

## Organizing Committee

### 10th ASCON Organizing Committee

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Convenors: Peter Thorpe, S.K. Roy, and Petra Osinski

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## **Acknowledgements**

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## A Brief History of ICDDR,B: Centre for Health and Population Research

- 1960 Cholera Research Laboratory established
- 1963 Matlab field station started
- 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 Urban Volunteer Programme initiated
- 1982 Field-testing of cereal-based Oral Rehydration Solution began MCH-FP Extension project began
- 1983 Epidemic Control Preparedness Programme initiated
- 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 into, Acute Respiratory Infection began
- 1989 The Matlab record-keeping system, specially adapted for government use, extended to the national family planning programme
- 1993 New *Vibrio cholerae* O139 Bengal identified and characterized
- 1994 Twenty fifth anniversary of ORS celebrated. ICDDR,B epidemic response team goes to Goma to assist cholera-stricken Rwandan refugees, identifies pathogens, and helps reduce mortality from as high as 48.7% to <1%
- 1995 Maternal immunization with pneumococcal polysaccharide vaccine shown to be likely to protect infants up to 22 weeks
- 1996 Hon'ble Prime Minister Sheikh Hasina terms The Cholera Hospital as the best diarrhoeal disease hospital in the world
- 1998 ICDDR,B celebrates its 20th year of existence ICDDR,B initiates national HIV surveillance in cooperation with MoHFW
- 1999 Hon'ble Prime Minister Sheikh Hasina opens the week-long festivity to mark the 20th anniversary of internationalization of ICDDR,B and calls upon all to support the Centre Protocolized management of severely-malnourished children published in *Lancet*

2000 ICDDR,B assists GoB with control of major dengue epidemic in Bangladesh  
The Centre launches theme-based programmes of six major initiatives

2001 ICDDR,B receives the first-ever Gates Award for Global Health

## Introduction

ICDDR,B: Centre for Health and Population Research organizes the Annual Scientific Conference (ASCON) each year to share the research findings of the Centre with stakeholders at home and abroad. During the last four ASCONs, the agenda of ASCON were broadened beyond dissemination of ICDDR,B research to provide also a venue for national research institutions to share their research results, thereby increasing the interchange between scientists and public-health professionals at ICDDR,B, national organizations, and international agencies working in Bangladesh.

The 10th ASCON to be held during 11-13 June 2002 has broadened the agenda still further by now inviting participants from South Asia as well as a few international speakers and presenters. The theme of the 10<sup>th</sup> ASCON: ***Malnutrition: Meeting the Challenges in South Asia*** is appropriate and well-timed. Clearly, South Asia has major challenges, but it also has substantial opportunities for addressing its malnutrition problems.

The burden of malnutrition is especially high in South Asia, with Bangladesh remaining the worst-affected country in the region. About 45% of children aged less than 5 years are stunted, about 50% of pregnant women are underweight, and the average weight of women is only 42 kg. About 45% of infants in Bangladesh have a birth-weight less than 2.5 kg. About 70% of women are anaemic, and 43% have iodine deficiency. Although there is no good indicator for zinc deficiency, intervention results demonstrate that many children and mothers are deficient in this important micronutrient. These disheartening statistics provide an indication of the extent of the malnutrition problem that we face in Bangladesh. Unfortunately, other countries in the region face many of these same problems. On the positive side, current levels of child malnutrition in Bangladesh appear to be far lower than had been observed a few years ago. Stunting has declined from 55 to 45 percent of children aged less than 5 years, while wasting has declined from 18 to 10 percent. In addition, important initiatives for combating micronutrient deficiencies have been and are being launched.

The commitment of the People's Republic of Bangladesh to the improvement of health and nutrition is most clearly evident from the inception of Bangladesh's National Nutrition Project, which aims at decreasing child malnutrition and rates of low birth-weight, improving maternal nutrition and combating micronutrient deficiencies. This commitment is further reflected this year by the kind inauguration of the 10th ASCON by the Hon'ble President of Bangladesh Professor A.Q.M. Badruddoza Chowdhury.

ICDDR,B, for its part, has played a significant role in understanding malnutrition problems in Bangladesh and the region and has helped provide solutions to several of them. The nature of nutrition research at the Centre has ranged from basic research on nutritional biochemistry to research relating to the clinical management of malnutrition and community nutrition. While the Centre has achieved much fame (including being awarded the first-ever Gates Award for Global Health) for its discovery of oral rehydration solution (ORS), which is now credited with saving the lives of 40 million children, the results of its nutrition research hold a similar promise for saving lives. Very important findings are now available on the management of acute severe malnutrition, ways to improve rates of appropriate breast-feeding, and on therapeutic and preventative uses of micronutrients.

The Centre views itself as an important partner with the Government of Bangladesh and has assisted the Bangladesh Integrated Nutrition Project (BINP) by helping organize the operations research. Key findings of this joint effort are being disseminated at the 10<sup>th</sup> ASCON. We anticipate continuing this relationship with the National Nutrition Project (NNP) and are prepared to gear our efforts toward helping the people of Bangladesh to solve the problem of malnutrition. Operations research should be and will be an integral part of NNP

since it will help identify interventions that are most effective, and will help policy-makers choose between alternative options and strategies. To the extent that policy-makers and researchers work together, operations research will be even more useful to the new NNP.

The Centre's Nutrition Programme has also been the recipient of a major grant from the World Bank. This grant provided funding of US\$2.7 million over three years to carry out research on nutrition that was relevant to the needs of Bangladesh, South Asia, and other developing countries. It provided a tremendous boost to enhancing the capacity of the Centre and to focusing Centre scientists on the issues of malnutrition. Many of the results obtained from studies done with this grant will be presented at this 10<sup>th</sup> ASCON.

Main areas of nutrition research to be featured at the 10<sup>th</sup> ASCON are nutrition-infection interactions, including interactions of diarrhoeal diseases, interactions of child caring, child nutrition and child development, zinc supplementation, breast-feeding and complementary feeding, maternal and child malnutrition in South Asia, feeding and growth patterns, management of severe malnutrition, emergence of obesity, BINP operations research, hospital and community-based management of severe malnutrition, nutrition interventions in pregnancy, and other regional experience with elimination of malnutrition. We anticipate that the results of the conference will attract the notice of policy-makers in the nation and the region, and that they may find the Conference helpful to them in making wise decisions that affect so many, especially the poor and the vulnerable.

We look forward to a successful outcome of the 10<sup>th</sup> ASCON. I am confident that this important occasion will result in fruitful recommendations for development of strategies and improved practices to be shared by the South Asian and other developing countries throughout the world. I expect it will also help in identifying new areas of research that will address the nutrition problems of the future.

**David A. Sack, M.D.**

Chairperson, Organizing Committee  
10th Annual Scientific Committee  
(ASCON)  
and Director, ICDDR,B

### Programme Summary

#### DAY 1: TUESDAY, 11 JUNE 2002

##### 09:30-12:00 Inaugural Session (Dhaka Sheraton Hotel)

Address of welcome and presentation on ICDDR,B's achievements	Professor David A. Sack, Director, ICDDR,B
Keynote address: <i>Nutrition-infection Interactions</i> :	Professor Ricardo Uauy Dagach Director, Institute of Nutrition and Food Technology, Chile
Address by the Special Guest:	Mr. Amanullah Aman, MP Hon'ble State Minister, Ministry of Health and Family Welfare
Address by the Chief Guest:	Professor A.Q.M. Badruddoza Chowdhury Hon'ble President of the People's Republic of Bangladesh
Vote of thanks:	Dr. S.K. Roy, Convenor, 10th ASCON Tea and coffee

##### 12:00-13:30 Registration at Sasakawa Auditorium, ICDDR,B, Mohakhali, Dhaka 1212

##### 12:30-13:30 Poster Session

13:30-14:45	Session 1	<b>Nutrition-Diarrhoeal Disease Interactions</b> (Sasakawa Auditorium) Abstract no. 029, 067, 076, 149, and 163 (Page no. 1-5)
	Session 2	<b>Interactions of Child Caring, Child Nutrition and Child Development</b> (Seminar Room) Abstract no. 032, 056, 071, 089, and 094 (Page no. 6-10)
	Session 3	<b>Diabetes/Metabolism/Nutrition</b> (CSD Conference Room) Abstract no. 009, 114, and 115 (Page no. 11-13)
14:45-16:00	Session 4	<b>Effects of Zinc Supplementation and Therapy</b> (Sasakawa Auditorium) Abstract no. 022, 048, 068, 107, and 161 (Page no. 14-18)
	Session 5	<b>Disease Burden, Prevention, and Therapy of Respiratory Infections</b> (Seminar Room) Abstract no. 038, 088, and 140 (Page no. 19-21)
	Session 6	<b>Detection and Characterization of Pathogens</b> (CSD Conference Room) Abstract no. 104, 105, 137, 142, and 148 (Page no. 22-26)
16:00-16:15	Tea	
16:15-17:00	Invited Lecture 1	<b><i>From Research to Policy: Experience from the National Integrated Nutrition Policy of the Republic of South Africa: Professor Marian Jacobs</i></b> <i>Professor of Child Health, University of Cape Town, South Africa</i> (Sasakawa Auditorium)
17:00-18:00	Panel Discussion/Roundtable:	<b><i>Key Findings from ICDDR,B Nutrition Research: How Ready for Policy and Practice?</i></b> (Sasakawa Auditorium)

## 10th ASCON

### DAY 2: WEDNESDAY, 12 JUNE 2002

- 08:30-09:30 **Keynote Lecture** *Meeting the Malnutrition Challenges in South Asia: Dr. Milla McLachlan*  
(Sasakawa Auditorium)
- 09:30-10:30 **Session 7** **Maternal and Child Malnutrition in South Asia**  
(Sasakawa Auditorium)  
Abstract no. 001, 039, 043, 092, and 098 (Page no. 27-31)
- 09:30-12:00 **Invited Lecture 2 and Session 8** **The Emerging Epidemic of Obesity: How Relevant to South Asia?**  
*Professor Joop van Raaij, Wageningen University, The Netherlands*  
(Seminar Room)  
Abstract no. 021 and 173 (Page no. 32-33)
- Session 9** **Accessibility and Financing of Healthcare**  
(CSD Conference Room)  
Abstract no. 010, 078, 119, and 173 (Page no. 34-37)
- 10:30-10:45 **Poster Session and Tea**
- 10:45-12:00 **Session 10** **Feeding and Growth Patterns of South Asian Infants and Children**  
(Sasakawa Auditorium)  
Abstract no. 007, 008, 044, 053, 133, and 152 (Page no. 38-43)
- Session 11** **Operations Research on the Bangladesh Integrated Nutrition Project (BINP)-1**  
(Seminar Room)  
Abstract no. 129, 130, 151, 166, and 175 (Page no. 44-49)
- Session 12** **Breast-feeding Promotion and Support**  
(CSD Conference Room)  
Abstract no. 014, 024, 042, 059, 065, and 132 (Page no. 50-55)
- 12:00-13:00 **Session 13** **Management of Severe Child Malnutrition**  
(Sasakawa Auditorium)  
Abstract no. 003, 070, 150, 164, and 176 (Page no. 56-60)
- Session 14** **Operations Research on the Bangladesh Integrated Nutrition Project (BINP)-2**  
(Seminar Room)  
Abstract no. 111, 125, 126, 158, and 162 (Page no. 61-65)
- 13:00-14:00 **Poster Session (Authors present) and Lunch**
- 14:00-15:15 **Invited Lecture 3** **Nutrition Policy at the Canadian International Development Agency—  
The Key Role of Micronutrients: Dr. Barbara Macdonald, Senior Nutrition  
Specialist, Multilateral Branch, Food Aid, Canadian International  
Development Agency (CIDA), Canada**  
(Sasakawa Auditorium)
- Session 15** **Micronutrients and Health**  
(Sasakawa Auditorium)  
Abstract no. 090, 165, 168, and 171 (Page no. 66-69)
- Session 16** **Nutrition Interventions during Pregnancy**  
(Seminar Room)  
Abstract no. 041, 093, 109, 110, 174, and 179 (Page no. 70-75)
- Session 17** **Household Food Expenditure and Food Consumption**  
(CSD Conference Room)  
Abstract no. 051, 155, and 178 (Page no. 76, 78-79)



