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Loretta Saldanha, CSD and A.R. Patwary, CSD

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A Brief History of ICDDRB,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

1981 New Dhaka hospital built Urban Volunteer Programme initiated

1982 Classical cholera returned Field-testing of cereal Oral Rehydration Solution began MCH-FP Extension Project began

1983 First issue of the Journal of Diarrhoeal Diseases Research published

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

1990 The new Matlab Health and Research Centre opened

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 New Sasakawa International Training Centre built

1993 New laboratories built and equipped 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

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

Introduction

Seventh Annual Scientific Conference

The Seventh Annual Scientific Conference (ASCON) has adopted two themes: (i) Nutrition, and (ii) Emerging and Re-emerging Infectious Diseases. Both themes were chosen because of their immediate relevance to child health and maternal health.

Nutrition research has been a priority of ICDDR,B since its inception. Addressing nutrition issues is central to the mission of ICDDR,B and is a primary concern in Bangladesh with a wide prevalence of nutritional deficiencies. Deficiencies of macronutrients and of micronutrients have an enormous impact on health and productivity due to primary effects and their effects as critical co-factors in gastrointestinal and other infections, low birth-weight, and psychomotor and cognitive development, among others. Questions relating to malnutrition, the nutritional status of children and the impact of nutritional status on maternal health have motivated research at ICDDR,B in areas such as management of diarrhoeal diseases, micronutrient deficiencies, nutrient metabolism, and body composition. Nutrition research conducted at the Centre has evolved over the years to expand from divisional research protocols to the creation of the Nutrition Working Group, which includes participation from the four scientific divisions of ICDDR,B: Clinical Sciences Division, Laboratory Sciences Division, Public Health Sciences Division, and Health and Population Extension Division. Most recently, nutrition research has broadened in scope through our participation in the Bangladesh Integrated Nutrition Project, a collaborative effort with the Government of Bangladesh.

Research activity in emerging and re-emerging infectious diseases has global relevance as we enter an era where we are witnessing the worldwide re-emergence of diseases thought to be under control, such as tuberculosis and malaria. As we continue to struggle to control cholera, we identify newly emerging infectious diseases such as AIDS. The widespread and often inappropriate use of antibiotics has led to the emergence of drug-resistant strains of infectious diseases. Consequently, once manageable diseases, such as bacterial dysentery, malaria, tuberculosis, and STDs, such as gonococcus are becoming more difficult to treat and in some cases deadly because of their resistance to traditional therapies.

Research at ICDDR,B on diarrhoeal diseases through laboratory sciences, clinical studies and community-based trials is recognized globally. More recently, our research in infectious diseases has expanded in the important areas of reproductive health and acute respiratory infections. Our expanded capacity to conduct research on these critical health issues faced by Bangladesh and global populations in general, is due to the recent establishment of our STI/RTI laboratories, and the upgrading of our laboratories and diagnostic facilities designed to conduct necessary research on antimicrobial-resistant pathogens. The strength of our hospital surveillance system, overall epidemiological expertise, and the important inclusion of social and behavioural science component in conducting field research enables us to identify disease patterns and prevalence among populations and create strategies designed to educate people and to implement preventive strategies designed to achieve sustainable results.

We are pleased to welcome colleagues from the Government of Bangladesh, the research community, including NGOs to the 7th ASCON. We continue the practice of opening ASCON to outside presenters. This underscores the recognition of important work done throughout the research community in Bangladesh on both nutrition and emerging and re-emerging infectious diseases. It also provides an opportunity and a forum for interaction with our colleagues and collaborators and to learn more about the research conducted in these two important fields. We believe much of the results and outcomes presented here will be shown to have implications for health policy and programmes in Bangladesh as well as for the global community.

We would here like to express our sincere gratitude to UNICEF, WHO, Helen Keller International, and USAID/Washington for their assistance in co-sponsoring this event.

We welcome and invite you to fully participate in the Conference proceedings. A key aim of the Conference is to serve as an occasion to further explore some of the findings presented and to create an impetus for future research on nutrition and emerging and re-emerging infectious diseases. Once again, welcome.

George Fuchs, MD
Chairperson, Organizing Committee
7th Annual Scientific Conference (ASCON)

Programme Summary

Day 1: Saturday, 14 February 1998

08:30 - 09:00 a.m. Registration

Session I: Inauguration

09:01 - 09:15 a.m. **Address of Welcome**
Prof. Robert M. Suskind
Director, ICDDR,B

09:16 - 09:25 a.m. **Address by Chief Guest**
Mr. A.S.H.K. Sadique
Hon'ble Minister for Education
Government of the People's Republic of Bangladesh

09:26 - 09:35 a.m. **Vote of Thanks**
Dr. George Fuchs
Chairperson, Organizing Committee

09:36 - 10:05 a.m. Tea Break

10:06 - 11:00 a.m. **Keynote Speech: Nutrition**
Speaker: Dr. David Alnwick, UNICEF, New York, USA

Concurrent Sessions

11:01 - 12:30 p.m. Session IIa: Public Health Nutrition-I (Sasakawa Auditorium)

11:01 - 12:30 p.m. Session IIb: Micronutrients (Lecture Room 1)

12:31 - 01:00 p.m. **Lunch**

01:01 - 02:00 p.m. Poster Session-1

02:01 - 03:30 p.m. Session IIIa: Infant Nutrition (Sasakawa Auditorium)

02:01 - 03:30 p.m. Session IIIb: Public Health Nutrition-II (Lecture Room 1)

03:31 - 03:45 p.m. Tea Break

03:46 - 05:00 p.m. Session IVa: Clinical Nutrition (Sasakawa Auditorium)

03:46 - 05:00 p.m. Session IVb: Nutrition Policy (Lecture Room 1)

Day 2: Sunday, 15 February 1998

09:00 - 09:45 a.m. **Session V: Keynote speech**
Emerging and Re-emerging Infectious Diseases
Speaker: Dr. Maria Neira, WHO, Geneva, Switzerland

09:46 - 10:15 a.m. Tea Break

10:16 - 11:15 a.m. Poster Session-2

Concurrent Sessions

11:16 - 01:00 p.m. Session VIa: Emerging and Re-emerging Infectious Diseases (Sasakawa Auditorium)

11:16 - 01:00 p.m. Session VIb: Miscellaneous Health-related Topics-I (Lecture Room 1)

01:01 - 01:30 p.m. Lunch

01:31 - 03:30 p.m. Session VIIa: Women and Adolescent Nutrition (Lecture Room 1)

01:31 - 03:30 p.m. Session VIIb: Miscellaneous Health-related Topics-II (Sasakawa Auditorium)

03:31 - 04:00 p.m. Tea Break

Concluding Session

04:01-04:10 p.m. **Address by Chairperson**
Mr. Salah Uddin Yusuf
Hon'ble Minister for Health and Family Welfare
Government of the People's Republic of Bangladesh

04:11-04:25 p.m. **Summary on Nutrition**
Dr. George Fuchs
Director, Clinical Sciences Division, ICDDR,B

04:26-04:40 p.m. **Summary on Emerging and Re-emerging Infectious Diseases**
Dr. V.I. Mathan
Director, Laboratory Sciences Division, ICDDR,B

04:41-04:50 p.m. **Concluding Remarks**
Mr. Muhammed Ali
Secretary, Ministry of Health and Family Welfare
Government of the People's Republic of Bangladesh

04:51-05:00 p.m. **Vote of Thanks**
Prof. Robert M. Suskind, Director, ICDDR,B

Programme Details

Day I: Saturday, 14 February 1998

08:30-09:00 a.m.	Registration
Session I:	**Inauguration**
09:01-09:15 a.m.	**Address of Welcome** Prof. Robert M. Suskind, Director, ICDDR,B
09:16-09:25 a.m.	**Address by Chief Guest** Mr. A.S.H.K. Sadique Hon'ble Minister for Education Government of the People's Republic of Bangladesh
09:26-09:35 a.m.	**Vote of Thanks** Dr. George Fuchs Chairperson, Organizing Committee
09:36-10:05 a.m.	Tea Break
10:06-11:00 a.m.	**Keynote Speech: Nutrition**
Session IIa:	**Public Health Nutrition-I (Sasakawa Auditorium)**
Chairperson:	Mr. M.A. Mannan, Secretary, Bangladesh National Nutrition Council (BNNC)
Co-chairperson:	Dr. Rukhsana Haider, ICDDR,B
11:01-11:10 a.m.	Birth weight and its association with maternalnutrition and socioeconomic variables in rural Bangladesh *D.S. Alam, M. Yunus, K.M.A. Aziz, A. de Francisco, E. Haque, J.M.A. Raaij, and G.J. Fuchs*
11:11-11:20 a.m.	Determinants of infant growth in the slums of Dhaka city: size and maturity at birth and breast-feeding *S.E. Arifeen, R.E. Black, G. Antelman, Q. Nahar, S. Alamgir, H. Mahmud, and A.H. Baqui*
11:21-11:30 a.m.	Mineral status in relation to rickets in Chakaria, Bangladesh *R.M. Welch, C.A. Meisner, N. Hassan, J.M. Duxbury, M. Rutzke, P.R. Fischer, A. Rahman, J.P. Cimma, T.O. Kyaw-Myint, A.L. Kabir, K. Talukder, D.B. Staab, S. Haque, and G.F. Combs, Jr.*
11:31-11:40 a.m.	Consequences of low birth weight on infant growth, development, and morbidity *Rukhsana Gazi, Fazlul Karim, and A.M.R. Chowdhury*
11:41-11:50 a.m.	Effect of BRAC's Rural Development Programme on Calorie Consumption *Masuma Khatun, Abbas Bhuiya, A.M.R. Chowdhury, and S.M. Ziauddin Hyder*

11:51-12:00 noon	Effect of birth weight, intrauterine growth retardation and prematurity on infant survival: a prospective study in the slums of Dhaka city *S.E. Arifeen, R.E. Black, G. Antelman, Q. Nahar, H. Mahmud, S. Alamgir, and A.H. Baqui*
12:01-12:30 p.m.	Discussion and remarks
12:31-01:00 p.m.	Lunch Break
01:01-02:00 p.m.	**Poster Session-I**
Session IIb:	**Micronutrients (Lecture Room 1)**
Chairperson:	Dr. Anwar Iqbal, Director, Nutrition, Bangladesh Agricultural Research Council (BARC)
Co-chairperson:	Dr. Iqbal Kabir, ICDDR,B
11:01-11:10 a.m.	Effects of vitamin A and ß-carotene supplementation to lactating mothers and their infants in Bangladesh *A.L. Rice, R.J. Stoltzfus, A. de Francisco, J. Chakraborty, C.L. Kjolhede, and M.A. Wahed*
11:11-11:20 a.m.	Subclinical vitamin A deficiency in pre-school children living in urban slums of Dhaka city *M.A. Wahed, Rashidul Haque, A.S.M. Hamidur Rahman, Sadiqur R. Talukder, M.J. Albert, and J.O. Alvarez*
11:21-11:30 a.m.	Effect of iron and other micronutrients on haematological indices and nutritional status of urban slum children *Kazi Selim Anwar, M.A. Karim, Mahfuzur Rahman, R. Hoque, U. Habiba, A. Hossain, and A.K. Azad*
11:31-11:40 a.m.	Determination of zinc status in children suffering from acute respiratory tract infection and ARI associated with severe protein-energy malnutrition *Md. Salim Shakur, M.A. Malek, Nasreen Bano, and S.A. Tarafder*
11:41-11:50 a.m.	Effectiveness of an iron supplementation programme for pregnant and postpartum women in rural Bangladesh *R.J. Stoltzfus,* J. Chakraborty, A.L. Rice, B. de la Biere, and A. de Francisco
11:51-12:00 noon	Use of nutritional surveillance project to monitor factors that determine vitamin A capsule distribution *A. Hye, M. Muita, R. Loganathan, S.R. Khan, S. Karmaker, S. Aziz-ur-Rahman, and Lynnda Kiess*

12:01-12:10 p.m.	Zinc supplementation during pregnancy in Bangladeshi women had no effect on birth weight *Saskia J.M. Osendarp, A.H. Baqui, M.A. Wahed, Hasan Mahmud, S.E. Arifeen, Joop M.A. van Raaij, and George J. Fuchs*
12:11-12:30 p.m.	Discussion and remarks
12:31-01:00 p.m.	Lunch Break
01:01-02:00 p.m.	Poster Session-I
Session IIIa:	**Infant Nutrition (Sasakawa Auditorium)**
Chairperson: (ICMH)	Prof. M. Q-K. Talukder, Director, Institute of Child and Mother Health
Co-chairperson:	Dr. Shameem Ahmed, ICDDR,B
02:01-02:10 p.m.	Breastmilk retinol levels in Bangladeshi mothers: reflection on the serum retinol level of infants *Nigar S. Shahid, M.A. Wahed, K.M.A. Aziz, M. Rahman, and M.C. Steinhoff*
02:11-02:20 p.m.	Initial breast-feeding practices of urban mothers can be influenced by peer counseling *Rukhsana Haider, Ann Ashworth, Iqbal Kabir, and Sharon R.A. Huttly*
02:21-02:30 p.m.	Exclusive breast-feeding reduces ARI and diarrhoea deaths among infants in Dhaka slums *S.E. Arifeen, R.E. Black* , G. Antelman, and A.H. Baqui
02:31-02:40 p.m.	BRAC's Rural Development Programme and child nutrition *Masuma Khatun, Abbas Bhuiya, A.M.R. Chowdhury, and S.M. Ziauddin Hyder*
02:41-02:50 p.m.	Effect of lathyrus protein concentrate on the growth of infants *Shaheen Ahmed, H.K.M. Yousuf, and H.N. Mondal*
02:51-03:00 p.m.	Growth of the newborns in their early life (two weeks) according to feeding pattern in rural area of Bangladesh *Zeba Mahmud and Sadia A. Chowdhury*
03:01-03:30 p.m.	Discussion and remarks
03:31-04:00 p.m.	Tea Break

Session IIIb:	**Public Health Nutrition-II (Lecture Room 1)**
Chairperson:	Dr. A.M.R. Chowdhury, Bangladesh Rural Advancement Committee (BRAC)
Co-chairperson:	Dr. Abbas Bhuiya, ICDDR,B
02:01-02-10 p.m.	Comparison of anthropometrical indicators between malnourished children admitted to a nutritional rehabilitation unit and their counterparts in a community *A. de Francisco, J. Chakraborty, and F. Ahmed*
02:11-02:20 p.m.	Birth weight in rural Bangladesh *Sadia A. Chowdhury* and Zeba Mahmud
02:21-02:30 p.m.	Community-based nutrition pilot initiative of BRAC *Sadia A. Chowdhury, Emily W. Counts, and Zeba Mahmud*
02:31-02:40 p.m.	Comparison of nutritional status among pre-school children living in rural, slum and urban Dhaka *Lynnda Kiess*
02:41-02:50 p.m.	Assessing the impact of a community-based nutrition project in rural Bangladesh through active participation of women *Yeakub Patwary, Mohammad Abu Hafiz, Rowshan Jahan, Shahin Ara Begum, and Mozammel Hossain*
02:51-03:00 p.m.	Aetiology of anaemia in Bangladesh *Mohammad Mushtuq Husain and S.M. Keramat Ali*
03:01-03:30 p.m.	Discussion and remarks
03:31-03:45 p.m.	Tea Break
Session IVa:	**Clinical Nutrition (Sasakawa Auditorium)**
Chairperson:	Dr. Manzoor Hossain, Director, Dhaka Shishu Hospital
Co-chairperson:	Dr. S.K. Roy, ICDDR,B
03:46-03:55 p.m.	Serum zinc and vitamin A status of malnourished children fed a high-protein diet during recovery *I. Kabir, M.M. Rahman, R. Haider, R.N. Mazumder, and D. Mahalanabis*
03:56-04:05 p.m.	Standardized management reduces mortality among severely malnourished children with diarrhoea *T. Ahmed, M. Ali, M. Ullah, I.A. Choudhury, B. Begum, M.E. Haque, I. Shameem, R.C. Das, B. Zaman, S. Wares, P.K. Mondal,*

	A.M. Khan, N.H. Alam, M.A. Salam, G.H. Rabbani, R. Suskind, and G.J. Fuchs
04:06-04:15 p.m.	Nutritional rickets without vitamin D deficiency in the Chakaria region of Bangladesh *P.R. Fischer, A. Rahman, J.P. Cimma, T.O. Kyaw-Mint, A.R.M.L. Kabir, K. Talukder, N. Hassan, B.J. Manaster, D.B. Staab, J.M. Duxbury, R.M. Welch, C.A. Meisner, S. Haque, and G.F. Combs, Jr.*
04:16-04:25 p.m.	Effect of zinc and vitamin A supplementation in undernourished children with persistent diarrhoea in Bangladesh *F. Khatun, S.K. Roy, M.A. Malek, M.A. Wahed, N.R. Sarkar, N.M. Saifuddin, Q,E. Islam, and G.J. Fuchs*
04:26-04:35 p.m.	Zinc and rehabilitation from severe protein-energy malnutrition: higher dosage regime associated with increased mortality *C.P. Doherty, M.A.K. Sarkar, Md. Salim Shakur, and W.A.M. Cutting*
04:36-04:45 p.m.	Patterns of infection in severe protein-energy malnutrition and their effect on recovery *M.F. Haque, M.S. Akbar, and M.A.K. Kashem*
04:46-05:00 p.m.	Discussion and remarks
Session IVb:	**Nutrition Policy (Lecture Room 1)**
Chairperson:	Mr. Mazrool-ul-Karim, Team Leader, MTST, Bangladesh Integrated Nutrition Project (BINP)
Co-chairperson:	Dr. A.H. Baqui, ICDDR,B
03:45-03:55 p.m.	Inconsistencies in the findings of the Bangladesh child nutrition surveys *Radheshyam Bairagi and Riti Ibrahim Ahsan*
03:56-04:05 p.m.	Bangladesh national plan of action for nutrition *M.Q-K. Talukder*
04:06-04:15 p.m.	National food and nutrition policy: a multisectoral approach in Bangladesh *M.A. Mannan*
04:16-04:25 p.m.	Nutrition initiative in Bangladesh: is it a blessing or human right? *A.F.M. Iqbal Kabir, M.A. Mannan, A.J.M. Omar Faruque, S.K. Roy, K. Mizanur Rahman, A.Z. Amanatullah, and M. Fazlur Rahman*

04:26-04:35 p.m.	Trends, measures and indicators of food and nutrition security in rural Bangladesh: findings from the Nutritional Surveillance Project *R. Loganathan, N. Huq, A. Hye, S.K. Baker, M.F.A. Kirwan, M.W. Bloem, J. Gorstein, and Lynnda Kiess*
04:36-04:45 p.m.	The Bangladesh Integrated Nutrition Project: the secrets of achievements *A.M.M Anisul Awwal, M.A. Hafiz, B. Manuara, B. Shahin Ara, and J. Rawshan*
04:46-05:00 p.m.	Discussion and remarks

Day 2: Sunday, 15 February 1998

09:00-09:45 a.m.	Session V (Sasakawa Auditorium)
Keynote Speech:	Emerging and Re-emerging Infectious Diseases
Speaker:	Dr. Maria Neira, WHO, Geneva, Switzerland
09:46-10:15 a.m.	Tea Break
10:16-11:15 a.m.	Poster Session-II
Session VIa:	**Emerging and Re-emerging Infectious Diseases (Sasakawa Auditorium)**
Chairperson:	Dr. Zakir Hossain, Director, Primary Health Care, Directorate of Health
Co-chairperson:	Dr. Md. Yunus, ICDDR,B *A. de Francisco,* T. Azim, Sarah Hawkes, N. Alam, and A.J. Hall
11:26-11:35 a.m.	Multiresistant *Salmonella* infections: an emerging health problem in Bangladesh *Mahbubur Rahman and M.J. Albert*
11:36-11:45 a.m.	Sero-epidemiological study of dengue and dengue haemorrhagic fevers in a metropolitan city of Bangladesh *Emran Bin Yunus, Dilrose Banu, M. Jamal Hussain Chowdhury, K.R. Talukder, Syed Meshbahul Haque, and Abdul Mannan Bangali*
11:46-11:55 a.m.	Community-based TB control programme in Bangladesh: a grassroots-level experience of BRAC *A.M.R. Chowdhury, Sadia A. Chowdhury, and Akramul Islam*
11:56-12:05 noon	Early termination of a randomized controlled trial for evaluating alternate therapeutic regimens for uncomplicated

	malaria in a thana health complex of Bangladesh *Md. Ridwanur Rahman, Dulal Chandra Paul, Md. Rashid, and Ajoy Ghosh*
12:06-12:15 p.m.	Molecular analysis of toxigenic *Vibrio cholerae* strains isolated in Bangladesh during 1961-1996: relationship between continual emergence of new toxigenic clones and epidemics of cholera *Shah M. Faruque* , Asadulghani , A.R.M. Abdul Alim , A.K. Siddique , John J. Mekalanos, and M.J. Albert
12:16-12:25 p.m.	Contrasting findings of acute respiratory infection between urban and rural children: recent observations from an ongoing study *K. Matsumura, K. Selim, M. Farooq, A. Talib, A. Alam, I. Arita, M. Rahman, and M. Takami*
12:26-12:35 p.m.	Immunoblot analysis as a diagnostic tool for detection of visceral leishmaniasis in Bangladesh *Nahid Tofail Iftekhar, Firdausi Qadri, Moshiur Rahman, Md. Ruhul Amin, and K. Masihur Rahman*
12:36-01:00 p.m.	Discussion and remarks
01:00-01:30 p.m.	Lunch Break
Session VIb:	**Miscellaneous Health-related Topics-I (Lecture Room I)**
Chairperson:	Prof. M.R. Khan, Project Director, Institute of Child Health
Co-chairperson	Dr. Mahbubur Rahman, ICDDR,B
11:16-11:25 a.m.	Reported morbid symptoms and conditions of pregnant, intrapartum and postpartum women: experience from three villages *Rubina Shaheen, Md. Yunus, A. de Francisco, Myrna Tonkinson, and J. Patrick Vaughan*
11:26-11:35 a.m.	Efficacy and safety of ciprofloxacin suspension in the treatment of childhood shigellosis *M.A. Salam, U. Dhar, Wasif A. Khan, and M.L. Bennish*
11:36-11:45 a.m.	Health conditions of pregnant women and perinatal mortality in a slum of Dhaka city, Bangladesh *Abdullah Al Mamun* and Therese Juncker
11:46-11:55 a.m.	Determinants of safe delivery practices in rural Bangladesh

	Md. Mafizur Rahman, Barkat-e-Khuda, Thomas T. Kane, Masud Reza, and A.B.M. Khorshed A. Mozumder
11:56-12:05 noon	Teenage marriage and its consequences: experience from rural Bangladesh *Nikhil Ch. Roy, A.B.M Khorshed A. Mozumder, Shameem Ahmed, and Barkat-e-Khuda*
12:06-12:15 p.m.	Target-specific home-based motivation: test case with family planning *Subrata Routh, Shamim Ara Jahan, and Aye Aye Thwin*
12:16-12:25 p.m.	Determinants of infant and child mortality in rural Bangladesh *A.B.M. Khorshed Alam Mozumder, Barkat-e-Khuda, Thomas T. Kane, and Kenneth Hill*
12:26-12:35 p.m.	An assessment of injecting drug users in Dhaka city: need of intervention for a vulnerable group *Swarup Sarkar, Nazrul Islam, Ziya Uddin, Sushena Reza, Fazlul Karim, Golam Rabbani, and Maurice Bloem*
12:36-01:00 p.m.	Discussion and remarks
01:01-01:30 p.m.	Lunch Break
Session VIIa:	**Women and Adolescent Nutrition (Lecture Room 1)**
Chairperson:	Prof. S.M. Keramat Ali, Institute of Nutrition and Food Science (INFS), Dhaka University
Co-chairperson:	Mr. M.A. Wahed, ICDDR,B
01:30-01:40 p.m.	Association between anaemia and socioeconomic status among non-pregnant women in rural Bangladesh *S.M. Ziauddin Hyder, Eva-Charlotte Ekström, A.M.R. Chowdhury, and Lars-Åke Persson*
01:41-01:50 p.m.	Age at menarche and nutritional status of adolescent girls in a rural area of Bangladesh *Sameena Chowdhury, Rowshan A. Begum, A.K.M Shahabuddin, Andrew Seal, and Quamrul Hassan*
01:51-02:00 p.m.	Adolescent nutrition in a rural community in Bangladesh *Khurshid Talukder, M.Q-K. Talukder, A.K.M. Shahabuddin, M.Q. Hassan, Andy Seal, M. Abdul Hannan, Andrew Tomkins, and Anthony Costello*

02:01-02:10 p.m.	Knowledge, attitude and practice of pregnant women on feeding patterns in Bangladesh *Zeba Mahmud, Emily W. Counts, and Sadia A. Chowdhury*
02:11-02:20 p.m.	Determinants of haemoglobin level during pregnancy and relationship with pregnancy outcome in Bangladeshi urban poor *Saskia Osendarp, M.A. Wahed, A.H. Baqui, S. E. Arifeen, Hasan Mahmud, Joop van Raaij, and G.J. Fuchs*
02:21-02-30 p.m.	Contraceptive use and maternal weight among the poor in rural Bangladesh *Mizanur Rahman, A.H.M. Mahbub-ul Latif, and Julie DaVanzo*
02:31-02:40 p.m.	Impact of lactational performance on calcium metabolism through bone mass density in marginally nourished Bangladeshi women *Sameena Chowdhury, T.A. Chowdhury, S.K. Roy, A. Nessa, and S. Ali*
02:41-03:30 p.m.	Discussion and remarks
03:31-04:00 p.m.	Tea Break
Session VIIb:	**Miscellaneous Health-related Topics-II (Sasakawa Auditorium)**
Chairperson:	Maj. Gen. (Retd) M.R. Choudhury, National AIDS Committee-Bangladesh
Co-chairperson:	Prof. Barket-e-Khuda, ICDDR,B
01:31-01-40 p.m.	Waning of maternal measles antibody in the offsprings *Prakash S. Shrestha, Shameem Ahmed, Nurul Islam, Mohammed Jalaluddin, Abbas Bhuiyan, and A.M.S. Matiur Rahman*
01:41-01-50 p.m.	Aetiology and pathogenesis of chronic diarrhoeal illness in adults *A.K. Azad, M. Islam, R. Islam, M.A. Salam, S.S. Hoque, A.N. Alam, and T. Butler*
01:51-02:00 p.m.	Typhoid ileal perforation: experience with 64 cases *Anisur Rahman*
02:01-02:10 p.m.	Need for HIV/AIDS prevention programme for Bangladeshi migrant *Joachim Victor Gomes, S.M. Morshed, Elora Barua, Kalipada Sarkar, Md. Abul Bashar, Hasan Imam Shaon, and Maurice Bloem*

02:11-02:20 p.m.	Neurologic manifestations of childhood shigellosis *Wasif A. Khan, Ujjwal Dhar, Mohammed A. Salam, and M.L. Bennish*
02:21-02:30 p.m.	Molecular epidemiology and antimicrobial susceptibility of *Neisseria gonorrhoeae* isolated from commercial sex workers in Dhaka city *M. Rahman, B. Bhuiyan, S. Nahar, R.A. Miah, Nazrul Islam, M. Rahman, and M.J. Albert*
02:31-02:40 p.m.	Effect of vegetarian diet on rheumatoid arthritis, seronegative spondarthropathies, and fibromyalgia *Mohammed Yakub Ali, S.M. Keramat Ali, Muhammed Mustafizur Rahman and A.K.M. Yunus Halim*
02:41-02:50	Arsenic in drinking water: an emerging environmental health challenge *Bilqis A. Hoque, Shafiul A. Ahmed, Uttam K. Chowdhury, J.T.A. Chowdhury, G. Morshed, Donald M. Maynard, and Seth H. Frisbie*
02:51-03:00	Economic evaluation of MCH-FP clinic-based syphilis screening in rural Bangladesh *M. Mahmud Khan, Sarah Hawkes, and Disha Ali*
03:01-03:10	Role of nitric oxide in the pathogenesis of shigellosis and cholera in children *Sufia Islam, G.J. Fuchs, A.K. Chowdhury, A. Rahman, M. Miller, and G.H. Rabbani*
03:11-03:30	Discussion and remarks
03:31-04:00	Tea Break
04:01-05:00 p.m.	Concluding Session
Chairperson:	Mr. Salah Uddin Yusuf, Hon'ble Minister for Health and Family Welfare Government of the People's Republic of Bangladesh
Co-chairperson:	Mr. Muhammed Ali, Secretary, Ministry of Health and Family Welfare Government of the People's Republic of Bangladesh
04:01-04:10 p.m.	Address by Chairperson
04:11-04:25 p.m.	Summary on Nutrition: Dr. George Fuchs, Director, CSD, ICDDR,B
04:26-04:40 p.m.	Summary on Emerging and Re-emerging Infectious Diseases: Dr. V.I. Mathan, Director, LSD, ICDDR,B

04:41-04:50 p.m.	Concluding Remarks: Co-chairperson
04:51-05:00 p.m.	Vote of Thanks: Prof. Robert M. Suskind, Director, ICDDR,B

Poster Session-1: Saturday, 14 February 1998

Co-ordinators: Dr. Shahadat Hossain and Mr. Taqsem A. Khan

P-1	Copper, iron and manganese status in severely malnourished hospitalized children *Md. Salim Shakur, Nasreen Bano, and S.A. Tarafder*
P-2	Effect of zinc supplement on children suffering from feeding refusal with failure to thrive *Md. Salim Shakur, Nasreen Bano, and S.A. Tarafder*
P-3	Pre-lacteal feeding practices in Matlab, Bangladesh *Sabah Tarannum, S.M. Ziauddin Hyder, A.M.R. Choudhury, and Abbas Bhuiya*
P-4	Study on food-refusal, morbidity and nutritional status of children of the middle and upper socioeconomic class in Dhaka city *M. Asirul Hoque, Quazi Salamatullah, Mamunar Rashid,and Maqbul H. Bhuiyan*
P-5	Anaemia in pregnancy: a rural community perspective *S.M. Ziauddin Hyder*
P-6	Iron supplement and its predictors among newly-married girls and women in rural Bangladesh *Thomas T. Schaetzel and Mohammad Shahjahan*
P-7	Intra-household food distribution in a rural area of Bangladesh *Rita Das Roy, S.M. Ziauddin Hyder, A.M.R. Chowdhury, and Alayena Adams*
P-8	Family planning and pregnancy-related nutrition behaviours and beliefs among newly-married girls and women in rural Bangladesh *Thomas T. Schaetzel and Mohammad Shahjahan*
P-9	Prevalence of vitamin A deficiency among adolescent female workers *Nabila Hasan and Faruk Ahmed*
P-10	Intensive nutrition education programme for adolescent girls *Sadia A. Chowdhury, Zeba Mahmud, and Emily W. Counts*

P-23 Bangladesh-Australia Child Health Project: a child-to-child and child-to-parent approach for nutrition and health education
Masuda Akhtar, K.I. Selim, K. Mahfuzul Huq, M.K. Majumder, S.K. Roy, and M. Fazlur Rahman

P-24 Home-gardening approach to reduce micronutrient malnutrition of the rural population in Bangladesh
Md. Eshaque Ali and M. A. Mannan

P-25 Changes in plasma ceruloplasmin activity in an animal model of shigellosis
G.H. Rabbani, M. Moyenul, and Y. Kabir

Poster Session-2: Sunday, 15 February 1998

Co-ordinators: Dr. S.U. Alamgir and Mr. Meer Ramzan Ali

P-1 Potential invasive properties of *Vibrio cholerae* O139 Bengal in a rabbit model: a preliminary study
A.M. Khan, M.K. Bhattacharya, G.H. Rabbani, and G.J. Fuchs

P-2 Prevalence of intestinal parasites in the healthy adult and adolescent population in a rural community
S.M. Ziauddin Hyder, M. Akram Hossain, and Sadia A. Chowdhury

P-3 Women in need: pattern of STD infection among street-based sex workers of Dhaka city
Swarup Sarkar, Ziya Uddin, Yasmin Ahmed, Nazrul Islam, Sushena Reza, Fazlul Karim, and Maurice Bloem

P-4 Acute transient childhood myositis resembling paralytic illness: a newly discovered entity in Bangladesh
Md. Salim Shakur and Md. Sultan Uddin

P-5 Acute viral hepatitis in pregnancy
Rokeya Begum and Syeda Nurjahan Bhuiyan

P-6 Parasites in healthy city dwellers
M.A. Samad Talukder

P-7 Seroprevalence of syphilis, hepatitis B, and HIV infections
A.K.M. Shariful Islam, Osul Ahmed Chowdhury, M. Shibbir Ahmed, and Ahmed Kabir Chowdhury

P-8 Plasmid fingerprinting for the investigation of inter-household spread of multiresistant faecal bacteria in rural Bangladesh
Kazi Selim Anwar and Paul Shears

P-29 Intestinal transport of different electrolyte solutions across small intestine of rabbit *in vivo*
S. Islam, A. Rahman, G.J. Fuchs, A.K. Chowdhury, M.A. Wahed, and G.H. Rabbani

P-30 Evaluation of the plant extract (Hirtacin) in a rabbit model of shigellosis
Qazi Khaleda Rahman, Chowdhury Rafiqul Ahsan, Kamaluddin Ahmed, and G.H. Rabbani

Birth Weight and Its Association with Maternal Nutrition and Socioeconomic Variables in Rural Bangladesh

D.S. Alam§, M. Yunus§, K.M.A. Aziz§, A. de Francisco§, E. Haque§, J.M.A. van Raaij1, and G.J. Fuchs§

Objective: Examine the distribution of birth weight and its relationship with maternal nutrition and major socioeconomic variables.

