.

Contribution of Public, Private and NGO Sectors in Reducing Social Exclusion and Impacting Health Equity in Bangladesh

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Background: The concept of social exclusion, developed in France and applied widely in the European Union, has been in use in Bangladesh in recent years, mostly by international development agencies. Does this discourse of deprivation, developed in the welfare states of northern Europe, have salience in its application to countries like Bangladesh where, for example, 31% of the rural population lives in chronic poverty? The concept of social exclusion has 3 principal components: (a) a dynamic and relational perspective which requires the identification of who or what causes exclusion; (b) an explicit recognition of multiple dimensions of deprivation; and (c) a longitudinal perspective, recognizing that individuals and groups are dynamic intra- and inter-generationally. The Social Exclusion Knowledge Network expanded the concept to include health status as a contributor to and an outcome of exclusion and to show that actors beyond the state or public sector can critically impact exclusionary processes.

Objective: Explore the relevance of the modified model of social exclusion to the Bangladesh context and document impact of policies and actions of the public, private, and NGO sectors on social exclusion and health.

Methodology: Appraisals of policies and actions that are meant to or have the potential to promote social cohesion and, thus, impact health equity were conducted. Policies and actions of the public, NGO and private sectors were purposively selected. Where possible, impact on health outcome was also looked at.

Results: Three key findings emerged. First, the case studies supported that a number of actors, including the state, civil society, the NGO sector, the private sector, and international agencies, can impact the processes that contribute to social exclusion. Second, while financial poverty is an important contributor to social exclusion in Bangladesh, cultural, political and social exclusion also impacted development of peoples' capabilities and their access to society's resources. Third, there was a dearth of data on exclusion, exclusionary processes, and the links between exclusionary processes and health inequities; this needs to be rectified.

Conclusion: While there are negative associations between social exclusion and health status, much stronger documentation is needed of the relationship. Including multiple sectors as having potential to impact exclusionary processes is fundamental to the application of the social exclusion model in Bangladesh.

Effect of Social Franchising on Access to and Quality of Health Services in Low- and Middle-income Countries: A Systematic Review

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Background: Social franchising has been developed as a possible means of improving provision of health services through engaging the non-state sector in low- and middle-income countries.

Objective: Examine the evidence of social franchising on access to and quality of health services in low- and middle-income countries.

Methodology: Searched were the Cochrane Effective Practice and Organisation of Care (EPOC) Group Specialised Register (up to October 2007), Cochrane Central Register of Controlled Trials (The Cochrane Library 2007, Issue 3), MEDLINE, Ovid (1950 to September Week 3, 2007), EMBASE, Ovid (1980 to 2007 Week 38), CINAHL, Ovid (1982 to September Week 3, 2007), EconLit, WebSPIRS (1969 to September 2007), LILACS, Science Citation Index Expanded and Social Sciences Citation Index (1975-March 2008), Sociological Abstracts, CSA Illumnia (1952-September 2007), WHOLIS (1948-November 2007). An extensive search of the fugitive literature was conducted through the sites of agencies and consulting firms who work in social franchising and health-service delivery in low- and middle-income countries. The selcection criteria included: randomized controlled trials, non-randomized controlled trials, controlled before and after studies and interrupted time series comparing social franchising models with other models of health service-delivery, other social franchising models or absence of health services. The criteria for inclusion and exclusion of studies were applied independently by 2 reviewers who scanned titles and abstracts. Full reports of selected citations were gathered and screened independently by 2 reviewers. At each stage, results were compared, and discrepancies were settled through discussion.

Results: No studies were found which were eligible for inclusion in this review.

Conclusion: There is a need to develop rigorous studies to evaluate the effects of social franchising on access to and quality of health services in low- and middle-income countries. Such studies should be informed by the wider literature to identify models of social franchising that have a sound theoretical basis and empirical research addressing their reach, acceptability, feasibility, maintenance, and measurability.

Capacity-building in Bangladesh Health Services: Building Social Capital to Improve Collaboration

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Background: Many proven, cost-effective health interventions, especially for women and children, are not adequately accessible to the poor and the marginalized. Consensus has grown implicating weak health systems as being unable to deliver or administer those interventions. To strengthen those systems through the community and institutional capacity-building involves increased collaborative capacity to better share responsibility through joint work. By seeking some clarity from the plurality of definitions and frameworks, contributions can be made to developing a social capital approach to capacity-building.

Objective: Examine differing perceptions of expected outcomes of a community-managed healthcare capacity-building exercise between government and non-government staff to promote clarity of outcomes for systems changes.

Methodology: A literature review explored 'collaborative capacity' from capacity-building and social capital perspectives to develop a conceptual framework. Next, a case study of a technical assistance intervention where NGO staff worked with government doctors to develop training and supervision capacity is presented. Textual data from documents relating to the technical assistance and participant-observations were categorized into practices, perceptions, and observed behaviours relating to the framework.

Results: Matrices were developed using framework analysis, following Potter and Brough's hierarchy of capacity-building as the conceptual framework. A narrative (in rough timeline format) was used for highlighting goals of an NGO focus on less tangible relational elements of capacity-building while the government doctors focused more on improvement of technical skills. A 'reversal' from technical or material emphasis to people-oriented relational goals is proposed to promote planning and evaluation in collaborative capacity development.

Conclusion: Building social capital as defined in relational terms is an approach to developing less tangible health service capacities. However, this will be a challenge when relationships in health services are often strongly affected by status consciousness. Participatory, action learning methods may be more appropriate for the task.

Public-Civil Mix Model to Replicate for Effective Service-delivery and Make Health System Receptive to People's Need

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Background: Controlling tuberculosis (TB) in India is a tremendous challenge. Every year, 1.8 million persons develop the disease. More than 1,000 deaths occur due to TB every day. Under Scheme 5 of the Revised National Tuberculosis Control Programme, the Government enters into partnership with credible organizations to implement the TB-control programme in an assigned area, designated as Tuberculosis Unit area. Each Tuberculosis Unit covers a population of about 500,000 and has 5 Designated Microscopic Centres (1 DMC in a population of 100,000). LEPRA Society is entrusted with a few such Tuberculosis Units. One such Tuberculosis Unit is Singhia in Samastipur district of Bihar. LEPRA Society was entrusted with the responsibility of running the Tuberculosis Unit in February 2008. It has a population of 5.13 lakh. There is no medical college and also no private nursing home in this area. The Tuberculosis Unit is the only health institution in the area. The total number of patients registered for treatment in the third quarter of 2007 was as low as 98. The new smear-positive case-detection rate for the third quarter of 2007 was as low as 61%.

Objective: Evaluate the effectiveness of the Public-Civil Mix Model to operationalize the government health system in a population of 5.13 lakh.

Methodology: The effectiveness of the model was examined on two criteria: (a) Increase in the number of referrals of Chest Symptomatic Patients. To increase the number of referrals, innovative-awareness campaign was launched in the area and (b) The number of sputum smear-positive patients diagnosed. To increase the number of cases, Social Mobilization Camps were organized. Performance report of tuberculosis for one year was studied.

Results: The number of referrals of chest symptomatic patients has increased by 82.6%. The number of sputum smear-positive patients diagnosed has increased by more than 100%.

Conclusion: Effective and innovative oversight, strong coalition building between various stakeholders and good team work make the health system receptive to people's need.

03:00 pm-04:30 pm (Venue: Media Bazar-Ground Floor)   074 (151)
Scientific Session 3: Service Delivery

Functioning of the Bangladesh Health System in Two Rural Subdistricts in Bangladesh

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Background: International development partners are encouraging the Ministry of Health and Family Welfare to consider the comparative advantage of contracting out selected services to the private sector to improve quality and meet increasing demand by its large majority of rural people.

Objective: Identify the type of selected services provided by different actors and institutions undertaking health action with their relative share and discuss possibilities of contracting out.

Methodology: Data on the number of actors and institutions in Mirsarai and Abhoynagar were collected with assistance from the association of drug-sellers and through observation. Demographic characteristics of the people who used curative services from 2006 to 2008 were obtained from the public-sector health management information system (HMIS) and population-based demographic surveillance system (DSS) administered by ICDDR,B in these areas.

Results: The number of graduate curative care providers and hospital-beds has increased in the private sector over the years, in addition to usual public-sector infrastructure in the rural setting. Private-sector growth has mostly occurred for specialist consultation, maternity and diagnostic services. Preliminary analysis of HMIS data showed an overall increase in the use of curative services for children aged below 5 years—an increasing trend in the use of available services among adolescents and referrals made, 5 doses of tetanus toxoid, and 3 antenatal care visits in the public-sector. Admission for any maternity services and one postnatal care also showed an increase but a higher rate of caesarean section in the private sector was observed in both the areas. The overall use of outpatient curative service from the Mirsarai Upazila Health Complex increased among females, for children aged below 5 years but remained unchanged in Abhoynagar. The use of inpatient curative service has also increased but more marked among females from the Abhoynagar UHC. Preliminary analysis of DSS data showed that the overall use of graduate curative care providers remained same, and non-graduate care providers were used for the majority of curative service in both the areas.

Conclusion: Despite the growth of the private sector, for the majority of preventive services, the public sector has remained the key actor and informal non-graduate service providers for curative services in both the areas. Given the rural poverty situation, before deciding contracting out caesarean section in the private sector requires close examination.

Urban Service-delivery and Improved Health Outcomes of Mothers and Children in Rajshahi Division of Bangladesh

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Background: Municipalities are responsible for ensuring primary healthcare services to the population residing in urban areas of Bangladesh. Following the promising experience of Concern Worldwide's municipal health partnership model in Saidpur and Parbatipur from 1999 to 2004, a five-year Municipal Health Partnership Project (MHPP) was set up to streamline and replicate the model in 7 municipalities.

Objective: Assess change in maternal and child-health outcomes following initial 2 years of the programme model in selected municipalities.

Methodology: Household knowledge, practice and coverage (KPC) surveys were conducted in January 2005 and in January 2007 using the lot quality assurance sampling method and applying stratified random sampling across all 75 wards of selected municipalities. Based on household lists, randomly-selected respondents included 20 mothers of children aged 0-11 month(s), 20 mothers of children aged 12-23 months, and 10 fathers of children aged 0-23 month(s) for a total of 2,962 mothers and 753 fathers in 2005 and 3,000 mothers and 750 fathers in 2007. All survey data were computerized, processed, and analyzed using the SPSS software for Windows (15.0 version).

Results: Comparison of the survey data indicated improved coverage of maternal and child-health outcomes from 2005 to 2007 following the project intervention. Intake of prenatal iron tablets increased from 42% to 55% and postpartum vitamin A from 25% to 39%. After 2 years, 66% of deliveries were assisted by a skilled or trained attendant. Most (97%) newborns' umbilical cords were cut with a sterilized instrument, and 38% of newborns received at least one check within 48 hours of delivery. The full vaccination coverage of children by the first birthday reached 90% and vitamin A supplementation 73% (up from 82% and 59% respectively). Gains in sick child's care-seeking were also made with 74% of children with pneumonia symptoms being seen by a trained care provider (up from 45%) and oral rehydration therapy of children with diarrhoea remained high at 70%.

Conclusion: During the initial 2 years of replication of the model, the MHPP has already demonstrated a significant change in maternal and child-health outcomes at low cost. It is time to critically review the model for potential national scale-up.

Perinatal Deaths in Matlab, Bangladesh: Preliminary Findings from an Integrated MNCH Programme

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Background: Achieving Millennium Development Goal 4—to reduce child mortality—remains a major challenge in developing countries. Although postneonatal mortality has declined, early neonatal death, including stillbirth, continues to contribute to the majority of child mortality in Bangladesh and other developing countries.

Objective: Evaluate the effect of the new integrated maternal, neonatal and child health (MNCH) programme on perinatal mortality (death of a foetus after 28 weeks of gestation or death of a neonate within 7 days of birth) in Matlab, Bangladesh.

Methodology: The study was conducted in rural Matlab in Chandpur district, Bangladesh, where ICDDR,B has been maintaining a health and demographic surveillance system (HDSS) since 1966 and basic MCH-FP services since late 1977. A new MNCH programme was initiated in 2007 by strengthening the health system, especially linkages between the community and the facility levels. Community health workers were trained in danger signs, referral, and newborn resuscitation. The health facilities were upgraded, including renovations and ensuring essential logistics. Members of clinical staff were given refresher training on evidence-based antenatal, intrapartum and postpartum preventive and curative care, including newborn resuscitation. In total, 7,351 pregnant women were included in the analysis, and perinatal mortality rates, before (2005-2006) and after (January-October 2008) the intervention, were evaluated.

Results: The delivery rates at facilities were 55% and 69% before and after the intervention respectively (p<0.05). For the corresponding periods, the proportion of women who completed 4 antenatal care-visits were 21% to 45% (p<0.05). The perinatal death rates were 43/1,000 pregnancies and 34/1,000 pregnancies (p=0.054) before and after the intervention respectively. After adjustment for sociodemographic variables, the odds of perinatal mortality was 23% lower after than before the intervention (odds ratio: 0.77; 95% confidence interval 0.59-1.00).

Conclusion: The new programme seems to have effect in improving perinatal survival in the study area. However, further evaluation is needed with data of an additional year of intervention prior to making any future recommendation to adopt in the health system of the country.

Outbreaks of Diarrhoea during 2007 Floods: Experience at a Diarrhoea Treatment Facility in Dhaka, Bangladesh

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Background: During the summer of 2007, Bangladesh suffered from one of the worst diarrhoeal disease outbreaks in the recent history. Severe torrential rains led to devastating floods, submerging some 34 of the 64 districts in Bangladesh, resulting in a major outbreak of diarrhoea.

Objective: Study the epidemiologic, demographic and clinical characteristics of diarrhoeal patients admitted to the Dhaka Hospital of ICDDR,B from July to September 2007 and its impact on the hospital in ensuring efficient management.

Methodology: Information on 838 patients enrolled in the hospital's surveillance system was extracted for analysis. Information on requirements of additional staff, consumption of oral rehydration solution, and antibiotics-use was also collected.

Results: During the study period, 43,359 patients with moderate to severe diarrhoea attended the hospital. 34% of them had culture-proven cholera while enterotoxigenic *Escherichia coli* and rotavirus were each isolated from 12% of the patients. Of the proven cholera patients, 84% presented with severe dehydration, and 93% of them required intravenous rehydration. Multidrug-resistant *Vibrio cholerae* O1 (El Tor) in these patients were resistant to the first-line drug—tetracycline. Based on minimum inhibitory concentration of clinical strains, the hospital changed policy to using single-dose oral azithromycin (1 g for adults and 20 mg/kg for children) therapy for management of cholera patients. Unprecedented patient-visits necessitated policy changes and establishment of coping mechanisms that resulted in zero deaths in individuals with uncomplicated cases of diarrhoea.

Conclusion: ICDDR,B's successful management of an enormous patient influx is largely attributable to its unparallel experience and expertise, logistical preparedness, and adaptive health management approach.

Addressing Abortion-related Mortality and Morbidity: The Scaling Up of the Bangladesh Menstrual Regulation Programme

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Background: An estimated 66,500 abortion-related deaths take place globally each year. 98% of these occur in developing countries. These deaths are almost entirely preventable given access to modern contraception and safe abortion services. However, many countries, including Bangladesh, legally restrict access to safe abortion. The Bangladesh Menstrual Regulation (MR) Programme was designed to reduce unintended pregnancies and morbidity and mortality relating to unsafe abortion in the context of a restrictive abortion law.

Objective: Describe how the Bangladesh MR programme evolved from an urban-based relief effort in 1972 to a nationwide primary care-level programme, review intersectoral processes that have influenced and continue to influence policy development and programme implementation, assess the impact of the programme, explore contextual factors that have influenced the potential of the programme over time, and look at issues of programme sustainability and replicability in settings beyond Bangladesh.

Methodology: A case-study design was used for facilitating in-depth exploration of the forces that have shaped and continue to shape the Bangladesh MR programme. An extensive review of published, peer-reviewed, and grey literature relating to the MR programme was conducted.

Results and Conclusion: Available evidence suggests that the programme has had a protective effect with regard to women's health. However, safe public-sector services are not equitably accessible. Over the 30 years of the programme, the existence programme performance has been best in periods of strong government, non-governmental organization, and donor coordination.

Implementing Youth-friendly Health Services in Public-Private Settings: A Health System Improvement Initiative

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Background: This collaborative project between the National AIDS/STD Programme (NASP), Directorate General of Health Services (DGHS), Ministry of Health and Family Welfare and Save the Children-USA (SC-USA), funded by GFATM, is implemented by the HASAB consortium under the management and technical guidance of SC-USA, NASP, and World Health Organization (WHO), Geneva.

Objective: Develop an evidence base of the health system improvement initiative through making health services more accessible, need-based, quality-driven, and confidential for the young people.

Methodology: The intervention design focuses on the interlinked approach of life-skill education (LSE), youth-friendly health services (YFHS), and accessing condom for youth (ACY) to demonstrate the synergistic role of prevention, care, and protection to avert HIV/AIDS risk among youths. The initial phase concentrated on designing and developing a youth-focused, feasible, affordable, and attractive health service model following the WHO guidelines which have been piloted in 23 facility sites (public and private settings) of different tiers of the health system in 4 divisions. The implementation followed every process and steps which included site selection, facility assessment, and refurbishment, development of 10 national YFHS standards, including training package and trainer's pool, and training to service providers.

A series of national- and local-level sensitizations was done to create a sense of ownership on this public-private partnership approach. A referral linkage was established between the LSE clubs and other NGOs/private services to better access the YFHS centres. The process has been documented, evaluated, and disseminated nationally to follow the large-scale replication in phases; the current coverage included 32 districts in 6 divisions through 184 health facilities.

Results: Since pilot to date, the young people received services through 184 YFHS service centres, and 194 master trainers were developed, who further trained 3,582 service providers. Moreover, a nationally-approved 10 YFHS standard, orientation package, briefing materials, and the process documentation were the results of such implementation.

Conclusion: An evidence base on the YFHS system improvement initiative is a true reflection of the public-private partnership. The availability of the YFHS standards and the orientation package are the significant policy gains for scaling services.

03:00 pm-04:30 pm (Venue: Green View 1-First Floor)   080 (061)
Scientific Session 3: Nutrition

Training in Complementary Feeding Counselling of Healthcare Workers and Its Influence on Maternal Behaviours and Child Growth: A Cluster-randomized Controlled Trial in Lahore, Pakistan

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Background: A study in Brazil had shown the success of training of health workers on communication and counselling in improving the nutritional status of young children. Questions were raised whether the method used in the study in Brazil would also be effective when applied in other countries.

Objective: Determine the efficacy of training of health workers in nutrition-counselling in enhancing their communication skills and performance, improving feeding practices, and reducing growth-faltering in children aged 6-24 months.

Methodology: A cluster-randomized controlled trial was carried out. Forty health centres were paired, and one centre of each pair was randomly allocated to the intervention group and the other to the control group. The integrated management of childhood illness (IMCI) module—'Counsel the mother'—was used for training health workers in the health centres in the intervention group. Data from 36 paired health centres and 375 mothers and their children aged 6-24 months recruited from these health centres following consultation with health workers were included in analysis. Mother-child pairs were visited at home within 2 weeks, 45 days, and 180 days after recruitment. Information was recorded on the feeding practices, recall of the recommendations of health workers, and sociodemographic variables at these home-visits. Weight and length of the child were measured at each contact.

Results: The communication skills and consultation performance of health workers were significantly better in the intervention group than in the control group (82% vs 51%, p=0.0152). The mothers' recall of the recommendation of health workers and reported infant-feeding practices were also significantly better in the intervention group than in the control group (29% vs 4%, p=0.01), even 180 days after the recruitment consultation. Growth-faltering was less in the intervention group, with the largest effect observed among children in the age-group of 12+ months.

Conclusion: The results indicate that training in IMCI feeding counselling can enhance the communication skills and performance of health workers. Improved feeding practices of counselled mothers can, in turn, reduce growth-faltering in their children.

Comparison of Nutritional Status of Under-2 Children in the NNP Baseline Survey 2004 with Their Siblings in 2007

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Background: Malnutrition currently contributes to over 50% of all preventable under-5 deaths in Bangladesh. A number of initiatives have been taken to reduce the burden of childhood malnutrition. The impact of nutrition services in families has not been measured on siblings of recipient children in the National Nutrition Project (NNP) services in Bangladesh.

Objective: Compare the nutritional status of younger siblings in 2007 with that of under-2 children surveyed in 2004.

Methodology: The Baseline Survey of the NNP, conducted in 2004, covered households of 44 NNP intervention, 53 Bangladesh Integrated Nutritional Programme, and 16 NNP comparison upazilas (total 113 upazilas) having under-2 children from 6 divisions in Bangladesh. The study was conducted in the same areas of the NNP Baseline Survey 2004. Of 9,217 under-2 children from the baseline, 2,124 (708 Primary Sampling Units [PSUs] x 3 children per PSU) were randomly selected in the follow-up survey of 2007. In total, 483 younger siblings of 2,124 selected children, who were born after the 2004 survey, were examined in the follow-up survey. Anthropometry, dietary intake, socioeconomic status and morbidity data were collected from the randomly-chosen households from 708 PSUs from 113 upazilas. Data were compared with index children and their immediate younger siblings.

Results: Of the 2,124 index children, 483 younger siblings were identified. 37% of the index children in 2004 was underweight in the intervention (NNP and BINP) area compared to 40% in younger siblings (p<0.01), and 37% of the index children in 2004 was underweight in the control area compared to 34% in sibling children (p<0.02). The proportion of stunted children among the index was 41% in the intervention area compared to 43% in the sibling children (p>0.05), In the control area, 45% of the index children were stunted compared to 38% in siblings (p<0.01). Wasting of children in the intervention area significantly increased in the younger siblings than the index children (17% vs 18%, p<0.01).

Conclusion: The younger siblings in 2007 appeared to have increased stunting, underweight and wasting compared to their elders in 2004.

Determinants of Exclusive Breastfeeding in Bangladesh

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Background: While exclusive breastfeeding (EBF) has been increasing throughout the developing world since the 1990s, it has fallen in Bangladesh from 46% in 1993-1994 to 43% in 2004. The underlying factors for the static situation, despite increased awareness and efforts to improve breastfeeding situation, need to be known.

Objective: Identify the determinants of EBF up to 6 months of age.

Methodology: This community-based case-control study was carried out in 35 villages in 3 unions of Savar upazila in Dhaka district during September-November 2005. Approximately 23,553 households were screened to identify mothers of 7-12 months old infants. Of all the identified children in this age-group, only 125 child-mother pairs had exclusively breastfed in the first 6 months of life of the child and were interviewed as cases using a detailed structured questionnaire. From the much larger group of non-EBF child-mother pairs, every fifth pair was interviewed as controls—a total of 253.

Results: There were statistically significant differences between cases (EBF group) and controls (non-EBF group) with regard to sanitary latrines, mother being a garment worker, early marriage before 18 years of age, breastfeeding initiation within 30 minutes of birth, having another member of the family who exclusively breastfed, and having antenatal care from a skilled healthcare provider. An EBF mother was 3 times more likely to report that she had a relative who had exclusively breastfed her infants up to 6 months of age of the child (p<0.01). Quantitative analysis suggested that, although many mothers knew that EBF was good for their children, lack of family support and ignorance of the family forced them to adopt bottle-feeding. However, awareness of demerits of breast-milk substitutes was not sufficient to reject this. Family members, relatives, and doctors advised almost 75% of non-EBF mothers to switch from breastfeeding to an alternative method.

Conclusion: The most significant determinants of EBF up to 6 months of age were having a relative who had breastfed her infants. In terms of intervention, this finding confirms the importance of mother-to-mother support in promoting EBF in the community.

Efficacy of a Standardized Protocol Using Local Diet during Nutritional Rehabilitation of Severely-malnourished Children in Bangladesh

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Background: Adequate catch-up growth of severely-malnourished children requires feeding with diets that are nutritious, inexpensive, easy to prepare, and culturally acceptable. Locally-available diets for nutritional rehabilitation are less expensive and sustainable. A standardized diet protocol (SDP) was developed based on such diets for improving catch-up growth during nutritional rehabilitation. The diets used in the SDP include *khichuri* and *halwa*. *Khichuri* is a gruel made of rice, lentils, vegetables, and oil (1 g=~1.5 kcal). *Halwa* is an energy-dense diet prepared from cereal flour, molasses, lentils, and oil (1 g=~2.5 kcal).

Objective: Assess the efficacy of a standardized protocol using local diets for the management of severely-acute malnourished children.

Methodology: Severely-malnourished children with diarrhoea and other acute illnesses were managed according to a treatment protocol implemented earlier at ICDDR,B. After completion of the acute phase management, children aged 6 months to 5 years underwent nutritional rehabilitation when the SDP based on *khichuri*, *halwa*, and a milk-cereal diet were used. The amount of milk-cereal diet was gradually tapered down such that the children are mostly on khichuri and halwa at the time of discharge. Multivitamins, zinc, and iron were also given. The Nutrition Rehabilitation Unit (NRU) is located at the Dhaka Hospital of ICDDR,B.

Results: During June 1996–December 2003, 1,712 severely-malnourished children were managed in the NRU. Criteria for admission to the NRU included improvement in general condition following management of the acute phase of malnutrition in the longer-stay ward and having any of the following nutritional indexes: weight-for-length <70% of the NCHS median, weight-for-age <50%, or bipedal oedema. For statistical analysis, children were divided into groups based on gain in their daily body-weight gain (g/kg/d)—group A (≥5.00 g/kg/d) and group B (0-4.99 g/kg/d). Eighty-one percent of the children gained body-weight of ≥5.00 g/kg/day. Overall, the children required a median of 12 (range 8-18) days to achieve a oedema-free weight-for-length >80%.

Conclusion: The use of a standardized diet protocol based on locally-prepared and culturally-appropriate diets is an efficacious and sustainable method of nutritional rehabilitation of severely-malnourished children.

Daily Low-dose of Vitamin A Is Equally Efficacious as Initial High-dose Vitamin A, Followed by Daily Low-dose in the Management of Severely-malnourished Children with Acute Illnesses

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Background: Both protein-energy malnutrition and vitamin A (VA) deficiency are common in low-income countries, including Bangladesh. The World Health Organization (WHO) recommends administration of a single high-dose of VA for treating severely malnourished children on admission. Administration of high-dose VA in these children who are often affected with infections and deficient of retinol-binding protein (RBP) may lead to adverse effects, and efficacy of high-dose has recently been questioned.

Objective: Compare the efficacy of a daily low-dose (5000 IU) vs initial single high-dose (200,000 IU), followed by a low-dose of VA (total 15 days for both the groups) in the management of severely-malnourished children with diarrhoea and/or acute lower respiratory tract infection (ALRTI).

Methodology: In a randomized, double-blind, controlled clinical trial at the Dhaka Hospital of ICDDR,B

day (in multivitamin drops) for 15 days and standard treatment as per the hospital's guideline, which is very similar to the WHO guidelines.

Results: In total, 260 children (48.5% were female, 50% had oedema, all had diarrhoea, and 54% had concomitant ALRTI), with a mean±standard deviation age of 16±10 months, were studied. Children of the 2 groups did not differ at baseline in any of the nutritional, demographic, socioeconomic and medical characteristics. Over the 15-day treatment period, outcomes in terms of resolution of diarrhoea, ALRTI, and oedema were similar between the groups. Three children died; all received high-dose VA. The table shows important biochemical values relating to vitamin A.