## Programme and Abstracts

15:15-16:00	Session 18	<b>Community-based Management of Severe Child Malnutrition in Urban Bangladesh: An NCoE-supported Initiative</b> Abstract no. 058, 060, 153, and 154 (Page no. 80-83)
16:00-16:15	Poster Session and Tea	
16:15-17:00	Special Presentation	<b><i>Food and Micronutrient Interventions in Pregnancy to Prevent Maternal Anaemia and Low Birth-weight: Efficacy and Effectiveness Trials in Matlab, Kapasia, and Chowddagram</i></b>
17:30-18:30	Institutional Presentations:	<b><i>Research Interests and Capacities of Regional Institutions</i></b>
19:00-20:30	Networking Dinner	<i>(by invitation)</i>

### DAY 3: THURSDAY, 13 JUNE 2002

08:30-09:30	Keynote Lecture	<b><i>Combating Child Malnutrition in South Asia: Dr. Umesh Kapil, All India Institute of Medical Sciences, New Delhi, India</i></b>
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#### Concurrent Sessions

09:30-10:45	Session 19	<b>Community Nutrition Interventions: Improving Infant- and Child-feeding Practices and Maternal Nutrition</b> (Sasakawa Auditorium) Abstract no. 006, 063, 064, 069, 112, and 146 (Page no. 84-89)
	Session 20	<b>Health Systems Research</b> (Seminar Room) Abstract no. 012, 013, 023, 047, 073, and 144 (Page no. 77, 90-94)
	Session 21	<b>Reproductive Health and Population Dynamics</b> (CSD Conference Room) Abstract no. 054, 108, 116, 117, 170, and 177 (Page no. 95-100)
10:45-11:00	Tea	
11:00-12:00	Invited Lecture 4	<b><i>Regional Approaches to Eliminate Child Undernutrition in Asia: Findings from a Seven-Asian Country Study by ADB and UNICEF: Dr. Joseph M. Hunt, Health, Nutrition, and Early Childhood Advisor, Asian Development Bank</i></b>

#### 12:00-13:00 Closing Session (Sasakawa Auditorium)

Summary:	Professor Lars Åke Persson, PHSD, ICDDR,B
Poster award by the Chief Guest:	Mr. M. Fazlur Rahman, Secretary, Ministry of Health and Family Welfare
Address by the Chief Guest	
Concluding remarks by Chair:	Professor David A. Sack, Director, ICDDR,B
Vote of thanks:	Dr. S.K. Roy, Convenor, 10th ASCON

#### 13:00-14:00 Farewell Lunch

## POSTER SESSIONS

### DAY 1: TUESDAY, 11 JUNE 2002

**Time: 12:30-18:00**

**Authors present: 12:30-13:30**

- Session 1 Health Services**  
Abstract no. 011, 025, 026, 027, 096, 106 136, 159, and 169 (Page no. 101-109)
- Session 2 Diarrhoeal Diseases**  
Abstract no. 028, 061, 084, 101, 103, 139, and 172 (Page no. 110-116)
- Session 3 Infectious Diseases**  
Abstract no. 087, 102, 128, and 167 (Page no. 117-120)
- Session 4 Diabetes and Metabolism**  
Abstract no. 045, 052, 080, and 113 (Page no. 121-124)
- Session 5 Sexually Transmitted Diseases and Behaviour**  
Abstract no. 122, 123, and 124 (Page no. 125-127)
- Session 6 Environmental Health**  
Abstract no. 004, 030, 072, 118, and 120 (Page no. 128-132)

### DAY 2: WEDNESDAY, 12 JUNE 2002

**Time: 08:30-18:00**

**Authors present: 13:00-14:00**

- Session 7 Breast-feeding and Child Health**  
Abstract no. 035, 077, 083, 091, and 100 (Page no. 133-137)
- Session 8 Maternal Malnutrition**  
Abstract no. 015, 020, 127, 131, 134, and 160 (Page no. 138-143)
- Session 9 Micronutrients**  
Abstract no. 016, 031, 033, 034, 066, 081, and 099 (Page no. 144-150)
- Session 10 Community Nutrition**  
Abstract no. 017, 018, 019, 037, 055, 057, 079, 082, 097, 135, and 156 (Page no. 151-161)

## Programme Details

### DAY 1: TUESDAY, 11 JUNE 2002

09:30-12:00      **Inaugural Session**

Venue:              Dhaka Sheraton Hotel

Arrival of the Chief Guest

Recitation from the Holy Qur'an

Address of welcome and presentation on ICDDR,B's achievements  
Professor David A. Sack, Director, ICDDR,B

Keynote address:                      *Nutrition-infection Interactions*  
Professor Ricardo Uauy Dagach  
Director, Institute of Nutrition and Food Technology, Chile

Address by the Special Guest:      Mr. Amanullah Aman, MP  
Hon'ble State Minister  
Ministry of Health and Family Welfare

Address by the Chief Guest:        Professor A.Q.M. Badruddoza Chowdhury  
Hon'ble President, People's Republic of Bangladesh

Vote of thanks:                        Dr. S.K. Roy, Convenor, 10th ASCON

Tea and coffee

12:00-13:30      **Registration at Sasakawa Auditorium, ICDDR,B, Mohakhali, Dhaka 1212**

12:30-13:30      **Poster Session**

### Concurrent Sessions

13:30-14:45      **Session 1              Nutrition-Diarrhoeal Disease Interactions**  
(Sasakawa Auditorium)

Chair:                Dr. Ranjit Kumar Dey  
Director  
Planning, Research and Environmental Health  
Directorate General of Health Services  
Ministry of Health and Family Welfare

Co-chair:            Dr. G.B. Nair, LSD, ICDDR,B

Effects of green banana and pectin on intestinal permeability and fluid loss in Bangladeshi infants with persistent diarrhoea—**S.K. Saha**, T. Teka, B. Zaman, N. Majid, M. Khatun, M.A. Wahed, G.J. Fuchs, and G.H. Rabbani (*Page 1*)

*Helicobacter pylori* infection: its role in gastric acid secretion and iron absorption in Bangladeshi children—**Shafiqul A. Sarker**, G.J. Fuchs, Lena Davidsson, Shamina Sattar, Nur H. Alam, Hasan Mahmood, and Klaus E. Gyr (*Page 2*)

## 10th ASCON

Absorption of macronutrients from a defined semi-elemental diet containing medium- and long-chain triglycerides in children with persistent diarrhoea—**P.K. Bardhan**, N.H. Alam, S. Akramuzzaman, M.A. Wahed, D. Mahalanabis, and Klaus E. Gyr (*Page 3*)

Clinical presentation, complications, and outcome of shigellosis in children infected with different *Shigella* spp.—**W.A. Khan**, M.A. Salam, and M.L. Bennish (*Page 4*)

Effect of non-enteric infection on weight gain and food intake in children with persistent diarrhoea—**Shinjini Bhatnagar**, Rajiv Bahl, M.K. Bhan, and International Working Group on Persistent Diarrhoea (*Page 5*)

### **Session 2 Interactions of Child Caring, Child Nutrition and Child Development** (Seminar Room)

Chair: Professor Naila Khan  
Professor of Pediatrics  
Dhaka Shishu Hospital

Co-chair: Dr. Lauren S. Blum, PHSD, ICDDR,B

Nutrition and early childhood development—**M.Q-K. Talukder** and M.Q. Hassan (*Page 6*)

Patterns of decision-making on complementary feeding practices by caregivers of children in rural Thailand—**Farzana Bilkes**, Thembekile P. Nxumalo, Libuseng Bereng, Jane Paterson, Coeli Geefhuysen, Jintana Yyoung-Aree, and Vongsvat Kosulwat (*Page 7*)

Effect of psychosocial stimulation on development of malnourished children in Community Nutrition Centres of the Bangladesh Integrated Nutrition Project—J.D. Hamadani, F. Khatun, G.J. Fuchs, **S.N. Huda**, and S.M. Grantham-McGregor (*Page 8*)

Positive and negative deviance in child nutrition in rural Bangladesh—**R.T. Naved** (*Page 9*)

Lessons learnt from introducing kangaroo care in a rural hospital in Bangladesh—**Rekha Folia** and Nicola Browne (*Page 10*)

### **Session 3 Diabetes/Metabolism/Nutrition** (CSD Conference Room)

Chair: Professor Quazi Salamatullah  
Director  
Institute of Nutrition and Food Science, University of Dhaka

Co-chair: Dr. Mahbubur Rahman, LSD, ICDDR,B

Association between size at birth and fasting glucose, insulin concentrations, lipid profile, and insulin-like growth factor-1 in rural children of Bangladesh—**D.S. Alam**, Md. Yunus, M.A. Wahed, H.R. Chowdhury, A.F. Khan, L. Ali, and G.J. Fuchs (*Page 11*)

Relationship of leptin with obesity and glycaemic and insulinaemic status in type 2 diabetic subjects—**M.O. Faruque**, S.K.A. Karim, K.B. Biswas, L. Ali, A.K. Azad Khan, and H. Mahtab (*Page 12*)

Influence of maternal diabetes on serum leptin and insulin status of offspring—**S. Jahan**, F. Huq, R. Begum, and L. Ali (*Page 13*)

## Programme and Abstracts

14:45-16:00

**Session 4**      **Effects of Zinc Supplementation and Therapy**  
(Sasakawa Auditorium)

Chair:              Professor Md. Suhrab Ali  
                         Professor of Biochemistry  
                         Bangabandhu Sheikh Mujib Medical University

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

Effect of weekly supplementation with iron and/or zinc or a micronutrient mix on diarrhoea and acute lower respiratory infection-associated morbidity in Bangladeshi infants—**Abdullah H. Baqui, K. Zaman, Lars Åke Persson, Shams El Arifeen, Md. Yunus, N. Begum, and Robert E. Black (Page 14)**

