

20th ANNIVERSARY OF ICDDR,B

and

8th ANNUAL SCIENTIFIC CONFERENCE
(ASCON)



**PROGRAMME
AND
ABSTRACTS**

**VACCINE RESEARCH
and
ENVIRONMENTAL HEALTH**

13-14 February 1999



**CENTRE
FOR HEALTH AND
POPULATION RESEARCH**

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International Centre for Diarrhoeal Disease Research, Bangladesh
Mohakhali, Dhaka 1212, Bangladesh



ICDDR,B

Centre for Health and Population Research

ICDDR,B, or "The Centre", was established in 1978 as successor to the Cholera Research Laboratory created in 1960 to study the epidemiology, treatment, and prevention of cholera. The Centre is an independent, international, non-profit organization for research, education, training, clinical services, and information dissemination. Located in Dhaka, the capital city of Bangladesh, the Centre is the only truly international health research institution based in a developing country. The results of research conducted over the years at the Centre provide guidelines for policy makers, implementing agencies, and health professionals in Bangladesh and around the globe. Researchers at the Centre have made major scientific achievements in diarrhoeal disease control, maternal and child health, nutrition, and population sciences. These significant contributions have been recognized worldwide.

How is the Centre Organized?

The Centre is governed by a distinguished multinational Board of Trustees comprising researchers, educators, public health administrators, and representatives of the Government of Bangladesh. The Board appoints a Director and four Division Directors who head the Centre's four scientific divisions. The Director's Division provides support to the scientific divisions. The Director's Division includes Administration and Personnel Department, Finance Department, Training and Education Department, External Relations and Institutional Development Department, Dissemination and Information Services Centre (DISC), Audiovisual Department, and the Director's Office.

The **Clinical Sciences Division (CSD)** staffed with physicians and scientists trained in paediatrics, general medicine, gastroenterology, infectious diseases, nutrition, and epidemiology is engaged in: (i) hospital- and community-based clinical research in the fields of infectious diseases and nutrition; (ii) hospital care to more than 120,000 patients annually at the Clinical Research and Service Centre in Dhaka; (iii) preventive health care to mothers and children; and (iv) training in case management of diarrhoeal diseases and research methodology. Research activities are along the themes of case management (nutritional, fluid, and pharmacological therapies), pathophysiology, and preventive, maternal and child health.

The **Public Health Sciences Division (PHSD)**, staffed with public health professionals, epidemiologists, social scientists and economists, focuses on the evaluation of population-based interventions to improve child health, reproductive and sexual health, and evaluates public health programmes. Research includes such areas as: reproductive health; high-risk sexual behavioural patterns; family planning; safe motherhood; child health at the community level; epidemiological patterns and transmission of infectious diseases (especially diarrhoeal, acute respiratory and nutrition-related illnesses); health care delivery services; illness prevention through education; behaviour modification; and vaccine trials. The Division has the responsibility of conducting field studies at Matlab involving 210,000 people under the Demographic Surveillance System (DSS) and 110,000 people under the Maternal and Child Health-Family Planning (MCH-FP) Project.

The **Laboratory Sciences Division (LSD)** has scientists with expertise in enteric and respiratory microbiology, molecular genetics, environmental microbiology, immunology, parasitology, reproductive tract infections, sexually transmitted diseases, and nutritional biochemistry. The Division undertakes research on a thematic basis on emerging and re-emerging infectious diseases, vaccine evaluation, control of diarrhoeal diseases, nutrition, and reproductive tract infections. The Division also provides laboratory services to scientists of the Centre and to patients who are referred.

The **Health and Population Extension Division (HPED)** undertakes operations research and interventions in family planning, reproductive and child health, epidemics control, and environmental health. The Division provides technical assistance, training, and environmental laboratory services to the Government of Bangladesh and non-governmental organizations in these fields. The Division comprises the Operations Research Project, the Epidemic Control Preparedness Programme, and the Environmental Health Programme.

The **Training and Education Department (TED)** started training programmes in 1978 for manpower development in research field, increasing capabilities to manage programmes for the control of diarrhoeal diseases and family planning services. The training programmes are designed to enhance

(see inside of the back cover)

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International Centre for Diarrhoeal Disease Research, Bangladesh
Mohakhali, Dhaka 1212, Bangladesh

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CSD--Clinical Sciences Division, DD--Director's Division, HPED--Health and Population Extension
Division, LSD--Laboratory Sciences Members

Acknowledgments

ICDDR,B is supported by countries and agencies which share its concern for the health problems of developing countries. Current donors include: the aid agencies of the governments of Australia, Bangladesh, Belgium, Canada, European Union, Japan, The Netherlands, Norway, Saudi Arabia, Sweden, Switzerland, the United Kingdom, and the United States; international organizations, including the United Nations Children's Fund (UNICEF), the World Bank, and the World Health Organization (WHO); private foundations, including Aga Khan Foundation, Child Health Foundation (CHF), Ford Foundation, George Mason Foundation, Population Council, Rockefeller Foundation, Save the Children Fund (USA), and Thrasher Research Foundation; and private organizations, including American Express Bank, Helen Keller International, International Atomic Energy Agency, International Center for Research on Women, International Development Research Centre, International Life Sciences Institute, Karolinska Institute, London School of Hygiene & Tropical Medicine, Loughborough University, Lederle Praxis, National Institutes of Health (NIH), New England Medical Center, Northfield Laboratories, Procter & Gamble, RAND Corporation, Rhône-Poulenc Rorer, Social Development Center of The Philippines, Swiss Red Cross, Johns Hopkins University, the University of Alabama at Birmingham, the University of Göteborg, the University of Pennsylvania, the University of Virginia, UCB Osmotics Ltd., Wander A.G., and others.

A Brief History of ICDDR,B

- 1960 Pakistan-SEATO Cholera Research Laboratory established
- 1963 Matlab field station started First of a series of cholera vaccine trials launched
- 1966 Demographic Surveillance System established
- 1968 First successful clinical trials of Oral Rehydration Solution (ORS)
- 1969 Relationship between stopping breast-feeding and resumption of menstruation demonstrated
- 1971 Independence of Bangladesh
- 1973 Shift from classical to El Tor cholera identified
- 1977 Maternal-child health and family planning interventions began in Matlab
- 1978 Government of Bangladesh Ordinance establishing ICDDR,B signed
- 1982 Classical cholera returned Field-testing of cereal Oral Rehydration Solution began MCH-FP Extension Project began
- 1984 ICDDR,B received UNICEF's Maurice Pate Award
- 1985 Full Expanded Programme on Immunization activities tested in Matlab WC/BS cholera vaccine trial launched
- 1987 ICDDR,B received USAID's "Science and Technology for Development" Award
- 1988 Treatment of and research on acute respiratory infection began
- 1989 The Matlab record-keeping system, specially adapted for government use, extended to the national family planning programme
- 1991 ICDDR,B scientists assisted in response to the diarrhoeal disease epidemics after the cyclone in southern Bangladesh, and the cholera epidemic in South America
- 1992 ICDDR,B-Bangladesh Rural Advancement Committee (BRAC) study commenced
- 1993 New *Vibrio cholerae* O139 Bengal identified and characterized
- 1994 ICDDR,B celebrated the 25th anniversary of the first successful clinical trial of ORS ICDDR,B team helped slash mortality in Rwandan refugee camps in Goma, Zaire
- 1995 Maternal immunization with a pneumococcal polysaccharide vaccine was shown to protect infants up to 22 weeks Visit by the U.S. First Lady Hillary Clinton who praises the Centre as a world resource, and she initiates Lessons without Border

1996 First official visit to the Centre by a Prime Minister of the host country

1998 ICDDR,B celebrates its 20th anniversary as an international institution

Introduction

The Eighth Annual Scientific Conference (ASCON) has adopted two themes—Vaccine Research and Environmental Health. Both of these themes are the keys to addressing child health and survival, maternal health, and prevention strategies.

Vaccine research had its beginning in the Matlab field site in 1963. It was there where the Cholera Research Laboratory, the forerunner of ICDDR,B, conducted cholera vaccine trials that proved the vaccine developed in the mid-sixties and early seventies to be ineffective. The results from these trials led to the discontinuation of recommending the vaccine, saving the world from misuse of millions of dollars. Since that time, cholera vaccine research has continued, and new trials for cholera vaccines may be on the horizon. Other diarrhoeal disease vaccines, such as for rotavirus, shigella, and salmonella also show promise. Once again, Matlab sub-station of the Centre is poised to serve, in many respects, as an ideal field test site due to its thirty-year history of maintaining demographic surveillance on its 210,000 population. The availability of these longitudinal data for such a long and uninterrupted period on this rural Bangladeshi population will continue to make Matlab an attractive field site for vaccine trials and other community-based research. In vaccine research, we must bear in mind that immunogenicity and efficacy of vaccines must be tested in the appropriate vulnerable groups. Otherwise, the results will not be valid, and financial resources will be wasted.

There are numerous other questions surrounding vaccines. They include concerns, such as the proper distribution of vaccines, immunogenicity trials, the purpose and outcomes of community-based efficacy and effectiveness trials, appropriate methods of vaccine research, ethical issues raised in vaccine trials, assessment of the disease burden; and prioritization of vaccines to be incorporated into the national EPI and operations research on implementing effective immunization campaigns. Additionally, given the Centre's history, many will be interested in our research efforts, our track record in vaccine trials, and global implications of the work in vaccine research conducted at ICDDR,B. There is no doubt that some of these questions will be raised and addressed over the course of the next two days.

The Centre has been intimately involved in environmental health research both in the laboratory and the community. The results have been significant. Hundred years after discovery of the cholera germ, scientists of this Centre, in collaboration with scientists from abroad, have discovered the reservoirs of cholera. The results of basic research conducted here as well as the methodology for cholera epidemic control preparedness have been disseminated throughout the world from the Centre in Bangladesh. These achievements of the Centre are also claimed as major achievements for Bangladesh. Through their basic research work, the Centre's scientists continue to find practical solutions to prevent diarrhoeal disease outbreaks. The environmental health research in Bangladesh will have its impact on other communities worldwide that face similar environmental problems resulting in outbreaks of diarrhoeal diseases.

The importance of the public health concerns of environmental health cannot be underestimated. The promotion of public health messages and prevention strategies based on an understanding of the nature and extent of the growing environmental problems in our community are essential for developing appropriate solutions that will benefit people of all age groups and at every level of society. It is the work done at the field level by concerned communities, government agencies, and NGOs working together that is required to yield sustainable solutions. Education is critical for advancing environmental health concerns. Thus dissemination of information cannot be restricted to the community health workers and NGOs operating in the field, and messages must reach every household at every level. At the 8th ASCON, we will have the opportunity to review some challenges of prevention of infectious

diseases through clean water supply and of controlling the levels of toxins in the atmosphere and water sources. The effectiveness of the public health messages and prevention strategies employed through urban and rural community-based activities can be examined, and many of the issues explored five years ago in the 3rd ASCON can be re-examined, along with progress being made in this area.

Research by scientists at the Centre and others has been significant in both of the topics presented in the 8th ASCON, with collaborative research being done at the international level. This, in part, reflects the unique research environment of ICDDR,B.

We are pleased to welcome our colleagues from the Government of Bangladesh, academic research community, and from the NGO research sector to the ASCON. This 8th ASCON is open to outside presenters as we have been continuing the practice from our two previous ASCONs. This underscores the important work done throughout the research community in Bangladesh in both vaccine research and environmental health. It also provides an excellent opportunity and a forum for us to interact with our colleagues and collaborators and learn of the research conducted in Bangladesh in these two important fields. Undoubtedly, some of the results and outcomes presented here will ultimately be shown to be important with implications for health policy and programmes in Bangladesh and in the global community.

We invite you to fully participate in the conference proceedings, by interacting with the presenters. The Conference should serve as an occasion to further explore some of the findings presented here and create an impetus for new vaccine research and strategies to address environmental health concerns. Once again, we welcome all of you. Enjoy the 8th ASCON.

George Fuchs, MD
Chairperson, Organizing Committee
8th Annual Scientific Conference (ASCON)
and
Interim Director, ICDDR,B

Programme Summary

DAY 1: Saturday, 13 February 1999

8:30-9:30 Registration

9:31-11:00 Inauguration (Sasakawa Auditorium)

Address of Welcome: George Fuchs, Interim Director, ICDDR,B

Address by Special Guest: Salah Uddin Yusuf, Hon'ble Minister for Health and Family Welfare, Government of the People's Republic of Bangladesh

Address by Chief Guest: Sheikh Hasina, Hon'ble Prime Minister, Government of the People's Republic of Bangladesh

Vote of Thanks: Abdullah H. Baqui, Convener, 8th ASCON Organizing Committee
11:01-11:30 Tea Break

Session I

11:31-12:30 Keynote Speech: Vaccine Research (Sasakawa Auditorium)

Speaker: Dr. George Curlin, Deputy Director, National Institutes of Health (NIH), Bethesda, USA

12:31-13:15 Lunch Break

Poster Session (Lobby of the Sasakawa International Training Centre)

Concurrent Sessions

13:16-14:45 Session IIa: Morbidity and Vaccine Research I
(Sasakawa Auditorium)

13:16-14:45 Session IIb: Other Health Issues I: Disease Control and Child Health
(Seminar Room)

14:46-15:15 Tea Break

15:16-16:45 Session IIIa: Morbidity and Vaccine Research II
(Sasakawa Auditorium)

15:16-16:45 Session IIIb: Other Health Issues II: Health Services
(Seminar Room)

DAY 2: Sunday, 14 February 1999

**08:30-10:00 Session IVa: Morbidity and Vaccine Research III
(Sasakawa Auditorium)**

**08:30-10:00 Session IVb: Other Health Issues III: Reproductive Health
(Seminar Room)**

10:01-10:30 Tea Break

Poster Session (Lobby of the Sasakawa International Training Centre)

Session V**10:31-11:30 Keynote Speech: Environmental Health (Sasakawa Auditorium)****Speaker:** Dr. R. Bradley Sack, Professor, Department of International Health, Johns Hopkins University School of Hygiene and Public Health, Baltimore, USA**Concurrent Sessions**11:31-13:00 Session VIa: Health and the Environment I
(Sasakawa Auditorium)11:31-13:00 Session VIb: Health and the Environment II
(Seminar Room)

13:01-13:45 Lunch

13:46-15:15 Session VIIa: Health and the Environment III
(Sasakawa Auditorium)13:46-15:15 Session VIIb: Other Health Issues IV: Miscellaneous
(Seminar Room)

15:16-15:30 Tea Break

15:31-17:00 Concluding Session (Sasakawa Auditorium)

Summary of Vaccine Research: Dr. Abdullah H. Baqui, Acting Division Director, Public Health Sciences Division, ICDDR,B

Summary of Environmental Health: Prof. Barkat-e-Khuda, Acting Division Director, Health and Population Extension Division, ICDDR,B

Address by Chief Guest: Prof. Abu Sayeed, Hon'ble State Minister for Information, Government of the People's Republic of Bangladesh

Concluding Remarks by Chairperson: Prof. George Fuchs, Interim Director, ICDDR,B

Programme Details

DAY 1: Saturday, 13 February 1999

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11:01-11:30 Tea Break

11:31-12:30 Session I: Keynote Speech: Vaccine Research I (Sasakawa Auditorium)

Speaker: Dr. George urlin, Deputy Director, National Institutes of Health (NIH), Bethesda, USA

12:31-13:15 Lunch Break

Poster Session (Lobby of the Sasakawa International Training Centre)

Coordinators: Dr. Shahadat Hossain and Dr. Ishtiaq Bashir, ICDDR,B

Concurrent Sessions

13:16-14:45 Session IIa: Morbidity and Vaccine Research I (Sasakawa Auditorium)

Chairperson: Prof. A.K.M. Nurul Anwar, Director General of Health Services, Government of the People's Republic of Bangladesh

Co-chairperson: Dr. Iqbal Kabir, CSD, ICDDR,B

Response to Tuberculin Skin Testing at Six Months of Age and Relation with Birth Characteristics in Infants of Dhaka City Slums—**Saskia J.M. Osendarp, Joop M.A. van Raaij, Shams El Arifeen, Hasan Mahmud, Abdullah H. Baqui and George Fuchs**

Safety and Immunogenicity of an Oral Inactivated Enterotoxigenic *Escherichia coli* Vaccine in Bangladesh—**Firdausi Qadri, Christine Wenneras, Pradeep K. Bardhan, Yasmin Ara Begum, Debasish Saha, N.H. Alam, M. John Albert, R.B. Sack and A-M Svennerholm**

Maternal Immunization with Meningococcal Vaccine—**Nigar S. Shahid, E. Roy, T. Begum and Mark C. Steinhoff**

Safety of a Live, Attenuated *Shigella flexneri 2a* Oral Vaccine (SC602) in Bangladeshi Adults—
Abdullah H. Baqui, Daniel Isenbarger,
Shams El Arifeen, Rubhana Raqib, Mahbubur Rahman, Md. Yunus,
J. Chakraborty, J. Patrick Vaughan, David N. Taylor, L. Hale,
Malabi Venkatesan, Lorrin Pang, and Robert E. Black

Distribution of Group A Rotavirus Strains in Bangladesh: Emergence of Type G9 in 1995—
Goutam Podder, Leanne E. Unicomb,
Jon R. Gentsch, Patricia Woods, Tasnim Azim, K. Zahid Hassan,
A.S.G. Faruque, M. John Albert, Ruth F. Bishop and Roger I. Glass

Sensitivities of *Shigella* Species Isolated from Stool Samples in Gonoshasthaya Hospital,
Savar—**M.A. Samad Talukder, Ayesha Khatun and Ismat A. Begum**

Discussion and remarks

13:16-14:45 Session IIb: Other Health Issues I: Disease Control and Child Health (Seminar Room)

Chairperson: Professor N. Islam, National Professor

Co-chairperson: Dr. Shams El Arifeen, PHSD, ICDDR,B

Trends in and Determinants of Infant Mortality by Age at Death and Causes of Death in Matlab,
Bangladesh during 1983-1996—
Golam Mostafa and Jeroen K. van Ginneken

Importance of Community-based Programme and Village Doctors in Reducing ALRI Deaths in
Rural Areas of Bangladesh—**Mohammad Ali** and Andres de Francisco

Outcome of Severe Pneumonia in Severely Malnourished and Well-nourished Children Aged
Less Than 5 Years—**N. Nahar,** H.A. Begum, M.A.H. Mollah, N.C. Saha and U. Mitra

Cyclical Pattern of Cholera in Bangladesh—**Md. Yunus,** R.B. Sack and K. Zaman

Measuring Children's Acute Morbidity in Matlab, Bangladesh: A Comparison of Perceived versus
Checklist Data—**Nurul Alam**

Discussion and remarks

14:46-15:15 Tea Break

15:16-16:45 Session IIIa: Morbidity and Vaccine Research II (Sasakawa Auditorium)

Chairperson: Maj. Gen. A.S.M. Matiur Rahman, Armed Forces
Institute of Pathology, Dhaka

Co-chairperson: Dr. Abbas Bhuiya, PHSD, ICDDR,B

Barriers to Immunization in the Slums of Dhaka City—**Henry B. Perry,**
Sufia Nurani, Md. Abdul Quaiyum, S.A. Jinnah and Anjali Sharma

Effect of Reducing the Number of EPI Sessions on Cost and Effectiveness of the Programme—*M. Mahmud Khan, Richard Yodar, Abdullah Al Mamun and **Suhaila H. Khan***

Child Immunization: Trends and Determinants in Bangladesh—***Abdullah Al Mamun** and M. Mahmud Khan*

Bangladesh's First "Mop-up" Campaign for Polio Eradication: An Assessment—***Syed Izaz Rasul, S. Mizan Siddiqi and Henry B. Perry***

Financing of the EPI in Bangladesh—*M. Mahmud Khan, Richard Yodar, Abdullah Al Mamun and **K.M.A. Aziz***

LQAS Assessment of EPI Coverage in the Slums of Dhaka City—***S. Mizan Siddiqi**, Henry B. Perry, Izaz Rasul and Md. Ashrafuddin*

Discussion and remarks

15:16-16:45 Session IIIb: Other Health Issues II: Health Services (Seminar Room)