Conclusion: The efficacy of a daily low-dose of vitamin A is comparable with an initial high-dose of VA, followed by a daily low-dose in the management of

Baseline (serum)	Low-dose	High-dose	Effect	Low-dose (median)	High-dose (median)
Retinol (µg/dL)	13.0±9.5	13.3±9.1	Retinol difference (48 hours)	9.85	9.80
RBP (mg/dL)	1.29±0.9	1.26±0.9	RBP difference (48 hours)	1.00	0.92
Pre-albumin (mg/dL)	8.3±3.9	7.6±3.9	Retinol difference (15 days)	27.50	26.20
C-reactive protein (mg/L)	7.5 (median)	9.7 (median)	RBP difference (15 days)	2.60	2.51
RBP=Retinol-binding protein					

during 2005-2007, children aged 6-59 months with weight-for-height z-score of <-3 and/or nutritional oedema were enrolled upon getting written consent from their guardians. They received either a high-dose of VA (n=130) or a placebo (n=130) on admission day. Both the groups received 5,000 IU of VA per

severely-malnourished children with acute illnesses. Outcome of treatment was similar in both the groups.

Effects of Energy Density and Feeding Frequency of Complementary Foods on Food Consumption and Time Spent during Individual Meals by Healthy, Breastfed Bangladeshi Children

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Background: Appropriate feeding to infant and young children is necessary to prevent growth-faltering and optimize health during the first 2 years of life. Little information is available on the effects of dietary energy density and feeding frequency of complementary foods on food consumption during individual meals and the amount of caregiver's time spent in child feeding.

Objective: Evaluate the effects of varied energy density and feeding frequency of complementary foods on food intake and time required for child-feeding during individual meals.

Methodology: During 9 separate, randomly-ordered dietary periods lasting 3-6 days each, self-determined intakes of semi-solid cereal porridges by 18 healthy, breastfed children aged 8-11 months, who were fed coded porridges with energy densities of 0.5, 1.0, or 1.5 kcal/g, during 3, 4, or 5 meals/day, were measured. Complementary food intake was measured by weighing the feeding bowl before and after every meal. Daily consumption of breastmilk was measured by test-weighing method.

Results: The children consumed greater amounts of complementary foods per meal when received diets with lower energy density (p=0.044) and fewer meals per day (p<0.001). Food intake was less during the first meal of the day than the other meals. Greater time was spent per meal when fewer meals were offered. The time spent per meal did not vary by dietary energy density, but the children ate lower energy-density diets faster (p=0.019). Food intake velocity was also greater when more meals were offered per day (p=0.005).

Conclusion: The energy density and feeding-frequency of complementary foods affect food intake during individual meals, the time spent for food consumption, and the velocity of food intake. The results would further help strengthen or revise the current complementary feeding guidelines.

Day 3: Thursday, 12 February 2009   086 (227)
08:45 am-10:00 am (Venue: Windy Town-First Floor)
Plenary for Health Financing

Research Needs and New Initiatives in Health Systems Financing Research: An Alliance HPSR Perspective

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The Alliance for Health Policy and Systems Research (HPSR) is an international collaboration aiming at promoting the generation and use of health policy and systems research as a means to improve the health systems of developing countries. The purpose of this presentation is to provide an overview of the Alliance's current activities in the field of health systems financing (HSF). These activities are categorized according to the Alliance's three main objectives:

Objective 1: Stimulate the generation and synthesis of policy-relevant knowledge on health systems, encompassing evidence, tools, and methods. Work in this area includes: identifying priority HSF research questions; supporting the African Health Economics and Policy Association to conduct an essay competition for the African region on user-fees; and establishing a centre for conducting health financing systematic reviews at Shandon University, China.

Objective 2: Promote the dissemination and use of health policy and systems knowledge to improve the performance of health systems. The Alliance has pursued two main strategies in this area: packaging research syntheses and making these readily available to health policy-makers; and sponsoring national processes to support evidence-informed decision-making, including the preparation of issue-focused policy briefs and deliberative forums.

Objective 3: Facilitate the development of capacity for the generation, dissemination, and use of HPSR knowledge among researchers, policy-makers, and other stakeholders. Activities in this area include: supporting young researchers towards developing HPSR teaching as a component of postgraduate courses in low- and middle-income countries; and supporting innovative strategies to enhance capacity to apply health policy and systems research evidence in policy-making.

Some key challenges faced by the Alliance in conducting its work will be highlighted, and inputs from the audience will be sought as to how the Alliance can strengthen its activities in areas, such as capacity development and building networks and fostering information exchange.

10:30 am-11:30 am (Venue: Windy Town-First Floor)   087 (062)
Scientific Session 1: Health Financing

Costs Associated with Use of Healthcare Services in Chakaria, Bangladesh

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Background: Cost of healthcare services may deter or delay patients, especially the poor, from seeking appropriate care. Affordability or perceived cost of care is a significant factor influencing healthcare behaviour, such as choice of the care provider and time of care.

Objective: Determine the costs incurred for healthcare sought from various types of healthcare providers for an episode of illness.

Methodology: A survey of 1,000 randomly-selected households was carried out in Chakaria during February 2007. Information was collected on cost incurred for healthcare from those who had reported any illness within 14 days prior to the survey. Information relating to details of costs was available from 342 of 360 respondents who had sought care for the illness. The survey collected information on direct medical costs incurred, which included costs of medicines, service-fee for practitioners, transport, diagnostic tests, and indirect costs which refer to loss of earnings.

Results: The findings showed that the per-capita cost for healthcare sought for an episode of illness was substantially higher for a qualified MBBS practitioner than any other type of informal care provider, e.g. paramedics, village doctors, and homeopaths. The indirect costs involved were also higher for an MBBS practitioner. The costs of drugs constituted a major proportion of healthcare expenditure for all types of practitioners, especially so for the informal healthcare providers. Other than the MBBS practitioners, all types of practitioners charged a negligible fee. The cost of transport associated with visiting the MBBS practitioners was also higher. The cost of healthcare did not differ significantly by socioeconomic status or gender. The per-capita cost for an episode of illness for the poorest quintile was quite substantial, indicating that healthcare costs incurred placed an unfair burden on the poorest households.

Conclusion: The higher fees and cost of transport associated with visiting an MBBS practitioners may result in a higher perception of costs and may act as a deterrent for seeking care from a qualified provider.

Performance-based Payment to Community Midwives Enhances Use of Safe Motherhood Services in Chakaria, Bangladesh

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Background: In Chakaria, the use of safe motherhood services among women from poor households remained low even after introducing community-based midwives. A study was conducted to find out whether providing free safe motherhood services, in exchange of vouchers to women from poor households, enhances the use of safe motherhood services provided by skilled birth attendants (SBAs).

Objective: Determine the effectiveness of performance-based payment for safe motherhood services in terms of increasing service-use by women from poor households.

Methodology: SBAs, formerly members of ICDDR,B staff, have been paid by the Chakaria Community Health project for safe motherhood services they provide to women from the lowest 2 quintiles since January 2006. The SBAs identify all pregnant women living in the intervention area during early pregnancy and vouchers were delivered by the ICDDR,B field staff to women from the lowest 2 asset quintiles. The women were advised to avail of the services from the designated SBAs in exchange of the vouchers. The SBAs collected the vouchers when they provided services and made claims for reimbursement from the ICDDR,B field office in Chakaria once a month. The programme staff disbursed money after verification of the claims. Data from the Chakaria Health and Demographic Surveillance System of 2005 and 2007 were used for comparing the use-rate of different safe motherhood services before and after introducing the programme within the intervention area.

Results: In general, the midwives were found to provide more antenatal care (ANC), postnatal (PNC) and delivery services to the poorest women when data from 2005 (pre-intervention) and 2007 (post-intervention) were compared. Among the poorest women in the intervention area, the use of ANC service increased from 32.7% to 48.3%; assistance during delivery increased from 3.2% to 15.6%; and the use of PNC services increased from 6.8 to 19.8%. 71.4% of the vouchers-receipients used ANC services while 46.9% used delivery services. Further, there were 6-16% discrepancies between claims made by the midwives and payments disbursed after authentication for different services.

Conclusion: Performance-based payment significantly improved the use of different safe motherhood services by poor women. However, attention needs to be paid to reasons why the programme did not manage to reach many eligible women.

089 (073)

Safe Delivery Incentives: Experiences from Safe Motherhood Programme in Nepal

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Background: High financial cost acts as a major barrier to women accessing maternal care in rural Nepal. A study in 2003 showed that the cost of delivery in health facility exceeded US$ 80, including travel, medical fees, and opportunity costs—a substantial amount for a rural family. In 2005, this was addressed through a nationwide Safe Delivery Incentives Programme (SDIP). An independent evaluation was carried out between January 2007 and April 2008.

Objective: Assess the implementation process and impact of the SDIP and provide recommendations for its improvement.

Methodology: Qualitative and quantitative methods were used for assessing service provision and use and financial flows in 6 districts. Facility surveys were carried out through interviews with health workers, district officials, central policy-makers, and 5,903 women who recently delivered.

Results: The SDIP was shown to have a positive impact on the use of institutional delivery services of the Government, with an estimated 24% increase in the probability of a woman who is aware of the SDIP delivering in a government institution and a 13% increase in the probability of her delivering with a trained health worker. As a result of evidence from the early part of the evaluation, implementation had improved; the proportion of eligible women receiving the incentive increased from 34.4% in year one to 59.3% in year three. There was a substantial decline in delayed payments, from an average 100 days in year one to 5 days in year 3. The impact was the greatest among the bottom 3 wealth quintiles and negligible among the top 2 quintiles, giving an inherent impact on equity.

Conclusion: The use of evidence from the evaluation to improve the programme design and implementation processes was an important outcome. Although there are clear positive impacts, the incentives do not sufficiently protect poor households from the effects of delivery costs. In 25 of the least-developed districts, where delivery services are also free, experiences will be further analyzed to feed into the development of a policy for free delivery services which could be combined with incentives for maximum impact.

Rapid Assessment of Demand-side Financing Experiences in Bangladesh

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Background: Towards the attainment of maternal health-related Millennium Development Goals, the Directorate General of Health Services of the Ministry of Health and Family Welfare, Government of Bangladesh, under the Health, Nutrition and Population Sector Programme, embarked on piloting a demand-side financing (DSF) scheme in 33 upazilas during 2005–2007. Some upazilas offered universal coverage, and others used means-testing to target the poor.

Objective: Measure progress in terms of registration of pregnant women and distribution of vouchers, utilization of services using vouchers, identification of barriers to disbursement of DSF funds to beneficiaries and service providers and develop recommendations on solutions to overcome barriers.

Methodology: A rapid assessment was undertaken, in March 2008, of 3 upazilas using quantitative and qualitative methods, including in-depth interviews and focus-group discussions of beneficiaries, multiple levels of health service providers, administrators, and community leaders.

Results: The findings indicated an increase in institutional delivery and workload of care providers. All stakeholders expressed concerns about the availability of supply-side issues, including the facilities and the reimbursement mechanisms. Near-universal concern was expressed over the higher financial incentives for institutional delivery compared to current financial incentives for sterilization, which many fear could negate the success of the national family-planning programme.

Conclusion: Further improvement in the physical infrastructure of the existing public-sector facilities is likely to contribute to higher use. The opportunity exists to further engage the non-state-sector service providers and facilities for involvement with the scheme. The potential for an increase in the use of caesarian sections, changes in the physical infrastructure, and the appropriate posting of human resources in the public sector should be monitored. The existence of financial incentives and the availability of technical assistance by a third party in the DSF scheme require a close examination in terms of sustainability and scale-up.

10:30 am-11:30 am (Venue: Media Bazar-Ground Floor)   091 (014)
Scientific Session 1: Maternal-Child Health

Determinants of Rates of Exclusive Breastfeeding in Nigeria

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Background: Exclusive breastfeeding has important protective effects on survival of infants and decreased risk of many early-life diseases. According to the World Health Organization (WHO), exclusive breastfeeding is one of the most natural and best forms of preventive medicine.

Objective: Determine the prevalence of and assess the sociodemographic factors associated with exclusive breastfeeding rates in Nigeria.

Methodology: Data on 658 children aged 0-6 month(s) were drawn from the Nigeria Demographic and Health Survey (NDHS) 2003. The NDHS 2003 was a multi-stage cluster-sample survey of 7,864 households. The exclusive breastfeeding indicator was estimated according to the indicator described by the WHO in 2007. Rates of exclusive breastfeeding were examined against a set of individual and household-level variables using multi-level logistic regression analyses.

Results: Rates of exclusive breastfeeding were 22.9% (95% confidence interval [CI] 17.1-29.8) and 16.4% (95% CI 12.6-21.1), respectively, among 3 months and 6 months old children. After backward stepwise method, multi-level logistic regression with fixed effect revealed that an increased age of the infant was associated with significantly less exclusive breastfeeding (odds ratio [OR]=1.54, CI 1.23-1.95, p<0.001). Mothers who had 4 or more antenatal visits (OR=0.37, CI 0.14-0.96, p=0.040) were significantly associated with the increased rate of exclusive breastfeeding. Female infants were more likely (OR=0.47, CI 0.23-0.97, p=0.041) to be exclusively breastfed than male infants. Mothers who lived in the North Central geopolitical region were significantly more likely to exclusively breastfeed their babies than those who lived in other geopolitical regions.

Conclusion: The rate of exclusive breastfeeding in Nigeria is low and falls well short of the WHO recommendation of 90% coverage. Antenatal care was strongly associated with exclusive breastfeeding. Intervention studies, including peer-counselling, to support breastfeeding using cluster-randomized controlled trials are needed to provide evidence about the most effective interventions to increase exclusive breastfeeding in Nigeria. Appropriate infant-feeding practices in each geopolitical region will be needed if Nigeria is to reach the child survival-related Millennium Development Goal of reducing infant mortality from about 100 deaths per 1,000 livebirths to 35 deaths per 1,000 livebirths by 2015.

Use of Indicators of Family Care and Maternal Depression and Their Relationship with Child Development in Bangladesh

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Background: In developing countries, poverty detrimentally affects the development of millions of young children, and poor stimulation in the home is one of the main mechanisms responsible for this. However, there is a lack of suitable instruments to measure home stimulation at a population level, and a simple survey-based indicator of environmental quality is needed. A pilot study of the family care indicators (FCI), designed to assess the quality of the home environment in large surveys in developing countries, was conducted.

Objective: Assess the validity of the FCI on measuring the quality of the home environment in large surveys in developing countries.

Methodology: The family care indicators (FCIs) were derived from the Home Observations for Measurement of the Environment (HOME) scale and a short version of the Centre for Epidemiological Studies-Depression scale. Six subscales were created: 'play activities', 'varieties of play materials', 'sources of play materials', 'household books', 'magazines and newspapers in the home', and 'maternal depression'. All the subscales were highly or moderately reliable over 7-14 days. The children were assessed on the Bayley Scales of Infant Development, and their language was assessed by mothers' report.

Results: A sample of 801 mothers of children aged 18 months in rural Bangladesh participated in the study. All FCI subscales significantly correlated with child developmental outcomes, the HOME, and socio-economic background variables. 'Play activities' and 'varieties of play materials' were the subscales most highly associated with child development measures. The children's Bayley Mental Development Index increased linearly with scores on both 'varieties of play materials' and 'play activities'. Results of multiple regression analyses showed that, after controlling for socioeconomic variables—'varieties of play materials', 'play activities', 'magazines and newspapers', and 'maternal depression'—independently predicted one or more developmental outcome(s).

Conclusion: This measure appears to be promising as survey-based indicators of the quality of the home environment for young children.

Effects of Psychosocial Stimulation on Growth and Development of Severely-malnourished Children in a Nutrition Unit in Bangladesh

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Background: Young children with severe malnutrition usually have poor mental development. Psychosocial stimulation may reduce their cognitive deficit but it is not usually provided.

Objective: Incorporate stimulation into the routine treatment of severely-malnourished children in a nutrition unit and evaluate the impact on their growth and development.

Methodology: Severely-malnourished children, aged 6-24 months, admitted to the Nutrition Rehabilitation Unit, were enrolled. All study children received standard nutritional care. A control group of 43 children was studied initially, followed by an intervention group of 54 children. The intervened mothers and children participated in daily group meetings and individual play sessions for 2 weeks in the hospital and were visited at home for 6 months. Children's growth was measured and development assessed using the Bayley Scales of Infant Development.

Results: Twenty-seven children were lost to the study. In the remaining children, both the groups had similar developmental scores and anthropometry initially. After 6 months, the intervention group had improved more than the controls did by a mean of 6.9 (p<0.001; 95% confidence interval [CI] 3.9-10.0) mental and 3.1 (p=0.024; 95% CI 0.4-5.7) motor raw scores and a mean of 0.4 (p=0.029; 95% CI 0.1-0.8) weight-for-age z-scores, controlling for background variables.

Conclusion: Psychosocial stimulation integrated into treatment of severely-malnourished children in hospital, followed by home-visits for 6 months, was effective in improving children's growth and development and should be an integral part of their treatment.

Kangaroo Mother Care in a Rural Hospital in Matlab, Bangladesh: Some Preliminary Findings

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Background: Low-birthweight (LBW) babies require special attention if they are to survive, particularly with regard to warmth, feeding, hygiene practices, and prompt identification and treatment of complications. Kangaroo mother care (KMC) where early, prolonged, and continuous skin-to-skin contact between the mother and the newborn is maintained is a simple, cost-effective approach that can meet many of these basic needs of newborns.

Objective: Evaluate management of neonates admitted to a newly-established KMC unit in a rural hospital in Matlab, Bangladesh.

Methodology: The study enrolled both stable and unstable newborn babies in the Matlab Hospital of ICDDR,B from 1 July 2007 to 31 October 2008. Neonates were admitted to the KMC unit if the mother was willing to follow KMC and birthweight was <2,000 g and/or gestational age <37 completed weeks. Data were collected on acceptability of KMC, feeding, duration of skin-to-skin contact, morbidity, and mortality.

Results: Of 162 newborns admitted, 85 (52.4%) were female babies. About 49% were preterm appropriate-for-gestational age, 26% were preterm small-for-gestational age (SGA), and 22 were term-SGA age by Lubchenco classification. The mean (±SD) duration of stay in KMC was 10 (±6) days. Major complications on admission were infection (septicaemia, pneumonia, skin infection, and umbilical infection), hypothermia, birth asphyxia, and jaundice. The case-fatality rate among the admitted newborns was 6.7%. Of the 11 newborns who died, 8 died from extreme prematurity and/or LBW, 2 due to neonatal sepsis, and one due to birth asphyxia with septicaemia. On discharge, 99% of the newborns were exclusively breastfeeding. Most parents expressed satisfaction with the KMC process. Preferred positions for KMC were semi-sitting (54%), followed by lying-down (26%). The median frequency of visit by parents was 4 times per stay.

Conclusion: KMC is a cost-effective alternative to incubator care for LBW newborns in low-resource settings. The preliminary findings demonstrate the feasibility, acceptability, and effectiveness of KMC in rural Matlab. However, additional evaluation needs to be conducted with a larger sample to develop future policy recommendations.

10:30 am-11:30 am (Venue: Green View 1-First Floor)   095 (056)
Scientific Session 1: Diarrhoeal Disease

Novel Antibacterial Substance Produced *Pseudomonas aeruginosa* with High In-vitro Antimicrobial Activity against *Vibrio cholerae* O1 and O139

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Background: *Pseudomonas aeruginosa* is common inhabitants of soil, fresh-water and marine environments. A strain of *P. aeruginosa* was isolated, which produced blue pigments in broth culture that has vibriocidal activity. Toxigenic strains of *Vibrio cholerae* belonging to the O1 and O139 serogroups cause cholera, a devastating diarrhoeal disease. *V. cholerae* O1 has recently acquired resistance to tetracycline, doxycycline, erythromycin, and azithromycin in Bangladesh, making antibacterial therapy to cholera extremely difficult.

Objective: Characterize the antibacterial substance produced by *P. aeruginosa*.

Methodology: A single colony of *P. aeruginosa* was inoculated in 50 mL Luria bertani broth and incubated in shaking at 120 rpm at a temperature of 37° C for 24 hours. The broth culture was centrifuged at 10,000 rpm for 10 minutes and filtered through 0.22 ìm membrane. The filtrate was lyophilized and resuspended in 2.5 mL distilled water and was subjected to sephadex column. Antibacterial activity of every fifth fraction was examined by the agar diffusion method against *V. cholerae* O1. Antibacterial activity was also examined on *V. cholerae* O1, O139, and non-O1/non-O139, *Aeromonas* spp., *V. parahaemolyticus*, Enterobacter faecales, *Campylobacter* spp., *V. mimicus*, *Staphylococcus aureus*, *Shigella* spp., *Salmonella* spp. and *Escherichia coli*. Effect of heat, proteinase K, and mode of antibacterial activity were also examined.

Results: Using a sephadex column, the lyophilized substance was separated into 5 different coloured fragments. Vibriocidal activity was present in blue fragment. The antibacterial substance produced by *P. aeruginosa* had remarkable killing activity on *V. cholerae* O1, O139, non-O1/non-O139, *Aeromonas* spp., *V. parahaemolyticus*, *E. faecales*, *Campylobacter* spp., *S. aureus*, and *V. mimicus* but not on *Shigella* spp., *Salmonella* spp., and *E. coli*. It was very stable to heat, non-evaporating, and bactericidal compound. It was not digested by proteinase K.

Conclusion: Recently-acquired multidrug-resistant *V. cholerae* O1 is susceptible to the antibacterial substance produced by *P. aeruginosa*. This unknown substance was also highly active against *V. cholerae* O139 and non-O1/non-O139. Further chemical characterization of the compound is being done.

Nostoc sp. Prohibits Vibriophage-mediated Lysis of *Vibrio cholerae* O1 in Microcosm

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Background: Epidemics of cholera occur regularly in Bangladesh, and results of a number of studies suggest that blue-green algae act as an inter-epidemic reservoir of *Vibrio cholerae*. It has recently been found that vibriophages in the environment inversely correlate with the abundance of toxigenic *V. cholerae* in water samples and incidence rates of cholera.

Objective: Know whether vibriophages have any lytic activity on *V. cholerae* O1 when they hide inside the mucilaginous sheath of *Nostoc* sp., a blue-green alga.

Methodology: Three sets of laboratory microcosms in duplicates were prepared to find out the relationship among vibriophages, *V. cholerae* O1 El Tor Inaba (N16961), and *Nostoc* sp. Environmental vibriophage was isolated from sewage-effluence in the Matlab Health and Research Centre using standard phage culture technique. *V. cholerae* O1 were enumerated using taurocholate tellurite gelatin agar plate. Phage titre calculated from the number of plaques was observed on the lawn of *V. cholerae* O1 on gelatin agar plate. VBNC (viable but not culturable) stage of *V. cholerae* O1 was detected using direct fluorescence antibody (DFA) technique. A multiplex polymerase chain reaction (PCR) was performed to confirm the VBNC stage and presence of pathogenic gene of *V. cholerae* O1.

Results: The phage added at day 3 had no recognizable effect on the lysis and reduction of *V. cholerae* O1 both in water and inside the mucilaginous sheath of algae. However, the phage that was added at 0 hour had the ability to lyse them in 6-24 hours in water before entering inside the algae. The phage could not invade the mucilaginous sheath of the *Nostoc* sp.; thus, *V. cholerae* O1 can use this as a phage-evasion technique. The DFA and PCR also demonstrated the VBNC state and presence of pathogenic gene in *V. cholerae* O1 after 60 days in the microcosm water and algae.

Conclusion: Vibriophages had a little effect only on free-swimming *V. cholerae* O1 in microcosms. Therefore, further studies are needed to draw conclusion about the role or effect of vibriophages to reduce the number of *V. cholerae* O1 when they are in the protective environment of algae.

Virulence Potential, Phenotypic and Molecular Characterizations of *Vibrio parahaemolyticus* Isolated from Estuarine Environments, and Comparisons with Clinical Strains, of Bangladesh

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Background: *Vibrio parahaemolyticus*, a pandemic pathogen causing gastroenteritis worldwide, is often reported from diarrhoea in Bangladesh, although little is known about the virulence potential and molecular traits of *V. parahaemolyticus* occurring in this region.

Objective: Determine the virulence potential and molecular traits to develop unified global intervention and preventive measures.

Methodology: *V. parahaemolyticus* isolated from environmental (n=25) and diarrhoeal (n=16) sources of the coastal ecosystem of Bangladesh (February 2006–January 2008) were subjected to extensive analysis for phenotypic and molecular characterizations which included serotyping, antibiogram, and haemolytic activity (Kanagawa phenomenon), followed by polymarase chain reaction (PCR) for the detection of virulence marker genes, such as *tox*R, *tdh*, *trh*, and *tlh*. The strains were also analyzed by group-specific (GS) and open-reading frame 8 (ORF 8)—PCR, and finally, DNA fingerprinting was determined employing RAPD, PFGE, and BOX-PCR to understand their virulence and relatedness with the pandemic group.

Results: Serotyping revealed O8:K21 and O9:KUT to be prevalent, accounting for 48% and 28% of the environmental strains respectively. The pandemic serogroup O3:K6 was prevalent among the clinical strains, followed by O8:K21, accounting for 50% and 19% of the strains respectively. All the clinical strains of different serogroups had the major virulence gene *tdh* whereas 64% of the environmental strains possessed the *tdh*, although *trh* was not detected in any of the clinical and environmental strains tested. Only 3 (19%) of the clinical (*tdh*+ O3:K6) strains having *tdh* were KP-positive, demanding further study. Also, 56% of clinical strains which comprised pandemic serogroup O1: KUT (n=1) and O3: K6 (n=8), including 3 KP+ strains, had the pandemic marker GS and ORF8 and, thus, belonged to pandemic groups genotypically, although none was confirmed by *tdh-tox*RS/new sequence determination. The DNA fingerprinting employing AP-PCR, BOX-PCR and, finally, pulsed-field gel electrophoresis (PFGE; of *sfi*I-restriction-digested DNA) and dendograms constructed with gel images revealed the strains to be heterogeneous genetically, except that the *tdh*+ clinical and environmental strains belonging to multiple serogroups fell under the closely-related clusters.

Conclusion: *V. parahaemolyticus* strains occurring in the coastal aquatic environments of Bangladesh are potentially pathogenic and, thus, a likely cause of diarrhoea. The closely-related pandemic clonal complexes that prevail in coastal water pose potential health-risks for millions of coastal villagers of Bangladesh.

Appearance of Three New Genotypes of Cholera Toxin B-subunit in *Vibrio cholerae* O139 Isolated in Bangladesh

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Background: *Vibrio cholerae* O139 Bengal, appeared in 1992, caused large epidemics of cholera in Bangladesh and India and subsequently spread to neighbouring countries. Results of genetic studies showed that *V. cholerae* O139 originated from the El Tor biotype by horizontal gene transfer to acquire a novel O antigen. The authors recently reported a shift in ctxB genotype of El Tor strains from genotype 3 to genotype 1 among 3 genotypes reported so far..

Objective: Initiate to determine the genotype of ctxB of *V. cholerae* O139 isolated since its genesis in 1992.

Methodology: The nucleotide sequence of the *ctx*B gene of 35 representative strains of *V. cholerae* O139 isolated between 1993 and 2005 were examined, and 13 of these strains were genetically profiled using a multilocus virulence gene approach.