Methodology: Between October 1995 and November 1996 at Matlab, 675 women, at 5-7 months' gestation period, were enrolled in a controlled diatary supplement intervention. Half of the women (n=341) received daily dietary supplement of 20 g soybean oil. Maternal nutrition status (weight, height, and MUAC) and socioeconomic variables (maternal education, parity, family size, household income, and land ownership) were measured at baseline, and infants' birth weights were taken within seven days of delivery. Gestational age was calculated from the last menstrual period. Analyses were conducted on 564 (83%) mother-infant pairs with complete data.

Results: Preliminary results showed no significant association between dietary supplement and mean birth weight or low birth weight. Mean (SD) birth weight for the entire sample was 2,520 (440) g, and the incidence of low birth weight was 47%. Maternal weight in mid- or late pregnancy, non-primiparity, and larger family size (>4) had significant positive association with birth weight. While short stature and primiparity were found to have significant negative association with low birth weight.

Conclusion: The findings suggest that small amount of calorie supplementation during pregnancy has no effect on birth weight in the study population. These results also suggest that poor maternal nutrition status, but not the socioeconomic status, is the major determinant of birth weight in rural Bangladesh.

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Determinants of Infant Growth in the Slums of Dhaka City: Size and Maturity at Birth and Breast-feeding

S.E. Arifeen§, R.E. Black1, G. Antelman§, Q. Nahar§, S. Alamgir§,
H. Mahmud§, and A.H. Baqui§

Objective: Investigate the effect of low birth weight (LBW), intrauterine growth retardation (IUGR), prematurity, and breast-feeding on infant growth.

Methodology: The sample consisted of 1,654 infants born in selected slum areas of Dhaka city. They were enrolled at birth and followed up prospectively till their first birthday. Apart from repeated anthropometric measurements, the mothers were also interviewed for information on infant feeding and morbidity at each follow-up visit. Analytical techniques included correlation analysis and random effects regression for modelling infant growth.

Results: Correlation was high and stationary between repeated body weight measurements from 3 months onward. Correlation between weights before 3 months and later weights was lower and declined rapidly with increasing age gap, suggesting greater plasticity of growth in the first 3 months of life. After adjusting for other variables, the mean differences in body weight by birth weight, IUGR, and prematurity categories remained constant throughout infancy. For example, low- and normal-birth-weight infants differed by 556-603 g, while the differences between symmetric and asymmetric IUGR babies were 172-184 g. A positive impact of exclusive breast-feeding in the first 3-5 months on infant growth was detectable at 12 months of age (+95g). The overall growth in this sample was of the pattern that heavier babies grew even heavier. However, exclusive breast-feeding appeared to counteract this pattern by equally benefitting the lighter and heavier infants.

Conclusion: The study has demonstrated the important role of weight at birth and appropriate breast-feeding practices in determining nutritional status in infancy. Effective strategies for improving birth weight, till now a poorly-addressed issue in Bangladesh, are urgently needed. The sustained effect on growth and the beneficial effect on LBW infants are compelling reasons for increased and effective promotion of exclusive breast-feeding in early infancy.

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Mineral Status in Relation to Rickets in Chakaria, Bangladesh

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M. Rutzke5, P.R. Fischer6, A. Rahman7, J.P. Cimma8,
T.O. Kyaw-Myint9, A.L. Kabir10, K. Talukder11, D.B. Staab12,
S. Haque13, and G.F. Combs, Jr.14

Objective: Explore the aetiology of rickets in Chakaria and identify opportunities within the local food system to prevent the disease. The rickets prevalent among children of the Chakaria region of Bangladesh is not usually associated with vitamin D deficiency. Therefore, Ca-deficiency would appear to be at least a predisposing factor in its aetiology. That rickets has emerged as a public health problem in Chakaria within the last two decades suggests that changes in food habits and/or environmental exposures may have contributed to the disease either by reducing Ca intakes (e.g. reduced access to Ca-rich foods) or use (e.g. increased exposure to such Ca-antagonistic factors as Al, Pb, Cd, F, Sr, Ba, low P, low-B). The Chakarian food system has indeed changed during this time: winter rice (requiring irrigation during the dry season) has been introduced; shrimp production in flooded paddy fields has increased; deep tubewells have been drilled to provide potable water.

Methodology: Mineral analyses were done on samples of whole blood and foods collected from the Chakaria region in October 1997. Blood was obtained from children aged 36-98 months identified by their families as either rachitic (n=11) or unaffected (n=8), who were each given physical and radiographic examinations (results reported separately). Samples of drinking water from tubewell, cooking water (pond), and cooked and uncooked rice were collected from three households, one of which had rachitic children. Samples of other foods likely to be sources of Ca and other limiting nutrients (mungbean, grasspea, chickpea, Indian chickpea, cowpea, lentil, black gram, amaranth, red chillies, taro, a sea-fish, churie, shrimp, and faishya) were purchased from the market at Chakaria. Water pH was measured at the point of sampling; samples were held frozen (blood) or at ambient temperature (water), or dried (food) prior to analysis. Samples were digested with nitric-perchloric acids and analyzed for 20 elements (Pb, Cd, Cu, Zn, Co, P, K, Na, Mg, Fe, B, Mo, Ni, V, As, U, Cr, Al, Sr, and Ba) by inductively coupled plasma emission spectrometry.

Results: The results of the study showed blood mineral values for rickets cases and controls to be similar with the exception of P (serum: cases, 43 mg/L vs. control, 52 mg/L, $p>.05$; whole blood: cases, 216 mg/L vs. control, 235 mg/L, $p>.05$). All values in both pond and well water samples were within normal limits. All elements in the rice samples were within safe limits reported for plant foods; rice was very low in Ca (86 mg/kg as eaten). All elements in the local foods were within the normal ranges reported for these elements with two notable exceptions: amaranth and shrimp, both containing high concentrations of almost all elements (amaranth, mg/kg dry weight: Ca, 26,947; Al, 1455; Pb, 1.5; Sr, 129; Ba, 32; Cr, 9.8; V, 3; As, 0.2; shrimp, mg/kg dry weight: Ca, 37,278; Al, 209; Pb, 0.3; Sr, 322; Ba, 34; V, 0.5; As, 4.3).

Conclusion: The results do not indicate wide exposure to antagonists of Ca use, but point to a food supply generally low in Ca.

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Consequences of Low Birth Weight on Infant Growth, Development, and Morbidity

Rukhsana Gazi, Fazlul Karim, and A.M.R. Chowdhury

Objective: Observe the consequences of low birth weight (LBW) on growth, development, and morbidity of infants, and compare the feeding practices between infants with normal and low birth weight.

Methodology: BRAC and the London School of hygiene & Tropical Medicine jointly undertook a research project on maternal morbidity in three unions of Manikganj district (1991-1993). The present investigation forms a part of that study and was carried out in the same setting during 1993-1994. Six hundred fifty pregnant women were registered in their last trimester of pregnancy. Birth weights of 644 infants were taken within 48 hours of delivery. They received monthly follow-up visit up to one year of age. During each visit, information was collected using a structured questionnaire.

Results: Although the LBW infants showed catch-up growth (z-score>-2) at 1-6 month(s) of age, their growth started to falter earlier than the infants with normal birth weight. Within the same birth weight group, the growth of the male infants faltered more than the female infants. Factors, such as maternal weight, father's literacy, birth weight, floor condition of living room, absence of illness of infants, had a significant association with the total weight gain at the 12th month of age. A very small proportion of the LBW infants could cross each of the selected development milestones, such as head-holding, sitting, crawling, teething , walking, etc. Acute respiratory infection (ARI) and diarrhoea were the major causes of mortality and morbidity in both the groups. Seventy-three percent of the 34 infants who died before 12 months of age were the LBW babies. The mean episodes per year of the three major illnesses among the infants were: ARI 4, diarrhoea 2, and skin infection 1. The mean chest circumference and the mean body weight of the infants with LBW were lower than their counterparts at 1-12 month(s), but the differences were highly significant at 7th and 8th month. A significant higher proportion of the LBW infants received early supplementation compared to the normal infants which seems to be a dangerous practice.

Conclusion: All members of the community should be educated on the consequences of LBW and its prevention as well as proper care of the infants with LBW.

Bangladesh Rural Advancement Committee (BRAC), 75 Mohakhali C/A, Dhaka 1212

Effect of BRAC's Rural Development Programme on Calorie Consumption

Masuma Khatun1, Abbas Bhuiya§, A.M.R. Chowdhury1, and S.M. Ziauddin Hyder1

Objective: Explore the level of calorie consumption, and determine the effect of BRAC membership on calorie consumption of the programme participants.

Methodology: The analysis was based on the data on food intake by 2,061 households of the first round survey of the BRAC-ICDDR,B Joint Research Project in Matlab. Data were collected during April-August 1995 using a four-cell study design. Socioeconomic and food consumption data were collected through home visits through a 7-day recall of major food items. Daily household calorie consumption was divided by adult food consumption unit to obtain per capita calorie consumption. Variables found significant through bivariate analysis were regressed against calorie consumption less than 1805 kcal/day to assess the relative effect of BRAC membership.

Results: Only 25% of the total households had adequate calorie intake (>2310 kcal/day). Per day calorie consumption was significantly higher among the BRAC member households compared to the BRAC non-members ($p<0.05$). Calorie consumption was significantly associated with household size, household land holding, occupation, and literacy of the household head, per capita monthly food and non-food expenditure ($p<0.001$). Controlling for those associated factors, the BRAC member households had 33% less possibilities to consume <1805 kcal/day compared to the non-member households ($p<0.01$).

Conclusion: A vast rural population (75%) could not afford to meet the daily calorie requirement. It seems that an intervention, like that of BRAC, can have a significant impact in meeting the daily calorie requirement. In-depth analysis is needed to determine the pathways through which different BRAC inputs lead to an increased calorie consumption.

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Effect of Birth Weight, Intrauterine Growth Retardation and Prematurity on Infant Survival: a Prospective Study in the Slums of Dhaka City

S.E. Arifeen§, R.E. Black1, G. Antelman§, Q. Nahar§, H. Mahmud§, S. Alamgir§, and A.H. Baqui§

Objective: Study the effect of low birth weight (LBW), intrauterine growth retardation (IUGR), and prematurity on infant survival and on risk of deaths due to acute respiratory infections (ARI) and diarrhoea.

Methodology: A cohort of 1,677 infants born in a sample of slums in Dhaka city was enrolled and studied prospectively. One-hundred eighty deaths were reported to occur by 12 months of age. Cause of death was assigned based on data collected with a structured verbal autopsy questionnaire. Baseline data, and birth weights and lengths were measured at enrolment. Proportional hazards regression analysis was used for estimating the effect of the key explanatory variables while controlling for the effect of other variables.

Results: Overall, 21.7% of the deaths were due to ARI, 14.4% due to diarrhoea, and 5.6% due to both the causes. The proportional hazards regression analysis identified LBW, IUGR, and prematurity as important determinants of infant mortality. Preterm-IUGR infants were most at risk, especially for deaths due to ARI (RR=6.03). Diarrhoea deaths were 2.83 times more likely among the symmetric-IUGR infants compared to the non-IUGR infants. Compared to the normal-birth-weight infants, the LBW infants were at a greater risk of death due to all causes (RR=2.08), ARI (RR=2.52), and diarrhoea (RR=2.79). Although both prematurity and IUGR were associated with the increased risk of death, the timing of the effect varied with IUGR contributing to greater postneonatal mortality.

Conclusion: The study shows that size and maturity at birth are two important determinants of infant survival. The high prevalence of LBW and IUGR and the associated increased risk of deaths due to ARI and diarrhoea partially explain why these are still common causes of infant deaths in Bangladesh. Substantial improvements in infant survival, especially in the postneonatal period, can be expected with improved foetal growth and birth weight in this population.

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Effects of Vitamin A and ß-carotene Supplementation to Lactating Mothers and Their Infants in Bangladesh

A.L. Rice1, R.J. Stoltzfus1, A. de Francisco§, J. Chakraborty§, C.L. Kjolhede1, and M.A. Wahed§

Objective: Assess the efficacy of vitamin A and ß-carotene supplementation for the improvement of vitamin A status of women and their breastfed infants.

Methodology: Women delivering live infants in Matlab were randomized to receive either single-dose 200,000 IU of vitamin A at 2 weeks postpartum and daily placebos (n=74), daily dietary doses (n=73) of ß-carotene (7.6 mg=1 RDA) or daily placebos for 9 months postpartum (n=73). Breastmilk vitamin A concentrations were measured at baseline, 3, 6 and 9 months postpartum. Serum retinol concentrations and modified relative dose response (MRDR) test ratios were measured in infants and a subsample of women.

Results: Vitamin A supplementation to lactating mothers improved the maternal vitamin A status and breastmilk concentrations at 3 months, but the effect was not sustained. Dietary ß-carotene significantly improved the maternal vitamin A status and breastmilk vitamin A concentrations only at 9 months. At 6 months postpartum, 25% of the women had low liver stores, and over 65% produced breastmilk with low concentrations of vitamin A. The status of 6-month old infants reflected the trend in breastmilk concentrations and was the highest in the vitamin A group, followed by the ß-carotene and placebo groups. Of the infants of the supplemented women, over 25% had serum retinol concentrations <0.70 mmol/L, and over 85% had low liver stores of vitamin A.

Conclusion: Both the interventions had beneficial effects on the maternal and infant vitamin A status. However, neither was sufficient to completely overcome the subclinical vitamin A status present in these women. Both vitamin A dose and dietary ß-carotene failed to build adequate vitamin A stores in their 6-month old infants. Mothers should be supplemented with 200,000 IU of retinol within 8 weeks postpartum, in line with the government recommendations. Additional ß-carotene supplementation may improve vitamin A levels in mothers and their infants.

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Subclinical Vitamin A Deficiency in Pre-school Children Living in Urban Slums of Dhaka City

M.A. Wahed§, Rashidul Haque§, A.S.M. Hamidur Rahman§, Sadiqur R. Talukder§, M.J. Albert§, and J.O. Alvarez1

Objective: Assess the biochemical evidence of vitamin A deficiency in pre-school children living in the urban slums of Dhaka.

Methodology: To examine the separate and combined effects of low-dose ß-carotene supplementation and anti-helminthic therapy, 226 children aged 2-5 years from different slums in Mirpur thana were recruited for this study. All children were free from apparent illness, frank malnutrition, and sign of clinically evident vitamin A deficiency. Their serum ß-carotene and retinol levels were measured using high pressure liquid chromatography.

Results: The mean (range) serum ß-carotene and retinol levels were 5.67 (2.6-21.7) and 18.9 (5.6-37.3) mg/dl respectively. Fifty-seven percent of the children were vitamin A-deficient based on the serum retinol level (<20 mg/dl). About 20% of the children had no measurable ß-carotene in their serum. Neither serum retinol nor ß-carotene showed any relationship with age or nutritional status.

Conclusion: The results of the study indicate a high prevalence of vitamin A deficiency among the pre-school children in urban slums.

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Effect of Iron and Other Micronutrients on Haematological Indices and Nutritional Status of Urban Slum Children

Kazi Selim Anwar, M.A. Karim, Mahfuzur Rahman, R. Hoque, U. Habiba, A. Hossain, and A.K. Azad

Objective: Compare the effect of iron and a micronutrient package (folic acid + vitamin C) on haematological indices and nutritional status of dewormed and non-dewormed children of Mirpur slum, Dhaka.

Methodology: Two hundred thirty-three anaemic (<11 g/dl) children aged 2-12 years were randomly assigned to 6 groups: (dewormed: A1, A2, and A3 and non-dewormed: B1, B2, and B3). A1 and B1 received Ferrous fumerate, A2 and B2 micronutrients, and A3 and B3 placebo. Biweekly anthropometry and pre/post-interventional haematological profiles were determined examining 0.5 mL fingerprick blood. Outcome means were compared with the baseline data using the SPSS/PC+/anthropometry software.

Results: Children of A1 and B1 groups had an increased RBC count and higher Hb/PCV values [A1>A3 (p=0.000); B1>B2 (p=0.000), except Hb (p=0.07)] and B1>B3(p=0.000). Although no differences existed between A1 and A2 for RBC count (p=0.82), it was higher for Hb (p=0.000) and PCV (p=0.000) level. Children of both A1 and A2 had higher RBC count/Hb/PCV level than that of B2 [(p=0.000, except Hb (p=0.01)] and B3 [(p=0.000 for both)], but it did not differ from B1 [(p=0.23 and 0.27 for RBC), p=0.54 and 0.09 for Hb and p=0.26 and 0.006 for PCV respectively]. The RBC count was related with post-interventional weight and height gains (p=0.03 and 0.02 respectively). Although higher mid-upper arm circumference (MUAC) value was associated with Hb and PCV level (p=0.001 and 0.003 respectively, increased Hb and PCV values were associated with both dewormed (p=0.003 and 0.000 respectively) and non-dewormed iron-supplemented children (p=0.002 and 0.000 respectively).

Conclusion: Iron as supplement was better than micronutrients to boost up haematological indices, but had less impact on the nutritional status. Higher RBC count was associated with weight and height gains among the iron-supplemented children, while the Hb and PCV level was related to the higher MUAC values. Further study is needed.

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Determination of Zinc Status in Children Suffering from Acute Respiratory Tract Infection and ARI Associated with Severe Protein-Energy Malnutrition

Md. Salim Shakur1, M.A. Malek2, Nasreen Bano3, and S.A. Tarafder4

Objective: Determine zinc status in children suffering from acute respiratory tract infections (ARI) i.e. pneumonia and ARI associated with severe protein-energy malnutrition (PEM).

Methodology: A randomized case-control study was conducted on 137 children aged 6-60 months. Of them, 25 patients had ARI (pneumonia), 52 severe PEM (weight-for-age less than 60% of NCHS standard or the presence of nutritional oedema) without pneumonia or other significant clinical problems, and 25 patients severe PEM complicated by ARI. Thirty-five well-nourished children without significant clinical problem of the same age group were taken as control. Serum and corresponding hair zinc content were estimated by flame atomic absorption spectrophotometry. Results were expressed in ppm (parts per million).

Results: The results of the study showed that serum zinc was significantly lower (<0.05) in ARI (1.26±.0.60 ppm), PEM (1.31±0.55 ppm), and in PEM complicated by ARI (0.90±0.51 ppm) than control (1.76± .98 ppm). Serum zinc in ARI with PEM was also significantly lower (p<0.05) than ARI without PEM. In case of hair zinc, the control group (249±154 ppm) had significantly higher zinc level (p,<0.05) than the ARI group (158±48 ppm), the PEM group (174±75 ppm), and ARI with the PEM group (177±70 ppm). However, unlike serum zinc, there was no significant difference between hair zinc in ARI, with that of ARI, and with that of ARI associated with severe PEM. In addition to bivariate analysis, multivariate linear logistic and regression model was used, which showed the significant negative association of serum zinc with ARI, PEM, and ARI with PEM, but hair zinc showing statistically insignificant (>0.05) negative association with ARI, PEM, and ARI with PEM.

Conclusion: The results of the study suggest that low zinc status is associated with ARI and PEM, and may further be decreased when ARI occurs in PEM. Interventions to improve zinc intake in children of developing countries, like Bangladesh, particularly to malnourished children will improve zinc status, and thereby may reduce ARI and PEM-related morbidity and mortality.

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Effectiveness of an Iron Supplementation Programme for Pregnant and Postpartum Women in Rural Bangladesh

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Objective: Compare the levels of anaemia in a population served by an iron supplementation programme with that in other rural populations in Bangladesh.

Methodology: Haemoglobin concentration was determined from a venous sample of blood using the HemoCue system for women during the postpartum period. Two hundred twenty women who delivered between June and August 1994 were examined: half of them at 2 weeks and 6 months after delivery, and the other half at 3 months and 9 months postpartum (mean of two values are presented). The Matlab MCH-FP intervention programme has been distributing iron/folic acid tablets to all pregnant and lactating women since 1974. Compliance was tested using a questionnaire. Laboratory results were compared with: (i) historical data: haematocrit levels taken in Matlab in 1975 from 2,445 women (converted to estimate haemoglobin levels by 0.33); and (ii) contemporary data: haemoglobin surveys conducted by the International Food Policy Research Institute (IFPRI) in 1996 from non-pregnant married women aged less than 50 years using the HemoCue method. Criteria for non-anaemia in non-pregnant women was 12 g/dl Hb.

Results: The mean Hb levels (95% confidence interval; percentage below 12.0 g/dl) were as follows: (1) Matlab 1994: 12.9 (12.7-13.1) g/dl (23%); (2) Matlab 1975: 11.7 (11.7-11.8) g/dl, (60%); (3) IFPRI Manikganj: 12.0 (11.8-12.1) (47%); (4) IFPRI Mymensingh: 11.3 (11.1-11.5), 59%; (5) IFPRI Jessore: 11.9 (11.8-12.1), 44%. There were no significant differences in height and weight among the study populations. The Matlab 1994 had a significantly higher proportion of women aged less than 30 years. Compliance with iron/folic acid in this population was very high. The iron/folic acid distribution programme may have had an impact varying between 47 and 61% of reduction in the prevalence of anaemia, with an increase of 0.9 to 2.1 g/dl Hb concentration.

Conclusion: The low postpartum anaemia levels may be associated with an intensive iron/folic acid supplementation programme in Matlab.

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Use of Nutritional Surveillance Project to Monitor Factors that Determine Vitamin A Capsule Distribution

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Objective: Describe the determinants of vitamin A capsule distribution during the national vitamin A (VA) week.

Methodology: In April 1990, the Helen Keller International (HKI) and several partner organizations set up a nutritional surveillance project (NSP) in rural areas and selected urban slums. Information has been collected from 41 rural thanas and 4 urban slums on health, nutrition and socioeconomic status of approximately 18,000 children bimonthly. Monitoring the vitamin A capsule (VAC) coverage (received and fed) is an important function of the NSP. In this analysis, data from round 44 of the NSP were used for assessing the coverage of the national VA week conducted in early June 1997. The sample consisted of 11,283 children aged 12-59 months.

Results: The overall VAC coverage, in the rural area was 79.1%, but ranged by thana from 51.5% to 97.7%. Several reasons may have contributed to this wide range of coverage, including varying levels of organization, distribution, and the effects of the May 1991 cyclone. However, in most thanas, more than 75% of the children were reached based on the NSP finding. Preliminary analysis showed that there was no difference in the coverage due to gender or mother's education. However, a slight difference was observed for difference in the ownership of land. The NSP has also been successful in monitoring changes over time. One is the drop in coverage to 31% due to a VAC supply problem resulting from a change in donors supporting the programme. The second is the substantial increase to 87% in the rural VAC coverage following the linkage of capsule distribution to the second National Immunization Day (NID) campaign for polio eradication. The Government of Bangladesh has built on this success to continue with a centre-based national vitamin A week.

Conclusion: The centre-based distribution during the national vitamin A week is an effective method for VAC distribution. While the Government, through donor support, has sustained this effort for more than two years, there are still more children (15-25%) who are not being reached. There is need for an immediate action to reach these children as well as looking for more sustainable approaches to prevent vitamin A deficiency in Bangladesh.

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Zinc Supplementation During Pregnancy in Bangladeshi Women had no Effect on Birth Weight

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Objective: Study the effect of zinc supplementation during pregnancy in Bangladeshi women on birth weight.

Methodology: Observational studies suggest a positive association between zinc status during pregnancy and pregnancy outcome, but the results of controlled supplementation trials have been mixed. A prospective double-blind trial was conducted in a very poor urban Bangladesh community where low birth weight was highly prevalent. Five hundred and fifty-nine women were enrolled between 12 and 16 weeks gestation, stratified by parity and randomly assigned to two groups: 30 mg elemental zinc/day (n=269) or placebo (n=290). Supplementation continued until delivery, and compliance with supplementation was 86%. Serum zinc levels were estimated at baseline and at 7 months gestation while anthropometrics and dietary intake of the women were assessed monthly and morbidity weekly. The newborns were measured by a physician within 72 hours after birth, and weights and gestational ages were known for the 410 singleton infants. The overall incidence of low birth weight was 42.9% (45.9% in zinc-supplemented vs. 40.3% in placebo-supplemented; p=0.27). The incidence of prematurity by LMP was 21.2% (22.7% in zinc-supplemented vs. 19.9% in placebo-supplemented group; p=0.52). Means and distributions of birth weight, length at birth, and head circumference at birth were not significantly different between the two groups.

Conclusion: It is concluded that antenatal supplementation with daily 30 mg elemental zinc alone has no apparent impact on birth outcome in the study population.

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Breastmilk Retinol Levels in Bangladeshi Mothers: Reflection on the Serum Retinol Level of Infants

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Objective: Examine the retinol levels in breastmilk and serum of 32 mothers and same from cord blood and serum of infants of urban middle class families.

Methodology: Colostrum and morning collection of full expression of breastmilk at 4, 12, and 20 weeks were obtained. Cord blood and infant's serum at 6, 14, and 22 weeks were taken. All samples were collected and stored at -20 ºC following standard procedures. These were analyzed by the high pressure liquid chromatography (HPLC) method. The fat content of breastmilk was estimated by creamatocrit method on the day of specimen collection.

Results: The retinol content of breastmilk (9%) and serum samples (17%) was below 10 µg/dl; the retinol content of all breastmilk (22%) and serum samples (59%) was below 20 µg/dl. Both median and mean retinol levels in mothers' milk were directly correlated with the amount of fat in the breastmilk samples. The median fat content of mothers' milk was 7% (range 3-20) with a lower median in the colostrum (6%). The colostrum retinol level was low (14.1 µg/dl±14.22); the breastmilk retinol level increased up to 12 weeks (61.9 µg/dl±43.72) and had a slight decrease at 20 weeks. The median fat and retinol contents were the lowest in the colostrum (7.2±2.4% and 14 µg/dl±14.2 respectively). The breastmilk retinol levels had a mean value of 72.67 µg/dl, 72.30 µg/dl, and 67.96 µg/dl at 4, 12, and 20 weeks' samples respectively. The median serum retinol level for cord blood samples was 16 µg/dl±2.7, and the values for the serum samples collected at 6,14, and 22 weeks were: 12.97 µg/dl, 21.5 µg/dl, and 19.79 µg/dl respectively.

Conclusion: Infant's serum appears to reflect only 20-40% of the consumed breastmilk in the previous two weeks. The results of the study indicate that maternal reserves of retinol must be improved to produce adequate vitamin A status in their infants.

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Initial Breast-feeding Practices of Urban Mothers Can be Influenced by Peer Counselling

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Objective: Assess the effect of peer counselling on the early postpartum breast-feeding practices of urban mothers.

Methodology: Forty localities of similar size in Dhaka were randomized as the intervention or control areas. From each of the 20 intervention areas, local women who had breastfed their babies and were motivated to help other mothers, were trained as peer counsellors. Three counselling sessions were provided (two visits before delivery in presence of influential family members, and one within 48 hours of delivery) to initiate early breast-feeding and to breastfeed exclusively for five months. Socioeconomic data and information on previous infant-feeding practices were collected in the last trimester of pregnancy by the trained interviewers. On day 4, they collected postdelivery feeding practices.

Results: Mothers selected for the study (363 in each group) were of similar age and socioeconomic status. Significantly more mothers in the intervention group initiated breast-feeding within one hour (64% *vs*. 15%) and gave their babies colostrum as the first food (69% *vs*. 11%). Most intervention mothers whose babies received prelacteals reported that either the baby's grandmothers had administered the prelacteals contrary to their own wishes, or they had to accept the advice of local health facility staff and family members. In spite of these obstacles, on day 4, significantly more mothers were breast-feeding exclusively in the intervention group (84% *vs*. 30%).

Conclusion: Peer counsellors can improve the early postpartum breast-feeding practices, but it could be even more effective if health staff and family members do not give conflicting advice.

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Exclusive Breast-feeding Reduces ARI and Diarrhoea Deaths among Infants in Dhaka Slums

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Objective: Describe the breast-feeding practices and assess the effect of exclusive breast-feeding in early infancy on the risk of infant deaths, especially those due to acute respiratory infections (ARI) and diarrhoea.

Methodology: In a prospective study in the slums of Dhaka city, 1,677 infants were followed up from birth till 12 months of age. Based on the baseline information at enrollment, the infants were visited 5 more times for anthropometric measurements and infant-feeding information. Verbal autopsy, based on a structured questionnaire, was used for assigning causes to the 180 reported deaths. Proportional hazards regression models were used for estimating the effect of breast-feeding practices, introduced as a time-varying variable, after accounting for other variables.

Results: The proportion of infants exclusively breastfed was only 6.2% at enrollment, increasing to 53.1% at 1 month and then gradually declining to 4.8% at 6 months of age. Predominant breast-feeding declined from 65.9% at enrollment to 4.1% at 12 months of age. Very few infants were not breastfed while the proportion of partially breastfed infants increased with age. The breast-feeding practices did not differ between the low- and the normal birth-weight infants at any age. The overall infant mortality was 114 deaths per 1,000 live-births. Compared to exclusive breast-feeding in the first few months of life, partial or no breast-feeding was associated with 2.30-fold higher risk of infant deaths and 2.48- and 3.96-fold higher risk of deaths due to ARI and diarrhoea respectively.

Conclusion: The important role of appropriate breast-feeding practices in the survival of infants is clear from this analysis. The reduction in ARI deaths underscores the broad-based beneficial effect of exclusive breast-feeding beyond its role in reducing dietary contamination as evident here in the strong protection against deaths due to diarrhoea. Formulation of effective strategies for increasing the practice of exclusive breast-feeding in early infancy is recommended.