Chairperson: Dr. Shamsul Hoque, Director, PHC & DC,
Directorate of Health Services, Government
of the People's Republic of Bangladesh

Co-chairperson: Dr. Shahadat Hossain, CSD, ICDDR,B

Inter-bari Differences in the Use of Modern Contraception in Rural Bangladesh—***Nashid Kamal***

Improving Early Identification of ARI at Community Level through Checklists for Field Workers—***S.M. Tariq Azim**, Salahuddin Ahmed, Tajul Islam, Mahbubul Alam and Humayun Kabir*

A Qualitative Assessment of the Health and Family Planning Information, Education, and Communication Needs among the Residents of Dhaka City—***Mahbub A. Mazumder**, Monowar Jahan and Subrata Routh*

Health Problems and Healthcare-seeking Behaviour in Urban Slums of Bangladesh—***Muhammod Abdus Sabur** and Khodadad Hossain Sarker*

Delivering Family Planning Services without Home Visits: Preliminary Findings from Operations Research Activities in Dhaka City—***Cristóbal Tu?ón**, Subrata Routh, Barkat-e-Khuda, K.A. Mazumder and Nirod Chandra Saha*

Review of Interventions to Promote Local-level Planning and Coordination of Essential Health and Family Planning Services—***Jasim Uddin**, Jahanara Khatun, Mafizur Rahman, Cristóbal Tu?ón and Siraj Uddin*

Discussion and remarks

DAY 2: Sunday, 14 February 1999

**08:30-10:00 Session IVa: Morbidity and Vaccine Research III
(Sasakawa Auditorium)**

Chairperson: Mr. D.K. Nath, Director General,
Directorate of Family Planning, Government
of the People's Republic of Bangladesh

Co-chairperson: Dr. Firdausi Qadri, LSD, ICDDR,B

Status of Immunization in Bangladesh—**A.M.R. Chowdhury**,
Abbas Bhuiya, K.M.A. Aziz, F. Karim, Shamim Ara, Shagufta Sultana and Insana Begum

Cultural Concepts Reflected in Disease Terms in Local Dialect Regarding Vaccine-
preventable Diseases at Bhairab, Bangladesh—**K.M.A. Aziz**, A.M.R. Chowdhury, Abbas
Bhuiya, Dineke Mol, Shagufta Sultana, Insana Begum, Shamim Ara and F. Karim

Demand Aspects Relating to Immunization at Bhairab, Bangladesh —*Abbas Bhuiya*,
A.M.R. Chowdhury, *K.M.A. Aziz*, *Amina Mahub*, *F. Karim*, **Shagufta Sultana**, *Dineke
Mol*, *Shamim Ara* and *Insana Begum*

Supply Aspects Relating to Immunization at Bhairab, Bangladesh—
A.M.R. Chowdhury, **Insana Begum**, *F. Karim*, *Abbas Bhuiya*,
K.M.A. Aziz, *Shamim Ara*, *Shagufta Sultana* and *Dineke Mol* (

Immunization Status of Children in Chittagong Hill Tracts—
Abbas Bhuiya, *A.M.R. Chowdhury*, **Shamim Ara**, *F. Karim*
and *K.M.A. Aziz*

Discussion and remarks

**08:30-10:00 Session IVb: Other Health Issues III: Reproductive
Health (Seminar Room)**

Chairperson: Prof. Nazrul Islam, Department of Virology,
Bangabandhu Sheikh Mujib Medical University

Co-chairperson: Dr. Md. Yunus, PHSD, ICDDR,B

Barriers to Emergency Obstetric Care in a Rural Setting of Bangladesh—**Rukhsana
Gazi**, Liz Goodburn, A.M.R. Chowdhury and F. Karim

Role of Male Clinics to Promote Reproductive Health Issues: The Matlab Experience—*J.
Chakraborty*, **N. Alam**, *P. Saha*, *F. Ahmed*
and *Andres de Francisco*

Effect of Adolescent Family Life Education Programme of BRAC—**Rukhsana Gazi**,
Shamsher Ali Khan and A.M.R. Chowdhury

Sexual Behaviours among Male Adolescents in an Urban Community of Dhaka City—
Ashrafal Alam Neeloy, Tamanna Sharmin and Lazeena Muna

Assessing Risks of Contracting HIV for Female Adolescents in Dhaka City—*Lazeena
Muna*, **Tamanna Sharmin** and *Ashrafal Alam Neeloy*

Programmes on Males Who Have Sex with Males in Bangladesh: Necessity and Barriers—**Sharful Islam Khan** and Tamanna Sharmin

Discussion and remarks

10:01-10:30 Tea Break

Poster Session (Lobby of the Sasakawa International Training Centre)

**10:31-11:30 Session V: Keynote Speech: Environment Health
(Sasakawa Auditorium)**

Speaker: Dr. R. Bradley Sack, Professor, Department of International Health, Johns Hopkins University School of Hygiene and Public Health, Baltimore, USA

Concurrent Sessions

**11:31-13:00 Session VIa: Health and the Environment I
(Sasakawa Auditorium)**

Chairperson: Prof. M. Mosihuzzaman, Chairman, BCSIR

Co-chairperson: Dr. Cristóbal Tuñón, HPED, ICDDR,B

Arsenic Levels in Drinking Water and Prevalence of Skin Lesions—**Mahfuzar Rahman**, Martin Tondel and Ireen Akhter Chowdhury

Village Health Workers Can Test Tubewell Water for Arsenic—
A.M.R. Chowdhury, **Mohammed Jakariya**, Ashiqul H. Tareq and Jalaluddin Ahmed

Groundwater Arsenic Contamination and its Effect on Human Health in Bangladesh—A. Wadud Khan, Sk. Akhtar Ahmad, **M.H. Salim Ullah Sayed**, Sk. Abdul Hadi, M.H. Faruque, Manzurul Haque Khan, Md. Abdul Jalil and Rukshana Ahmed

High Levels of Lead and Cadmium in Blood of Children of Dhaka—**M.A. Wahed**, Marie Vahter, Barbro Nermell, Tanvir Ahmed, M.A. Salam and V.I. Mathan

Symptomatic Lead Poisoning in Bangladeshi Children—**Naila Z. Khan**, Reaz Mobarak and Mohammad Wahed

Discussion and remarks

**11:31-13:00 Session VIb: Health and the Environment II
(Seminar Room)**

Chairperson: Prof. A.K. Azad Khan, BIRDEM, Dhaka

Co-chairperson: Dr. M. Sirajul Islam, LSD, ICDDR,B

Medical Waste Disposal in Dhaka City: An Environmental Evaluation—
Nasima Akter, **Noor Mohammad Kazi** and A.M.R. Chowdhury

Environmental Health Education Intervention in Selected Poor Settlements—**Bilqis Amin Hoque**, Robert E. Black, Golam Morshed, Shafiul Azam Ahmed and Hashmat Ara

1998 Flood: Nutrition Situation, Coping Mechanism, and Rehabilitation Plan—**S.M. Moazzem Hossain** and Muhammad Shuaib

Rapid Assessment of Health Status of Children and Women in a Flood-affected Area in Bangladesh—**Aminur Rahman**, Provat C. Barua, Sameena Chowdhury, Rowshan A. Begum, Ferdousi Islam, Nazneen Begum, M.A. Hannan, A.R.M.L. Kabir, Khurshid Talukder and Saria Tasnim

Assessment of Environmental Degradation and Health Hazards Due to Sericulture Programme Activities in Bangladesh—**Nasima Akter, Arnina Rahman and Mohammed Jakariya**

Hearing Loss among Autorickshaw Drivers of Dhaka City—**Zahidul Hasan**, Mahmudur Rahman, Alauddin Sheikh and Anis Waiz

Discussion and remarks

13:01-13:45 Lunch Break

13:46-15:15 Session VIIa: **Health and the Environment III (Sasakawa Auditorium)**

Chairperson: Prof. Sirajul Islam Khan, Dean, Faculty of Biological Sciences and Professor of Microbiology, University of Dhaka

Co-chairperson: Dr. A.K.M. Siddique, HPED, ICDDR,B

Survival of *Vibrio cholerae* O139 with *Anabaena* sp. and Detection of Toxigenic *Vibrio cholerae* from Samples of Aquatic Environment—**M.S. Islam**, K.M. Khan, L.N. Islam, M. John Albert, R.B. Sack, A. Huq and R.R. Colwell

Biological Contamination of Tubewell Water—**Bilqis Amin Hoque**

Probable Role of Mucinase in the Survival of *Vibrio cholerae* O1 in Association with a Cyanobacterium *Anabaena* sp.—**M.S. Islam, M.M. Goldar, M.G. Morshed, M. John Albert, R.B. Sack, A. Huq and R.R. Colwell**

Preliminary Survey of the Abundance of *Aeromonas* Phages in Ponds and Sewage Beds of Dhaka, Bangladesh—**Z. Rahim**, M.S. Islam, R.B. Sack, A. Huq and R.R. Colwell

Blue-green Algal Bloom in Pond Ecosystems and Seasonality of Cholera Cases in an Endemic Area of Bangladesh—**M.S. Islam, M.N.H. Khan, M. Khondker, Md. Yunus, M.A. Rahman, M.A. Sadique, E. Huq, M. John Albert, R.B. Sack, A. Huq and R.R. Colwell**

Detection of *Shigellae* from Rectal Swabs and Handwashing Samples Collected from the Members of Index Families Infected with Shigellosis—**M.S. Islam, A. Sadique, M.M. Goldar, M.S. Hossain, M.M. Rahman, A.H. Baqui, M.A. Rahman, M. John Albert and R.B. Sack**

Discussion and remarks

13:46-15:15 Session VIIb: **Other Health Issues IV: Miscellaneous (Seminar Room)**

Chairperson: Dr. Halida Hanum Akhter, Director,
BIRPERHT, Dhaka

Co-chairperson: Dr. Rukhsana Haider, CSD, ICDDR,B

Green Leafy Vegetables from Natural Sources: The Case of Rural Poor in Bangladesh—
Farzana Ahmed, K.M.A. Aziz, Md. Yunus and R.B. Sack

Zinc Supplementation during Pregnancy in Bangladeshi Urban Poor: Effect on Infant
Growth and Morbidity during the First Six Months of Life—**Saskia J.M. Osendarp**, Joop
M.A. van Raaij, Shams El Arifeen, Abdullah H. Baqui and George Fuchs

Seroepidemiology of Hepatitis B Virus Infection in Bangladesh—
M. Hasan Zaki, C. Rafiqul Ahsan, Tareak-Al-Nasir and Samir K. Saha

Spread of Multidrug-resistant *Salmonella* Group B in Dhaka—
M. Monir Hossain, Maksuda Islam, M. Ruhul Amin, M. Hanif
and **Samir K. Saha**

Children's Chronic and Acute Morbidity in Matlab, Bangladesh: Levels and Correlates—
Nurul Alam

Road Traffic Accidents in Dhaka—**Moslem Uddin Khan** and Nasrin Parvin Khan

Discussion and remarks

15:16-15:30 Tea Break

15:31-17:00 Concluding Session (Sasakawa Auditorium)

Summary of Vaccine Research: Dr. Abdullah H. Baqui, Acting Division
Director, Public Health Sciences
Division, ICDDR,B

Summary of Environmental Health: Prof. Barkat-e-Khuda, Acting Division
Director, Health and Population
Extension Division, ICDDR,B

Address by Chief Guest: Prof. Abu Sayeed, Hon'ble State
Minister for Information, Government of
the People's Republic of Bangladesh

Concluding Remarks by Chairperson: Prof. George Fuchs, Interim Director,
ICDDR,B

POSTER SESSIONS

Coordinators: Dr. Shahadat Hossain and Dr. Ishtiaq Bashir, ICDDR,B

Observation on National Immunization Day in Slums of Mohakhali, Dhaka—
Suhaila H. Khan

Perception of Rural Women on RTIs/STIs—**Rukhsana Gazi** and A.M.R. Chowdhury

Lactating Mothers and Contraception: Some Points to Ponder—**Rumana A. Saifi** and Subrata Routh

Assessment of Post-flood Health Status of Pregnant Women in a Rural Community of Bangladesh—**Sameena Chowdhury**, Aminur Rahman, Ferdousi Islam, M. Quamrul Hassan, A.K.M. Fazlur Rahman and Rowshan A. Begum

Youths and HIV/AIDS in Bangladesh—**Shakeel A.I. Mahmood**

Distribution of Government Health Services in Different Geographical Locations in Bangladesh—**Muhammod Abdus Sabur** and Shamsun Nahar

Knowledge and Practice of the Mostly Used 'Doctors' in Bangladesh— **Muhammod Abdus Sabur**, A.S.M. Mainul Hassan and Khodadad Hossain Sarker

Profile of the Most Commonly Used Healthcare Providers of Private Sector in Bangladesh—**Muhammod Abdus Sabur**, Khodadad Hossain Sarker and A.S.M. Mainul Hassan

Factors Influencing Hospitalization of Rural Children with ARI— **G.M. Monawar Hosain**, M.A. Samad Talukder, Md. Tariqul Islam and Qasem Chowdhury

Handwashing Practices in Urban and Rural Areas of Bangladesh—**Bilqis Amin Hoque**, Shafiul Azam Ahmed and Abdullah Al Mahmud

Plesiomonas shigelloides-associated Diarrhoea in Bangladeshi Children: Clinical Features and Epidemiological Trend—**A.M. Khan** and A.S.G. Faruque

Effect of Seasonal Change on Human Autonomic Functions—*Yuki Niimi, Toshiyoshi Matsukawa, Yoshiki Sugiyama, A.S.M. Shamsuzzaman, Hiroki Ito, Gen Sobue and Tadaaki Mano*

Skin Involvement Pattern of Arsenicosis Patients—**M. Abul Hasnat**, Q. Quamruzzaman, Mahmuder Rahman and Shibtosch Roy

Chronic Arsenicism and Squamous Cell Carcinoma: A Case Study—**Mahfuzar Rahman**, Martin Tondel and Olav Axelson

Efficacy of Tetracycline in the Treatment of Cholera Caused by *Vibrio cholerae* O1 Resistant to the Drug *in vitro*—*A.M. Khan, Uvon Gierke, M. Begum and George Fuchs*

Arsenic-induced Keratosis and Squamous Cell Carcinoma—**Mahfuzar Rahman**, Peter Söderkvist, Barbro Lundh-Rozell and Olav Axelson

Immunological Effect of Vitamin A and Zinc in a Placebo-controlled Four-cell Trial—**S.K Roy**, Tasnim Azim, George Fuchs, S.M. Akramuzzaman, S.A. Ahmed, K.E. Islam, D. Mahalanabis and M. Rahman

Risk Factor for Mortality in Severely Malnourished Children with Diarrhoea in Bangladesh—*Maaïke Buis, Renee Weersma, S.M. Akramuzzaman and S.K. Roy*

Morbidity and Vaccine Research I
Response to Tuberculin Skin Testing at Six Months
of Age and Relation with Birth Characteristics
in Infants of Dhaka City Slums

*Saskia J.M. Osendarp^{1,2}, Joop M.A. van Raaij², Shams El Arifeen¹, Hasan Mahmud¹,
Abdullah H. Baqui¹ and George Fuchs¹*

Objective: Investigate whether the response to tuberculin skin testing at 6 months of age is related to infants' birth characteristics.

Methodology: A total of 345 infants from Dhaka city slums, whose mothers had received either zinc or placebo supplementation during pregnancy, received the standard Bacille Calmette Guerin (BCG) vaccination within 72 hours after birth. The infants were followed for weekly morbidity assessment and monthly anthropometric measurements. Cell-mediated immune response was tested at 6 months of age by delayed hypersensitivity skin test to purified protein derivate (PPD) tuberculosis (5 tuberculin units). Size of induration was determined after 72 hours and considered positive when an induration of >5 mm was observed.

Results: A total of 207 (60.5%) infants had a negative tuberculin skin reaction at 6 months of age. Birth-weight was significantly related to tuberculin reaction ($p < 0.001$). The percentage of negative skin responses was significantly higher in low-birth-weight compared to the normal-birth-weight infants (71.9% vs. 52.7%; $p < 0.001$). The prevalence of measured fever during the first 6 months of life was also significantly related to tuberculin skin response ($p < 0.001$). No relation was observed between other birth characteristics, sex of infant or zinc treatment of mother and response to tuberculin testing.

Conclusion: The results of this study indicate that infants born with low-birth-weight have impaired cell-mediated immunity at 6 months of age compared to normal-birth-weight infants as is shown by a more frequent negative response to tuberculin skin testing. Supplementation with zinc during pregnancy does not affect this relationship.

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Safety and Immunogenicity of an Oral Inactivated Enterotoxigenic *Escherichia coli* Vaccine in Bangladesh

*Firdausi Qadri*¹, *Christine Wenneras*², *Pradeep K. Bardhan*¹, *Yasmin Ara Begum*¹, *Debasish Saha*¹, *N.H. Alam*¹, *M. John Albert*¹, *R.B. Sack*³ and *A-M Svennerholm*²

Objective: Carry out phase I trial on an oral ETEC vaccine in Bangladeshi adults and children.

Methodology: Healthy adult volunteers (18-45 years of age, n=38) and children (3-10 years of age, n=21) were given two doses of the ETEC vaccine 14 days apart. The vaccine was composed of a mixture of inactivated ETEC bacteria expressing colonization factors (CFs) together with recombinant cholera toxin B-subunit (rCTB). The immune responses were studied by measuring antibody-secreting cells (ASCs), and antibody levels in faeces and plasma.

Results: The vaccine was safe with little or no adverse effects. The immune responses to the CFs and the toxoid in both children and adults peaked after a single dose of the vaccine. The majority of the vaccinees (³ 90%) responded with ASCs to CFA/I (GM=80-194 ASC/10⁷ MNC) as well as to rCTB (GM=307-1533 ASC/10⁷ MNC). Intestinal IgA antibody responses were also observed in intestinal fluids to CFA/1 (>67%) and rCTB (>80%). About 81% of the children and 55% of the adults responded with IgA antibodies to CFA/1, and over 90% of both children and adults responded to rCTB in plasma.

Conclusion: The results of the phase I clinical trial indicate that the ETEC vaccine is both safe and immunogenic. A single dose of the vaccine acts as a booster in adults as well as children who have been primed by previous ETEC exposure.

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Maternal Immunization with Meningococcal Vaccine

Nigar S. Shahid¹, E. Roy¹, T. Begum¹ and Mark C. Steinhoff²

Objective: Evaluate the safety and immunogenicity of *Neisseria meningitidis* (Nm) vaccine given during pregnancy

Methodology: A double-blind randomized safety and immunogenicity trial was conducted on 70 women recruited from the private patients of four obstetricians in Dhaka city. A single dose of either N. meningitidis vaccine containing polysaccharide groups A, C, Y and W-135 or a 23-valent pneumococcal polysaccharide vaccine was given at 30-34 weeks of gestation and the women were then closely followed up at 8, 12, 24, and 72 hours to record adverse effects of vaccination. Serum samples were collected from mothers at the time of immunization after 1 month, and at delivery. Colostrum samples and breastmilk specimens were collected at 1 and 2 weeks and at 1, 3, and 5 months after delivery. Cord blood sera and infants sera were obtained at 6, 14, and 22 weeks. Serological assays for anti-Nm A antibodies were done in the sera of both mothers and infants and breastmilk.

Results: Minor local reactions to vaccination were noted which resolved completely in 72 hours. Pre-immunization anti-Nm A GMTs were similar in the vaccinated and the control groups (2.25 m g/mL vs. 2.82 m g/mL). At delivery, serum anti-Nm A GMT titres were 13.18 m g/mL and 4.91 m g/mL in the vaccinated and the control groups ($p < 0.05$). Anti-Nm A antibody levels were 2.44 m g/mL at 6 weeks, 1.21 m g/mL at 14 weeks and 0.59 m g/mL at 22 weeks of the infants' life in the vaccinated group. The infant/maternal ratios were 0.49 and 0.67 in the vaccinated group and the control group respectively. IgA level was 36.25 m g/mL in colostrum ($p < 0.05$) and 12.51 m g/mL in breastmilk ($p < 0.01$) at 6 months.