Results: Nucleotide sequence analysis of the *ctx*B genes and the deduced amino-acid sequence revealed that 5 strains from 1993 to 1997 possessed sequences identical to that of El Tor reference strain N16961 and belonged to genotype 3. In contrast, 26 strains isolated from 1999 to 2001 and in 2005 differed from the strain N16961 only at position 68 (threonine replaces isoleucine) and, therefore, belonged to a new genotype. Three strains isolated in 1998, 2000, and 2002 had alanine at position 28 but both El Tor and classical reference strains had aspartate at the same position and had histidine, phenylalanine, and threonine at position 39, 46, and 68 respectively, same as the classical reference strain 569B of genotype 1. The amino-acid sequence of 1 strain from 2005 was identical to the sequence of 26 strains mentioned above, except at position 34, where proline was present instead of histidine. All the 13 strains, profiled by the multilocus profiling system, showed the presence of all the genes, with a few exceptions as found in toxigenic El Tor biotype strains.

Conclusion: The appearance of 3 new genotypes of CT among toxigenic *V. cholerae* O139 is reported; the impact of these changes that may have on the epidemiology of the disease is currently investigated.

Group-lending Model and Social Closure: Microcredit, Exclusion, and Health in Bangladesh

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Background: According to the social exclusion theory, health risks are positively associated with involuntary social, economic, political and cultural exclusion from society. The group-lending model of microcredit is a development intervention in which small-scale credit for income-generation activities is provided to groups of individuals who do not have material collateral.

Objective: Assess whether group-lending of microcredit in Bangladesh reduces health inequities by addressing social exclusion.

Methodology: The study analyzes available literature on microcredit and health in Bangladesh, using a social exclusion framework.

Results: The paper outlines 4 pathways through which microcredit can affect health status: financing health emergencies, financing health inputs, as a platform for health education, and increasing social capital. For participants, the group-lending model of microcredit provides a source of societal cohesion and health and economic benefits. For others, microcredit intervention can confirm outsider status and increase health risks.

Conclusion: The paper suggests that, while microcredit improves health, it also replicates health inequities.

Healthcare Financing for Maternity Care in Bangladesh

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Background: In Bangladesh, the maternal mortality ratio (MMR) is still very high, although it has declined from about 600 in 1980 to 322 in 2004. The use of maternal healthcare services by trained professionals is alarmingly low. About half of the pregnant women still do not seek any antenatal care. Results of studies suggest that the major causes that prevent mothers from availing of maternal healthcare include the following: (a) women are not aware of the need and availability of maternal healthcare and (b) women do not have financial ability to avail of maternal healthcare in the case of emergency.

Objective: Test the feasibility of introducing financial scheme for poor rural women to attract them towards pregnancy care.

Methodology: A pretest–post-test design was employed in 2 unions of Nabiganj upazila of Habiganj district. Baseline and endline surveys were conducted to measure the changes of interventions. In addition, in-depth interviews with recipients and non-recipients of financial assistance were conducted.

Results: The preliminary results suggest a significant increase in using maternal healthcare services by the poor women. The poor pregnant women who received antenatal care from trained professionals increased from 55% to 91% while the use of postnatal care increased from 23% to 58%. While delivery in the home is almost universal in rural Bangladesh, the institutional delivery also increased from 2.5% to 19% in the study areas.

Conclusion: The results suggest that a healthcare financing system for maternity care of poor rural women can effectively be implemented within the government health and family-planning programmes. However, improving the technical competence of service providers, strengthening healthcare facilities in terms of equipment and physical facilities and ensuring community participation are crucial for creating demand for and use of maternal healthcare by poor rural women.

Willingness to Pay for Birthing Hut among Urban Slum-dwellers in Dhaka, Bangladesh

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Background: For planning future sustainability of the Manoshi programme (Maternal-Child Health-care for Urban Slum Dwellers), BRAC is interested in knowing slum residents' willingness to pay registration fee at the time of enrollment of a pregnancy with the birthing hut and its consequences on coverage and volume of services if such fee is introduced.

Objective: Assess willingness to pay (WTP) for birthing hut among residents of urban slums and identify factors that the programme can change to influence household/individual willingness to pay for birthing hut.

Methodology: A contingent valuation survey was conducted at the household level with 1,074 respondents of 3 selected slums in Dhaka city during March-September 2008. Married women of reproductive age (pregnant and non-pregnant) and their husbands were interviewed separately. The respondents were assigned to 2 groups. In one group, the questionnaire was partially administered on day 1 and given time to think before completing the interview on the following day. The whole interview was completed on day 1 for the other group. Each respondent was asked about one pre-selected price from an array of 4 prices (Tk 250, 300, 350, and 400). Prior to implementation of the survey, ap-

proval of the internal review committee of ICDDR,B was obtained.

Results: The large majority (n=1,066) of the respondents expressed their interest in birthing hut. Overall, 75% of the respondents agreed to pay more than the price asked for, 20% agreed to pay the amount equal to the asked-price, and only 5% mentioned lesser amount than the price asked for. Maximum WTP was Tk 500, and minimum was Tk 100. Interestingly, the average WTP among husbands was higher (Tk 450) than that among wives (Tk 400). Responses varied between groups that got time to think and no time to think. The respondents were willing to pay more if desired quality of care is maintained that included availability of medicines, skilled workers, 24-hour service, and minimum cost of management. More than 95% of the respondents opined that they would visit birthing hut even if the prices were higher than their expectation.

Conclusion: Private demand for birthing hut is high. The large majority of the respondents are willing to pay registration fee.

Treatment Cost of Typhoid Fever at Two Hospitals in Kolkata, India

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Background: Typhoid fever has been an important health problem in many parts of the world. An estimated 16 million cases and 600,000 deaths occur each year. The cost of treatment has gone up due to emergence of multidrug-resistant typhoid.

Objective: Estimate treatment cost of typhoid fever at two hospitals in Kolkata, India.

Methodology: The study was an incidence-based cost-of-illness analysis from the provider's perspective. Micro-costing approach was employed for calculating patient-specific data. Unit costs of medical services used in calculation were directly measured from the study hospital by standard method.

Results: Eighty-three widal-positive and/or culture-confirmed patients with typhoid fever during November 2003–April 2006 included in the study were admitted to or treated in the outpatient department of B C Roy Memorial Children Hospital and in the Infectious Diseases & Beliaghata General Hospital. Children (93%) were mainly affected; 81% was treated at the outpatient department. The average hospital stay of child, adult and all patients were 8.4 days, 4.2 days, and 3.15 days respectively. The average treatment costs of children, adults, and all patients were US$ 16.72, 72.71, and 20.77 respectively (in 2004 prices). However, there was a substantial difference between outpatient and inpatient costs (US$ 2 vs US$ 99.36). The average cost of hospitalized child and adult was US$ 115.36 and US$ 72.71 respectively.

Conclusion: While comparing the treatment costs between age-groups, it was found that hospitalized child patients spent a higher cost than that of hospitalized adult patients because the length of stay of children was double that of adults despite the dose of drug for children is less than that for adults, resulting in less cost. Pharmacy cost was only 14% of the total cost while routine service cost was 81% of the total cost. Vaccination could be an alternative way of reducing the economic burden on resource-poor countries, like India.

11:45 am-12:45 pm (Venue: Media Bazar-Ground Floor)
Scientific Session 2: Health and Human Rights

Evaluation of Mental Health Counselling to Abused Women in Rural Bangladesh

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Background: The literature suggests multiple adverse mental health impact of abuse by husbands on women and on their offspring. South Asia is known to have one of the highest rates of violence against women. About 67% of ever-married women in Bangladesh are exposed to abuse by husbands, suggesting a need for mental health-care of these women. It is difficult to make such services available in rural Bangladesh in particular due to lack of specialists and absence of infrastructure. Thus, coming up with alternative mechanisms for providing mental health support to abused women and evaluating them for understanding their impact becomes essential for addressing this serious public-health problem.

Objective: Evaluate an initiative to use paramedics as the first-level mental health counsellors to abused ever-married women in rural Bangladesh from the perspective of the women who attended the session(s).

Methodology: Both qualitative and quantitative research methods were used. Thirty in-depth interviews in July-August 2006, followed up by a survey in June-July 2007, targeted to cover all counsellees (n=372) in Matlab. The qualitative data were coded using Atlas/ti, and content and context analyses were conducted. The quantitative data were analyzed using the SPSS software (version 14.0). Standard informed consent procedures were followed. Clearance for the study was obtained from the ethical review committees of ICDDR,B and Uppsala University.

Results: The results showed that, overall, the arrangement of the counselling session(s), management of ethical issues, and skills of paramedics were rated quite favourable by the abused women. Only a few considered the session useless while the majority considered it a bit useful, and one-fourth of the women considered it very useful. Usefulness of the session(s) was expressed mostly in terms of relief attained talking about the issue. Most women reported boosted self-confidence, and about 50% of the women reported trying to convince their husbands not to repeat violence after attending the session(s).

Conclusion: In a context characterized by low self-confidence, lack of opportunity to talk about violence, and absence of professional mental health counselling services, this initiative looks promising enough to warrant further testing.

Conceptualizing Relationship between Disaster and Health Security

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Background: Rapid increase in the frequency and intensity of natural disasters in Bangladesh is evident. In a resource-poor context, impact of disasters on health is well-documented. However, impact of health on disaster requires further exploration. This paper is based on a study that explored the local knowledge on health security to develop a health-security framework for the disaster-preparedness programme. Although disaster in Bangladesh has been studied in various dimensions, very little is known about the community people's perceptions of disaster and its link to health. Conceptualizing disaster from the people's perspective is important to contextualize the problem which is crucial to design any intervention.

Objective: Understand the people's perceptions of disaster and its link to health security.

Methodology: Data were collected through in-depth interview and focus-group discussion from 3 purposively-selected disaster-prone areas in Bangladesh—Matlab, Chakaria, and Nilphamari—which are subsequently known to be flood-cyclone- and draught-prone areas of Bangladesh.

Results: Although the local people indicated the link between health and disaster, they conceptualized health security in terms of good food, livelihood resources, and good income. Access to health facility was considered a minor indicator of health security. The people also differentiated between individual health security and community health security.

Conclusion: There is a need to understand local concepts of health security and the way people relate it to disaster to take any intervention in relation to health and disaster.

Stake and Stakeholders of Healthcare Provision in Chakaria, Bangladesh

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Background: A study conducted in Chakaria, Bangladesh, showed that village doctors are the major source of healthcare in the area. However, in treating patients, 75% of the times they resort to inappropriate practices and even to harmful practices in some cases (7%). Convinced by the important role that the village doctors play in the healthcare of the villagers and the prevalence of inappropriate practices by them, a stakeholder analysis was carried out before designing interventions for harm reduction. This paper reports findings from the stakeholder analysis.

Objective: Identify and assess the importance of groups of people or institutions that may significantly influence the success of the intervention to reduce harmful and inappropriate practices by village doctors.

Methodology: The stakeholders were identified in consultation with the village health post committee of Chakaria, and the union council chairman and its members. The type and level of power of the stakeholders were also assessed in consultation with them. Eleven informal discussions and some informal interviews with various groups in the community, e.g. beneficiaries, care providers, government representatives, civil society, were conducted to investigate their main concerns and level of agreement with the proposal.

Results: All the stakeholders perceived the village doctors as essential part of healthcare in Chakaria. However, most of them expressed concerns about the quality of services provided by these village doctors and felt the need for overall quality improvement interventions for them. The village doctors mentioned the difficulties they faced in improving quality of services. Access to the latest medical information and hands-on training were mentioned as possible solutions. They also expressed concerns about lack of support from the Government in this regard.

Conclusion: The stakeholder analysis helped in finding out the kind of influence—positive or negative—the various stakeholders would have in implementing such an intervention and in developing strategies to get the most effective support possible for the initiative and reduce any obstacle to successful implementation of the programme.

Human Resource Situation for Maternal Health Services in Public-sector Facilities in Bangladesh

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Background: In developing countries, lack of skilled care providers is a major barrier for providing maternal healthcare (MHC) services. In Bangladesh, there is a need to assess the current human resource (HR) situation for strengthening the MHC services.

Objective: Review the availability of MHC service providers in public facilities.

Methodology: Facility audit was performed in 13 medical college hospitals (MCHs), 58 district hospitals (DHs), 70 maternal and child welfare centres (MCWCs), 403 upazilla health complexes (UHCs), and 1,445 upgraded union health and family welfare centres (UHFWCs) in all 64 districts in Bangladesh during November 2007—July 2008. Trained interviewers administered structured questionnaire to interview health managers/ care providers and retrieve records.

Results: Of the sanctioned posts of doctors in the MCHs, DHs, MCWCs, and UHCs, 117.7%, 81.3%, 96.4%, and 71.5% respectively were filled up. In the above facilities, overall, 68.9% of doctors were present on the day of visit. In the MCHs, DHs, and MCWCs of in-positioned doctors, 50.7%, 23.2%, and 24.1% had specialization in obstetrics and gynaecology respectively. Overall, only 57.0% of the in-positioned doctors for anaesthesia had a formal degree. In the MCHs, DHs, MCWCs, and UHCs, of total sanctioned posts for nurses, 112.6%, 89.2%, 183.3%, and 92.8% were filled up respectively. In the UH-FWCs, of the sanctioned posts for sub-assistant community medical officers and family welfare visitors, 72.6% and 91.2% were filled up respectively. On the day of visit, 20.1% and 18.8% of them were absent.

Conclusion: In the MCHs, the posting of MHC service providers was more than sanctioned posts. However, in the DHs, UHCs, and UHFWCs, a large proportion of posts was vacant. Overall, there is a shortage of specialists for MHC services. The study recommends modification of the HR policy for strengthening MHC services in Bangladesh.

11:45 am-12:45 pm (Venue: Green View 1-First Floor)   107 (038)
Scientific Session 2: Diverse Grouping

Prevalence of Sputum Smear-positive Tuberculosis in Kamalapur, an Urban Bangladesh

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Background: The recent report of the World Health Organization on global burden of tuberculosis revealed that Bangladesh ranked the sixth highest among 212 countries in 2008. The report was prepared based on the estimations made in the prevalence survey conducted during 1964-1966 following a fixed mathematical calculation. Since this method of calculation could not reveal the actual extent of tuberculosis (TB) in Bangladesh, a prevalence study was conducted in an urban area of Bangladesh.

Objective: Determine the prevalence of sputum smear-positive TB in an urban area in Bangladesh.

Methodology: A TB surveillance system was established at Kamlapur in 2004 tagged with the existing health and demographic surveillance system of ICDDR,B. Trained interviewers visited all households under the surveillance once every 3 months and interviewed all individuals aged ≥15 years to identify suspected TB cases (cough for >21 days), and sputum specimens of suspected cases were collected and examined for acid fast-bacilli (AFB) to determine sputum smear-positive TB.

Results: Of 42,247 adults (male 50.5%, female 49.5%), 23,473 (male 37.9%, female 62.0%) were interviewed at first contact. Of them, 422 (1.8%) had a persistent cough for >21 days. The prevalence of persistent cough for >21 days was more common among the males than among the females (3.0% vs 1.0%, p<0.001). Sputum specimens from 352 of the 422 persistent cough cases (male 84.0%, female 82.2%) were examined for AFB; 19 (5.4%) of them were positive for AFB. The positivity was also higher among males (6.2%) than among females (4.0%). The population-based prevalence of smear-positive TB was 97/100,000 (95% confidence interval [CI] 57-137) among the people aged ≥15 years, and this was more than 4 times higher among males (187/100,000, 95% CI 97-277) than among females (42/100,000, 95% CI 9-75).

Conclusion: The burden of TB among urban population requires appropriate measures to control TB in Bangladesh. The higher prevalence of persistent cough and sputum smear-positive TB among males need further exploration.

Training on Diagnosis and Treatment of Leprosy to General Health Workers for Reducing Wrong Diagnosis and Re-registration at Primary Health Centre Level

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Background: A study was carried out in 9 Primary Health Centres (PHCs) of Munger district, Bihar, India, which showed the success of training in diagnosis and treatment skills of government health workers at the PHC level. It improved the quality of diagnosis of leprosy cases and reduced the re-registration and recycling of old cases.

Objective: Improve the diagnostic skills and treatment of leprosy cases at the PHC level to reduce wrong diagnosis and incidence of re-registration.

Methodology: An evaluation was carried out in the 9 PHCs of Munger, Bihar, India, after the second Modified Leprosy Elimination Campaign. The results indicated that wrong diagnosis was made in 22% of cases among newly-registered patients by health workers at the PHCs. Immediately after this campaign, the training programmes were conducted at these 9 PHCs in Munger district for their health workers. The training programme was for medical officer, supervisors, multipurpose health workers (male and female), and pharmacists with different objectives. Follow-up training was also given after 6 months. After completion of the training programme, one year's data from the 9 PHCs were collected and evaluated by the research team.

Results: Diagnostic skills and treatment of leprosy cases significantly improved among those care providers who received the training. The wrong diagnosis reduced from 22% to 1.3% in the newly-registered cases.

Conclusion: The results indicate that training to the general health workers can enhance their diagnostic skills and performance at the PHC level. It reduces the incidence of wrong diagnosis and re-registration of old cases.

Antibody Responses to *Escherichia coli* O157 Lipopolysaccharide among Healthy Population in Bangladesh

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Background: Shiga toxin-producing *Escherichia coli* (STEC) O157 are significant foodborne pathogens that are capable of causing severe gastrointestinal diseases, including haemolytic-uraemic syndrome. Domestic ruminants are considered the main reservoirs of these organisms. There is a lack of STEC O157 infections among diarrhoeal patients in Bangladesh, although these organisms are highly prevalent in animal reservoirs and in the human food-chain.

Objective: Determine the serum antibody response against STEC O157 lipopolysaccharide (LPS) among healthy population in Bangladesh.

Methodology: Sera from 233 blood samples were collected from different groups of people, including butchers from both urban (n=42) and rural areas (n=91), household members of butchers (n=9), and people with other occupations (n=91). LPS from STEC O157:H7 strain (NCTC 12079) were prepared by hot-phenol extraction method, and antibody responses against STEC O157 was detected by Western blotting analysis of the LPS with serum samples.

Results: Of the 233 serum samples, 116 (50%) had antibodies (IgG, IgA and/or IgM) to STEC O157 LPS. Antibody classification showed that all 116 samples, positive for polyvalent antibodies, were positive for IgG, and 87 were also positive for IgM. Among 9 household members of butchers involved in other occupations, 5 showed positive antibody response. Of the 133 serum samples collected from butchers, 54 (41%) were antibody-positive. Among participants other than butchers and their family members, 57 (63%) showed a positive antibody response, which was significantly higher than that of butchers (p<0.05). Use of water from municipal water-supply system or other contaminated water sources for drinking and washing was associated with a positive antibody response to *E. coli* O157 significantly among urban population than rural population (p<0.001).

Conclusion: The lack of STEC O157 infection among Bangladeshi population might be attributable to the protective immunity against these pathogens acquired by the frequent exposure to the antigens.

Cytotoxic, Enterotoxic and Paralytic/Lethal Effects of Shiga Toxin (Stx2d)-producing *Escherichia coli* Isolated from a Patient in Bangladesh

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Background: Shiga toxin (Stx)-producing *Escherichia coli* (STEC)-associated infections can be asymptomatic or present clinical manifestations, including diarrhoea, haemorrhagic colitis, and haemolytic-uraemic syndrome (HUS). Human STEC strains produce Stx1, Stx2, or Stx2 variants alone or in combination. The role of these bacterial toxins in producing clinical manifestations still remains unknown. In this report, it is demonstrated that Stx2d-producing *E. coli* exhibit not only the cytotoxic activity but also impair neurological function in mice.

Objective: Intend to establish the role of Shiga toxin (Stx2d) in developing clinical manifestation in shigellosis, using mammalian cell culture and animal model.

Methodology: A Shiga toxin (Stx2d)-producing *E. coli* strain was isolated from a diarrhoeal patient from 2% sample surveillance in the Dhaka Hospital of ICDDR,B using standard laboratory procedure, confirmed, and characterized serologically and by polymerase chain reaction (PCR) respectively. Toxin(s) preparations involved 40%, 60%, and 80% saturation of the culture supernatant with ammonium sulphate. Cytotoxic, enterotoxic and paralytic/lethal activities were tested in HeLa cell, rabbit ileal loops, and Swiss albino mice respectively. Histopathological study of the rabbit loop segments and different organs of mice were performed.

Results: Treatment of the toxin fractions in HeLa cell showed strong cytotoxic effects. Fluid accumulation accompanied by mucosal haemorrhages was observed in the rabbit ileal loops. The ileal loop segments showed moderate inflammation in mucosa, sub-mucosa, and enterocyte necrosis and shearing off tip of villi. Toxic effect appeared after 30 hours, hind limb paralysis, and rapid breathing were observed, and all mice died within 36 hours. In the histopathological study, kidney, spinal cord, and brain-tissue exhibited remarkable changes. The tubular epithelial cells showed degenerative, necrotic change, and a few tubular dilatations in cortical area. Spinal cord-tissue revealed a moderate number of congested blood vessels, larger foci of micro-haemorrhage, and separated cord-tissue fragments and brain-tissue revealed a moderate number of congested blood vessels, larger foci of micro-haemorrhage, swelling of endothelial cell, and sub-endothelial gap whereas liver-tissue did not show change.

Conclusion: The Stx2d toxin(s) produced by *E. coli* showed a cytotoxic and enterotoxic activity. The toxin(s) also showed a strong paralytic/lethal activity in mice and finally death within 36 hours. The mouse-model results are consistent with clinical abnormalities in shigellosis in humans.

POSTER PRESENTATIONS
Day 1: Tuesday, 10 February 2009
Service Delivery

Challenges and Opportunites in Tuberculusis Control in Garment Factories in Dhaka, Bangladesh

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Background: Employees in garment factories in Dhaka, Bangladesh, often work in crowded rooms with poor sanitation and unventilated housing structures, creating an ideal condition for the spread of tuberculosis (TB) infection. Past outreach programmes demonstrated low case-detection due to the challenges of gaining management commitment and easing workers' fear of losing job.

Objective: Identify remedial factors, opportunities, and feasible recommendations in increasing the detection and treatment of TB cases in garment factories.

Methodology: The study was conducted in 6 garment factories in Mirpur and Dhanmondi areas of Dhaka city. Eighty male and female general garment factory workers were randomly surveyed from 3 factories. Fifteen TB patients with different gender, marital status, and background were purposively selected for case studies, and in-depth interviews were conducted to explore perceptions about TB, healthcare-seeking behaviour, stigma, treatment experience, and workplace-related challenges and to document their suggestions. Nineteen factory managers from all 6 garment factories and 10 members of the BRAC TB Control Programme staff participated in individually-organized in-depth interview sessions.

Results: Overall analysis of data revealed that both male and female garment workers in the garment factories in Dhaka had limited knowledge about TB. While workers and TB patients in the garment factories were aware of the impact of TB, drive for diagnosis was challenged by fear of losing jobs, being forced to take leave without pay, or stigma from colleagues. Unmarried women were most affected by stigma. TB-control activities in the garment factories were characterized by limited and sporadic activities. Senior management was either in denial or largely ignorant of TB as a disease. Provision of health services to workers was influenced by buyers' compliance policy, conservative attitudes of owners towards workers, and male dominance of the management.

Conclusion: To further strengthen the TB-control programmes in garment factories, effective advocacy and social mobilization among factory management and workers, greater efforts to increase general heath compliance, and priority to patients' privacy are needed. More comprehensive studies are also needed to have a better understanding of the trends and existing situation of TB in garment factories.

Effect of Strengthening the Community's Response to Manage Health Issues on Increasing Institutional Deliveries in Munger District of Bihar, India

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Background: The rate of institutional deliveries at the government health system in Munger district of Bihar, India, is only 5.1%,—one of the lowest in Bihar. The maternal mortality ratio (MMR) in Bihar is 371 per 100,000 livebirths, which is the fourth highest in the country. The high level of MMR can be attributed to low level of institutional/supervised deliveries, high level of anaemia among women, and low level of full antenatal coverage and care.

Objective: Study the impact of community-level planning and developing the community linkages with the public-health system on increasing the number of institutional deliveries in the district.

Methodology: The community-level health planning, IEC/BCC activities, and capacity-building of general health staff and community volunteers were done for a year in 6 of the 13 blocks of the districts. The number of institutional deliveries were recorded and compared in the following year for the intervention and non-intervention areas.

Results: The rate of increase in the number of institutional deliveries in the intervention area was 35% more than the member of institutional deliveries in the non-intervention area. In total, 12,920 deliveries took place in one year in the intervention area and 8,390 deliveries in the non-intervention area. The population of the intervention and the non-intervention area is 806,828 and 602,235 respectively.

Conclusion: The community has the ability to manage their contemporary health issues if it is empowered with knowledge and skills to identify the problem and generate action from within.

Introducing MNCH Care Providers and Facilities in Rural Bangladesh: Findings from a Formative Study

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Background: BRAC has initiated a community-based health intervention for reducing maternal, neonatal and child mortality in rural Bangladesh (Rural MNCH Programme). Research and Evaluation Division of BRAC undertook a formative research for identifying different service providers and facilities involved in providing MNCH-related services in rural Bangladesh.

Objective: Investigate existing healthcare providers and facilities delivering MNCH services in 2 selected rural areas of Bangladesh.

Methodology: The study followed qualitative methods, such as social mapping, free-listing, in-depth interview, focus-group discussion, and observation. Purposive, snowball and convenient sampling method was used for data collection. Two unions were selected from 2 different subdistricts of Gaibandha and Mymensingh where the BRAC's Health Programme (BHP) has already initiated a rural MNCH project. Two types of respondents were interviewed for collecting primary data. These were at the beneficiaries and provider levels.

Results: In Vatgram union of Gaibandha district, both public and private sectors were involved in providing MNCH care. The majority of the villagers were used to seek MNCH care from traditional healers (193 birth attendants, of whom 49 were trained TBAs, 144 untrained TBAs, 74 faith healers, and 27 kabiraj), including homeopathic doctors (n=19), and village doctors (n=43). They sought the help of government and private allopathic facilities only in the case of complications. However, they did not have a favourable attitude towards these facilities as they thought that these were not adequately prepared to deal with such complications.

Conclusion: These preliminary results indicate that MNCH-related healthcare facilities available to them are insufficient and that modern healthcare facilities are not easily accessible.

Equitable Delivery of Maternity Services in Rural Bangladesh: An Evaluation of LAMB Target Unions

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Background: Studies in many countries, including Bangladesh, show that a large disparity exists in access to maternity health service between the lowest and the highest wealth quintile. Even training the skilled birth attendants (SBAs) to conduct deliveries in home in rural communities does not necessarily remove this disparity. The LAMB Community Health and Development project seeks to provide maternity care for all women through appropriate and accessible services, subsidized for the poor.

Objective: Evaluate the effect of a community-based maternal-child health delivery and referral system to provide equitable health services.

Methodology: Maternity service-use antenatal care (ANC and delivery) was analyzed by the wealth quintile for 1,500 women who delivered in 6 LAMB community target unions in Rangpur and Dinajpur district in 2007. Outcomes were compared with Bangladesh country data from the 2001 Maternal Health Services and Maternal Mortality Survey. Relative risk (RR) and 95% confidence intervals (CIs) were calculated using the Intercooled Stata software (version 9.0).