Zinc supplementation started during diarrhoea reduces morbidity and mortality in Bangladeshi infants: a community-based randomized trial—**Abdullah H. Baqui, Robert E. Black, Shams El Arifeen, Md. Yunus, J. Chakraborty, Saifuddin Ahmed, and J. Patrick Vaughan (Page 15)**

Impact of zinc supplementation on morbidity and growth of low-birth-weight infants in Kolkata, India—**Dipika Sur, Byomkesh Manna, and K. Rajendran (Page 16)**

Impact of zinc on children with cholera—**S.K. Roy, K.E. Islam, Farzana Yusuf, and Asma Begum (Page 17)**

Absorption of dietary and medicinal zinc during persistent diarrhoea measured by stable isotopes—**S.K. Roy, K.E. Islam, S.F. Tait, T. Fox, and A.M. Tomkins (Page 18)**

**Session 5**      **Disease Burden, Prevention, and Therapy of Respiratory Infections**  
(Seminar Room)

Chair:              Professor D.S. Akram  
                         Project Director, Nutrition Support Programme, and  
                         Head, Department of Paediatrics  
                         Dow Medical College & Civil Hospital  
                         Karachi, Pakistan

Co-chair:         Dr. Pradip K. Bardhan, CSD, ICDDR,B

Selected findings from a community-based surveillance of acute lower respiratory infections in children in Matlab, Bangladesh—**Nazma Begum, K. Zaman, Shams El Arifeen, Chandra Shekhar Das, Md. Yunus, J. Chakraborty, Hafizur Rahman, Ashraf Uddin Siddik, Mahbubur Rahman, Shahadat Hossain, and Abdullah H. Baqui (Page 19)**

Immunogenicity and impact of pneumococcal polysaccharide vaccine on nasopharyngeal carriage of *Pneumococcus* after maternal immunization—**Nigar S. Shahid, Mark Steinhoff, and Claudette Thompson (Page 20)**

High prevalence of multidrug-resistant *Haemophilus influenzae* type b invasive infections in Bangladeshi infants: implications for therapy and vaccination policy—**Mahbubur Rahman, Shereen Shoma, Shahadat Hossain, Abdullah H. Baqui, Nazmun Nahar, Harunur Rashid, K. Zaman, Farida Khatun, and G.B. Nair (Page 21)**

## 10th ASCON

### Session 6      **Detection and Characterization of Pathogens** (CSD Conference Room)

Chair:            Dr. Nita Bhandari  
                     Department of Pediatrics  
                     All India Institute of Medical Sciences  
                     New Delhi, India

Co-chair:        Dr. M.A. Salam, CSD, ICDDR,B

Phenotypic and genotypic characterization of *Shigella flexneri* serotype 1, with special emphasis on subserotype 1c isolated in Bangladesh—**Kaisar A. Talukder**, Z. Islam, M.A. Islam, D.K. Dutta, A. Safa, F. Hassan, A.S.G. Faruque, M.A. Hossain, K. Alam, S. Nasrin, G.B. Nair, and D.A. Sack (*Page 22*)

Detection and characterization of new *Shigella boydii* strains isolated from diarrhoeal patients in Bangladesh—**Kaisar A. Talukder**, D.K. Dutta, A. Safa, M.A. Islam, M. Ansaruzzaman, F. Hassan, A.S.G. Faruque, M.A. Hossain, K. Alam, S.K. Niyogi, G.B. Nair, and D.A. Sack (*Page 23*)

Early diagnosis of dengue virus infection by rapid immunochromatographic test using single serum samples—**Mahbubur Rahman**, Khalilur Rahman, Shereen Shoma, Harunur Rashid, A.K. Siddique, G.B. Nair, Ananda Nisaluk, and Robert F. Breiman (*Page 24*)

Thermostable direct haemolysin of *Vibrio parahaemolyticus* stimulates chloride secretion by intermediate conductance chloride channels in human epithelial cell line, Caco-2—**Shereen Shoma**, Kyoko Maeda, Mahbubur Rahman, G.B. Nair, Akira Takahashi, and Yutaka Nakaya (*Page 25*)

Evaluation of Premier enterohaemorrhagic *Escherichia coli* assay for detection of infection due to *Shigella dysenteriae* type 1—**M.A. Salam**, W.A. Khan, E.T. Ryan, and M.L. Bennis (*Page 26*)

16:00-16:15

Tea

16:15-17:00

#### Invited Lecture 1

***From Research to Policy: Experience from the National Integrated Nutrition Policy of the Republic of South Africa: Professor Marian Jacobs, Professor of Child Health, University of Cape Town, South Africa***  
(Sasakawa Auditorium)

Chair:            Dr. George J. Komba-Kono  
                     World Health Organization  
                     Dhaka

## Programme and Abstracts

17:00-18:00

**Panel Discussion/Roundtable**

***Key Findings from ICDDR,B Nutrition Research: How Ready for Policy and Practice?***  
(Sasakawa Auditorium)

Presenter: Professor David A. Sack  
Director, ICDDR,B

Panelists: Professor Marian Jacobs  
Professor of Child Health  
University of Cape Town  
South Africa

Professor H.P.S. Sachdev  
Department of Pediatrics  
Maulana Azad Medical College  
New Delhi, India

Chair: Dr. Md. Abdul Baqi  
Director, Primary Health Care  
Directorate General of Health Services  
Ministry of Health and Family Welfare

## 10th ASCON

### DAY 2: WEDNESDAY, 12 JUNE 2002

08:30-09:30      **Keynote Lecture**  
*Meeting the Malnutrition Challenges in South Asia: Dr. Milla McLachlan*  
(Sasakawa Auditorium)

Chair:              Professor A.K. Azad Khan  
Secretary General  
Diabetic Association of Bangladesh

### Concurrent Sessions

09:30-10:30      **Session 7              Maternal and Child Malnutrition in South Asia**  
(Sasakawa Auditorium)

Chair:              Dr. Milla McLachlan  
Nutrition Adviser, Human Development Network  
The World Bank  
Washington, DC, USA

Co-chair:          Professor Barkat-e-Khuda, Policy and Planning, ICDDR,B

Recent trends in nutritional status of children in India—**H.P.S. Sachdev** and D. Shah (*Page 27*)

High risk of low-birth-weight children and nutritional status of mothers in India—**Srinivasan Soundararajan** and Palaniyandi Murugesan (*Page 28*)

Child nutrition survey of Bangladesh 2000—Khurshid Talukder  
and **A.K.M. Abdus Salam** (*Page 29*)

Community nutrition research in the South Asian Nutrition Research-cum-Action Network  
Countries during 1995-2000: a literature review—**E.-C. Ekström** (*Page 30*)

Nutrition scenario in Bangladesh: changes over the decades—**M.A. Mannan**,  
A.Z. Amanatullah, Md. Eshaque Ali, and Dilruba Akhter (*Page 31*)

#### **Invited Lecture 2 and Session 8**

*The Emerging Epidemic of Obesity: How Relevant to South Asia?*  
Professor Joop van Raaij, Wageningen University, The Netherlands  
(Seminar Room)

Chair:              Professor H.P.S. Sachdev  
Department of Pediatrics  
Maulana Azad Medical College  
New Delhi, India

Co-chair:          Dr. Nigar S. Shahid, PHSD, ICDDR,B

Prevalence and determinants of obesity among women in India—**M. Ubaidullah**  
(*Page 32*)

Prevalence and determinants of childhood obesity in Dhaka city—**S.M.M. Rahman**, I. Kabir,  
M.A. Khaled, M.A.H. Bhuyan, Harun-Ar-Rashid, M.A. Malek, and M.R. Khan (*Page 33*)



## Programme and Abstracts

### **Session 9**      **Accessibility and Financing of Healthcare** (CSD Conference Room)

Chair:            Mr. Kh. Fazlur Rahman  
                      Additional Secretary  
                      Ministry of Health and Family Welfare

Co-chair:        Dr. Charles P. Larson, HSID, ICDDR,B

Treating sick children in rural Bangladesh: roles of access to and quality of care—  
**Nurul Alam** (*Page 34*)

Means testing for inpatient bill-recovery in a rural hospital in Bangladesh—  
**M.A. Pietroni**, Richard Butterworth, and Erik ter Haar (*Page 35*)

Who is vaccinated in Bangladesh? The immunization divide—Mushtaque R. Chowdhury,  
**Abbas Bhuiya**, Simeen Mahmud, A.K.M. Abdus Salam, and Fazlul Karim (*Page 36*)

Gender inequity in health and healthcare in rural Bangladesh: does health insurance make any  
difference?—**M. Kamrul Islam** M. Mahmud Khan, Kuntal K. Saha, and Nazmul Sohel  
(*Page 37*)

**10:30-10:45**

### **Poster Session and Tea**

**10:45-12:00**

### **Session 10**      **Feeding and Growth Patterns of South Asian Infants and Children** (Sasakawa Auditorium)

Chair:            Dr. Kayode Oyegbite  
                      Head, Health and Nutrition Section  
                      UNICEF, Dhaka

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

Breast-feeding patterns during diarrhoea and healthy periods in rural Bangladesh: an  
observational study—**K. Zaman**, D.A. Sack, J. Chakraborty, Md. Yunus,  
Abdullah H. Baqui, and Robert E. Black (*Page 38*)

Infant-feeding practices, morbidity, and growth the during first six months of life in rural  
Bangladesh—**D.S. Alam**, J.M.A. van Raaij, J.G.A.J. Hautvast, Md. Yunus,  
and G.J. Fuchs (*Page 39*)

Trends of exclusive breast-feeding practices in two rural areas of Bangladesh—  
**Rukhsana Gazi**, Ali Ashraf, Abdul Quaiyum, and Shubas Chandra Das (*Page 40*)

Low energy and micronutrient intake among infants in rural Bangladesh is attributable to low  
intake and micronutrient density of complementary food—**Joel E. Kimmons**, Kathryn G.  
Dewey, E. Haque, J. Chakraborty, Saskia J.M. Osendarp, and Kenneth H. Brown (*Page 41*)

Infant-feeding practices from birth to two years of age and nutritional status of children and  
mothers in Bangladesh—**A. Hannan**, M.Q. Hassan, A.K.M. Fazlur Rahman, A. Rahman,  
and M.Q-K. Talukder (*Page 42*)

Determinants of exclusive breast-feeding in a rural area of Bangladesh—**J. Killewo**, N. Alam,  
K. Gausia, F. Ahmed, Md. Yunus, J. Chakraborty, and L.Å. Persson (*Page 43*)

**Session 11      Operations Research on the Bangladesh Integrated Nutrition Project (BINP)-1**  
(Seminar Room)

Chair:            Professor Mahmudur Rahman  
                     Director  
                     National Institute of Preventive and Social Medicine