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BRAC's Rural Development Programme and Child Nutrition

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Objective: Explore the effect of the BRAC's rural credit programme on the nutritional status of children aged 6-72 months.

Methodology: Mid-upper arm circumference (MUAC) of 1,518 children aged 6-72 months were recorded from the first round survey of the BRAC-ICDDR,B Joint Research Project in Matlab. Data were collected during April-August 1995, using a four-cell study design. Measurements were taken using a TALC MUAC tape. Apart from intra-cell comparison, these children were also compared with similar data from a baseline survey done in 1992. Both bivariate and multivariate analyses of data were done.

Results: The prevalence of protein-energy malnutrition (PEM) was significantly lower among the children of the BRAC members compared to these of the non-members ($p<0.01$). During the pre-intervention period, the prevalence of severe PEM was found to be similar among these two groups. After three years of the BRAC intervention, it decreased from 15.4% to 8.7% among children of the BRAC member households ($p<0.05$). However, among the non-member households, the prevalence remained unchanged (15.8%). In the bivariate analysis, children of the older members (25 months or more) and of the borrowers of the larger loan (Tk 7,500.00) were significantly better-off compared to other categories. However, after controlling for background indicators, sex and age of the children, year of schooling of the mothers, the number of living children, age of the mothers, and the per capita monthly expenditure were the significant predictors of nutritional status of children.

Conclusion: Three years of involvement in the BRAC's development activities are probably too a little time to have a significant measurable effect on the children's nutritional status. However, the results of the study showed a numerical trend in the improvement of the nutritional status of children of the BRAC member households.

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Effect of Lathyrus Protein Concentrate on the Growth of Infants

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Objective: Study the effect of a protein concentrate from *khesari dal* (Lathyrus peas) on the growth of malnourished children.

Methodology: A random sample of 30 second-degree malnourished children aged 1-3 year(s) was selected from the Kawran Bazar Beltola slum area. The children were divided into: (a) experimental group: those who received Lathyrus protein concentrate, and (b) control group: those who received a similar quantity of a cereal food, *suji*. Each child from both the groups was given fixed and measured quantity of food and vitamin at regular intervals for three months. The growth of each child was monitored by anthropometric measurement before and at regular intervals during the feeding period. Signs and symptoms of allergy, gastrointestinal disturbances, and clinical examinations of eyes, lips, tongues, etc. were recorded. A questionnaire was used for collecting information on the economic conditions, family background, and environment of the children. Data were analyzed by statistical method.

Results: The children of both the groups were suffering from second-degree malnutrition as analyzed by weight-for-age or weight-for-height. At the beginning of the experiment, the average weight of children in the experimental group was 6.82 kg and that of the control group was 7.37 kg. After 15 weeks of feeding, the average weight of children in the experimental group increased to 8.3 kg (mean weight gain 1.23 kg) and that of the control group to 8.05 kg (mean weight gain 0.97 kg). It means that weight gain was 26.8% more in the children taking Lathyrus protein concentrate feed. These children showed better resistance to diarrhoea and fever as revealed by the morbidity data.

Conclusion: The results of the study provide an encouraging indication of using the protein of a popular and vastly grown pea (*khesari dal*) as an excellent nutritional supplement for the undernourished children. Mass production of this easily cultivable legume and processing it to extract the concentrate to use it as a supplementary feed can help eliminate protein-energy malnutrition of a vast section of the population.

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Growth of the Newborns in Their Early Life (Two Weeks) According to Feeding Pattern in Rural Area of Bangladesh

Zeba Mahmud and Sadia A. Chowdhury

Objective: Scrutinize the growth of the newborns for two weeks concurring to their feeding pattern.

Methodology: One hundred pregnant women, randomly selected and registered from 50 villages of Trishal thana of Mymensingh district, were prospectively followed up for one year. The birth weight, length, head and chest circumference of their newborns were recorded within 24 hours of birth. Weight was collected daily, length, head and chest circumference were recorded weekly for two weeks following birth and their feeding pattern, and colostrum intake and prelacteal food were recorded daily using a structured questionnaire.

Results: The records show the mean weight at birth was 2.6±0.3 kg, length was 46.4±2.7 cm, head circumference 32.9±1.4 cm, and chest circumference was 314±21 mm with the female child, being less than those of the male in all aspects. Mean weight loss of 62 g occurred within the first 24 hours, but was recovered within 3 days. All the babies were given colostrum within 72 hours, 90% within the first 24 hours of birth, and this 90% lost less (60±15 g vs. 76±12 g) weight (RR=1.53). Prelacteal food, primarily sugar water and pond/tubewell water, had been given to 69% of the neonates, and those who were not given prelacteal food lost less weight (56± 9 g vs. 65±17 g) in the first 24 hours. Although all the mothers breastfed their infants, exclusive breast-feeding was virtually non-existent even in the first 14 days of the child's life with the evidence of feeding other liquids. There was no evidence of bottle feeding or of intake of solid food in the sample. There was an increase in the growth indicators (weight, length, head, and chest circumference) of these children and interestingly more so for the female babies.

Conclusion: The mothers are not aware of exclusive breast-feeding as prelacteal feeding exists, and water is not considered a carrier of bacteria. Creation of intensive awareness and social mobilization for increasing breast-feeding are required.

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Comparison of Anthropometrical Indicators between Malnourished Children Admitted to a Nutrition Rehabilitation Unit and Their Counterparts in a Community

A. de Francisco, J. Chakraborty, and F. Ahmed

Objective: Relate z-scores of malnourished children treated in a Nutrition Rehabilitation Unit (NRU) with that of their counterparts in a community.

Methodology: The Matlab MCH-FP Programme regularly measures mid-upper arm circumference (MUAC) to detect severe malnutrition in a community. An NRU was established to rehabilitate children detected as severely malnourished (MUAC <120 mm), and to involve mothers in the process. The z-score values (ANTHRO) of the admitted children were compared with those for their counterparts selected randomly in a community, using normal test comparisons for continuous variables.

Results: During a five-year period, 548 malnourished children aged less than five years from the intervention area were admitted for a mean (SD) of 19.1 (17.1) days. Admission was highly seasonal, particularly high during the pre-harvest period; 3.3% of the children were admitted twice during the study period; 32% of the admitted patients were infants, and 75% were aged less than two years. Mean weight gain was linear over time till the 5th week of admission when it reached a plateau. The weight-for-age and weight-for-height values, but not height-for-age, improved significantly among patients at the NRU. The admitted children were both stunted and wasted. Five hundred community children from a neighbouring non-intervention area were significantly less stunted and wasted than those admitted in the NRU. Malnourished comparison children had a higher weight-for-height score ($z=-11.5$, $p<0.0001$) and weight-for-age score ($z=-9.5$, $p<0.0001$) than those recorded for children from the intervention area when admitted to the NRU, and had also a significantly higher weight-for-age score than that recorded on children when discharged from the NRU ($z=-4.8$, $p<0.001$).

Conclusion: The results of the study showed that children rehabilitated in an NRU improved significantly in terms of their nutritional status, but their z-score values on discharge were still comparable to those of the malnourished children living in the community. Community-based rehabilitation programmes may be required to continue caring for the still fragile children at risk of morbidity and mortality.

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Birth Weight in Rural Bangladesh

Sadia A. Chowdhury and Zeba Mahmud

Objective: Study the feasibility of recording birth weight in a rural community, and examine factors associated with the patterns of birth weight.

Methodology: Data were collected from a population of 60,000 throughout Bangladesh over a 3-year period, where BRAC provides health and nutrition education. In this study, 2,516 village women who had given birth to singleton liveborn infants were identified, registered, and followed up through their pregnancy. Information on their age, parity, occupation, education, receipt of antenatal care (ANC) services, etc. was obtained using a structured questionnaire administered by the members of the BRAC staff. The birth weights of their infants were recorded within 72 hours of birth. Both bivariate and multivariate analyses were performed to determine the risk factors of low birth weight (LBW). Odd ratios were calculated in each type of analysis to estimate the risk of an individual mother having a low-birth-weight infant.

Results: The mean birth weight (MBW) was 2601±409 g, and 22% of the infants were born with LBW. There was an increase in the percentage of infants with normal birth weight (i.e. >2.5 kg) from 64% to 80% during the study period. The MBW for the female infants was 2,559 g with 25% LBW, while the male infant had the MBW of 2,638 g and 20% LBW. The first-born infants had the highest LBW rate (32%) and weighed 200 g less than the infants with >3 birth order. Women aged less than 18 years were twice as likely to have LBW infants compared to the women aged 18-34 years. The risk of delivering an LBW infant decreased as the number of ANC visits increased. Maternal education and socioeconomic status were found to be inconsistent risk factors for LBW.

Conclusion: Multiple factors influence birth weight. Therefore, there is a need to address mothers' age, parity, non-formal education on nutrition and care during pregnancy to decrease the number of LBW infants. These issues should be addressed in all programmes for the improvement of maternal and child health.

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Community-based Nutrition Pilot Initiative of BRAC

Sadia A. Chowdhury, Emily W. Counts, and Zeba Mahmud

Objective: Ascertain the feasibility of implementing a community-based nutrition programme aimed at reducing endemic malnutrition in mothers and in their children aged less than two years.

Methodology: Since 1993, BRAC has been operating a community-based nutrition project in Muktagacha thana of Mymensingh district. In the programme area, each village is served by a full-time BRAC health functionary. As part of the programme, children aged less than two years receive monthly growth monitoring. Those identified with growth faltering or are severely malnourished are included in the supplementary feeding demonstration. At the feeding centre, the mothers also receive nutrition education from the community health workers regarding child feeding and caring practices. The food supplement is made from a mix of rice powder, pulse powder, molasses, and oil and is given for 90 days.

Results: 72% of the children in the programme exited with a weight gain greater than 500 g in 1993, which increased to 87% by the end of 1995. Although the exiting criterion was only a gain of 500 g, the mean weight gain was 700 g in 1993 and increased to 900 g in 1995. Males and females exhibited the same level of weight gain and success in exiting from the feeding programme. However, based on z-scores, girls routinely entered the programme with slightly better nutritional status. Children aged 13-18 months entered with the poorest nutritional status, but as to be expected, were benefited the most.

Conclusion: There has been a positive impact on the nutritional status of the children by providing nutrition education through feeding demonstration by the community health workers.

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Comparison of Nutritional Status among Pre-school Children Living in Rural, Slum and Urban Dhaka

Lynnda Kiess

Objective: Describe and compare the nutritional situation among pre-school children living in rural, urban and urban slum areas in Bangladesh.

Methodology: The Nutrition Surveillance Project conducts nutrition and health surveillance in partnership with NGOs in 4 urban slum working areas of Dhaka, Chittagong and Khulna and 41 sites throughout rural Bangladesh. In December 1996, the Helen Keller International (HKI) and the International Centre for Diarrhoeal Disease Research, Bangladesh collaborated on a cross-sectional health and nutrition study in Lalbagh, a non-slum area in Dhaka. Data from the December round of the NSP for slum areas (n=1,788) and the rural sites (n=16,140) were used with the non-slum site (n=1,392). Similar instruments and methodology were employed in all three areas. Descriptive analysis was undertaken to explore the differences in household socioeconomic, food expenditure and consumption patterns, and health and nutritional status among the pre-school children aged 6-59 months living in these areas. Logistic regression was used for estimating the odds of being malnourished. Various risk factors and the relative strength of the risk factors for malnutrition were also measured for the three different environments.

Results: The prevalence of stunting (%<-2 z-score) among the pre-school children was higher in the urban slums, followed by the rural and urban non-slum areas (66.2%, 61.1%, and 52.5%) respectively. Analysis of the household socioeconomic situation showed that there was also great disparity within each of these areas. Comparing nutritional status among the children from vulnerable households (landless and/or where the main earner is a casual worker) by area revealed the severity of underweight in the urban slums: 71.0% vs. 61.9% in the urban non-slums vs. 64.8% in the rural areas. Diarrhoea, vulnerability, and slum habitat were significantly associated with increased risk of being underweight.

Conclusion: Urban growth is currently estimated at over 9% per year in Bangladesh. While urbanization is associated with industrialization and economic development, it also results in an increase in slum and squatter settlements. As seen from this analysis, the pre-school children in the slum areas of Dhaka and other sites were at equal or greater risk of poor health and malnutrition than their counterparts in the rural and non-slum areas. While the malnutrition rates for children living in the areas are also high by international standards, the results of the study suggest that particular attention should be given to improve the situation for children living in the urban slums.

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Assessing the Impact of a Community-based Nutrition Project in Rural Bangladesh through Active Participation of Women

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Objective: Assess the impact of community-based nutrition activities of the Bangladesh Integrated Nutrition Project in reducing the prevalence of malnutrition in children aged less than two years.

Methodology: The Bangladesh Integrated Nutrition Project (BINP) has been implemented in six rural thanas by the Government of Bangladesh since early 1996. Its main objective is to develop a national nutrition programme to bring about positive behavioural changes for the control of malnutrition among the children and women. Direct beneficiaries of the Project are children aged less than two years, pregnant and lactating mothers. Data for this study were collected through the monthly performance reports prepared at the Community Nutrition Centres (CNC) by the Community Nutrition Promoters (CNP) and were analyzed at the project office. The study reports the progress of the community-based nutrition activities and the impact of the Project over an eight-month period since April 1997. Nine hundred seventy-two community nutrition centres were opened to bring about 60,000 children under regular monthly growth monitoring and promotion (GMP) to identify severely malnourished and growth-faltered children. Weights of the children were plotted on the growth-monitoring chart, and the nutritional status was determined by the CNP. Children having weight-for-age less than 60% of the median of the NCHS standard were considered severely malnourished as per above criteria and were targeted for educative/therapeutic supplementary feeding to improve their nutritional status.

Results: The GMP began with a coverage rate of 75.5% children in April 1997 and rose to 92.7% in November 1997. The severe malnutrition rate among the targeted children came down to 2.88% from 13.81% over an eight-month period. While the rate was compared with the data collected during the baseline survey at the beginning of the Project, it seemed that the severe malnutrition rate in the project thanas reduced significantly. The rate of severe malnutrition in the BINP thanas was also found remarkably low compared to the findings of the Child Nutrition Survey undertaken by the Bangladesh Bureau of Statistics (BBS) and the Bangladesh Demographic and Health Survey conducted in 1997.

Conclusion: Participation of the community people, especially women in interventions can reduce the prevalence of malnutrition in children within a short time.

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Aetiology of Anaemia in Bangladesh

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Objective: Find out the magnitude and aetiology of anaemia prevailing in Bangladesh.

Methodology: A sample of 7,764 people drawn from 14 villages of 14 districts was selected, using the multistage cluster-sampling technique. Sociodemographic data were collected, using an interview schedule. Blood samples were collected for Hb estimation by the cyanmethaemoglobin method. Anaemia was diagnosed as per WHO criteria. To find out the relationship between worm infestation and anaemia, stools of all subjects were examined in the field condition in saline and iodine preparation. To find out the relationship between food intake pattern and anaemia, the dietary intake pattern of the study population aged over two years was collected through 24-hour recall method and that of children aged less than two years was collected by interviewing mothers.

Results: Of the respondents, 44.4% were male, and 55.6% were female. Overall, 86.0% of the study population was detected to be anaemic [cut-off value: haemoglobin 12 g per 1 dl of blood]. Using WHO criteria, the prevalence of anaemia was found to be 66.5% in the male children and 71.3% in the female children [age group 0-5 years, cut-off value: Hb 11 mg/dl of blood for both sexes], 90.7% for boys and 90.6% for girls [age group 6-14 years, cut-off value: Hb 12 mg/dl of blood for both sexes], 89.1% for adult males [age group >14 years, cut-off value: Hb 13 mg/dl of blood] and 86.8% for adult females [age group >14 years, cut-off value: Hb 12 mg/dl of blood]. More females were moderately and mildly anaemic (7-11.9 g/dl). Males in comparison with their female counterparts in the same age groups had higher proportion with normal haemoglobin concentration of 12 g/dl or more. Most study subjects (76.5%) were moderately and mildly anaemic (Hb 7-11.99 g/dl). Of them, most anaemic people (59.6% of the total study population) had Hb 7-10.99 g/dl. The distribution of the prevalence of anaemia was almost the same all over the country. Anaemia was found to be positively associated with poor social status, larger family size, and socioeconomic status indicated by the type of house, the type of water supply, and possession of latrine. Anaemia was also found associated with poor nutritional status both for the children aged 0-120 months (z-score) and the adult population (BMI). Cooking food by water other than tubewell water was found risky for anaemia (odd ratio=1.67; $l2=10.05$; $p<0.001$). The latrine type or the mode of use (OR=1.25; $l2=11.17$; $p<0.001$) was associated with anaemia. The presence of anaemia was also related with the presence of intestinal parasites (OR=1.3; $l2=15.61$; $p<0.0001$). The presence of ova of AL was highly significant (OR=1.5; $l2=15.61$; $p<0.0000001$). The type of food (vegetarian and omnivorous population) had association (OR=1.5; $l2=34.77$; $p<0.00000001$) with anaemia. The children, who are not exclusively breastfed, but given any supplementary food, had relation (OR=3.45; $l2=15.83$; $p<0001$) with anaemia. Diagnosis of anaemia by clinical signs was not proved very sensitive. Using cut-off point for Hb of 10 mg/dl for anaemia, sensitivity and specificity were adequate. Morphological study showed that most anaemic subjects had iron deficiency.

Conclusion: In the study, anaemia was found to be associated with age, sex, social status, source of water, type of food, and infection. Anaemia, however, may be marked for nutritional, social and environmental factors rather than only these problems. It is, therefore, uncertain if the therapeutic treatment of anaemia alone can improve the situation.

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Serum Zinc and Vitamin A Status of Malnourished Children Fed a High-protein Diet during Recovery

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Objective: Evaluate the effect of a high-protein diet on growth, serum proteins, and micronutrient status of malnourished children.

Methodology: Sixty-nine children were randomized to receive either a high-protein (HP) or a standard protein (SP) diet for three weeks in the metabolic study ward, and then followed-up at home for six months. Body weight and height were measured, and concentrations of serum proteins, retinol, and zinc were also determined on admission, at 3 weeks, and at 6 months.

Results: The mean±SD height increment was 5.3±1.0 cm in the HP group compared to 4.2±1.1 cm in the SP group ($p<0.001$). The mean increment of serum protein concentrations (7.5 g/L vs. 2.9 g/L) and retinol (45 µg/L vs. 20 µg/L) was significantly higher in the HP group compared to the SP group at 3 weeks, but not at 6 months. Inspite of higher dietary zinc intake in the HP group than in the SP group (5.7 mg/kg.d vs. 2.9 mg/kg.d), the serum zinc concentrations were not significantly different between the two groups.

Conclusion: Diet rich in protein, energy, and micronutrients fed during the recovery period enhances the growth of malnourished children, but does not have sustained effects on protein and micronutrient status.

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Standardized Management Reduces Mortality among Severely Malnourished Children with Diarrhoea

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Objective: Reduce mortality and cost of treating severely malnourished children with diarrhoea by following a standardized management protocol.

Methodology: The mortality rates and the cost of treatment were compared between severely malnourished children aged 0-5 years, who received standardized management (standardized group, SG) and conventional management (comparison group, CG). Key points of SG are the standardized use of rehydration fluids with emphasis on oral rehydration solutions (ORS), slower rehydration, appropriate feeding, routine micronutrient supplementation, antibiotics therapy, and proper management of complications. Conventional management included rehydration within 3-4 hours, giving antibiotics only if there were obvious features of infection, delay in feeding until rehydrated, and supplementing with micronutrients only when indicated. The SG included children admitted to one of the three clinical units from 1 January to 30 June 1997. Children admitted to the same clinical unit from 1 January to 30 June 1996 (before the protocol was implemented) constituted the CG. Odds ratios with 95% confidence intervals were calculated for outcome variables, like mortality rates.

Results: Admission characteristics of children in the SG (n=334) and CG (n=293) were comparable except that more SG children had oedema, acidosis, and *Vibrio cholerae* isolated from stools. Sixty percent of the children in the SG were successfully rehydrated with ORS rather than intravenous fluids compared to 29% in the CG (p=0.00001). The use of expensive antibiotics was less in the SG (p=0.0001). The SG children had fewer episodes of hypoglycaemia (15 vs. 26, p=0.02). Costs of laboratory tests, intravenous fluids, and antibiotics were significantly less in the SG. Thirty children (9%) died in the SG whereas 49 (17%) died in the CG (p=0.003; OR 0.49, 95% CI 0.3-0.8).

Conclusion: Standardized management resulted in a 47% reduction in mortality among the severely malnourished children with diarrhoea, fewer episodes of hypoglycaemia, and lesser use of intravenous fluids. The use of expensive antibiotics as well as the cost of laboratory tests and intravenous fluids were also minimized. The use of a standardized approach should be considered in the care of severely malnourished ill children.

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Nutritional Rickets without Vitamin D Deficiency in the Chakaria Region of Bangladesh

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Objective: Explore the aetiology and characterize the clinical aspects of rickets in children in Chakaria.

Methodology: Fourteen rachitic children and 13 children identified by subjects' families as unaffected were evaluated clinically and investigated.

Results: The age of rachitic children (9 males and 5 females) varied from 36 to 98 months (mean 69 months); their parents reported them being symptomatic of rickets since an average of 24 months of age (range 0-48). Rachitic deformities included knock-knees (10), bowed legs (4), and sabre tibia (3). Ten of the 14 affected children had active rickets as determined by serum alkaline phosphatase activities > 350 U/L; 7 of the 12 children subjected to x-rays had radiographic evidence of active rickets. The rachitic children had a mean alkaline phosphatase activity of 492 U/L (range 198-834; controls with mean 206 and range 138-331; $p<0.0001$), a mean serum calcium level of 9.6 mg/dl (range 8.5-10.4, not significantly different from controls), a mean serum phosphorous level of 4.3 mg/dl (range 1.9-5.6; controls with mean of 5.2, range 4.3-5.8; $p<0.003$), a mean serum 25-OH-vitamin D level of 20 ng/mL (range 7-65 with two subjects less than 14; controls: mean 25, range 16-35; $p<0.008$), and a mean serum 1,25-(OH)2 vitamin D level of 131 pg/mL (range 78-190; control mean 73, range 22-144, and 9 of the 13 subjects above the upper limit of "normal" $p<0.0005$). Of the 10 children with active rickets, only two had low vitamin D levels (one with hypophosphataemia), and one had hypophosphataemia; calcium deficiency was the most likely aetiology of the rickets in at least seven of the affected children. Interestingly, three "unaffected" children had physical findings consistent with rickets (each with beaded ribs, one also with widened wrists, another also with knock-knees) without elevated alkaline phosphatase activities.

Conclusion: The results of the study demonstrate that active rickets in Chakaria is not usually associated with vitamin D deficiency, and that the clinical presentation of rickets in Bangladeshi children is similar to that of African children with calcium-deficiency rickets. Furthermore, the findings of rachitic deformities and elevated serum 1,25(OH)2 vitamin D levels among "unaffected" children suggest that subclinical calcium deficiency might be much more prevalent than previously suspected.

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Effect of Zinc and Vitamin A Supplementation in Undernourished Children with Persistent Diarrhoea in Bangladesh

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Objective: Evaluate and compare the efficacy of vitamin A and/or zinc supplementation on the clinical course of persistent diarrhoea in Bangladeshi children.

Methodology: A double-blind randomized, controlled trial was carried out with 96 moderately malnourished children (60%-75% of wt./age of 50th centile of NCHS standard) aged 6 months to 3 years with diarrhoea for more than 14 days. Children were randomly allocated in 4 groups. Each group (n=24) received either zinc (20 mg elemental zinc in two divided doses per day), or vitamin A (total 200,000 IU in twice daily doses over 7 days) or both (zinc plus vitamin A in a multivitamin syrup); and the control group received only multivitamins (except vitamin A) equal to that of the treatment groups for 7 days. Clinical data were collected by a physician, and stool output, consistency, and frequency were recorded by using metabolic balance for 7 days.

Results: The baseline characteristics of the 4 study groups were comparable. The total diarrhoeal stool output among the 4 groups over 7 days was significantly different ($p<0.02$). Cumulative stool weight reduced significantly ($p<0.0001$) from day 2 to day 7 in the children receiving zinc compared to the control group and also significantly reduced ($p<0.02$) from day 5 to day 7 in the children receiving vitamin A compared to the control group. Differences between zinc and vitamin A or zinc vs. zinc plus vitamin A were not significant ($p=0.5$, $p=0.7$ respectively). The cumulative stool frequency significantly reduced from day 4 to day 7 in the zinc group compared to the control group ($p<0.001$). No significant differences were found between any other pairs. The net gain in the body weight over the 7-day study period was significant only in the children receiving zinc compared to the control group (+100 g vs. -40 g, $p<0.04$). The percentage of children who had clinical recovery (passage of soft stool was taken as recovery) within 7 days was significantly greater in the zinc group (86%) compared to the control group (48%, $p=0.007$) or vitamin A (48%, $p=0.007$), but not with zinc plus vitamin A (68%, $p=0.14$).

Conclusion: The results indicate that zinc supplementation in persistent diarrhoea reduces stool output along with frequency, and promotes earlier recovery; and strongly suggest that zinc supplementation is a standard management for undernourished children with persistent diarrhoea.

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Zinc and Rehabilitation from Severe Protein-Energy Malnutrition: Higher Dosage Regime Associated with Increased Mortality

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Objective: Investigate the catch-up growth of children in severe protein-energy malnutrition, with particular reference to linear growth and the effect of zinc supplementation.

Methodology: One hundred forty-one children aged 6 months-3 years were recruited after admission to a Nutritional Rehabilitation Unit in the Dhaka Shishu Hospital. They were randomized to receive either 1.5 mg/kg for 15 days, 6 mg/kg for 15 days, or 6 mg/kg for 30 days of elemental zinc and followed up for 90 days.

Results: Anthropometric outcome variables included change in height-for-age (z score), change in knee/heel length as measured by knemometer, change in weight-for-age and weight-for-height (z scores) and change in mid-upper arm circumference (MUAC), as well as change in skin-fold subscapular/triceps thickness. No anthropometric variable indicated significant improvement with increased zinc dosage, and in addition, mortality increased significantly in those exposed to high-dose zinc (6 mg/kg) opposed to those exposed to low-dose zinc supplementation (1.5 mg/kg) with a Yates-corrected chi-square p value of 0.033 and a risk ratio of 4.55 (95% confidence limits: 1.09 <RR<18.8).

Conclusion: The study suggests that there is no benefit of higher-dose zinc supplementation. On the contrary, it seems to contribute to increased mortality in the severely malnourished children.

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Patterns of Infection in Severe Protein-Energy Malnutrition and their Effect on Recovery

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Objectives: Detect the incidence of infections and infestations among the severely malnourished children, and compare it with the age-matched control group admitted to the general wards for other reasons without any obvious signs of malnutrition.

Methodology: This prospective study was carried out on 50 severely malnourished children and 50 age-matched control with good nutritional status at the Nutrition Rehabilitation Unit (NRU) of the Dhaka Shishu Hospital from August 1995 to January 1996.

Results: Of the 50 patients, 22 (44%), 15 (30%), and 13 (26%) were suffering from marasmic-k.w., marasmus, and k.w. respectively. Most patients were aged less than one year and belonged to poor socioeconomic status. Thirty-two percent of the fathers and 58% of the mothers were illiterate; 54% of the families used *kancha* latrines, and only a few of the parents washed their hands with soap and water after defecation. Poverty, illiteracy, crowded unhygienic living conditions, poor personal hygiene, lack of safe drinking water, and poor sanitation were found to be the principal socioeconomic determinants of malnutrition and infection which proved that factors which predispose the host to malnutrition also predispose to infection, thus establishing the vicious circle of infection-malnutrition-infection. The severely malnourished children showed a very high incidence of infection (74% vs. 44%), particularly diarrhoea, respiratory tract infections (RTI), bacterial skin infection, and urinary tract infections (UTI). Besides infections, there were many overt and covert complications of infection, e.g. anaemia, dyselectrolytaemia, which simultaneously needed equal attention, like that of controlling infections. The average duration of hospital stay of patients with infections was 14.6 (±8.11) days. Patients in whom no infection was detected were discharged after an average hospital stay of 6.57 (±3.13) days.

Conclusion: This showed a prolongation of hospital stay for the severely malnourished children complicated by different sort of infections.

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Inconsistencies in the Findings of the Bangladesh Child Nutrition Surveys

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Objective: Investigate the reasons of inconsistencies in the findings in the Bangladesh child nutrition surveys.

Methodology: Although the regular personnel of the Bangladesh Bureau of Statistics (BBS) collected data on anthropometry and age in the previous surveys, 1995-96 data were collected by the locally recruited workers employed for this survey only. Data on 100 children included in the 1995-96 survey were collected also by the BBS personnel independently. A comparison of the data from the two sources formed the basis of this study.

Results: The average difference between the two sources (bias) was found to be about 1.8 months in age and 0.13 cm in mid-upper arm circumference (MUAC). The differences in weight and height were negligible. However, random error was found to be significant in data on height.

Conclusion: Bias in age was thought to be mainly responsible for the inconsistencies in malnutrition in different nutrition surveys in Bangladesh. There is a need to develop a tool for collecting data on age accurately, on the basis of a study in a demographic surveillance area where accurate data on age are available. It is also suggested that MUAC should be routinely collected in any nutrition survey until such a tool is fully developed. The importance of accuracy in weight and height data is emphasized.

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Bangladesh National Plan of Action for Nutrition

M.Q-K. Talukder

Objective: Discuss the principles of the Bangladesh Plan of Action for Nutrition. Bangladesh is one of the 159 countries which unanimously adopted a world declaration on nutrition at the International Conference on Nutrition (ICN) held in Rome in 1992. These nations pledged to prepare a National Plan of Action for Nutrition (NPAN) and to take appropriate actions for eliminating hunger and reducing all forms of malnutrition.

Methodology: The Ministry of Health and Family Welfare, Government of Bangladesh, constituted a National Working Committee and a subcommittee to prepare the NPAN. The Bangladesh National Nutrition Council was assigned to coordinate the task. Fifteen concerned ministries were involved in the preparation process. A series of meetings and workshops were held, and individual contributions were sought. The Food and Agricultural Organization (FAO) of the United Nations provided technical assistance and two national and international consultants.

Results: Five documents were prepared. The NPAN core document was developed on the basis of nine themes for nutrition action declared at the ICN. The NPAN contains a description of the existing nutrition situation in the country, defines the policy, objectives, and goals, outlines strategies, and provides the institutional framework for translating the plan into action. Various projects to be developed by the 15 ministries have been identified for implementation to combat malnutrition.

Conclusion: The NPAN has recently been adopted by the Government. Different programmes of the NPAN should help eradicate malnutrition by the year 2010

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National Food and Nutrition Policy: A Multisectoral Approach in Bangladesh

M.A. Mannan

Objective: Improve the nutritional status and the quality of life of the people, particularly the vulnerable groups.

Methodology: A draft national food and nutrition policy (FNP) was prepared by three experts taking into consideration the nutrition situation of the people of the country. It was presented in a workshop participated by policy makers, sectoral stakeholders, and beneficiaries. The recommendations of the workshop were incorporated in the policy. It was finally modified based on the sectoral comments, and the policy dialogue initiated. The FNP was placed before the Bangladesh National Nutrition Council (BNNC) and the Council of Ministries (Cabinet) for approval.