Results: Preliminary univariate analysis of the LAMB sample showed that women in the highest wealth quintile were 40% more likely to have at least one ANC visit compared to the lowest quintile (RR 1.39, 95% CI 1.15-1.69) while, in the Bangladesh figures for 2001, the highest wealth quintile was 2.5 times more likely to have at least one ANC visit (RR 2.50, 95% CI 2.42-2.58). Analysis of LAMB delivery data showed that women in the highest wealth quintile were twice as likely to have a SBA compared to women in the lowest quintile (RR 1.98, 95% CI 1.22-3.21) compared to the Bangladesh figures for 2001 where women in the highest quintile were over 10 times as likely to use an SBA compared to women in the lowest quintile (RR 10.38, 95% CI 9.34-11.53).

Conclusion: A system which provides appropriate care in the community, a working referral system, and subsidy for the poor can decrease the disparity in access to healthcare between the rich and the poor.

Exclusion or Inclusion of the Urban Poor in Urban Primary Healthcare Project in Bangladesh?

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Background: Most studies, such as those of Paler (2000) and Mills (1998), deal with cost-effective analysis of healthcare service contracting out from public to private sectors in terms of efficiency, accountability, and good management of healthcare services. The issues, such as quality of services, beneficiary pattern, and impact of newly-imposed user-fee on the poor and on the marginal non-poor are missing in these studies.

Objective: Explore and understand how targeting happens with what effect in terms of in/exclusion in the Project in Rajshahi, Bangladesh and find out how people's belief, perceptions, and attitudes towards illness influence healthcare-seeking behaviour.

Methodology: Both primary and secondary sources of information were used in the study. Primary data were collected through questionnaire interview. Household heads (either male or female) of 2 particular areas where the centre is situated were the main targets. This interview was administered for 4 weeks in August 2006. Multistage sampling for site selection and purposive sampling for carrying out a household survey were used. Fifty-six and 64 household heads, respectively, in Budpara and Naodapara were interviewed.

Results: Both external and internal factors relating to the project influenced the use-rate of services of the UPHCP centre. People's existing belief, perceptions, and attitudes on healthcare-seeking behaviour and past dependence on existing local healthcare service providers, such as pharmacy, influenced their attitude towards the UPHCP centre. Moreover, most respondents, particularly the poor, highlighted unsuitability of time set-up of the centre, double financial burdens (both treatment and medicine cost), and poor-quality services as the main factors for not availing of services.

Conclusion: The urban poor seem to be excluded from the benefits of the project for leakage (that means inclusion error) in Rajshahi city. The circulation of more information about the UPHCP centre by media and changing time set-up of the centre will attract the poor to avail of healthcare services more than before.

Divisional Variations in Safe Maternal Delivery Practices in Bangladesh: A Logistic Regression Analysis

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Background: Although a vast infrastructure exists to provide maternal healthcare, rates of maternal mortality are still very high in Bangladesh. This study would provide a basis to evaluate the effectiveness of the existing systems and to make future policy decisions, with a view to reducing maternal morbidity and mortality in Bangladesh so that the country would be able to reach the Millennium Development Goals (MDGs) target by 2015.

Objective: Determine the effectiveness of the existing safe-delivery facilities in 6 divisions of Bangladesh and also investigate the effects of some selected factors in taking assistance from medically-trained persons, such as doctors, trained nurses or midwives, or family welfare visitors during delivery.

Methodology: Data for the study were drawn from the Bangladesh Demographic and Health Survey (BDHS) 2004. The study was executed separately for 6 administrative divisions for the 5-year period preceding the survey, having an eligible woman with one or more child(ren). Well-known statistical tools, such as Pearson chi-square test and logistic regression model, were used for analyzing data.

Results: It is apparent from the study that the overall performance of respondents of 6 divisions towards safe delivery practices was very low. The divisional variations were also clearly evident in the study. Respondents' and their husbands' education, place of residence, electrification, husbands' occupational status, and respondents' exposures to mass media were significantly (p<0.001) associated with the delivery assistance taken from medically-trained persons. The probability of safe maternal delivery practice increased with the increase in education for both respondents and their husbands. Rural respondents were less likely to go for safe delivery practices than urban respondents. Non-Muslims were more ahead to safe maternal delivery than Muslims, except for Rajshahi division. Electrification increased the probability of safe delivery practices. At the same time, these factors had a significant (p<0.01) influence on safe maternal delivery practices.

Conclusion: The results indicate that education, urbanization, and electrification encourage women to deliver with assistance from medically-trained persons. Quality education to all and planned urbanization can, in turn, reduce the probability of mortality of mothers and their newborn babies.

Increasing Uterotonic Coverage through Community-based Prevention of Postpartum Haemorrhage with Misoprostol

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Background: In Nepal, maternal mortality is unacceptably high, and the principal cause is postpartum haemorrhage (PPH); 81% of women deliver at home without assistance from skilled birth attendants (SBAs) and oxytocin injection is, therefore, not available. Community-based distribution of oral misoprostol (600 mg) is an alternative to widely-expanded uterotonic coverage, where injection oxytocin is unavailable. Female Community Health Workers (FCHVs) distributed misoprostol (600 mg) to pregnant women, counselling on timing of use, dose, side-effects, and prompt care-seeking if heavy bleeding occurs. They also counselled women, encouraging institutional delivery. During postnatal home-visit, the FCHVs confirmed the use of misoprostol, noted symptoms experienced at delivery (including bleeding), and recovered unused misoprostol. Programme performance was assessed using a detailed project-monitoring system and pre- and post-surveys of households.

Objective: Test the feasibility of an approach, a pilot project was implemented in Banke district of Nepal from November 2005 to June 2007.

Methodology: A cluster sampling was designed to compare outcomes before and after the intervention.

Results: A woman was considered to be protected from PPH if she (a) takes misoprostol (600 mg) given by FCHVs, or (b) delivers in presence of an SBA, either at home or in health facility. SBAs provided injection oxytocin when they assisted for delivery both at health facilities and home. The results showed a significant increase in PPH protection. Uterotonic coverage of oxytocin was only 10.6% before the intervention which increased to 90.1% (12.1% oxytocin and 73.0% misoprostol) after the intervention.

Conclusion: The results offer compelling evidence of the effectiveness of a community-based intervention to prevent PPH. Integrated approaches of oxytocin by SBAs and misoprostol distribution by FCHVs were effective to increase uterotonic coverage. Distribution of misoprostol by FCHVs was feasible, safe, and acceptable to women. PPH education achieved a high degree of correct use and safety.

Characteristics of Attendants Assisting Women at Childbirth during Domiciliary Delivery in Rural Community of Bangladesh

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Background: Every pregnancy needs special care for a healthy outcome relating to both mother and baby. In Bangladesh, about 75% of pregnant women do not receive antenatal care, and more than 90% of deliveries are conducted in home and do not receive assistance from a trained attendant. It is well-understood that modern obstetrical care is yet to reach the village level, the population of which will continue to depend on traditional birth attendants (TBAs) for years to come.

Objective: Identify the characteristics of attendants assisting women at childbirth during domiciliary delivery and explore the perceptions of mothers regarding delivery in the rural community of Bangladesh.

Methodology: This cross-sectional community-based study, with retrospective collection of data regarding characteristics of attendants assisting mothers during childbirth and their perceptions regarding delivery, was carried out during January-June 2005 in one randomly-selected rural union of Dhaka district. Seventy mothers were randomly selected from the targeted population. Information was collected through face-to-face interview of respondents using a structured questionnaire.

Results: Of the 70 mothers interviewed, 55% were aged 20-30 years. Most (88%) of the respondents were illiterate and from low-income group. More than 81% perceived delivery in home to be convenient because of 'familiar surrounding', less mental tension (3.4%), less chance of infection (1.7%), and others (13.6%); 74.3% need not feel for hospital delivery. Only 11% of deliveries (n=8) were conducted by trained TBAs, 82.8% by untrained *dais*, and 5.8% by elderly family members or relatives. Of the trained TBAs (n=8), 50% were trained from the government training programme and 50% from other sources. 50% of birth attendants (n=35) had over 20 years of delivery practice, 40% had 10-20 years, and others had experience of less than 5 years. Boiled blade and thread were used in all the cases for umbilical cord-cutting and tying. Only trained TBAs used delivery-kits. Around 17% of the mothers reported having complications during the last delivery, such as postpartum haemorrhage and puerperal sepsis (41.7%), eclampsia (16.7%), and retained placenta (25%); of them, 83% were referred to upazila health complexes or other referral centres.

Conclusion: The findings reflect that trained TBAs are still inadequate, and their use is poor in the rural community. Improving training of TBAs, general awareness regarding antenatal and postnatal care, their complications, and consequences would improve domiciliary delivery care in rural areas.

Are Bangladeshi Student Nurses Getting Enough Scope for Practical Training?

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Background: Use of skilled birth attendants (SBAs) is one of the major strategies to reduce maternal and neonatal mortality in Bangladesh. There is no midwifery cadre in the country, and doctors are rarely involved in the provision of essential maternal and newborn care services. Nurses with diploma have 4-year training and, by definition, qualify as SBAs as they have a one-year theoretical and practical training on midwifery.

Objective: Explore the process of training on maternal and neonatal health (MNH) component as per course curriculum (quality of teaching process—theoretical and practical).

Methodology: Data were collected during February-August 2008 from the Nursing Training Centre (NTC), medical college hospitals, and district hospitals of Khulna and Sylhet in Bangladesh. Non-participatory observation was the key tool used for understanding what the student nurses are actually learning and how far they can expose with maternal and newborn care services in the hospital ward. Semi-structured in-depth interview and focus-group discussion with 4th year student nurses were conducted to know the limitations and advantage of the training programme.

Results: The findings revealed that the training process lacked adequate scope for practical training. Student nurses were not getting enough delivery cases for clinical practices that they learned from theoretical classes. The reasons identified were shortage of qualified (diploma-holder) nurses in hospital wards, and student nurses have to work in different wards whereas they were supposed to work in the labour ward during their 4th year midwifery training course. Medical college hospital is the training hub for trainee doctors but the number of patients in the labour ward was not enough to meet the requirement of trainee nurses and doctors. Lack of coordination between NTCs and hospital management was also responsible for not getting enough scope to work in the labour ward and conduct delivery by student nurses.

Conclusion: To ensure emergency obstetric and essential newborn care and to provide quality care services, scope for adequate practical training for student nurses need to be strengthened. The nurses with diploma are a potential workforce to provide skilled and emergency basic obstetric and essential newborn care in Bangladesh.

Assessment of Nursing/Midwifery Management Capacities of Gujarat State, India

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Background: High maternal mortality and morbidity is a serious concern in India. To address this, public-health managers have recognized that nursing/midwifery services are the backbone. Organizing effective nursing care at the community and institutions necessarily needs good management in health system and administrative practices. This aspect is somewhere lacking in the Indian health management system.

Objective: Identify the strengths and limitations in the nursing management capacities to deliver maternal health services.

Methodology: Primary data were collected and compiled through 16 in-depth interviews of nursing professionals. Secondary data were collected from the health department's documents. Two major indicators were reviewed with a gender perspective: policy/organization and human resources in Gujarat state of India.

Results: The major findings showed that the nursing cadre was not properly represented at the policy level. There was no specific policy for recruitment, transfer, or promotions of the nursing professionals. Pay-scales were very low. Nursing students were not being given proper hospital-based training compared to those who had their nursing education 2-3 decades ago, especially in delivering maternal healthcare. The State Institute of Health and Family Welfare played limited role in the training of nursing professionals as their role was limited to training female health workers. The nursing profession did not receive its deserved professional status; adversely, they were facing gender discrimination and sexual harassment at workplace.

Conclusion: The study proposes a new organizational structure at the policy level. The Government should come up with regulations for health institutions in terms of recruiting trained and qualified professionals. There should be specific recruitment, transfer, and promotion policy for the nursing professionals. The study recommends that all nursing schools and colleges be linked to rural health institutions to provide hands-on training in conducting deliveries. The field-level nursing staff should be provided with proper housing with a water facility, a vehicle to travel, and an attendant to assist. There should be continuous on-the-job training on contemporary issues. The prevalence of gender discrimination and sexual harassment at the workplace should be addressed through a committee.

Work-related Injuries among Staff Working at Dhaka Hospital of ICDDR,B

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Background: Work-related injuries are rarely investigated and reported from developing countries, and the authors are unaware of any hospital survey reports from Bangladesh.

Objective: Assess the magnitude of the problem of work-related injuries among staff of the Dhaka Hospital of ICDDR,B and assess their knowledge about and attitudes towards this problem in a preliminary study.

Methodology: A confidential, 18-item questionnaire for self-administration was distributed to 212 staff members of different categories in June 2008. The questionnaire included exposure to work-related injuries other than needle-stick injury for which a separate survey was earlier done.

Results: In total, 137 (65%) staff members, which included doctors (n=24), nurses (n=37), housekeeping staff (n=25), and other staff (51), such as clinical health workers, kitchen staff, and office assistants, responded to the questionnaire. Forty-eight (35%) of them reported at least one incidence of work-related injury in their job while 31 (23%) reported multiple incidences. The types of work-related injuries included bumping with other persons in rush hours (10%), scald due to splashing of hot rice-ORS over body (7%), squeezing of fingers in doors (4%), muscle sprain from slipping on wet floor (3%), fall on wet floor (3%), cut injury in hospital kitchen (4%), and ill-defined injuries while lifting objects (3%). 60% of the staff members reported to the staff clinic following work-related injuries, and of them, 40% had taken first-aid measures on their own initiatives before reporting to the staff clinic. 55% of the staff members considered that regular surveillance and research could reduce work-related injuries.

Conclusion: Work-related injuries are quite common among staff working at the Dhaka Hospital of ICDDR,B. Developing standards, guidelines, and policies for pre-employment screening, preventive measures, training, and education may help minimize work-related injuries and associated costs.

Accreditation of Medical Laboratory Services in Bangladesh

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Background: Although newspapers and other media focus on dissatisfactions of patients on medical laboratory reports, no field-level study has so far been performed.

Objective: Understand the role of medical laboratory technologists (MLTs) in diagnostic services.

Methodology: The study was conducted in Dhaka among randomly-selected MLTs (n=96) during March-August 2008 to explore their status, activity profile and satisfaction-level using a pre-structured questionnaire.

Results: Of the 96 respondents, 50% from the upazila-level health centres performed all pathological tests and one-third from the district-level hospitals completed tests, and the reports were signed by the in-charge. The remaining respondents from the division-level health institutions performed their activities; however, 20-25% of tests were guided/ performed by the respective field specialists. They played vital roles in diagnostic services (laboratory test performance). The respondents were not satisfied on their current position. The underlying factors linked to dissatisfaction of the MLTs included: no higher education in the respective fields and low status. There was no evaluation/accreditation system for medical diagnostic services.

Conclusion: Medical technology education is not satisfactory. Dissatisfaction of MLTs is related to the evaluation system, which is fully absent. To bring the patients' confidence on and satisfaction with medical laboratory reports, there is a need to set an accreditation system of laboratory services and continuous development activities for MLTs. More studies on the subject are needed.

Fitra Fund: Local Initiative Supporting Healthcare Access for the Poorest

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Background: Community Clinics in Bangladesh were to charge user-fees, which would stay local and support improved quality of healthcare. However, developing effective cross-subsidization schemes as a mechanism for achieving financial sustainability is complex. Demand-side financing (DSF) benefits the poorest but requires outside resources from taxes or donor funds. Sustainable initiatives require local planning by highly-influential religious leaders or freedom fighters.

Objective: Describe a locally-initiated and managed subsidy-source receiving NGO logistic support but no funds and explore historical and current issues, such as overcoming barriers to transparency. Future plans include increasing funds for local use, and serving as a model programme for roll-out of ideas.

Methodology: This is a descriptive qualitative case study of a local initiative using review of written documents, key-informant interviews, and focus-group discussions.

Results: As part of community-managed healthcare the LAMB-PLAN partnership operationalized several government-built community clinics. Fees were charged but initially some local residents were turned away because of inability to pay. The clinic management committee investigated possibilities, eventually forming a poor fund committee. Their basic plan was to collect pledges of 1 taka/household/month, portions of *fitra/chamra* (donations in cash or leather of animals sacrificed during Eid-ul Azha, distinct from *zakaat* meant for traditionally for beggars), and *puja* offerings. LAMB staff and volunteers collected the money, with Poor Fund Committee members responsible for deposit and withdrawal of the money. As local poor residents apply, their local religious leaders certify their need, and disbursement of the amounts are decided by the freedom fighter chairman. At the Annual General Meeting, finances and procedures are reviewed, with any participant able to ask for information on specific patients. The community considers this local money to be used for the local people.

Conclusion: Collections of money from *fitra* paid to mosques, *puja* offerings at temples, or philanthropic donations to churches can be used for social security in subsidising healthcare for the poorest. The responsible Bhabki Poor Fund Committee wants to increase their available funds. They took the opportunity to present their story to primary healthcare authorities (Programme Manager, Child Affairs and Support Services with confidence to invite visitors to see their model programme.

Improving Access to Maternal and Child Health Services through Community-based Health Financing

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Background: Lack of transportation and cost of health services are major barriers to care-seeking, especially in rural Bangladesh. The distance to health facilities, lack of available vehicles, high cost of transportation, and lack of funds during an emergency contribute to low use of health services. Community-based health financing is a critical component in increasing access to healthcare in poor countries.

Objectives: Describe the creation and use of a self-managed, community-based health-financing scheme in rural Bangladesh.

Methodology: A community-based health financing scheme, called the emergency health fund (EHF), was developed by 3 community-based organizations (CBOs) in 3 unions of Netrokona district of Bangladesh, covering a population of 89,000. CBO members voluntarily contributed 2 taka (~0.03 US$) each month to a community-managed bank account. CBO members, trained traditional birth attendants, and community health volunteers were permitted to apply for interest-free loans on behalf of the general population. The existing funds and the number of emergency referrals made were monitored on a monthly basis. A population-based maternal and child health survey was conducted at baseline (January 2005) and at mid-term (January 2007) to assess care-seeking behaviour using 30-cluster random sampling.

Results: Two years after the creation of the EHF, the percentage of children aged 0-23 month(s) whose mothers sought advice/treatment increased from 78% to 94% for diarrhoea and from 8% to 19% for pneumonia. During the 2-year period, the total amount of money collected was Tk 30,862 (~455 US$), and the total amount distributed for emergency purposes was Tk 20,266 (~298 US$) with each loan ranging from Tk 300 to 4,000 (~4 to 58 US$). Twenty-nine people received loans from the EHF, including 18 women aged 15-49 years and 11 children aged less than 5 years. The types of services received included severe pneumonia, burn, postnatal complications, delivery-related complications, cancer, asthma, and malaria. Of the 29 loans distributed, 100% started and 48% completed repayments.

Conclusion: The community-led initiative to create the EHF was associated with an increase in care-seeking for children with diarrhoea or pneumonia.

Willingness to Pay for Water in Bangladesh: A Contingent Valuation Study

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Background: In many developing countries, quality of drinking-water is a serious public-health problem, and people are often exposed to untreated water which is responsible for a large incidence of chronic diseases. Clean water yields positive dividends in terms of ecosystem, health, quality of life for humans, and economic prosperity. As of 2006 in Bangladesh, about 78% of the rural population has sustainable access to improved drinking-water sources compared to 85% of the urban population (WHOSIS).

Objective: (a) Compute the household's willingness to pay (WTP) and (b) identify the factors that affect households' decision for a new water source to ensure safe drinking-water (through affordable monthly payment) in Bangladesh.

Methodology: In total, 44,993 households from 75 upazilas under the BRAC's WASH programme were surveyed by Research and Evaluation Division of BRAC. Data were collected on demography, socioeconomic status, access to and status of water supply and sanitation, hygiene knowledge, and spot-observation by the enumerator collecting information on sanitation facility, water source, and surroundings of the household. Data were also collected on the household's willingness to pay for a new water source and a new hygiene sanitation facility using the contingent valuation method. For the purpose of the current study, 18,563 households were selected.

Results: The study used censored Tobit model since the dependent variable (monthly WTP) contained a lot of zero values, and the household that bid had a lower and upper bound. The independent variables as key determinant of WTP were: household members, sex of household head, education of household head, water availability, incidence of diarrhoea, permanent water source, NGO membership, interest in own tubewell, quartile of awareness level, and asset quartile. All the variables were statistically significant at 5% level of significance, except for medium awareness which was significant at 10%. All the variables had a positive association with WTP, with the exception of water availability and permanent water source as expected.

Conclusion: The mean WTP for a new water source is below the initial capital cost and operation and maintenance costs as estimated by in an earlier study. In such a case, the Government could carry out awareness-raising activities and also provide sufficient subsidy and/or credit facility to households for a new safe water source.

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HIV/AIDS Risk Behaviour of Male and Female Intravenous Drug-users Attending Drug Treatment Facilities in Dhaka, Bangladesh

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Background: In many countries around the globe, drug-users, particularly intravenous-injecting drug-users, play the key role at the initial stage in the HIV epidemic. Bangladesh is vulnerable to an expanded HIV epidemic due to the prevalence of risk factors that facilitate the rapid spread of HIV, including the large commercial sex industry and needle-sharing among intravenous drug-users.

Objective: Assess HIV/AIDS risk behaviour of male and female intravenous drug-users attending to 3 Family Health International (FHI)-funded agencies for availing of drug treatment facilities in Dhaka, Bangladesh.

Methodology: This descriptive cross-sectional study was conducted among purposively-selected 334 male and female intravenous drug-users in Dhaka who came to 3 FHI-funded agencies for availing of treatment facilities during September 2005–May 2006.

Results: The findings explored alarming risk behaviours among the male and female intravenous drug-users. Sharing of needles was common among them. Of the males (n=190) who had ever injected drugs, about one-third shared needles, and about three-fifths of the females (n=144) did the same. After initiating injecting drugs, about 85% of the males suffered from many diseases, such as jaundice, tuberculosis, genital ulcers, fever, and diarrhoea whereas about 98% of the females had reported the same. About 13% of the males versus 48% of the females could mention the correct modes of HIV transmission and prevention. Only one in 10 male versus one in 5 female respondents knew where to go for a confidential HIV test. Three in every 5 males versus one in every 5 females acknowledged that they were in touch with NGO intervention in the last one year.

Conclusion: Behaviour change communication activities through peer education and outreach workers should be strengthened to reduce misconceptions about HIV transmission and prevention, with more on reducing needle-sharing.

Maternal Enabling Factors Are Associated with Growth of Infants and Young Children in Rural Bangladesh

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Background: Although childcare is an important determinant of child growth, it is less studied, in part, due to lack of indicators appropriate for measuring childcare practices. Measures of maternal enabling factors (MEFs) are essential to ensure adequate childcare as mothers are the primary caregivers in most low-income societies.

Objective: Investigate the association between the MEFs and the growth of infants and young children in rural Bangladesh.

Methodology: Data on 984 pregnant women, enrolled in the Maternal and Infant Nutrition Intervention in Matlab (MINIMat) study in rural Bangladesh during 2001-2005, were analyzed. An MEF scale was created using variables on maternal and household characteristics, such as maternal age, education, nutritional status, workload, violence, household food security, and wealth. Weights and lengths of infants born to these women were converted to anthropometric indices according to the 2006 WHO growth standards. The association between the MEFs and the growth of children was investigated using general linear models adjusting for potential confounders. The attained weights, lengths, and anthropometric indices of children were also compared in different tertiles of the MEF scale.

Results: The mean birthweight and length of the infants compared were 2.7±0.4 kg and 47.8±2.0 cm respectively. About 30% of the 984 infants weighed <2.5 kg at birth. The MEFs were associated ($p<0.001$) with the attained weight, length, and all anthropometric indices of children aged 3-24 months, which were significantly higher ($p< 0.05$) among children in the upper tertiles of MEF than among those in the lower tertiles. The proportions of children who were underweight, stunted, and wasted were lower ($p<0.05$) in the higher tertiles of MEF than in the lower tertiles.

Conclusion: The results provide strong evidence of the positive effects of MEFs on growth of infants and young children in rural Bangladesh. Health systems in low-income countries might benefit from investing resources in interventions for improving and promoting the favourable environment for mothers to ensure optimum child growth to prevent childhood undernutrition.

Health Needs of the People of Saint Martin Island of Bangladesh

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Background: Saint Martin Island, the remotest territory of Bangladesh, is located at southeast corner of Bangladesh, about 40 km from mainland Teknaf. Many aspects of life at the island and some health indicators differ significantly with those of mainland.

Objective: Know about a few health indicators at Saint Martin Island and disseminate these so that the competent authority can take necessary steps for improving the health status of the islanders.

Methodology: This cross-sectional observational study was conducted in 2006. In total, 302 families were selected through a systematic sampling technique. Sample size was determined conveniently considering resources (money, manpower, and time). Trained medical students collected data from the family head or the senior member of the family using a pre-tested mixed-type questionnaire. A coloured measuring-tape was used for the measurement of mid-upper arm circumference (MUAC). Collected data were scrutinized, compiled, and presented with tables and charts.

Results: One-third of the families in the island were surveyed. The average family size was 5.48 persons (rural Chittagong—5.06 in 2002). 28% of the respondents managed their family well. The adult (15 years+) literacy rate was 42% (rural Chittagong—72% in 2002, z-score> 3.89, p<0.0001).

Tubewell was the source of drinking-water (100%). 27% of the families used water-seal latrine (rural Chittagong—80%, z-score >3.89, p<0.0001). The rate of completely-immunized children was 58% (rural Chittagong—78% in 2002, z-score >3.89, p<0.0001). Knowledge, attitudes, and practice relating to infant-feeding was faulty in 30-40% of cases (n=302). 32% (rural Chittagong—16%, z-score >3.89, p<0.0001) of children aged less than 5 years were severely malnourished (MUAC <12.5 cm). The common health problems were: skin diseases (32%), non-communicable diseases (13%), diarrhoeal diseases (7%), and respiratory tract infection (6%). There was no MBBS doctor for over 5,000 people. An MBBS doctor occasionally treated 15% of the cases by in Teknaf.

Conclusion: Achievement of some health indicators, particularly education, sanitation, immunization, and nutrition status of under-5 children was significantly poor compared to those of rural Chittagong. This is due to ignorance, poverty, poor sanitation, and absence of quality-health services. The government and non-government organizations should come forward to improve the situation.

Reducing Delays in Seeking Emergency Obstetric Care: Recognition of Prolonged Labour in Matlab, Bangladesh

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Background: The Government of Bangladesh is committed to reducing maternal mortality by 75% by 2015. The key intervention in maternal mortality reduction is ensuring skilled attendance at delivery and establishing a functioning health system that provides 24-hour access to emergency obstetric care. In Bangladesh, over 85% of women give birth at home with traditional birth attendants (TBAs). In Matlab, ICDDR,B has implemented a maternal and child health programme since 1987. Although the proportion of women delivering in facilities has increased, about 40% of women still give birth at home. Families and TBAs are not able to recognize obstetric complications when these occur, and there are typically delays between the onset of life-threatening complications and appropriate care.

Objective: Explores how women, family members, and traditional and skilled providers identify and respond to prolonged labour, a leading cause of maternal mortality.

Methodology: This study was conducted in the ICDDR,B intervention area in Matlab, during July 2006–January 2007. The study interviewed 100 respondents with successive free-listing using a semi-structured questionnaire to elicit women's spontaneous responses to labour and birth. The proportion of respondents who spontaneously mentioned causes of prolonged labour, care practices, and care-seeking behaviours was calculated.