Co-chair:        Dr. K.Z. Hasan, PHSD, ICDDR,B

Critical review of Bangladesh Integrated Nutrition Project mid-term evaluation—**S.M. Moazzem Hossain** and Anna Taylor (*Page 44*)

Risk factors for relapse back to severe malnutrition among children in Bangladesh who underwent a supplementary feeding programme—**A.K.M. Fazlur Rahman**, F. Islam, A.R.M.L. Kabir, A. Hannan, A. Rahman, and Rowshan Ara (*Page 45*)

Sociodemographic and health characteristics of Bangladeshi malnourished children aged less than two years requiring food supplementation—**F. Islam**, F. Rahman, A.R.M.L. Kabir, A. Hannan, A. Rahman, and Rowshan Ara (*Page 46*)

Comparison of high- and low-intensity nutrition education in reducing moderate malnutrition—**S.K. Roy**, Sohana Shafique, Ananya Laboni, Rabi Biswas, Aasma Afroz, and Syeda S. Akter (*Page 47*)

Perceptions of mothers about child-caring practices and effect of a nutrition-education programme in a rural district of Bangladesh—**S.K. Roy**, Zeba Mahmood, Syeda Sharmin Akter, and **Aasma Afroz** (*Page 48*)

What should be the optimum duration of supplementation for malnourished children?—**S. Tasnim**, S. Afroza, F. Rahman, M.Q-K. Talukder, and A.K.M. Shahabuddin (*Page 49*)

**Session 12      Breast-feeding Promotion and Support**  
(CSD Conference Room)

Chair:            Professor M.R. Khan  
                     National Professor

Co-chair:        Dr. A.K.M. Iqbal Kabir, CSD, ICDDR,B

Promotion of exclusive breast-feeding at the community level: programmatic implications for low-birth-weight babies—**Rukhsana Gazi**, Ali Ashraf, and Jahanara Khatun (*Page 50*)

Effectiveness of a baby-friendly hospital initiative on promotion of exclusive breast-feeding among mothers in Dhaka city in Bangladesh—**M. Alam** (*Page 51*)

Impact of peer counselling on exclusive breast-feeding: a comparison of individual and group counselling in rural Bangladesh—**I. Kabir**, R. Haider, S. Banu, T. Faruque, and F.B. Firu (*Page 52*)

Relactation and diarrhoea in infants aged less than four months—**Seema Alam**, Akshay Batra, and Ashraf Malik (*Page 53*)

## Programme and Abstracts

A community-based intervention to improve breast-feeding and complementary feeding practices through nutritional counselling in rural Haryana, India—**Nita Bhandari**, Sarmila Mazumdar, Rajiv Bahl, R.C. Agarwal, Jose Martines, Robert E. Black, and M.K. Bhan (*Page 54*)

Impact of social mobilization on breast-feeding practices in a rural area of Bangladesh—**S. Chowdhury**, F. Rahman, F. Islam, M.Q. Hassan, A. Rahman, and N. Begum (*Page 55*)

12:00-13:00

### Session 13      **Management of Severe Child Malnutrition** (Sasakawa Auditorium)

Chair:            Professor Selim Shakur  
                    Professor of Pediatrics  
                    Dhaka Shishu Hospital

Co-chair:        Dr. Petra Osinski, CSD, ICDDR,B

Rehabilitation of severely-malnourished children using an indigenous high-density diet—Fatima Y. Bharmal, and **D.S. Akram** (*Page 56*)

Mortality among malnourished children admitted to a Nutrition Rehabilitation Unit in rural Matlab, Bangladesh: a retrospective cohort study—**A. Rahman**, Md. Yunus, H.R. Chowdhury, C.S. Das, L.A. Persson, and U. Janlert (*Page 57*)

Home-based nutritional rehabilitation of severely-malnourished children recovering from diarrhoea and other acute illnesses—Tahmeed Ahmed, M. Munirul Islam, **Baitun Nahar**, M.A. Azam, M.A. Salam, Ann Ashworth, and G.J. Fuchs (*Page 58*)

Experience with protocolized treatment of severe malnutrition in a general hospital ward—**S.M. Moazzem Hossain**, Anna Taylor, Ashrafuddin Ahmed, Nazrul Islam, Shamsur Rab, Tamanna Ferdous, Michael Golden, and Yvonne Grellety (*Page 59*)

Daycare-based management of acutely-ill severely-malnourished children in an urban clinic in Dhaka—**Hasan Ashraf**, R. Mahmud, A.I. Begum, I. Hossain, T. Ahmed, P. Osinski, and G.J. Fuchs (*Page 60*)

### Session 14      **Operations Research on the Bangladesh Integrated Nutrition Project (BINP)-2** (Seminar Room)

Chair:            Dr. A.F.M. Iqbal Kabir  
                    Nutrition Specialist  
                    The World Bank  
                    Dhaka

Co-chair:        Dr. Rubina Shaheen, PHSD, ICDDR,B

Inequality in severe child malnutrition between nutritional intervention and comparison areas—**Shakil Ahmed**, M. Mahmud Khan, Badal C. Dhar, S.K. Roy, and Abbas Bhuiya (*Page 61*)

Economic cost of mistargeting: a case study of nutritional intervention project for pregnant women—M. Mahmud Khan, **Shakil Ahmed**, Ali E. Protik, Badal C. Dhar, and S.K. Roy (*Page 62*)

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Prevention of malnutrition: efficacy of a new strategy—S.K. Roy, **R. Biswas**, S.S. Akter, A. Laboni, A. Afroz, S. Shafique, S.A. Banu, A. Parvin, J. Khanam, S.B. Nazim, R. Sultana, and R. Naheed (*Page 63*)

Testing of tubewell-water of community nutrition centres under the Bangladesh Integrated Nutrition Project for presence of arsenic—**Md. Jakariya** (*Page 64*)

Understanding of mothers about growth monitoring and promotion card used in the Bangladesh Integrated Nutrition Project—M.A. Mannan, **A.Z. Amanatullah**, and Md. Eshaque Ali (*Page 65*)

**13:00-14:00** **Poster Session (Authors present) and Lunch**

**14:00-15:15** **Invited Lecture 3**

***Nutrition Policy at the Canadian International Development Agency—The Key Role of Micronutrients: Dr. Barbara MacDonald, Senior Nutrition Specialist, Multilateral Branch, Food Aid, Canadian International Development Agency (CIDA), Canada***  
(Sasakawa Auditorium)

**Session 15** **Micronutrients and Health**  
(Sasakawa Auditorium)

Chair: Dr. Barbara MacDonald  
Senior Nutrition Specialist  
Multilateral Branch, Food Aid  
Canadian International Development Agency (CIDA)  
Canada

Co-chair: Mr. M.A. Wahed, LSD, ICDDR,B

Perceptions and practices of adolescents about iodized salt and iodine nutriture in rural Bangladesh—**Sohana Shafique**, Md. Mohiduzzaman, Cadi P. Banu, and Quazi Salamatullah (*Page 66*)

Homestead gardening as a food security strategy in rural Bangladesh—**V.N. Bushamuka**, A. Taher, A. Talukder, and A. Hall (*Page 67*)

Micronutrient malnutrition in children of North West Frontier Province of Pakistan—**Parvez I. Paracha** (*Page 68*)

Nutritional rickets in an Arab country—**Abdul Majid Molla**, Majeda Hamoud, Mona Al-Badawi, and Ayesha Molla (*Page 69*)

**Session 16** **Nutrition Interventions during Pregnancy**  
(Seminar Room)

Chair: Professor T.A. Chowdhury  
Head, Department of Obstetrics and Gynecology  
BIRDEM

Co-chair: Professor Japhet Killewo, PHSD, ICDDR,B

Supplementation of fish-oil to pregnant mothers during the last trimester has no effect on birth-weight—**I. Kabir**, R. Haider, S.M. Akramuzzaman, I. Hossain, and T. Romana (*Page 70*)

## Programme and Abstracts

Anaemia during pregnancy in rural Bangladesh: can it be controlled by iron supplements?—**E.-C. Ekström**, Z. Hyder, A.M.R. Chowdhury, B. Lönnerdal, and L.Å. Persson (*Page 71*)

Longer duration of food supplementation to malnourished pregnant women does not increase duration of labour: a study in Shaharasti, Bangladesh—**Rubina Shaheen** (*Page 72*)

Conceptualizing pregnancy in rural Bangladesh—**Papreen Nahar** and Lauren S. Blum (*Page 73*)

Facilitating healthy pregnancies: effect of targeted food supplementation and services on weight gains in pregnancy and birth-weights—Stephanie Ortolano, Zeba Mahmud, **A.F.M. Iqbal Kabir**, and F. James Levinson (*Page 74*)

Food intake behaviour and anaemia among floating sex workers in Dhaka city—**Shaheda Islam** and Rafiqul Islam (*Page 75*)

### **Session 17 Household Food Expenditure and Food Consumption** (CSD Conference Room)

Chair: Professor Sushil Ranjan Howlader  
Director  
Institute of Health Economics  
University of Dhaka

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

Rural employment and household food expenditure: an exploratory study—Carlo Del Ninno and **Dilip Kumar Roy** (*Page 76*)

Effects of agroeconomic factors on food consumption—**M.U. Mia**, C.A. Florencio, and M. Hossain (*Page 78*)

Process and impact study of BINP garden and poultry activities—Rezaul Karim, F. James Levinson, and **Sascha Lamstein** (*Page 79*)

15:15-16:00

### **Session 18 Community-based Management of Severe Child Malnutrition in Urban Bangladesh: An NCoE-supported Initiative** (Sasakawa Auditorium)

Chair: Professor Rezaul Karim  
Institute of Nutrition and Food Science  
University of Dhaka

Co-chair: Dr. D.S. Alam, PHSD, ICDDR,B

Contextualizing malnutrition: cultural perspectives on child-feeding and childhood illness in urban slums of Dhaka—**L. Blum** and P. Nahar (*Page 80*)

Beyond education: social benefits of health sessions—L. Blum and **E. Ferdous** (*Page 81*)

Protocolized management of severe child malnutrition: feasibility and effectiveness of primary healthcare-based child nutrition services for the urban poor—**P. Osinski**, T. Ahmed, T. Faruque, G.J. Fuchs, J. Hyderi, and S.K. Roy (*Page 82*)

Z-score-based assessment, target-setting, and monitoring in community-based protocolized management of severe child malnutrition in Dhaka, Bangladesh—**P. Osinski**, T. Ahmed, T. Faruque, G.J. Fuchs, J. Hyderi, and S.K. Roy (*Page 83*)