Results: The FNP, approved recently by both BNNC and the Cabinet, is intended to compliment the Government's other sectoral development policies. The strategy for effective implementation of the FNP is divided into four major sectors: (a) Food, agriculture, fisheries, livestock, and forestry for increased production, proper distribution, and food security; (b) Health, family welfare, and environment for primary health care, caring practices, disease control, sanitation, and hygiene; (c) Nutrition education and communication for the creation of awareness at different levels with formal and non-formal education; and (d) Community development and social welfare for poverty alleviation, income generation, and economic growth. To implement the various provisions of the FNP, a national plan of action for nutrition has been approved.

Conclusion: The FNP has the opportunity for its successful implementation since it has been developed through a multisectoral approach, and the stakeholders have the ownership. However wide publicity at different levels, and strong coordination among the stakeholders during its implementation, monitoring and evaluation are required.

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Nutrition Initiative in Bangladesh: Is It a Blessing or Human Right?

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Objective: Review the National Food and Nutrition Policy (FNP) and the National Plan of Action for Nutrition (NPAN) to see if they would be able to meet the need of the country by the year 2010 through project like Bangladesh Integrated Nutrition Project (BINP).

Methodology: Secondary data were analyzed to review the nutrition initiatives taken in Bangladesh.

Results: Against all odds, the country has achieved some progress in various nutrition indicators. Stunting among children aged less than five years has reduced to 51.4% in 1995-1996 compared to 64.2% in 1992; coverage of vitamin A supplementation among children rose from 30% in 1980 to 84% in 1996; and consumption of iodized salt in the households increased to 67% in 1996 from 44% in 1995. All these marked major progresses in the selected indicators. Between 1993 and 1996, the average household consumption had increased at a rate of 8.2% annually. Despite these positive changes, malnutrition is still at an unacceptably high level. About 9 of the 10 children are malnourished in one way or the other; 70% of the pregnant women and children are anaemic; and about 650 children's deaths per day are attributed to malnutrition. Early childhood malnutrition, including anaemia and iodine deficiency disorder reduce learning ability and retard national efforts on education and development. The country, however, has made progress on several areas, viz. Cabinet's approval of the National Food and Nutrition Policy, finalization and approval of NPAN and launching the Bangladesh Integrated Nutrition Project (BINP). The FNP, NPAN, and BINP strive for achieving nutrition goals for Bangladesh. The FNP gives an overall policy, the NPAN provides a broad-based guideline of inter-sectoral nutrition plans, including activities under various ministries/sectors, and the BINP is the most active programme of the FNP and the NPAN.

Conclusion: Good nutritional status is the basic right of women and children. It is important that the issue of nutrition should be moved from blessing and welfare programme to the agenda of rights. Given the magnitude of the problems, immediate actions should be taken under the NPAN and FNP. The BINP activities should be expanded and enriched where necessary.

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Trends, Measures and Indicators of Food and Nutrition Security in Rural Bangladesh: Findings from the Nutritional Surveillance Project

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Objective: Describe the trends in nutrition and food security since 1990 with respect to market dependency, differences in production periods, lean and peak (seasonal) influences, and vulnerability.

Methodology: Data for this analysis came from the ongoing Nutritional Surveillance Project (NSP) of the Helen Keller International (HKI), Dhaka and the Institute of Public Health Nutrition (IPHN). Using a network of 19 partner organizations, the NSP monitors trends in nutritional status of children through bimonthly collection of data on nutrition, health, and socioeconomic and demographic variables from approximately 16,000 children and 14,000 households from 41 subdistricts throughout Bangladesh. 157,344 children were included in this analysis. Information on socioeconomic status, food consumption, and health status was collected using standardized questionnaire, and weights and heights were measured up to an accuracy of 100 g and 0.1 cm respectively.

Results: The study presents a comparative picture of the nutritional status of children in the 'vulnerable' group and 'non-vulnerable' group of households. The nutritional status of children (weight-for-age) improved in peak season. The gap between the two groups remained, and the magnitude of improvement was higher among the children from the non-vulnerable households. The nutritional status of children improved from Time 1 (T1) to T2 for both the groups with greater magnitude of improvement among the non-vulnerable households. Nutritional status deteriorated slightly from T2 to T3, with more deterioration among the vulnerable households. The nutritional status of children was significantly associated with lean season, vulnerability status, diarrhoea, gender and high rice-price period.

Conclusion: Children from the households that have land (non-vulnerable groups) benefited from the low rice-price period. These households consumed more of their own production and increased expenditure on other foods. Children from the vulnerable households also benefited in the low rice-price period. With relatively lower rice prices, these households purchased more rice from the market and had the opportunity to spend more on other foods. This increase in real income, due to the decline in rice prices, translates into the increased food availability. The increased food availability, evident by the increased per capita intake of rice and expenditure on other foods, is associated with declining levels of malnutrition.

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The Bangladesh Integrated Nutrition Project: The Secrets of Achievements

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and J. Rawshan

Objective: Find out the association of information, education and communication (IEC) in relation to the outcome of intervention. The IEC activities have been identified as the heart of the community-based nutrition activities of the Bangladesh Integrated Nutrition Project (BINP), which was launched about two and a half years ago and is on the ground practically for little more than a year.

Methodology: This evaluation is based on both primary and secondary data collected from various sources and in various time-frames. The major sources of data were the monthly performance report, the fortnightly report prepared jointly by all stakeholders of the BINP, the monthly monitoring report prepared by the Ministry, IDA supervision Mission's report, IDA-UNICEF joint review Mission's report, the six-monthly progress report of the Project, field visits, interviews, and structured questionnaires. Data from all the primary and secondary sources were collected, analyzed and interpreted, but most data presented here are qualitative in nature.

Results: The knowledge, attitude and practice of supplementary feeding for the severely malnourished children were well known to all the mothers interviewed. The effect of supplementary feeding in reducing malnutrition was also known to them. It revealed that the role of IEC activities in reducing severe malnutrition was significant ($p<.001$). There was also a significant association between supplementary feeding of women and the outcome of pregnancy in terms of low birth weight and maternal mortality and knowledge. The IEC activities have changed the health and nutrition behaviour of the community with respect to growth monitoring and promotion, feeding of colostrum, infant feeding, caring practices of children and women, and nutritional status of the children aged less than two years in all the project thanas. All activities at the community were mutually supported and accentuated by the cooperation of both government (GO) and non-governmental organizations (NGO).

Conclusion: Effective IEC activities with the GO-NGO cooperation can result in positive nutrition behaviour, and improve the nutritional status of children and women of the community. Every activity to develop a nutrition vision in Bangladesh should have a strong IEC element and mutual support and cooperation of the local institutions, including NGO for longer sustainability.

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Perinatal Transmission of Hepatitis B in Rural Bangladesh

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Objective: Estimate the relative importance of perinatal transmission of hepatitis B in Bangladesh.

Methodology: Paired-serum samples (330 mothers and their 334 infants) were tested for hepatitis B markers in a cross-sectional study. Infants were aged 2-8 months (~40 per age month), and cord blood was drawn from 33 deliveries. Laboratory personnel were kept blind on any information regarding the individual. The study evaluated hepatitis B core (HBcAg), surface antigen (HBsAg) and e-antigen (HBeAg) using a commercial ELISA test kit. All samples were screened for HBcAg and those testing positive were further tested for HBsAg. Those positive for HBsAg were in turn tested for HBeAg.

Results: The mothers were young and of low parity, with a mean (SD) height of 150 (5.4) cm. The mean birth weight of 33 infants delivered at the hospital was 2.5 (0.46) kg. In maternal samples, 107 (32.4%) were positive for HBcAg, 18 (5.4%) for HBsAg, and 4 (1.2%) for HBeAg. In infant samples, 35 (10.5%) were positive for HBcAg, 1 (0.3%) for HBsAg, and none for HBeAg. Of the 35 HBcAg-positive infants, only 1 was an offspring from a HBcAg-negative mother, and was a 7-month old girl who was otherwise HBsAg-negative. Of the 18 HBsAg-positive mothers, 4 (22%) were HBeAg-positive. All 14 children of the mothers who were HBeAg-negative were negative for HBsAg. Only one among four (25%) of the children of the HBeAg-positive mothers was HBsAg carrier (8 months old), and in three children, transmission did not occur (two 8 months old, one 6 months old).

Conclusion: Hepatitis B is prevalent in rural Bangladesh. Perinatal transmission mode is relatively low. HBsAg-positive and negative for e-antigen mothers do not infect their babies. The low transmissibility of surface antigen to infants reported in this study contrasts with the published reports from other developing countries.

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Multiresistant *Salmonella* Infections: An Emerging Health Problem in Bangladesh

Mahbubur Rahman and M.J. Albert

Objective: Determine the prevalence and importance of multiresistant *Salmonella* isolates in Dhaka, Bangladesh.

Methodology: The present status of multiresistant *Salmonella* infections was studied by analyzing cases who submitted faecal samples for culture to ICDDR,B hospital in Dhaka during 1989-1995.

Results: In total, 4,044 *Salmonella* strains were isolated from 120,489 (3.36%) faecal samples during 1989-1995. Of the 499 salmonellae isolated in 1989, group C (33%) was the most common isolate, followed by *S. typhi* (21.2%), and group B (20.8%). In 1992, the isolation rate of *Salmonella* group B increased significantly to 57% ($p<0.01$) of the 628 *Salmonella* isolates, which increased further to 65% of the 977 *Salmonella* isolates in 1995. The isolation rates of *S. typhi* and all other serogroups decreased significantly in 1995 compared to 1989. Of the 82 *Salmonella* group B isolates tested, 45 (55%) were *S. typhimurium* and 35 (43%) *S. gloucester*. Both the serotypes were resistant to ampicillin, trimethoprim-sulphamethoxazole, chloramphenicol, and tetracycline which are mediated by a 157-kb conjugative plasmid.

Conclusion: The findings of the study suggest that multiresistant *S. gloucester*, a rare serotype, and *S. typhimurium* were responsible for *Salmonella* diarrhoea in Bangladesh.

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Sero-epidemiological Study of Dengue and Dengue Haemorrhagic Fevers in a Metropolitan City of Bangladesh

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Objective: Identify the proportion of dengue and dengue haemorrhagic fevers (DHF) in children attending the Chittagong Medical College and Hospital (CMCH).

Methodology: The Ministry of Health and Family Welfare, Government of Bangladesh and the World Health Organization (WHO) jointly sponsored a hospital-based descriptive cross-sectional survey which identified dengue and DHF serologically. At the paediatrics departments (both out- and in-patients) of the CMCH during September 1996-June 1997, 255 cases were included consecutively following inclusion criteria, i.e.: febrile illness for 72 hours, 1–15 years of age, no focal clinical sign, and no evidence of any other infections detected by the available routine tests. Paired serum samples were taken from each case the first sample on admission or at attendance, and second sample after 7 days. The serum samples were processed and preserved for bulk transportation to the Virology Laboratory of the Institute of Epidemiology, Disease Control and Research in Dhaka. A specified data collection form was used for each subject. For serology, haemagglutination inhibition (HI) test was used following the Clarke and Casals Technique 1958 and interpreted according to the WHO criteria. Data were analyzed, using the EPINFO 6 software.

Results: 255 were finally included for the study yielding same numbers of paired samples for HI test. The total number of males was 155 (60.7%) and of females 100 (39.3%), ratio being 1.5 and the mean age 7.2 years. Thirty-five (13.7%) cases were found to be positive for dengue, of which 71.4% were males and 28.5% females (ratio 2.5); 14.3% were of primary, 37.1% of secondary, and 48.6% of mixed (primary/secondary infections). Dengue virus subtypes alone or in combination were: D2 2.9%, D3 47.7%, D4 28.6%, D2+D3 2.9%, D2+D4 11.4%, D3+D4 8.6%, and no D1. The 5–9-year age group was most affected with 57.1% frequency, followed by 1–4 and 10+ years age group. Seasonal occurrences of the positive cases were: premonsoon 28.5%, monsoon 25.7%, and postmonsoon 45.7%.

Conclusion: Contrary to the common notion, dengue is present in Bangladesh with high male preponderance; higher frequency relates to monsoon; secondary and mixed types and all subtypes of virus except D1 predominate. Present situation is possibly an alarming harbinger of future catastrophe.

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Community-based TB Control Programme in Bangladesh: A Grassroots-level Experience of BRAC

A.M.R. Chowdhury, Sadia A. Chowdhury, and Akramul Islam

Objective: Review the experience of BRAC in community-based tuberculosis control programme in Bangladesh. Tuberculosis is one of the leading killers in Bangladesh accounting for nearly 80,000 deaths and 150,000 additional cases each year. For TB diagnosis and for making treatment available and accessible at the village level, BRAC initiated a community-based TB control programme in 1984 in one thana (phase one). *Shasthya Shebikas* (voluntary female health workers) were the nucleus of the programme, who were involved in symptomatic identification and ensuring directly observed treatment. In the phase two (1992-1994), the programme was expanded to include nine more thanas, and in the phase three (1995), another eight thanas were included.

Methodology: All data from 1992 to 1995 were analyzed. Analyses in phase two (12-month therapy) and phase three (8-month therapy) were done separately to find out the treatment outcomes. In addition, a cross-sectional survey of tuberculosis was conducted in more than 9,000 randomly selected households in two phases—two intervention or programme thanas and one non-programme thana. Follow-up analysis of all the treated patients in the programme thanas was also done.

Results: In phase two analysis, 90% of the identified 3,886 cases accepted the 12-month regimen treatment. In phase three, all of the 1,741 identified cases accepted the 8-month regimen treatment. The cure rate was 81% and 85.9% in phase two and phase three respectively. The relapse rate two or more years after the completion of treatment was found to be higher than the earlier rate. The drop-out rate was found to be 3.1%. In the cross-sectional survey, the prevalence of tuberculosis was found to be half in the BRAC intervention area (0.07 vs.15 per 100).

Conclusion: The community-based tuberculosis control programme of BRAC, in collaboration with the National Tuberculosis Programme, achieved 85% cure rate and high case-detection rate. The prevalence survey suggested that at least half of the existing cases have been detected by the programme.

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Early Termination of a Randomized Controlled Trial for Evaluating Alternate Therapeutic Regimens for Uncomplicated Malaria in a Thana Health Complex of Bangladesh

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Objective: Compare the efficacy of alternate therapeutic regimens for uncomplicated malaria (UM) recommended for hyper-endemic malarious zones of Bangladesh.

Methodology: The Ministry of Health and Family Welfare, Government of Bangladesh and the World Health Organization jointly sponsored a Thana Health Complex (THC)-based randomized controlled trial for comparing 1st, 2nd and 3rd line regimens for UM. The regimens were chloroquine (CQ) for 3 days, oral quinine sulphate for 3 days followed by single-dose sulphadoxine/pyrimethamine (Q3+SP), and oral quinine for 7 days (07). The sample size included 400 patients, and randomization was done by lottery. Patients aged over 12 years and of both sexes with fever or history of (H/O) fever over the last 48 hours, blood slide showing asexual *P. falciparum* parasite count between 500-250,000/cmm, with no severe manifestations, no H/O antimalarials over the last 7 days and having no concomitant febrile illness, were included in the study. Patients agreeing with written consent to stay in hospital for 8 days and allowing daily blood slide examination were included and followed up on day 14, 21, and 28. Patients failing to attend for follow-up were visited in their homes. Drug administration was supervised. Clinical and parasitological responses were recorded on a pre-designed scale. The results were analyzed, using the EPI INFO 6 software.

Results: Complete data on 212 patients were available for a mid-term evaluation, of which 8 patients were lost to follow-up. A sensitive clinical response was observed in 22 (17.32%) of the 81 patients in the CQ group, 59 (77.63%) of the 76 patients in the Q3+SP group, and 47 (100%) of the 47 patients in the Q7 group. An early treatment failure was observed only in the CQ group (45.67%), and all the failures with Q3+SP were due to late treatment. The parasitological response was almost similar except that two patients in the Q7 group had asymptomatic parasitaemia on day 28. The groups were comparable in respect of all other variables.

Conclusion: The highly significant difference in sensitivity led to the termination of the trial. If similar sensitivity pattern is observed in other parts of the country, modification of national recommendations would be required. Mefloquine may be considered the second choice of treatment if not the first.

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Molecular Analysis of Toxigenic *Vibrio cholerae* Strains Isolated in Bangladesh During 1961-1996: Relationship Between Continual Emergence of New Toxigenic Clones and Epidemics of Cholera

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Objective: Analyze virulence-associated genes, and study clonal relationships among toxigenic *Vibrio cholerae* strains isolated in Bangladesh during 1961-1996 to establish whether seasonal epidemics are caused by repeated emergence of the same strains or by diverse clones of toxigenic *V. cholerae*.

Methodology: Three hundred seventy-eight *V. cholerae* isolates obtained from cholera patients or from surface water were included in the study. Molecular analysis of virulence-associated gene clusters, including the CTX genetic element, *tcpA*, *tcpI*, and *ToxR* was performed using specific probes or PCR assays. Comparative analysis of serotype-specific *rfb* gene clusters in selected *V. cholerae* O1 and O139 strains was performed by multiple PCR assays using primers corresponding to defined regions of the *rfb* genes. Clonal relationships among strains were studied by computer-assisted numerical analysis of restriction fragment length polymorphisms in conserved rRNA genes. Induction and propagation of the lysogenic bacteriophage-encoding cholera toxin (CTXF) were studied both in animal models and under laboratory conditions.

Results: Analysis of toxigenic *V. cholerae* strains isolated during 1961-1996 revealed clonal diversity among the strains isolated during different epidemics. This study demonstrated the transient appearance and disappearance of more than 6 different clones among classical vibrios, at least 5 clones of El Tor vibrios, and 3 different clones of *V. cholerae* O139. Different clones of strains belonged to different ribotypes and often to different CTX genotypes resulting from differences in the copy number of CTX element and variations in the integration site of CTX in the chromosome. Studies on the induction of lysogenic CTXF revealed that 37.95% of the strains tested could be induced with mitomycin-C to produce infectious extracellular CTXF particles which infected recipient strains under conditions conducive to the expression of *tcp* genes.

Conclusion: There has been a continual emergence of new clones of toxigenic *V. cholerae* replacing the existing clones, possibly through the horizontal transfer of virulence-associated genes, and natural selection involving unidentified environmental factors and immunity of the host population. In view of the recent discovery of lysogenic conversion by CTXF as a possible mechanism of origination of new toxigenic clones, it appears that the continual emergence of new toxigenic clones and their selective enrichment during cholera outbreaks constitute an essential component of the natural eco-system for the evolution of epidemic *V. cholerae* strains and the genetic elements that mediate the transfer of virulence genes.

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Contrasting Findings of Acute Respiratory Infection between Urban and Rural Children: Recent Observations from an Ongoing Study

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Objective: Compare the clinico-epidemiological and microbiological findings on acute respiratory infection (ARI) between the urban and rural Bangladeshi children aged less than five years.

Methodology: The study, initiated in 1994, was conducted on the basis of a series of cross-sectional observations on the children aged less than five years with the complaints of ARI, attending the outpatient departments (OPDs) of selected urban hospitals and rural thana health complexes (THCs). The children were clinically examined, and epidemiological data were collected from the children's family. Naso-pharyngeal swabs were streaked onto enriched chocolate agar and were cultured bacteriologically. Data were analyzed, using the SPSS/PC+ software.

Results: Although five hundred forty-six children have been studied so far since 1994, recent cross-sectional data on 83 children (38 from urban and 45 from rural OPDs) are reported here. As per WHO's classification of ARI, pneumonia was predominantly prevalent (44%, 36/83), followed by non-pneumonic (41%, 34/63) cases. Infants (aged less than one year) from rural OPDs suffered more than their urban counterparts (p=0.01). Moreover, the rural subjects suffered from pneumonia (p=0.003) more than the urban ones (p=0.24). The male and female subjects differed in their clinical types of ARI (p=0.002) while more (92%, 11/12) girls suffered from severe pneumonia than the boys (8%, 1/12), more boys (69% 25 of 36) suffered from pneumonia than the girls (31%, 11/36). *Haemophilus influenzae* was predominantly isolated (63%, 52/83) over other bacteria (37%, 31/83). *H. influenzae* was isolated from pneumonia and severe pneumonia cases more from the rural subjects (61%, 17/28) than their urban counterparts (58%, 14/24). In contrast, serotype-specific *H. influenzae* was more significantly associated with the pneumonia cases from the urban (p=0.000) than the rural (p=0.16) areas. Over 95% of the subjects had cough, and over 63% had difficult breathing. Chest indrawing, wheeze, and crepitation were significantly associated with the isolation of *H. influenzae* more among the urban than rural subjects (p=0.003 and 0.007 respectively).

Conclusion: The clinical and bacteriological findings on ARI cases among the children aged less than five years contrast between the urban and rural areas. A more detailed study is underway.

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Immunoblot Analysis as a Diagnostic Tool for Detection of Visceral Leishmaniasis in Bangladesh

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Objective: Develop a specific diagnostic test for visceral leishmaniasis in Bangladesh.

Methodology: Sera of 32 confirmed visceral leishmaniasis (VL) patients, obtained from different hospitals in Bangladesh during November 1996-April 1997, were studied by the immunoblot technique with antigen prepared from *Leishmania donovani*. Controls included sera of 34 healthy individuals from both endemic and non-endemic regions, 25 patients with non-leishmanial infections, and one individual treated for visceral leishmaniasis. Direct agglutination test (DAT) was performed on all sera.

Results: Sera of the VL patients showed heterogeneity of polypeptide recognition and identified many polypeptides with relative molecular mass ranging from 16 to >106 kD. The 56-64-kD band was recognized by all sera, while the 106, 78, 76 and 66-kD polypeptide bands were identified by 91%, 91%, 97%, and 97% of the sera from the VL patients respectively. Three of these polypeptides and the 56-64 kD polypeptide were recognized by 97% of the sera from the VL patients. The 76-kD polypeptide band was not recognized by sera of only two patients, of whom one had been treated for VL. The recognition of the 56-64-kD band had a sensitivity and specificity of 100% and 90% respectively and that of the 76-kD band has a sensitivity and specificity of 97% and 98%. For both VL patients and the treated individual, DAT was positive at high titre (1:102400). The sera of patients with non-leishmanial infection identified one or two of the five specific polypeptides, but in no case more than two.

Conclusion: Immunoblot analysis can be a valuable tool in specific diagnosis of active visceral leishmaniasis in Bangladesh. The recognition of the 56-64-kD band, in addition to any three bands, may be considered diagnostic of VL. Additionally, further studies can confirm if this technique can differentiate active infection from treated infections unlike DAT, which is currently used in Bangladesh.

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Reported Morbid Symptoms and Conditions of Pregnant, Intrapartum and Postpartum Women: Experience from Three Villages

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Objective: Investigate reported morbid symptoms and conditions of antepartum, intrapartum and postpartum women.

Methodology: In early 1996, a cross-sectional survey was conducted in three villages outside ICDDR,B Matlab intervention and comparison areas. All married women aged 14-49 years were identified, and 208 women were found to be either pregnant or within 12 weeks of postpartum period. One hundred and fifty-seven (76%) of these women were interviewed for morbid symptoms and conditions they had during the survey, and were also asked to recall symptoms and conditions they suffered during their antepartum, intrapartum or postpartum periods.

Results: During the survey, 127 (81%) women reported at least one morbid symptom or condition, while 85 (54.1%) women reported symptoms, indicative of anaemia, 36 (22%) leukorrhoea, 34 (21.7%) urinary problems, and 33 (21%) genital prolapse. In addition, 67 (43%) women reported postpartum haemorrhage, 44 (28%) prolonged, obstructed or difficult labour, 27 (17.2%) perineal tear, 19 (12 %) breast problems, and 16 (10%) postpartum fever. Women of older age and higher parity were more likely to report at least one morbid symptom or condition and also were more likely to report symptoms, indicative of anaemia ($p<.05$).

Conclusion: Pregnant, intrapartum and postpartum women in rural Bangladesh bear significant burden of morbid symptoms and conditions, especially with increasing age and parity. Though not validated by physical examinations or laboratory tests, the data suggest a true account of women's perceptions of their own illnesses which are of crucial importance since women, in most situations, use health services according to their perceptions of sufferings. To improve the rural women's health, health policy makers need to be aware of women's health problems as women view them.

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Efficacy and Safety of Ciprofloxacin Suspension in the Treatment of Childhood Shigellosis

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Objective: Compare the clinical and bacteriologic efficacy and toxicity of ciprofloxacin and amdinocillin pivoxyl in the treatment of shigellosis in children.

Methodology: This randomized, double-blind, controlled clinical trial was conducted at the Dhaka Hospital of ICDDR,B from August 1995 to March 1997. Children aged 2-15 years with *Shigella*-associated dysentery of £72 hours were eligible, provided their parents gave a written consent. Patients stayed in the hospital for 6 days and returned for follow-up evaluation 7 and 30 days after discharge. Assessment of joint symptoms and function was made daily and at follow-ups. Safety of the study drugs was evaluated in a total of 141 children enrolled in the study (70 in the ciprofloxacin group and 71 in the amdinocillin pivoxyl group) of whom the clinical and bacteriologic efficacy could be evaluated in 120 children (60 children in each treatment group). Patients received either ciprofloxacin suspension, 10 mg/kg 12 hourly or amdinocillin pivoxyl tablets, 15-20 mg/kg 8 hourly for 5 days. Therapy was clinically effective, if a patient did not have frank dysentery on day 3; and had no bloody-mucoid stools on day 5, had £1 watery stool, £6 total stools, and was afebrile; and bacteriologically successful, or if *Shigella* could not be isolated from faecal samples on day 3 and thereafter. The rates of clinical and bacteriologic cure, and the rates and types of the adverse events in the two treatment groups were compared using the standard statistical tests.

Results: Therapy was clinically successful in 48/60 (80%) and 39/60 (65%) patients (difference 15%; 95% CI -0.7- 30.8), and bacteriologically successful in 60 (100%) and 54 (90%) patients (difference 10%; 95% CI 2.4 -17.6%) who had received ciprofloxacin and amdinocillin respectively. Joint pain after initiation of therapy occurred in 13/70 (18.6%) and 16/71 (22.5%) patients who had received ciprofloxacin and amdinocillin respectively (p>0.2), and no patient had signs of arthritis.

Conclusion: Ciprofloxacin is an effective and safe drug for use in multiply-resistant childhood shigellosis.

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Health Conditions of Pregnant Women and Perinatal Mortality in a Slum of Dhaka City, Bangladesh

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Objective: Examine the association between perinatal mortality with health conditions, and treatment-seeking behaviour of pregnant women in a slum population of Dhaka city in Bangladesh.

Methodology: A cohort of 2,007 pregnant women with a community setting was studied between June 1994 and January 1997. Women who, according to their last menstruation date, had less than 21 weeks of amenorrhoea, were considered for the study. The women were recruited from two antenatal clinics run by Radda Barnen, a large organization established in Mirpur, and from house-to-house survey in the catchment area of Radda Barnen. Those who signed a consent form were interviewed. The women were followed from 21 weeks of gestation to pregnancy termination. Information was collected on height, weight, mid-upper arm circumference (MUAC), haemoglobin, blood pressure, incidence of illnesses, and their treatments. Socioeconomic information was collected during the recruitment of the women, and information on the type of pregnancy termination was collected within 3 days of termination. Still-birth or mortality of the newborns within 3 days of delivery was taken as the indicator of perinatal mortality.

Results: Perinatal mortality was 60.3 per 1,000 live-births (still-birth ratio was 40.5 and 0-3-day mortality was 18.8 per 1,000 live-births). The logistic regression analysis showed that eclampsia, history of blood loss during pregnancy, hypertension, haemorrhage, and other infections were significant risk factors for perinatal mortality. Intrauterine device used within the last two years preceding the present conception was also a significant risk factor for perinatal mortality. Body mass index or heights were not associated with perinatal mortality. Perinatal mortality was negatively associated with the number of visits to medical professionals during pregnancy. The educated women had significantly lower perinatal mortality than the uneducated ones, after controlling for demographic, biomedical and economic factors.

Conclusion: Access to medical care during pregnancy can substantially reduce perinatal mortality among the poor women in the urban slums.

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Determinants of Safe Delivery Practices in Rural Bangladesh

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Objective: Investigate the demographic, socioeconomic and cultural factors associated with safe delivery practices in rural Bangladesh.

Methodology: Data were drawn from a cross-sectional survey conducted in six rural subdistricts of Bangladesh in 1994. A sample of 10,368 currently married women of reproductive age was selected, following the multistage random-sampling procedures, and were interviewed a structured questionnaire to elicit information on various demographic, socioeconomic, cultural and selected programmatic variables, including public health issues, such as maternal health care and delivery practices. In analyzing data, descriptive statistics and multivariate regression methods were employed. In this analysis, the term "safe delivery" refers to a delivery conducted by a qualified person, such as registered physician, paramedic, nurse, or trained traditional birth attendant.

Results: The results of the study showed that almost all deliveries (99%) took place at homes of the women, and most of them (93%) were conducted by the untrained traditional birth attendants, relatives, or neighbours in unsafe and unhygienic conditions. Only 7% of the deliveries (referred to here as "safe deliveries") were conducted by the qualified persons, such as registered physicians, nurses, paramedics, and traditional birth attendants. The multivariate regression results showed that the younger women and the women with lower parity were significantly more likely to have safe deliveries. Education and exposure to radio and television were significantly associated with the safe delivery practices. The women with five or more years of education, and those who possessed radio or television, were also more likely to have safe delivery.

Conclusion: The results of the study suggest that information, education, and communication (IEC) activities should be strengthened to educate the community, particularly the uneducated and older women on the importance of safe delivery. Pregnant women need greater access to trained providers and facilities providing emergency obstetric care.

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Teenage Marriage and its Consequences: Experience from Rural Bangladesh

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Shameem Ahmed, and Barkat-e-Khuda

Objective: Investigate the factors regarding health of mothers and children associated with teenage pregnancy, and assess the awareness in the community about the consequences of early marriage.

Methodology: Data for this study came from a longitudinal Sample Registration System (SRS) in two rural subdistricts under the ICDDR,B Operations Research Project, for a two-year period covering January 1995-December 1996. A total of 7,246 married women of reproductive age (15-49 years) observed were categorized in two groups: those who were married and aged less than 20 years and those who are aged 20 years and above. Children belonging to these two groups of women were also covered in the study. Social and economic status, education, contraceptive practice, and health care-seeking behaviour of these women and their family members were observed. Both bivariate and multivariate analyses were carried out by considering women who got married at an early or later age as the dependent variable.

Results: Preliminary findings indicate that the poor and economically disadvantaged women got married early compared to the economically advantaged groups. The women who were married early tend to have more children than those who married late. The proportion of maternal deaths was found to be higher among the women married in their teens. The educated women got married later and had lower reported pregnancy-related complications than their less-educated counterparts. Although knowledge of contraceptives was higher among the younger group of women, its practice was higher among the older groups. Awareness and knowledge about maternal and child health were found to be higher among the educated and relatively older women who got married later.

Conclusion: Although the Bangladesh Government has set the minimum age for marriage for girls at 18 years and for boys at 21 years, three in four females aged 15 to 19 years are married. The law is hardly practised, particularly in the rural areas. This study reveals that a teen-aged mother and her children face increased health risks, as well as limited social and economic options when compared with older mothers and their children. Thus, efforts should be made to raise the age for marriage of women in Bangladesh and to increase community awareness regarding the negative effects of early marriage.

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Target-Specific Home-based Motivation: Test Case with Family Planning

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Objective: Develop systematic approach toward targeting of non-users of family planning (FP) methods and provide motivation at their homes, and examine the effects on modern FP method acceptance.