Results: The signs and symptoms of prolonged labour varied. The respondents often described continuous pain (72%), pain that comes and goes but does not stop (57%), and infrequent pains (55%). Other signs that indicated prolonged labour were: non-progression of the baby's head (61%), rupture of membranes (54%), and cervix remaining closed (51%). Malpresentation and baby being too big were the most frequently-cited (32% and 24% respectively) causes of prolonged labour. Most (95%) described seeking care from a skilled birth attendant, but 39% sought care from a traditional or spiritual healer. Surgery (caesarean section) was cited as the most frequent care practice (95%). The consequences of prolonged labour were death of women (70%) and the need for surgery (69%).

Conclusion: The findings will be incorporated into health messages to strengthen appropriate care-seeking among women with home-births in an effort to strengthen linkages between communities and facilities and ultimately reduce maternal mortality.

Local Model for the Umbilicus in Sylhet, Bangladesh

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Background: Evidence from Nepal suggests that topical application of chlorhexidine in umbilical cord care can considerably reduce neonatal mortality. Another large efficacy-trial and an operational research that is evaluating strategies for delivering chlorhexidine to the households are underway. A local model is presented here for the umbilicus in Sylhet based on the findings of formative research conducted for the operational research study.

Objective: Assess the acceptability of chlorhexidine and also assess the preferences for who would apply it on the umbilical region. Specific objectives included assessing current umbilical and skin care knowledge and practices for neonates in the study sites, including its 'ethnophysiology'.

Methodology: Semi-structured 48 interviews with mothers, family members, and health workers and 3 focus-group discussions with traditional birth attendants, village doctors, and community health workers were conducted. Interviews sought to understand the basic umbilical cord care practices in the community, including people's knowledge regarding umbilicus' functions both before and after delivery.

Results: Ethonoanatomy of the umbilicus in Sylhet suggests that the uterus and the liver are both in the abdomen. The liver is located above the uterus; so, if the uterus is pushed up, it pushes the liver. During pregnancy, the baby is attached by the cord to the placenta. Baby's life is contained in the *khowar* or the placenta. Illness relating to the umbilicus arises through 2 basic mechanisms: cutting the cord too early (cutting before delivery of the placenta) and not keeping the umbilical cord-stump dry. Cutting the cord too early has consequences for both mothers and newborns. Consequence to the mother is that the placenta will retract and hurt the liver while that to a newborn is separation from *khowar* and possibility of contracting a cold/pneumonia. This tends to postpone drying and wrapping since it is seldom-practised before cutting the cord. Also, if not kept dry, umbilicus can become rotten/infected.

Conclusion: The results suggest that people follow a distinct rationale to explain their practices. Given the model of the umbilicus, it is evident that people would resist the suggestion of cutting the cord early, thereby risking postponing of drying and wrapping. Therefore, it is important that programmers and planners pay heed to the local models of knowledge before planning an intervention. A culturally-ssensitive intervention would be moral and more effective.

Monitoring Procedure for Scaling Up of Zinc Treatment for Childhood Diarrhoea

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Background: Diarrhoea remains a leading cause of morbidity and mortality in developing countries. Zinc provides an effective treatment for diarrhoea among under-5 children. Zinc treatment reduces the severity and duration of diarrhoea and the likelihood of future episodes. WHO and UNICEF have jointly recommended zinc as part of routine management of childhood diarrhoea. WHO also recommends zinc treatment for childhood diarrhoea in IMCI. It has been estimated that zinc treatment could save the lives of 75,000 children in Bangladesh and almost 400,000 children globally each year.

Objective: Monitor the impact of a national campaign to scale up zinc treatment for childhood diarrhoea, assess the scaling up and the coverage of zinc treatment, measure the continuous progress of scaling up, find out the barriers to nationwide scaling up of zinc treatment, and develop recommendations on solutions to overcome the barriers.

Methodology: A cross-sectional monitoring surveillance—both pre-and post-launching of activities—was used in tracking the awareness and use of zinc treatment, healthcare-seeking pattern, use of antibiotics, and use of ORS for scaling up of zinc. Four representative population sample strata—slums and non-slums in Dhaka megacity, 3 city corporations, 3 municipalities, and 3 rural areas—were selected. Approximately 3,200 children with an active or recent diarrhoea were enrolled in each survey round.

Results: Scaling up of zinc improved the awareness over the 2-year course of the campaign among caretakers at the rate of 90%, 74%, 66%, and 50% in urban non-slum, municipal, urban slum, and rural population respectively. The use of zinc treatment during diarrhoea did not increase as did awareness. The use of complete doses of zinc treatment increased slowly.

Conclusion: Attempts to scale up any public-health intervention in low- and middle-income countries should be done under rigorous conditions of continual observation and surveillance. Exploring activities of grassroots-level healthcare providers is necessary. Counselling for care providers at all levels, mainly village doctors and medical representatives from pharmaceutical companies, should be reinforced.

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PDA Technology: Quality Information for Decision-making in Bangladesh Health System of the Public Sector

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

Objective: Discuss use of PDA for recording data on diarrhoea, pneumonia, and immunization, and generating quick report and explore its potential use in the Bangladesh health system of the public sector.

Methodology: Hand Base 3.0 Forms 4.0 software was used as a data-collection tool loaded onto iPaq Pocket PC h4000 series of processor Intel® RXA1200 with 56.77 MB RAM and Windows Mobile-2003. Five outreach workers and 2 quality-control interviewers with secondary-level education and without any prior computer experience received 4 days of training on handling of PDA, one week each for field-piloting and refresher training in a selected rural setting. The front-end was designed with range-checks and skip-patterns during data entry and correction of mistakes. Backup support at the end of every interview onto storage-cards in the PDA and collected data were downloaded to computers every week, and feedback reports were used for evaluating accuracy.

Results: The PDAs were well-accepted by both outreach workers and interviewers. No major PDA-related problems or data-loss were encountered. Overall, completeness of data on 11,183 children from November 2007 to August 2008 was over 99%. The errors in recording of date of birth reduced from 10% to 1%, type of diarrhoea from 3% to zero and management from 5% to 1%, and almost same for pneumonia; key punch also reduced to 30%.

Conclusion: Evidence of time-consuming and error-prone process of data-entry and compilation, and improvement in quality of data demonstrates the potential of selective use of PDA in a resource-constraint setting. The frontline supervisors of the Bangladesh health system of the public sector are potential candidates to be trained on lot quality assurance sampling methods, and reported data on immunization, diarrhoea, and pneumonia by outreach workers can be validated at the household level. Validated data can be used for decision-making on corrective measures to improve quality of data and performance of outreach workers. Quality data would contribute to better health policy development in Bangladesh.

Evaluation of Chlorhexidine Introduction
Strategy in Sylhet District, Bangladesh

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Background: Chlorhexidine is a highly potent anti-infective agent. There is now an evidence of the efficacy of umbilical cord-cleansing with topical chlorhexidine as seen in from one trial in Nepal. An additional trial now underway in Sylhet district of Bangladesh will be completed by 2009.

Objective: Examine how topical chlorhexidine can be introduced and promoted as umbilical cord-cleansing agent into widespread use under routine programmatic conditions.

Methodology: This operational research pilot study has been conducted in Mathiura and Tilpara unions, Sylhet, Bangladesh, since April 2008. The study presents results from formative research (May-June 2008), planning workshops (June and October 2008), and monitoring data, and qualitative process documentation results from the first phase of implementation (August-November 2008). In the first phase, chlorhexidine was promoted through project health counsellors, first-level government health facilities, and associated health workers. The project health counsellors organized and facilitated community meetings targeting pregnant women and their husbands. Instructions for chlorhexidine application were distributed to participants at community meetings.

Results: From 16 August to 31 October 2008, the health counsellors observed 266 applications of chlorhexidine to a doll by participants at community meetings. Of these, 31.75% were correctly applied according to the instructions, 74.3% of the particpants washed their hands with soap, and 97.7%, 77.3%, and 99.2% applied chlorhexidine with cotton-balls to the base, stump, and tip respectively. The investigators observed 27 applications of chlorhexidine to the newborns in the home: 84.1% of appliers washed their hands with soap, 100%, 85.2%, and 96.3% applied chlorhexidine to the base, stump, and tip respectively; 59.25% applied chlorhexidine within 24 hours of delivery, and 89.3% applied it daily. In 48% of the cases, the mother made the first application of chlorhexidine. For subsequent applications, the mother was the applier in 71.8% of the cases.

Conclusion: Community meetings, instructions, and active participation by government health-care providers have been critical to motivating communities and raising awareness of chlorhexidine-use for umbilical cord-cleansing in the home. Results of earlier studies indicate that some points of the instructions and data-collection tools need improvement. Therefore, new instructions and evaluation tools were developed and pre-tested to improve promotion and evaluation of chlorhexidine-use in the community.

In-vitro Sensitivity of Secnidazole and Tinidazole Oral Preparations against *Entamoeba histolytica*

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Background: The quality of medicines available in some developing countries is inadequate in terms of content of active ingredients. A previous study with metronidazole tablets from different pharmaceutical industries in Bangladesh has shown these as good as standard metronidazole against clinical isolates of *Entamoeba histolytica*. Other anti-amoebic drugs, such as secnidazole and tinidazole tablets, obtained from different pharmaceutical companies in Bangladesh may also be effective against clinical isolates of *E. histolytica*.

Objective: Evaluate *in-vitro* sensitivity of different brands of secnidazole and tinidazole tablets from different pharmaceutical companies of Bangladesh against clinical isolates of *E. histolytica*.

Methodology: An in-vitro drug sensitivity study was carried out with randomly-selected 3 different brands of secnidazole tablets and one brand of tinidazole tablet collected from different retail medicine shops in Bangladesh. Different concentrations of the standard and the sample secnidazole and tinidazole were prepared. Clinical isolates of *E. histolytica* were harvested from 24 hours old cultures and suspended in an axenic medium (LYI-S-2). The parasite count was adjusted to 3×10^6 parasites/mL in a medium. The samples were assayed by using microtitre plates after treatment with different concentrations of drugs. The viable parasites were counted by haemocytometer. Descriptive statistical analyses were done by one-way ANOVA using the SPSS software (version 12.0); a probability level of 0.05 was considered statistically significant.

Results: The mean viable parasites after treatment with 3 secnidazole samples at the concentration of 4.32 μM were 6±1.00, 7±0.58, and 11±2.08, and none of the differences was significant when compared with standard. Tinidazole tablet inhibited about 89% of *E. histolytica* at the concentrations of 3.2 μM.

Conclusion: The study concludes that all brands of secnidazole tablets inhibit above 80% of *E. histolytica* at different concentrations. However, tinidazole can inhibit about 89% of *E. histolytica* only at higher concentrations. The findings may help raise awareness among physicians to select quality products.

Managing Childhood Illnesses Using Community Health Volunteers in Rural Bangladesh

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Background: Pneumonia and diarrhoea are the leading causes of deaths among children aged less than 5 years, in Bangladesh, accounting for 28% of all deaths. The current community-integrated management of childhood illness (C-IM-CI) strategy in Bangladesh emphasizes the need for strengthening existing facility-based health services. However, in areas where health facilities are inaccessible, care-seeking remains low. Community case management (CCM) is a strategy to deliver curative interventions for serious childhood illnesses at the household level using trained, supervised community members.

Objective: Determine whether community-selected, unpaid community health volunteers (CHVs) can be successfully trained to identify, treat, and refer cases of diarrhoea and pneumonia in children at the household level.

Methodology: In 2005, 90 CHVs were selected by the community and trained in counselling and referral as part of the national C-IMCI strategy. In 2007, 39 of the CHVs received 7 days of additional training from C-IMCI-certified trainers in pneumonia and diarrhoea case management using clinical criteria and algorithms derived from the UNICEF/WHO (2006) guidelines. The CHVs visited 357 children aged less than 2 years in 2 unions of Panchagarh district of Bangladesh from August 2007 to March 2008. The quality of CHV-delivered services was assessed for each case using a C-IMCI checklist developed in collaboration with the Ministry of Health and Family Welfare and the ICDDR,B.

Results: Of 255 cases of childhood illness managed by the CHVs, 25% presented with pneumonia, 72% with diarrhoea, and 3% with both. The CHVs correctly diagnosed and treated diarrhoea and/or pneumonia in 85% of the cases. Although 40% were properly referred to a local heath facility, only 23% were actually taken to a health facility. While 11% of 255 mothers were satisfied with care received from health facilities, 91% were satisfied with CCM services provided by the CHVs. Levels of satisfaction were higher when the CHVs provided direct care to sick children compared to counselling alone.

Conclusion: The integration of CCM by trained CHVs into the national C-IMCI strategy is feasible and shows promise for improved care-delivery to children at risk for pneumonia and diarrhoea in rural Bangladesh.

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Predictors of Post-discharge Deaths among Children Aged Less Than 5 Years Discharged from District Hospitals in the Philippines

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Background: Diarrhoea and pneumonia remain the leading causes of death among children aged less than 5 years. Mortality in these children is determined by several factors, including poverty, pre-existing health conditions, nutritional status, severity upon admission, and clinical management. While hospital care services aim at treating and preventing death of these children, the ability to properly care for acutely-ill children and identify factors that increase likelihood of re-admission and post-discharge mortality has not been adequately studied.

Objective: Identify the predictors of mortality among children with diarrhoea or pneumonia discharged from district hospitals in the Philippines.

Methodology: Using data from the Quality Improvement Demonstration Study, the deaths of 24 children from a cohort of 3,275 who were confined in 30 district hospitals with diarrhoea or pneumonia-related illnesses were investigated. The relative role of socioeconomic and demographic factors, health status, and the quality of care received on the likelihood of post-discharge deaths among these children was determined. Data from those who survived were then compared with those who died, and logistic regression was used for modelling and estimating the determinants of mortality in the study population. Hospital charts of the dead children were also analyzed to corroborate quality scores determined using standardized clinical vignettes.

Results: After controlling for clinical severity, it was observed that children who were sicker based on self-reported health status and whose mothers were less educated had a higher likelihood of post-discharge mortality. It was also observed that longer lengths of stay and lower-quality hospital care, as measured by clinical vignette scores, significantly increased the likelihood of mortality. Hospital charts had less data but corroborated findings from clinical vignettes. Mortality rates in the study population were estimated to decline from 7 to 1 per 1,000 cases if all hospitals met minimum quality thresholds and passed the 55% cut-off score.

Conclusion: The quality of care, as measured using standardized clinical vignettes, may be an easy and effective means to identify where quality can be improved. Better quality appears to offset other mortality risks and, if improved, could substantially reduce deaths from diarrhoea and pneumonia.

Effect of Counselling on Appropriate Exclusive Breastfeeding on Weight Gain of Low-birthweight Babies

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Background: Low birthweight (LBW), defined as a body-weight of less than 2,500 g at birth, is a major problem in Bangladesh where 36% of babies are born with LBW.

Objective: Evaluate the impact of nutrition education on early initiation of breastfeeding, exclusive breastfeeding and growth of low-birthweight babies.

Methodology: The study identified 184 LBW babies and their mothers who attended the Maternal Care and Health Training Institute and Dhaka Medical College Hospital. The subjects were randomly allocated to either intervention or control group. Nutrition education was focused on early initiation of breastfeeding, exclusive breastfeeding during the first six months, and improved food intake by mothers and was delivered in 2 sessions per month for 2 months. The mothers in the intervention group received nutrition counselling for 2 months while the control-group mothers did not receive any education. The nutritional status of the mothers and newborns was assessed through anthropometry performed every 2 weeks.

Results: The rate of early initiation of breastfeeding was significantly higher in the intervention group compared to the control group (62.8% vs 37.2%, p<0.001). The mean initial body-weight and length of the LBW babies was similar in both the groups (2270±182 g vs 2236±262 g, p=0.316 and 43.0±1.3 cm vs 43.0±1.7 cm, p=0.77). Body-weight and length of the LBW babies after 2 months increased significantly in the intervention group compared to the control group (5,166±404 g vs 4,363±408 g, p<0.001 and 50.2±1.3 cm vs 48.7±1.6 cm, p<0.001). The intervention group suffered less from illness compared to the control group (10% vs 66%, p<0.001).

Conclusion: The findings showed that weight and length gain of the LBW babies were significantly increased by nutrition education. Therefore, nutrition education on breastfeeding proves to be a strong tool to reduce the high risk of malnutrition and mortality among LBW babies. Programme implementation is urgently needed.

Structured Neonatal Clinical Sheets—Design and Implementation of a Useful Clinical Tool

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Background: A detailed history and examination is imperative to make an accurate diagnosis and clinically manage any patient. Documenting takes time, and in busy, low-resource, majority world settings in most cases, time is limited. In addition, problem of retaining trained specialist staff in the rural setting and new trainees can magnify the challenge, including their supervision.

Objective: Observe whether the implementation of structured sheets in the neonatal case-records is a useful tool in the busy neonatal unit of a rural comprehensive emergency obstetric care facility in north-west Bangladesh.

Methodology: The neonatal unit of the Lamb Hospital designed and implemented 3 structured sheets: (a) Admission history and examination sheet, (b) Daily progress ward-round sheet, and (c) Discharge diagnosis sheet (based on International Classification of Diseases). The uniform design of all sheets involves circling pre-printed options on the sheet. When the circle is at the left of a vertical dark line, the finding is normal or near-normal. When the circle is at the right of the line, the answer is abnormal. Circles (answers) on the far right of the page are the most serious clinically.

Results: The tools have been found to be useful in several areas. (a) Quality improvement in clinical information—all areas of clinical documentation have become much more detailed and complete. (b) Efficiency increased as circling takes less time than long-hand writing. The pertinent findings can be clearly and easily identified by subsequent medical team members. (c) As a basic teaching job-aid for new doctors as the printed options acts as clinical prompts, and (d) For data entry, the variables can be entered directly by the Management Information System department.

Conclusion: The design was found to be a useful clinical tool in neonates—an efficient model to increase the quality of clinical information which is then readily available for clinical decision-making during the admission and afterwards for data analysis.

Effects of *In-utero* Arsenic Exposure on Child Immunity and Morbidity in Rural Bangladesh

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Background: Chronic exposure to arsenic, a potent carcinogen and toxicant, via drinking-water, is a worldwide public-health problem. Little is known about its early-life effects on immunity.

Objective: Evaluate the impact of *in-utero* exposure on infant immune parameters and morbidity.

Methodology: Pregnant women were enrolled at 6-13 weeks of gestation in Matlab, a rural area of Bangladesh, extensively affected by arsenic contamination in tubewell water. Women (n=140) delivering at local clinics were included in the study. Anthropometry and morbidity data of pregnant women and children, and infant thymic size by sonography were collected. Maternal urine and breastmilk were also collected for immune marker and assessment of arsenic.

Results: Maternal urinary arsenic during pregnancy showed a significant negative correlation with interleukin-7 (IL-7) and lactoferrin (Ltf) in breastmilk and child thymic index. Urinary arsenic was also positively associated with fever and diarrhoea during pregnancy and acute respiratory infections (ARIs) in infants. The effect of arsenic exposure on ARI was only evident in male children.

Conclusion: The findings suggest that *in-utero* arsenic exposure impaired child thymic development and enhanced morbidity, probably via immunosuppression. The effect seemed to be partially gender-dependent. Arsenic exposure also affected breastmilk content of trophic factors and maternal morbidity.

Prevalence of Iron-deficiency Anaemia among Young Children of Rural Bangladesh

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Background: According to a national rural survey, 87% of children aged 6-24 months were anaemic (Hb<110 g/L) in Bangladesh. The main aetiology of anaemia in young children in Bangladesh is reported to be poor dietary iron intake, especially during the period of rapid growth. However, the prevalence of iron-deficiency anaemia (IDA) in children aged less than 2 years is not well-known.

Objective: Assess the prevalence of IDA among young children of rural Bangladesh.

Methodology: A survey-based screening of 1,237 rural children was conducted in 30 villages in Monohardi subdistrict of Narsingdi district. Children's blood was tested for haemoglobin (Hb), ferritin, C-reactive protein (CRP), and serum transferrin receptor. Anthropometric measurements and developmental assessments using the Bayley Scales of Infant Development were taken for a subsample of 428 children. Descriptive analyses were performed to assess the prevalence of IDA and its relationship with nutritional and socioeconomic status.

Results: The mean age (standard deviation [SD]) of the children was 13.0 (5.1) months; 53% of the children were mildly, 28.4% were moderately, and 18.6% were severely malnourished. The mean (SD) of their head circumference was 44.3 (1.7) cm. The prevalence of anaemia was 60% (n=755) using Hb cut-off at 110 g/L. However, 18% of the anaemic children had IDA based on the ferritin level of <12 µg and the CRP level of <5 mg. Considering the serum transferrin receptor cut-off level of >6 µg as an indicator of depletion of iron store, the prevalence of IDA was 30%. The prevalence of IDA was similar in both infants (<12 months) and children (>12 months). However, the prevalence of anaemia was higher in infants (68% vs 53%, p=≤0.001). All anaemic children's mean (SD) mental developmental index and psychomotor developmental index tended to be 2-4 points lower than in non-anaemic children.

Conclusion: In rural Bangladesh, the prevalence of anaemia is high; however, only one-third of them have IDA. It is important to explore other causes of anaemia and plan their management to support their optimum development.

Household Food Security Is Associated with Early Childhood Language Development in Bangladesh

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Background: Developmental deficit during childhood can cause delayed learning and poor performance in school in later life. This may impose a huge social and economic burden on low-income countries where household food insecurity (HHFS) is highly prevalent. Despite its strong relationship with health and nutritional status in children, the association between HHFS and childhood development has been less studied in developing countries.

Objective: Investigate the effects of HHFS on cognitive, motor and language development of children at 7 and 18 months of age in rural Bangladesh.

Methodology: In total, 1,439 infants born during May 2002–December 2003 to mothers under the Maternal and Infant Nutrition Intervention in Matlab (MINIMat) study in Bangladesh were studied. An HHFS scale was created from 11 items of HHFS measures collected during pregnancy. At 7 months, cognitive and motor development of infants was assessed using a means-end-problem-solving test and Bayley's Scales of Infant Development-II (BSID-II) respectively. At 18 months, they were re-assessed for their mental and psychomotor development using the BSID-II and language development using language test based on MacArthur's Communicative Development Inventory. Linear regression models were used for examining the association between HHFS and these developmental measures at 7 and 18 months of age adjusting for potential confounders.

Results: HHFS was associated with language expression (B=0.17, 95% confidence interval [CI] 0.04-0.30, p=0.009) and language comprehension (B=0.005, 95% CI=0.00-0.01, p=0.045) at 18 months of age. There was no significant association between HHFS and mental or motor development at 7 or 18 months of age. At 18 months of age, the mean language expression and language comprehension of children in higher quartiles of HHFS were significantly higher (p<0.05) than those in children in lower quartiles of HHFS status.

Conclusion: The results suggest that HHFS positively affects language development of rural Bangladeshi children. Early language development has been reported to predict future child development. Therefore, policy-makers must consider strategies to ensure HHFS status in rural Bangladesh and similar settings elsewhere for optimum child development.

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Service Delivery

A Study of Quality Improvement Interventions on the Level of Service-use from Primary Health Centres in Bihar, India

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Background: The National Rural Health Mission promises to deliver basic health services to the underserved communities of rural India through flexible financing and innovative human resource management (24x7 medical services, multiskilling, etc.), resulting in the availability of 12 medicines for outpatient department (OPD) and 24 medicines for inpatient department and diagnostic services. However, this was associated with the provision of user-fee to avail of the services.

Objective: Examine the impact of quality improvement on the level of service-use in the primary health centres (PHCs) in Bihar, India.

Methodology: A structured questionnaire was administered to 200 patients attending the 20 PHCs in 4 districts. In each PHC, 10 patients were interviewed. The OPD data of the past 2 years was also reviewed.

Results: The average OPD per month in the study area was 12,000 in the first year (August 2006 to July 2007) which doubled (24,500) over the one-year period (August 2007 to July 2008) at the PHCs where the patients were interviewed. The results of the interviews conducted with patients attending the PHCs revealed that the inequalities increased in outpatients who visited the centres for treatment. The diagnostic services were used by only 36% of those who were advised by medical officers to undergo a diagnostic test. The data also reflected that 72.3% of those who underwent the diagnostic tests were male, and 27.7% were female. These figures suggest that the system is favouring those who have ability to pay for services. The gender inequalities also reflected in the use of services by patients.

Conclusion: The services should be designed in a way that favours its use by the poor and that encourage use by both the sexes.

Antenatal Morbidities and Care-seeking Patterns of Currently-pregnant and Non-pregnant Mothers in Rural Bangladesh

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Background: The health of women is crucial for families to survive, for economies to thrive, and cuts to the very heart of our society. Antenatal services are a major component of comprehensive maternal healthcare and are considered to be vital for the well-being of mothers and their children.

Objective: Assess antenatal morbidities and healthcare-seeking patterns of currently-pregnant and non-pregnant mothers.

Methodology: A community-based cross-sectional study was carried out on a representative sample of 4,809 mothers. Of them, 1,706 were pregnant mothers and 3,103 were mothers having a child aged less than one year. Data were collected during February-April 2008 in 12 upazilas under 6 districts of 2 divisions. Trained interviewers collected information using a structured questionnaire. Analysis techniques were employed using the SPSS software (11.5 version).

Results: 39% of the respondents mentioned for some sorts of problems during their current or the last pregnancy. The morbidities included weakness (58.4%), lower abdominal pain (54.1%), headache (37.5%), excessive vomiting (35.0%), heart burn or acidity (29.4%), and oedema (18.9%). Other reported morbidities were high fever (15.6%), urinary tract infection (14.1%), bleeding during pregnancy (4.7%), and diabetes mellitus (1.8%). More than 75% of the mothers mentioned that they sought care, and 24.5% did not. Treatment-seeking practice was assessed among 77.2% of the mothers with a child aged less than one year and 72.4% of the pregnant mothers. 51.8% of the mothers got treatment from a hospital or a clinic, around 20% from village doctors, and 17.6% from private clinics. The remaining 10.6% got treatment from traditional healers, Family Welfare Visitors, Family Welfare Assistant, MBBS doctors, aged persons, and homeopaths.

Conclusion: The findings are indicative of special interventions focusing towards rural mothers which help to develop strategies to improve maternal and child-health services and to prepare behaviour change communication materials to create awareness among women regarding safe motherhood.

Practice of Emergency Contraception among Government and Non-government Service Providers in Bangladesh

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Background: Using emergency contraception, women can avoid unplanned and unwanted pregnancies which, in turn, reduces unsafe abortion. In Bangladesh, 1.2 million births are unplanned, and the number of menstrual regulation/abortions is increasing. In Bangladesh, tablet 'Postinor-2' has been adopted as an emergency contraceptive method in the family-planning programme since 2004. Despite its availability, it is still not popular in the country. To promote emergency contraception among women to prevent unwanted pregnancy, service providers should have sound knowledge on emergency contraception.

Objective: Assess service providers' knowledge on different types of emergency contraception methods, their attitudes towards and practice of emergency contraception and remove barriers to providing emergency contraception.

Methodology: This cross-sectional survey was carried out in 6 districts, 30 upazilas, and 150 unions. Of 3,285 respondents, 1,681 were government and 1,604 were non-government service providers. Data were collected using a structured questionnaire during February-April 2008. Analysis was done using the SPSS software (11.5 version).