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- 16:00-16:15**      **Poster Session and Tea**
- 16:15-17:00**      **Special Presentation**  
*Food and Micronutrient Interventions in Pregnancy to Prevent Maternal Anaemia and Low Birth-weight: Efficacy and Effectiveness Trials in Matlab, Kapasia, and Chowddagram*
- Chair:              Professor David A. Sack  
                         Director, ICDDR,B
- Speakers:        Professor Lars Åke Persson, PHSD, ICDDR,B  
                         Dr. Shams El Arifeen, PHSD, ICDDR,B
- 17:30-18:30**      **Institutional Presentations**  
*Research Interests and Capacities of Regional Institutions*
- Chair:              Mr. Peter Thorpe  
                         ISD, ICDDR,B
- Co-chair:         Ms Vanessa Brooks  
                         ERID Office, ICDDR,B
- Moderator:      Dr. Petra Osinski  
                         CSD, ICDDR,B
- 19:00-20:30**      **Networking Dinner (*by invitation*)**

### DAY 3: THURSDAY, 13 JUNE 2002

- 08:30-09:30**      **Keynote Lecture**  
*Combating Child Malnutrition in South Asia: Dr. Umesh Kapil, All India Institute of Medical Sciences, New Delhi, India*  
Chair: Professor Lars Åke Persson, PHSD, ICDDR,B

### Concurrent Sessions

- 09:30-10:45**      **Session 19**      **Community Nutrition Interventions: Improving Infant- and Child-feeding Practices and Maternal Nutrition**  
(Sasakawa Auditorium)  
Chair: Professor M.Q-K. Talukder  
Chairman, Bangladesh Breastfeeding Foundation  
Co-chair: Dr. Eva-Charlotte Ekström, PHSD, ICDDR,B  
Increase in 'demand-led' (maternal/community pursuit of) growth monitoring using home-based direct recording scales—M. Verkerk, K. Prenger, **S. Pahan**, and S. Saha (*Page 84*)  
Effect of use of direct recording scales on maternal understanding of growth charts in North-West Bangladesh—J. Slot, K. Prenger, and **E. Hasdak** (*Page 85*)  
Measurement of mid-chest circumference to identify low-birth-weight newborns—**Stacy Saha** and Rekha Folia (*Page 86*)  
A province-based nutrition support programme: what works and what does not—**D.S. Akram** and S. Mustafa (*Page 87*)  
Sustainability of nutrition education on consumption of green leafy vegetables by young children in poor communities in rural Bangladesh—**Md. Yunus**, D.S. Alam, J.P. Vaughan, K.M.A. Aziz, and Abdullah H. Baqui (*Page 88*)  
Enhancement of nutritional status among the poorest of the poor through community peer educators in Andhra Pradesh—**Nasreen Sultana** (*Page 89*)
- Session 20**      **Health Systems Research**  
(Seminar Room)  
Chair: Dr. M.A. Mannan  
Secretary  
Bangladesh National Nutrition Council  
Co-chair: Dr. Peter Kim Streatfield, PHSD, ICDDR,B  
Retention, perceived usefulness, and use of the family health card in the Health and Population Sector Programme of Bangladesh—**Rukhsana Gazi**, Jahanara Khatun, Ali Ashraf, and Mahbub ul Alam (*Page 90*)  
Trafficking of women and children in Bangladesh: an overview—**Rukhsana Gazi**, Ziaul Haque Chowdhury, and S.M. Nurul Alam (*Page 91*)  
EQ-5D<sub>index</sub> a measure of health status, and health inequalities in England—**Md. Afzal Hossain Sarker** (*Page 92*)

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Roles of women in water and sanitation practices—**Md. A. Halim Miah**,  
Md. Mahtabul Hakim, Md. Omer Faruque, Md. Zahirul Islam, Sheikh Masudur Rahman,  
and Afsana Yasmeen (*Page 93*)

Organisms causing nosocomial infection and their antibiogram isolated from patients of  
Intensive Care Units—**A.S.M. Matiur Rahman**, N.M. Kawsar, M. Nizam Uddin,  
and E.A. Mondal (*Page 94*)

Health issues of an ageing Bangladeshi population—**Golam Mostafa** and Peter Kim Streatfield  
(*Page 77*)

### **Session 21 Reproductive Health and Population Dynamics** (CSD Conference Room)

Chair: Dr. Zafar A. Hakim  
Director (MCH Services) and Line Director, ESC (RH)  
Directorate of Family Planning  
Ministry of Health and Family Welfare

Co-chair: Dr. Robert F. Breiman, HSID, ICDDR,B

Prevalence and risk factors for sexually transmitted infections among females working in a  
truck-stand in urban Bangladesh—**Nazmul Alam**, Kaniz Gausia, S.I. Khan, Motiur Rahman,  
Md. Yunus, Parwez Chaudhury, and Japhet Killewo (*Page 95*)

Influence of gender composition on subsequent fertility—**Carel T. van Mels** (*Page 96*)

Effect of low-dose oral contraceptive pills on blood glucose and other cardiovascular risk  
factors in normal and underweight women—**S.B. Kasem**, S. Neelotpol, S.K.A. Razzaque,  
K.B. Biswas, R. Sultana, T.A. Chowdhury, and L. Ali (*Page 97*)

Old age, poverty, and community support: qualitative evidence from a village in Bangladeshi—  
**Ashraful Alam Neeloy** (*Page 98*)

Effect of antiretroviral therapy on the rate of disease progression in people with haemophilia  
and HIV infection—**Masuma Akter Khanam**, Lesley Ashton, Roger Garsia,  
and Jenny Learmont (*Page 99*)

Correlates of timing of induced abortion in rural Bangladesh—**Mamunur Rashid**  
and M. Kapil Ahmed (*Page 100*)

**10:45-11:00**

**Tea**

**11:00-12:00**

### **Invited Lecture 4**

***Regional Approaches to Eliminate Child Undernutrition in Asia: Findings from  
a Seven-Asian Country Study by ADB and UNICEF: Dr. Joseph M. Hunt, Health, Nutrition,  
and Early Childhood Advisor, Asian Development Bank***



## Programme and Abstracts

**12:00-13:00**      **Closing Session**  
(Sasakawa Auditorium)

Summary:                      Professor Lars Åke Persson, PHSD, ICDDR,B

Poster award by the Chief Guest: Mr. M. Fazlur Rahman  
Secretary  
Ministry of Health and Family Welfare

Address by the Chief Guest

Concluding remarks by Chair:      Professor David A. Sack  
Director, ICDDR,B

Vote of thanks:                      Dr. S.K. Roy  
Convenor, 10th ASCON

**13:00-14:00**      **Farewell Lunch**

## POSTER SESSIONS

**DAY 1: TUESDAY, 11 JUNE 2002**

**Time: 12:30-18:00**

**Authors present: 12:30-13:30**

### Session 1

#### Health Services

Views of mothers on unmet needs for medical services for their sick children in rural Bangladesh—**Nurul Alam** (Page 101)

Extent of data-transfer errors in the unified management information system of the Health and Population Sector Programme of Bangladesh—**Md. Jasim Uddin** and Ali Ashraf (Page 102)

Incorporating the voice of the community to facilitate transparency and accountability in the health system—**Md. Jasim Uddin**, Ali Ashraf, A.K.M. Sirajuddin, and Mahbub-ul-Alam (Page 103)

Unmet reproductive and child health needs of clients of urban NGO clinics—**Jahanara Khatun**, Nikhil Chandra Roy, and Tariq Azim (Page 104)

Understanding of causes of death in children aged less than 5 years by verbal autopsy—**K. Prenger** (Page 105)

A comparison of house-to-house visit versus fixed-site centres for delivery of family-planning services—**Mehrab A. Khan**, Moarrita Begum, M.K. Barua, J. Chakraborty, Mazharul Islam, and Radheshyam Bairagi (Page 106)

Studies on street food in relation to health status of consumers in selected locations of Dhaka metropolitan city—**M.A. Mannan** and F. Rahman (Page 107)

Assessment of the upazila-level record-keeping and reporting system of the Health and Population Sector Programme of Bangladesh—**A.H. Nowsher Uddin** and Ali Ashraf (Page 108)

Effect of organizational support to improve nutritional status of street children in Dhaka: a comparative study—**Banibrota Nandy** and Malay Kanti Mridha (Page 109)

### Session 2

#### Diarrhoeal Diseases

Reduced-osmolarity ORS versus WHO-ORS: a clinical study in neonates for treatment of acute watery diarrhoea—**A.M. Khan**, S.A. Sarker, S.A. Jahan, N.H. Alam, and G.J. Fuchs (Page 110)

Metronidazole resistance in *Helicobacter pylori* in India—**A. Chowdhury**, A.K. Mukhopadhyay, J.Y. Jeong, S. Datta, S. Chattopadhyay, S. Choudhuri, D. Dailidene, G.B. Nair, and D.E. Berg (Page 111)

Diarrhoeal morbidity in a diarrhoea treatment unit in urban Pakistan—**Iqbal A. Memon** and Farida Memon (Page 112)

Clonal analysis of enterotoxigenic *Escherichia coli* isolated from diarrhoeal patients in Bangladesh—**M. Ansaruzzaman**, Nurul Amin Bhuiyan, Yasmin Ara Begum, I. Kuhn, G.B. Nair, A.-M. Svennerholm, David A. Sack, and Firdausi Qadri (Page 113)

Epidemiological and molecular characterization of *Shigella flexneri* in Bangladesh—**Kaisar A. Talukder**, D.K. Dutta, M.A. Islam, A. Safa, F. Hassan, A.S.G. Faruque, M.A. Hossain, K. Alam, G.B. Nair, and D.A. Sack (Page 114)

## Programme and Abstracts

*Cryptosporidium*-associated diarrhoea in pet dogs and their attendants: a report from a pet animal clinic in Dhaka, Bangladesh—**A.S.M. Hamidur Rahman** and M.A. Ali (Page 115)

Pilus and O:34 antigen of cytotoxic enterotoxin gene-positive isolates of *Aeromonas* spp.—**Zaur Rahim**, G.B. Nair, S.I. Khan, T. Ramamurthy, and A.N. Ghosh (Page 116)

### Session 3

#### Infectious Diseases

Prevalence of extra-pulmonary tuberculosis in hospital patients—**M.A. Samad Talukder**, and M.M. Zakaria (Page 117)

Aetiology of pneumonia in a cohort of newborns from birth to 24 months of age in rural Mirzapur, Bangladesh—**K.Z. Hasan**, Pauline Jolly, Grace Marquis, Eliza Roy, Goutam Poddar, Khorshed Alam, Fazlul Huq, Mohammed Ali, and R.B. Sack (Page 118)

Bronchiolitis and nutritional status—**A.R.M.L. Kabir**, N. Haq, R. Amin, A. Hossain, S. Khatoon, S. Akhter, T. Sharif, S. Ahmed, A. Rahman, M. Hossain, S. Ahamed, and A. Khashru (Page 119)

Evaluation of potential use of an osmotically-driven ultrafiltration device for preparation of therapeutic feeds for home management of malnourished children—S.K. Roy, A. Tomkins, M.S. Islam, A. Seal, T. Ahmed, G.J. Fuchs, D. Strickland, A. Asma, **N. Parveen**, and R. Begum (Page 120)