Conclusion: Maternal immunization with Nm vaccine is safe and immunogenic. A 5 to 6-fold rise in maternal anti-Nm A antibody titre occurred in the vaccinated group. A decline in the infants' anti-Nm A antibody level occurred after 6 weeks, but levels remained high in the breastmilk up to 6 months after delivery in the vaccinated group.

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Safety of a Live, Attenuated *Shigella flexneri* 2a Oral Vaccine (SC602) in Bangladeshi Adults

Abdullah H. Baqui¹, Daniel Isenbarger², Shams El Arifeen¹, Rubhana Raqib¹, Mahbubur Rahman¹, Md. Yunus¹, J. Chakraborty¹, J. Patrick Vaughan³, David N. Taylor⁴, L. Hale⁴, Malabi Venkatesan⁴, Lorrin Pang², and Robert E. Black⁵

Objective: Assess the safety of a live, attenuated *Shigella flexneri* 2a oral vaccine candidate (SC602) at a 3-dose level compared to a placebo among Bangladeshi adults in an inpatient setting.

Methodology: Twenty healthy adult Bangladeshi men aged 20-39 years were admitted to the Matlab, Bangladesh field research hospital to participate in a randomized, double-blind, placebo-controlled phase I safety trial of SC602--a live, attenuated *Shigella flexneri* 2a vaccine. After the study was explained, the volunteers were screened and those who wished to participate signed the consent document. They were randomized to receive a single oral dose of 1×10^4 , 1×10^5 or 1×10^6 colony-forming units or placebo with a bicarbonate solution. Volunteers were interviewed and examined daily by a physician till discharge. All stool samples were collected for characterization and culture.

Results: There were no significant side-effects in any of the volunteers. None of the volunteers had diarrhoea, fever or significant abdominal pains. Malaise and anorexia were the most commonly-reported symptoms. The symptoms usually lasted for less than a day. SC602 was isolated from 5 of the 20 volunteers beginning 24-48 hours after vaccination. All volunteers were discharged on day 6 after vaccination. Two volunteers who were shedding the vaccine on day 5 were treated with ciprofloxacin before departure. The code was opened at the completion of the clinical portion of the trial. Analysis of symptoms did not demonstrate any dose-related concerns. A dose-related increase in excretion was observed with 3 of the 5 persons in the 1×10^6 group excreting *S. flexneri*.

Conclusion: The vaccine was well-tolerated. None had diarrhoea, dysentery, fever or severe symptoms. Mild symptoms were common, but there was no clear dose-related pattern of symptoms. Excretion was dose-related, but it was not associated with symptoms. Based on these data, we recommend further evaluation of this vaccine in larger study population.

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Distribution of Group A Rotavirus Strains in Bangladesh: Emergence of Type G9 in 1995

Goutam Podder¹, *Leanne E. Unicomb*², *Jon R. Gentsch*³,
*Patricia Woods*³, *Tasnim Azim*¹, *K. Zahid Hassan*¹, *A.S.G. Faruque*¹,
*M. John Albert*¹, *Ruth F. Bishop*⁴ and *Roger I. Glass*³

Objective: Determine the circulating G and P type rotavirus strains in Bangladesh.

Methodology: One thousand five hundred thirty-four rotavirus strains collected during 1992-1997 were characterized. Characterization was done using a combination of methods: monoclonal antibody-based enzyme immunoassay, reverse transcription polymerase chain reaction, and oligonucleotide probe hybridization. Strains were collected from various parts of Bangladesh.

Results: Results from this study combined with our previous findings from 1987 to 1991 (n=2515 faecal specimens in total) demonstrated that the distribution of the 4 major G types varied from year to year; types G1-4 constituted 51% of all strains tested (n=1371), and type G4 was the most prevalent (21%), followed by type G2 (17%). Of the 351 strains tested for both G and P types, common types P[8]G1, P[4]G2, and P[8]G4 on a global basis comprised 45% (n=159) of the strains. Mixed G and/or P types were found in 23% (n=79) of the samples tested. Type G9 rotavirus that were genotype P[6] and P[8] emerged in 1995. G9 strains constituted 16% (n=56) of the typeable rotavirus strains.

Conclusion: A vaccine must provide protection against type G9 rotavirus as well as the 4 major G types.

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Sensitivities of *Shigella* Species Isolated from Stool Samples in Gonoshasthaya Hospital, Savar

M.A. Samad Talukder¹, Ayesha Khatun² and Ismat A. Begum²

Objective: Examine sensitivities of *Shigella* species isolated from stool specimens in Gonoshasthaya Hospital, Savar.

Methodology: Stool specimens were cultured on MacConkey agar, XLD agar, and TCBS agar routinely for isolation of pathogens, including *Shigella* species and incubated at 37°C overnight. Non-lactose-fermenting non-motile Gram-negative bacilli were biochemically identified and serologically confirmed as *Shigella* species. Sensitivity tests of isolated organisms were done on Mueller-Hinton media.

Results: Period of study was 1 January 1996 to 30 November 1998. Seven hundred and fifty stool specimens were examined, and 43 (5.73%) yielded *Shigella* species. Of these, 22 were of males and 21 of females aged six months to 65 years (mean age 9.8 years). Thirty-two patients were aged less than 15 years, and 11 patients were above 15 years. There were 22 (51.2%) *Shigella dysenteriae*, 12 (27.9%) *S. flexneri*, 5 (11.6%) *S. boydii* and 4 (9.3 %) *S. sonnei*. Forty-two (97.7%) were sensitive to ciprofloxacin, 29 (67.5%) to gentamicin and nalidixic acid, 9 (21%) to cotrimoxazole, 8(18.6%) to mecillinam, and 5(11.6%) to ampicillin and tetracycline.

Conclusion: *Shigella dysenteriae* was the most commonly isolated species. Resistance to common antibiotics was high, making treatment difficult.

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Other Health Issues I: Disease Control and Child Health

Trends in and Determinants of Infant Mortality by Age at Death and Causes of Death in Matlab, Bangladesh during 1983-1996

Golam Mostafa and Jeroen K. van Ginneken

Objective: Study the trends in and causes of infant mortality in different age groups and identify the demographic and socioeconomic factors influencing mortality.

Methodology: Longitudinal data of the DSS from 1983 to 1996 were used for determining the trends in and causes of infant mortality. All births that occurred during 1983-1987 were followed, and deaths that took place in the first year of life were recorded. Mortality rates of infants in the age groups of 0-3 days, 4-14 days, 15-29 days, 1-2 months, 3-5 months, and 6-11 months were analyzed to determine the trends in and causes of death. Logistic regression was used for estimating the effects of age, parity, maternal education, religion, and area. Analysis was done separately for different segments of infancy.

Results: Overall infant mortality declined in both treatment and comparison areas. Mortality in all the age groups below one year has declined except for 0-3 days. The decline was more marked in the treatment area where carefully designed and intensive MCH-FP services are delivered through a special project. Neonatal tetanus mortality declined dramatically in the 1980s. Neonatal mortality continued to be high due to other causes even in the treatment area. Diarrhoea, acute respiratory infections, and malnutrition were major causes of death after the first month of life. The influence of maternal age in infancy was limited to 0-14 days after birth. Zero parity is a risk factor at all ages below one year. High (5+) parity is an important risk factor in the postneonatal period. Muslims had lower mortality than non-Muslims, especially in the age group where tetanus was a major source of infection. Infants of educated mothers experienced lower mortality than uneducated ones (also after controlling for other variables).

Conclusion: Neonatal tetanus mortality declined dramatically. Neonatal mortality continued to be high due to other causes. Diarrhoea, acute respiratory infections, and malnutrition were the major causes of death after the first month of life.

Importance of Community-based Programme and Village Doctors in Reducing ALRI Deaths in Rural Areas of Bangladesh

Mohammad Ali and Andres de Francisco

Objective: Assess the importance of community-based health service programme and other potential factors in reducing ALRI deaths in rural areas of Bangladesh.

Methodology: The study was conducted in the Matlab Health and Demographic Surveillance area with a population of about 210,000. A community-based health service project has been operating in one half of the area (MCH-FP area) since 1978. Vital demographic events are being recorded from the entire study area. Data on children (less than 2 years of age) and their ALRI-specific mortality from 1987 to 1993 were investigated. The unit of analysis was *bari* (cluster of households), and the data were aggregated accordingly. Child-year at risk was considered as population exposed to the death risk. The *baris* with less than one child-year at risk were excluded. GIS was used for creating socio-environmental variables and mapping the ALRI mortality. Because of the skewed distribution of ALRI mortality, Poisson regression model was used as the analytical tool. In total, 6,116 *baris* were studied.

Results: The results confirmed a lower ALRI mortality (44% lower) in the intervention area. The bivariate analysis revealed that ALRI mortality was associated with lower educational status, lower doctor-population ratio, and higher distance from *baris* to the nearest treatment centre. Multivariate analysis rejected the association of the distance factor. Village doctors have shown an expected effect; within intervention area, the villages with higher doctor-population ratio ($P < 0.001$) have 83% lower mortality than that in the other villages. However, the higher ratio has no impact on the mortality in the non-intervention area. It was surprising that the southern part of intervention area where the Matlab hospital is located has 1.38 times higher mortality compared to its other part.

Conclusion: Village doctors can effectively reduce ALRI mortality in rural areas if they are backed by health interventions. The higher mortality rate in the southern part requires investigations of the service-delivery system in the area.

Outcome of Severe Pneumonia in Severely Malnourished and Well-nourished Children Aged Less Than 5 Years

N. Nahar, H.A. Begum, M.A.H. Mollah, N.C. Saha and U. Mitra

Objective: Compare the treatment outcomes of severe pneumonia in severely malnourished and well-nourished children aged less than 5 years.

Methodology: Two groups of children aged 2 months to 5 years with severe pneumonia were enrolled; 120 well-nourished and having half in each treatment group received either chloramphenicol or penicillin. Similarly, 120 severely malnourished children received either chloramphenicol or penicillin plus gentamicin. The treatment outcome was measured clinically and compared radiologically.

Results: In total, 76% (n=183) cases improved. The case fatality rate (CFR) was 7% (n=16), and all of them were malnourished. Compared to penicillin, better clinical response was noted with chloramphenicol in the well-nourished group ($p=0.001$). The children in the malnourished group responded equally to either chloramphenicol or penicillin plus gentamicin ($p=0.838$). No side-effects of chloramphenicol were noted.

Conclusion: Chloramphenicol is a better alternative for treatment of severe pneumonia in children irrespective of their nutritional status ($p=0.049$). Chloramphenicol can be used in treating severe pneumonia in children.

Cyclical Pattern of Cholera in Bangladesh

Md. Yunus¹, R.B. Sack² and K. Zaman¹

Objective: Describe the cyclical phenomena in the incidence of cholera in a demographically defined population in a rural area of Bangladesh.

Methodology: The study was conducted in rural Matlab where ICDDR,B has been operating a diarrhoea hospital, and maintaining a longitudinal Demographic Surveillance System (DSS) covering a current population of about 212,000 in the area since 1966. There has been continued cholera surveillance in this population. All diarrhoeal patients from the DSS area, attending the Matlab hospital, had their stool cultured for *Vibrio cholerae* using standard procedures.

Results: Cholera patients were seen throughout the year, but there were also two epidemics of cholera a year, occurring regularly every spring and fall each lasting for 2-3 months. Because of the long duration of this surveillance, it has been possible to observe certain cyclical phenomena in the cholera incidence in this population, not previously recognized with shorter observation periods. It appeared that there had been four major cycles of cholera during this 33-year time period in Matlab, each lasting for 7-9 years and involving both biotypes (Classical and El Tor) of serogroup O1 and serogroup O139. Each cycle seemed to be characterized by a decrease in or disappearance of one biotype or serogroup and the appearance or re-appearance of a different one. Cholera incidences have ranged from a low of 0.2 per 1,000 to a high of 6.5 per 1,000 people per year. The fifth cycle may just be starting.

Conclusion: The cyclical phenomena may help predict years in which large number of cholera cases are anticipated; may facilitate the establishment of more timely and adequate treatment facilities, and the testing of cholera vaccines and their widespread use as public health tools later.

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Measuring Children's Acute Morbidity in Matlab, Bangladesh: A Comparison of Perceived versus Checklist Data

Nurul Alam

Objective: Ascertain validity of the estimates of children's acute morbidity obtained by interview on the mothers' perceived illness of their children and the checklist questions.

Methodology: The Matlab Health and Socioeconomic Survey (MHSS) 1996 recorded acute morbidity of 3,795 children aged 1-179 months. Female interviewers asked mothers at their homes: (a) whether the child was sick (e.g. fever, cough, cold, etc.) during the last one month (mothers' perceived illness of their children) and (b) whether the child had any of the symptoms of: headache, eye infection, cough-cold-fever, diarrhoea, etc. in the last month (the checklist). Comparison of the prevalence of morbidity obtained by the above questions for the same recall period gave some estimates of the extent of inaccuracy in children's acute morbidity. Factors relating to inaccuracy included age and gender of child, mothers' education, and type of symptoms.

Results: Data on the mothers' perceived illness of their children yielded morbidity prevalence of 48.2%, while the checklist data yielded morbidity prevalence of 52.4% among children. The difference in the prevalence of 4.2% age points could be regarded as the extent of under-reporting on self-perception. Under-reporting was 2.5% if symptoms were of cough-cold-fever, and more than 22% if symptoms were of diarrhoea, headache, stomachache, etc. Under-reporting was slightly higher for younger (<5 years) than for older children but did not vary by gender of the child and mothers' education and religion.

Conclusion: In the interview, morbidity symptoms whose severity could easily be understood by mothers were reported better than other symptoms. The question on mothers' perceived morbidity of their children should not be asked in estimating disease burden.

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Morbidity and Vaccine Research II Barriers to Immunization in the Slums of Dhaka City

Henry B. Perry^{1,2,3}, **Sufia Nuran**², **Md. Abdul Quaiyum**², **S.A. Jinnah**¹ and **Anjali Sharma**³

Objective: Document the barriers to immunization services which slum women had experienced or had heard about through discussions with their friends.

Methodology: In a qualitative study done in late 1996, one hundred mothers living in slum households in Zone 3 of Dhaka City Corporation were interviewed by an ICDDR,B field researcher using a detailed, open-ended questionnaire.

Results: The most frequent barrier mentioned by the respondents was disrespectful behaviour of the vaccinators, particularly if the respondent had lost her EPI card. The second most commonly mentioned barrier was the fee which they have to pay--both official fees charged by the NGOs and "unofficial" fees charged by the government vaccinators. Other barriers reported by the respondents include their own difficulties in travelling away from home, opposition from family members, long waiting time, inconvenient hours of clinic operation, lack of information, and earlier experiences with side-effects following immunizations.

Conclusion: The lower coverage of immunization in the urban slums of Dhaka is of great concern, particularly because high population density, poor hygiene conditions, high frequency of home deliveries, and high levels of malnutrition contribute to the production of population "pockets" at high risk for mortality from vaccine-preventable diseases. The findings of this study point at the need to: (1) promote more respectful behaviour from the vaccinators, (2) make the payment policy for immunization more transparent and flexible, (3) provide an honourable way for those who are unable to pay for immunization, and (4) disseminate clients' perceived obstacles to immunization to service providers and programme leaders.

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Effect of Reducing the Number of EPI Sessions on Cost and Effectiveness of the Programme

M. Mahmud Khan, Richard Yodar, Abdullah Al Mamun and Suhaila H. Khan

Objective: Evaluate the financial implication of reducing the number of EPI sessions per month in Bangladesh and discuss possible impacts on immunization coverage.

Methodology: This exercise was carried out from the perspective of the providers, i.e. the EPI programme, the Ministry of Health and Family Welfare, and agencies collaborating in the delivery of EPI services. The raw data for this study were obtained from the annual expenditure statements provided by the EPI Unit for 1995-1998. From this, a three-year average of annual expenditure was calculated in 1997 prices. The EPI's accounting system has twenty separate line items or categories of expenditure. These were reclassified into standard categories typically used in immunization costing studies. Current prices of vaccines were obtained from UNICEF. To estimate the target population, the demographic data and parameters were obtained from BBS reports and yearbooks.

Results: In Bangladesh, vaccinations are done through 110,000 sessions held every month. To reduce the cost of delivering EPI services, reduction in the number of sessions has been proposed. This study examines the possible effect on costs if the sessions reduce to 55,000 or 22,000 per month. Recently-adopted health programme proposes delivery of immunization through fixed sites at the union level--each site operating five days a week, the total number of sessions organized in a month being about 22,000. The number of vials needed for DPT and OPV remained constant irrespective of the number of sessions organized in a month. This is because the number of children to be immunized with DPT and OPV is, on the average, about eight per session when the number of sessions per month is 110,000. If the number of sessions is cut to half, the average number of children to be immunized per session increases to about 16, and each session will need to open two 10-dose vials rather than one.

Conclusion: Reducing the number of EPI sessions will adversely affect the coverage of immunization unless more rigorous social mobilization campaign is launched. Assuming that the coverage will decline by 20 percentage points for reducing the sessions by 50%, total cost of EPI remains more or less the same if additional cost of social mobilization is added. Policy makers should carefully evaluate the savings generated by reduction in the number of sessions and the additional cost needed to maintain the current coverage.

Child Immunization: Trends and Determinants in Bangladesh

Abdullah Al Mamun and M. Mahmud Khan

Objective: Examine the coverage of immunization in Bangladesh and identify important determinants of child immunization from household-level data.

Methodology: Data from the Bangladesh Demographic and Health Survey 1996-1997 have been used in this analysis. The survey gathered information on immunization of all children of less than 5 years. The influence of regional, demographic and socioeconomic variables was examined using differential analysis in the bivariate approach and logistic regression in the multivariate approach in order to identify the factors affecting child immunization coverage.

Results: According to the information from both vaccination records and mothers' recall, only 54% of Bangladeshi children (12-23 months) can be considered fully immunized, although the level of coverage for BCG and the first two doses of DPT and polio exceeds 80%. Only 12% had no vaccination at all. Various factors, including mothers' age, parity, sex of the child, place of residence, region of residence, religion, mothers' education, economic status, electricity in the household, and exposure to mass media, appear to be significant in influencing the levels of child immunization in Bangladesh. It was observed that child immunization is substantially higher in urban than in rural areas. There is a sharp regional differential in child immunization in Bangladesh. It was also observed that immunization coverage is better for births to younger women and those of lower birth order. Among the socioeconomic variables, the educational levels of mother and father had the strongest positive effect on child immunization.

Conclusion: Results suggest that higher age at marriage of women, improving educational status of mothers, better communication, and media coverage as well as intensive immunization activities in rural areas will improve the coverage of immunization.

Bangladesh's First "Mop-up" Campaign for Polio Eradication: An Assessment

Syed Izaz Rasul, S. Mizan Siddiqi and Henry B. Perry

Objective: Assess the results of a programme to ensure that 100% children aged less than 5 years in high-risk areas receive oral polio vaccine (OPV) on or soon after the National Immunization Day (NID) on 14 December 1998.

Methodology: In three high-risk areas where live wild polio virus had been isolated during the past 12 months (Madaripur, Shariatpur and Bhola municipalities), a week-long house-to-house campaign was conducted from 17 to 23 December 1998. The purpose of this campaign was to identify all children aged less than 5 years in these municipalities, who had not participated in the NID on 14 December and to administer OPV and vitamin A to them. In each of the three municipalities, 18 personnel (municipal health staff, NGO workers, and NID volunteers) worked for 5 days to complete the campaign. A team comprising personnel from the national EPI headquarters, BASICS, and the Civil Surgeon's Office, supervised the campaign.

Results: In total, 21,810 households were visited; 2,250 children aged less than 5 years were given OPV; and 1,575 received vitamin A capsule containing 200,000 international units (IU). The percentage of children who did not receive OPV during the NID on 14 December 1998 ranged between 5.9% and 17.8%. Shariatpur municipality had the highest coverage (94.1%), while Bhola had the lowest (82.2%).