Results: 95% of the service providers heard the name of emergency contraception. The government service providers (98%) had more knowledge than the non-government service providers (92%). More than half of the respondents heard about emergency contraception from training. Of the respondents, 46.5% received training on emergency contraceptive pill, and the remaining had no training. Most (85%) respondents could mention the time of initiation of emergency contraception pill. Nearly 100% of the service providers identified poor publicity of emergency contraception as its major obstacle to promoting it in Bangladesh. The most frequent emergency contraceptive used in the centre was progester one-only pill, i.e. Postinor-2.

Conclusion: It is critically important that the service providers should have sound knowledge on emergency contraception and have access to adequate continuing education in emergency contraception. Simultaneously, at the national level, there should be an initiative to broadening the knowledge of emergency contraception among women and men.

Knowledge and Practice of Emergency Contraception among Drug-sellers in Bangladesh

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Background: In Bangladesh, emergency contraception has been adopted in the national family-planning programme a couple of years ago. Although a number of methods that are currently available in the system can be used as emergency contraception, all that is needed is to prescribe the methods in altered doses. Recently, a brand of pill named Postinor-2 is available in the government and NGO sector but very little is known about its acceptability, use-pattern, and perception of providers regarding the method.

Objective: Assess the knowledge and practice of drug-sellers towards emergency contraception.

Methodology: In a cross-sectional survey, 1,367 drug-sellers were interviewed through a structured questionnaire. Data were collected from randomly-selected 6 districts, 30 upazilas, and 150 unions in Bangladesh. Analysis was done using the SPSS software (11.5 version).

Results: Around 50% of the respondents had no institutional training on selling drugs, and 86.6% ever heard the name of emergency contraception methods. 77.9% of the drug-sellers mentioned the name of Postinor-2 as emergency contraception method. 52.6% dispensed drug following the client's history of unprotected sex. Most frequently-sold emergency contraception was Postinor-2 (58.4%), followed by Emcon (32.6%), Gynaeco-cid (4.5%), and Sukhi (4.1%). 32.9% mentioned infrequent sale of emergency contraception. Poor selling of emergency contraception was due to inadequate supply (38%) and low demand (37.2%), and the remaining 24.8% was lack of knowledge and high cost.

Conclusion: The study explored the knowledge about attitudes towards, and practice of emergency contraception pill among drug-sellers. The findings will help programme managers design and implement strategies for the successful promotion of emergency contraception in Bangladesh by providing training on emergency contraception pill to drug-sellers, along with service providers.

Supporting a Private Health Facility for Management of Severely-malnourished Children with Medical Complications

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Background: Khulna Shishu Hospital (KSH) is a 250-bed private hospital for children established in 1980. Since June 2006, Concern Worldwide, Bangladesh supports the hospital to establish a nutrition referral centre for protocolized management of severely-malnourished children (severe wasting or severe underweight and/or bilateral oedema), aged less than 5 years, with medical complications.

Objective: Assess whether improved technical capacity of service providers and additional logistics supply ensure protocolized management of severely-malnourished children with medical complications.

Methodology: Review of the database of admitted children which contains information on socio-demographic characteristics, nutritional status, medical and nutritional management, and treatment outcomes and 2 clinical reviews were conducted to analyze the performance of the referral centre taking into consideration standard indicators by an independent external assessor (March 2007 and August 2008).

Results: During July 2006–July 2008, 222 children (126 boys, 96 girls) were admitted to the referral centre, one-third of whom had oedema. The recovery rate among the admitted children was about 74% (international Sphere standards: >75%); the average weight gain among children without oedema was 7.3±7.7 g/kg/day (Sphere: >8 g/kg/day); the average length of stay was 12 days (Sphere: 3-4 weeks); 4.1% of the children died (Sphere: <10%); and the drop-out rate was 8.6% (Sphere: <15%). More than 90% of the children from the low-income group (<Tk 3,000/month) stayed for less than 7 days in the hospital, and 89% of deaths occurred in that group. During the second year of implementation, 76.7% of the children received antibiotics according to the protocol, and the rationale for change in antibiotics was documented. The proportion of children who left against medical advice decreased from 33% to 15%, and the recovery rate increased to 80%. 48% of mothers/caregivers received at least once a 5-point counselling package which comprised messages relating to infant- and young child-feeding and caring practices while staying at the centre.

Conclusion: The average length of stay and the percentage of drop-out and of children dying met international Sphere standards but the average daily weight gains remained under-performed. The increased technical and management capacity of service providers and additional financial inputs substantially contributed to running a nutrition referral centre effectively within the private hospital.

Distance to Health Facilities, Season, and Care of Sick Children in Rural Bangladesh

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Background: In rural Bangladesh, women who usually work at home fear travelling alone to a distant place. Distance from a rural household to the nearest health centre and season impact the use of health facilities for sick children.

Objective: Examine the effects of distance from households to the nearest health centres run by qualified doctors and paramedics on the use of trained healthcare providers for sick children aged less than 5 years, controlling for illness and child's characteristics in 2 rural areas in Matlab, Bangladesh.

Methodology: Data for the study came from the children's morbidity survey conducted in the Matlab Health and Demographic Surveillance System (HDSS) area in two seasons; March-April (summer) and August-September (rainy) 2008. One half of the HDSS area gets high-quality primary health care (PHC) services of ICDDR,B in addition to the usual government PHC services in another half. The households in the HDSS area are divided into 1,349 clusters, and each of the 5 female community health research workers was given 70 clusters, selected randomly to record childhood morbidity and care in sickness. They were given training on data collection using the PDA (Personal Digital Assistant) in February 2008. The GIS (geographic information system) record- ed the linear distance from the household to the nearest physician-run health facility, paramedic- run health facility, and distance to the paved road. Cross-tab and logistic regression estimated the distance decay effects on health services-use for treating children with fever and pneumonia, controlling for illness and child's characteristics in each area.

Results: Short distance to the physician-run health complex, but not to the paramedic-run clinic, increased the use of doctors in both the areas for treating children with fever/cough and pneumonia. Short distance also decreased the use of untrained village doctors and home-care. Season played important roles in seeking care. Other factors associated with care in sickness were the child's and illness characteristics and household economic condition.

Conclusion: The findings suggest that short dis- tance to a doctor increases the use of doctors and reduces the use of village doctors and home-care. Deployment of doctors in union-level facilities will increase use of the doctor.

Knowledge and Perception of Unmarried Adolescent Girls on Selected Reproductive Health Issues

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Background: Since 24% of the population in Bangladesh is adolescents, it is important to know about their knowledge and perceptions about reproductive health issues to address their needs.

Objective: Explore knowledge and perceptions of adolescent girls about selected reproductive healthcare issues, such as age of marriage, menstrual practices, perceived health problems, and use of healthcare facilities.

Methodology: A cross-sectional survey was conducted in 2 rural sites and one urban slum area. The study population included unmarried adolescents aged 13-19 years. From the 3 study areas, 2,400 (800 from each) unmarried adolescents was selected through systematic random sampling and interviewed using a structured questionnaire.

Results: 70-80% of the adolescents thought that a female should get married at the age of 18 or 19 years. The large majority (80%) of them thought that parents should take decisions about children's marriage. About 12% thought that such decisions should come directly from girls. About 60% thought that an ideal age for first pregnancy would be 20-24 years. About 15% did not know about the age of menstruation. More than 60% thought that old cloths should be used during menstruation. In urban areas, mothers were the most common source of information regarding menstruation (50%) compared to rural areas (25%). About 8% of the adolescents had excessive menstrual bleeding, and 4% had sore in inner thighs during menstruation. Of adolescents who experienced any problems during menstruation, one-fifth sought treatment. A higher proportion (73%) of the adolescents in urban slums knew about HIV/AIDS compared to rural adolescents (60%). Irrespective of the study areas, television was the most common source of information about HIV/AIDS. A few adolescents visited healthcare facilities in all the 3 areas.

Conclusion: The unmarried adolescents had inadequate knowledge about reproductive health issues. The use of healthcare facilities by adolescents was poor. A national strategy should provide information and services to adolescents addressing their specific needs.

Knowledge of Men on Selected Reproductive Healthcare Issues

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Background: Men are the important decision-makers within the households. The issue of male's involvement in women's healthcare has increasingly been recognized in several countries.

Objective: Explore knowledge of men on family-planning and other selected reproductive healthcare issues.

Methodology: The study is part of a baseline study under the Demand Based Reproductive Health Commodity Project, a collaborative project of ICDDR,B with the Government of Bangladesh, Population Council, and RTM International. This study was conducted in 2 rural and one urban slum areas. In total, 3,600 (1,200 in each of 3 field sites) husbands of women were selected through systematic random sampling from the enumeration list and interviewed using a structured questionnaire.

Results: In both urban and rural areas, men were generally more aware of female contraceptive methods than of male methods. About 50% of the men themselves obtained the contraceptive method for current use. 77% of the men were knowledgeable about pregnancy-related life-threatening problems, although a smaller proportion in urban slums (60%) was aware of the problems than in rural areas (85%). The public sector (government health and family-planning service providers) was not a leading source of information on safe pregnancy and delivery for men in any study areas. While over 80% of the men in both Dhaka slums and Raipur had heard of HIV/AIDS, 51% of the men in Nabiganj heard of it. Irrespective of the study area, television was the commonest source of HIV/AIDS-related information. One-fifth of the men had visited a health facility in their locality during the last 3 months. Urban men had visited pharmacies (44%) and private clinics (18%) while men in Nabiganj had visited private clinics (39.4%), and in Raipur, they visited the Upazilla Health Complex (27%) or the Health and Family Welfare Centres (20%). Men in all the areas were most likely to visit a health facility for general treatment of family members or for child-health problems.

Conclusion: Knowledge of men on family planning and reproductive health is poor in the study areas. Interventions should be designed to raise awareness among males so that they can play positive roles in the decision-making process of reproductive healthcare for women.

Knowledge Regarding Tetanus and Status of Tetanus Toxoid Vaccination among Nurses in a Tertiary Hospital, Dhaka

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Background: To eliminate maternal and neonatal tetanus (MNT), the World Health Assembly recommends all women of childbearing age living in high-risk areas to be targeted for immunization with 5 doses of tetanus toxoid (TT) vaccine. As nurses constitute part of the female general population and are also healthcare providers who can create awareness, the present study was conducted to assess their knowledge of tetanus and TT vaccination status.

Objective: Assess the knowledge regarding mode of transmission and prevention of maternal and neonatal tetanus, dose schedule of tetanus toxoid, and status of vaccination with TT among the study nurses.

Methodology: A cross-sectional study was conducted during October-November 2007. In total, 153 nurses of the Bangladesh Medical College Hospital, Dhaka, were interviewed using a pre-tested, semi-structured questionnaire. Inclusion criteria consisted of all female nurses, including student nurses. Purposive sampling technique was used. The vaccination cards were checked. Data were analyzed using the SPSS software (version 11.5). Chi-square test was used for statistical association. Qualitative approach, using in-depth interviews, was employed to determine the reason for not being vaccinated.

Results: Less than half had taken the vaccine as per schedule (includes respondents whose dose was not yet due). About 20% had taken invalid doses while 22.8% could not mention, having lost the card. Thirteen had not taken any dose. Reasons cited for not taking any dose were: ignorance, forgetfulness, and lengthy time to complete the schedule. Knowledge was found to be unsatisfactory and was significantly associated with marital status (p<0.005) and parity (p<0.05). Knowledge of dose schedule was significantly associated with vaccination status as per schedule (p<0.001).

Conclusion: The proportion of nurses who had taken tetanus toxoid as per schedule was far from satisfactory. Practice regarding their own vaccination was similar to that of women in the general population. Tendency of nurses to disregard their own health needs becomes evident. Although findings from this study cannot be generalized, it identifies some challenges for the immunization programme in Bangladesh.

Scenario of Sexual and Substance Abuses among Street Children of Kolkata City, India

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Background: Street children are those who might not necessarily be homeless or without families but who live in situations where there is no protection, supervision, or direction from responsible adults. These children are an important bridging population for the transmission of HIV/AIDS in the community. This is because they are often subjected to sexual and substance abuses, and both behaviours are associated with higher transmission of HIV in the community.

Objective: Study demography, substance and sexual abuses of street children of Kolkata.

Methodology: A community-based cross-sectional study using the conventional cluster technique was conducted among hard-to-reach population in northern and central part of Kolkata city of West Bengal, India. A field-tested questionnaire was introduced among 556 street children to understand their sociodemography and the problem of substance and sexual abuses in them. Interview was followed by collection of 3-4 mL blood sample by an unlinked anonymous method to know their blood-borne infections (HIV, HBV, and VDRL). Data were edited and entered into a computer using the Epi Info software (6.04d version).

Results: The results revealed that the overall prevalence of substance abuse was 29.7% and that of sexual abuse was 9.2% among the study participants. One percent of the study population had HIV, and 6% and 4%, respectively, had HBV and VDRL. Substance abuse was significantly associated with older age of 11 years or more and other risk factors of the study participants. Similarly, sexual abuse was also significantly associated with lower age of 10 years or less, and orphan children.

Conclusion: The study has documented substance and sexual abuses among street children in Kolkata city, along with blood-borne infections/sexually transmitted infections, such as HIV, HBV, and VDRL.

Key words: Community-based studies; Cross-sectional studies; Hepatitis B virus; HIV; Street children; Substance abuse; Sexual abuse; Sexually transmitted infections; India.

Beyond Awareness-raising: Action Research in the Context of Rights-based Approach

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Background: Field staff in a health project often consider themselves health experts and teachers but continued barriers to healthy behaviours led to the development of the LAMB model towards a rights-based approach and community initiative-oriented participatory action research (PAR). The approach is an alternative to traditional awareness-raising programmes, in seeking both action and understanding, but has been used by only a few health or development organizations in Bangladesh. PAR group-work was effective in reducing perinatal mortality in a 2004 Nepal study being rolled out by the Diabetes Association of Bangladesh. This approach to health-oriented community mobilization is related to overcoming barriers to health. It teaches staff and communities together to ask questions, seek answers, and then intervene locally.

Objective: Document staff transition from health experts to community PAR facilitators, strengths and difficulties in community implementation, and lessons learnt in information gathering and dissemination.

Methodology: This is a descriptive case study of a pilot programme. Data were collected from documents and literature review, key-informant interviews, participant-observation of training by authors, and adaptation of materials by development consultant, implementation in community groups, and review of results.

Results: Initially, terminology of PAR was very conceptual and so required practical examples and adaptation for the Bangladesh context. Staff-role expectations were revised from provider of information to fellow-learner through the process of seeking information alongside group members. Groups learned to seek solutions rather than receive help when repeatedly reminded by staff of their own capacity. Staff and communities were taught to consider what could be done (by local groups in their own communities) and what should be done by those in authority (the link to justice/rights-based approach).

Conclusion: Using PAR promoted staff and community transition from a service-delivery to a rights-based approach. Effective sustainable engagement of communities with overcoming barriers to health should be supported by teaching the people in the rural community how to learn (rather than just teaching facts). It was difficult to start with small, achievable initiatives first, to reinforce concepts of what is possible. Staff realized, that 'People know things, and can apply these'.

Focusing on Mental Health for Achieving Health Seucrity in the Context of Disaster

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Background: Disaster has a significant impact on human health. Mental illness in the light of disaster has received little attention in Bangladesh. It is a matter of health, economics, social justice, and human rights importance.

Objective: Document and address mental health needs in the context of natural disaster, understand the meaning of health security in terms of disaster vulnerability, measured by health status of the population or its proxies, on the post-disaster recovery in terms of health and other consequences, and explore health security indicators with a focus on mental health of the disaster victims in Bangladesh.

Methodology: Both quantitative and qualitative research methods were used for understanding the meaning of health security and disasters at a regional and household level in Bangladesh. Three research locations—Matlab in Chandpur district, Chakaria in Cox's Bazar district, and Domar in Nilphamari district—were purposively selected. Data were collected through focused-group discussions (FGDs), household (HH) surveys, in-depth interviews, group discussions (GDs) (formal and informal), e-postal surveys, and household monitoring.

Results: The findings showed that the people directly related good health with happiness, mental peace, or anxiety-free mind. The mental stress was believed to have a significant impact on health in the people's perceptions and in reality. Anxiety and depression were identified as significant factors causing illness which increases in the disaster context. Before, during, and after a disaster situation, people worried about their foods, health, livelihood, other assets, and their children. The respondents gave description of frustration, depression, tension, or anxiety they felt and how they thought these affected their health. Droughts occured in the northern part of the country, leading to failing crops, loss of livestock, food crisis, and impoverishment. The data showed that poverty and falling into poverty were key risk factors for mental stress. The data also showed how the stress due to failing crops, loss of livestock, and impoverishment was related with the mental health consequences in rural Bangladesh.

Conclusion: This research shows evidence of immediate and long-term impact of extreme weather events on mental health in low-income settings. With the growing number of disasters in Bangladesh, the findings emphasize the need to incorporate mental health response and recovery into the wider health system. Increasing natural disaster induced by climate change is an indication of the need to prioritize mental health on the national health research agenda.

Impact of Community-led Total Sanitation Programme on Water Quality, Sanitation, and Diarrhoeal Morbidity in Rural Bangladesh

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Background: Plan International has been working in rural Bangladesh to promote the use of sanitary latrines using the community-led total sanitation (CLTS) approach. It is important to determine the impact of the programme in terms of latrine-use, hygienic practices, and prevalence of diarrhoea.

Objective: Explore the impact of the CLTS on open defaecation, hygiene practices, water quality, and diarrhoeal morbidity.

Methodology: The study was conducted in 2 districts of Bangladesh. One intervention and one control upazila were chosen from each district, and one village was randomly chosen from each upazila. Households which had at least one child aged less than 5 years (under-5 children) were selected for the survey. Mothers of under-5 children were interviewed about latrine-use behaviour, extent of open defaecation, cost of latrine building, improvement and maintenance of latrines, disposal of waste, hand-washing behaviour, knowledge of hygiene behaviour, morbidity, and management of diarrhoea of under-5 children. In the absence of the mother, another informed member of the household was interviewed. Tubewell water from stored-water and surface-water were tested for bacteria at the Environmental Laboratory of ICDDR,B.

Results: When pre-and post-intervention periods were compared, rates of open defaecation reduced by 92% in the CLTS area compared to 28% in the non-CLTS area ($p<0.01$). A significantly higher proportion of poor households used latrines in the CLTS area compared to the non-CLTS area (76.4% vs 23.6%, $p<0.01$). In terms of hygiene practices, 54% in the CLTS area and 90% in the non-CLTS area disposed children's excreta on an open surface. A higher proportion of latrines in the CLTS area was considered clean and had amenities, such as water, soap, and sandals, available to them compared to those in the non-CLTS area. The stored water samples from both the areas were contaminated. Finally, there was no significant difference in the prevalence of diarrhoea among under-5 children in the 2 areas.

Conclusion: The CLTS programme has been successful to promote the installation and use of latrines, particularly among the poorest households. It is important that other routes of faecal contamination of water, such as inappropriate disposal of children's faeces, lack of cleanliness of latrines, and practices relating to contaminating drinking-water are addressed to have a measurable impact on the prevalence of diarrhoea.

Management of Solid Clinical Wastes
at the Dhaka Hospital of ICDDR,B

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Background: Unless properly managed, clinical wastes, generated by healthcare facilities, can be a greater threat for transmission of infectious diseases than source patients. In Bangladesh, un-wholesome waste disposal by many healthcare facilities poses serious health hazards to general city-dwellers.

Objective: Conduct a baseline survey of generation, segregation, and management of solid clinical wastes at the Dhaka Hospital of ICDDR,B.

Methodology: The Dhaka Hospital has established a system and guidelines for disposal of its wastes in the late eighties. A survey was conducted from January through November of 2008 that involved use of questionnaire, in-depth interviews, meetings, discussions, and site inspections to assess the system. The process of identification, segregation, characterization and collection, weighing, and disposal and incineration of solid clinical wastes was observed.

Results: Hospital staff, familiar with the guidelines, practised identification and segregation of wastes. Solid, potentially-infectious wastes, and recycling wastes were weighed daily, and the general household wastes, occasionally. Solid clinical wastes included sharps comprising used and unused needles, syringes, blades, glass-tubes, and ampoules, and potentially infectious sharp solid wastes included used gloves, cotton-balls, swabs, gauze, nasogastric tubes, catheters, and flatus-tubes. The daily volumes of various types of wastes produced varied, depending mostly on the number of patient-visits. The average generation rate of solid clinical wastes was 314 kg per month (about 10 kg per day). The average generation rate of recycling wastes (empty plastic bags of intravenous fluids and sets) was 351 kg per month (about 12 kg per day). The generation rate of general household wastes varied between 468 kg and 900 kg per day. The sharps and other potentially-infectious solid wastes were incinerated daily at the Centre's own facility, and the general household wastes were disposed of at the Dhaka City Corporation's collection sites for dumping.

Conclusion: It was observed that the solid waste-disposal system of the hospital, including disposal of potentially-infectious ones, has been working well. Development of similar guidelines and monitoring of the practice could be easily implemented at other healthcare facilities.

Appropriate Cooking Practice Depends on Reaching Appropriate Target Group through Awareness Diversification

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Background: Bangladesh has immense untapped potentials. Health and nutrition is one such sector where huge potentials are still underused. Inappropriate cooking practices and food habits deprive people from nutritive value, such as washing after cutting, too much boiling/frying, keeping foods uncovered, too much/unnecessary washing, wasting valuable part of fruits and vegetables by peeling thick, and so on. Poverty, associated with lack of adequate access to food, is one of the vital factors of malnutrition among children and women in Bangladesh. A pilot research was conducted to see whether knowledge and skills from health forum and training have any effect on retention of nutrition during cooking.

Objective: Assess the effect of health forum and skilled training provided by the BRAC programme on appropriate cooking practices and food habits among ultra-poor women in rural Rangpur.

Methodology: A mixed method was used in the study. A questionnaire was developed which included both qualitative and quantitative parts. The quantitative sample size was 200 households in both intervention and non-intervention areas. The qualitative sample size in the intervention area included 12 in-depth interviews and 4 focus-group discussions. Similarly, it was done in the non-intervention group.

Results: The results showed that some traditional practices, such as cooking of rice without draining water, help them retain nutrition. Due to the health forum and skills training, the usage of packet salt with iodine intake increased in both intervention and non-intervention areas (through community participation and transmission of information).

Conclusion: Knowledge and skills training with financial support to ultra-poor women reduce losses of nutrients in every-day life by popularizing appropriate cooking and related practices through awareness-raising programmes.

Relative Risk of Non-accidental Deaths among Children by Their Nutritional Status in Rural Areas of Bangladesh

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Background: The mortality risk of children by nutritional status in Bangladesh was studied 25 years ago and earlier, which showed lack of recent information on the risk by levels of malnutrition. The present study evaluated the relative risk of mortality of under-2 children by their degree of malnutrition and updated information.

Objective: Determine the relative risk of non-accidental deaths in 2007 among under-2 children surveyed in 2004 by their nutritional status.

Methodology: The Baseline Survey of the National Nutrition Project (NNP), conducted in 2004, covered 44 NNP intervention, 53 BINP (Bangladesh Integrated Nutrition Programme), and 16 NNP comparison upazilas, with households having under-2 children from 6 divisions in Bangladesh. The study was conducted in 105 upazilas of the NNP Baseline Survey. The survey compared risk of deaths of children surveyed in 2004 by their nutritional status. Verbal autopsy was used for identifying the possible underlying cause of childhood death. A combination of structured and open-ended questionnaire was used for collecting information on the causes of death. Accidental deaths were excluded in assessing the risk of malnutrition.

Results: Of 9,217 index children in 2004, 49 died due to non-accidental causes. Severely-underweight children had 4 times higher mortality risk than normally-nourished children. There were 3.41 and 1.68 times higher risk of mortality of severely- and moderately-wasted children compared to well-nourished children. Severely-stunted children had 2.83 times higher and moderately stunted children had 1.26 times higher mortality risk compared to non-wasted children. The main causes of death were septicaemia, shock, pneumonia, diarrhoea, gastroenteritis, and tetanus. According to weight-for-age z-score, 35% of deaths occurred in 12% of severely-malnourished children, 16% of deaths occurred in 24% of moderately-malnourished children, and 47% of deaths occurred in 64% of normally-nourished children.

Conclusion: The results showed that there was about 4 times higher risk of mortality in severely-underweight children, and moderately-underweight children had little or no more risk compared to normally-nourished ones. Programmmes to reduce child mortality should target severely-underweight children than wasted children for saving more lives.

Socioeconomic Freedom of Women Is Influential for Their Nutritional Status in Bangladesh

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Background: The health systems in Bangladesh face a huge burden of diseases and involve costs to address maternal health problems. Results of studies in some countries suggest that empowering women can be an effective strategy to address their poor health status. However, very little is known about the impact of socioeconomic freedom (SEF) of women on their nutritional status in low-income countries.

Objective: Investigate the association between SEF of women and their nutritional status in Bangladesh.

Methodology: Data on 11,440 ever-married women aged 13-49 years were drawn from the Bangladesh Demographic and Health Survey 2004. SEF of women was measured using 6 dimensions of SEF: educational attainment, exposure to mass media, decision-making ability, employment status, decision-making ability on family planning, and freedom for movement. A composite scale was created from these 6 dimensions to define SEF. Body mass index (BMI) of women was used as an indicator of nutritional status. A cut-off point of BMI <18.5 kg/m^2 was used for defining women as chronic energy-deficient. Multivariate regression models were used for examining the association between SEF and nutritional status of women adjusting for possible confounders.

Results: About 38.6% of the women were illiterate, 21.8% had no exposure to mass media, 9.1% had no decision-making ability, 78.1% were unemployed, 8.2% made their decisions on family planning by others, and 3.3% had no freedom for movement. SEF of women was positively associated ($p<0.01$) with their BMI. Their mean BMI in higher tertiles of the SEF scale was significantly ($p< 0.01$) higher than that of women in lower tertiles.

Conclusion: These results suggest that SEF of women is influential for their nutritional status in Bangladesh. The health systems in poor countries might benefit from investing resources to reinforce SEF of women. Intervention programmes should, therefore, focus on each dimension of SEF to create a favourable environment to address maternal undernutrition in low-income countries.

Prevalence of Periodontal Disease in Relation to Eating Habit, Stress, Personal Habit, and Oral Healthcare among a Tribal Population

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Background: Periodontal disease appears to be a major global public-health problem, affecting the majority of the adult population. It is the leading cause of tooth-loss in adults and might have a link to other systemic conditions, such as diabetes and cardiovascular diseases. Understanding the relationship of the prevalence of periodontal disease with eating and personal habits, stress, and oral healthcare is necessary for designing proper oral healthcare-delivery and treatment.

Objective: Determine the periodontal status in relation to eating habit, personal habit, stress, and oral healthcare among the Garos, a hill-tribe of Bangladesh.

Methodology: All available adults of the community were included. Personal and eating habits, stress, and oral healthcare were determined through face-to-face interview using a questionnaire. All teeth, except the third molar, were examined at 6 sites for gingival colour and swelling, bleeding on probing, probing pocket depth (PPD), and clinical attachment level (CAL). Gingival index (GI) was recorded according to LÖe and Silness. The greatest score for each of the 6 sites was used for assessing the PPD and CAL.