### Session 4

#### Diabetes and Metabolism

Epidemiological study of diabetic and non-diabetic pregnant mothers in terms of height, birth-weight, and type of delivery—**Shireen Begum**, Syed Nazmul Huda, Md. Rafiqul Islam, Syed Azam Mohammad, A.K.M. Yunus Halim, and S.M. Keramat Ali (Page 121)

Blood glucose, non-esterified fatty acid, and insulin response to banana and jackfruit in type 2 diabetic subjects—**I.B. Rashid**, K. Fatema, F. Sani, A. Akter, K.M. Nadira, S. Ahmed, and L. Ali (Page 122)

Comparison of nutritional characteristics of type 2 diabetic subjects with or without micro-albuminuria—**S. Rahman**, S.M.K. Ali, and A.M.M. Mokarram Hossain (Page 123)

Lack of correlation between paternal insulin sensitivity and anthropometry at birth—**S. Jahan**, R. Zinnat, T.A. Chowdhury, Z. Hassan, G.A. Hitman, and L. Ali (Page 124)

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#### Sexually Transmitted Diseases and Behaviour

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Air pollution is more deadly than traffic crashes in Bangladesh—**Shakeel Ahmed Ibne Mahmood**, Azharul Islam Khan, Shamima Jahan, Md. Shahjahan Ali, and Md. Moniruzzaman Miah (*Page 130*)

The disadvantaged are the most likely to face the menace of tobacco consumption in a remote rural area of Bangladesh—**Kaneta K. Choudhury**, S.M.A. Hanifi, and Abbas Bhuiya (*Page 131*)

Perceptions of villagers about water qualities and health in the context of arsenic contamination in Matlab, Bangladesh—**S.M.A. Hanifi**, Shamim Ara Begum, Sabrina Rashid, and Abbas Bhuiya (*Page 132*)

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Breast-feeding patterns among working female doctors in Dhaka city—  
Syeda Kheleda Ferdousi, **Rowshan Ara Begum**, and Ferdousi Islam (*Page 134*)

An educational intervention designed to improve child-feeding and caring practices of mothers in four rural areas of Bangladesh—S.K. Roy, Rabi Biswas, **Aasma Afroz**, and S.S. Akter (*Page 135*)

Mothers' perceptions and practices about giving breastmilk and breastmilk substitutes to infants in Dhaka—S.K. Roy, Sebastian de Groot, **Sohana Shafique**, G.J. Fuchs, Syeda S. Akter, and Aasma Afroz (*Page 136*)

Assessment of breast-feeding activities in baby-friendly and other hospital environments—**Md. Eshaque Ali**, A.Z. Amanatullah, and M.A. Mannan (*Page 137*)

**Session 8**

**Maternal Malnutrition**

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Nutritional status of women in India—**M. Ubaidullah** (*Page 139*)

Effect of supplementation of fish-oil and soybean-oil during pregnancy on psychomotor development of infants—Tofail, I. Kabir, J.D. Hamadani, **S.N. Huda**, F. Chowdhury, S. Yesmin, F. Mehreen, G.J. Fuchs, and T. Romana (*Page 140*)

Effect of age, parity, and menopause on bone mineral density in a group of Bangladeshi women—**S. Chowdhury**, T.A. Chowdhury, A. Nessa, and S. Ali (*Page 141*)

Relationship of placental weight with birth-weight—**Nazneen Begum**, C.A. Kawser, and A.K.M.F. Rahman (*Page 142*)

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**Session 9**

**Micronutrients**

Nutrition challenge and prevalence of anaemia in India—**A.K. Ravishankar**, S. Ramachandran, and V. Selvam (*Page 144*)

Effect of micronutrient supplementation during pregnancy, maternal anaemia, birth-weight, and APGAR score of infants—**S. Ahmed**, S. Salahuddin, and M. Begum (*Page 145*)

Serum concentrations of trace elements in cholera toxin-treated animals—**F. Marni**, M. Akhtar, A.M.S. Alam, S.K. Saha, and G.H. Rabbani (*Page 146*)

Iodized salt: knowledge, attitude and practice of mothers from northern Bangladesh—**T.M. Alamgir Azad**, Md. Abul Hossain Molla, and Md. Aminul Haque Bhuyan (*Page 147*)

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Prevalence of iodine deficiency and perception and practice of urban pregnant women regarding iodized salt—**Santhia Ireen**, Md. Mohiduzzaman, Cadi P. Banu, and Quazi Salamatullah (*Page 148*)

Rickets: an ignored micronutrient deficiency disorder—**Iqbal A. Memon** (*Page 149*)

Prevalence of anaemia among children in Bangladesh: time to act—**A.Z. Amanatullah**, M.A. Mannan, and Md. Eshaque Ali (*Page 150*)

### Session 10

#### Community Nutrition

Improvements in nutritional status of mothers in a rural area of the Bangladesh Integrated Nutrition Project—**Azizul Haque** (*Page 151*)

Nutritive value and cultural acceptability of pupae of mulberry and non-mulberry silkworms in north-east of India—**Neelima Mishra**, N.C. Hazarika, K. Narain, and J. Mahanta (*Page 152*)

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Malnutrition and sociocultural variation among the lepcha children of Kalimpong, India—**Barun Mukhopadhyay** (*Page 154*)

Relationship between school achievement and nutritional status of school children in 20 primary schools in rural Bangladesh—Khurshid Talukder, **Farzana Bilkes**, M. Quamrul Hassan, Syed Nazmul Huda, M. Quddusur Rahman, and Morsheda Aziz (*Page 155*)

Dietary assessment in developing countries: issues around validity—**K.E. Islam** and S Filteau (*Page 156*)

Sociodemographic correlates of anaemia among adolescent girls in rural area of Agra district, Uttar Pradesh, India—**V. Dutta** and D. Nandan (*Page 157*)

Effect of nutrition education and specific nutritious food on improvement of growth of young children—**S.S. Akter**, S.K. Roy, G.J. Fuchs, and Zeba Mahmood (*Page 158*)

Review of efficacy and effectiveness of interventions to improve nutritional status—M.A. Mannan (*Page 159*)

Nutritional status of children and mothers in Bangladesh—**A. Hannan**, M.Q. Hassan, A.K.M. Fazlur Rahman, A. Rahman, and M.Q-K. Talukder (*Page 160*)

Agroeconomic determinants of nutritional status of preschool children—**M.U. Mia**, C.A. Florencio, and M. Hossain (*Page 161*)

## Effects of Green Banana and Pectin on Intestinal Permeability and Fluid Loss in Bangladeshi Infants with Persistent Diarrhoea

S.K. Saha<sup>1</sup>, T. Teka<sup>1</sup>, B. Zaman<sup>1</sup>, N. Majid<sup>1</sup>, M. Khatun<sup>1</sup>, M.A. Wahed<sup>1</sup>,  
G.J. Fuchs<sup>2</sup>, and G.H. Rabbani<sup>1</sup>

**Objective:** Evaluate the effects of a rice-based diet containing amylase-resistant starch (ARS)-rich green banana or pectin on intestinal permeability and fluid loss in persistent diarrhoea.

**Methodology:** In a double-blind trial, 56 boys aged 5-12 months were randomly given a rice-based diet containing either 250 g/L of cooked green banana (n=20) or 4 g/kg of pectin (n=17) or rice-diet alone (n=19), providing 540 kcal/L daily for 7 days. The study was conducted at the Clinical Research and Service Centre of ICDDR,B: Centre for Health and Population Research during June 1996-January 1998. Permeability was assessed using lactulose-mannitol tests. Urinary excretion of these two non-metabolizing sugars was assayed after an oral loading dose. The tests were done on admission to the hospital and after 7 days of treatment.

**Results:** Treatment with banana caused a significant decrease in excretion of lactulose ( $0.41 \pm 0.011$  vs  $1.61 \pm 0.13\%$  of oral dose,  $p < 0.01$ ), an increase in excretion of mannitol ( $3.21 \pm 0.16$  vs  $1.82 \pm 0.13\%$ ,  $p < 0.05$ ), and a decrease in lactulose-mannitol ratio ( $0.21 \pm 0.12$  vs  $0.5 \pm 0.14$ ) compared to pre-treatment values. Treatment with pectin produced similar results. From day 3 to day 7, there was a 50-60% reduction in stool weight in infants treated with banana or pectin compared to the control group. The changes in permeability strongly correlated with the reduction in stool volume.

**Conclusion:** Treatment with green banana or pectin may change intestinal permeability as indicated by lactulose-mannitol tests, ultimately reducing fluid loss in infants with persistent diarrhoea.

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## ***Helicobacter pylori* Infection: Its Role in Gastric Acid Secretion and Iron Absorption in Bangladeshi Children**

Shafiqul A. Sarker<sup>1</sup>, G.J. Fuchs<sup>1,2</sup>, Lena Davidsson<sup>3</sup>,  
Shamima Sattar<sup>1</sup>, Nur H. Alam<sup>1</sup>, Hasan Mahmood<sup>1</sup>, and Klaus E. Gyr<sup>4</sup>

**Objective:** Determine if infection due to *Helicobacter pylori* (Hp) is associated with abnormal secretion of gastric acid, compare absorption of iron (Fe) from a water-soluble Fe sulphate with water-insoluble (gastric acid-soluble) Fe fumarate in Hp-infected and non-infected children, and assess the impact of therapy for Hp infection on secretion of gastric acid and absorption of Fe in young children.

**Methodology:** Thirty children aged 2-5 years, with and another 30, without Hp infection, as determined by <sup>13</sup>C-urea breath test, were enrolled from a peri-urban community near Dhaka city. Gastric acid output (GAO) was measured before and 60 days after a 2-week course of anti-Hp therapy at the Clinical Research and Service Centre of ICDDR,B: Centre for Health and Population Research. Acid outputs (mmol/h) were measured during a one-hour basal (basal acid output, BAO) period, and one-hour stimulated period (stimulated acid output, SAO) following s.c. pentagastrin. Absorption of Fe was measured before and after anti-Hp therapy with a double-stable isotope technique based on the incorporation of stable isotope into the erythrocytes 14 days after administration of <sup>57</sup>Fe-fumarate or <sup>58</sup>Fe-sulphate.

**Results:** The mean ( $\pm$ SD) BAO and the mean ( $\pm$ SD) SAO were significantly lower in the Hp-infected children than in the age-matched non-infected children ( $0.3\pm 0.4$  vs  $0.8\pm 0.6$ ,  $p=0.001$  for BAO;  $2.0\pm 1.4$  vs  $3.3\pm 1.9$ ,  $p=0.005$  for SAO). The means of GAO after anti-Hp therapy ( $n=25$ ) were  $0.6\pm 1.0$  for BAO and  $3.4\pm 2.4$  for SAO, which were similar to those of the non-infected children. Absorption of Fe from Fe-sulphate was significantly higher than that from Fe-fumarate before (20% vs 5%;  $p<0.0001$ ) and after the treatment (23% vs 6%;  $p<0.0001$ ) in both infected and non-infected children (16% vs 5%;  $p<0.001$ ). Anti-Hp therapy did not improve the absorption of Fe from either compound.