Conclusion: Bangladesh is entering a new phase in its polio eradication programme. Since high levels of OPV coverage have been maintained nationwide for several years, the time has come to begin intensive immunization in pockets of low-coverage areas and in areas where live polio virus has been identified. The study indicates that "mop-up" campaigns are feasible and can be effective in ensuring that all children in high-risk areas are reached with OPV and vitamin A supplementation.

Financing of the EPI in Bangladesh

*M. Mahmud Khan¹, Richard Yodar¹, Abdullah Al Mamun¹
and K.M.A. Aziz²*

Objective: Analyze the current and projected costs of delivery of EPI services to determine the resource gap and implications for future of the programme.

Methodology: This study examines the resource requirement for providing EPI services in Bangladesh from the perspective of the providers. In costing EPI, all costs incurred by households and communities in obtaining immunizations were not considered. Recurrent and capital costs were used and obtained from the EPI accounts office and supplemented with cost data obtained from the Directorate of Health Services, EPI officials, and other individuals knowledgeable about EPI activities.

Results: This study found that the EPI in Bangladesh is expected to fully immunize 1.56 million infants aged less than one year by using resources equivalent to about \$18.3 million in 1997-1998. Therefore, the total cost per fully-immunized child was about \$11.76--much lower than the developing country average of \$15. Immunization is estimated to prevent 134,000 deaths during the current year at a cost of \$136 per death prevented. It is estimated that about 1.15 million deaths have been averted since 1987 due to immunization activities. At the current level of costs, the gap between total resources needed (\$18.3 million) and the resources provided through government funding (\$8.3 million) approximates \$10 million. This gap must be closed either through generating additional resources, or through cost containment, or both. Current EPI cost represents approximately 0.06% of GDP, 0.05% of GoB revenue, and 4.95% of the budget of the Ministry of Health and Family Welfare.

Conclusion: In general, the EPI programme was found to be highly cost-effective in Bangladesh, especially when compared with the costs in other developing countries and with the cost-effectiveness ratios of various preventive and curative interventions. Thus, one of the best ways to generate savings in the entire health sector is to reduce the needs in the highly-visible curative sector by reducing its demand through prevention of common childhood illnesses. Although the EPI is not an expensive strategy, it is unlikely that the Ministry of Health and Family Welfare will be able to allocate 5% of its budget for immunization in the near future. Therefore, cost containment strategies should be emphasized.

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LQAS Assessment of EPI Coverage in the Slums of Dhaka City

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Objective: Document the current immunization coverage levels in slum households of Dhaka city and identify areas of low coverage.

Methodology: Two lot quality assurance sampling (LQAS) surveys were carried out in slum households of Dhaka city to assess childhood immunization coverage among children of 12-23 months and to assess maternal tetanus toxoid (TT) coverage among women who had given birth during the previous 12 months. In each survey, information was collected from 170 respondents. Seventeen slum households were randomly selected for each survey from each of the 10 zones of Dhaka city.

Results: Fifty-eight percent of the children (12-23 months) were fully immunized before reaching their first birthday. Seventy-five percent of the mothers who had given birth during the previous 12 months had obtained two doses of TT, but only 23% had fully obtained the recommended five doses. Five zones were identified by the survey as having childhood immunization coverage not meeting pre-set threshold levels, and three zones were identified as not meeting pre-set TT levels. Only 71% of the children aged less than one year participated in the most recent National Immunization Day.

Conclusion: The findings of the study indicate that EPI coverage is increasing in slum households of Dhaka city compared to earlier surveys, but the goal of 90% coverage by the year 2000 will probably not be reached. In addition to providing information about coverage levels, the LQAS methodology identified zones of Dhaka city which could benefit from focused programmatic assistance.

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Other Health Issues II: Health Services
Inter-bari Differences in the Use of Modern Contraception
in Rural Bangladesh

Nashid Kamal

Objective: Investigate the causes of inter-bari variation in the use of modern contraception by evaluating both current demand and supply sides of the issue.

Methodology: Two known clusters of *baris* with high and low use of contraception were studied in rural areas of Dhaka and Chittagong divisions during May-August 1997. Clusters are primary sampling units (PSU) as of the 1981 Census, roughly corresponding to a village in rural Bangladesh. *Bari* is a unit of dwelling in rural Bangladesh, usually bonded by patrilineal relationship usually consisting of more than one hut in the same compound. The two clusters were purposively chosen for this study. From the low-prevalence area, 44 current users and 58 non-users were interviewed in detail. From the high-prevalence area, 66 current users and 58 non-users were interviewed in detail. The government family planning (FP) workers in both the clusters were interviewed. Detailed history of their experiences over the past 20 years was documented.

Results: Although in the initial days of introduction of contraception, religious sentiment of the bari head was an important deterrent to being a user, it no longer seemed to be the case in the low-prevalence cluster. The main problem for non-users was the poor performance of the FP worker. Within-bari discussion was almost non-existent, and most (48.6%) women learned about FP methods from the female FP worker. However, she seemed to restrict her visit to only known users and did not make substantial attempts to recruit new users. Some places in her catchment area were also inaccessible due to bad communication, and those baris were totally avoided by the FP worker which may explain the inter-bari differences in the use of modern methods of contraception. In the high-prevalence area, the baris are well-covered by the government and non-government FP workers. The sole reason for inter-bari differences seemed to be the absence of the husband due to high rate of migration for work outside that cluster.

Conclusion: The reasons for inter-bari differences in the use of modern contraceptives are different for high-use and low-use areas. In low-prevalence areas, higher motivational effort and better coverage by family planning workers should be ascertained by careful supervision.

Improving Early Identification of ARI at Community Level through Checklists for Field Workers

S.M. Tariq Azim¹, Salahuddin Ahmed², Tajul Islam¹, Mahbulul Alam¹ and Humayun Kabir¹

Objective: Assess whether the sensitivity and specificity of identifying a case of ARI by health workers could be improved by introduction of a checklist.

Methodology: Twenty health assistants (HAs) were randomly selected from two thanas. Initially, without using any checklist, the HAs examined 228 children aged less than 5 years coming to the Thana Health Complex (THC). Later, they examined 374 children at the THC using the ARI checklist. All the children, irrespective of HAs' diagnoses, were sent to the medical officers for assessment and were treated accordingly.

Results: The sensitivity of identifying a case of ARI (i.e. identify a child having cough or difficult breathing) by the HAs was 58.1% before the introduction and 64.2% after the introduction of the checklists ($p=0.3$). Similarly, the specificity was 71% and 69% respectively, showing no significant difference. The ability of the HAs to correctly classify ARI cases as 'no pneumonia', 'pneumonia' or 'severe pneumonia/disease' changed from 31.4% to 37.4% ($p=0.3$).

Strikingly, in 56 cases (8.5%) diagnosed as ARI, the physicians did not count the respiratory rate or record any signs of severe pneumonia to support their diagnoses. Similarly, in 114 cases (88.3%) diagnosed by the HA as ARI, the respiration rate was not counted.

Conclusion: The study shows that ability of the health workers to identify and classify ARI cases is low, and the introduction of a checklist aid, not complemented by training and supervision, did not help improve their skill.

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A Qualitative Assessment of the Health and Family Planning Information, Education, and Communication Needs among the Residents of Dhaka City

Mahbub A. Mazumder, Monowar Jahan and Subrata Routh

Objective: Assess the existing systems of information, education, and communication (IEC) of health and family planning services among the residents of Dhaka city; identify their needs and options for better communication and community mobilization mechanisms; and recommend effective strategies of communication and community mobilization.

Methodology: This qualitative study was conducted in September-October 1996 in Ward no. 58 and 80 of Dhaka City Corporation where the operations research intervention on "Alternative Strategies for the Delivery of MCH-FP Services" was field-tested. Eight focus group discussions with clients and 12 formal group discussions with community representatives (school teachers, community leaders, youth club members, general practitioners, pharmacy attendants, etc., with an equal split for both the areas) were held to collect the required information.

Results: Field workers and radio were the major sources of information, education, and communication on health and family planning. No established community source was identified. Interpersonal communication and miking were found to be the most wanted channels of message transmission. Leaflets, posters, and billboards were also mentioned as effective means of information dissemination. They also stated that local clubs, associations, and youths of the community (if involved) could effectively and quickly disseminate health and family planning information to them. The respondents expressed mixed feelings about the prospects of formal committees in this regard. Most respondents were in favour of getting services from static clinics, if the behaviour of the staff is good. Various health and family planning services were offered by both male and female providers, with supply of required medicines at cheaper prices.

Conclusion: A combination of interpersonal communication and localized media (miking, banners, posters, billboards) can be used for providing IEC to the community. Local clubs and youths of the community could be involved for the information, education and communication activities. Services from static clinic could be a feasible alternative to current doorstep services with appropriate provisions for IEC.

Health Problems and Healthcare-seeking Behaviour in Urban Slums of Bangladesh

Muhammod Abdus Sabur and Khodadad Hossain Sarker

Objective: Explore the common health problems and healthcare-seeking behaviour in urban slums of Bangladesh.

Methodology: Focus group discussions and in-depth interviews were conducted with adult males and females separately by using checklist and semi-structured questionnaire. Recall period was for the last one month. Data were collected during April–May 1998 from two slums of Chittagong city.

Results: Most common health problems in all age groups and sexes were found to be: gastric pain, dysentery, and skin diseases. Diarrhoea, pain, general weakness, and jaundice were also identified as commonly prevailing problems. Menstrual problems and anaemia among females and fever, cough, pneumonia, and measles among children were also identified. Non-qualified allopathic drug sellers of the drug shops situated within and nearby the slums were found to be the main source of healthcare for slum dwellers. Even in presence of qualified practitioners, their services are not availed due to their inability to pay consultation fees. Faith healers were also found to be consulted for specific problems as these were perceived to be caused by evil spirit.

Conclusion: Almost all health problems of the slum dwellers originated from the prevailing unhygienic environment of the slums and working/food habit of the slum population. Ensuring better environment in the slums and good working/food habit may prevent most diseases. Non-qualified allopathic drug sellers were found to be the main source of initial treatment for slum dwellers even when qualified practitioners were available. Drug sellers' service is associated with incorrect treatment and harmful practice. Programme aiming at improving their capacity might ensure quality of care for the slum population.

Delivering Family Planning Services without Home Visits: Preliminary Findings from Operations Research Activities in Dhaka City

*Cristóbal Tu?ón, Subrata Routh, Barkat-e-Khuda, K.A. Mazumder
and Nirod Chandra Saha*

Objective: Assess the effect of discontinuing home visits by urban field workers on selected family planning indicators.

Methodology: Data from the surveillance systems of ORP and the former MCH-FP Extension Project (Urban) in the Lalbagh area of Dhaka city were used for studying contraceptive prevalence rate (CPR), family planning methods used, and the source of supplies from June 1996 to June 1998.

Results: Between January and March 1996, forty percent of the women of reproductive age had been visited by a family planning field worker in the previous three months. This figure dropped to 4% during the July-September 1997 round after the regular home visits to distribute oral contraceptives and condoms in the area were discontinued. Nevertheless, CPR increased from 53.8% to 55.4% over the period. Although CPR is still higher in non-slum areas, the gap has become narrower. The proportion of couples using pills or condoms has not varied. The total number of couples who obtained family planning methods from clinics increased slightly. There is now a greater dependence on pharmacies as a source of supplies.

Conclusion: The findings confirm previous observations about the feasibility of discontinuing the home delivery of condoms and oral contraceptives without reducing CPR, and the importance of pharmacies in urban areas such as Lalbagh. There is a need to study continuation rates among the increasing number of couples obtaining supplies from pharmacies. Since field workers also referred clients to clinics for essential services, more research is needed on the effect of reducing home services on the use of clinics for the essential services package.

Review of Interventions to Promote Local-level Planning and Coordination of Essential Health and Family Planning Services

*Jasim Uddin, Jahanara Khatun, Mafizur Rahman, Cristóbal Tu?ón
and Siraj Uddin*

Objective: Examine the existing mechanisms of local-level planning and coordination of health and family planning services and experiences of government and NGO agencies in urban and rural settings.

Methodology: Data on the existing local-level planning process, both in rural and urban settings, were collected through discussions, observations on field activities, analyses of organized meetings, and review of literature.

Results: The government health and family planning programme has a limited comprehensive local-level planning process. The national-level managers assign targets among the field workers. Formally, the Government has established committees at the district, thana and lower levels which are supposed to meet every month for planning and reviewing local performance. The available evidence is that most of these committees are largely inactive. Local-level planning interventions undertaken by the former MCH-FP Extension Projects of ICDDR,B in rural and urban areas have revealed that systematic processes of performance review helped managers and supervisors diagnose problems and find solutions in rural areas. However, the success of the interventions was largely based on the commitment and skills of thana managers. Interventions in urban areas were effective in establishing a forum for service providers to discuss and resolve common health issues and problems. Both in urban and rural settings, the role of the external facilitator was critical. Interventions undertaken by different organizations in NGO and government settings, with special projects to support government officials, have shown promising results in small areas. The effects of these interventions are still being monitored, and the replicability of these interventions is yet to be established.

Conclusion: Interventions to promote local-level planning and coordination in Bangladesh need to identify mechanisms to motivate and train local managers and supervisors and seem to require external facilitation. The interventions must recognize the transition to the full range of ESP services and on the shift in emphasis from doorstep to static clinic. Realistic ways of obtaining a meaningful involvement of community representatives could enhance the availability of local resources and improve use pattern of those resources.

Morbidity and Vaccine Research III Status of Immunization in Bangladesh

*A.M.R. Chowdhury¹, Abbas Bhuiya², K.M.A. Aziz¹, F. Karim¹,
Shamim Ara¹, Shagufta Sultana¹ and Insana Begum¹*

Objective: Estimate the progress of EPI since its introduction in 1979.

Methodology: In estimating the progress, secondary sources of data were used.

Results: From a mere 2% in 1986, the vaccination coverage quickly rose to 61% in 1991. Difference in coverage between routine monitoring by EPI programme implementers and independent surveys is presented. Reliability of the surveys of independent coverage is corroborated by other surveys. Surveys show that the coverage reached its peak in the early 1990s. An analysis of the national coverage according to different antigens suggest a very high rate for BCG and a sharp dropout between BCG and the third dose of DPT/OPV. A recent review by international experts mentioned 91% coverage of BCG and labelled it as an example of a laudable performance in the Bangladesh context. There was a high dropout rate of 30% between BCG and measles vaccines. Difference in coverage among selected geographical regions is noted. The highest coverage of nearly 94% was recorded in Kushtia, and the lowest was a meagre 28% in Kishoreganj.

Conclusion: The matters of concern include high dropout rate between BCG and measles vaccines, and wide difference in vaccine coverage reporting by different sources. Replacement of the target-oriented approach relating to low performance by acceptance of actually-achievable performance with improved supervision is recommended. It will also contribute to accurate reporting.

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Cultural Concepts Reflected in Disease Terms in Local Dialect Regarding Vaccine-preventable Diseases at Bhairab, Bangladesh

K.M.A. Aziz¹, A.M.R. Chowdhury¹, Abbas Bhuiya², Dineke Mol¹, Shagufta Sultana¹, Insana Begum¹, Shamim Ara¹ and F. Karim¹

Objective: Explore the implications of disease terms found in local dialect of rural Bhairab, Bangladesh, with reference to dealing with the vaccine-preventable diseases, like tetanus, polio pertussis, diphtheria, measles, and tuberculosis.

Methodology: Information was obtained through in-depth interview with 48 mothers of rural Bhairab having child(ren) <2 years of age during December 1996-February 1997. The mothers were selected through stratified sampling.

Results: A number of traditional terms in the local dialect were in use among the mothers. The terms identified were related to tetanus, polio, diphtheria, tuberculosis, and measles. The beliefs associated with the explanation of these disease occurrences are reflected in the disease terms, like *alga batas*, *alga dos*, *thaura*, *daira laga*, and *lula batas*. Through use of local dialect, members of the community get an occasion to discuss the culturally prescribed ways of getting relief from these diseases. As a result, some mothers gave greater attention to the traditional prescription without giving importance to the modern recommended methods.

Conclusion: The perceptions of immunization workers and mothers are based on two modes: science and tradition. These two modes must meet. This cannot take place if one tells the other to listen without listening to the others' views. Both must try to understand each other, and then only a greater compliance to immunization can occur.

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Demand Aspects Relating to Immunization at Bhairab, Bangladesh

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Objective: Explore the factors associated with the demand of immunization for young children by investigating mothers' knowledge, opinions, and beliefs regarding compliance with the vaccine schedule.

Methodology: The investigation was undertaken using in-depth interview at urban and rural Bhairab among 97 mothers selected through stratified sampling during December 1996-February 1997.

Results: The rural and urban mothers held the view: vaccination is good for the child, and it protects from diseases. Majority of them did not consider vaccine to be harmful. Many of them referred to the side-effects of vaccines. The urban mothers considered TB as one of the most serious diseases. Most rural mothers considered all vaccine-preventable diseases to be severe. The sources of knowledge on vaccine were: mass media, neighbours, relatives, friends, and health workers. Mothers considered other preventive measures alongside vaccination. The causes of vaccine-preventable diseases were sometimes confusing with the symptoms. Side-effect was a major factor for not completing the vaccinations.

Conclusion: All the sources of knowledge failed to create enough impetus in creating inspiration for high demand for vaccination. Consideration of other preventive measures and side-effects kept the demand for vaccination low. Improvement in demand for vaccination requires emphasis on the function of vaccine in preventing specific life-threatening diseases resulting in the control of deaths and thus enabling the growing up of children.

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Supply Aspects Relating to Immunization at Bhairab, Bangladesh

A.M.R. Chowdhury¹, **Insana Begum**¹, F. Karim¹, Abbas Bhuiya²,
K.M.A. Aziz¹, Shamim Ara¹, Shagufta Sultana¹ and Dineke Mol¹

Objective: Examine the quality of supply in implementing immunization services at the EPI sessions at Bhairab and their implications.

Methodology: Observations and interviews were conducted in 5 urban and 4 rural sessions. The informants and the sessions were purposively selected. The study was undertaken during December 1996-February 1997 at Bhairab.

Results: Vaccines were sometimes received very late by the providers which delayed the vaccination session. Except DPT, all other vaccines were available in all the sessions. To maintain the temperature in the carrier, health workers used ice packs. Strip thermometers were not used in outreach sessions, and supervision was generally lacking. EPI cards for children were not available in any of the sessions for several months. Re-usable needles were used, and they were not always sharp. Two registers and tally sheets were used in every vaccination sessions. Supervisors and health workers always got cooperation from local people in getting supply of furniture and provision of a place to hold vaccination sessions.

Conclusion: Late arrival of supply, short supply of DPT, inadequate number of needles, and no supply of EPI card for children sometimes hampered the smooth functioning of the EPI sessions. Community members were extraordinarily cooperative in offering logistics support. Use of strip thermometers in the vaccine carriers might have a problem in maintaining the potency of vaccines. The quality of supervision and performance and continued supply of vaccines and materials are the critical areas that require remedial measures.

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Immunization Status of Children in Chittagong Hill Tracts

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and K.M.A. Aziz²

Objective: Evaluate the immunization programmes conducted by EPI among children aged less than 24 months in Chittagong Hill Tracts in the background of prolonged period of political instability.

Methodology: A survey was conducted during May-July 1998, following signing of the Peace Treaty, among 656 mothers with at least one child aged less than 24 months. Equal numbers of mothers were selected representing the Chakma, Marma, Murang, Tripura and Bangalee communities.

Results: Wide variation in EPI coverage was observed among the tribes. Proportion of the fully-immunized children was the highest for the Bangalees (42.64%), followed by Tripura (18.2%), Marma (19.3%), Chakma (12.3%), and Murang (8.9%). Separate analyses for 12-23 months age cohort also revealed the same pattern. Most frequent reasons for non- or partial immunization included irregular visits by the health providers, lack of mothers' knowledge about immunization, long distance of the immunization centres.

Conclusion: There were wide gaps in immunization coverage between the national and the study areas. After the Peace Treaty, the movement in the area has become safe. Effort to increase the immunization coverage is a critical need of the hour.