Methodology: Motivation of non-users of FP method through targeted home visits was carried out as a component of the operations research intervention on Alternative Strategies for Delivery of MCH-FP Services (ASDS) tested in two sites of Dhaka city during January 1996-May 1997. This strategy was experimented to affect focused outreach activities, in place of door-to-door delivery of services, to attain maximum effectiveness within fund constraints. To assess the effects of the approach and acquire insights of the providers' and clients' perspectives, an evaluation was conducted during March-May 1997. The service records of the fieldworkers on the non-users of modern FP methods among slum and non-slum households were analyzed; 40 observations of fieldworker-women encounters were made, 48 in-depth interviews of the target clients, and in-depth interviews with the seven fieldworkers of the intervention sites were conducted.

Results: Despite a major change in the two-decade-old conventional service delivery system relating to withdrawal of home distribution of contraceptives, target-specific home-based motivation resulted in the high acceptance of modern FP methods among the non-users. A third of the non-slum and a fourth of the slum non-users in one intervention area (at Hazaribagh), and little more than a fourth of the both non-slum and slum non-users in another (at Gandaria) became acceptors of modern FP methods. The systematic approach of addressing the non-users developed in participatory workshops with the fieldworkers was found effective by both fieldworkers and the target clients. The changed role of the fieldworkers, from FP commodity suppliers to case-workers, resulted in more time allocated for motivation, and more effective need-based motivation and counselling.

Conclusion: Focused home visits for providing motivation to the target population led to higher effectiveness of programmes with fewer fieldworkers, hence with reduced costs. Although target-specific home-based motivation was applied for FP in this study, this approach may be adapted for other health programmes too.

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Determinants of Infant and Child Mortality in Rural Bangladesh

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Thomas T. Kane, and Kenneth Hill

Objective: Examine the trends in and covariates of infant and child mortality in several rural areas of Bangladesh.

Methodology: Data on a cohort of 21,268 children born between 1983 and 1991 in three rural project sites were obtained from the longitudinal Sample Registration System (SRS) of the MCH-FP Extension Project (Rural) of ICDDR,B—now called Operations Research Project (ORP). The analysis followed the model specified in the extended analysis of the 1993-94 Bangladesh Demographic and Health Survey (BDHS) and was divided into three components: neonatal mortality, postneonatal mortality, and mortality between 12 and 23 months. Estimates of mortality differentials by sociodemographic characteristics were derived, using a life-table technique. Multivariate logistic regression procedures were also applied separately to include fixed and temporal characteristics of the newborn cohort. The mortality estimates were compared with those of the national-level (BDHS) extended analysis.

Results: Reduction in the rates of mortality of children aged less than five years was slightly more rapid at the ORP sites than in the country as a whole. Childhood mortality has been declining in the ORP areas since 1983, compared to the national average. Part of the decline can be attributed to increasing educational levels among parents, and changes in the length of birth interval associated with fertility decline.

Conclusion: The results of the study confirm the findings of other research work, showing that longer preceding birth intervals play a significant role in reducing child mortality. Of course, provision of primary health care services are associated with reduced risk. The data from the SRS in the ORP sites show a significant relationship between childhood immunization and reduced child mortality. Access to tubewell water was also associated with reduced mortality risk for young children.

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An Assessment of Injecting Drug Users in Dhaka City: Need of Intervention for a Vulnerable Group

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Objective: Estimate the size, sociodemographic characteristics, risk perception, and behaviours of the injecting drug users (IDUs) as part of designing an appropriate risk-reduction intervention directed toward the IDUs in Dhaka city.

Methodology: A street-based IUD was defined as one who injected drug during the past six months. Extensive ethnographic field observations were made to identify locations of drug use in 15 thanas of Dhaka city. Identified IDUs were recruited as guides. For quantitative data collection, structured questionnaires were supplied to 234 IDUs. For qualitative data collection, in-depth interviews and focus group discussions were conducted. For clinical examination of biological markers, blood and saliva samples were collected.

Results: Tidigesic was the most common injectable drug used. About 40% of the IDUs lived on footpath, slums, or bus/rail stations, and 37% were rickshaw-pullers and transport workers. Sixty-three percent were in jails. About 45% and 24% started using drugs when they were aged 16-20 years or below respectively. Eighty-two percent shared their needles/syringes, and 48% shared with more than ten persons. Fifty-two percent shared with their sexual partners. Seventy-eight percent took injection 1,000 times or more during their life time. The average frequency of injection was three times a day. Only 15% used their own syringes/needles. Sixty percent heard about HIV/AIDS, and one-fourth knew that needle-sharing might transmit HIV/AIDS. Friends and radio/TV were the common source of information regarding HIV/AIDS. Peers were mentioned as good choice for the source of information .

Conclusion: The prevalence of needle-sharing among the IDUs in Dhaka city is very high. Knowledge on danger of HIV/AIDS and other health hazards due to needle-sharing is low. As happened in Thailand or northeastern states of India, the IDUs may initiate the HIV epidemic here. There is need of an intervention to make information on needle/syringe exchange and counselling facility accessible to the IDUs. There is also a need of an environment which would facilitate intervention on needle exchange or the introduction of drug substitution.

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Association Between Anaemia and Socioeconomic Status among Non-pregnant Women in Rural Bangladesh

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Objective: Determine the magnitude of social stratification of anaemia among the non-pregnant women in a rural area of Bangladesh. Current prevention and control programmes for anaemia have been limited in their effectiveness. A contributing factor for this limited effectiveness could be that there is a social stratification of anaemia among the women and that the programmes may not reach the strata of women with the highest prevalence of anaemia.

Methodology: The study was carried out in 12 villages of Fulbaria thana of Mymensingh district in March 1996. One hundred seventy-nine married healthy women aged 15-45 years were selected. Information on indicators of socioeconomic situation and haemoglobin concentration was collected through household visit. The socioeconomic indicators included household economic status, schooling of women, and land ownership. A socioeconomic score was developed where these three indicators were combined. Haemoglobin concentration was assessed on a fingerprick blood sample using a portable photometer and disposable cuvettes. Haemoglobin concentrations were categorized into normal (120+ g/L of haemoglobin), mild (100-<120 g/L), moderate (70-<100 g/L), and severe (<70 g/L).

Results: The overall prevalence of anaemia among the women was 73%. The prevalence of severe, moderate and mild anaemia was 1%, 21%, and 51% respectively. All the three indicators of socioeconomic situation were found to be associated with the prevalence of anaemia. Women without formal schooling had a prevalence of 78% compared to 68% for women with schooling ($p<0.05$). Women who lived in the households with less than 50 decimals of land had a prevalence of 79% compared to 63% if they had more land ($p<0.05$). Finally, women who perceived their economic situation as deficit had the prevalence of 83% compared to 68% among those who perceived it as non-deficit ($p<0.05$). The combined socioeconomic score was associated with anaemia in a stepwise manner, and the prevalence of anaemia increased with each additional negative socioeconomic indicators. Women exposed to all three negative aspects had a prevalence of 86% compared to 58% among those not exposed to any socioeconomic risk factors.

Conclusion: Anaemia is a highly-prevalent health problem among women in rural Bangladesh. Although most women are affected, those from poor socioeconomic strata have the highest prevalence of anaemia. To improve the effectiveness of anaemia prevention and control programmes, it may prove to be of value to ensure that the programme coverage of women of the poorest socioeconomic strata is sufficiently high.

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Age at Menarche and Nutritional Status of Adolescent Girls in a Rural Area of Bangladesh

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Objective: Determine the age at menarche and its association with nutritional status of adolescent girls in a rural area of Bangladesh.

Methodology: A cross-sectional study was conducted in four villages of Rupganj thana of Narayanganj district. Data on 437 adolescent girls aged 10-17 years were collected during October-December 1996 using a pre-tested structured questionnaire, and the nutritional status was measured by weight, height, body mass index (BMI), mid-upper arm circumference (MUAC), and haemoglobin level.

Results: Of the 437 girls, 165 (37.8%) had commenced menarche. The mean age at menarche as determined by retrospective recall was 13 years (±0.89). The median age at menarche estimated by % menstruating girls in each age group was 13. The mean haemoglobin level was 9.5 g/dl; the prevalence of anaemia (Hb <11g/dl) was 90.2%; 42.6% of the girls had angular stomatitis, and 28.8% glossitis. Of the adolescents, 60.2% (n=263) were underweight (<5th centile, WHO-recommended reference) and 48.1% were stunted (<3rd centile, NCHS/WHO). The mean weight and BMI were significantly higher among the menstruating girls aged 13-15 years ($p<0.01$) than the non-menstruating girls. The mean height was found significantly higher among the menstruating girls aged 11-14 years ($p<0.05$).

Conclusion: The results of the study suggest that the mean age at menarche is 13 years in the studied rural area of Bangladesh. Adolescent girls aged 13-15 years who are heavier and taller than their age-peers are more likely to have commenced menstruation. Most adolescent girls were anaemic and undernourished. Hence, the adolescents require specific intervention to overcome their anaemia and improve their nutritional status for better reproductive health.

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Adolescent Nutrition in a Rural Community in Bangladesh

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Objective: Assess the nutritional status of adolescent boys and girls in a rural community of Bangladesh.

Methodology: Eight hundred three households, each containing at least one adolescent boy or girl, were selected consecutively from four purposively chosen villages in Rupganj thana of Narayanganj district. Initially, the guardians of the 1,483 healthy and unmarried adolescents aged 10-17 years (51% boys and 49% girls) were interviewed about family structure and socioeconomic status. Of these children, 906 (47% boys and 53% girls) from 597 households were weighed, had their height and mid-upper arm circumference (MUAC) measured and were clinically examined. Blood was then collected from 861 adolescents for haemoglobin estimation.

Results: The median monthly income per person in the 597 families was approximately Tk 554 (US$ 12). Of the household heads, 27% were labourers, 21% solvent farmers, 14 % ran small-sized businesses, and 6% unemployed. Although 86% of the 906 children were attending school, school attendance fell from 98% at 10 years of age to less than 63% at 17 years of age. Sixty-seven percent of these adolescents were thin (defined as BMI < 5th centile of WHO-recommended reference). Seventy-five percent of the boys and 59% of the girls were thin. The prevalence of stunting (height-for-age < 3rd centile) was 48% both for the girls and the boys. On clinical examination, angular stomatitis was found to be present in 46% of the adolescents; 27% had glossitis, 38% pallor, 11% dental caries, 3.2% an obviously enlarged thyroid, and 2.1% eye changes for vitamin A deficiency. According to INACG (International Nutritional Anaemia Consultative Group 1985) cut-off values for anaemia, 94% of the boys and 98% of the girls were anaemic.

Conclusion: Rural Bangladeshi adolescents suffer from high rates of malnutrition and almost universal anaemia, and boys are as malnourished and anaemic as girls.

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Knowledge, Attitude and Practice of Pregnant Women on Feeding Patterns in Bangladesh

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Objective: Study the beliefs and practices associated with diet during pregnancy to design appropriate educational strategies and to promote appropriate behavioural change.

Methodology: About 300 pregnant women of Muktagacha thana of Mymensingh district were selected for the study. A questionnaire was used for interviewing the pregnant women to obtain information regarding age at the time of pregnancy, parity, breast-feeding practices, antenatal care, taboos about food, household food habits, and food distribution. Twenty-four-hour dietary recall was used for obtaining information on daily dietary practices of the women.

Results: The mean age and parity of the women were 22±2 years and 3 respectively. The 24-hour food recall data reflected that there was very little variety in the diet, with rice being the primary component. Only 20% of the women had 3 or more serving of animal protein. Ninety-four percent reported having no yellow vegetables, 59% no fruit, and 65% no oil in their daily diets. Furthermore, 96% of the women were the last people to take food in the house. During pregnancy, 34% of the women were still breast-feeding their last child, even in their 3rd trimester. Of those who did not breastfeed, only 6% had stopped due to their pregnancy. Although only 3% of the women practised taboos about food, they avoided protein and calorie-rich foods, such as egg, hilsha, and mrigal fish. Conversely, 30% reported that the custom of consuming food, such as egg, milk, and green vegetables, was followed in their households. They mentioned a preference for dry cereals. An increased dietary intake during pregnancy, in terms of quantity, was reported by 65%, while 39% reported lower intakes.

Conclusion: To combat malnutrition, intersectoral programmes targeted toward poverty alleviation need to be undertaken. In addition, the whole family needs to be educated on the nutritional needs of pregnant women.

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Determinants of Haemoglobin Level during Pregnancy and Relationship with Pregnancy Outcome in Bangladeshi Urban Poor

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Objective: Investigate the determinants of haemoglobin (Hb) level during pregnancy and relationship with the pregnancy outcome in Bangladeshi urban poor.

Methodology: As part of zinc supplementation trial, 559 women from Dhaka urban slums were enrolled between 12 and 16 weeks gestation. On enrollment, Hb and serum zinc levels were assessed. Anthropometric measurements (weight, height, and MUAC) were taken/or recorded, and information was collected on reproductive history, socioeconomic status, and dietary intake, including the use of iron supplements. Women were prospectively followed up until delivery, and repeated Hb assays were performed at 7 months gestation.

Results: Mean Hb concentrations at enrollment and at 7 months gestation were 11.5±1.3 g/dl and 10.8±1.2 g/d respectively ($p<0.001$) with 34.6% and 53.7% of the women classified as anaemic (Hb<11 g/dl) at baseline and at 7 months gestation respectively. Lower nutritional status (body mass index, MUAC, and serum zinc) and lower socioeconomic status were associated with lower Hb levels at baseline. The use of iron supplements was very low in this population: only 10 women (1.9%) reported to have taken iron tablets in the last 14 days, and no relationship between the use of iron tablets, and the Hb levels was observed. The Hb levels at 4 months gestation were positively related to gestational length at birth as measured by LMP even after controlling for other possibly confounding variables. Birth weight, length at birth, infant chest-head and MUAC at birth were not related to the Hb levels at 4 months gestation. The Hb levels at 7 months gestation were not related to the pregnancy outcome.

Conclusion: Anaemia in early pregnancy may be associated with a higher risk of prematurity based on LMP.

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Contraceptive Use and Maternal Weight among the Poor in Rural Bangladesh

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Objective: Examine if contraceptive method use is associated with maternal weight among the poor in rural Bangladesh, after controlling for the influence of demographic and socioeconomic confounding factors. Poor women in Bangladesh are believed to suffer from chronic malnutrition primarily because of low level of calorie as well as micronutrient consumptions. High fertility or repeated pregnancies and its associated resource-scarcity may also adversely affect maternal nutrition. Contraceptive use may prevent fertility-related maternal malnutrition. Moreover, the use of hormonal methods, like oral pills or injectables, may lead to weight gain which is recognized as a contraceptive side-effect in well-nourished populations. In Bangladesh, about 50% of the women use contraception, and about 55% of the users are pill or injectables users.

Methodology: The study includes 2,185 randomly selected married women of reproductive age from landless households in four rural thanas of Tangail and Mymensingh districts. Information on height, weight, perceived health, contraceptive use, and demographic and socioeconomic conditions was collected through a family-life survey conducted in 1993-1994. Body mass index (BMI) and perceived health were regressed on the type and use duration of contraceptive methods and control variables. Contraceptive methods were categorized as: pills or injectables, permanent methods, and condoms or traditional methods. Twenty-six IUD cases were excluded from the analysis.

Results: The oral pill and injectables users had significantly higher BMI than the non-users. The BMI significantly increased with the duration of use of the oral pill and injectables. Neither the use of permanent and other methods nor the durations of use of these methods were associated with BMI. The positive association between the use duration of oral pills or injectables and the BMI indicated that hormonal methods helped increase the poor women's weight. Women's perceived health was positively and significantly associated with the duration of pills or injectables use, but not with those of other methods meaning that weight gain was not a discomfort.

Conclusion: The prolonged use of oral pills or injectables seems to provide beneficial effect among the poor women. Further research is needed to better understand whether or not weight gain due to pill or injectables use provides nutritional benefit to poor women in Bangladesh.

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Impact of Lactational Performance on Calcium Metabolism through Bone Mass Density in Marginally Nourished Bangladeshi Women

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Objective: See the impact of breast-feeding behaviour/or pattern on bone mass density (BMD) in a group of Bangladeshi women.

Methodology: Four hundred Bangladeshi women aged 20-81 years were studied for their nutritional status, child birth events, breast-feeding behaviour, and effect of calcium metabolism ascertained by studying their BMD of distal end of radius and ulna during 1995-1996 in an urban postgraduate hospital in Dhaka. History of breast-feeding was ascertained, and reproductive performance records were taken. A bone densitometer—single-photon x-ray absorptiometry (SEXA)—was used for measuring the BMD.

Results: The mean age of the subjects was 41.9±14.6 years, and the mean parity was 4.5±2.9. The mean BMD of radius and ulna (g/cm2) was 0.42±0.07. The results of the study showed that the BMD was negatively correlated with age of the subjects ($r=0.87$, $p<0.001$) and parity ($r=0.71$, $p<0.001$). The peak BMD was observed during the age of 25-39 years which declined after the age of 40 years. The BMD was negatively associated with the duration of total months of exclusive breast-feeding reported by the women ($r=0.42$, $p<0.00001$), the number of infants born ($r<0.38$, $p<0.00001$), the total number of months with lactational amenorrhoea ($r=0.25$, $p<0.01$), and the total months of partial breast-feeding of the infants born ($r=44$, $p<0.0001$). The mean BMD also reduced significantly with the increase in parity (<p,0.001), controlling for age, workload, body mass index, parity, and other lactational amenorrhoea (slope 6.8, $p<0.04$).

Conclusion: The results of the study suggest that the BMD of Bangladeshi women is negatively related with their prolonged breast-feeding pattern. The suggestion on policy implies that women's dietary adequacy in terms of the essential minerals is an important public health issue, and deserves attention to strengthen campaign for the protection and promotion of breast-feeding to improve child nutrition and survival.

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Waning of Maternal Measles Antibody in the Offsprings

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and A.M.S. Matiur Rahman3

Objective: Assess the decline of measles antibody, passively acquired from the mother, in infants from birth to nine months of age, and determine the age at which maternal measles antibody declines markedly, making infants susceptible to measles.

Methodology: The study was conducted in the departments of Paediatrics, and Obstetrics and Gynaecology, Institute of Postgraduate Medicine and Research, Dhaka, during September 1992-December 1993. Children were followed up in the Paediatrics Outpatient Department up to 9 months. Blood samples from 120 full-term infants were collected at birth, at 3, 6, and 9 months of age. Samples of the mothers' blood were collected within 7 days of delivery. The measles antibody levels were detected using the ELISA IgG-antibody kit.

Results: Eighty-nine percent of the blood samples were positive for measles IgG antibody, and was associated with their weights. In infants, this was positive in 91% at birth, and was associated with birth weight. The antibody levels were positive in 64% of the infants at 3 months, 21% at 6 months, and only 17% at nine months. This decline with age was highly significant, and was more marked after three months of age. In males, the decline was more marked between 3 and 6 months of age while in females, it was more marked between 6 and 9 months. Three infants developed measles before they were aged nine months.

Conclusion: Nutritional status affects the presence of measles antibody in both mothers and infants at birth. The maximum decline in measles antibody occurred in infants during 3-6 months of their age. Maternal measles antibody was extremely low at 9 months of age. Measles vaccine may be given to children in developing countries at the age of 6 months, with a booster at the age of one year.

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Aetiology and Pathogenesis of Chronic Diarrhoeal Illness in Adults

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Objective: Study the aetiology of chronic diarrhoea and understand the underlying pathology leading to the disease.

Methodology: Chronic diarrhoea was defined as duration of diarrhoeal illness for approximately three weeks or longer. Nine fatal cases fulfilled the criterion and constituted the study population. Autopsy was carried out on all of them. Relevant clinical, laboratory and pathologic findings were demonstrated to understand the pathogenesis of the disease.

Results: Intestinal amoebiasis, pancolitis with mucosal necrosis and variable degree of ulceration leading to serositis or colonic perforations ranked top, being present in 3 (33.3%) cases. Coinfection with *Shigella* spp., malaria, and disseminated tuberculosis were found. Disseminated tuberculosis secondary to pulmonary tuberculosis with tuberculous ulcerations of the small bowel, or small bowel and ascending colon ranked second, being present in 2 (22.2%) cases. Severe cytomegalovirus (CMV)-associated ileitis and *Shigella*-associated colitis were noted in these cases. Severe malnutrition was a common concomitant illness in all cases. Infections, suggestive of depressed cell-mediated immunity and/or pathologic findings of lymphoid atrophy, were present in 4 (44.4%) cases. One case with severe malnutrition and lymphoid atrophy had hyperinfection with *Strongyloides stercoralis* with evidence of auto-infection. Other rare causes included diabetes mellitus with pancytopenia and ileal ulcerations and shigellosis in one, combined congenital generalized lymphangiectasia with entire gastrointestinal (GI) tract involvement and secondary systemic amyloidosis with extensive GI tract involvement in one, and immunoproliferative small and large bowel disease in one. This postmortem study failed to enrol the cases of ulcerative colitis who got well with either medical or surgical management.

Conclusion: Early management of potentially treatable infectious diseases leading to chronic diarrhoeal illness and concurrent nutritional support should be tried. Strongyloidiasis in malnourished patients should be treated.

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Typhoid Ileal Perforation: Experience with 64 Cases

Anisur Rahman

Objective: Survey patients with typhoid ileal perforation admitted to a general hospital.

Methodology: Sixty-four patients (51 males and 13 females of average age 27.36 years) with perforated ileum managed operatively were studied prospectively for over one year.

Results: History of fever was not always present. Clinical features were consistent with bacterial peritonitis with paralytic ileus associated with hypovolaemic and/or septic shock. A detailed history, clinical examination, and a plain X-ray of the abdomen were the mainstay for diagnosis. During laparotomy, various procedures were followed for dealing with the perforations. Patients treated by wedge resection of the perforation, followed by repair, seem to have the best prognosis. There were 18 deaths in this study. Postoperative complications included wound infection, wound dehiscence, anastomotic leakage, septicaemia, bedsores, and respiratory problems.

Conclusion: Compared to other studies, the present one indicates an improvement in the prognosis of the above condition.

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Need for HIV/AIDS Prevention Programme for Bangladeshi Migrants

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and Maurice Bloem1

Objective: Assess the prevalence of HIV-related risk factors among Bangladeshi migrants returned from abroad, and also assess the present risk behaviour of departing migrants, as well as possible risk behaviour when migrants reach the country of destination.

Methodology: This study was conducted on people who go abroad (both first time migrants and returnees), to see the kind of sexual practice they have in the country who are not yet labelled as high-risk population. A behavioural study was conducted with a sample of 125 people through a questionnaire survey and in-depth interview. The questionnaire survey was done at the clinics where the leaving migrants came for their medical check-ups during November 1997. Data were analyzed, using statistical package, and qualitative methods were followed to perform the case studies that gave insights into the behavioural pattern.

Results: The study revealed that a significant proportion of the migrants had pre- and extramarital sexual activities, including multiple sex with both females and males before leaving the country. The use of condom was insignificant among those who ever had sex, and this was for the purpose of family planning only. Less than 5% of the study population had knowledge and perception of risk and prevention methods on sexually transmitted diseases (STDs) and HIV/AIDS. The result of the study suggests that high-risk behaviour exists among the population planning to work outside the country.

Conclusion: All research organizations, clinical and behavioural support services should make a collaborative effort to develop programmes to prevent HIV epidemic before a disaster takes place. Based on the results of the study, the following interventions for the people leaving the country are suggested: (a) development of a thorough pre-departure programme (in-country); (b) development of a thorough post-departure programme (in countries of destination); and (c) development of an integrated programme for possible and potential migrants and their families.

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Neurologic Manifestations of Childhood Shigellosis

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Objective: Review the neurologic manifestations of shigellosis in children.

Methodology: Eight hundred sixty-three consecutive patients with shigellosis admitted to the treatment centre of ICDDR,B during a one-year period were prospectively studied. Patients were divided into four groups based on history and findings of physical examinations: conscious; unconscious; seizure witnessed in hospital; and seizure by history but not witnessed.

Results: Of the 71 patients aged about 15 years, 14% were unconscious either on admission or during hospitalization; none had seizures. Seven hundred ninety-two patients were aged less than 15 years; 9% were unconscious, 5% had a seizure witnessed, and 3% had a seizure by history. Patients aged less than 15 years, who had a seizure witnessed, had a significantly higher median weight-for-age (67% of NCHS median vs. 57%); higher mean temperature (38.7°C vs. 37.9°C); lower mean sodium (126 mmol/L vs. 129 mmol/L); and were more often bactaeremic (24% vs. 7%) and hypoglycaemic (blood glucose <2.2 mmol/L; 24% vs. 2%) than conscious patients. When the analysis was restricted to patients aged less than five years and to those infected with *Shigella flexneri* (who accounted for 64% of all patients with shigellosis), the findings were similar. *Shigella* was not significantly associated with any of the 4 neurologic categories. In the multiple regression analysis of patients aged less than 15 years, factors independently associated with unconsciousness were: shock, elevated admission temperature, elevated immature and total leukocyte counts, and weight-for-age less than 60% of the median; for witnessed seizure, factors independently associated were: shock, weight-for-age less than 60% of the median, and elevated immature leukocyte count. Forty-eight percent of the 73 unconscious patients aged less than 15 years died in the hospital compared to 29% of the 41 patients who had a seizure witnessed ($p=0.081$), 6% of the conscious patients ($p<0.001$), and none of the 24 patients who had a seizure by history ($p<0.001$).

Conclusion: Both diminished consciousness and seizure were associated with a poor outcome in children with shigellosis. Prompt reduction of fever and correction of metabolic alterations may reduce the incidence of these potentially lethal complications and deaths.

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Molecular Epidemiology and AntimicrobialSusceptibility of *Neisseria gonorrhoeae* Isolated from Commercial Sex Workers in Dhaka City

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Objective: Analyze epidemiological data on gonococcal infection among the commercial sex workers in Dhaka city, antimicrobial susceptibility testing for *Neisseria gonorrhoeae*, and plasmid profile of isolates.

Methodology: Endocervical swab samples from 224 commercial sex workers (CSWs) were cultured for *N. gonorrhoeae*. The isolates were identified by the standard microbiological method and by PCR based on primers which amplify a 390-bp region of the cryptic plasmid of *N. gonorrhoeae*. Susceptibility to and minimum inhibitory concentration of penicillin, tetracycline, ciprofloxacin, cefuroxime, ceftriaxone, and spectinomycin were determined by the agar dilution and disc diffusion method. The total plasmid was extracted from the isolates, and the plasmid profiles were analyzed.

Results: *N. gonorrhoeae* was isolated from 94 (41.96%) of the 224 CSWs. Of the isolates, 65.96% were resistant and 34.04% were moderately susceptible to penicillin; 60.64% were resistant and 38.3% were moderately susceptible to tetracycline; 11.75% were resistant and 26.6% had reduced susceptibility to ciprofloxacin; 1.18% were resistant and 11.7% had reduced susceptibility to cefuroxime, and 1% were resistant to ceftriaxone. All isolates were sensitive to spectinomycin. Plasmid profile analysis showed that (32) 34.04% of the strains contained antibiotic-resistant plasmid. All strains contained 2.6 MDa cryptic plasmid. Thirty-eight (40.4%) isolates contained 24.5 MDa conjugative plasmid. Twenty-two isolates were penicillinase-producing *N. gonorrhoeae* (PPNG), and all of them contained 3.2 MDa ß-lactamase-producing plasmid of African type. Ten isolates were tetracycline-resistant *N. gonorrhoeae* (TRNG) and contained 25.2 MDa TRNG plasmid.

Conclusion: High level of resistance to ciprofloxacin may limit the usefulness of this agent for the primary treatment of gonorrhoea in Bangladesh.

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Effect of Vegetarian Diet on Rheumatoid Arthritis, Seronegative Spondarthropathies, and Fibromyalgia

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Objective: Study the effect of vegetarian diet along with routine drug treatment on arthritis.

Methodology: Initially, 90 patients were recruited: 30 patients each with rheumatoid arthritis (RA), fibromyalgia (FMS), and seronegative spondarthropathies (SNSAP) having no other medical problems. In each of these three groups, 15 patients (cases) were randomly provided prescribed vegetarian diet of 2,253 kcal (consisting of low aromatic aminoacids) along with indomethacin/diclofenac sodium/pyroxicum/ ibuprofen/amitriptyline, and the rest 15 patients (control) received similar medications with normal mixed diet. All patients had clinical examinations (joint swelling/tender point count with tenderness indices, duration of morning stiffness/fatigue, sleep disturbances, visual analogue scales) before and after dietary intervention for one month. Tests for Hb%, ESR, total WBC, platelet, RF tit, C-reactive protein, IgG and IgM levels were also performed.

Results: All cases in RA and FMS showed significant improvement in all clinical and laboratory parameters ($p<0.05$) compared to control as well as their baseline levels. However, in SNSAP, the significant improvement was observed in both case and control groups compared to their respective baseline levels.

Conclusion: A vegetarian dietary intervention with indomethacin/diclofenac sodium/pyroxicum/ibuprofen/amitriptyline for one month relieved the sufferings of patients with RA and FMS, indicating that diet selection is essential for the management of these chronic conditions. Thus, dietary intervention may be the main regimen for the management of FMS where pain-relieving drug does not have any beneficial effect, although for SNSAP the role of diet needs to be further studied.

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Arsenic in Drinking Water: An Emerging Environmental Health Challenge

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and Seth H. Frisbie1

Objective: Determine the nature of arsenic contamination in drinking water in Bangladesh.

Methodology: This preliminary study was conducted during July-August 1997. A cross-sectional survey was carried out to collect information at the household level (observational study design). The performance of field kits used by other agencies available to us was compared with a selected laboratory technique. Five hundred and seventy tubewells and their users were studied. Tubewell water samples collected from almost the whole country, except some areas in Chittagong and Sylhet, were analyzed for arsenic and ferrous iron contents. Users of these tubewells were interviewed and their statements reviewed, and the methods commonly used by other agencies to measure arsenic contamination were compared.

Results: About 61% of the tubewells were found to contain arsenic in excess of the WHO-recommended value of 0.01 mg/L. The arsenic concentration varied from 0 mg/L to approximately 1.0 mg/L, and the ferrous iron content varied from 0 mg/L to 41 mg/L. The association between arsenic and iron and the depth of handpumps was found to vary with the hydrogeological conditions. The study revealed that only 4% of the respondents were aware of the arsenic contamination in the used tubewells. Unclear messages related to water treatment were as well found to be disseminated at the field level.

Conclusion: The environmental health challenge relating to arsenic contamination is massive and complex, and needs to be addressed appropriately. Findings of the research and development activities should be coordinated appropriately.

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Economic Evaluation of MCH-FP Clinic-based Syphilis Screening in Rural Bangladesh

M. Mahmud Khan§, Sarah Hawkes1, and Disha Ali§

Objective: Examine the costs and benefits of screening women of reproductive age visiting the MCH-FP centres, to identify the syphilis cases for treatment and estimate the cost-effectiveness of alternative screening strategies at different levels of syphilis prevalence.

Methodology: A field study was carried out to estimate the population-based rates of reproductive tract infections (RTIs), including STIs, in men and women in Matlab. The prevalence rate of syphilis was found to be about 0.8%, indicating a low prevalence of syphilis in rural Bangladesh. Based on the finding of the study, costs of screening and treatment of syphilis have been estimated assuming that the prevalence rate should be less than 3% in most rural communities. For costing the medical interventions, the market price of the laboratory tests and drugs was used. The study estimated the direct medical costs associated with screening and treatment of syphilis, excluding all direct non-medical and other indirect costs.