**Conclusion:** Although infection due to *H. pylori* was associated with impaired acid secretion and anti-Hp therapy improved GAO, the infection *per se* did not influence absorption of Fe in this population. Absorption of Fe from ferrous fumarate was significantly lower than from ferrous sulphate in both *H. pylori*-infected and non-infected Bangladeshi children, indicating the need for careful evaluation of the effectiveness of ferrous fumarate as the fortificant in young children and in other population groups where low gastric acid secretion is prevalent.

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## Absorption of Macronutrients from a Defined Semi-elemental Diet Containing Medium- and Long-chain Triglycerides in Children with Persistent Diarrhoea

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M.A. Wahed<sup>1</sup>, D. Mahalanabis<sup>2</sup>, and Klaus E. Gyr<sup>3</sup>

**Objective:** Compare the absorption of macronutrients in children with persistent diarrhoea treated with a liquid diet containing either coconut-oil or soybean-oil.

**Methodology:** The study was carried out in ICDDR,B. Seventy male patients, aged 3-12 months, with persistent diarrhoea were randomly assigned to one of the two dietary groups. The two isocaloric diets (75 kcal/100 mL) contained minced chicken meat, glucose, and either coconut-oil (Diet 1) or soybean-oil (Diet 2). A 72-hour balance study was started after a 24-hour pre-balance period. Aliquots from homogenized stool, vomitus, urine, study diets and breastmilk samples were preserved at  $-70^{\circ}\text{C}$  until assayed. The coefficients of absorption (%) of fat, protein, and carbohydrate are shown as mean $\pm$ SEM.

**Results:** The patients belonging to the two groups were comparable in age, body weight, nutritional status, and duration of diarrhoea on admission. The coefficients of absorption of the macronutrients are presented in the table:

Nutrient	Diet 1 (n=33)	Diet 2 (n=37)	p value
Fat	60.4 $\pm$ 4.8	61.0 $\pm$ 4.0	0.924
Protein	32.3 $\pm$ 3.6	34.3 $\pm$ 3.0	0.666
Carbohydrate	64.4 $\pm$ 4.8	62.7 $\pm$ 5.5	0.813

There was no significant difference between the two groups of patients on stool output, nutrient intake, or subsequent clinical course. All patients eventually recovered from diarrhoea.

**Conclusion:** Results of the present study suggest that there is significant malabsorption of macronutrients in children suffering from persistent diarrhoea, and substitution of LCT-containing dietary fat (soybean-oil) by MCT-rich coconut-oil in the diet has no beneficial effect on absorption of macronutrients.

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## Clinical Presentation, Complications, and Outcome of Shigellosis in Children Infected with Different *Shigella* spp.

W.A. Khan,<sup>1</sup> M.A. Salam<sup>1</sup>, and M.L. Bennis<sup>2</sup>

**Objective:** Determine the clinical manifestations and outcome of shigellosis among the four different species of *Shigella*.

**Methodology:** All patients (n=863) infected with *Shigella* admitted to the inpatient ward of ICDDR,B Hospital during March 1987-February 1988 were prospectively enrolled.

**Results:** During the study period, 792 (92%) children, aged less than 15 years, with infection due to *Shigella* were enrolled into the study: 157 (20%) were infected with *Shigella dysenteriae* type 1, and the rest 635 (80%) were infected with other *Shigella* spp. Children infected with *S. dysenteriae* type 1 had more ( $p<0.001$ ) severe gastrointestinal manifestations, such as grossly bloody stools (44% vs 12%) and rectal prolapse (52% vs 15%). They had more ( $p<0.05$ ) extra-intestinal manifestations, such as leukaemoid reaction (22% vs 2%), haemolytic-uraemic syndrome (8% vs 1%), severe hyponatraemia (58% vs 26%), and neurologic changes (21% vs 13%;  $p=NS$ ). The fatality rates did not differ between patients infected with the four different species: 13% *S. sonnei*, 11% *S. dysenteriae* type 1 and *S. flexneri*, 10% *S. boydii*, and 4% *S. dysenteriae* type 2-10.

**Conclusion:** Both intestinal and extraintestinal manifestations and complications of shigellosis were more common in children infected with *S. dysenteriae* type 1 than with other *Shigella* species, but the death rates did not differ between the groups.

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## Effect of Non-enteric Infection on Weight Gain and Food Intake in Children with Persistent Diarrhoea

Shinjini Bhatnagar<sup>1</sup>, Rajiv Bahl<sup>1</sup>, M.K. Bhan<sup>1</sup>,  
and International Working Group on Persistent Diarrhoea<sup>2</sup>

**Objective:** Describe the prevalence of associated local and systemic infections among children with persistent diarrhoea, and determine the effect of infection on food intake and weight gain.

**Methodology:** This multicentre cohort trial was conducted from 1992 to 1993 in 6 hospitals in Dhaka, Ho Chi Minh City, Karachi, Mexico City, New Delhi, and Lima. In total, 413 children, aged 4-35 months, with diarrhoea of  $\geq 14$  days duration and either weight-for-height  $< 80\%$  of the National Center for Health Statistics median, associated systemic infection, or dehydration, were included in a multicentre persistent diarrhoea algorithm study (Bull WHO 1996;74:479-89). Milk/yogurt-cereal diets were offered at the rate of 110 kcal/kg.day divided into 6-7 feeds. Bacteraemia and urinary tract infection (UTI) were diagnosed if pathogens were isolated in blood culture or were  $> 10^5$ /mL in the urine culture respectively. Acute lower respiratory infection (ALRI) was diagnosed clinically following the WHO criteria. Nude weights were taken at enrollment, on rehydration, and after every 24 hours till the end of the study.

**Results:** Bacteraemia (2.2%), ALRI (7.3%), and UTI (8.5%) were the common non-enteric infections. More than one of the above infections were present in 7.5% of the children. Bacteraemia was higher (3.5%) in the moderate-to-severe malnourished children than in those with mild (0.5%) and no malnutrition (0%). The median (IQR) daily calorie intake between admission and discharge was more than 90 kcal/kg.day in all children, irrespective of infection (bacteraemia 102 (76,140), ALRI 105 (79,120), UTI 92 (71,110), multi-system infection 108 (81,117), and no infection 95 (82,124)). Percent weight gain up to discharge was comparable in all groups, except those with bacteraemia who had significantly lower weight gain ( $p=0.03$ ).

**Conclusion:** Bacteraemia only significantly affected weight gain among the hospitalized children with persistent diarrhoea. High food intakes can be achieved even in presence of systemic infection with aggressive feeding with appropriate food. Increased energy expenditure, abnormal use of nutrients, and increased micronutrient losses may be responsible for poor weight gain in bacteraemia despite high food intake.

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## Nutrition and Early Childhood Development

M.Q-K. Talukder<sup>1</sup> and M.Q. Hassan<sup>2</sup>

**Objective:** Review the relationship between nutrition and early childhood development.

**Methodology:** Current literature on the topic was reviewed. More than 50 original and review papers on early child development in relation to child nutrition, breast-feeding, complementary feeding, and maternal nutrition, and on effect of stimulation and supplementary feeding were included in the review. Early childhood development is the development that takes place from conception to 5 years with a focus on the first 3 years.

**Results:** Joos *et al.*, Gorman, Pollitt and Oh, Grantham-McGregor *et al.*, Husaini *et al.*, and Waber *et al.* have shown that nutrition supplementation has important effects on gestation and on the first two years of life and that greater duration of supplementation is associated with better early childhood development. Stimulation alone and with supplementation of food has a positive impact on the growth of stunted children. Grantham-McGregor *et al.* have shown that the development quotient of stunted children improves by 7.5 points and 15 points when they are stimulated and stimulated plus supplemented respectively. Perhaps the most remarkable impact of breast-feeding illustrates the scientific basis of interplay of nutrition and early child development. Various controlled studies have shown a better intelligence quotient at different ages in children who were breastfed. Lucas *et al.* have shown that preterm infants, who were exclusively breastfed, have IQ 8.3 points higher at 7.5 to 8 years than those who were artificially fed. Analyses of studies also showed that maternal nutrition and complimentary feeding have an impact on early child development.

**Conclusion:** Nutrition and early child development go hand in hand. Implementation of early child development programmes is recommended in the existing health and nutrition activities in the communities.

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## Patterns of Decision-making on Complementary Feeding Practices By Caregivers of Children in Rural Thailand

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**Objective:** Identify the patterns of decision-making on breast-feeding and complementary feeding practices by mothers/caregivers of children and the factors that influence the decision-making process.

**Methodology:** A qualitative study using in-depth interviews, group-discussions, and semi-structured observations was conducted in two subdistricts (Hingkong and Khaow Kloong) of Ratchaburi province, Thailand. The study focused on caregivers of children aged 0-36 month(s) in the areas served by the Hingkong and Nongmaifaow health centres. First child mothers, second child mothers, and grandmothers were interviewed. Focus-group discussions and semi-structured household observations were carried out to validate information from in-depth interviews. In addition, anthropometry and morbidity data were collected on all children (n=228) who attended the health centres during November-December 1999. Forty-eight mothers were selected for in-depth interviews.

**Results:** The results confirmed that it is a cultural norm to feed water and non-milk liquids soon after birth and to feed semi-solids within the first month of life. Grandmothers played a dominant role in deciding what the infants should eat and on the timing of introduction of food for the first child mothers. Their role was less dominant for the second child mothers. There was a positive and appropriate shift from very early to later introduction of some solids, such as banana, and an earlier introduction of protein foods, such as fish. Decision-making was a collective and shared role in a multi-generational context in this transitional population. Although the patterns of decision-making for the first and second child mothers and grandmothers were different, there were no differences in the nutritional status of the children by birth order. The factors that influenced the decisions on complementary feeding were information sources, experience in child-caring, working patterns, family size, structure, and avoidance of traditional foods.

**Conclusion:** The simple knowledge, attitude, and practice model does not fully explain the decision-making process. In most cases, it depends on cultural context rather than on knowledge.

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## Effect of Psychosocial Stimulation on Development of Malnourished Children in Community Nutrition Centres of the Bangladesh Integrated Nutrition Project

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and S.M. Grantham-McGregor<sup>4</sup>

**Objective:** Improve the mental development of malnourished children attending the Community Nutrition Centres (CNCs) of the Bangladesh Integrated Nutrition Project (BINP).

**Methodology:** A randomized controlled trial was conducted during November 1999-February 2002 in Monohardi upazila of Narsingdi district in Bangladesh. Twenty CNCs were randomly assigned to psychosocial intervention or control. In the intervened CNCs, malnourished children (weight-for-age <-2 z-score) and their mothers (n=93) participated in a year-long intervention programme of group meetings and home-visits by paraprofessionals when child-development activities were demonstrated twice a week. They were compared with malnourished children (n=101) attending the 10 control CNCs. The food supplementation included packets containing 150 or 300 kcal given to moderately- or severely-malnourished children respectively. It was offered 6 days a week for 90-120 days and was repeated in some children who did not improve. Before and after the study, the growth and development of children were assessed.