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**Other Health Issues III: Reproductive Health
Barriers to Emergency Obstetric Care in a Rural Setting
of Bangladesh**

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Objective: Explore the situation during delivery at the rural home level and identify the barriers to emergency obstetric care.

Methodology: This investigation formed a part of the collaborative study undertaken by BRAC and London School of Hygiene & Tropical Medicine on maternal morbidity in Manikganj district of Bangladesh (1992-1993). It included 26 pregnant women who were followed up at home twice a week for the past six months of their pregnancy. Experienced female interviewers collected data through informal discussion and participatory observation. No notes were taken during the conversations, but a detailed diary of each visit was maintained immediately after they returned to the research base.

Results: The study found that women themselves were not often aware of self-care. A fear of sin that was attributed to the presence of unknown male doctors in the hospital acted as a barrier. Women's relationship with her in-laws was very important. An early assessment and indication for referral by TBAs was another important component in the decision-making process. Although in a few cases the TBAs instructed to shift the complicated cases relatively early, there are many examples where the TBAs were trying to manage by themselves. The hospital is an unfamiliar place for the rural people. A common perception was that the hospital people only pay attention to the rich and educated people. When all efforts made by a TBA, a Fakir or a village doctor failed, only then the family members thought about hospitalization. In-laws and neighbours jointly undertook the decision. Physical distance of the facility and transport problems were taken into consideration by the family prior to the final decision to transfer the patient to hospitals.

Conclusion: All members of the community need to be educated about the danger signs of obstetric emergencies. Poster, charts, audiovisual aids, and folk drama might be used as effective tools for the campaign. TBA training interventions should give more emphasis on early recognition of complications and early indications for referral rather than attempting management at home.

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Role of Male Clinics to Promote Reproductive Health Issues: The Matlab Experience

J. Chakraborty, N. Alam, P. Saha, F. Ahmed and Andres de Francisco

Objective: Explore the relative importance of reaching males with the aim at involving them in reproductive health programmes; evaluate the need for managing males' complaints of the reproductive tract; and help planning future interventions to improve reproductive health programmes.

Methodology: Given the shortcomings of the family planning programmes, interventions to involve men in the reproductive health programmes have been initiated in various projects. In Matlab, the programme established four male clinics in 1995 at the health centre level to provide services to male clients attending the clinics. The clinics were operated one day a week between 10 a.m. and 5 p.m. Services provided included diagnosis of and treatment for sexually transmitted infections and perceived sexual illness. Management was ensured using the WHO-recommended syndromic guidelines, and counseling on HIV/AIDS issues was provided. Services also included promotion of male family planning methods and condom demonstration. Paramedics posted at the health centres maintained records on patients' complaints, age, diagnosis, treatment, and service provided.

Results: During July 1997-June 1998, 258 patients attended the male clinics. Of these, 32% were unmarried. In total, 42% of the patients were aged less than 30 years; and 8% were less than 20 years. Most patients (51%) were not educated. Most were working in the agricultural sector. A high proportion (13%) was student. Complaints included: discharge from urethra (22%), ulcer in genitalia (4%), and swelling of penis (2%). Other common reasons for consultation were burning micturation (10%) and premature ejaculation (10%). Diagnoses included: psychosexual problem (27%), urinary tract infection (15%), inguinal bubo (10%), genital ulcer (3%), and urethritis (7%). Men were receptive to the messages on family planning, counseling, and advice.

Conclusion: There seems to be a great demand for male clinics. Men attended the clinics spontaneously and reported their perceived illnesses. It is possible to increase the coverage by increasing the frequency and hours of work. Male clinics are important vehicles to involve men in the reproductive health initiatives in Bangladesh and in other developing countries.

Effect of Adolescent Family Life Education Programme of BRAC

Rukhsana Gazi¹, Shamsher Ali Khan² and A.M.R. Chowdhury³

Objective: Evaluate the effect of Adolescent Family Life Education (AFLE) programme of BRAC on knowledge and attitude of the ninth grade students regarding reproductive health.

Methodology: The study was carried out in Mymensingh district in 1998. A survey was conducted among 440 randomly-selected students of class nine through a self-administered structured questionnaire. Of them, 219 underwent AFLE, while 221 were comparison students who did not undergo AFLE. Data were collected on selected issues relating to reproductive health, such as contraception, pregnancy care, infant-feeding, menstruation, leucorrhoea, and sexually transmitted diseases. Bivariate analysis was performed, and chi-square test was done to see the difference between the two groups of students. Qualitative information on issues, such as menstrual hygiene, healthcare-seeking behaviour, and romantic relationships were obtained through informal discussions and focus group discussions.

Results: Significantly higher proportion of the AFLE participants, than their peers, could correctly answer the questions on minimum age of female (90% vs. 76.5%, $p<0.0002$), temporary and permanent methods of contraception (56.9% vs. 39.3%, $p<0.0002$), method options for male and female (85.8% vs. 77.8%, $p<0.029$), proper birth-spacing (88.1% vs. 73.5%, $p<0.0001$). A higher proportion of AFLE students (91.8% vs. 85.1%, $p<0.03$) expressed their views that a couple should take joint decision on family planning. Significantly higher proportion of comparison students expected more than two children for their own family; they had misconceptions on menstruation, leucorrhoea, and transmission of sex-related diseases. AFLE students were more likely to know about additional diet during pregnancy (96.8% vs. 86.0%, $p<0.0005$), colostrum feeding (91.3% vs. 75.1%, $p<0.0005$), and timing of maternal immunization (43.4% vs. 33.9%, $p<0.0005$). However, irrespective of whether they had undergone AFLE courses or not, they knew about the need to immunize during pregnancy. In spite of general disapproval of pre-marital sex, some were exposed to it. In general, the students were reluctant to consult health professionals about contraception and sex-related problems as they felt a lack of privacy and confidentiality.

Conclusion: The study provides the insight that there is a lack of basic knowledge on issues of reproductive health among general students, and the AFLE programme has a positive effect. A major challenge would be to provide information to others who are outside the schools through peer networking.

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Sexual Behaviours among Male Adolescents in an Urban Community of Dhaka City

Ashrafal Alam Neeloy, Tamanna Sharmin and Lazeena Muna

Objective: Understand the existing sexual behaviours among male adolescents of Dhaka city.

Methodology: In-depth interviews were conducted with 47 male adolescents aged between 15 and 24 years residing at Moghbazar. Respondents were selected using snowball sampling technique. Several group discussions were conducted.

Results: Majority of the respondents had pre- and/or extra-marital sexual intercourse. Sex workers were the most common partners of those who had pre- and/or extra-marital sex. Although the main sexual preference was heterosexual, homosexual practices were also found. Pornography was the major source of sexual knowledge which was shared among peers. Majority of the respondents did not have a clear knowledge about AIDS and safer sex. Condom was perceived as a method of birth control and was rarely used.

Conclusion: Widespread unsafe sexual practices and lack of knowledge about safer sex have put the young people at risk. A programme is needed to educate the young population about sexuality and HIV/AIDS, including risky and less risky behaviours. Identification and in-depth knowledge of the sub-culture of male adolescents can enhance the success of prevention programmes relating to HIV and STDs.

Assessing Risks of Contracting HIV for Female Adolescents in Dhaka City

Lazeena Muna, Tamanna Sharmin and Ashrafal Alam Neeloy

Objective: Explore the values, beliefs, knowledge, and behaviours of female adolescents regarding different issues of sex and sexuality; assess the risky behaviours of contracting HIV; and provide relevant policy implications.

Methodology: In-depth interviews with 37 female adolescents (13 to 25 years old) were conducted in greater Moghbazar area in early 1997. Opportunistic and snowball sampling procedures were employed to get the informants. Confidentiality and sensitivity have been ensured.

Results: Female adolescents, both engaged in sexual activities and not engaged, are at risk of contracting HIV. Sexually active girls are practising unprotected sex with multiple partners. Girls not sexually active are ignorant of transmission and prevention of HIV. None of the adolescents perceives herself at risk. Myths on contracting HIV are very much prevalent. Social rigidity and lack of services made them not seeking care in need as well as being silent about the fact.

Conclusion: Health behaviour change model could be employed to make female adolescents and change agents understand about the consequences of being at risk. There is a clear need to provide information and education to be responsible for their own health. The caretakers and health service providers must be oriented to and sympathetic about the need of sexual health services for female adolescents.

Programmes on Males Who Have Sex with Males in Bangladesh: Necessity and Barriers

Sharful Islam Khan and Tamanna Sharmin

Objective: Explore and describe the reasons for prompting interventions on males who have sex with males (MSMs) in Bangladesh and identify barriers to addressing the issue.

Methodology: Three hundred fifty-six in-depth interviews had been conducted in two separate qualitative studies on MSMs in Dhaka and Chittagong cities. For this paper, data from 40 in-depth interviews from those previous studies were purposively used to match the objective. In addition, information from a few MSM outreach workers and officials of a local NGO was also gathered. Tape-recorded data were translated into English and entered as text files. Content, contextual, and thematic analyses were performed.

Results: Despite social stigma and strong religious norms against MSM acts, its existence in Bangladeshi society is being increasingly apparent in several studies. In big cities, like Dhaka and Chittagong, MSM activity is prevalent in the form of friendship and fantasy sex, situational and opportunistic sex, forced sex, group sex, alternate sex, and of course, at commercial settings. Stereotype invisibility and secrecy often frame the situation ignored, overlooked, and rejected. Selling sex is initiated and continued mainly due to comparatively easier economic subsistence and nourishment, which will probably persuade sustained and rapid growth of commercial male sex in Bangladesh. Low level of condom use without proper lubrication, strong sexual drives and practices, higher number of partners and also sex with females are commonly reported behaviours. Knowledge gap, low self-esteem and guilty feelings have made them vulnerable to getting STDs/HIV. It seems still impractical for NGOs to be registered to work on MSM issue explicitly in Bangladesh. Discrimination in terms of social and legal status, violations of human rights, and harassment by law-enforcing agencies and musclemen (*mastans*) have added extra barriers to reaching these marginalized populations. Blaming and judgmental attitudes shown by health personnel further constrain their access to health services and information.

Conclusion: The notion of only "heterosexual transmission of STD/HIV" in Bangladesh is under challenge. Sociocultural, political and religious dismay to work with stigmatized MSMs are urgently needed to be reconsidered. As STDs/HIV primarily affect marginalized group, denial and discrimination, legal obscurity, and human rights violation will no longer halt the transmission or protect the image of the country. Rather, acknowledging and understanding the MSM issue with scientific clarity, possible legal reformation considering cultural sensitivity, both government and NGO commitment to work from public health perspectives, are essential steps. More research and appropriate interventions have no alternatives to saving the country from the outrage of HIV/AIDS.

Health and the Environment I
Arsenic Levels in Drinking Water and Prevalence of Skin Lesions

Mahfuzar Rahman¹, Martin Tondel¹ and Ireen Akhter Chowdhury²

Objective: Determine the relationship of arsenic-associated skin lesions and degree of arsenic exposure.

Methodology: In a cross-sectional study, several wells contaminated with arsenic were identified in four villages. Arsenic water levels were measured by flow-injection hydride generation atomic absorption spectrometry (FI-HG-AAS), and arsenical skin lesions were diagnosed as the presence of one or more of these criteria: hyperpigmentation of unexposed body surfaces and/or keratosis, especially on palms and soles. We interviewed and examined 1,481 subjects by a door-to-door visit, who were depending on these wells--all in ages of 30 years or more.

Results: A total of 430 subjects had skin lesions and arsenic water levels ranged from 10 m g/L to 2,040 m g/L. Individual exposure assessment was estimated by levels (m g/L) and in terms of a dose-index (m g/L-kg) and a concentration-time product (m g-years/L). The crude overall morbidity from skin lesions was 29%. After age-adjustment to the world population, the prevalence was 30.1 and 26.5 per 100 for men and women respectively. There was a significant trend for the prevalence in relation to exposure levels ($p < 0.01$). The age-adjusted prevalence of skin lesions in females rose from 20.1 to 30.8 per 100 in terms of dose-index and 17.9 to 30.5 per 100 in terms of concentration-time product in the lowest compared to the highest category. The age-adjusted prevalence of skin lesions in males rose from 19.3 to 34.8 per 100 in terms of dose-index and from 18.6 to 34.8 per 100 in terms of concentration-time product in the lowest compared to the highest category. The test for trend for the total population was significant ($p < 0.001$) in both series of risk estimates.

Conclusion: The study shows a higher prevalence of arsenic skin lesions in the study villages. This is an alarming sign of arsenic exposure and requires urgent remedy, especially regarding future skin cancer.

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Village Health Workers Can Test Tubewell Water for Arsenic

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and Jalaluddin Ahmed²*

Objective: Evaluate a simple, inexpensive and rapid arsenic testing methodology and assess the level of clarity of the messages imparted to the villagers during testing tubewell water for arsenic.

Methodology: BRAC's Shasthya Shebikas and programme organizers were involved in a field-testing of tubewell water using a newly-developed field-kit by the National Institute of Preventive and Social Medicine. Random samples were analyzed using spectrophotometer for cross-checking the field-kit results. Household survey and focus group discussion methods were used for monitoring the programme at Hajiganj. The results obtained by simultaneous use of field-kit and spectrophotometer techniques showed a 92% matching.

Results: At the BRAC offices, 802 tubewell water samples were tested. Of these, 12% had contamination level of more than 0.05 mg/L. In Hajiganj 11,954 tubewells were tested with field-kits. Of these, 93% had arsenic (>0.05 mg/L). From Hajiganj samples, 193 were selected randomly for testing using spectrophotometer. Very few villagers were found to follow the advice imparted to them during arsenic testing.

Conclusion: BRAC has tested a simple and low-cost procedure of tubewell water which is implementable at the community level. Through involvement of community in the test, awareness of the problem was created as a by-product. This study has demonstrated that a change in the water source ensuring safe water by introducing an effective, affordable, and simple procedure can be helpful to overcome the arsenic contamination problem.

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Groundwater Arsenic Contamination and its Effect on Human Health in Bangladesh

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Rukshana Ahmed²

Objective: Explore the pattern of health effects due to arsenic contamination of groundwater and evaluate the chronic arsenicosis management regimen currently being practised in Bangladesh.

Methodology: This paper has been prepared on the basis of fact-finding surveys conducted purposively all over Bangladesh from 1994 to 1998 and records of patients available at the Department of Occupational and Environmental Health (DOEH) at the National Institute of Preventive and Social Medicine (NIPSOM). The surveys were carried out in villages on receiving information from the locality about the presence of groundwater contamination by arsenic and/or presence of suspected patients. Evaluation of the chronic arsenicosis management regimen, currently being practised, was carried out on 43 patients in a village that is being continuously monitored by DOEH.

Results: Arsenic contamination of groundwater has been identified in 52 districts. In total, 6,000 cases located in 170 villages of 72 thanas of 37 districts have been identified. The most common presentations are melanosis (93.5%), keratosis (68.3%), leukomelanosis (39.1%), and hyperkeratosis (37.6%). A few patients (0.8%) with obvious skin cancers have been detected. The clinical manifestations observed in Bangladesh have been categorized in three stages, and most patients were found in the first and second stages. The cases in initial and secondary stages have shown improvement on withdrawal of further intake of the contaminated water in conjunction with vitamin A, E, and C, vitamin-rich vegetables and fruits, and keratolytic agent (where applicable).

Conclusion: Toxic effect arising from arsenic contamination of groundwater is a new and emerging public health problem in Bangladesh. An estimated 50 million people are at risk of developing arsenicosis. The commonest clinical manifestations are melanosis and keratosis. Patients in initial and second stages treated with vitamin A, E, and C, vitamin-rich vegetables and fruits, and keratolytic agent (where applicable) along with withdrawal of further intake of the contaminated water have shown improvement.

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High Levels of Lead and Cadmium in Blood of Children of Dhaka

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Objective: Determine the blood lead (Pb) and cadmium (Cd) levels in children as an index of the exposure to these toxic elements in the environment.

Methodology: In total, 49 children were included. They were living in the Tejgaon industrial area (11), Mohammadpur (14), and Keraniganj (24). A group of 9 children from other parts of Dhaka city admitted in the CRSC of ICDDR,B was used for comparison. Determination of Pb and Cd in blood was done by atomic absorption spectrophotometer (AAS) attached with graphite furnace. Blood was collected from antecubital vein after careful cleaning with swabs containing isopropanol in Venojects[®] tubes containing EDTA.

Results: The concentrations of Pb (mean±SD 176±49 µg/L) in the children from 3 study areas together were significantly higher than those from hospital (mean±SD 126±84 µg/L). Blood Pb levels in children from the Tejgaon industrial area (215.6±51.8 µg/L) were significantly higher compared to children from Mohammadpur (153.1±48.4 µg/L), Keraniganj (170.9±36.9 µg/L), and hospital. All children from 3 study areas showed high blood Pb levels (>100 µg/L) at which adverse health effects had been demonstrated. Also the blood Cd levels were higher in the children (mean±SD 1.1±0.6 µg/L) from the study areas than those from the hospital (mean±SD 0.33±.31 µg/L). Cd levels were significantly higher in children from Keraniganj than all other areas.

Conclusion: Both Pb and Cd levels in the blood of children from high-risk areas are alarmingly high. These could be due to high lead in the environment from gasoline, paints, ceramics, batteries, etc. High Pb in hospitalized children indicates general contamination in the Dhaka city. Young children are mostly exposed to Cd through inhalation of smokes and contaminated soils and dust from industrial emissions and sewage sludge. There appears to be differences in the extent of contamination in different high-risk areas and the factors responsible should be investigated.

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Symptomatic Lead Poisoning in Bangladeshi Children

Naila Z. Khan, Reaz Mobarak and Mohammad Wahed

Objective: Study the effects of lead poisoning on psychomotor and behavioural functions in children.

Methodology: Children presenting with a range of development problems with no specific neurological cause for their cerebral dysfunction were screened for blood lead levels. High levels were considered to be pathognomonic of lead poisoning, and were supported by other symptoms and signs. Case reports were compiled, including social history.

Results: Blood lead levels were extremely high and at toxic levels in children presenting with psychomotor delay and behavioural problems, indicating lead poisoning.

Conclusion: Lead poisoning may cause extensive damage to the brain and nervous systems of children in Bangladesh. The effects may be more extensive for malnourished children from lower-income families living close to heavy traffic.

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Health and the Environment II

Medical Waste Disposal in Dhaka City: An Environmental Evaluation

Nasima Akter¹, Noor Mohammad Kazir² and A.M.R. Chowdhury¹

Objective: Examine the medical waste management system in Bangladesh, and identify the potential impacts that medical wastes pose to both humans and the environment. Also assess the health and environmental risk of medical waste and provide recommendations and guidelines on methods to handle medical wastes with a minimum impact on human health and the environment.

Methodology: In total, 28 government, private, and diagnostic centres were included in this study. These were selected as large, medium, and small categories. Data were obtained from field observations, interviews, and laboratory analyses.

Results: Hospital wastes which are disposed of in common dustbins in the city are hazardous and toxic. This study showed that the hospital staff, at all levels, were not aware of the methods of safe disposal and handling of hospital wastes. Moreover, waste disposal practice was found to be quite unsafe, and both clinical and non-clinical wastes were found to be thrown together. The laboratory analyses of wastes showed the presence of infectious wastes and the risk of severe contamination of the environment. Waste collectors: cleaners, ayas and tokais are vulnerable to health hazards.

Conclusion: Hospital wastes pose a significant threat to human health and environment. Proper waste management strategy is needed to ensure health and environmental safety. There is an urgent need for awareness-raising programmes on *health and* environmental hazards of hospital wastes.

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Environmental Health Education Intervention in Selected Poor Settlements

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Objective: Evaluate the impact of an environmental health education intervention in terms of water, sanitation, hygiene, and solid waste (WSHS) issues.

Methodology: This study is a part of an integrated water, sanitation, hygiene, and solid waste disposal needs assessment, education, and provision improvement project. The WSHS needs of a permanent settlement of the poor in Bauniabad and a temporary settlement of the poor in Ward 48 of Dhaka city were assessed using two cross-sectional surveys. The first survey was conducted to obtain baseline information about these settlements, and the second survey to evaluate the effectiveness of a preliminary educational programme (of six months duration) implemented in these settlements. Data on relevant knowledge and practices about WSHS were collected using interview, focus group discussion, and environmental analysis techniques. The educational intervention included courtyard meetings with female and male members of families. The results of the two surveys were compared for determining the needs before and after making people aware of the basic WSHS issues.