Results: If the prevalence rate of syphilis remains less than 6% in the population, screening with RPR, followed by TPHA, will be more cost-effective than performing RPR only. At the higher prevalence rates, RPR alone should be used for screening population for syphilis. The benefit-cost ratio of syphilis screening with treatment (treating both woman and her husband) was found to be about 4.5 for Bangladesh. Although the ratio was significantly higher than one, it was lower than the ratio obtained for the control of diarrhoeal diseases, childhood immunizations, and many other preventive interventions in the developing countries.

Conclusion: With the increased use of the MCH-FP centres, the unit cost of RPR and TPHA should fall significantly, which will further improve the benefit-cost ratio. Moreover, the reduced costs will make screening with RPR, followed by TPHA which is cost-effective at a much higher cut-off prevalence. In this study, the indirect benefit of curing syphilis, especially in preventing HIV infection, has not been considered. The prevalence of HIV in this population is not known, but if we assume the prevalence rate to be 1%, the probability of preventing an HIV infection through treatment of syphilis becomes so low that we can safely ignore this additional benefit at this low level of HIV and syphilis prevalence. However, at the higher prevalence rates, the benefits may become significant and should be taken into account.

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Role of Nitric Oxide in the Pathogenesis of Shigellosis and Cholera in Children

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M. Miller1, and G.H. Rabbani§

Objective: Evaluate the role of nitric oxide (NO) in the pathogenesis of shigellosis and cholera in children.

Methodology: Concentrations of nitrite, a stable metabolite of NO (by Griess reaction) in urine and serum samples of 24 patients aged 1-5 years (10 shigellosis, 14 cholera) were determined. Tests were done on admission to hospital with acute diarrhoea and repeated at early convalescence after 3-7 days of specific antimicrobial therapy.

Results: In children with shigellosis, urinary nitrite excretion (nM/mg creatinine) was significantly increased during acute illness compared to early convalescence, median (range): 7061 (1046-18264) vs. 4316 (2369-12428, $p<0.05$). Nitric oxide concentration in serum (mmol/L) also significantly ($p<0.05$) increased during acute illness compared to convalescence values: 206 (159-214) vs. 104 (102-273). Similarly, in children with cholera, both urinary and serum nitrite excretions were significantly ($p<0.05$) elevated during acute illness compare to convalescence: 5034±1345 vs. 2178±404 (urine); 450±89 vs. 201±56 (serum).

Conclusion: These results indicate that NO production is increased both in acute shigellosis and cholera, more markedly in the former infection because of colonic inflammation. Urinary nitrite excretion can be a useful marker of severity of these infections.

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Copper, Iron and Manganese Status in Severely Malnourished Hospitalized Children

Md. Salim Shakur1, Nasreen Bano1, and S.A. Tarafder2

Objective: Determine the status of few essential trace elements, like copper, manganese, and iron in patients with severe protein-energy malnutrition (PEM) by estimating their concentration in serum and hair, and find their relationship with various anthropometric measurements.

Methodology: This case-control study was carried out in the Nutrition Ward of the Dhaka Shishu (Children) Hospital. Forty severely malnourished children (weight-for-age <60% of NCHS median) aged 6-60 months were taken as active cases. Forty-six relatively well-nourished children (weight-for-age <70% of NCHS median) of the same age group were taken as control. Serum and corresponding hair copper, manganese, and iron contents were estimated by flame atomic absorption spectrophotometry, and the results were expressed as parts per million (ppm).

Results: Both serum and hair copper contents were found low in PEM (0.80±0.38 ppm vs.1.98±1.16 ppm, $p<0.05$ and 13.44±13.09 ppm vs.14.52±10.58 ppm, $p>0.05$). However, serum and hair iron contents were found higher in PEM (1.54±1.38 vs. 0.85±0.53 ppm, $p<0.05$ and 57.93±53.85 ppm vs. 20.88±11.38 ppm, $p<0.05$ respectively). Hair manganese content was also found higher in PEM (7.22±4.62 ppm vs. 6.03±3.39 ppm, $p>0.05$) while serum manganese was not recordable. Serum copper content maintained positive correlationship with weight-for-age ($r=0.4403$, $p<0.001$) while serum iron content in PEM maintained negative relationship with age in month ($r=0.3572$, $p=0.012$). Hair iron content had negative relationship with weight-for-age ($r=0.3979$ $p=0.001$), and hair iron content had positive relationship with hair manganese content ($r=0.2794$, $p=0.020$)

Conclusion: Considering the low copper status in PEM from the above results, copper supplement may be beneficial in severe PEM. However, iron supplement in severe PEM may aggravate clinical condition as there may be already iron overload in these groups of patients contributing more to existing oxidative stress of PEM.

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Effect of Zinc Supplement on Children Suffering from Feeding Refusal with Failure to Thrive

Md. Salim Shakur1, Nasreen Bano1, and S.A. Tarafder2

Objective: Evaluate the effect of oral zinc supplement on feeding refusal with failure to thrive children.

Methodology: A randomized prospective case-control trial was conducted on 40 children aged 36-72 months with complaints by parents of feeding refusal and failing to thrive. Children having weight-for-age between 60 and 89% of NCHS median and not gaining weight satisfactorily (weight-for-age remaining static or decreasing) for the last three months, but otherwise active and having satisfactory development and having no acute or chronic clinical disorder, were included in the study. Twenty children in Group A received oral Zinc acetate (2 mg elemental zinc per kg) and oral multivitamin syrup while 20 children in Group B received oral multivitamin syrup only for one month, and both the groups were followed up biweekly. The groups were comparable with respect to initial characteristics, including nutrition (weight-for-age), zinc status (serum and hair zinc concentration of 141 mg/dl±54.70, 184 mg/g±48.60 and 152 mg/dl±39.20, 192 mg/g±82.54 in Group A and Group B respectively). Body composition, in the form of fat-free body mass (FFBM), fat mass (FM), total body water (TBW), and body mass index (BMI) were also measured before and after the completion of trial using a bioelectric impedance analyzer (BIA).

Results: At the end of the trial, a significant number of patients in Group A had improved appetite (60% vs. 15%, OR 8, 95% CI OR, (1.752,36.488, p<.01). The increased appetite was associated with significant increased weight gain (>5% increase in weight) in group A (p<0.01). The increased weight gain was associated with increase in FFBM, FM, and BMI in Group A.

Conclusion: Low-dose zinc supplement may help improve appetite in non-specific feeding-refusal children without any adverse effect on body composition even though the children are biochemically not zinc-deficient. However, appetite stimulation effect of zinc and its rational use to feeding-refusal children with failure to thrive merits further study.

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Pre-lacteal Feeding Practices in Matlab, Bangladesh

Sabah Tarannum1, S.M. Ziauddin Hyder1, A.M.R. Choudhury1, and Abbas Bhuiya§

Objective: Analyze the nature and extent of the knowledge of mothers on pre-lacteal feeding practices in a rural community of Bangladesh.

Methodology: The study was based on the analysis of data collected under the BRAC-ICDDR,B Joint Research Project in Matlab during April-August 1995. Data on the feeding practices were obtained by interviewing the mothers of 473 children aged less than two years. Households were categorized into two groups: poor and not poor, based on their socioeconomic conditions. Data were analyzed using bivariate and multivariate tools.

Results: Results of the study showed that only 7% of the infants were given breastmilk as first feeding. Honey, mustard oil, and water with sugar were found to be the most frequent types of pre-lacteal liquid given. About 13% of the infants did not receive any liquid within 24 hours of birth. In most cases, grand mothers (47%) initiated the feeding followed by traditional birth attendant (25%). Although about 30% of the respondents knew the importance of breast-feeding, they did not have accurate knowledge on how and when to initiate it. The findings of the study confirm that exclusive breast-feeding is still non-existent in rural Bangladesh, and in most cases, non-beneficial liquid is given to newborns in an unhygienic way.

Conclusion: It is necessary to create awareness about the child-feeding practices, especially about the colostrum and breast-feeding, among the mothers, grand mothers, and midwives who are mainly concerned to reduce early infections and promote better nutrition. The existing nutrition education efforts should emphasize on the importance of exclusive breast-feeding and harmful effects of the pre-lacteal liquids.

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Study on Food-refusal, Morbidity and Nutritional Status of Children of the Middle and Upper Socioeconomic Class in Dhaka City

M. Asirul Hoque1, Quazi Salamatullah2, Mamunar Rashid 3, and Maqbul H. Bhuiyan4

Objective: Identify the food-refusal and morbidity among the children of urban middle and upper socioeconomic class, assess 24-hour energy intake in selected morbidity in food-refusal and non-refusal group of children, and also assess their nutritional status.

Methodology: This was a descriptive type of study, and the study design was a non-experimental one with static group comparison between two groups: (a) a study group where event of food-refusal was present, and (b) a comparison group where event of food refusal was absent. Four hundred children were included in the study which fit in the timeframe of data collection. As the study was qualitative in nature, the sample size was not determined, and was detected arbitrarily. The method of systematic random sampling was used for the collection of data from three organizations of Dhaka city.

Results: Diarrhoea, acute respiratory infection, and fever were common in both study and comparison groups. In presence of diarrhoea, acute respiratory infection, and fever, the majority of children took energy <RDA in both the groups, but the refusal group was affected more in the majority of cases. In presence of diarrhoea in the upper middle class, 96.3% of the study and 50% of the comparison group children took energy <RDA, and in the upper class, more than 90% of the children from both the groups took energy <RDA. In presence of diarrhoea, in the upper middle class study group, 22.2% of the children were short and 14.8% of the children were thin, and in the upper class study group, 8.0% of the children were short and 22.0% of the children were thin. In the comparison group in both the classes, children were not short or thin.

Conclusion: In presence and absence of food-refusal, the majority of the children having morbidity consumed energy less than RDA. Increased energy and nutrient intake during illness may play a strong role in the prevention of malnutrition.

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Anaemia in Pregnancy: A Rural Community Perspective

S.M. Ziauddin Hyder

Objective: Investigate the prevalence of anaemia and the associated factors among pregnant women in two rural areas of Bangladesh.

Methodology: Data were collected in March 1997 from 90 pregnant women residing in 6 villages of Saturia and another 6 villages of Fulpur thana in Manikganj and Mymensingh districts respectively. All the identified pregnant women in the 12 villages who were willing to participate were included in the study. The women were interviewed to collect their socioeconomic information. Fingerprick blood samples were taken, and haemoglobin concentration was measured in the field using a portable HemoCue photometer system. The system uses cyanomethaemoglobin method to assess haemoglobin concentration. The WHO criteria (haemoglobin concentration <110 g/L) were used for defining anaemia during pregnancy.

Results: The results of the study showed that 54% of the women had anaemia according to the WHO criteria. Area of residence, literacy, iron tablet intake, and the duration of BRAC membership were significantly associated with the prevalence of anaemia ($p<0.05$). The women who lived in Fulpur had higher prevalence of anaemia (63%) compared to those who lived in Saturia (32%); the illiterate women had higher prevalence (60%) than the literate women (23%); the women who reported to take iron tablet had lower prevalence (36%) than the women who did not (60%); and lastly, the women who were associated with BRAC for more than one year had the lower prevalence of anaemia (27%) compared to the women who were involved with BRAC for less than one year (74%).

Conclusion: A very high proportion of the pregnant women is anaemic in the rural communities of Bangladesh. The BRAC's rural development programmes, in addition to its ongoing income-generating, food production and essential health care-delivery activities, should find ways to increase the effectiveness of the existing iron supplementation programme through increasing its compliance and coverage.

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Iron Supplement and its Predictors among Newly-married Girls and Women in Rural Bangladesh

Thomas T. Schaetzel and Mohammad Shahjahan

Objective: Determine the level and predictors of iron supplement among the primaparous, newly-married girls and women in rural Bangladesh.

Methodology: A baseline survey relating to nutrition and pregnancy was administered to 2,259 newly-married women and girls in December 1996 for ongoing monitoring of the pilot intervention among the newly-married couples (NMC) of the Bangladesh Integrated Nutrition Project (BINP). All available girls and women married four months or less were interviewed in three rural thanas: one thana implementing the BINP NMC strategy, one thana implementing the standard BINP strategy, and a non-BINP thana. The first of a series of follow-up surveys was administered in March 1997 to a subset of the baseline group, and iron supplementation behaviour was analyzed among the 321 women pregnant at follow-up. Survey datasets were linked electronically using shared identifiers, and predictors of supplement were determined through logistic regression model-building procedures.

Results: 25.5% of the pregnant women in the sample were/had been taking medicine during pregnancy, and 63.4% of this group (52 girls and women) reported taking iron/folate tablets. 61.5% of those who had taken iron/folate reported a twice daily dose, and 67.3% were still taking iron at the time of the survey. 40.2% of those still taking iron had been taking it for 3 months or longer; 88.2% of those who had discontinued supplementation did so within two or fewer months. Two factors relating to supplement emerged. Mothers' education of a girl/woman, independent of her own education status (OR=2.9), and any attendance at satellite clinic (OR=5.4; SC attendance was also shown to be associated with needing permission from mother-in-law to attend the health centre).

Conclusion: The majority of primaparous, newly-married women who took iron supplements during pregnancy appeared to be receiving the WHO-recommended daily dosage. However, a small percentage of women was undertaking this regimen; drop-out from supplementation appeared to be high; and supplementation duration appeared to be very low among those who dropped out. Continued progress in universal women's education can improve health-care behaviours, such as iron supplementation, and further emphasis should be placed on holding satellite clinics according to schedule and motivating pregnant girls and women to attend these.

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Intra-household Food Distribution in a Rural Area of Bangladesh

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Objective: Explore the sex preference in intra-household food distribution in a rural area of Bangladesh.

Methodology: This in-depth study of the BRAC-ICDDR,B Joint Research Project was conducted in six villages of Matlab thana. School-going brothers and sisters aged 10-14 years from the BRAC and the non-BRAC households were selected for the study. The sample was selected using a quota random-sampling technique. Both quantitative and qualitative research methods were employed for data collection. Three hundred seventy-six brothers and sisters from 188 households were interviewed using a structured questionnaire. Respondents from one village were chosen for direct observation of food distribution behaviour. Six focus group discussions were conducted with the mothers of two villages to understand their views regarding their food distribution behaviour.

Results: The results of the study suggest that there was no major discrimination in the perceived food intake (both regular meal and snacks) between brothers and sisters. The small differences observed in food intake were due to the unavailability of food at home and perhaps due to mothers favouring the sons. During meal observation in one village, it was found that the brothers were given preference over their sisters during food distribution. The mothers' opinion in this subject was that one should treat both daughter and son equally, but it was not always done in practice. Some mothers cited, "sons are the future security for the parents, and they also help their father in work. So, they are offered more food." However, they did not report anything about the contribution of their daughters to household chores. A similar result was observed in the BRAC member and non-member households.

Conclusion: The results of the qualitative and quantitative analysis show that although there was no significant difference in the perceived adequacy of the meals between brothers and sisters, there was a difference in the food distribution pattern by sex.

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Family Planning and Pregnancy-related Nutrition Behaviours and Beliefs among Newly-married Women in Rural Bangladesh

Thomas T. Schaetzel and Mohammad Shahjahan

Objective: Determine baseline awareness and knowledge about nutrition in pregnancy among the newly-married women in Bangladesh.

Methodology: A survey of family planning behaviour and knowledge related to nutrition and pregnancy was administered to the 2,259 newly-married women in December 1996 to establish the baseline levels for ongoing monitoring of the pilot intervention among the newly-married couples (NMC) of the Bangladesh Integrated Nutrition Project (BINP). All available newly-married women (married four months or fewer) were interviewed in three rural thanas: one thana implementing the BINP NMC strategy, one thana implementing the standard BINP "total vulnerable group" strategy, and a non-BINP thana.

Results: The mean age of the respondents was 16.1 years, and 50% were 15 years or younger. Of the 2,259 newly-married women, 30.2% were currently using birth control (65.2% of these using oral contraceptives), and family planning was least commonly practised among the youngest age group. Fifty-eight percent of the respondents believed that pregnancy requires an increased food intake, but 25.4% of those who believe food intake should decrease and 57.4% of those who believe food intake should remain as usual stated that a "bigger" or "healthier/stronger baby" would result. Only 30.9% of the respondents felt that pregnancy requires an increased rest, and 41.6% heard of iron/folate supplements, but only 29.9% of these were aware that they were important for pregnancy, and 40% responded that the local doctor/medicine shop was the location to obtain them.

Conclusion: The young age of newly-married women presents an important challenge for targeting family planning and nutrition messages relating to reduction of low birth weight: family planning motivation is particularly essential to delay first pregnancy; adolescents and their families require education on the nutritional needs of adolescent pregnancy and the benefits of increased rest; and information is necessary prior to pregnancy concerning iron supplementation and the free availability of these supplements through the primary health-care system.

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Prevalence of Vitamin A Deficiency among Adolescent Female Workers

Nabila Hasan1 and Faruk Ahmed 2

Objective: Investigate the prevalence of vitamin A deficiency among the adolescent working girls of low-socioeconomic group.

Methodology: Three hundred eighty-eight girls aged 12-19 years, working at 10 different garment factories of Dhaka city, were selected randomly for this cross-sectional study. Information on socioeconomic conditions, diet, and knowledge and perceptions about vitamin A deficiency and vitamin A-rich foods was obtained through interviews. Anthropometric data and blood samples were also collected following the interview.

Results: By the NCHS standards, 15.5 % of the working girls were thin (Wt/Ht <90%), and nearly 7% were overweight (Wt/Ht >120%). About 44% of the girls were anaemic (Hb <12 g/dl). In about 56%, serum vitamin A was below the adequate level of 30 g/dl, and 14% had frank vitamin A deficiency (<20g/dl). Food frequency data on vitamin A-rich foods revealed that a large percentage of the girls did not take egg (41%), milk (64%), liver (85%), and sweet pumpkin (85%). However, 40% of the girls took dark-green leafy vegetables, and 17% small fish at least 4 times a week. Only 39% had correct understanding of night blindness, 29% had correct knowledge about the causes of night blindness. The majority of the participants had no idea about the prevention (64%) and treatment (68%) of night blindness. Sixty-eight percent had no knowledge about vitamin A-rich foods. Of those who knew, the majority mentioned dark-green leafy vegetables as a rich source of vitamin A.

Conclusion: The findings suggest that the study population bear a significant public health risk which may be due to their lack of nutritional knowledge and poor dietary habits.

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Intensive Nutrition Education Programme for Adolescent Girls

Sadia A. Chowdhury, Zeba Mahmud, and Emily W. Counts

Objective: Assess the achievements of the adolescent girls who received intensive nutrition education, including supplementation, aiming at bringing about sound nutritional practices.

Methodology: In one of the thanas, the BRAC's non-formal and primary education (NFPE) schools incorporated health and nutrition education, monthly monitoring of weight, height and mid-upper arm circumference (MUAC), and daily food supplementation (600 calories/day) for the adolescent girls, in addition to the normal curriculum. These activities covered the girls for the total school period of 3 years, and were provided by the female community health workers and the NFPE school teachers.

Results: The mean age of the adolescent girls was 13.4±0.69, and the mean age of menarche was 13.2±0.77. As a group, the mean increase in MUAC was 2.24 cm, and the mean increase in weight and height was 4.52 kg and 5.51 cm respectively. The girls exiting supplementation after two years had better weight gain than the girls of the same age entering supplementation. For example, girls entering at age 10 years exited at age 12 years with a weight of 32.23 kg which was greater than the entry weight of 12-year old girls at 30.5 kg.

Conclusion: Girls receiving two years of intensive nutrition education and supplementation had better weights and were taller, and therefore, an improvement in the growth indicator can be achieved among the adolescent girls with these interventions. Programmes aiming at improving the women's nutritional status, and thereby, their infants should consider focusing on the adolescents as future mothers.

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Effect of Women-Focused Development Programme on Nutritional Status of Rural Women

Sabrina Rasheed 1, Abbas Bhuiya§, S.M. Ziauddin Hyder1, and A.M.R. Chowdhury1

Objective: Assess the effect of women-focused development programme on the nutritional status of women measured by the body mass index (BMI).

Methodology: Anthropometric measurements and socioeconomic information of 1,597 women aged 15-55 years were obtained from eight villages of Matlab thana, through the BRAC-ICDDR,B Joint Research Project during April-August 1995. BMI of <16 was used as a cut-off point for severe chronic energy deficiency. The association between the proportion of women with BMI of <16 and the BRAC membership status (categorized as BRAC member poor, BRAC non-member poor and rich) was explored in both bivariate and multivariate analyses. In the multivariate analysis, the effect of age, parity, and education of women was controlled.

Results: According to the multivariate analysis, age, parity, and BRAC membership status of the households showed a significant association with the proportion of severely malnourished women. In the comparative sense, the BRAC-member women had a 35% more chance of being severely malnourished whereas the BRAC-non-member poor women had a 64% more chance of being severely malnourished than the women from the rich households.

Conclusion: The development programme focused on women has a positive impact on the women's nutritional status.

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Maternal Nutrition and Birth Weight

S. M. Keramat Ali, A.K.M Yunus Halim,
and Mohammed Yakub Ali

Objective: Determine the weight of rural pregnant women and its effect on birth weight of their babies.

Methodology: One thousand seven hundred and seven pregnant women of Shakipur thana in their 3rd trimester constituted the sample size. Information on height, weight, mid-arm circumference (MUAC), and 24-hour dietary intake by these women were collected by interview through house-to-house visit. The birth weight of only 10 babies could be collected.

Results: About 64% of the women were aged 15-25 years. In 81% of the families, the monthly income was Tk 2000. The average birth interval was 24 months. They showed a U-shaped pattern interval of chronic energy deficiency as defined by the body mass index (BMI) of <18.5. The graph showed that with the increase in BMI of the mothers, the birth weight of their babies also increased. About 52% of the mothers had body weight ranging from 41 to 44 kg, and had more low-birth-weight babies. In general, the mothers took low calories contributed by low macro and micronutrients. Mothers having MUAC of less than 23 cm had an average body weight of 43.5 kg.

Conclusion: In case of women having pregnancy weight of <43.5 kg and MUAC of <23 cm, BMI ranged from 16 to 18.5. Low-birth weight of babies is more associated with rural mothers who take 1,339 kcal per day.

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Some Socioeconomic Differentials of Weight, Height, and Body Mass Index of Women in Rural Areas of Bangladesh

Yeakub Patwary, Rowshan Jahan, and Shahin Ara Begum

Objective: Examine the levels and regional variations of weight, height, and body mass index (BMI) of approximately 14,000 women from 44 thanas in Bangladesh, and identify their socioeconomic correlates. The correlates are women's age, number of children, family type and size, education, religion, and land owned by the household. Women in rural Bangladesh are of low weight and short stature. Poor maternal health and nutrition status contribute to the high incidence of low birth weight and high infant mortality. Women's poor health and nutrition status may be due to their poor socioeconomic conditions. The strength of association between the household socioeconomic conditions and women's nutrition is little known.

Methodology: Data for the study were collected from 44 thanas in Bangladesh on sampling basis. About 600 households were selected following the multistage cluster sampling methodology to collect information on selected indicators. Weight and height of all available women aged 15-49 years were measured along with some selected socioeconomic, demographic, and health-related information.

Results: The preliminary results of the study showed that 45.5% of the women of childbearing age were malnourished having their BMI <18.5; and 59.6% of the malnourished women had no formal or non-formal education.

Conclusion: There is a strong relationship between women's literacy and maternal nutrition.

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Prevalence of Chronic Energy Deficiency in the Elderly Population of Matlab

Sabrina Rasheed1, Masuma Khatun1, S.M. Ziauddin Hyder1, A.M.R. Choudhury1, and Abbas Bhuiya§

Objective: Study the prevalence of chronic energy deficiency (CED) in the elderly population of Matlab and its association with different socioeconomic status indicators.

Methodology: Socioeconomic and anthropometric measurements of 626 individuals aged 55 years and above, residing in 14 villages of Matlab thana of Chandpur district, were obtained during April-August 1995 using pre-coded questionnaire. Body Mass Index was used as an indicator of CED. Bivariate and multivariate analyses were done, and variables found to be significant in the preliminary bivariate analysis were used as the independent variables in the logistic regression model.

Results: The results of the study showed that about 80% of the elderly people suffered from different degrees of CED, and 35% from severe CED. In both bivariate and multivariate analyses, severe CED was highly prevalent ($p<0.01$) among the elderly people in the BRAC-eligible poor households. According to the logistic regression, severe CED was most prevalent among the unemployed and disabled (56%) and least prevalent among those involved in farming (20%). The elderly people, residing in families with more than five members, seemed to suffer most from severe CED ($p<0.01$).

Conclusion: Severe CED is highly prevalent in the rural elderly population, and was associated with socioeconomic status, employment status, and family size. Therefore, BRAC may be able to provide support services for the elderly people through the existing credit and health programmes.

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The Prevalence of Anaemia among Males and Females in Rural Bangladesh

S.M. Ziauddin Hyder, Sadia A. Chowdhury,
and A.M.R. Chowdhury

Objective: Investigate the prevalence of anaemia among males and females in a rural community of Bangladesh.

Methodology: The survey was conducted in a healthy population in March 1996 in 12 villages of Fulbaria thana of Mymensingh district. One hundred six males and 228 non-pregnant females aged 11-48 years were studied. Information on haemoglobin concentration, parasite infestation, and household socioeconomic status was obtained. A HemoCue photometer was used for measuring haemoglobin concentration. Microscopic examination of stool was done in the Microbiology Laboratory of the Mymensingh Medical College.

Results: About 69% of the males and 70% of the females were found to be anaemic according to the WHO criteria. There was no difference in the prevalence of anaemia between males and females. Literacy and economic status were associated with the prevalence of anaemia among the females, but not among the males ($p<0.05$). Anaemia was also more common among those holding little or no land and among those having current *Ascaris* infestation ($p<0.05$).

Conclusion: Anaemia is highly prevalent in the rural communities of Bangladesh, which affects both males and females equally. Studies should be undertaken to examine the cases of anaemia in different age and sex groups to develop effective preventive and control measures.

Bangladesh Rural Advancement Committee (BRAC), 75 Mohakhali C/A, Dhaka 1212

Determinants of Nutritional Status of Pre-school Children in BRAC-eligible Households

Sabah Tarannum and S.M. Ziauddin Hyder

Objective: Asses the prevalence and determinants of nutritional status of children aged 6-59 months in the BRAC-eligible households.

Methodology: The Nutritional Surveillance Project (NSP) of BRAC and the Helen Keller International collects children's anthropometric and corresponding household's socioeconomic data at an interval of every two months on a cohort of 100 village in 4 rural thanas. During each round, 20 children from each village have been surveyed. The present analysis is based on 11,611 measurements of children aged 6-59 months collected during April 1994-December 1996. Socioeconomic data were collected, using a structured questionnaire, and weight and height data were collected, using Salter scale and wooden height board. The nutritional status was expressed as stunting which defined as height-for-age <90% of the NCHS median. BRAC eligibility was defined as the households having land <50 decimals, and one of the households members sold manual labour at least 100 days in the last one year. Both bivariate and multivariate tools were used for analyzing the data.

Results: The overall prevalence of stunting was 71% which was higher in males (67%) than females (57% ($p<0.01$). The prevalence of stunting was highest (71%) among the 6-24 month age group. The prevalence of stunting was associated with age, point prevalence of Acute Respiratory Infection (ARI) and diarrhoea, vitamin A capsule (VAC) coverage, type of latrine, sex of household head, family size, mother's literacy, occupation of main earner, BRAC membership, and per capita monthly food expenditure ($p<0.01$). Multivariate analysis suggests that birth order, point prevalence of diarrhoea, sex of household head, monthly food expenditure, occupation of main earner, and loan received during last month are the significant predictors of stunting of the children among the BRAC-eligible households ($p<0.05$).

Conclusion: Compared to the national average of 46%, a very high proportion of the children in the BRAC eligible households are stunted. Nutritional considerations in monitoring and evaluation of the ongoing poverty Alleviation programmes should be carefully incorporated to incorporated to enhance their impact on nutritional status.

Bangladesh Rural Advancement Committee (BRAC), 75 Mohakhali C/A, Dhaka 1212

Infant Growth Patterns in the Slums of Dhaka in Relation to Birth Weight, Intrauterine Growth Retardation and Prematurity

S.E. Arifeen§, R.E. Black1, G. Antelman§, and A.H. Baqui§

Objective: Describe the patterns of growth in body weight among infants till their first birthday, especially with reference to birth weight, intrauterine growth retardation (IUGR), and prematurity.

Methodology: One thousand six hundred fifty-four infants, born in selected slum areas of Dhaka, were enrolled at birth and followed longitudinally till they reached 12 months of age. Weights, lengths, and baseline information of these infants were measured at enrollment. Anthropometric measurements were taken again at 1, 3, 6, 9 and 12 months of age. Analysis was limited to descriptive statistics based on means and proportions, and comparisons to growth references.

Results: The mean birth weight of the infants was 2,517 g, and 46.6% had low (<2,500 g) birth weight (LBW). Sixty-nine percent were born with IUGR, and 17% were premature. Of the growth-retarded newborns, birth weights of 63% of the infants were proportionate to their lengths according to the ponderal index. This indicates that most IUGR infants were subjected to chronic intrauterine undernourishment. The growth of the infants in the study sample was similar to that of a pooled sample of breastfed infants from affluent countries, in that the study infants closely tracked the -2 SD curve of the "reference" infants. The mean z-scores (based on the breastfed reference) were very similar at birth and 12 months (-2.38 and -2.34) and only showed slight improvements in the first 3 months (-1.72). Differences in weight at birth between infants grouped according to birth weight, IUGR and/or prematurity status were retained throughout infancy.

Conclusion: The infant growth rate in this sample was similar to that observed amongst the breastfed infants in developed countries. Catch-up growth was not seen, and weight at 12 months was largely a function of weight at birth. The data suggest the need to focus on the improvement of birth weight as the principal means for improving nutritional status of infants in this population.

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Knowledge, Attitude and Practice Patterns of Adolescent Girls

Zeba Mahmud and Sadia A. Chowdhury

Objective: Understand dietary intake and health beliefs of adolescent girls.

Methodology: The study group comprised 360 randomly selected adolescent girls aged 11-18 years, attending the BRAC's Non-formal Primary Education (NFPE) schools in Muktagacha thana of Mymensingh district. A questionnaire was used for obtaining sociodemographic information and information on knowledge, attitude, and practices regarding their normal diet and diet during illness and menstruation.

Results: The mean age of the adolescent girls was 12±2 years. Ninety-seven percent of the girls felt that they were taken care of and not considered a financial burden. The food intake patterns showed that more than 70% of the girls ate rice 3 times a day. When the girls were asked whether their food intake had increased with age, 78% reported that it increased in terms of quantity whereas 8% reported that it decreased with age. Data on the nutrition values of food showed that only 59% of the girls could identify energy-containing foods, such as rice, flour, roti, potatoes, and oil. Vegetables were identified as rich source of vitamins by 49%. During menstruation, 32% reported avoiding specific foods, such as milk, sour food, fish, and eggs, and 31% reported decreased food intake during fever and indigestion. Rice was the food most likely to be avoided during fever. Focus group discussions recorded that they learnt food avoidance from the elders in the family.

Conclusion: Although the adolescent girls had a fairly positive perception of their well-being, they were influenced by their families to be self-sacrificing regarding food intake. Therefore, any intervention designed to bring about the behavioural change for better nutrition should include the family members in the target audience.