Results: Of 240 subjects, 63.8% were female. 14.2% were aged less than 30 years, 72.5% were aged 30-60 years, and 13.3% were more than 60 years. The mean age was 47.78 years. They usually consumed tea and traditional sweets in between meals. 73.6% chewed betel-leaf. 59.6% maintained oral hygiene using tooth brush and 40.4% in traditional ways. The mean number of teeth present was 26, and the mean number of affected teeth was 8.9 (PPD ≥3 mm). The mean±standard deviations of GI, PPD, and CAL of the community were 0.43±.070, 2.34±0.47, and 2.71±0.77 respectively. There was a significant difference in CAL between smokers and non-smokers (t-test, $p<0.05$). PPD was significantly high among frequent betel-leaf chewers and the frequent sugar-intake group. Attrition and CAL were significantly high in older age-group.

Conclusion: Smoking increases the prevalence and severity of periodontal disease. Tooth brush users have a less prevalence of periodontal disease. Without any organized oral healthcare or awareness programme, the low prevalence of periodontal disease may, at least partly, be explained by the traditional eating-habit of people in the Garo tribe.

Status and Predictors of Child Malnutrition in Bangladesh: A New Approach

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Background: Child malnutrition status and its determinants are identified applying 3 anthropometric indices, such as height-for-age, weight-for-height, and weight-for-age. These anthropometric indices are used separately for identifying the predictors of stunting (chronic malnutrition), wasting (acute malnutrition), and underweight (chronic or acute, or both). However, a child is recognized as undernourished if s/he is stunted, wasted, or underweight.

Objective: Determine the status and predictors of child malnutrition considering the 3 anthropometric indices simultaneously, i.e. considering a child as malnourished if s/he is stunted, wasted, or underweight.

Methodology: Complete anthropometric information was available for 6,005 children from the Bangladesh Demographic and Health Survey 2004. Malnutrition status was considered a dependent variable. Key independent variables included several socioeconomic, demographic, environmental, maternal nutrition, child-feeding practices, and disease variables. To examine significant association of the selected variables with child malnutrition status, bivariate analysis was carried out first, and then multiple logistic regression analysis was adopted to find out the predictors of child malnutrition considering the significant variables.

Results: Considering all the 3 anthropometric indices simultaneously, it was observed that 57% of the children were suffering from any of the 3 forms of malnutrition while 43%, 13%, and 48% of the children were stunted, wasted, and underweight respectively. Most variables were significantly associated with child malnutrition status. Children aged 12-23 months, having lower birth interval, illiterate parents, worse economical and environmental condition of households, poor feeding practices, incidence of acute diseases, and acutely-malnourished mothers, were more vulnerable to be malnourished.

Conclusion: The use of 3 indices simultaneously shows a very high prevalence of child malnutrition rather than their separate use. Age of child, birth interval, education of parents, wealth status of households, child-feeding practices, incidence of acute diseases, and maternal nutrition are significant predictors of child malnutrition. The findings suggest concentrating more on child-feeding practices after 6 months of age, improving wealth status of households, enhancing consciousness about prevention and treatment of acute diseases, and especially progressing education and nutrition status of mothers to reduce the vulnerability of child malnutrition.

Rickets in Bangladesh: An Emerging Public-health Nutrition Crisis

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Background: Rickets, first reported in Europe in the mid-1600s, was recognized as an important health problem in Bangladesh in 1991. Dozens of countries have reported rickets in the past 3 decades; however, in Bangladesh, it received the first attention by Social Assistance and Rehabilitation of the Physically Vulnerable (SARPV), visiting the Chakaria region of southeastern Bangladesh after a devastating cyclone in 1991. Helen Keller International reported 0.26% prevalence of rickets among 21,571 children in 2000 and 0.12% among 10,005 children in 2004.

Objective: Determine the national prevalence of rickets among Bangladeshi children aged 1-15 year(s) and examine its association with their nutritional status.

Methodology: In total, 16,000 rural and 4,000 urban children from all socioeconomic groups were randomly selected from 6 divisions of Bangladesh and examined for features of rickets, and their parents/guardians were interviewed to understand the current and past feeding practices of the respective children. In clinically-suspected cases, anthropometric measurements [weight, height, and mid-upper arm circumference (MUAC) and radiological examination] were done for identifying radiological signs of active rickets, and 5 mL of venous blood was taken for biochemical tests.

Results: The national survey showed that the prevalence rate of rachitic children was 0.99%. The mean age of rachitic children was 5.6 years, and the mean weight was 13.89 kg. Radiologically, 24% had active rickets, 34% were in the growing phase of rickets, and 42% were not evident. The prevalence of severe stunting was 53%, severe underweight 40%, and severe wasting 1.4% (<-3 standard deviation).

Conclusion: The results suggest that rickets is an emerging public-health problem in Bangladesh. The Government needs to develop policies and programmes to prevent and cure rachitic disability in Bangladesh and terminate the social and humanitarian crisis.

Diarrhoeal Disease   162 (007)

Absence of Pathogenic *Escherichia coli* O157:H7 among Diarrhoeal Patients in University of Gondar Teaching Hospital, Northwest Ethiopia

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Background: Diarrhoeal diseases are the major cause of morbidity and mortality, and infections due to bacterial and intestinal parasites are common worldwide, posing serious health problems. *Escherichia coli* O157:H7 is a pathogenic serotype of *E. coli* associated with acute, watery and/or bloody diarrhoea. So far, there was no study on the prevalence of *E. coli* O157:H7-associated infection in Ethiopia.

Objective: Determine the magnitude of pathogenic *E. coli* O157:H7 in diarrhoeal patients in the University of Gondar Teaching Hospital.

Methodology: A cross-sectional study involving diarrhoeal patients was conducted during August 2005–December 2005. Stool specimens from the patients were collected, and bacteriological and parasitological investigations were made following standard procedures.

Results: 16.9% and 1.04% of *Shigella* and *Salmonella* species respectively were identified. The magnitude of intestinal parasites among specimens examined was 34.9%. The dominant protozoan parasite was *Entamoeba histolytica/dispar*–41 (10.2%), followed by *Giardia lamblia*–35 (7.6%), *Cryptosporidium parvum*–6 (1.6%), and *Isospora belli*–5 (1.3%). The dominant helminth was *Ascaris lumbricoides*–26 (5.2%), followed by *Strongyloides stercoralis*–22 (5.2%), *Schistosoma mansoni*–15 (3.9%), and hookworms–11 (2.9%). *E. coli* O57:H7 was not found in the stool samples tested.

Conclusion: The absence of *E. coli* O157:H7 in the diarrhoeic stool specimens might show its limited circulation in the area. Thus, screening of diarrhoeic stool specimens for *E. coli* O157:H7 in routine clinical practice in the area may not be necessary. However, in-depth multicentric studies are required to substantiate the present findings.

Production of Cholera Toxin by Hybrid and Altered Strains of *Vibrio cholerae* O1 Isolated from Bangladesh and Mozambique

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Background: Results of recent studies indicate that *Vibrio cholerae* O1, biotype El Tor strains producing classical type CTB (altered *V. cholerae* strains) began to emerge in South Asian countries in early 1990s, and lately these strains have entirely replaced the prototype El Tor strains in the whole area. In 2003, a new variant of El Tor *V. cholerae* O1 strain (hybrid) harbouring a tandem repeat of classical CTXΦ was identified in Mozambique. The comparative production of cholera toxin (CT) of these hybrid and altered strains is still unknown.

Objective: Analyze the production of CT by altered and hybrid clinical and environmental strains of *V. cholerae* O1 isolated from Bangladesh and Mozambique.

Methodology: Biotype-specific culture media of classical and El Tor biotypes of *V. cholerae* O1, such as AKI (El Tor-specific) and yeast extract peptone (YEP, classical-specific), were used for in vitro production of CT by GM1 ELISA. Live culture of whole-cell bacteria was evaluated to assess the amount of CT (quantitative) in rabbit ileal loops (RIL).

Results: Compared to the prototype El Tor reference strain, hybrid clinical strains of *V. cholerae* O1 from Mozambique produced the highest quantity of CT while hybrid environmental strains produced the lowest both *in vitro* and *in vivo*. Live culture in physiological saline also showed the highest level of fluid accumulation in RIL by Mozambiquean hybrid strains compared to hybrid environmental and clinical strains from Bangladesh. Altered strains produced a moderate level of CT both in vitro and in vivo but comparatively less than hybrid strains from Mozambique. The AKI medium supported the optimum production of CT by hybrid isolates from Mozambique and the El Tor reference strain whereas YEP media supported the optimum production of CT by classical reference strain.

Conclusion: The results suggest that the hybrid strains from Mozambique expressed the highest amount of CT compared to the reference El Tor strain and hybrid strain from Bangladesh. Altered strain produced a moderate level of CT; however, among all different strains, the prototype classical strains still produced the highest level of CT.

Atypical *Shigella boydii*: Prevalence, Phenotypic and Molecular Characterization

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Background: Shigellosis occurs both in endemic and epidemic forms in children and remains a major public-health problem in developing countries. The classification scheme for *Shigella* is not comprehensive because atypical strains are being isolated in different parts of the world, including Bangladesh. So, there was a need to focus on these sorts of atypical strains.

Objective: Characterize atypical strains of *Shigella boydii* using phenotypic and genotypic traits to understand molecular epidemiology.

Methodology: In total, 7,225 *Shigella* species were isolated from diarrhoeal patients attending the Dhaka Hospital of ICDDR,B during 1999-2004 using standard microbiological and biochemical methods. Of these, *S. flexneri* (n=4,551) was predominant (63%), followed by *S. boydii* (17.4% n=1,259). Of 390 randomly-selected *S. boydii* strains 82 strains (21%) were identified as atypical. Among these, 37 were available to characterize using phenotypic techniques, such as biochemical reaction, serological typing, antibiogram, phage typing, and molecular techniques, including polymerase chain reaction, plasmid profile, and pulsed-field gel electrophoresis.

Results: All these atypical strains give biochemical reaction typical of *S. boydii* and agglutinated with polyvalent antisera of *S. boydii*. Fourteen of the 37 strains showed positive reaction for mannitol fermentation, had ipaH gene, harboured 140-MDa invasive plasmid, and showed keratoconjunctivitis in the guinea pig eye. These findings indicate that all of them are virulent. Most strains were resistant to multiple antibiotics, such as ampicillin (50%), sulphomethoxazole-trimethoprim (50%), nalidixic acid (36%), and mecillinum (7%). None of these atypical *S. boydii* was resistant to ciprofloxacin. Most atypical strains were not lysed by any available *Shigella* phage. Their plasmid profiles and pulsed-field gel electrophoresis analysis revealed that most atypical strains were heterogeneous which is different from the existing type-specific *S. boydii* serotypes.

Conclusion: The results indicate that there might have genetic diversity among these atypical *S. boydii* from the existing and provisional serotypes of *Shigella*. Therefore, these atypical strains, isolated in Bangladesh, should be properly characterized to measure the actual threat of shigellosis in Bangladesh and in other parts of the world.

Molecular Modelling and Docking of Inaba-specific Antibodies for Prediction of Their Binding Site with Perosamine Molecule: A Bioinformatics Approach

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Background: *Vibrio cholerae* O1 Inaba lipopolysaccharide (LPS) represent the best antigenic determinant. Monoclonal antibodies (Mab) are produced against serotype Ogawa and Inaba. Co-crystallization of Fab fragment of Mab, S-20-4 with synthetic fragment of Ogawa O-specific polysaccharide (O-PS) recognizes the terminal perosamine residue as primary antigenic determinant. Crystal structure of Mab, F-22-30 (PDB code 2uyl) recognizes both Ogawa and Inaba, indicating a putative binding pocket in recombination site where perosamine could occupy.

Objective: Develop the model of Inaba-specific antibodies of *V. cholerae* and determine binding mode of carbohydrate antigen using molecular docking approach.

Methodology: Female BALB/c mice, immunized with purified Inaba LPS were obtained from *V. cholerae* O1 El Tor Inaba. Spleen cells were used for extraction of antigen-specific B cells using biotinylated Inaba LPS by streptavidin bead-based positive selection; extracted RNA and cDNA via RT-PCR as template for PCR amplification for specific VH and VL genes. PCR products were cloned, transformed, and sequenced. Germline Ig and corresponding CDR were identified using VBASE2 database. M2 and M4 Inaba sequences were selected for 3D structure modelling, energy minimization, model evaluation, interaction interface, molecular docking, and identification of ligand binding using multiple bioinformatics. Multiple sequence alignment was performed using the ClustalW 2.0 program.

Results: In case of M2-Inaba-Fv, heavy-chain amino acids took part in interaction. Hydrogen-bonding interactions formed between the Ser 103 H and –OH group of perosamine. In case of M4-Inaba-Fv, light-chain amino acids were involved in interaction. Three amino acids of heavy chain—Gln 39, Pro 41, and Tyr 94—were involved in the formation of binding site. Most residues were part of CDR region, including some framework residues, and their predicted binding energy was similar (-6.35 and -7.22 kcal/mol for M2-Inaba and M4-Inaba respectively). Comparison of their binding sites with crystal structure of F-22-30 (2uyl) showed that some amino acids were in similar position with sequence variation. They occupied different amino acids; however, most of them were similar in nature.

Conclusion: The study provides new insight in recognition of carbohydrate antigen by different antibodies against Inaba LPS and rational basis towards the development of a synthetic carbohydrate-based anti-cholera vaccine.

Antimicrobial Resistance and Isolation Rate of Non-fermentating Gram-negative Bacteria in Blood Samples

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Background: Non-fermentating Gram-negative bactaeremia poses an emerging problem in both community and hospital care unit due to increasing antibiotic resistance. Due to its ubiquitous distribution over the past decade, these bacteria have emerged as important opportunistic pathogens in the increasing population of immune-compromised patients.

Objective: Determine the isolation rate and antimicrobial susceptibility pattern of non-fermentative bacteria, such as *Pseudomonas* spp., *Acinetobacter* spp., and *Stenotrophomonas maltophilia*, causing bactaeremia among patients who attended healthcare service of ICDDR,B.

Methodology: A retrospective data analysis was performed on 28,151 blood samples processed in the Clinical Microbiology Laboratory of ICDDR,B during January 2005–December 2007. Standard bacteriological procedures were used for identifying non-fermentative Gram-negative bacillus. Antibiotic susceptibility testing was performed by the disc-diffusion (Kirby-Bauer) method using the CLSI guideline.

Results: Of 28,151 blood samples, 3,743 (13.3%) were positive for various pathogens, of which 362 (1.3%) were *Pseudomonas* species, 244 (0.9%) were *Acinetobacter* species, and 139 (0.5%) were *S. maltophilia*. Of these pathogens, *Pseudomonas* spp. were highly resistant to chloramphenicol (60%) and gentamicin (47%), followed by amoxicillin (45%), ceftriaxone (33%), and amikacin (12%). *Acinetobacter* spp. were highly resistant to amoxicillin (48%) and chloramphenicol (45%), followed by co-trimoxazole (39%), ceftriaxone (36%), gentamicin (32%), and amikacin (10%). *S. maltophilia* isolates were highly resistant (29%) to cefixime, followed by gentamicin (6%) and amoxicillin (4%), and resistance to chloramphenicol and ceftriaxone was similar (3%). An increased level of resistance to higher-generation cephalosporins (cefixime) was observed in *Acinetobacter* spp. (45%), *Pseudomonas* spp. (30%), and *S. maltophilia* (29%). Resistance to carbepenems was similar in *Pseudomonas* spp. and *Acinetobacter* spp. (4%); however, *S. maltophilia* was less resistant to carbepenems.

Conclusion: Emergence of multidrug-resistant non-fermentative bactaeremia now poses significant problems in terms of treatment and infection control, resulting in a significant health and economic burden.

Vibrio cholerae Serogroup O1 and O139 Causing Endemic Cholera in the Coastal Aquatic Environment of Bangladesh: A Molecular Epidemiological, Ecological and Phylogenetic Study

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Background: *Vibrio cholerae*, a causative agent of cholera, has been established as an autochthonous flora of the aquatic environment, but the questions of where the bacterium lives between epidemics, what determines the seasonality of cholera, and how an epidemic strain emerges, remain unanswered. Cholera has been correlated with the climatic factors, e.g. sea-surface temperature, sea-surface height, and plankton blooms in the Bay of Bengal. Although epidemiological data suggest that cholera emerges first in coastal villages, before cases occur inland, research and interventions on cholera, which date back to the 1960s in Bangladesh, were done mainly in Dhaka and Matlab, these are two inland endemic sites, 50 km apart, where epidemics of cholera annually show 2 distinct seasonal peaks—spring and fall.

Objectives: Study cholera and its causal agent, *V. cholerae*, in the aquatic ecosystem of the cholera endemic coastal villages; the aim being to decipher the aquatic reservoir, geographic distribution, emergence, and transmission of cholera serogroups in the ecosystem near the Bay of Bengal to be able to understand how Asiatic cholera is modulated in this region.

Methodology: This study, a combined epidemiological and ecological surveillance, was carried out biweekly in 2 coastal endemic sites (2004-2007) employing various culture methods and ecological analyses, such as direct, enrichment, and antibiotic-aided culture enumeration, colony-blot hybridization, fluorescent in situ hybridization, direct fluorescent-antibody detection, multiplex polymerase chain reaction, DNA sequencing, and analysis of targeted genes.

Results: The results showed that, although endemic cholera in coastal villages is caused mostly by *V. cholerae* O1 El Tor and rarely by O139 Bengal, both cholera serogroups shared a niche in the coastal aquatic ecosystem. This study is the first to show a unprecedented high frequency of isolation of both cholera serogroups from surface waters of Mathbaria, where the bacteria exist year round, during and between seasonal epidemics, either as actively growing cells or in a dormant state within biofilms, free-living or in association with plankton, regardless of seasonal epidemics.

Conclusion: Extensive characterization and typing of both cholera serogroups isolated in the study and comparison with strains isolated from samples collected at inland endemic sites, during and in the preceding years, provide strong evidence that the aquatic environment of the mangrove swamp region of the Bay of Bengal serves as an important reservoir for those *V. cholerae* that cause Asiatic cholera in this region.

Need for Cholera Vaccine in Slums of Kolkata, India: Evidence from a Community-based Prospective Study

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Background: Cholera produces acute severely-dehydrating diarrhoea, which often requires intravenous rehydration. Outbreaks can easily overwhelm healthcare systems. Thus, despite the widespread availability of oral rehydration solution, cholera continues to produce serious public-health consequences where it occurs. Better understanding of the burden, epidemiology, and potential risk factors for cholera is needed to develop and implement new and creative approaches to eliminate this ancient scourge. A population-based prospective cholera surveillance was, therefore, undertaken in Kolkata, West Bengal, India.

Objective: Measure the burden of the cholera, describe its epidemiology, and find out its potential risk factors.

Methodology: A community-based prospective study was conducted in ward 29 and 30 of Kolkata Municipal Corporation area. The study population was enumerated in early 2003 and in 2004. In total, 62,817 individuals were included in the surveillance for acute, watery, non-bloody diarrhoea from 1 May 2003 to 30 April 2004. The surveillance was conducted through 5 project health outposts and 2 referral hospitals. A stool sample was collected from each patient for culture of *Vibrio cholerae*.

Results: There were 124 culture-confirmed cholera cases (all El Tor Ogawa *V. cholerae* O1), of which 15 (12%) were in children aged less than 2 years, 29 (23%) had severe dehydration, and 48 (39%) were hospitalized for intravenous rehydration. The incidence rate of cholera was the highest among those aged less than 2 years at 11.2 cases per 1,000 person-years (95% confidence interval 6.8-18.4). Highly-significant risk factors for cholera included a household member with cholera during the surveillance, young age, and low economic status. Cholera was also associated with living in the most congested areas of the study site.

Conclusion: A heavy burden of cholera was found in Kolkata with risk factors not easily amenable to intervention. Young children bear the brisk not only of diarrhoeal diseases in general, but of cholera as well. Mass vaccination could be a potentially-useful tool to prevent and control seasonal cholera in this community.

Emergence and Rapid Spread of High-level Ciprofloxacin Resistance in *Shigella* Species in Urban and Rural Bangladesh: An Implication for Therapy

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Background: Shigellosis, a global public-health problem in both developed and developing world, including Bangladesh, is associated with significant morbidity, mortality, and burden on economy and health. Its importance has increasingly been recognized because of the emergence and spread of multidrug-resistant strains, resulting in treatment failures that limit empiric therapy where laboratory facility is limited.

Objective: Review the current pattern of *Shigella* associated infection in diarrhoeal patients of all ages and gender and examine antimicrobial resistance.

Methodology: Culture results of stools/swabs obtained from patients attending ICDDR,B from 2001 to 2007 were evaluated. *Shigella* spp. were identified by colony morphology, confirmed biochemically and serologically by slide-agglutination using polyvalent group and type-specific commercial antisera. Antimicrobial susceptibility was performed by disc-diffusion using the CLSI guidelines against 5 drugs, including ciprofloxacin, and the phenotype was determined.

Results: In total, 8,447 (7.54%) isolates were confirmed as *Shigella* from 112,040 diarrhoeal patients in Dhaka and 1,199 (9.38%) isolates from 12,789 patients in Matlab. Higher proportions of isolates were *Shigella flexneri* both in Dhaka (61.44%) and Matlab (71.10%). Of the isolates, regardless of their resistance to ampicillin, co-trimoxazole, nalidixic acid, species, and location, 3.36% strains simultaneously acquired resistance to mecillinam and ciprofloxacin with 80.86% in Dhaka and 19.14% in Matlab. Resistance to 5 drugs was 3.40%, to 4 drugs 60.18%, and to 3 drugs 27.78%. The emergence of ciprofloxacin resistance was first observed in *S. dysenteriae* other than *S. dysenteriae* type 1 in Matlab in December 2001 and thereafter in *S. flexneri* strain in Dhaka in February 2002. In 2003, 4 strains of ciprofloxacin-resistant *S. dysenteriae* type 1 were reported from both the places. No *S. dysenteriae* type 1 was isolated in Matlab after May 2003 and in Dhaka after October 2004. Since its emergence, ciprofloxacin-resistant strains are rapidly increasing and fanned out among all other *Shigella* species, commonly among *S. flexneri*. The rapid increase of resistance may be due to the favourable environment of transmission and indiscriminate uses of antibiotics in inadequate dosages.

Conclusion: The rapid increase of multidrug resistance limits the empiric therapy for shigellosis, which is alarming and likely to emerge as a threat to public health. It, thus, warrants the prudent use of antimicrobials by healthcare providers and development of new effective antimicrobials and vaccines to contain the disease and threat to public health.

Medical Waste-management Practices in the Hospitals of Bangladesh

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Background: Management of medical wastes, an essential component of hospital services, involves technical, financial, managerial, administrative and logistic support. Hospital services deserve more attention on this issue since everybody wishes to see the hospital as an ideal place for medical treatment having good sanitation and hygienic environment. Bangladesh, with a population of more than 130 million, is overburdened with medical wastes. There is scope to examine the current practice of management of medical wastes in different categorries of hospitals in Bangladesh.

Objective: Find out the prevailing medical waste-management practices and their effectiveness in Bangladesh.

Methodology: Qualitative approach was used for obtaining information for the study using observation technique, in-depth interview, and focus-group discussions (FGDs). Sixty healthcare facilities in 6 divisions and 4 off-site disposal areas were visited for observation. The duration of each observation was 1-2 hour(s). A semi-structured field-tested questionnaire was designed for in-depth interview. Thirty key informants, such as administrators, doctors, nurses, and medical technologists, were interviewed from half an hour to 2 hours. Six FGDs were organized with 6 groups, consisting of 7-8 persons per group from one and a half to 2 and a half hours for each group.

Results: The results from observations, in-depth interviews, and FGDs showed variations in different variables used for comparison among different institutions and between government and non-government hospitals. Medical college hospitals (tertiary) and government specialized hospitals were found to follow inadequate and ineffective medical waste-management practices. Specialized hospitals produced more infectious wastes (0.11 kg/day/bed) than tertiary and secondary hospitals (0.08 kg/day/bed and 0.06 kg/day/bed respectively). Non-government hospitals were managing infectious wastes better than the government hospitals. Nosocomial/cross-infection rate was much higher in the government hospitals.

Conclusion: The results indicate the lack of sufficient initiatives from the Government-end in introducing effective medical waste-management practices. Non-government healthcare facilities can take the lead for public-private partnership in this specific issue. The rate of nosocomial infection in the government hospitals needs immediate attention for controlling the spread of infectious diseases.

Audit of Comprehensive Emergency Obstetric Care Facilities under Public Sector in Bangladesh

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Background: For an estimated 15% of deliveries, women suffer from severe obstetric complications and need to be treated in comprehensive emergency obstetric care (CEmOC) facilities. In many developing countries, establishing functional CEmOC services is a major challenge primarily due to supply-side constraints. To establish an effective CEmOC system, there is a need to assess the quality of care, time to time, for improvement of services.

Objective: Review the availability of different components of CEmOC services in designated public-sector facilities in Bangladesh.

Methodology: All the 59 district hospitals (DHs) and 132 upazilla health complexes (UHCs) in the public sector were audited during November-December 2007 and January-July 2008 by trained interviewers under the supervision of medical doctors. Sets of semi-structured questionnaire were used for collecting information by interviewing key personnel (health managers and/or health service providers) at the selected health facilities and retrieving records from registers.

Results: Among 191 facilities audited, different components of the CEmOC were available in only 14.7% of the facilities (32.2% DHs and 6.8% UHCs). The 2 major components of CEmOC—caesarean section (CS) and blood transfusion—were not available in 31.9% (5.1% DHs and 43.9% UHCs) and 34.6% (6.8% DHs and 47.0% UHCs) respectively. The major causes of unavailability of CS services were lack of service providers (obstetricians 56.5% and anaesthesiologists 71.7%), lack of functional operation theatre (19.9%), and laboratory facilities (2.6%). Among other services, manual removal of retained products of placenta and assisted vaginal delivery were not available in 4.7% and 80.1% of the facilities respectively. The services also suffered due to shortage of essential drugs, such as antibiotics (62.8%), oxytocics (99.5%), and anticonvulsants (98.4%).

Conclusion: Although the Government has set up one CEmOC facility ideally for every 500,000 people in Bangladesh, many of those are non-functional due to unavailability of skilled manpower, lack of equipment, and inconsistent supplies. For accelerating progress in achieving the Millennium Development Goal 5 targets, there is an urgent need for strengthening the CEmOC services by fulfilling the gaps.

Factors Facilitating and Hindering Maternal Healthcare Services in Bangladesh

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Background: During the last decade, the Government of Bangladesh and development partners have strengthened emergency obstetric care (EmOC) services at various levels. At the union level, the Government is currently upgrading 1,500 Health and Family Welfare Centres (HFWCs) to provide basic obstetric care. At the subdistrict level, 132 upazilla health complexes (UHCs) were strengthened to provide comprehensive obstetric care. At this stage, understanding the factors that influence delivery and use of maternal healthcare services in the public sector is important in developing health programmes to ensure that maternal health services reach all who need.

Objective: Explore the factors that facilitate and hinder demand and supply in delivering maternal health services in the public sector.

Methodology: A qualitative study was undertaken during May-August 2008. The study sites were 2 subdistricts—each in the district of Barguna and Patuakhali in Bangladesh. Research methods included free-listing and in-depth interviews with community people and key-informant interviews with the public-sector service providers.