Results: Almost all people in these settlements had access to tubewell or tap water. About 80% of the people in the permanent settlement in Bauniabad used sanitary latrines compared to 30% of the people in the temporary settlement in Ward 48. Dustbins were accessible to 93% and 2% of the people in Bauniabad and Ward 48 respectively. About 50% of the Bauniabad people used dustbins. None of the pits of latrines was desludged in a sanitary way when full. All these practices remained similar after the intervention. Hands of more than 80% of the mothers were found contaminated in both areas before and after the intervention. Knowledge on WSHS issues, relevant to diarrhoea transmission and actual WSHS practices, were also poor in both the settlements. However, these parameters improved after the educational intervention. The rate of satisfactory responses about the modes of diarrhoea transmission improved from 50% to 75% and 46% to 68% in Bauniabad and Ward 48 people respectively. The lack of improvement in practices, in their opinion, was due to the lack of (i) appropriate WSHS services, (ii) appropriate technology, (iii) coordination, (iv) knowledge, and (v) community involvement.

Conclusion: Findings of the study indicate that the WSHS conditions and the requirements for improvement were similar in both the areas. The preliminary educational intervention helped the people and the project assess the needs following improved awareness among the people.

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1998 Flood: Nutrition Situation, Coping Mechanism, and Rehabilitation Plan

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Objective: Assess nutrition status of children (6-59 months) in the flood-affected communities; and identify major problems encountered, coping mechanisms, and the priorities for suitable rehabilitation.

Methodology: A cross-sectional survey was conducted in six rural areas of Bangladesh from 26 August to 5 September 1998. In each area, 10 randomly-chosen villages were divided into clusters of 35-40 households. All the households with children (aged less than 5 years) of a randomly-chosen cluster were interviewed, and all children were measured for nutrition status. In total, 1988 households were visited, 1,313 respondents interviewed, and 1,595 children measured. Thirty-six focus group discussions (21 with male and 15 with female) were conducted to know the coping mechanisms and priority for rehabilitation plan.

Results: 16.5 percent of the children were moderately malnourished (-2 to -2.99 Z-scores of wt-for-ht) and 2.6% were severely malnourished (below -3 Z-scores of wt-for-ht). Major problems encountered by the affected populations include: unemployment leading to food scarcity (inability to buy), unhealthy environment leading to diseases, communication disruptions, accommodation problems, disrupted schooling of children, loss of crops, etc. Leg sores and children's sickness (diarrhoea, ARI, conjunctivitis, etc.) were the most important health-related issues reported. All apprehended a major outbreak of diseases immediately after recession of water. To cope with the shortage of food during flood, most people reduced the frequency of meals and amount of food. Many started fishing (for sales or consumption), operating boats, selling daily labour, fetching and selling fodder for cattle, etc. Sales of assets at an unusually low price as well as attempts to find jobs in the nearest urban areas were common. Affected people who had lost their jobs due to flood did not wish to have 'relief'--rather they preferred long-term interest-free loans and were ready to work and return the money.

Conclusion: Nutrition situation did not warrant immediate nutrition intervention, but other findings showed potential signs of deterioration. Consultations with community members may help design the most appropriate relief and rehabilitation interventions.

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Rapid Assessment of Health Status of Children and Women in a Flood-affected Area in Bangladesh

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Objective: Determine the health status of children (aged less than 6 years) and women during the 1998 flood in a rural community in Bangladesh.

Methodology: A cross-sectional study was carried in Sonargaon thana of Narayanganj district to determine the health status of children (aged less than 6 years) and women during the 1998 flood. Ten flood shelters, one from each union, were randomly selected as clusters. In total, 284 women and 269 children were included in the study. Data were collected between 20 September and 27 September 1998 by using an interviewer-administered questionnaire.

Results: The mean ages of the study children and mothers were 32 months (3 days to 6 years) and 25 years (15-48 years) respectively. At the time of interview, the average duration of stay in the flood shelters was 50 days (3 to 90 days). Most respondents (98.2%) used tubewell as their source of drinking water. Only 39.4% of the population had access to sanitary toilets, and the rest used open places or flood-water. Among the population investigated, 127 (44.7%) women and 252 (93.7%) children suffered from various types of illness. The common illnesses encountered by the women during the study period were: fever 24 (18.9%), cough and cold 23 (18.1%), respiratory tract infection 5 (3.9%), diarrhoea 10 (7.9%), skin infection in foot 9 (7.1%), angular stomatitis 3 (2.3%), other skin infections 3 (2.3%), and others 79 (62.20%). The common illnesses of the children were: cough and cold 97 (38.5%), fever 94 (37.3%), diarrhoea 70 (27.7%), respiratory infections 14 (5.5%), angular stomatitis 14 (5.5%), skin infection 11 (4.4%), skin infection in foot 7 (2.8%), and other diseases 36 (14.3%). Although no death was reported among women during the study period, 7 children died during the same period. Of them, 6 deaths were due to drowning.

Conclusion: The results indicate that the children were more affected during the flood. The prevalence of morbidity and mortality were high among them. Although the source of drinking water was reported to be tubewell, the sanitary facility was very poor in the flood shelters.

Assessment of Environmental Degradation and Health Hazards Due to Sericulture Programme Activities in Bangladesh

Nasima Akter, Arnina Rahman and Mohammed Jakariya

Objective: Assess the potential environmental problems of the sericulture programme activities, including environmental and health concerns; identify remedial measures to reduce the adverse impact on the environment and public health; and establish monitoring criteria to maintain the environmental quality and sustainability of these programmes.

Methodology: The study was done under the guidance of Ayesha Abed Foundation. Data were collected through interviews, discussion with programme personnel, field observations, and laboratory analyses of water and soil samples. Variables included (separately for each programme): process, activities, energy, chemical and material uses, waste generation and disposal, and observed health and environmental problems.

Results: The major findings of the study were categorized as "health effects" and "environmental assessment" of the programme. Employees working in different sericulture programmes were found to suffer from various health problems. These can be caused by direct or indirect exposure to environmental pollution and contamination. The most important concern for environmental and public health issues is the disposal of liquid and solid wastes. Most chemicals found from laboratory analyses of waste water and sediment are persistent in nature and have long residual effects. The results of the analyzed chemical samples showed a higher value than the maximum allowable DoE (Department of Environment) standards for those chemicals.

Conclusion: The results indicate that the health and environmental problems, resulting from the sericulture programmes, are acute. Based on the findings, recommendations were made to lessen environmental degradation and health hazards, and make the programmes more environmentally sustainable.

Hearing Loss among Autorickshaw Drivers of Dhaka City

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Objective: Determine the prevalence of hearing loss among autorickshaw drivers of Dhaka city.

Methodology: A cross-sectional study on 113 autorickshaw drivers was carried out during April-May 1998 in the Department of ENT, Bangladesh Medical College, Dhaka. The drivers who appeared at the gate of the College between 8:00 a.m. and 10:00 a.m. were primarily chosen for the study. After screening in the Department of ENT, they were finally selected. Drivers having ear pathology or receiving streptomycin or quinine or crossing 55 years of age were excluded. Hearing function was measured by Pure Tone Audiometry. Data analysis was done by SPSS PC+ software package.

Results: Of the subjects studied, 34 (30.1%) had hearing loss and 37 (32.7%) had V-notch, while 62 (54.9%) had normal audiogram findings. Thirteen (11.5%) subjects had only V-notch without hearing loss. Mean durations of job among drivers with normal hearing and with hearing loss were 7.25 years and 16.59 years respectively. This difference was significant ($p < 0.001$). Significant correlation ($p < 0.005$ – $p < 0.05$) was observed between duration of job and hearing threshold at different frequencies of sound.

Conclusion: The nuisance value of autorickshaw is well-known to all city-dwellers of Bangladesh. It causes both noise pollution and air pollution. This study concludes that hearing loss is very common among autorickshaw drivers, and that the risk of developing hearing loss increases with increase in duration of job. In Bangladesh, no previous study was done in this field. Further studies are required to assess the ill effects of autorickshaw on general population in regard to noise pollution.

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Health and the Environment III

Survival of *Vibrio cholerae* O139 with *Anabaena* sp. and Detection of Toxigenic *Vibrio cholerae* from Samples of Aquatic Environment

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A. Huq⁴ and R.R. Colwell⁴

Objective: Investigate association of *Vibrio cholerae* O139 with a cyanobacterium *Anabaena* sp. in microcosms and detect toxigenic *V. cholerae* from various components of pond ecosystems in a rural cholera-endemic area of Bangladesh.

Methodology: Microcosms were prepared with 200 mL of autoclaved pond water, 2 g of *Anabaena* sp., and 105/mL *V. cholerae* O139 in a 500-mL conical flask (Pyrex). Another flask with only 105/mL *V. cholerae* O139 in 200 mL of autoclaved pond water was used as a control. Sampling of *Anabaena* sp., water on which *Anabaena* sp. was floating, and control water without *Anabaena* sp. were done at various time intervals. Culturable *V. cholerae* O139 were counted using TTGA media. Viable but non-culturable (VBNC) *V. cholerae* O139 were detected using fluorescent antibody and PCR techniques. Environmental samples, including water, plant, phytoplankton, zooplankton, snail, oyster, and sediment were collected every 15 days from 4 ponds in Matlab, Bangladesh. VBNC *V. cholerae* were detected from these samples using PCR and dot blot hybridization following standard procedures.

Results: The results showed that *V. cholerae* O139 survived in alga, control water, and water on which *Anabaena* sp. was floating as culturable form up to 23, 20, and 10 days respectively. *V. cholerae* O139 survived better in association with *Anabaena* sp. When *V. cholerae* O139 could no longer be cultured, the cells were assumed to enter the non-culturable state. VBNC cells were identified using fluorescent antibody technique and were found to persist till completion of the study (60 days) only in association with *Anabaena* sp. This result was supported by PCR, followed by dot blot hybridization. In total, 449 samples of aquatic environment were collected from 4 pond ecosystems of Matlab, and toxigenic *V. cholerae* were detected by PCR using *ctxA* as the target gene. Only 5 samples were found positive by PCR. However, the sensitivity of detection was intensified when PCR products were subjected to dot blot hybridization. The dot blot hybridization increased the positivity of PCR products from 5 to 41. Four of the *ctx*-positive samples were found to contain *V. cholerae* O139 when amplified with *V. cholerae* O139-specific primers.

Conclusion: This study demonstrated that *V. cholerae* O139 can be associated with *Anabaena* sp. and can persist in VBNC form for a long time (60 days). The results of this study are consistent with those carried out with *V. cholerae* O1. Therefore, it may be concluded that both epidemic serotypes of *V. cholerae* O1 and O139 behave similarly in respect to their association with the cyanobacteria *Anabaena* sp. in microcosms. This study also showed the presence of toxigenic VBNC *V. cholerae* in various components of the aquatic environment in an endemic area of Bangladesh.

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Biological Contamination of Tubewell Water

Bilqis Amin Hoque

Objective: Indicate the type and extent of common biological contamination of tubewell water and relate this to the conditions at the well-head.

Methodology: A cross-sectional survey was conducted to collect 2,000 tubewell water samples from 274 thanas of Bangladesh. The samples were tested in the Environmental Health Laboratory of ICDDR'B for faecal coliform, ammonia-nitrogen, and pH. Sanitary conditions at the well-head as well as depth of wells were observed. Distances between any latrine, dirty ditch, domestic ditch, pond, river or canal visible from the tubewell sites were estimated.

Results: The geometric mean and median values of faecal coliform bacteria were as low as 3 cfu/100 mL and 1 cfu/100 mL respectively, but only about 46% of the water samples met the WHO standard (nil faecal coliform per 100 mL sample) for drinking water. About 65% of the samples had less than 1.5 mg/L ammonia-nitrogen concentration. Most tubewells had platforms as about 82% of the studied wells were installed by the Department of Public Health Engineering. The presence of a dirty ditch within 15 metres of the tubewell was positively and more or less significantly associated ($p=0.09$) with the faecal coliform after controlling for other factors (using multivariate analysis). Presence of platform and depth of tubewell showed a negative association with the faecal coliform pollution. This was, however, not statistically significant.

Conclusion: The level of biological contamination of tubewells in terms of presence of faecal coliform is alarming. This was only an indicative study, and therefore, appropriate studies are required to determine the extent, risk factors, and nature of the problem.

Probable Role of Mucinase in the Survival of *Vibrio cholerae* O1 in Association with a Cyanobacterium *Anabaena* sp.

*M.S. Islam*¹, ***M.M. Goldar***¹, *M.G. Morshed*², *M. John Albert*¹, *R.B. Sack*³,
*A. Huq*⁴ and *R.R. Colwell*⁴

Objective: Investigate the role of mucinase in the survival of *Vibrio cholerae* O1 in association with a cyanobacterium *Anabaena* sp.

Methodology: A clinical isolate of *V. cholerae* O1, El Tor, Ogawa (3083-T), its haemagglutinin/protease (mucinase)-negative mutant (HAP-1-T) were used in microcosm studies for survival in association with plankton *Anabaena* sp. and in chemotaxis studies with porcine mucin. Simple drop-plate technique was followed to count culturable cells of *V. cholerae* O1 on taurocholate-tellurite-gelatin agar (TTGA) plate. Fluorescent antibody (FA) technique was used for counting viable but non-culturable cells of *V. cholerae* O1. Polymerase chain reaction (PCR) and southern hybridization techniques were used for detecting *V. cholerae* O1 with *Anabaena* sp. up to several months in microcosms. Capillary tube technique was used for determining the role of chemotaxis in the attachment of *V. cholerae* O1 with *Anabaena* sp.

Results: Wild type *V. cholerae* O1 (3083-T) survived up to 24 days in culturable form in association with *Anabaena* sp., but the mutant survived only for 10 days in microcosms. Both culture and FA results showed multiplication of wild-type strain of *V. cholerae* O1 in association with *Anabaena* sp. However, multiplication of *V. cholerae* in control water without *Anabaena* sp. was not observed. During chemotaxis study, 4% homogenates of *Anabaena* sp. showed 5.68% bacterial accumulation, but 2.98% accumulation occurred for the mutant strain at 90 minutes. Again, wild-type *V. cholerae* O1 showed 4.36% accumulation toward 2% solution of mucin, but mutant showed 1% accumulation at 90 minutes.

Conclusion: The significant survival of *V. cholerae* O1 in association with *Anabaena* sp. and attraction of *V. cholerae* O1 toward mucin may be the results of the activity of mucinase. These results indicate that the enzyme HA/protease (mucinase) may play an important role in association and survival of *V. cholerae* O1 with a mucilaginous cyanobacterium *Anabaena* sp.

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Preliminary Survey of the Abundance of *Aeromonas* Phages in Ponds and Sewage Beds of Dhaka, Bangladesh

Z. Rahim¹, M.S. Islam¹, R.B. Sack², A. Huq³ and R.R. Colwell³

Objective: Study the abundance of *Aeromonas* phages in pond ecosystem and sewage samples of Dhaka, Bangladesh.

Methodology: Two water and sediment samples of IPH-pond and five water and sediment samples of sewage-contaminated pond of Mohakhali, Dhaka, were processed to isolate phages specific for *A. hydrophila*. Lytic pattern of various *Aeromonas*-phages with *Aeromonas* strains was tested by spot method.

Results: In pond ecosystem, concentration of *Aeromonas* phages ranged from 6×10^1 to 2×10^4 PFU/mL or g of sample. Concentrations of *Aeromonas* phages in sewage sample ranged from 4×10^1 to 2×10^3 /mL or g. Concentrations of *Aeromonas* phages were more in water than in the sediment samples in pond ecosystem, whereas in sewage sample, phages were concentrated more in sediment than in the water samples. Phages were lytic in nature and specific for *A. hydrophila*.

Conclusion: *A. hydrophila* phages are abundant in sewage samples and pond ecosystem of Dhaka. Further work is needed to isolate specific phage of *Aeromonas* suitable for use in diagnostic purpose.

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Blue-green Algal Bloom in Pond Ecosystems and Seasonality of Cholera Cases in an Endemic Area of Bangladesh

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Objective: Investigate seasonality of blue-green algae in pond ecosystems and the seasonality of cholera in a rural endemic area of Bangladesh.

Methodology: The study was carried out in 4 pond ecosystems at Matlab in Bangladesh. One litre of water containing algae was collected at an interval of 15 days in a plastic bottle with Lugol's iodine solution for one year from July 1994 to June 1995. Five hundred mL of water sample was also collected for determining the various physico-chemical parameters, including pH and NO₃-N of water. The algae were enumerated using Sedgewick-Rafter counting chamber. Identification of the algal species and determination of physico-chemical parameters of water samples were carried out following standard procedures. Information on the incidence of cholera was collected from the records of ICDDR,B hospital at Matlab.

Results: The blue-green algae followed a strict seasonal pattern in most ponds studied. The incidence of cholera during the study period also showed a seasonal pattern. The period of algal bloom and the occurrence of high incidence of cholera took place almost at the same time. The increase in the number of algae also strongly correlated with pH and NO₃-N of water.

Conclusion: This study showed that the increase in the number of blue-green algae in the aquatic environment of rural Bangladesh takes place at the same time when the cholera cases increase. This study, like the previous studies, indicated a link between algal bloom and peak cholera season thus reinforcing the notion of blue-green algae as a possible reservoir of V. cholerae.

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Detection of *Shigellae* from Rectal Swabs and Handwashing Samples Collected from the Members of Index Families Infected with Shigellosis

M.S. Islam¹, A. Sadique¹, M.M. Goldar¹, M.S. Hossain¹, M.M. Rahman¹, A.H. Baqui¹, M.A. Rahman¹, M. John Albert¹ and R.B. Sack²

Objective: Detect *Shigellae* by culture technique from rectal swabs and handwashing samples collected from the members of index families infected with shigellosis.

Methodology: Rectal swabs and handwashing samples were collected in buffered glycerol saline (BGS) solution from the family members of index case on day 1, 3, 5, 7, and 9. Samples were inoculated onto MacConkey (MAC), Salmonella-Shigella (S-S), Xylose Lysine Deoxycholate (XLD) and Hektoe Enteric Agar (HEA) media. The plates were incubated at 37°C for 18-24 hours. Non-lactose-fermenting, tiny convex flat colonies were selected for further characterization following standard procedures. The species of *Shigellae* were identified by slide agglutination technique using specific antisera.

Results: In total, 925 rectal swabs were collected, of which 7.7%, 5.6%, 4.0%, 5.5% and 5.6% yielded *Shigellae* on day 1, 3, 5, 7, and 9 respectively by culture technique. In the case of handwashing samples, 0.6% and 2.5% yielded *Shigellae* on day 1 and 3 respectively but no *Shigellae* could be isolated from the handwashing samples on day 5, 7, and 9. The results showed that although some family members of index cases were harbouring *Shigellae* up to the 9th day of investigation, their hands became free from *Shigellae* from the 5th day of investigation.

Conclusion: This study emphasizes the need of handwashing of the family members, especially during the first few days after onset of shigellosis in a family.

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Other Health Issues IV: Miscellaneous
Green Leafy Vegetables from Natural Sources: The Case of
Rural Poor in Bangladesh

Farzana Ahmed¹, K.M.A. Aziz², Md. Yunus¹ and R.B. Sack³

Objective: Explore users' choices among the natural, home-garden, and market sources of green leafy vegetables.

Methodology: One hundred and fifty-six mothers having child(ren) aged 6-59 months were selected from the very poor socioeconomic groups of the community, from eight villages of the MCH-FP study area in Matlab. Data were collected on the sources of green leafy vegetables rich in beta-carotene consumed by the mothers and children during the preceding three days before interview using dietary recall method. Mothers were interviewed once in every two months representing all the six seasons of Bangladesh ranging from April 1994 to March 1995. The green leafy vegetables were categorized into high and low contents of beta-carotene.