Bangladesh Rural Advancement Committee (BRAC), 75 Mohakhali C/A, Dhaka 1212

Intervening Malnutrition in Rural Bangladesh: BRAC Experience

Sadia A. Chowdhury and Zeba Mahmud

Objective: Discuss the experience of BRAC in intervening malnutrition in rural Bangladesh. BRAC operates a community-based, integrated health and nutrition service with the aim of empowering the community with nutritional knowledge.

Methodology: The project in Muktagacha thana of Mymensingh district includes children aged less than two years, adolescent girls, and pregnant/lactating women. One female community health worker in each village (a) visits all households monthly to monitor health and provide education, (b) conducts monthly nutrition and health education meetings, and (c) manages growth-monitoring sessions for children aged less than two years to educate mothers and identifies malnourished/faltering in weight children for the 90-day feeding demonstration which provides 200 kcal/day. Pregnant women receive monthly antenatal care, education, and nutrition assessment. Those with body mass index (BMI) of <18.5 receive a daily food supplement (800 kcal/day) and education at home through 6-month lactation. For adolescent girls of the BRAC schools, the school curriculum added component on health and nutrition education, and monthly monitoring of weight, height and mid-upper arm circumference (MUAC), and daily food supplementation (600 calories/day).

Results: Of the approximately 8,000 children aged less than two years, 85% came to the growth-monitoring sessions. On an average, 2,000 children enter the feeding programme each year. There was no significant difference between the number of female and male children coming into the supplementation. The age of the adolescent girls ranged from 10 to 18 years. The mean weight, length, BMI, and MUAC was far below the 50th NCHS percentile. Even though the weight gain of the pregnant women was slight, their children had a higher birth weight. Moreover, this group had the greatest reduction in low birth weights, i.e. 36% between 1992 and 1994 compared to women from other BRAC areas.

Conclusion: An integrated and intersectoral process with one intersectoral community worker and intensive community participation addresses existing malnutrition, and the community learns to take responsibility for and to correct malnutrition.

Bangladesh Rural Advancement Committee (BRAC), 75 Mohakhali C/A, Dhaka 1212

Mother's Perception of Colour and Understanding of Growth Curve to Interpret Nutritional Status of Children in Rural and Urban Bangladesh

S. Mizan Siddiqi

Objective: Determine the mother's perception of colour and understand the growth curve to interpret the nutritional status of children.

Methodology: The study was conducted in two urban areas of Dhaka city and in one rural area in southern Bangladesh during June-July 1993. In each site, 312 mothers with children aged 6-36 months were interviewed by the trained interviewers. The mothers were asked to indicate colours and curves used in the growth cards to label weight gain, weight loss and static weight, and healthy and malnourished child. Mothers were selected using the EPI cluster-sampling technique.

Results: Red, yellow, and green were the most preferred colours chosen by the mothers to indicate weight gain, static weight, and weight loss respectively. Green was the most favoured colour to label a malnourished child, whereas red was chosen for a healthy child. Most mothers labelled upward curve for weight gain, horizontal curve for static weight, and downward curve for weight loss. Similarly, downward and upward curves were chosen by a majority of the mothers to label a malnourished and a healthy child respectively. A tendency toward bright colours (red and yellow) for labelling a healthy child and darker colours (green and black) for a malnourished child were observed in the study.

Conclusion: The findings of the study suggest that colour selection is culturally sensitive, and should be taken into consideration before introducing any colour as a marker for some meaning.

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Perceptions of the Urban Poor Mothers about Small Babies: A Case Study in Dhaka, Bangladesh

S.M. Siddiqi, F. Yasmin, and Iffat Shams

Objective: Explore perceptions about low-birth-weight babies among the urban poor mothers in Dhaka City, Bangladesh.

Methodology: Focus-group discussions were held with 78 women in the slum and low-income areas. Eight to ten women participated in each session.

Results: Less intake of food, vitamin deficiency, too-much-intake of rice, and evil spirit were recognized as the causes of delivering small babies. Difficult-to-take care and nurse, respiratory and gastrointestinal problems were recognized as the major problems by the respondents. The relationship between malnutrition and low-birth-weight babies were also well recognized. Frequent feeding, less intake of rice, intake of vegetables and fruit, cleanliness, rest, not-to-do hard work during pregnancy and not-to-get cold were the preventive measures suggested by the urban poor mothers.

Conclusion: Findings of the study can be used for designing an intervention on low birth weight.

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Nutritional Status of Children in the BRAC's Urban Primary Schools

Sk. Asiruddin1, Mamunur Rahman2, Sadia A. Chowdhury3, and A.F.M. Iqbal Kabir4

Objective: Assess the nutritional status of children in the BRAC primary schools in urban areas and its relationship with the surrounding socioeconomic variables.

Methodology: A cross-sectional study on 220 students, selected randomly from 22 BRAC primary schools in Dhaka city, was conducted from October 1996 to February 1997 under a research programme of the JEXCA Community Hospital and was funded by the Essential National Health Research, Bangladesh. Data were collected through a pre-tested partially close-ended questionnaire. Anthropometric measurement was expressed in z-score of the NCHS standard. Biochemical analysis for urinary iodine level was done in the International Centre for Control of Iodine Deficiency Disorders (ICCIDD) Lab, Institute of Nutrition and Food Science, Dhaka University, and the results were matched with other findings.

Results: Forty-two percent of the male and 58% of the female students were classified in three age groups: 6-8 years (17.7%), 8-10 years (42.3%), and 10-12 years (40%). About thirty-two percent of the children were found stunted and both wasted and stunted, and 8.19% of the children were only wasted. There was a significant relationship of anaemia with angular stomatitis (p=0.005), illness (p=0.005), weight/age (p=0.04) and height/age (p=0.05). Considering -2SD as the cut-off point, the incidence of acute malnutrition (Wt./Ht.) was the highest in 6-8 years age group, and chronic malnutrition (Ht./age) was the highest in 10-12-year age group. Urine iodine analysis showed only 17.7% children to be suffering from iodine deficiency disorders (IDD), while 10.85% of the household salt samples showed no iodine at all. Correlations of Vitamin A deficiency with illness and nutritional status were statistically significant. The school attendance of the male students was slightly higher (92.68%) compared to that of the female students (91.48%). Of the 5 city areas, 93.3% of the students in Narayangonj used tubewell water, 90% in Mogbazar used safe latrine, 25% in Jatrabari lived in good houses, and 10% in Moghbazar were engaged in different occupations. This finding will help BRAC's Non-formal Primary Education formulate appropriate socio-health interventions for the students and their families in those areas.

Conclusion: The nutritional status of children in the BRAC primary school in urban Dhaka was found to be lower than the NCHS standard. Vitamin deficiency disorders of the students can be corrected through promoting the school health programme.

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Bangladesh-Australia Child Health Project: A Child-to-Child and Child-to-Parent Approach for Nutrition and Health Education

Masuda Akhtar1, K.I. Selim1, K. Mahfuzul Huq1, M.K. Majumder1, S.K. Roy§, and M. Fazlur Rahman1

Objective: Evaluate the Child-to-Child and Child-to-Parent approach for message communication. This approach was used by the Bangladesh-Australia Child Health (BACH) Project to disseminate health and nutrition education, with special emphasis on growth monitoring, personal hygiene, oral rehydration therapy, and immunization through scouts and guides.

Methodology: The approach was implemented in 25 Bangladeshi villages over a 6-year period (1986-1992). Two hundred and thirty-nine Australian Rovers and Rangers (Scouts and Guides aged 16-26 years) worked in 16 batches with 787 Bangladeshi counterparts. A joint evaluation team, comprising the Bangladeshi and Australian members, visited each BACH village in March-April 1994. The team also included one scientist from ICDDR,B. The team visited every household of the project area to assess the nutrition and health status of children and the impact of the project activities. The parents were interviewed, and each child aged less than five years was measured and weighed.

Results: The growth of children as measured by height and weight showed that the vast majority of the values fell within the 2 SD (standard deviation) of the mean. In respect of measuring the nutritional status by mid-upper arm cicumference (MUAC), 8% of the male children and 13% of the female children were found to be malnourished. The IMR was found below 30/thousand live-births. The result also showed a significant coverage in immunization (95%), the use of sanitary latrines, and other aspects of sanitation. Low-cost measures were taken for the implementation of the programme. The Australian Rovers and Rangers came on their own expenses. On an average, US$ 3,000 were spent for an average of 400 families in each village. The immediate cost appeared one dollar per person.

Conclusion: The Child-to-Child and Child-to-Parent approach for health and nutrition education was found attractive and effective. The programme was found sustainable, cost-effective, and replicable without using any extra manpower. Behavioural changes in respect of nutrition and health are possible through scouts and guides.

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Home-gardening Approach to Reduce Micronutrient Malnutrition of the Rural Population in Bangladesh

Md. Eshaque Ali and M.A. Mannan

Objective: Evaluate the home-gardening approach for better intake of vegetables to reduce current micronutrient malnutrition of the rural population in Bangladesh.

Methodology: Two thousand two hundred five participatory farm families (PFFs) were selected from 35 rural areas of Bangladesh during the three-year project period. Every year, 735 PFF were identified and organized into a group of 21 farmers headed by a Lead Farmer (LF). A benchmark survey was conducted, using a structured questionnaire. Six administrative units and six unit officers were responsible for implementation, supervision, and monitoring of the activities of the units. The PFFs were trained on production, processing and preservation of seasonal vegetables, and also on health and other nutritional aspects. The family members were about 6, and the homestead garden size was about 6m/6m. The inputs included seed, seedling, fertilizer, fencing support, spade, and others, particularly educational materials. The yearly progress of production and consumption of vegetables was recorded and analyzed, using a computer software.

Results: The monthly PFF's average production and consumption of vegetables in three consecutive years were: 65 kg (SD 40) and 58 kg (SD 18), 73 kg (SD 66) and 62 kg (SD 16), and 63 kg (SD 19) and 61 kg (SD 23) respectively. The average daily vegetable availability at the home level was about 347 g/person (national average is about 125-150 g), and on edible portion, it was about 266 g/person. The PFF's awareness was created through imparting health and nutrition education. The training impact on vegetable processing was found to be 2.1 and 6.6 grade (of 10) respectively during pre- and post-training. The percent impact of seed and seedling production by the PFF at the pre-project ending was 5.5 (SD 2) and 23.4 (SD 11), 4.6 (SD 1.5) and 24.3 (SD 9.8), and 5.7 (SD 1) and 30.8 (SD 9) during 1st year groups, 2nd year groups, and 3rd year groups respectively. Qualitative assessment showed that some behavioural changes were found among the PFFs.

Conclusion: The consumption of vegetables increased among the beneficiaries, even more than that of the national level. This has an effect on deteriorating micronutrient deficiency syndrome and on the reducing micronutrient malnutrition of the rural people. This increased consumption of vegetables was due to awareness of better health and nutrition knowledge among the targeted PFFs. These activities are being sustained\ in most project areas, and are recommended for replication.

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Changes in Plasma Ceruloplasmin Activity in an Animal Model of Shigellosis

G.H. Rabbani§, M. Moyenul§, and Y. Kabir1

Objective: Evaluate changes in the ceruloplasmin activity in an animal model of shigellosis.

Methodology: The ceruloplasmin activity was estimated and compared with normal animal in a rabbit model of shigellosis. Colonic infection was induced in adult rabbits by inoculating *Shigella flexneri* 2a. Blood samples were obtained before and after infection from the 24 to 192-hour experiment period for control and infected animal for measuring the ceruloplasmin activity.

Results: The preliminary results showed that the ceruloplasmin activity (mg/dl, mean±SE) in the plasma was: 17.67±1.02 (control, n=12), 37.08±1.10 (24 hours infected, n=12), 42.04±0.99 (48 hours infected, n=7), 36.80±1.93 (72 hours infected, n=7), 33.11±1.70 (96 hours infected, n=6 hours), 13.88±1.86 (192 hours infected, n=7).

Conclusion: These preliminary data indicated that the serum concentration of the ceruloplasmin activity was significantly elevated during infection of 24 and 48 hours due to shigellosis. However, after 72-192 hours of infection, the ceruloplasmin activity in the plasma was progressively decreased which may be due to the accumulation of copper in the liver and brain and ultimately reached below the baseline values at 192 hours due to copper deficiency.

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Potential Invasive Properties of *Vibrio cholerae* O139 Bengal in a Rabbit Model: A Preliminary Study

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Objective: Study the invasive properties of *Vibrio cholerae* O139 Bengal.

Methodology: Adult New Zealand white rabbits were used. Closed intestinal loops of 10-cm length, following appropriate surgical procedures, were constructed. Live cultures of *V. cholerae* O139 (bacterial count: 109/mL) were inoculated in each loop. Two loops were constructed in the small intestine of an additional rabbit. One loop was challenged with *V. cholerae* O139, and the other one (control) with bacteria-free culture medium.

Results: After 18 hours, inflammatory changes were noted in the gut wall mucosa of all rabbits. Blood cultures revealed the growth of *V. cholerae* O139 in one animal, suggesting mucosal invasion followed by bacteraemia. While the gut wall of the control loop showed no signs of inflammation, there were definite signs of inflammation in that of the challenged one.

Conclusion: These preliminary observations indicate that some strains of *V. cholerae* O139 may have invasive properties in rabbits.

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Prevalence of Intestinal Parasites in the Healthy Adult and Adolescent Population in a Rural Community

S.M. Ziauddin Hyder1, M. Akram Hossain2, and Sadia A. Chowdhury1

Objective: Identify the magnitude of the problem of parasites among healthy adults and adolescents in a rural population of Mymensingh district.

Methodology: Fulbaria thana under Mymensingh district was selected for this study. Eleven villages around the thana Health Complex (THC) were randomly selected. Thirty samples were collected from each of the 11 villages. Houses were randomly selected. Thus, 330 individuals were interviewed whose stool samples were collected and sent within 6 hours of collection to the Department of Microbiology, Mymensingh Medical College for microscopic examination. Both saline and iodine preparation were done for the samples.

Result: The overall parasitic prevalence was found to be 33.3% of which 27.9% were among males and 35.8% among females. The adults of the age group 18-35 years had the highest prevalence, i.e., 40%. Among the infested individuals, *Ascaris lumbricoides* has got the highest prevalence of 88.3% followed by *Ankylostoma duodenale* 4.5%, *Strongyloides stercoralis* being the lowest 0.9%. Only 30% of the people who washed their hands with soap after defecation suffered from parasitism as against 77% who did not use soap.

Conclusion: The prevalence of intestinal parasites specially of ascaris is very high in the rural communities of Bangladesh. Adequate focus should be given to improve sanitation through information, education and motivation (IEM) to control the spread of intestinal parasites. Importance of using soap to wash hands after defecation should also be popularised.

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Women in Need: Pattern of STD Infection among Street-based Sex Workers of Dhaka City

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Objective: Assess the design, development and implementation of an HIV/AIDS and STD intervention targeting the street-based sex workers in Dhaka city.

Methodology: Sex workers were recruited to act as guides during assessment. An extensive ethnographic field observation was used for identifying the locations, and the capture-recapture method was used for estimating the size of street-based female sex workers in the city. Depending on the condom use, the sample size was determined, and 230 sex workers were recruited from the street. The participants in the survey were provided with medical examination by the qualified staff. Of the 230 women, 225 agreed to have clinical examination, as well as endocervical swabs and blood samples taken for laboratory examination. Endocervical swabs for gonorrhoea and blood samples were collected for VDRL tests and confidential and anonymous HIV testing. Samples were simultaneously tested in the Institute of Postgraduate Medicine and Research, Dhaka, and Bolton Sexual Health Center, UK. A cohort of samples was cultured in the International Centre for Diarrhoeal Disease Research, Bangladesh.

Results: Eighty percent reported that they had vaginal discharge, and 40 percent had burning sensation during urination. Thirty-nine percent reported that they had deep dyspareunia. Of the 81% women who had signs of reproductive tract infection, 69% had vaginal discharge, 62% cervical discharge, and 55% both vaginal and cervical discharge. On laboratory examination, TPHA and VDRL were found positive for 52% and 29% respectively. PCR-positive was 53% and 49% for gonorrhoea and chlamydia respectively. There was no positive case for HIV.

Conclusion: Given the prevalence of STD and high-risk behaviours among the street sex workers, a vigorous HIV/AIDS and STD control intervention should be implemented quickly. The nature and size of the target population calls for partnership between different organizations and parties. Satellite and mobile clinics should be established to provide sex workers with outreach services. Sex workers should be recruited and trained as peer educators to disseminate messages and risk reduction materials and work toward creating peer pressure. The sex workers should be provided with appropriate health information, including HIV/AIDS and STD prevention information, education, and condoms.

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Acute Transient Childhood Myositis Resembling Paralytic Illness: A Newly Discovered Entity in Bangladesh

Md. Salim Shakur1 and Md. Sultan Uddin2

Objective: Study the acute transient myositis in children.

Methodology: Ten children (6 male and 4 female) aged 3-5 years (mean age 46 months) presented in surgery during January-July 1996, with sudden onset of significant pain and weakness of lower limbs with inability to walk (forcing them to become bed-ridden), causing great concern to their parents. These children belonged to the higher socioeconomic class. All of the patients had muscle tenderness, particularly of lower limb muscles (calves), but no neurological deficit was clinically detected, and none showed altered sensorium. Most patients did not walk due to apprehension of enhancement of pain. Most had mild constitutional symptoms, including low-degree fever. All patients were investigated for complete blood count, ESR, CPR, and creatinine phosphokinase (CPK), and three were investigated for blood culture and widal.

Results: All the patients showed sky-high CPK (2297 g/L±194 g/L). All except one showed normal ESR; all showed normal white blood cell count. All other investigations were negative. All patients were treated conservatively at home with oral paracetamol, and three received antibiotics. All patients recovered uneventfully within 10 days (mean 7 days) of illness, with complete disappearance of weakness, pain and tenderness of lower limbs, with CPK coming back to normal level within 10 days in parallel with clinical recovery. The conditions showed sudden significant pain and weakness of lower limbs causing complete inability to walk mimicking paralytic illness to be transient reversible phenomena due to acute myositis. The raised serum CPK value was considered to be adequate confirmation of this, and rapid reversion to normal corresponded to clinical recovery.

Conclusion: Although no virology study was done, review of literature suggests viral aetiology, particularly influenza B virus, as the most likely aetiology of this condition.

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Acute Viral Hepatitis in Pregnancy

Rokeya Begum and Syeda Nurjahan Bhuiyan

Objective: Analyze the maternal and perinatal outcome of pregnancy complicated by viral hepatitis.

Methodology: Seventeen pregnant mothers with viral hepatitis admitted in the Department of Obstetrics and Gynaecology of the Chittagong Medical College during January-November 1997 were studied prospectively. Minimum investigations, such as for bilirubin, prothrombin time, SGOT, and SGPT, were made for all patients, and hepatic and obstetric complications were recorded.

Results: Most (70.5%) women were aged 25-35 years. Fourteen (82.3%) of them were multiparous. Forty percent of the pregnant women had only one time antenatal check-up, and the rest had no antenatal check-up. Ten (58.8%) cases came from urban areas. Jaundice was detected in 15 women (88.2%) in 3rd trimester of pregnancy. Five (29.4%) cases had hepatic failure at the time of admission. As no specific treatment exists for viral hepatitis, patients were managed by supportive treatment only. Thirteen (76.4%) cases died. Of these, 11 cases (84.6%) were due to hepatic failure, and 2 cases due to coagulation problems. All foetuses were stillborn.

Conclusion: Reduction in mortality of both mothers and infants due to viral hepatitis is utmost important; mortality can be reduced by creating awareness regarding primary health care. Most of viral hepatitis are enterically transmitted and spread through faecal contamination of drinking water. Attempts should be made to prevent the occurrence of this dangerous disease.

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Parasites in Healthy City Dwellers

M.A. Samad Talukder

Objective: Investigate faecal parasites in healthy Bangladeshi people who normally reside in Dhaka city.

Methodology: Direct microscopic examination of wet film of faeces in normal saline and Lugol's iodine on microscopic slide with cover slip was done without floatation or concentration method as the subjects were healthy adult population for routine medical check-up.

Results: Of the two hundred seventy-eight patients, including four women, submitted their stool specimens for examination; 71 (25.54 %) had 80 parasites. None of the subjects had any complaints. A single infection was present in 63 subjects (88.73%), double infection in 7 (9.89%), and treble infection in 1 (1.41%). The parasites isolated were *Ascaris lumbricoides* (including one larva, 51.25%), *Trichuris trichiura* 14 (17.5%), cysts of *Giardia lamblia* 12 (15%), cysts of *Entamoeba histolytica* 7 (9.89%), *Ancylostoma duodenale*, 3 (3.75%), *Trichomonas hominis* 2 (2.5%), and *Fasciolopsis buski* 1 (1.25%).

Conclusion: The prevalence of faecal parasites in healthy city dwellers was 25.54%, and just over 50% were *A. lumbricoides*. It was found that even healthy asymptomatic people (having no complaints) harbour parasites in endemic areas where warm climate may help the development of ova to infective form and infect even the healthy population.

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Seroprevalence of Syphilis, Hepatitis B, and HIV Infections

A.K.M. Shariful Islam1, Osul Ahmed Chowdhury1,
M. Shibbir Ahmed1, and Ahmed Kabir Chowdhury2

Objective: Determine seroprevalence of syphilis, hepatitis B, and HIV infections among patients with sexually transmitted disease (STD)/sexual health problem (SHP).

Methodology: A sequential cross-sectional study was done at the Skin and VD outdoor of the Sylhet M.A.G. Osmani Medical College Hospital during September 1996-August 1997. Sociodemographic information and data on clinical diagnoses, age of first sexual experience, number of sexual partners, casual relations, and sexual practices were collected confidentially by one of the researchers in a purposively designed pre-tested questionnaire after personal interview and clinical examination of the randomly selected patients (n=468) who gave verbal consent to participate in the study. Blood samples of these patients were collected and tested at the Microbiology Department of the College by the commercially available kits.

Results: Of the 468 patients tested, 460 were male and 8 were female. The mean age of the patients was 24.2 years with a range 9-46 years. Of these, 358 (76.5%) were unmarried, 109 (23.3%) married, and 1 (0.2%) widowed. In total, 44 (9.4%), 34 (7.3%), and 79 (16.9%) were reactive/positive. Of the 44 VDRL-reactive cases, 34 (77.3%) were confirmed to be syphilis by the TPHA test. The overall seroprevalence for syphilis and hepatitis B was 7.3% and 16.9% respectively. No HIV antibody was detected in any patient. The major diagnoses were 163 (34.8%) genital ulcerative diseases (GUD), 245 (52.4%) genital discharge diseases (GDD), and 60 (12.8%) sexual health problems (SHP). VDRL, TPHA, and HBsAg tests were reactive/positive in 22.7%, 19.1%, and 14.7% cases in GUD compared to 2.5%, 1.2%, and 18.4% cases in GDD respectively. Only 1.7% VDRL and 16.7% HBsAg tests were reactive/positive in the SHP patients. These differences were statistically significant.

Conclusion: Seroprevalence of syphilis was more confirmed in GUDs than in GDDs, whereas the seroprevalence of hepatitis B was more confirmed in GDDs than in GUDs. Besides, reactive/positive results of these tests were significantly higher in the STD patients than in the SHP patients. Because of these high rates of STDs and great potential for the spread of HIV infection, surveillance of STD patients should receive priority for the control and management of STDs in Bangladesh.

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Plasmid Fingerprinting for the Investigation of Inter-household Spread of Multiresistant Faecal Bacteria in Rural Bangladesh

Kazi Selim Anwar1 and Paul Shears2

Objective: Determine the household spread and epidemiology of multiple drug-resistant (MDR) faecal coliform bacteria from human and environmental sources employing plasmid fingerprinting.

Methodology: Thirty-three water specimens of *Kolshi* (storage pot), 13 tubewell, and 71 faecal samples were collected from 17 randomly selected households of two villages of Rajbari. Lactose-fermenting coliform (LFC) were cultured and MDR strains, after antibiogram (Stokes, 1972), were subjected for *in vitro* conjugation. Plasmid from donor LFCs and their transconjugants were extracted following the method of Boirnboim and Doly. Restriction endonuclease (REA) fragments were generated by digesting the large 98 Mda transconjugant plasmid using *Hin*dIII. Dendrogram was also employed to compare its findings with the conventional (manual) plotting method.

Results: Ninety-four percent of the faecal samples, 21 of the 33 *kolshi*, and only two of the tubewell samples were contaminated with LFC. Overall, 78% of the isolates were resistant to more than 3 antibacterials; R-pattern 'RRRSS' genes [(resistant to tetracycline (Tc), ampicillin (Am), and trimethoprim (Tm), and sensitive to chloramphenicol and nalidixic acid (Na)] were the commonest and prevalent in all types of samples and from almost every household. Conjugation experiment showed a complete transfer of 'RRRSS' genes which were carried most commonly by a large 98-Mda plasmid, though not all of these were genetically identical as revealed by REA. However, similar or different plasmid/transconjugant/REA profiles were observed in the same or different households or *baris* (cluster of households) of both the study areas.

Conclusion: It was evident that a wide range of MDR LFCs (as a marker of *Enterobacteriaceae*) was circulating in both the villages, within the households and among different *baris*. Water from *kolshi*, but not from tubewell, played a vital role in the household spread of these bacteria.

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Efficacy of Erythromycin, Ampicillin, and Tetracycline in the Treatment of Cholera in Children

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Objectives: Compare the clinical outcome(s) of treatment of cholera in children with ampicillin, erythromycin, and tetracycline.

Methodology: In a double-blind randomized 4-cell trial, 184 children aged 1-5 years whose weight-for-age was more than 80% of the NCHS standard were given either tetracycline, erythromycin, ampicillin, or placebo for 3 days (the dosage suggested by the World Health Organization) in a diarrhoeal disease hospital in Dhaka. Selection criteria included diarrhoea of less than 48 hours' duration, signs of some or severe dehydration, a dark-field stool microscopy demonstrating the presence of *Vibrio cholerae* and baseline purging rate more than 4 mL.kg/h (over 6 hours).

Results: After three days of antibiotic treatment, the mean±SEM stool output was significantly reduced in each of the three groups who received antibiotics compared to the placebo group. The mean duration of recovery was 66% longer in the placebo group (p=0.000), 25% in the ampicillin group (p=0.017), and 9% in the erythromycin group (p=0.37) compared to the tetracycline group. The clinical recovery rate by 96 hours was 75% (p=0.001) in the placebo group, 91.3% in the ampicillin group (p=0.16), and 95.7% in the erythromycin group (p=0.04) compared to the tetracycline group. The stool output in mL.kg.body wt. was: 318±50, 335±30, 323±25, and 498±37 respectively in tetracycline, ampicillin, erythromycin, and placebo groups.

Conclusion: The results of the study indicate that the clinical efficacy of tetracycline, ampicillin, and erythromycin in the treatment of cholera in children was comparable. It is recommended that, where test for *V. cholerae* is positive to ampicillin, it can be used as an effective alternative antibiotic for the treatment of cholera and acute respiratory tract infections.

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Desire for Children and Subsequent Abortion in Matlab, Bangladesh

Abdur Razzaque, Kapil Ahmed, Nurul Alam,
and Jeroen van Ginneken

Objective: Investigate the desire for children and subsequent abortion in the MCH-FP and comparison areas of Matlab, Bangladesh.

Methodology: Data of the in-depth survey 1984, KAP survey 1990 and the Demographic Surveillance System (1984-1994) were used.

Results: During 1984-1994, the incidence of abortion increased substantially in both comparison and intervention areas, and such increase was due to those who wanted no more children. After controlling for all the variables in the logistic regression, the probability of subsequent abortion was higher among those who wanted no more children than those who wanted more in both MCH-FP (5.2 times) and the comparison (8.9 times) areas. The incidence of abortion was lower in the MCH-FP area than that in the comparison area and was lower among the illiterates, users of contraception, and the Muslims in both the areas compared to the educated, non-users of contraception, and the Hindus.

Conclusion: The findings of the study suggest that there is a need to improve the quality of family planning services, particularly for those who want no more children to reduce abortion and abortion-related deaths.

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Implementation of the Essential Services Package through Standardized Service Delivery Protocols

Selina Amin§, Cristobal Tuñón§, S.E. Arifeen§, A.H. Baqui§, Rasheda Khanam1, and Samina Manaf§

Objective: Evaluate the range and quality of services delivered from the urban primary-care clinics through the adaptation and implementation of appropriate and practical service delivery protocols.

Methodology: The study was on a quasi-experimental design. Based on the national priorities, epidemiological data, implementation feasibility, and client preferences, eight components of essential services were identified. The existing national and international guidelines and protocols were reviewed and adapted. Providers from three clinics of an NGO and three government dispensaries (GOD) were trained on the newly-adapted protocols. These clinics were monitored by a physician regularly. For comparison, the activities of the clinic staff at the two non-intervention NGO sites and two non-intervention government sites were also monitored. A mid-term evaluation, conducted after a year of implementation, was based on the data from the pre- and post-training knowledge tests, structured observations of provider-client interactions, analysis of the clinic records, and interviews with providers and with clients.

Results: The results of the evaluation indicated that the intervention markedly improved the diagnostic and treatment practices of the service providers. There were marked improvements in the prescription patterns, with a reduced misuse of antibiotics for the management of diarrhoea, acute respiratory infection (ARI), and reproductive tract infection (RTI) along the lines suggested by the protocols. After the introduction of the protocols, inappropriate use of metronidazole was reduced from 86% to 31% in diarrhoea cases, and inappropriate use of antihistamine was reduced from 77% to 18% in ARI cases. These changes were not observed or were less pronounced in the comparison clinics. However, the providers stated that the protocols were easy to follow, but had increased the waiting time at the clinics.

Conclusion: The practice of following standard protocols improves the quality of services. However, the comments of the providers need to be analyzed further. Complementary subsystem interventions (quality of the physical facility, logistics, information and management support system) are needed to fully implement the protocols.

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Use of Antenatal Care in an Urban Area of Dhaka City

Quamrun Nahar

Objective: Describe the types, patterns and use of antenatal care (ANC) in an urban area of Dhaka city.

Methodology: A community-based study of antenatal care-seeking behaviour was conducted during February-June 1996. A sample of 200 women who were pregnant for at least six months was identified from an ongoing health and demographic surveillance system set up in Zone 3 of the Dhaka city. A pre-tested structured questionnaire was used for collecting information on the sociodemographic characteristics, reproductive history, and the ANC use patterns. In-depth interviews were also conducted among a subsample (n=16) of these women to understand the process of seeking ANC.

Results: Most study women (88%) received some form of ANC. However, about a quarter received only tetanus immunization (TT), and less than 10% received all the necessary elements of ANC as recommended by the Government of Bangladesh. In addition, half of the women made only one or two visits, and only one-third made the first visit during their first trimester. A diverse variety of health-care providers was used by the study women. While most women obtained ANC from modern providers, about a quarter used traditional providers, either alone or as an adjunct to the care given by modern providers. Factors affecting the use of ANC suggest that the women who were more educated had fewer children, and whose husbands had more schooling and who had higher monthly income were more likely to use ANC ($p<0.05$). Women's ANC-seeking behaviour seems to follow a four-stage process: recognition of the importance of ANC, stance to seek ANC, selection of a provider, and finally, seeking ANC.

Conclusion: Although the findings of the study reveal that the TT coverage among the pregnant women was high in urban Dhaka, other ANC services were very weak. The results of the study also suggest that there is still ample room for improvement in the delivery and organization of antenatal care, particularly in the process of client-provider interaction.

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Incorporation of Checklists in Clinic Information System Supports the Delivery of Quality Essential Health Services

S.M. Tariq Azim§, Sangeeta Mookherji 1, and A.H. Baqui§

Objective: Assess the impact of introducing a revised clinic information system on the quality of essential health services provided at the urban NGO clinics.