Results: The most reported facilitating factors for demand and supply were: advantage of indoor facility, free treatment and medicines, availability of doctors and nurses, availability of antenatal care (ANC), delivery care, postnatal care (PNC), and family-planning services, advantage of demand-side financing (DSF), and short distance from the residence. The factors that hinder and both supply and demand were: payment of bribes to get the services, lack of advanced technology and equipment, non-satisfactory behaviour of care providers, low quality of medicines, insufficient supplies, lengthy waiting time, limited space, encouragement of patients to go to private chamber, harassment to patients, and religious fallacy. The demand-side also identified additional factors, such as unavailability of female and specialist doctors, lack of caesarian-section service, lack of cleanliness, poor communication, wrong treatment, and mothers dying in the public facilities.

Conclusion: The Government should focus on maximum use of resources, emphasizing close monitoring and supervision, solution of inadequate human-resource problem, assurance of advanced technology and equipment, and adequate supply of medicines. Increasing the number of deliveries at facilities and reducing maternal mortality through comprehensive emergency obstetric care, at least in every upazilla health complex, is an urgent need.

Hypertension and Diabetes Survey among LAMB Project Staff

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Background: The demographic transition from diseases of poverty (infectious diseases, premature maternal, newborn, infant and child deaths) to those of non-communicable nature is occurring in Bangladesh. Although small in numbers, the middle- and upper-classes are increasingly at risk.

Objective: Assess the potential by examining a population of relatively middle class by screening staff of a small NGO in north-western Bangladesh, find cases of previously-undiagnosed hypertension and diabetes, and evaluate the control of hypertension and blood-sugar in staff patients with known hypertension and diabetes.

Methodology: All 351 central project staff based at LAMB project (not including community staff) were invited for measurement of blood pressure (BP) and random blood glucose. Staff also filled up a questionnaire and were weighed and measured. All patients with a diastolic BP greater than 90 or systolic greater than 140 were called back for further evaluation. All patients with a blood glucose of greater than 9 mmol/L were called for a fasting blood-glucose measurement. Evidence-based protocols exist for the management of both hypertension and diabetes at LAMB project.

Results: Of the 351 staff, 29 failed to attend for evaluation. Of the 322 who attended, 5 aged less than 40 years, with normal body mass index (BMI), were found to have abnormal random blood-sugar levels (>11 mmol/L), and later, all were confirmed as suffering from diabetes by high fasting glucose test results. Of the 7 known diabetic patients, 3 had random blood-sugars in the normal range. 30 staff members were known to have hypertension, of whom 14 had blood pressures within a normal range for a treated hypertensive patient. A further 70 previously-undiagnosed staff members had diastolic blood pressures of 90 or over requiring follow-up. Seventy-two staff members had a BMI of >25, and 5 had a BMI of >30.

Conclusion: The incidence of undiagnosed diabetes and hypertension was high, even in young middle-class patients with normal weight. Control of blood pressure and blood-sugar was only adequate in half of known patients despite provision of free healthcare and medication.

Diarrhoeal Disease

Characterization of *Shigella*-specific Bacteriophages Isolated from Environnemental Waters in Bangladesh

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Background: Shigellosis, a major public-health problem in many developing countries, including Bangladesh, is caused by *Shigella* species. Although *Shigella*-contaminated foods and drinks are often the sources of spread of the epidemic, its possible presence and transmission through environmental waters has not been adequately examined.

Objective: Isolate *Shigella*, *Shigella*-specific bacteriophages and their characterization at molecular level.

Methodology: Forty-five surface-water samples were collected from February 2006 to January 2007 around Dhaka, Bangladesh and were analyzed. All the samples were tested for *Shigella* and *Shigella*-specific phages using standard microbiological techniques and polymerase chain reaction (PCR). For phage specificity, different serotypes of *Shigella* strains and other enteric pathogens, especially *Salmonella* spp., *Vibrio cholerae*, and *Escherichia coli*, were tested. Isolated phages were characterized extensively using restriction fragment length polymorphism (RFLP), PCR, and PFGE of phage genome.

Results: *Shigellae* were not isolated from any water samples by culture method but 6 (13.3%) samples were positive for *ipa*H gene. Four different types of bacteriophage that are single serotype-specific were characterized. Besides these, there are some phages that were double and multi-serotype-specific. All bacteriophages were lytic phages and negative for capsid gene (gene 23) of various T4 type phages, except one which was multiserotype-specific. RFLP and PFGE patterns revealed that all phages were heterogenous.

Conclusion: It can be concluded that the isolated phages might be used as diagnostic markers and for epidemiological application in identifying *Shigella* in environmental water and biocontrol in the environment.

Characterization of Pigmented *Chromobacterium violaceum* Isolated from Northeastern Hilly Region of Bangladesh

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Background: *Chromobacterium violaceum*, a Gram-negative bacterium, usually occurs as a saprophyte in various tropical and subtropical ecosystems, primarily in water and soil. It is recognized as an opportunistic pathogen of extreme virulence and high mortality in humans. Both pigmented and non-pigmented colony types are ubiquitous in the environment. 'Violecin', produced by pigmented strains of *C. violaceum*, has antibiotic activity against soil amoebae and trypanosomes. It is reported to be employed for environmental detoxification of cyanates and arsenic. There is no report on natural occurrence or clinical incidence of *C. violaceum* in Bangladesh.

Objective: Isolate and identify *C. violaceum* and determine its natural distribution in soil and water in the northeastern hilly region of Bangladesh from where it was first isolated.

Methodology: Water (stream, lake, spring, and tubewell) and soil samples were collected from Maulvibazar and Habiganj districts of Bangladesh in 2007. The faecal contamination level was determined in terms of total coliforms and faecal coliforms using standard procedures. For the isolation and enumeration of *C. violaceum*, non-selective nutrient agar plate was used. Fur-ther, biochemical tests ware performed for the presumptive identification of *C. violaceum*. The isolates were then subjected to antibiogram, and genetic diversity was analyzed by ribotyping.

Results: Pigmented *C. violaceum* was highly abundant in all the collected water and soil samples. The counts ranged from 10 to 4,000 cfu/mL in water and 200 to 4,800 cfu/g in soil. Its occurrence was not influenced by faecal contamination as measured by faecal coliform counts. All the pigmented isolates were resistant to polymixin B and cephalothin but sensitive to ciprofloxacilin, furazlidone, nalidixic acid, tetracycline, and gentamycin. The presence of genetically-diverse population was evident by ribotyping where 5 different ribotypes were observed.

Conclusion: As no clinical incidence or environmental occurrence was reported earlier, a long-term monitoring programme is recommended to investigate the epidemiology and ecology of *C. violaceum* in the northeastern hilly region of Bangladesh.

Prevalence and Molecular Characterization of Enteropathogenic *Escherichia coli* Strains Isolated from Patients in Bangladesh

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Background: Enteropathogenic *Escherichia coli* (EPEC) is a leading cause of diarrhoea in infants aged less than 2 years in developing countries. To induce diarrhoea, EPEC uses several virulence factors acting on a still unknown mechanism.

Objective: Determine the prevalence of different virotypes of *E. coli* among diarrhoeal patients and characterize the EPEC strains involved.

Methodology: In total, 295 samples of *Escherichia coli* were collected from diarrhoeal patients in the Dhaka Hospital of ICDDR,B during July-October 2008. These strains were identified using standard microbiological techniques and were screened for *E. coli* virotype-specific genes (*lt*, *st*, *bfp*A, *eae*, and *aat*) by polymerase chain reaction (PCR). The EPEC strains were characterized by testing for antibiotic resistance, plasmid profile analysis, and pulsed-field gel electrophoresis (PFGE) to determine their clonal diversity.

Results: The most prevalent *E. coli* virotype was enterotoxigenic *E. coli* (22%), followed by EPEC (6.8%), and enteroaggregate *E. coli* (5.8%). Only one enteroinvasive *E. coli* was found. None of the samples contained enterohaemorrhagic *E. coli*. Of the 20 EPEC strains identified, 67% had the *eae* gene while 39% had both *eae* and *bfp*A genes. Antibiotic susceptibility tests revealed that 83% of the EPEC strains were resistant to trimethoprim-sulfhomethoxazole, tetracycline, ampicillin, chloramphenicol, and nalidixic acid, with 27% and 11% of the strains being resistant to ciprofloxacin and ceftazidime respectively. Plasmid profile showed extensive heterogenicity, with 30.8% belonging to a single type (P1). All the EPEC strains tested harboured the EPEC adherence factor plasmid. PFGE analysis of the XbaI-digested chromosomal DNA of the EPEC strains yielded heterogenous banding patterns, suggesting a diverse clonal variation among them.

Conclusion: The findings suggest that EPEC is an important cause of diarrhoea among children in Bangladesh. Molecular detection by the *eae*-PCR, followed by plasmid profiling and PFGE, is useful for monitoring EPEC-associated infections and discovering possible reservoirs.

Pattern of Antibiotic Resistance of *Campylobacter* Species Isolated in Dhaka, Bangladesh, 2006-2007

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Background: *Campylobacter* spp. is one of the major causes of diarrhoea and gastroenteritis in both developed and developing countries. The incidence of campylobateriosis has risen substantially in developing countries during the past 20 years, especially after 1990. Despite the increasing importance of campylobateriosis, available data on *Campylobacter* spp. and the antimicrobial resistance pattern are limited in Bangladesh.

Objective: Determine the prevalence rate of campylobacteriosis and the antimicrobial resistance pattern of the isolates associated with diarrhoea.

Methodology: The study retrospectively analyzed the available data of *Campylobacter* isolates, during January 2006–December 2007, from 10,159 stool specimens obtained from patients attending the Dhaka Hospital of ICDDR,B. Isolation and identification of *Campylobacter* were performed by standard microbiological procedures, and antimicrobial susceptibility following the CLSI guideline was determined.

Results: Of 10,159 stool samples tested, 902 (8.88%) were positive for *Campylobacter*, of which 726 (80.49%) were *C. jejuni*, and 176 (19.51%) were *C. coli*. The isolation rate was higher in 0-2 years age-group (n=238; 26.38%), followed by 2-5 years age-group (40; 4.43%), while the isolation rate was lower in adults (n=95; 10.53%) aged >35 years. *C. jejuni* (n=649; 98.76%) and *C. coli* isolates (n=175; 99.43%) were highly resistant to co-trimoxazole, followed by ciprofloxacin 649 (89.39%) and 161 (91.48%) respectively, nalidixic acid 641 (88.29%) and 154 (87.50%) respectively, tetracycline 341 (46.97%) and 86 (48.86%) respectively, and ampicillin 217 (29.89%) and 69 (39.20%) respectively.

Conclusion: Children aged below 5 years were more (75.28%) vulnerable to infection with *Campylobacter* spp. The majority of the isolates were resistant to co-trimoxazole, followed by ciprofloxacin, nalidixic acid, and tetracycline. Fluoroquinolone resistance among *C. jejuni* and *C. coli* isolates appeared to be widespread. The emergence of resistant *Campylobacter* may also have implications for the management of diarrhoeal disease.

Non-*Vibrio cholerae* Reservoir for *Vibrio* Pathogenicity Island, Pandemic Marker, and Related Virulence Genes in a Pond Ecosystem Serving as Niche for Cholera Serogroups, O1 and O139

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Background: A non-pathogenic *Vibrio cholerae* presumably becomes pathogenic, like El Tor arose from classical progenitor, by acquiring virulence and related genes from diverse populations of bacteria that share niche with *V. cholerae* in the aquatic ecosystem, although a little is known about the non-*V. cholerae* reservoir for these genes.

Objective: Determine the non-*V. cholerae* reservoir for the *Vibrio* pathogenicity islands (VPIs) and related marker genes in non-cholera bacteria, including other vibrios and aeromonads that share niche in the aquatic ecosystem.

Methodology: *V. cholerae* O1 (n=3), *V. cholerae* non O1/O139 (n=14), *Aeromonas* spp., (n=15) and *V. mimicus* (n=20) isolated from water samples (collected bimonthly during 2007-2008 from a pond located near the coastal ecosystem of the Bay of Bengal in Mahtbaria) were subjected to simplex and multiplex PCR for different open-reading frames (ORFs) of the VPI and related marker genes and gene clusters (VPI-1, CTXΦ, RS1Φ, RTX, VSP-I, VSP-II, MSHA). *V. cholerae* non-O1/O139, *V. mimicus*, and *Aeromonas* spp., harbouring varied proportion of virulence genes were subjected to molecular typing by enterobacterial repetitive intergenic consensus (ERIC) PCR and pulsed-field gel electrophoresis (PFGE).

Results: Twenty-nine percent of *V. cholerae* non-O1/O139, 25% of *V. mimicus*, and 7% of *Aeromonas* spp. harboured varied proportion of the ORFs of the VPI, such as TCPs; while 20% of *V. mimicus*, 14% of non-*V. cholerae* O1/O139, and 13% of *Aeromonas* strains had *ctx*AB encoding the cholera toxin (CT). Besides, all *V. cholerae* non-O1/O139, 86% of *Aeromonas*, and 40% of *V. mimicus* strains carried variable number of ORFs of *Vibrio* seventh pandemic island (VSP) I and II, although none of these strains carried the complete set of VSP genes. Thirteen percent of *Aeromonas* spp., and 10% of *V. mimicus* strains had the RS1Φ gene, *rst*C, that facilitates CTXΦ production. The prevalence of accessory virulence genes, such as mannose-sensitive haemolysin agglutination pili (*msh*A) and repeat in toxin (*rtx*) was high. DNA fingerprinting analyses using ERIC-PCR, and PFGE of NotI-digested genomic DNA of *V. cholerae* non O1/O139 revealed that there was no homogeneity among the strains carrying such virulence and related genes and were, thus, diverse clonally.

Conclusion: The VPI, CTXΦ, VSP I and II, and other accessory virulence and related genes that are clustered in pathogenic *V. cholerae* O1 and O139 have non-cholera reservoirs. Although none of the non-cholera populations harboured the complete cluster of any of these genes, the incorporations of these otherwise dispersed genes may presumably transform a non-cholera *V. cholerae* into an epidemiologically thriving clone, particularly in the coastal ecosystem of the Bay of Bengal where cholera has been endemic for centuries.

Antimicrobial Susceptibility, Molecular Characterization, and Cytotoxin Production by *Campylobacter* Species Isolated in Bangladesh

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Background: *Campylobacter* species, the major cause of bacterial gastroenteritis in humans, may be responsible for 400-500 million cases worldwide each year. The increasing rate of human infections caused by antibiotic-resistant strains of *C. jejuni* makes clinical management of campylobacteriosis difficult and is associated with prolonged illness.

Objective: Characterize, phenotypically and genotypically, *Campylobacter* strains isolated from clinical samples and observe production of cytotoxin(s).

Methodology: One hundred *Campylobacter* isolates collected at the Clinical Microbiology Laboratory of ICDDR,B during January-June 2008 were used in the study. Their antimicrobial susceptibility was examined following the recommendations of the Clinical and Laboratory Standards Institute using the disc-diffusion method. Cytotoxin production of these isolates was determined by HeLa cell assay. Pulsed-field gel electrophoresis (PFGE) was done to analyze the clonal relationship among the strains.

Results: Detailed biochemical studies revealed that all the isolates had the biochemical characteristics typical of *Campylobacter* species. Of the 100 isolates, 83 were identified as *C. jejuni* by standard biochemical test and confirmed by species-specific PCR. Of the remaining 17 isolates, 8 were *C. coli*. Antibiotic susceptibility test of *C. jejuni* revealed that 56 (67.5%) and 54 (65.1%) strains were resistant to ciprofloxacin and nalidixic acid respectively, and 22 strains (26.5%) were resistant to ampicillin and tetracycline. Only 2 (2.4%) of the 83 strains were resistant to erythromycin. No plasmids were detected in any *C. jejuni* strains. Fifteen *C. jejuni* strains were tested for cytotoxin activity and PFGE typing. Only 2 showed cytotoxic activity on HeLa cells. PFGE revealed that the *C. jejuni* strains were diverse.

Conclusion: Ciprofloxacin resistance in *C. jejuni* was very high but similar to data reported in 2002. The observed erythromycin resistance in *C. jejuni* was low and is comparable to the resistance frequencies reported elsewhere. Although the role, prevalence and disease burden of *Campylobacter*-associated diarrhoea in Bangladesh is not clear, high-level fluoroquinolone resistance makes clinical management of campylobacteriosis difficult.

Infectious Disease

Comparison of Acid Fast Bacilli Microscopy, Culture, and Polymerase Chain Reaction for Detection of *Mycobacterium tuberculosis* in Clinical Specimens

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Background: Tuberculosis (TB), one of the leading infectious diseases in the world, is responsible for more than 2 million deaths and 3 million new cases annually. Accurate and early diagnosis of TB is important for its effective treatment and management.

Objective: Investigate the role of acid fast bacilli (AFB) microscopy, culture, and polymerase chain reaction (PCR) in the diagnosis of TB.

Methodology: The study was undertaken in the Dhaka Central Jail, the largest prison in Bangladesh. In total, 13,707 inmates were actively screened from October 2005 to June 2008, and 2,169 were identified as TB suspects. Persons who had cough for more than 3 weeks were classified as TB suspects. Three sputum samples—one on the spot and 2 early morning—were collected from each suspect. All sputum samples collected from the suspects were brought to the Tuberculosis Laboratory of ICDDR,B for investigations, which included AFB microscopy, conventional culture using Löwenstein-Jension solid media, and PCR using primers from IS6110 gene sequence. The Ethical Review Committee of ICDDR,B approved the study protocol.

Results: Of 2,169 samples examined by AFB microscopy , 246 (11.34%) were positive whereas 307 (14.15%) were positive on culture. 20% were positive by culture which were negative by AFB microscopy. Sensitivity and specificity of smear microscopy were 80.13% and 99.79% respectively. Of 249 cases with pulmonary TB, 211 (85%) were positive both on culture and PCR examinations but 15% of culture-positive cases were PCR-negative. Considering the culture positivity as gold standard, the sensitivity and specificity of PCR were 86.75% and 100% respectively for active pumonary TB.

Conclusion: The results demonstrate that a considerable number of AFB smear-negative TB cases were positive on culture (20%). PCR was positive in 64% of culture-positive and smear-negative cases. The use of both culture and PCR increased the detection of cases in the Dhaka Central Jail.

Nutrition

Changes in Nutritional Status of Under-5 Children of the NNP Area between 2004 and 2007

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Background: In Bangladesh, 48% of under-5 children are underweight, and 43% are stunted. Review of data of the past 5 years on dietary intake and growth reviewed substantial decrease in the food intake and growth-faltering of children. Impact of services of the National Nutrition Project (NNP) after the intervention period has not earlier been evaluated.

Objective: See the changes in the nutritional status of children aged less than 2 years in the 2004 NNP Baseline Survey after 3 years.

Methodology: The Baseline Survey of the NNP, conducted in 2004, covered 113 upazilas (44 NNP intervention upazilas, 16 NNP comparison upazilas, and 53 Bangladesh Integrated Nutrition Project upazilas) under 6 divisions. Data on the nutritional status were collected from a sample of households drawn from 708 primary sampling units. Of 9,217 under-2 children, 2,124 were followed up.

Results: The proportion of stunting increased in 2007 compared to 2004 (39.5% vs 55%, p<0.001) in the intervention area (NNP and BINP area) as in the control area (37.6% vs 48.3%, p<0.001). The proportion of underweight children increased in 2007 compared to 2004 (34.1 % vs 42.6%, p<0.001) in the intervention area. However, the proportion of wasted children decreased in 2007 compared to 2004 (9.3% vs 14%, p<0.001) in both intervention and control areas (10.5% vs 17.5%, p<0.001).

Conclusion: Stunting and underweight in children of 2004 increased in 2007 but their wasting decreased significantly.

Evaluation of Hospital Diets for Three Different Diseases in Hospitals in Dhaka City

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Background: Appropriate dietary management, along with medical treatment, helps recovery of patients. A large number of heart, renal and diabetics patients need correct diet as part of the treatment. To assess the appropriateness of hospital diets in diabetes, coronary heart disease, and renal disease, patients aged 30-50 years were recruited.

Objective: Compare the appropriateness of hospital diets in diabetes, coronary heart disease, and renal disease with RDA.

Methodology: This prospective cross-sectional descriptive study with three diseases was conducted at three hospitals in Dhaka city during from March 2006–September 2006. One hundred and sixteen admitted subjects were recruited for nutritional intake. Data were collected on past illness, sociodemographic characteristics, diagnosis, and dietary intake on hospital-supplied diets and personal supply.

Results: Diabetic patients were supplied with 27% excess carbohydrate compared to RDA, and they were also supplied with 104% excess protein and 3.33% excess fat. Patients with coronary heart disease were supplied with 18% excess fat (saturated fatty acid), 104% excess calorie, 146% excess carbohydrate, and 58% excess protein. Patients with renal failure were supplied with 63% excess protein, 23% less calorie, 5.3% less carbohydrate, and 82% less fat. 57% of CHD patients, 88% of renal failure patients, and all of diabetic patients consumed diet from hospitals.

Conclusion: Food was not served according to the hospital diet menu, and diet supply was not appropriate for the study patients. Every hospital should appoint professional nutritionists or dieticians for better recovery of patients.

Barriers to and Impact of Nutrition Education on Early Initiation of Breastfeeding among Urban Mothers

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Background: Promotion of breastfeeding is a key child-survival strategy. Promotion of early initiation of breastfeeding (EIB) may contribute to the achievement of the Millennium Development Goal relating to child survival. 31% reduction in neonatal deaths could be achieved if breastfeeding is initiated within the first hour of birth.

Objective: Find out the barriers to EIB and see the impact of nutrition education on EIB compared to the control group.

Methodology: Ninety-six women above 8 months of pregnancy were selected for each of intervention and control groups from 3 maternity hospitals in Dhaka city. The study was conducted during April 2008—October 2008. Socioeconomic data were collected from randomly selected subjects in both intervention and control groups before delivery using a pre-tested questionnaire. The second visit was made to the mothers of intervention group to give nutrition education on the importance and correct techniques for initiation of breastfeeding within one hour of birth. In the final visit within the first week of delivery, information on breastfeeding and time of initiation was collected.

Results: The results of binominal logistic regression analysis showed that mothers of the intervention group were 4.3 times more likely to initiate breastfeeding within one hour of birth than the control group. Lack of awareness was a barrier to the improvement in EIB rate. EIB was significantly higher in the intervention group (62.5%) compared to the control group (39.6%) ($p<0.001$). Significant barriers to EIB were complications during pregnancy, poor food-intake during pregnancy, lack of information on importance of breastfeeding, lack of motivation of family members about breastfeeding, and lack of breastfeeding counseling.

Conclusion: Mothers who received family support on breastfeeding were 9 times more likely to initiate within one hour of birth, and mothers who had complications during pregnancy were 7 times less likely to initiate early than those who had no complications.

Improving Breastfeeding Practices in a Community-based Project in Selected Urban Slums, Bangladesh

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Background: Infant-feeding practices are often inadequate in urban slums of Bangladesh. Concern Worldwide, Bangladesh implemented a 5-year nutrition and food security project in selected slums of Dhaka, Chittagong, and Khulna from 2002 to 2007. One purpose of the project was to create awareness about infant- and young child-feeding practices among mothers through health- and nutrition-education session.

Objective: Assess whether breastfeeding practices have changed among mothers in the project areas over the 5-year period.

Methodology: Census data were collected from 10,864 respondents at baseline (BL, March-July 2000). At endline (EL, October-December 2006), multistage cluster-sampling and simple random-sampling were used within the cluster to select 900 respondents from 3 cities. Pre-coded questionnaire included questions on infant breast-feeding practices.

Results: Initiation of breastfeeding right after birth was 19.3% at BL and 81.2% at EL, within the 24-hour period, 43.8% at BL and 16.5% at EL, and after one day, it was 30.6% at BL and 2.3% at EL. The trend was similar among all the 3 cities. Exclusive breastfeeding for 5 months (national recommendation at BL) increased from 27.1% at BL to 55.9% at EL in the project areas. At BL, 90.0% of mothers stopped breastfeeding when the child was aged 12 months whereas, at EL, 96.2% of mothers of under-2 children continued breastfeeding for 2 years.

Conclusion: Breastfeeding practices improved after the intervention in the selected urban slum areas. The dramatic increase in children being breastfed right after birth increased exclusive breastfeeding, and prolonged breastfeeding for 2 years is likely to contribute to a better nutritional status of children. Thus, health- and nutrition-education session is likely to have contributed to breastfeeding practices among mothers.

Items Preferred by Mothers in Preparation of Complementary Food for Children

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Background: Breastmilk is the best and safest food for young babies. It maintains optimum growth up to the age of 4-6 months, and thereafter faltering of growth occurs in most children. Hence, it is important that babies be given additional foods, along with beastmilk at the right age and in sufficient amounts to enable them to grow and stay healthy. Complementary feeding is a critical window of opportunity to improve child growth.

Objective: Find out the food items preferred and given by mothers as complementary foods and reasons for not giving some important complementary food items.

Methodology: A cross-sectional descriptive study was conducted among 202 mothers with infants aged 6-12 months attending the outdoor department or admitted to the inpatient department of the Dhaka Shishu (Children's) Hospital; these mothers have started giving complementary foods to their infants. A structured questionnaire of qualitative and quantitative methods was used for collection of data on initiation age of complementary feeding, type of food preferred by the mothers for their infants, the factors influencing the food preference and food-hygiene practices in complementary feeding.

Results: *Khichuri* (55%) was the most common food item preferred and given by mothers, and 48.5% of the mothers chose infant formula milk (diluted) as a complementary food; 65.8% complained "baby does not accept" as the reasons of not giving proper complementary feeding to their infants; 70.30% gave complementary foods to their babies within 4-6 months which is the violation of the rules of exclusive breastfeeding.

Conclusion: The results indicate that a large number of infants are deprived of exclusive breastfeeding up to 6 months and also of adequate, timely and safe complementary foods.

Maternal and Infant Zinc Status of Appropriate and Small-for-gestational-age Bangladeshi Infants

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Background: Limited information is available on: (a) concentration of zinc in breastmilk of mothers in low-income countries at different times postpartum and (b) serum zinc status of appropriate-for-gestational-age (AGA) and small-for-gestational-age (SGA) infants.

Objective: Measure the breastmilk and zinc status of mothers and infants, using serum zinc values in mothers of AGA and SGA infants.

Methodology: Forty mother-infant pairs were recruited, with 21 infants as AGA and 19 as SGA. Gestational age was assessed by ultrasound at reported 32 weeks of gestation. Each mother-infant pair was studied in 3 separate rounds, at 4, 12, and 24 weeks postpartum. In each round, 2 mL venous blood was collected for assessment of serum zinc of both mother and infant. Breastmilk samples were collected on day 0 and 4 in each round.

Results: The mean birthweight and length was 3.0±0.2 kg and 48.7±1.0 cm for AGA and 2.4±0.4 kg and 46.8±1.8 cm for SGA infants respectively. Mothers' serum zinc content was different among the AGA and SGA mothers at 4 week postpartum (0.55 mg/L vs 0.60 mg/L, p=0.04); however, it was comparable both at 12 and 24 weeks. Infant's serum zinc content was comparable between AGA and SGA infants at all points in the 6-month follow-up period. Breastmilk zinc content in each round was comparable between AGA and SGA mothers; however, the overall breastmilk zinc content significantly decreased as the infant grew older (2.59±0.8; 1.50±0.5; 1.10±0.4 mg/L at 4, 12 and 24 weeks respectively, p=0.000).

Conclusion: Serum zinc content was comparable other than at 4-week postpartum among the mothers of AGA and SGA infants. Breastmilk zinc content decreased over the course of time of the study. The results of the study would help identify the age-specific zinc requirement during early infancy.

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