Results: The proportions of mothers and children who consumed green leafy vegetables with high and low content of beta-carotene are presented according to the sources: home-garden, market, and natural sources. In four of the six seasons, the natural source was the prime one followed by home-garden and market. Overall, the vegetables containing high beta-carotene were more often chosen for consumption.

Conclusion: In choosing vegetables, those with high beta-carotene content and simplicity were preferred. In promoting consumption of green leafy vegetables, the tapping of natural resources must be emphasized, particularly among the poor communities. The successful pursuit of green leafy vegetables was mainly possible due to freedom of movement and urge for procuring suitable foods by the poor women.

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Zinc Supplementation during Pregnancy in Bangladeshi Urban Poor: Effect on Infant Growth and Morbidity during the First Six Months of Life

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*A.H. Baqui*¹ and *George Fuchs*¹

Objective: Investigate the effect of maternal zinc supplementation during pregnancy on infant growth and morbidity during the first 6 months of life.

Methodology: The study was done on 381 infants of poor urban Bangladeshi mothers who had been randomized to receive daily 30 mg elemental zinc or cellulose placebo during pregnancy. Supplementation started between 12 and 16 weeks gestation and continued till delivery. During weekly home visits, information on infant morbidity during the past week was collected by mothers' recall. Weight, length, head-, chest-, and arm-circumference of the infants were measured monthly.

Results: At 6 months of age, no significant differences in Z-scores were found between the two treatment groups for weight-for-height, height-for-age or weight-for-age. Weight gain between birth and 6 months of age also did not differ between the two groups (3489±771 g vs. 3561±772 g; NS). Male infants in the zinc group experienced fewer episodes and days of dysentery compared to the placebo group ($p<0.05$). No other differences were observed in morbidity (total days or total number of episodes of respiratory tract infections, cough, acute diarrhoea, persistent diarrhoea or fever) among all infants from zinc- or placebo-supplemented mothers.

Conclusion: It is concluded that zinc supplementation during the last two trimesters of pregnancy in poor urban Bangladeshi women was associated with reduced morbidity due to dysentery in boys but had no apparent impact on infant growth during the first six months of life.

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Seroepidemiology of Hepatitis B Virus Infection in Bangladesh

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and *Samir K. Saha*^{3,4}

Objective: Study the seroepidemiology of hepatitis B virus (HBV) infection in Bangladesh to determine the burden of HBV infection and the target population for vaccination.

Methodology: Five hundred thirty-five healthy subjects of both sexes, aged between one month and 35 years, living in different districts of Bangladesh, were enrolled in the study during June 1997-June 1998. The cases were referred to Popular Diagnostic Centre by a non-government organization as part of the routine health check-up of their newly-appointed employees. HBsAg and anti-HBc markers were detected by ELISA method. Information was collected by a questionnaire to find out the relation of HBV infection with age, sex, blood group, socioeconomic status, and place of living. Data were analyzed by EPI Info 6.02 software package.

Results: Of the 535 subjects, 16 (3%) were found to be HBsAg-positive and 113 (21.1%) were positive for anti-HBc. Analysis of HBV markers in different age groups showed that the prevalence of HBsAg was higher in children (5.52%) than adults (1.7%), whereas it was reverse in the case of anti-HBc (14.9% vs. 24.3%). Further segmental analysis of age group showed that none of the children aged 0-3 years (n=55) was positive for HBsAg. However, the positivity of HBsAg was highest (10.2%) in the 7-9 years age group. Prevalence of HBsAg and anti-HBc in male (3.23% and 23.83%) was more than in female (1.87% and 10.28%). No significant relationship of HBV infection with socioeconomic status, blood group, and Rh factor was observed. The northern (n=73) and the south-east (n=84) regions of Bangladesh were found to have higher rate of infection than the south-west (n=39) and the central region (n=139).

Conclusion: Bangladesh is moderately endemic for HBV infection. The study revealed that preschool children and early adolescents are the high-risk age group, and horizontal transmission is possibly the major mode of transmission. Therefore, to prevent the HBV infection, children of three years old or below should be targeted for vaccination which suits well with the existing EPI schedule.

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Spread of Multidrug-resistant *Salmonella* Group B in Dhaka

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and Samir K. Saha*

Objective: Determine prevalence of *Salmonella* Group B infection in children.

Methodology: *Salmonella* strains isolated from the clinical specimens of paediatric patients were identified by biochemical tests, analytical profile index (API), and agglutination with specific antisera. The sensitivity pattern of the strains was determined by disc diffusion method following the NCCLS recommendations. Clinical features were recorded by taking previous history and subsequent every-day clinical evaluation of patients. Clinical and microbiological information was collected by a questionnaire and analyzed by EPI Info 6.04 software package.

Results: In total, 53 strains of *Salmonella* Group B were isolated from 52 children during 1997-1998. Of these, 25 cases were of nosocomial origin, and 28 were community-acquired. The strains were isolated from stool (45), CSF (3), blood (4), and urine (2). Most isolates (96%) were multidrug-resistant, and these were mainly sensitive to ceftazidime, ciprofloxacin, and pivmecillinam. Among these cases, 45 patients were cured (26 community-acquired and 19 nosocomial), and 7 died (2 community-acquired and 5 nosocomial). The sensitivity pattern and API score of the nosocomial and community acquired strains were similar.

Conclusion: *Salmonella* Group B is an emerging pathogen in Bangladesh, which can cause varied type of invasive and non-invasive diseases in children. Resistance of this organism to most antibiotics makes the treatment difficult. Similarity in drug resistance pattern and API score possibly indicate that the same clone of strain is circulating in this region. However, molecular analysis of these strains is needed to determine their similarity. Studies to examine the association between clinical features and virulence factors of *Salmonella* group B may be initiated.

Children's Chronic and Acute Morbidity in Matlab, Bangladesh: Levels and Correlates

Nurul Alam

Objective: Provide chronic and acute morbidity profiles of rural children aged less than 15 years living in different socioeconomic and sanitary conditions.

Methodology: The Matlab Health and Socioeconomic Survey (MHSS) 1996 recorded chronic and acute morbidity symptoms of 3,765 children aged 3-179 months. Mothers were asked to report any chronic disease symptoms (e.g. general weakness or anaemia, arthritis or rheumatism, asthma, other breathing difficulty, etc.) the child might have in the past three months. They were also asked to report if the child had any of the symptoms of: cough, fever, cold, headache, watery diarrhoea, etc. in the last one month. MHSS recorded data on mothers' education and cleanliness of the yard. 31% reported more than one symptom of acute morbidity and 14% more than one symptom of chronic morbidity. Prevalence of specific symptoms and of any symptoms was estimated by children's age and sex, mothers' education, and cleanliness of the yard.

Results: The prevalence of chronic morbidity was 13.9% with little variation between age groups. The most prevalent symptoms were asthma or breathing difficulty (4.7%) followed by general weakness or anaemia (3.2%). The odds of having chronic morbidity were higher for boys than girls, for illiterate mothers, and for unclean yard. More than a half (52.4%) of the sample children had at least one symptom of acute illness in the past month, and the prevalence showed an inverse relationship with children's age. Sex of the child, mothers' education, and cleanliness of the yard were not associated with the prevalence of acute morbidity. The acute symptoms in order of prevalence were: cough-cold-fever (32.1%), diarrhoeal diseases (12.8%), skin infection (3.3%), stomachache (3.1%), and eye infection (2.3%).

Conclusion: Both chronic and acute morbidity were widely prevalent among rural children. Household socioeconomic and sanitary conditions were inversely associated with the prevalence of chronic, but not with acute morbidity.

Road Traffic Accidents in Dhaka

Moslem Uddin Khan¹ and Nasrin Parvin Khan²

Objective: Evaluate the casualties of travellers on the roads of Dhaka.

Methodology: Information on road traffic accidents was obtained prospectively from a widely-circulated daily newspaper. Data for 1994-1995 were analyzed by seasons of accidents, types of offense, affected vehicles, and the age and sex of travellers dead and injured.

Results: There were 1121 traffic accidents, 1600 deaths, and 5982 injuries during the study period. Accidents took place more often during the dry season. Trucks were responsible for 44.6% of the accidents, buses 26.4%, minibuses 16%, and the rest were other types of vehicles. The affected vehicles were rickshaws and cycles (25.7%), two-stroke three-wheel vehicles (16.8%), motor cycles (12.1%). 73.8% of the accidents were due to rush driving and 12% due to loss of control. 49% of the deaths occurred in the 20-35 years age group, 16.9% in 10-19 years age group, and 17.1% in 40-59 years age group. There were 3.1 accidents, 4.4 deaths, and 16.4 injuries per day and 1.2 deaths per accident.

Conclusion: Rush driving, lack of valid licence, overloading, bad road and traffic conditions, lack of road partition, crowding on traffic roads, and poor understanding of the people about traffic rules are thought to be the main reasons of accident.

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Posters
**Observation on National Immunization Day in
Slums of Mohakhali, Dhaka**

Suhaila H. Khan

Objective: Explore in-depth knowledge, attitude, and practice of the slum dwellers regarding immunization of their children and the process of the National Immunization Day (NID) in urban slums.

Methodology: This case study made observations on the January 1998 NID in selected slums of Mohakhali, Dhaka. Data were collected by observing two NID centres and interviewing 24 purposively selected respondents. Eight mothers and eight *matobbars* (headmen) from four slums were interviewed pre-NID and post-NID, and four mothers and four vaccinators from two centres were interviewed during the NID sessions.

Results: People heard about the NID from neighbours and broadcasts from loudspeakers, radio, and television. The knowledge and perception of the respondents about polio and EPI were sketchy, and did not improve after the NID. The vaccinators were NGO health educators, housewife-social workers, university students, and schoolboys from the slums. NGO workers were more knowledgeable, but the quality of work of the social workers was better. Vaccination was done from both static and mobile centres. There was no shortage of vaccines, but the quality of vaccination in terms of oral drops, maintenance of hygiene, ice packs used for maintaining temperature of vaccines varied greatly. The mobile team did not use any ice pack. Vaccination was not given in an orderly manner, and no supervisors came. The interference of *mastans* (hoodlums) hampered vaccination in one centre. The vaccinators immunized two-thirds of their target population, and only half of the children were vaccinated properly. Children living outside the slums were missed. The NID sessions immunized the socioeconomically well-off and slum children who were missed during routine EPI. The slum dwellers opined that access was easier since immunization was given in the slums and that other than this one-time vaccination centre, they did not know of any EPI centres located in Gulshan thana.

Conclusion: Although this study had a small sample, the findings gave a picture of the status of NID and EPI in urban slums. NID sessions and EPI activities need more publicity. Interference of local leaders/hoodlums had negative consequences and need careful consideration/scrutiny. Current observations indicate that NIDs will probably be socially sustainable, but the question of their being financially sustainable remains unanswered and unexplored.

Perception of Rural Women on RTIs/STIs

Rukhsana Gazi¹ and A.M.R. Chowdhury²

Objective: Explore the perception of rural women on causes, transmission and prevention of reproductive tract infections and sexually transmitted infections (RTIs/STIs); obtain information on treatment patterns for these problems; and assess the needs of the community to combat the RTI/STI problems.

Methodology: This study was conducted among rural women in four areas of Mymensingh district in March 1998. Data were collected through Participatory Rapid Appraisal (PRA) methods which included focus group discussions, body mapping, ranking, and listing. In total, 8 focus group discussions (2 from each area) were conducted. In each area, one focus group discussion was conducted with younger mothers (having a child of two years or less) aged less than 30 years and another with older mothers (grand-mothers, aged more than 40 years). In body mapping technique, the participants were first given papers with an outline of the female body and asked to draw pictures of how the disease enters the body and involves different organs. Finally, the participants were asked to explain their drawings.

Results: The RTI/STI-related diseases were termed as *gupon roag/gupta roag* (private disease) by the rural women that might or might not be *hachor* (contagious). The rural women identified the number of such diseases. These were *gormi*, *siblis*, *pocha ghao*, *pripir/pipree*, and *orsho*. The perceived causes of the diseases were grouped on the basis of hygiene behaviour, pollution, general contact, and supernatural factors. They believed that some behaviours, such as lack of hygiene after sex, sex with bad women or persons having leucorrhoea and bad semen, sex during menstruation, and sharing underwear with affected persons might cause diseases. Gender, social status, marital status, education, occupation, and age of a person were believed to be the leading factors in disease causation. As preventive measures, hygiene behaviour, condom use, obeying religious rules, protection against contamination, and pollution were mentioned. Significant difference in perception was found between younger and older mothers regarding the consequences of diseases, their transmission, prevention, and treatment-seeking. Sources of treatments sought were both traditional and modern. Choices of treatment were based on risk perception, presentation of diseases, and gender. The rural women gave emphasis on male education, involvement of elderly women, and intervention for perceived risk-group (women in brothels) to overcome the problem.

Conclusion: Most participants were illiterate, but they were not ignorant about the magnitude of the problems relating to RTIs/STIs. They provided a wide range of useful information and shared their views and valuable experiences which would be helpful in addressing this issue. Understanding local terminology for RTIs/STIs will help develop a communication strategy for the local people.

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Lactating Mothers and Contraception: Some Points to Ponder

Rumana A. Saifi and Subrata Routh

Objective: Understand the contraceptive use-behaviour of lactating mothers and programmatic implications of the findings.

Methodology: Primary data gathered through longitudinal surveillance system of the Operations Research Project, namely the Sample Registration System, were the basis of analyses done to explore the contraceptive use-behaviour of the lactating mothers of Mirsarai and Abhoynagar rural sites for the period from July 1997 to June 1998. The sample comprised 2,800 and 3,400 married women of reproductive age (MWRA) for Abhoynagar and Mirsarai respectively.

Results: On an average, 20% of the MWRA were found to be lactating mothers, i.e. eligible women having living child(ren) aged two years or below. Two of every five lactating mothers were using family planning methods. Pills and injectables were the most predominant modern methods of family planning used by them. More than 90% of the lactating mothers under contraception practised breast-feeding with supplementation. Fifty percent of the lactating mothers were found to be non-contraceptors. Most of them were found to represent "unmet need" with potentials of being spacers or limiters.

Conclusion: Despite rapid increase in contraceptive prevalence rate (CPR) during the last two decades, the CPR is still far below the desired level in Bangladesh. Data from the 1996-1997 BDHS show that 16% of the currently married women represent "unmet need" for family planning services. The contraceptive use-behaviour of lactating mothers is an important aspect in this regard. This has considerable implication for "unmet need" for family planning and unwanted pregnancies. The present lack of attention to postpartum family planning service provision is a serious loophole in the national family planning programme. The findings, therefore, suggest for adoption of a comprehensive programme for the lactating mothers. This would contribute to reduced fertility through enhanced contraception of lactating mothers, and also contribute to better maternal and child health through reduction of unwanted pregnancies.

**Assessment of Post-flood Health Status of
Pregnant Women in a Rural Community of Bangladesh**

Sameena Chowdhury, Aminur Rahman, Ferdousi Islam,
M. Quamrul Hassan, A.K.M. Fazlur Rahman and Rowshan A. Begum

Objective: Determine the post-flood health problems of pregnant women in a rural community of Bangladesh.

Methodology: A cross-sectional study was carried out to determine the post-flood health problems of pregnant women. Two hundred and ninety-three pregnant women were randomly selected from two unions of Bandar thana of Narayanganj badly affected by the 1998 flood. Data were collected through questionnaire between 5 October and 12 November 1998.

Results: The mean duration of inundation was 52 ± 22.2 days. About 35% of the respondents took refuge in the flood-shelters or their relatives' house. During the flood, 70% of them used tubewell as their source of drinking water. Only 12.8% used sanitary toilets during the flood. Among the respondents, 50% suffered from various types of ailments. The common health problems were: fever 120 (41%), cough and cold 124 (42.3%), diarrhoea 45 (15.4 %), and skin diseases 151 (51.5%).

Conclusion: The major post-flood health problems encountered by the pregnant women were: fever, cough and cold, diarrhoea, and skin diseases in the study area. Breaking down of sanitary facility in the study area was also identified as one of the major causes of environmental pollution.

Youths and HIV/AIDS in Bangladesh

Shakeel A.I. Mahmood

Objective: Explore the susceptibility of the youths of Bangladesh to HIV/AIDS and recommend measures to be adopted for prevention of HIV infection in our younger generation.

Methodology: The study was done through the latest literature survey on global and regional prevalence of HIV/AIDS, analysis of the existing situation in Bangladesh, and discussion with the national experts.

Results: An epidemic of HIV/AIDS has already started in Bangladesh. Fortunately, the country continues to be a low-prevalence area. However, almost all the determinants for an explosive outbreak of an HIV/AIDS epidemic have been found to exist in the country. Here we have a very high prevalence of STDs/RTIs, indicating country's increased susceptibility to HIV/AIDS. This paper explores some factors that make the children of this country extremely vulnerable. Factors, such as ignorance, illiteracy, superstition, poverty, joblessness, malnutrition, etc. have been shown to be responsible for this vulnerability. In addition, the large number of street children in our country pose a definite threat. The incidence of injecting drug use among the youths of Bangladesh has also been a factor to increase the risk of HIV/AIDS at an alarming rate.

Conclusion: The paper strongly warns against the danger of 'denial' and complacency. It recommends actions almost on a war footing. Importance of appropriate education at all levels, including household, school and out-of-school education and counselling, is emphasized. Education on safe sex has to be given in conformity with our sociocultural background.

Distribution of Government Health Services in Different Geographical Locations in Bangladesh

Muhammod Abdus Sabur¹ and Shamsun Nahar²

Objective: Explore the distribution of government health services in different geographical locations in Bangladesh.

Methodology: For comparing within the cities, Dhaka, Chittagong, Rajshahi, and Khulna were selected. Among districts, two from each of the four old divisions--one being divisional headquarter and the other being situated far from the headquarter--were chosen, Thus Dhaka, Sherpur, Chittagong, Sylhet, Rajshahi, Panchagarh, Khulna, and Bhola were selected. Only services under the Directorate General of Health Services were considered. Availability of hospital bed, physician, nurse, paramedic, per-capita health and per-capita medical-surgical expenditure were analyzed. Only revenue budget for three consecutive financial years were considered. Ranking was made among the cities and the districts considering the above mentioned indicators. Secondary data were used.

Results: Nationally, one hospital bed is available for 3,189 people. Among cities, the corresponding figures were: 429 in Rajshahi, 1,049 in Dhaka, 1,550 in Khulna, and 1,885 in Chittagong. Among districts, the figures were found to be: 1,702 in Dhaka, 1,960 in Rajshahi, 2,390 in Sylhet, 2,854 in Khulna, 4,152 in Chittagong, 4,542 in Panchagarh, 7,143 in Sherpur, and 7,504 in Bhola. Nationally, one government physician is available for 13,715 people. Among cities, one doctor was available for 2,585 people in Rajshahi, 4,530 in Dhaka, 8,038 in Khulna, and 10,603 in Chittagong. Among districts, the same figures were found to be: 7,174 in Dhaka, 8,974 in Rajshahi, 10,423 in Sylhet, 12,550 in Khulna, 12,957 in Panchagarh, 16,820 in Chittagong, 22,409 in Bhola, and 23,016 in Sherpur. Per-capita revenue health expenditure in 1992-1993 was Tk 42.16 nationally. Average per-capita revenue health expenditure among cities was found to be: Tk 264 in Rajshahi, Tk 154 in Dhaka, Tk 70 in Chittagong, and Tk 65 in Khulna: and among districts, the figures were: Tk 96 in Dhaka, Tk 66 in Rajshahi, Tk 56 in Sylhet, Tk 44 in Khulna, Tk 35 in Chittagong, Tk 28 in Panchagarh, and Tk 27 in both Sherpur and Bhola. Among the four metropolitan cities, the availability of government health services was found to be the highest in Rajshahi followed by Dhaka, and the other two cities Chittagong and Khulna being equal and next to Dhaka. Among districts, Dhaka topped the list, while Rajshahi was second, Sylhet third, Khulna fourth, Panchagarh fifth, Chittagong sixth, Bhola seventh, and Sherpur was eighth and last in the list.