Methodology: A card-based client-oriented information system for the urban primary-level NGO clinics was developed that incorporated screening checklists on key elements of a number of essential services. Thus, there were checklists on screening for family planning methods, antenatal and postnatal check-up, assessment of reproductive tract infection cases, and assessment of children with diarrhoeal disease and acute respiratory tract infections. The system was tested in 1996 at the two primary-level clinics of a non-governmental organization (NGO) in Dhaka city. The study was quasi-experimental with another two urban primary-level clinics where service records were kept in registers, serving as comparison. Data for evaluation were collected through independent observations and review of the clinic cards.

Results: In the intervention clinics, in nearly 85% of the new clients seeking injectable contraceptives, the paramedics carried out the minimum required screening. Almost all (98%) of the pregnant women were screened as per the organization's guidelines, and important physical examinations were done in about 69% of the cases. In the comparison clinics, none of the clients who came either for injectable contraceptives or for antenatal check-up received the full range of screening procedures. Before the introduction of the protocol for syndromic diagnosis of RTI cases in the intervention clinics and after the training on the protocol, the diagnosis made by the paramedics was based mostly on the amount of vaginal discharge and the condition of cervix. With the introduction of checklist on RTI, in about 92% of the cases with vaginal discharge, syndromic diagnosis was made according to the protocol, based primarily on the characteristics of vaginal discharge and the partner's symptoms.

Conclusion: Incorporating checklists in a client-oriented routine record-keeping system assisted service providers to follow assessment protocols according to the organizational standards.

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Reducing Drug Costs through Rationalization of Diarrhoea and ARI Case Management in Urban Areas

Zahidul Quayyum, Selina Amin, A.H. Baqui, and Samina Manaf

Objective: Examine the possibility of reducing the drug costs through rationalization of diarrhoea and acute respiratory infection (ARI) case management in urban areas.

Methodology: Based on the WHO guidelines, protocols were adapted for the management of diarrhoeal diseases and ARI cases at the primary health care (PHC) level. Service providers at three selected clinics of the Concerned Women for Family Planning in urban Dhaka were trained on the protocols. The diagnosis and treatment patterns for diarrhoeal diseases and ARI cases before and after the introduction of standardized procedures were examined. Such information was collected from the clinic registers for six months before and six months after the introduction of the protocols. The drugs that were dispensed by the providers for the treatment were costed, and the drug cost per client for the treatment was estimated in two different situations, i.e. treatment with and without the use of standard protocols. These were then compared to determine whether the cost per client decreased after the protocols were introduced.

Results: The diagnosis pattern changed both in the case of diarrhoeal diseases and ARI cases. Before the introduction of the protocols, 50% of the patients with diarrhoeal diseases were inappropriately diagnosed. This had implication on the treatment procedures. Following introduction of the protocols, the use of oral rehydration solutions (ORS) increased, and metronidazole was not used for treating the diarrhoea cases. Similarly, cotrimaxazole was appropriately used for treating dysentery. The drug cost of treating diarrhoeal diseases declined by Tk 1.96 (12%) per client after introduction of the protocol. For the ARI cases, the drug cost was reduced by Tk 11.9 (53%) per client. This has helped reduce the total drug cost for diarrhoea and ARI cases by about 32%, saving Tk 1,688 for the clinics in the six-month period.

Conclusion: Inappropriate diagnosis and treatment pattern increase the cost of services for the providers. The use of standard protocols may help reduce the drug cost for treating cases of ARI and diarrhoeal diseases.

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Factors Contributing to Low Immunization Coverage among Urban Slum Children in Bangladesh

Jahanara Khatun

Objective: Describe the extent of immunization coverage in the urban slum of Zone 3 of the Dhaka City Corporation, and identify the factors contributing to the low immunization coverage.

Methodology: Childhood immunization coverage and socioeconomic data were collected from 651 women who had a child aged 12-23 months from the Urban Panel Survey (UPS) of the Urban MCH-FP Extension Project of ICDDR,B. Thirteen immunization service providers were interviewed, and 33 children were observed when obtaining their vaccination. Bivariate analysis was done to identify the association between the low immunization coverage and the sociodemographic characteristics.

Results: The results of the study showed that the complete immunization coverage of the children aged 12-23 months in the study area was 60.2%. However, in the slum area, the immunization coverage was 48% whereas in the non-slum cluster, it was 67%. The drop-out rate in the slum cluster from DPT1 to DPT3 was also higher than that in the non-slum cluster (21.7% vs. 9.3%). The characteristics of the urban slum children who completed their immunization series were strongly associated with the following variables: maternal education, maternal employment, family income, father's occupation, household possessions, and the number of living children. Provision-related factors that influence the low immunization coverage in urban slums were: inadequate location and timing of clinics, improper supervision, lack of referral, missed opportunities for vaccination, and lack of coordination among different service provider organizations.

Conclusion: The immunization coverage should be improved through strengthening routine immunization services and increasing the integration and coordination among the service providers. The Expanded Programme on Immunization (EPI) should develop a "Slum Strategy" to ensure that high-risk slum children are vaccinated properly. The EPI services should also be linked with development organizations to improve the overall health status of the slum dwellers. Further, health system research is needed to identify operational problems of EPI.

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Maternal Morbidity in Rural Bangladesh: Where Do Women Go for Care?

Parveen A. Khanum, Shameem Ahmed, Ariful Islam, and Sadia D. Parveen

Objective: Assess the obstetric complications experienced and subsequent care-seeking behaviour of rural women and their knowledge about the complications of pregnancy and childbirth.

Methodology: A structured questionnaire was used for interviewing 2,105 rural Bangladeshi women who delivered within one year of the survey. They were interviewed in their homes between May and August 1996.

Results: Obstetric complications were experienced by 66% of the women, and common among these were: prolonged labour, fever, bleeding, and oedema. The older and higher-parity women and those with less education were more likely to develop complications. Still-births were four times higher among those with complications. Of all the women who had complications, 41% consulted village practitioners, 18% went to the homeopaths, and 6% went to traditional healers. Of the 36% who sought care from medically-trained personnel, many went to untrained providers first. About 19% of the women went to nobody. Husbands were the principal decision makers for consultation with service providers. Ninety-one percent of all the deliveries took place at home, and only 8% of the complicated cases delivered at the health facility. The use of institutional facilities and/or trained providers was positively associated with women's education and their knowledge of obstetric complications. Women's knowledge about complications of pregnancy and childbirth was limited. Most women knew about prolonged labour and malpresentation, but very few knew about bleeding, retained placenta, and convulsion. A majority knew nothing about postpartum complications.

Conclusion: Very few women in rural Bangladesh know about the common complications of pregnancy and childbirth, and most do not at all seek medical help for these. Also, the use of institutional facilities for deliveries is poor. Therefore, efforts need to be strengthened for raising community awareness emphasizing on the importance of seeking medical help for obstetric emergencies. As an effort toward this, the Operations Research Project of ICDDR,B has designed an intervention on emergency obstetric care at the thana level. The intervention focuses on raising community awareness and referral and linkages.

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Neonatal Morbidity and Care-seeking Behaviour in Two Rural Areas of Bangladesh

Shameem Ahmed, Farzana Sobhan, and Ariful Islam

Objective: Assess the pattern of neonatal morbidity and subsequent care-seeking behaviour in rural Bangladesh.

Methodology: Data were collected from 3,030 women who had live-births between May 1995 and February 1997 in two rural subdistricts—Abhoynagar and Mirsarai—the field sites of the Operations Research Project of ICDDR,B. The women were interviewed in their homes using a semi-structured questionnaire. Bivariate analysis was done to assess the relationship between the different variables.

Results: More than two-thirds of the neonates were reported to have problems. The most common complaint was fever (40%), followed by respiratory distress (25%). Complications during pregnancy were found to be associated with increased neonatal morbidity ($p<0.001$). About 42% of the women did not seek help from any health service providers when their newborns had problems. Significant sex differential was observed among the male and female neonates for whom services were sought ($p<0.001$). In majority of the cases (48%), village doctors were consulted, followed by homeopaths in Mirsarai whereas in Abhoynagar, the opposite trend was seen. Only a negligible percentage attended the government facilities, like the Satellite Clinic, Health and Family Welfare Centre, and the Thana Health Complex. However, 30% of the mothers consulted private practitioners. It was found that health care-seeking behaviour was associated with mothers' education ($p<0.01$).

Conclusion: The government facilities for neonatal care are underused, and efforts should be made to raise awareness among mothers regarding this. Steps to reduce maternal morbidity by raising awareness of complications during pregnancy may result in decreased neonatal morbidity.

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Perceptions and Involvement of Members of Zonal Health and Family Planning Coordination Committees of Dhaka City Corporation

J. Uddin, M.A. Bhuiyan, S.U. Alamgir, and Cristobal Tuñón

Objective: Assess the perception and involvement of members of the zonal health and family planning coordination committees formed by the Dhaka City Corporation.

Methodology: The Dhaka City Corporation formed zonal health and family planning coordination committees in all 10 zones of the city to link all the local service providers and to establish a mechanism for local-level planning to ensure the effective use of the available local resources through minimizing gaps and overlaps in the health and family planning service delivery system. Of the 181 registered members of the zonal committees, 126 were selected for interview using quota sampling methodology. Data were collected through individual interviews using a structured questionnaire with both open- and close-ended questions. Data were also collected by field observations on the activities of the committees. Secondary data from the minutes of meetings, work plans, and registers were also analyzed. Data were processed and analyzed, using the EPI Info statistical software package.

Results: Over 70% of the respondents could mention the most important purpose of formation of the zonal committees, i.e. the zonal committee is intended to strengthen promotional activities, establish coordination among the government and non-governmental organizations, and establish a regular exchange of service statistics and information on health services at the zone level. The main health problems perceived by the respondents were lack of safe drinking water and sanitation facilities, unplanned growth of slums, improper garbage cleaning and drainage system, mosquitoes, and environmental pollution. About 67% of the scheduled zonal committee meetings were held, and on an average, 62% of the members attended the meetings. It revealed from the study that the committees contributed in coordinating implementation of national measles and neonatal tetanus campaign and National Immunization Day at the local level. Important activities were initiated and were partially implemented. These include reorganization of service delivery points to bring services close to the slum dwellers and minimizing gaps and overlaps, installation of incinerators for clinical waste disposal, and formation of the ward committees.

Conclusion: The zonal committee was found to be an effective forum for mobilizing support from service providers and community leaders in planning and coordinating delivery of urban health services.

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Improving Availability of and Access to an Essential Health Services Package in Urban Dhaka, Bangladesh

S.U. Alamgir, Cristobal Tuñón, S.E. Arifeen, A.H. Baqui, M.A. Bhuiyan, and J. Uddin

Objective: Improve access to and the availability of essential health services, and also improve the use of individual clinics and overall use at the zone level by reorganizing the government and non-governmental organization (NGO) facilities. The urban primary health care (PHC) facilities are managed by multiple organizations, i.e. two directorates of the Government; NGOs; Dhaka City Corporation; Ministry of Local Government, Rural Development and Cooperatives; and the for-profit commercial sector. In the government and NGO facilities, clients rarely obtain a combination of essential services. The distribution of these facilities is not optimal and results in some areas with "excess" of facilities often providing similar services while other areas are underserved, resulting in less access to service, creation of missed opportunities, and increase in cost of service provision and use.

Methodology: The Urban Extension Project (UEP) of ICDDR,B implemented an intervention in two zones of the Dhaka City Corporation (DCC). The UEP developed a methodology as a part of this intervention for reorganizing the government and NGO facilities in the two zones. The methodology was based on the locally available data (inventory, mapping, service use) and participatory workshops involving managers and decision makers of the government and NGO facilities. The workshop for Zone 3 was held in August 1996 and that of Zone 8 in November 1996. The workshops resulted in specific ward-wise redistribution plans which had four elements: (1) relocation of certain facilities, (2) bringing facilities and/or services preferably under one roof, (3) expansion of the range of services, and (4) improving referral among the neighbouring facilities. A mid-term evaluation was recently conducted.

Results: The findings of the evaluation indicate that reorganization is possible, using a participatory planning methodology. Six of the 14 specific recommendations for changes have already been implemented in Zone 3 whereas 7 of the 14 specific recommendations have so far been implemented in Zone 8. Improvement in service use was also observed, which indicates the possibility of improving the use of facilities at the clinic and the zone level after the reorganization of facilities.

Conclusion: Redistribution plans of the PHC facilities based on the intervention methodology can significantly reduce inadequacies, gaps and overlaps of essential services, and improve access to and the availability of essential services in the urban areas.

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Health Promotion Campaigns and Urban Women in Bangladesh

Cristobal Tuñón, Md. Abdul Quaiyum, Nazma Begum, and Selina Amin

Objective: Assess the differences in awareness of ongoing campaigns promoting essential health services in a representative urban population of Bangladesh.

Methodology: Sociodemographic information and data on awareness of recent health promotion campaigns were collected from respondents in the stratified multistage cluster sample of households from the Panel Survey based on the population in the Bakshi Bazar, Lalbagh and Rayer Bazar areas of Dhaka city. A sample of 2,636 women with children aged less than five years were interviewed in slum and non-slum areas during May-June 1996 after the National Immunization Days (NID). Subsequently, between January and March 1997, a random sample of 601 women from the same panel was interviewed after the launching of the Green Umbrella campaign.

Results: Over 60% of the slum women, in contrast to only 23% of the non-slum women, stated that they had never seen or heard about the logo of the Green Umbrella at that stage of the campaign. There were also significant differences among the slum and non-slum women in terms of their awareness of the NID. While 45% of the women in non-slum areas linked the campaign with polio prevention and eradication, only 25% made this link in the slum areas. Nearly 80% of the non-slum women and 20% of the slum women had heard about the NIDs from TV messages.

Conclusion: At the time of the survey, there were significant differences in the awareness of the slum and non-slum women regarding the Green Umbrella campaign. Both the campaigns—NID and Green Umbrella—were heavily dependent on the media. Media sources did not reach women of the slum and non-slum areas equally. Interpersonal channels, such as fieldworkers seem to be a more accessible source of information for the slum women. The findings of the study suggest the use of combined channels of communication in health promotion campaigns to reach the slum women.

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Accessible STD Care for Street-based Sex Workers of Dhaka City: Potentials and Experience of Partnership

Swarup Sarkar1, Yasmin Ahmed2, Ziya Uddin1, Sushena Reza1, Enamul Haque1, Fazlul Karim1, and Maurice Bloem1

Objective: Examine the effectiveness of the partnership between the SHAKTI-Project, CARE-Bangladesh, and the Marie Stopes Clinic Society (MSCS) in providing reproductive health care, including care for sexually transmitted diseases (STD) to street-based sex workers of Dhaka city through satellite clinics.

Methodology: The MSCS and the SHAKTI-Project agreed that the SHAKTI would undertake the outreach activity for the street-based sex workers while the MSCS would provide necessary clinical services. Four satellite clinics were planned jointly. SHAKTI will provide space in their storefront, furniture, and fixtures. The sex workers' peer educator of SHAKTI will refer the suspected cases to the satellite clinic. The MSCS will provide staff and drugs at a subsidized cost. Preliminary data collected from three satellite clinics have been examined. The mandate of the two projects was examined. In-depth interviews and focus group discussions were held with beneficiaries as well as the members of the staff of both the projects. Analysis of data is in progress.

Results: The preliminary information and observations showed that a transparent partnership worked toward the avoidance of duplicate use of resources, and facilitated the use of one's area of expertise and a faster implementation of activities. In addition, it helped create a congenial environment between the two projects, and stimulated the formation of broader teams in the field of STD/AIDS prevention.

Conclusion: For faster and economic implementation of activities different organizations can work together to reduce duplication of work, avoid the wastage of resources, and strengthen the ultimate coordination between different organizations working in the same field.

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An Assessment of Risk Perceptions of STD/HIV/AIDS and Presence of Risk Behaviours among Street-based Sex Workers in Dhaka City

Swarup Sarkar1, Ziya Uddin1, Nazrul Islam2, Sushena Reza1, Enamul Haque1, Fazlul Karim1, and Maurice Bloem1

Objective: Assess the risk of behaviour and perception of risk regarding STD/HIV/AIDS by the street-based sex workers in the Dhaka city.

Methodology: Sex workers were recruited to assist in accessing to other street-based sex workers, identifying their locations, estimating their size and to act as guides. A capture-recapture technique was used for estimating the size of street-based sex workers. Of the 15 thanas of Dhaka city, 13 were selected. Both qualitative and quantitative methods were used as data collection techniques. Extensive ethnographic observations were made, and in-depth interview of the key informants and focus group discussions were held. A quantitative survey was conducted with 230 sex workers recruited from the street. A strict quality control procedure was adopted to ensure consistency and minimize errors.

Results: Thirty-four percent of the women reported having more than one sex partner in the last 24 hours. More than half (56%) had sex during menstruation. One-sixth reported ever practising anal sex. Sixty-eight percent had sex more than 3 times per day. Only 50% reported that they occasionally used condoms. An insignificant proportion (2%) reported consistent condom use, and 34% used less than 50% of the time. Forty-three percent and 57% had knowledge about sexual transmission of STDs and AIDS respectively while 76% and 44% were sure that had condoms been used they would not have got or transmitted STDs and AIDS respectively.

Discussion: Risk of behaviour exists among the street sex workers, and risk perceptions are not adequate. HIV/AIDS and STD prevention programme targeting high-risk behaviour groups should include strategies to raise awareness through regular contact using peers and should be supplemented by provision of means of behaviour change, endorsement by the target group and the society. To promote safer behaviour, the intervention should work to create an environment which will facilitate the behavioural change among the street-based sex workers.

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Impact of Community-based Intervention on Diarrhoea through Oral Rehydration Therapy on Hospitalization of Children Aged Less Than Five Years in Rural Bangladesh

D.S. Alam, M. Yunus, A. Rahman, H.R. Chowdhury, and J. Patrick Vaughan

Objective: Examine the impact of community-based intervention on diarrhoea through oral rehydration therapy (ORT) on hospitalization of children aged less than five years in rural Bangladesh.

Methodology: The Maternal and Child Health and Family Planning (MCH-FP) programme has been involved in community-based intervention on diarrhoea through active promotion of ORT, covering nearly half of the ICDDR,B study area in Matlab. In the other half (the comparison area), ORS is available with the community health workers on demand. Children were considered genuinely eligible for hospitalization if they met any of the following criteria: (1) severe dehydration, (2) moderate dehydration with vomiting, (3) bloody stool, or (4) diarrhoea for more than three days. Data from the Matlab Diarrhoea Treatment Centre (DTC) were analyzed in relation to the area (MCH-FP/comparison) and eligibility criteria for hospitalization.

Results: Data on 1,760 (95% of the total admissions) children (61% male) with no (8%), mild (75%), moderate (14%), and severe (3%) dehydration at admission were included in the analysis. Age, sex, nutritional status, and the type of diarrhoea of the admitted children were comparable between the study areas. About 12% of the children presented with moderate dehydration with vomiting, 18% with bloody diarrhoea, 24% with diarrhoea for more than three days, and 10% of the patients required intravenous fluid within 24 hours of admission. Forty-seven percent of the children did not meet any of the criteria for hospitalization, and that proportion was similar in both the areas. Overall, 66% of the children took ORS at home, with a significantly higher proportion of the children from the MCH-FP area compared to the comparison area (72% vs. 64%, $c2=25$, $p<0.01$). The volume of ORS intake was significantly higher in the MCH-FP area compared to that of the comparison area (mean ±SD 2.23±2.3) vs. 1.72±2.1, $p<0.01$).

Conclusion: The findings of the study indicate that the home use of ORS is greater and significantly influenced in the areas served by MCH-FP. Nearly a half of the children had no valid criterion for admission. This suggests that mothers in the study areas are yet to be convinced that uncomplicated diarrhoea can be effectively managed at home through ORT. Further intensification and modification of the educational programmes are required.

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Molecular Analysis of *Shigella dysenteriae* Type 1 Strains by Using Pulsed-Field Gel Electrophoresis

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Objective: Determine the use of pulsed-field gel electrophoresis (PFGE) in molecular typing of *Shigella dysenteriae* type 1 strains from sporadic outbreaks and epidemic periods from different geographical location of the world.

Methodology: Genomic DNA of *S. dysenteriae* type 1 strains was analyzed using PFGE. The use of PFGE in a Not-I-digested DNA fragments clearly distinguished isolates involved in the epidemic from the non-epidemic strains. Genomic DNA was digested by Not-I restriction enzyme and the fragments separated, using the contour-clamped homogenous electric field method on a CHEF-DRII system on 1% agarose.

Results: One hundred thirteen isolates of *S. dysenteriae* type 1 (18 from epidemic and 95 from sporadic outbreaks) were typed by the PFGE method. These isolates were classified into 8 PFGE type A to H, comprising 1 to 22 patterns, and 25 patterns were identified in total. The major groups consisted of A and B. Type A was predominantly detected (in 51 of 56 strains) among the strains isolated in Bangladesh while type B was rare (in 2 of 56 strains) and isolated only from Rangpur during the epidemic period in 1984. Among the very recent isolates (1995-1997) in Bangladesh, there were no type A pattern 2 isolates. This pattern was present among the epidemic strains isolated in Rangpur and in the Hooghly district of West Bengal, in 1984.

Conclusion: The results of the analysis suggest that a clonal relationship existed between these strains during the epidemic period in Bangladesh and West Bengal in 1984. Thus, the PFGE technique could be used as an epidemiologic tool for identifying epidemic-associated strains as well as for molecular subtyping of epidemiologically unrelated strains.

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Clonal Groups of Enteropathogenic *Escherichia coli* Isolated in Case-Control Studies on Diarrhoea in Bangladesh

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Objective: Investigate the clonal status of enteropathogenic *Escherichia coli* (EPEC) strains isolated from case-control studies in Bangladesh.

Methodology: Eighty EPEC isolates from children with diarrhoea and 14 isolates from matched healthy controls from two case-control studies were analyzed. The first study, conducted during 1991-1992, comprised 451 children aged up to five years with diarrhoea and 602 matched control children without diarrhoea. The second study, conducted during 1993-1994, comprised 546 children with diarrhoea and 215 matched healthy children recruited from the same neighbourhood. The EPEC isolates were characterized by serogrouping, enterobacterial repetitive intergenic consensus (ERIC) sequence PCR, and biochemical fingerprinting method (the automated phene plate or PhP system).

Results: Twelve EPEC serogroups were found with O114 (n=19) and O127 (n=23) being the dominant serogroups. Most strains of O114 serogroup belonged to the same PhP and PCR types. Strains of O127 serogroup contained those producing cytolethal distending toxin CDT (n=16) and those which did not (n=7). Both were found among the patients and the controls. The results of PCR and PhP typing showed that the CDT-positive strains belonged to the same clonal group and were related to one of the two PhP/PCR types of CDT-negative O127 strains. Thirty-one O-non-typable EPEC strains and 21 strains of other less prevalent serogroups belonged to diverse Ph/PCR types. Furthermore, they did not show any similarity to the strains of the two major serogroups: O114 and O127.

Conclusion: Recent case-control studies in Bangladesh showed a high prevalence of EPEC strains associated with childhood diarrhoea. The results of the present study suggest that single clonal groups of EPEC strains belonging to serogroups O114 and O127 are predominantly associated with childhood diarrhoea in Bangladesh.

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Economic Benefits of Diabetes Control in Bangladesh

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Objective: Estimate the direct medical-care costs associated with diabetes, and indicate how the medical-care costs increased with the progression of the disease from the initial stage.

Methodology: This study was based on the data derived from the "Guidebook" of diabetic patients registered at the BIRDEM hospital. The sample consists of the registered patients in the hospital since December 1985. The surveillance collected two types of information: baseline information on patient's demographic characteristics and follow-up information of revisits later on. The baseline data also report health-related information at the first visit. The follow-up data include height, weight, blood pressure, blood sugar level, treatment recommended, and complications observed for patients. Using the blood sugar level cut-off points, the severity of diabetes was defined for the patients, and all patients were grouped into three severity categories. The use of medical services by different categories of diabetic patients was compared to estimate the effect of increased blood sugar levels on the medical-care costs. An attempt was also made to identify the costs not related to diabetes to estimate the economic benefits of preventing the disease.

Results: Although the prevalence of diabetes is low in Bangladesh, it is already the 10th most expensive disease in terms of total health-care cost allocated for an illness. Diabetes imposes significant additional costs on individuals, and the cost of diabetes tends to increase with time since onset. The severity of diabetes is also associated with increased direct medical-care cost implying that even a modest control of diabetes reduces the direct medical cost for patients.

Conclusion: The cost of diabetes is likely to increase at a rapid rate in the future due to its expected higher prevalence and the increased cost of medical interventions. An early diagnosis and control should significantly lower the future costs of medical care associated with diabetes. The Bangladesh health sector should consider the incorporation of diabetes screening as an important public health intervention. However, the degree of financial subsidy needed for this purpose should be determined by carefully examining its prevalence rate among the different socioeconomic groups.

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Evaluating the Alternative Strategies for Hepatitis A and B Vaccination in Bangladesh: An Economic Analysis

Disha Ali and M. Mahmud Khan

Objective: Compare the costs and benefits of adopting alternative strategies for hepatitis A and B vaccination in Bangladesh to determine the most cost-effective approach of preventing the infection.

Methodology: Three alternative strategies that have been evaluated are: (a) vaccinate all individuals in the society without testing, (b) vaccinate only those who are not immune to hepatitis A and B, and (c) vaccinate the non-immune cases among the high-risk population. A simple economic model, explaining the costs and benefits associated with screening and vaccination, was developed to examine the alternatives. The model predicts the costs and benefits at different levels of prevalence, cost of identification of the high-risk groups, sensitivity and specificity of the tests, the direct and indirect economic cost of infections, and effectiveness of the vaccinations in Bangladesh context. Costs of tests and vaccinations were obtained through the private provider survey in Dhaka, and the direct medical benefits of preventing the infections were derived from the expert opinion surveys. The indirect economic costs were estimated by considering the degree and duration of morbidity, and case-specific fatality information was obtained either from literature or through expert opinion surveys. The costing implicitly assumed that successive three doses of immunization would provide life-long immunity to an individual.

Results: Hepatitis A vaccination, due to its low direct and indirect cost, turned out to be a low-priority intervention for Bangladesh. Hepatitis B-screening tests and vaccinations are relatively costly. However, the benefit of preventing hepatitis B is also high. Despite the high cost of screening and vaccination, the prevention of hepatitis B remains a highly desirable intervention for Bangladesh.

Conclusion: Immunization against hepatitis B appears beneficial to the society at a reasonable range of prevalence. Economic benefits of preventing hepatitis B is high, but the intervention appears too costly to be funded through the public sector alone. Alternative methods of funding hepatitis B vaccination (HBV) should be considered. Therefore, in the short run, a mass campaign on HBV will not be feasible due to the financial resource constraints.

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Evaluation of Rice-based Reduced Osmolarity Oral Rehydration Solution in Children with Severe Persistent Diarrhoea

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Objective: Evaluate and compare the efficacy of a standard (WHO) oral rehydration solution (ORS) and a rice-based reduced osmolarity ORS in children with severe persistent diarrhoea. Persistent diarrhoea accounts for 7-21% of all childhood diarrhoeal episodes and 32-62% of all diarrhoea-related deaths in developing countries. Fluid and electrolyte balance is an important part in the management of persistent diarrhoea.

Methodology: This randomized controlled clinical trial was conducted on 64 children with severe persistent diarrhoea (duration >14 days, stool output >80 mL.kg.d). After a one-day observation period to confirm the diagnosis and severity, they were assigned to either standard WHO-ORS (sodium 90, potassium 20, chloride 80, citrate 10, glucose 111, osmolarity 311; all in mmo1/L or to a rice-based reduced osmolarity ORS (rice powder 33 g; sodium 60, potassium 14, chloride 57, citrate 6, osmolarity 137; all in mmol/L) for replacement of ongoing stool loss for seven days. Stool output and frequency, ORS, and food intakes were monitored daily. Serum electrolytes were also determined on study day 3 and 7. Daily and total (day 1-7) food intakes were comparable among the study groups. The stool volume (mL.kg.d) mean±SEM) was significantly less in infants receiving rice-based reduced osmolality ORS than the WHO-ORS on day 4 (86±11 vs. 44±28, p=0.05), 5 (73±10 vs. 144± 31, p=0.04), 6 (60±9 vs. 139±31 p=0.02), 7(59±11 vs. 120±59, p=0.04), as well as for the entire (1-7 d) study period (523±54 vs. 932±177, p=0.04). The median stool frequency (number/d) during the entire study period in children receiving reduced osmolality ORS was also significantly less than those in the WHO-ORS group (70±5 vs. 92±10, p=0.05). Furthermore, the children belonging to reduced osmolarity ORS required less amount of ORS in total compared to the WHO-ORS groups. Children in both the groups maintained normal serum electrolytes as determined on day 3 and 7.

Conclusion: It is concluded that rice-based reduced osmolarity ORS is more effective than WHO-ORS for replacement and reducing ongoing stool loss, and therefore, may be useful in the management of children with persistent diarrhoea.

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Intestinal Transport of Different Electrolyte Solutions Across Small Intestine of Rabbit *in vivo*

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Objective: Determine the relative effects of different electrolyte solutions in optimizing intestinal absorption of water and electrolytes.

Methodology: The rice electrolyte solutions, called Ceralyte 90 contained 40 g rice and 90 mM sodium, and Ceralyte 70 contained 40 g rice and 70 mM sodium per litre of solution. Different concentrations of carboxymethyl cellulose CMC (10.0, 5.0, and 2.5 g/L) were added to standard oral rehydration solutions (Std ORS) to increase its viscosity. Fifty-centimetre small intestinal segments were perfused with different electrolyte solutions, containing 6 g/L polyethylene glycol (MW 4000) as a non-absorbable marker.

Results: Mean±SE of water and sodium ion absorption with standard ORS vs. Ceralyte 90 was 1.53±0.11 vs. 1.59±0.09 mL/min/g of dry intestine (NS) and 0.24±0.21 vs. 0.58±0.09 mM/min/g of dry intestine respectively. The absorption of potassium and chloride ions was not different when compared among Std ORS, Ceralyte 90, and Ceralyte 70. Secretion of sodium ion was found when the rabbit was perfused with the electrolyte solutions, containing different concentrations of CMC. Water absorption and sodium ion secretion from electrolyte solution with 5 g/L CMC was significantly different when compared with the solution with 10 g/L CMC ($p=0.01$ and 0.0004).

Conclusion: It is concluded that Ceralyte 90 and Ceralyte 70 have no additional absorption-promoting effect on water and electrolytes transport. Increasing viscosity of electrolyte solution may cause stimulation of secretion across the small intestine of rabbit.

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Evaluation of the Plant Extract (Hirtacin) in a Rabbit Model of Shigellosis

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Objective: Evaluate the efficacy of the plant extract hirtacin in a rabbit model of shigellosis.

Methodology: Cecal-ligated rabbits were inoculated with *Shigella flexneri* 2a, and after 24 hours, three groups of rabbits were treated with hirtacin, ciprofloxacin, and placebo respectively for five days.

Results: The plant extract hirtacin and ciprofloxacin significantly reduced myeloperoxidase (MPO) level in plasma which serves as a marker of inflammation, while the MPO level was still high in the placebo group after five days of treatment. Also the clinical features of both the drug treated groups showed complete remission from dysentery while dysenteric symptoms still persisted in the placebo group after five days.

Conclusion: It is concluded that the plant extract hirtacin has a potent therapeutic activity in shigellosis.

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