Conclusion: Disparity was found to exist in the distribution of government health services among the studied geographical locations, both among cities and districts. Tertiary and specialized hospitals situated in the 4 metropolitan cities serve as referral centres for the entire country. This demands urgent attention and appropriate action for ensuring equity in healthcare.

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Knowledge and Practice of the Mostly Used 'Doctors' in Bangladesh

*Muhammod Abdus Sabur, A.S.M. Mainul Hassan
and Khodadad Hossain Sarker*

Objective: Explore the level of knowledge and practice of the mostly used "doctors" in Bangladesh.

Methodology: Non-qualified allopathic practitioners, popularly known as quacks/village doctors, practising in rural charlands and in metropolitan slums were interviewed in-depth through a semi-structured questionnaire and were observed by using checklist. Nine from rural and six from urban areas were included in the study.

Results: Except a few, all were found to know and practise incorrect treatment for hepatitis, which included use of intravenous fluid, antibiotics, and vitamin. Indications for intravenous fluids were found to be perceived as weakness and diarrhoea. About the drugs not to be used in diarrhoea, in pregnancy and for children, they were found to either know nothing or know incorrect treatment pattern except a few who knew not to use tetracycline for children. They had fair and correct knowledge about taking of history for cases of diarrhoea and acute respiratory infections and so also for physical examination for diarrhoea but not for pneumonia for which majority did not know anything. Their choices of treatment for these two conditions were found to be incorrect. Lack of privacy for the clients and general uncleanliness were common features in their drug shops. In most cases, similarity was observed among those who practised in the rural area and in the urban area.

Conclusion: Both in rural and urban areas, particularly in hard-to-reach communities, non-qualified allopathic practitioners are the mostly used source of basic curative care. Though affordable, accessible, and credible to the community, their inadequate knowledge leading to incorrect treatment and harmful practice is of concern. Programme aiming at improving their capacity may contribute to improving the situation.

Profile of the Most Commonly Used Healthcare Providers of Private Sector in Bangladesh

*Muhammad Abdus Sabur, Khodadat Hossain Sarker
and A.S.M. Mainul Hassan*

Objective: Explore the profile of the most commonly used healthcare providers of private sector in Bangladesh

Methodology: Non-qualified allopathic practitioners, popularly known as quacks/village doctors, practising in rural charlands and in metropolitan slums were interviewed in-depth through a semi-structured questionnaire. Nine from rural and six from urban areas were included in the study.

Results: All healthcare providers were male. Those practising in the urban areas were found to be younger to those in the rural areas. Mean length of period in this profession in urban practitioners was 5.2 years, whereas in rural practitioners the period was 6.9 years. Basic educational qualifications were found to be higher in urban than in the rural practitioners. Most were found to enter into the profession without any formal training or apprenticeship. Their clients were more or less equally divided into treatment-seekers, drug-buyers on others' prescriptions and drug-buyers on self-medication. Besides providing consultation and selling drugs, they were also engaged in pushing injections and dressing. Average monthly income of a rural practitioner was Tk 2,500 and urban practitioner Tk 5,000. Service on credit was found to be a common practice. In rural areas, all were found to be owners of the drug shops, but in the urban areas, some were found to be the employees of the shops.

Conclusion: Knowledge about the profile of the quacks will help design programmes aiming at improving their capacity which may contribute to improving the healthcare situation both in the rural and urban areas.

Factors Influencing Hospitalization of Rural Children with ARI

G.M. Monawar Hosain¹, M.A. Samad Talukder², Md. Tariqul Islam¹ and Qasem Chowdhury¹

Objective: Identify the socioeconomic and demographic factors influencing admission of children aged less than 5 years with acute respiratory tract infections in a rural hospital of Bangladesh.

Methodology: All patients aged less than 5 years with ALRI admitted in Gonoshasthaya Kendra (GK) Hospital from 15 April 1998 to 15 November 1998 were selected for this study. A paediatrician confirmed the diagnosis, and data were collected from the case notes of the admitted patients.

Results: Of the total 106 patients with ALRI, 90.6% were aged less than one year, and more than two-thirds (70.8%) were male. About three-fourths (73.6%) of the patients belonged to GK Project area, and 60.4% of the patients were insured with GK's health insurance system. Patients who were admitted in this hospital came from a distance of as high as 27 km (mean 6.6 km and median 4 km). Patients from the richer group were eight times more likely to be admitted than the poorer ones. Mean delay for admission after the onset of symptoms was 4.0 days for the richer and 5.6 days for the poorer group. Before admission, almost equal percentage (65% and 66%) of patients from both groups did not seek any treatment, and after admission three patients died.

Conclusion: The insured people are more likely to get admitted in this hospital (overall insurance coverage is 28.9%). The poorer people in this rural area spent more days to seek treatment for ALRI after the onset of symptoms.

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Handwashing Practices in Urban and Rural Areas of Bangladesh

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Objective: Assess the efficiency of current handwashing practices and determine its constraints.

Methodology: The study was conducted in rural Matlab and in Dhaka slums. One hundred families from Matlab and Dhaka each were purposively selected for the intervention. The housewives in these families received education on improved handwashing practices over a two-month period. Communities similar in terms of socioeconomic characteristics (100 rural and 100 urban slum families) were purposively selected as comparison. Handwashing-related data were collected using observation, interview, and handwashing sampling techniques. This sample size was determined based on available logistics as the observation required special arrangement. Handwashing practice was promoted and observed in terms of four components: (i) rubbing and washing both hands, (ii) using soap, soil or ash as an agent, (iii) rinsing hands with adequate volume of safe water, and (iv) drying hands in air or on a clean piece of cloth/towel.

Results: The frequency of handwashing varied between 4 and 25 times/day. Various combinations of the components of handwashing were practised by women according to their perceived need for handwashing. Most women washed one hand before feeding/eating. Only water was used for handwashing before eating and feeding. About 40% used an agent (such as soil, ash or soap) for handwashing after defaecation. Knowledge about the components of handwashing practices improved after the educational intervention, but its practice remained similar. Both hands were highly contaminated. Inadequate water supply (slum), unaffordability of preferred washing agent (rural and slum), and failure to absorb knowledge relating to the components of effective handwashing practices (rural and slum) were the main barriers to improvement in their practices. The prescribed handwashing was stated as more acceptable after defaecation than before feeding/eating.

Conclusion: This study showed that hands were contaminated, and it is difficult to improve handwashing practice by educational intervention only. It will require improvement of the related provisions also.

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Plesiomonas shigelloides-associated Diarrhoea in Bangladeshi Children: Clinical Features and Epidemiological Trend

A.M. Khan and A.S.G. Faruque

Objective: Determine clinical and epidemiological features of diarrhoea caused by *Plesiomonas shigelloides* in Bangladeshi children.

Methodology: The study used hospital-based surveillance system of the International Centre for Diarrhoeal Disease Research, Bangladesh which prospectively collects microbiologic and clinical information from a 4% systematic sample of all diarrhoeal patients attending the facility. Clinical and epidemiological information is obtained by interviewing the guardians of the children by trained paramedical staff, and the attending physician performs a thorough physical examination. From 1993 to 1995, data on 38 children of less than 5 years with diarrhoea and stool culture positive for *P. shigelloides* only were collected, and 128 children of the same age group who had diarrhoea only due to *Vibrio cholerae* O1 infection during the same period were randomly selected for comparison of clinical and epidemiological features. Children with *V. cholerae* O1 infection were selected for comparison because both *P. shigelloides* and *V. cholerae* O1 belong to the same family (*Vibrionaceae*).

Results: Of the 38 children with *Plesiomonas shigelloides*, 76% were <2 years old compared to 50% of the 128 children with *V. cholerae* O1 ($p<0.001$). In Plesiomonad group, 85% presented with watery diarrhoea vs. 97% in cholera ($p=0.02$), 15% had dysentery vs. 0% in cholera ($p<0.001$), 82% had stool <16 times per day vs. 71% in cholera, and vomiting was noted in 71% vs. 88% in cholera ($p=0.01$). In Plesiomonad diarrhoea, 78% had no dehydration vs. 34% in cholera ($p<0.001$), 21% presented with some dehydration vs. 44% in cholera ($p=0.02$), and 1% had severe dehydration vs. 22% in cholera. Fever was present in 3% of the children with *Plesiomonas* infection. Simultaneously, in cholera it was noted in 10%. Abdominal pain was observed both in cholera (27%) and *Plesiomonas* diarrhoea (24%). In Plesiomonad group, 11% had diarrhoea for >14 days (in cholera 4%). Seasonality shows that isolation of *P. shigelloides* in children is common like cholera which is endemic in Bangladesh throughout the year.

Conclusion: This preliminary study indicates that *P. shigelloides* may be an aetiological agent in young children presenting with diarrhoea in Bangladesh, and the clinical picture is likely to be dominated by watery diarrhoea and vomiting. Dysentery, clinically significant dehydration, fever, and abdominal pain may be occasionally observed. Further studies are needed to substantiate these findings.

Effect of Seasonal Change on Human Autonomic Functions

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A.S.M. Shamsuzzaman⁴, Hiroki Ito^{1,3}, Gen Sobue³, and Tadaaki Mano¹

Objective: Evaluate the effect of seasonal change on the sympathetic nervous system and circulatory functions in humans.

Methodology: Microneurographic recording of multi-unit efferent activity of the muscle-sympathetic nerve (MSNA) to the blood vessels of the skeletal muscle, plasma catecholamines, tympanic temperature, cardiac output, mean blood pressure, and heart rate were evaluated in 9 healthy young volunteers during winter (December-January) and during summer (June-July). Data were recorded during supine rest for 15 minutes (control) and during orthostatic stress by head-up tilt (20, 40 and 60°).

Results: During winter, the resting MSNA and the reflex responses to head-up tilt at higher level significantly increased without a significant difference in tympanic temperature ($p < 0.05$). Plasma catecholamines and heart rate also significantly increased with a tendency of mean blood pressure to increase.

Conclusion: Season is an important determinant of disease, particularly in tropical countries like Bangladesh. The combination of the increased MSNA and plasma catecholamines during winter have increased heat production and may have caused the redistribution of the circulatory blood volume from the surface to the core of the body, facilitating conservation of heat. The increased MSNA and catecholamines during winter may play an important role in thermoregulation and in blood pressure rise. Therefore, the higher cardiovascular and cerebrovascular mortality during winter may be caused by the increased vasoconstrictor activity.

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Skin Involvement Pattern of Arsenicosis Patients

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and Shibtosh Roy*

Objective: Determine the prevalence and type of melanosis and keratoses among the arsenicosis patients in view of the recent arsenic contamination in drinking water.

Methodology: Dhaka Community Hospital has identified 2400 arsenicosis patients during a countrywide survey for arsenic contamination of ground water. In total, 2400 patients were identified of whom 1149 were randomly selected for this study. Arsenicosis patients were examined by a dermatologist in the field.

Results: The mean age was 29.86 ± 14.28 years, and male had a higher frequency ($\chi^2 = 42.5$ df 1) among all the subjects. The crude morbidity for melanosis and keratoses were 99% and 66% respectively. The overall crude morbidity (both melanosis and keratoses) was 63.24% and found to be common in the 10-39 years age group for male and 10-49 years age group for female. There is a sharp fall in the prevalence of skin lesions after these age groups and could be due to increased mortality rate resulting from advanced stages of the disease.

Conclusion: Melanosis and keratoses are the most prominent characteristic skin lesions of arsenic ingestion. These skin lesions may also be used as an indicator of high exposure to arsenic. The keratotic lesions may eventually progress into squamous cell carcinoma. The results of this small survey show that an alarming situation is impending in Bangladesh, and warrants immediate attention.

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Chronic Arsenicism and Squamous Cell Carcinoma: A Case Study

Mahfuzar Rahman, Martin Tondel and Olav Axelson

Objective: Study a case of chronic arsenicism and squamous cell carcinoma.

Methodology: A 45-year old man with typical arsenic skin lesions and squamous cell carcinoma was studied. He has been using the same water-well for more than 30 years and remembered having skin lesions for at least ten years. Five of the six children and his wife had also skin alterations.

Results: The water arsenic level was 2280 $\mu\text{g/L}$ and was measured by flow-injection hydride generation atomic absorption spectrometry (FI-HG-AAS). In February 1998, an ulcerative skin lesion on his right hand was removed that he had had for over a year before the treatment. The histopathological examination revealed infiltrating squamous cell **carcinoma, grade II**.

Conclusion: Hutchinson first described a case of arsenic-induced skin cancer due to Fowler's solution (an arsenical medication), and it can also be observed nowadays due to environmental exposure. A potentially devastating health crisis is unfolding in Bangladesh where arsenic has leached from naturally occurring minerals into drilled wells. Today, chronic arsenic poisoning can still be observed not only in Bangladesh, but also in some other parts of the world. Bangladesh seems to have one of the biggest calamities of mass arsenic poisoning as some 30-70 million people may have been consuming arsenic-polluted water of above 50 $\mu\text{g/L}$ (the current WHO standard for drinking water applied in many countries of the world) for a long period. Arsenical skin lesions were diagnosed as the presence of one or more of these criteria: hyperpigmentation of unexposed body surfaces and/or keratosis, especially on palms and soles. Hyperpigmentation may occur anywhere on the body, often showing raindrop-like pigmentation or diffuse dappling of dark brown, especially marked in non-exposed parts of the body. Hypopigmentation follows the same distribution and may be present even in the absence of hyperpigmentation. Keratosis is small, corn-like elevations, usually 0.4-1 cm in diameter and nodular, found on the lateral borders of palms, fingers, and on the soles, heels, and toes. Diffuse keratosis on the palms and soles could also be present. All these warrant appropriate interventions to address arsenic poisoning in Bangladeshi population.

Efficacy of Tetracycline in the Treatment of Cholera Caused by *Vibrio cholerae* O1 Resistant to the Drug *in vitro*

A.M. Khan, Uvon Gierke, M. Begum and George Fuchs

Objective: Explore the efficacy of tetracycline in the treatment of cholera caused by *Vibrio cholerae* O1 resistant to the drug *in vitro*.

Methodology: In a pilot study, 157 adult patients having cholera caused by *V. cholerae* O1 were investigated. The study was done on patients attending the Dhaka hospital of ICDDR,B. The patients were divided into two groups. One hundred and thirty patients whose stool culture isolates were sensitive to tetracycline were considered 'the sensitive group' and 27 patients whose stool culture isolates were resistant to the drug constituted the 'resistant group'. Each patient was treated with tetracycline (500 mg 6 hourly) given orally for 3 days in addition to rehydration fluid.

Results: Though the means of total watery stool volume (175 ± 116 vs. 119 ± 107 mL/kg, $p=0.1$), duration of diarrhoea (36 ± 22 vs. 28 ± 16 h, $p=0.1$), ORS (187 ± 152 vs. 158 ± 104 mL/kg, $p=0.5$) and intravenous fluid requirements (57 ± 96 vs. 35 ± 58 mL/kg, $p=0.3$) were higher in the resistant group compared to the sensitive group, the differences were not statistically significant. These minor differences could be of epidemiological importance in the control of the disease.

Conclusion: The results of the study indicate that conventional dose of tetracycline may be clinically efficacious in the treatment of cholera caused by *V. cholerae* O1 resistant to the drug *in vitro*. So, further studies with increased dose of tetracycline and large sample size are needed to evaluate the exact range of efficacy of tetracycline.

Arsenic-induced Keratosis and Squamous Cell Carcinoma

Mahfuzar Rahman¹, *Peter Söderkvist*², *Barbro Lundh-Rozell*³
and *Olav Axelson*¹

Objective: Determine how well the macroscopic and microscopic observations relate to arsenic-induced skin lesions (melanosis and keratosis) as these are the most prominent characteristic hallmarks of arsenic ingestion.

Methodology: Skin biopsies from nine individuals with keratosis due to arsenic were collected by punch method with local anaesthesia. All tissue specimens were divided into two parts--one part was fixed in ethanol, and another in formalin--for further DNA isolation and paraffin-embedding. The histopathological diagnoses were confirmed by an experienced dermatopathologist in Stockholm. Arsenic measurements from well-water used by nine subjects were analyzed by flow-injection hydride generation atomic absorption spectrometry (FI-HG-AAS).

Results: Three of the nine skin samples had infiltrative growth with irregular apoptotic cells and squamous cell carcinoma. Two of the remaining six samples were of hyperkeratosis, one atypical hyperkeratosis, one orthohyperkeratosis, and two parakeratosis with apoptotic cells.

Conclusion: This very small-scale study suggests that macroscopic investigations are not good enough for diagnosing skin cancer. This study indicates that if wide-scale examinations were conducted in keratotic individuals, more cutaneous carcinomas would likely be found.

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Immunological Effect of Vitamin A and Zinc in a Placebo-controlled Four-cell Trial

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Objective: Evaluate the immunological effects of zinc and vitamin A.

Methodology: In a double-blind study in 1-3 years old children without acute illness and wt-for-age between 61-75% of NCHS standard, 147 children were randomly allocated to 4 groups: (1) Vitamin A 3,000 IU daily, (2) 40 mg elemental zinc daily, (3) Vitamin A and zinc, and (4) Placebo. Each child received intervention for 7 days. Serum zinc vitamin A, RBP and TTR assays were done. Vitamin A status was also determined by RDR test. Estimations of IL-2 and IL-10 were done on supernatants collected from whole blood stimulated with PHA. Proliferation of Peripheral Blood Mononuclear Cells (PBMCs) in response to PHA, Con-A, PWM, and PPD was measured. Granulocyte polarization in response to chemo-attractant was also measured. Measles IgG titre was assayed before and after the intervention. CMI had also been done. All tests were done at baseline and were repeated after 8 weeks.

Results: Significant increase in granulocyte polarization at the level of 10^6 and 10^8 ($p=0.05$) was observed only after zinc supplementation ($p=0.05$). Measles antibody titre increased significantly after two weeks with zinc supplementation ($p=0.01$). Significant height gain was observed in the vitamin A group compared to the zinc or zinc+ vitamin A group ($p=.01$) and significant weight gain was observed in all children except placebo group ($p<0.000$). The incidence of diarrhoeal episodes was significantly lower ($p=0.01$) in the zinc-supplemented children and positive RDR was observed in significantly higher proportion of children in the vitamin A group as well as zinc plus vitamin A group.

Conclusion: Zinc supplementation increased antibody titre of measles IgG and proportion of granulocyte polarization. No other benefits were seen in any other groups.

Risk Factors for Mortality in Severely Malnourished Children with Diarrhoea in Bangladesh

Maaïke Buis¹, Renee Weersma¹, S.M. Akramuzzaman² and S.K. Roy²

Objective: Identify risk factors for mortality in severely malnourished children with diarrhoea in Bangladesh.

Methodology: Records of 103 children who died and 103 children who survived were examined in a case-control study. Children of less than 3 years of age with wt-for-age less than 60% or wt-for-height less than 70% of the median (NCHS) standard were selected. Sex distribution was equal in the two groups. Variables considered as possible risk factors for death: socioeconomic status, disease history, associated complications, signs and symptoms of infections, and laboratory values were compared between the two groups.

Results: In univariate analysis, 16 factors: age, dehydration, hyponatraemia, acidosis, hypoglycaemia, leukocytosis, bands, pathogen found in blood, presence of pneumonia, clinically diagnosed septicaemia, presence of more than two complications, low to imperceptible pulse volume, hypothermia, kwashiorkor, duration of hospitalization, and clinically diagnosed severe anaemia were found to be significantly associated with death. Patients presenting with hypo or hypernatraemia, hyperkalaemia, acidosis, pneumonia, marasmic-kwashiorkor and enteric pathogens found in stool culture, and patients with leukocytosis had 2 to 2.5 times higher risk of mortality than the control. In the study group, patients who had pulse volume low to imperceptible and hypoglycaemia were found to have 4 times higher risk of dying. A very strong association was found between death and hypothermia and presence of clinically diagnosed septicaemia (odds ratio 4.8 and 11.7 respectively). Logistic regression reveals 4 factors: septicaemia, hypothermia, pneumonia and presence of kwashiorkor and marasmic-kwashiorkor to be significant after controlling for confounding factors.

Conclusion: The results of the study could be used as a prognostic guide by physicians treating such patients in diarrhoeal disease hospitals.

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