**Results:** Results of multiple regressions indicated that the intervention significantly improved the scores of the children on the mental development index (B=-5.02, SE=2.2, p=0.023) and the psychomotor development index (B=-4.4, SE=2.2, p=0.051) compared to the control group. The nutritional status of the children in both the groups remained the same after one year.

**Conclusion:** Although mental development of the malnourished children significantly improved with the intervention, their nutritional status did not improve. Results of previous studies suggest that had their growth improved, their mental function would have improved more. To achieve full rehabilitation, there is an urgent need to review the nutritional treatment of undernourished children in these communities and to integrate psychosocial stimulation into the treatment.

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## Positive and Negative Deviance in Child Nutrition in Rural Bangladesh

R.T. Naved

**Objective:** Explore the caring practices that positively or negatively influence nutrition of children belonging to similar socioeconomic and environmental conditions.

**Methodology:** The study used both quantitative and qualitative research methods. The study also used the concept of positive and negative deviance which are defined here as children having better or worse nutritional status than the 'norm' for the given population sharing similar socioeconomic and environmental conditions. The pooled quantitative data were obtained from the surveys conducted by the International Food Policy Research Institute during 1996-1997 in four districts (Jessore, Kishoreganj, Gafargaon, and Manikganj) of Bangladesh. In total, 153 children aged 6 to 24 months and having at least three observations were included in quantitative analyses. Their nutritional status was defined based on repeatedly-taken anthropometry over a one-year period. Positive and negative-deviant children were identified controlling for socioeconomic status and age. Qualitative data were collected through 10-hour structured observation of 22 children, in-depth interviews with their mothers, and focus-group discussions.

**Results:** Results of multivariate analyses showed that the nutritional status and extended family structure of the mothers were positively related to positive deviance and negatively related to negative deviance. An early introduction of complementary food and the incidence of diarrhoea were positively associated with negative deviance, whereas the income-earning capacity of mothers was negatively related to negative deviance. On the other hand, narrow birth-spacing, higher birth order among same sex siblings, and birth-weight lower than the village norm were negatively associated with positive deviance. The qualitative data showed that, in terms of feeding, hygiene behaviour, and psychosocial care, the positive-deviant children were in an advantageous position compared to their negative-deviant peers.

**Conclusion:** The findings suggest that the family environment and the status of mothers and their well-being play a critical role in nutritional outcomes of children. Feeding, hygiene practices, and psychosocial care of negative-deviant children need to be improved.

## Lessons Learnt from Introducing Kangaroo Care in a Rural Hospital in Bangladesh

Rekha Folia and Nicola Browne

**Objective:** Explore the lessons learnt from introducing kangaroo care in the hospital setting of LAMB over a 2-year period.

**Methodology:** Kangaroo care, a method of nursing low birth-weight infants first used in Colombia, South America, involves skin-to-skin contact between mother and infant. It was first introduced in LAMB Hospital, Dinajpur, at the end of 1999. The review was conducted over a one-month period within the LAMB Hospital. The positive outcomes for the baby, including decreased infection, increased weight gain, etc., are well-documented. A small quantitative chart review was included to compare infant mortality and length of stay in the hospital before and after the implementation of kangaroo care. Feedbacks were gained from the nurse midwives, doctors, and mothers involved in using kangaroo care through focus-group discussions, questionnaire, and anecdotal information from charts. A review of the patient charts for the first three months of 2002 was performed. This was compared with a review of the first three months of 1999, before the implementation of kangaroo care. The review of charts involved all babies of less than 2,000 g and considered the length of stay in hospital, mortality rates of babies, and presence of illness or infection in infants during their hospital stay.

**Results:** Kangaroo care was acceptable to the nurse midwives, doctors, and mothers of low-birth-weight infants. Qualitative results showed that the benefits of introducing kangaroo care included less anxiety for the mothers and infants. Benefits to the infants included less infection, greater temperature control, increased growth, and increased breast-feeding. When first introducing kangaroo care to a mother, the workload of a nurse-midwife increased, but as the mother became more confident, the workload subsequently decreased. To ensure the continued use of kangaroo care, the mothers needed to be reminded often of using it until they were comfortable with it. Disadvantages included discomfort during the hot season and the need to use caution when implementing kangaroo care with unwell mothers or babies. Outcomes for the babies included changes in the length of stay and survival.

**Conclusion:** Within the LAMB Hospital, kangaroo care provided benefits for mothers, infants, and staff. This method can be easily implemented in hospitals where nursing commitment exists. Besides, given its positive benefits, it would be beneficial in a community setting.



## Association Between Size at Birth and Fasting Glucose, Insulin Concentrations, Lipid Profile, and Insulin-like Growth Factor-1 in Rural Children of Bangladesh

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**Objective:** Examine the association between size at birth and fasting glucose and insulin concentrations, lipid profile, and insulin-like growth factor-1 (IGF-1) in rural children aged 5-6 years.

**Methodology:** The study was implemented in the Matlab study area of ICDDR,B: Centre for Health and Population Research from August to December 2001. Children included in this study had their size at birth measured in earlier study conducted during November 1995–August 1997. Fasting blood samples, collected from 362 children—173 low-birth-weight (<2,500 g) and another 189 normal birth-weight (≥2,500 g)—were analyzed for fasting glucose, insulin, and IGF-1 concentrations, and lipid profile. Data were compared between low-birth-weight and normal-birth-weight groups using Student's *t*-test.

**Results:** Results of preliminary analysis showed no significant difference between the low- and the normal-birth-weight groups in most parameters, including fasting glucose: 4.62±0.45 (mean±SD) vs 4.68±0.45 mmol/L; insulin 1.6±1.2 vs 1.7±1.2 μU/mL; IGF-1: 34.07±17.89 vs 32.04±17.48 ng/mL; plasma total cholesterol 3.24±0.67 vs 3.25±0.77 mmol/L; LDL 1.98±0.61 vs 1.96±0.73 mmol/L; and triglycerides 1.18±0.43 vs 1.18±0.43 mmol/L. However, the HDL concentration was lower in low-birth-weight than in normal-birth-weight children (HDL 0.71±0.17 vs 0.75±0.18 mmol/L; *p*<0.06).

**Conclusion:** The preliminary findings suggest that serum HDL concentration, not other metabolic or hormonal parameters at 5-6 years of age, is negatively associated with birth-weight of children.

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## Relationship of Leptin with Obesity and Glycaemic and Insulinaemic Status in Type 2 Diabetic Subjects

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A.K. Azad Khan<sup>3</sup>, and H. Mahtab<sup>1</sup>

**Objective:** Assess the basal serum leptin levels in a group of healthy Bangladeshi adults and evaluate the relationship of leptin with obesity and glycaemic status in type 2 diabetic subjects.

**Methodology:** During January-December 2001, a group of 90 type 2 diabetic subjects aged 30-50 years and an age-matched non-diabetic control group (n=30) were recruited from the Outpatients Department of BIRDEM, Dhaka. Body mass index (BMI), waist-hip ratio (WHR), waist-height ratio (WHtR), percent body fat (PBF), and total fat mass (TFM) were calculated. Serum glucose (FSG), lipids (TG, total cholesterol, and HDL), HbA<sub>1c</sub>, serum insulin and C-peptide, and serum leptin were measured in the fasting subjects. Comparison between the groups was made by unpaired *t*-test or Mann-Whitney test as applicable.

**Results:** The serum leptin levels in the control subjects [1.23 (range 0.05-8.55) median] was lower than those of the diabetic subjects [1.70 (0.11-12.3)]. The leptin levels in males were 3-4 times lower than the females, irrespective of glycaemic status and BMI. The levels were positively correlated with BMI, PBF, TFM, WHR, and WHtR and in diabetics. The leptin levels were also positively correlated with FSG and HbA<sub>1c</sub> up to 10% of the values. Serum insulin in the control subjects [8.05 (4.0-17.8)] did not differ from those of diabetic subjects [7.8 (1.9-48.9)]. Insulin and leptin increased with increasing BMI in both control and diabetic subjects, and, in the later group, it increased significantly ( $p < 0.05$ ).

**Conclusion:** There is a substantial sexual dimorphism in leptin levels, irrespective of obesity and diabetes. Concentration of serum leptin is positively associated with BMI and other indices of obesity which is more evident in diabetic subjects. Hyperleptinaemia is associated with hyperinsulinaemia.

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## Influence of Maternal Diabetes on Serum Leptin and Insulin Status of Offspring

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**Objective:** Explore the relationship between maternal diabetic state and serum leptin levels of offspring.

**Methodology:** The study was conducted at the Department of Gynecology and Obstetrics of BIRDEM, Dhaka, in 2001. Blood was drawn from the placental side of umbilical cord of 30 babies of gestational diabetes mellitus mothers (GDM-babies), 45 babies of type 2 diabetes mellitus mothers (DM-babies), and 30 babies of non-diabetic mothers (ND-babies) of term pregnancy. All mothers were aged 25-35 years. Blood samples were analyzed for glucose, C-peptide (as a measure of insulin status), and leptin at the Biomedical Research Group Laboratory of BIRDEM.

**Results:** Birth-weights of the GDM- and DM-babies were significantly higher than those of the ND-babies (weight in kg, mean±SD, 3.011+0.63 in GDM, 3.09+0.76 in DM, and 2.69+0.63 in ND;  $p<0.026$  for GDM vs ND). There was no significant difference between the DM- and the GDM-babies. The glucose level in the GDM-babies (mmol/L, 5.22+1.69) was significantly higher than that in the non-diabetic (2.29+0.69,  $p<0.01$ ) and DM-babies (4.37+1.91,  $p<0.05$ ). There was no difference in birth-weight between the GDM- and the DM-babies. The leptin levels in the GDM-babies [ng/mL, median 33.33 (range 4.80-81.20)] were significantly higher than those in the non-diabetic [13.79 (2.0-47.63),  $p<0.001$ ] and DM-[21.0 (2.0-80.67),  $p<0.042$ ] babies. Serum C-peptide in the GDM-babies [ng/mL, 1.90 (0.98-5.0)] was significantly higher than in the DM- [0.67(0.50-7.0),  $p<0.001$ ] and non-diabetic [0.50(0.50-1.50),  $p<0.001$ ] babies. However, there was no significant difference in leptin-glucose ratio among the three groups. Leptin in cord blood of the GDM- and DM-babies correlated with weight of babies ( $r=0.66$ ,  $p<0.001$ ), irrespective of group, but it did not correlate with placental weight. Serum insulin and C-peptide did not correlate with birth-weight in any group.

**Conclusion:** Serum leptin seems to be associated with foetal growth. Type of diabetes in mother produces different insulinaemic and leptinaemic responses in the foetus, indicating a possible genetic involvement.

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**Effect of Weekly Supplementation With Iron and/or Zinc  
or a Micronutrient Mix on Diarrhoea and Acute  
Lower Respiratory Infection-associated  
Morbidity in Bangladeshi Infants**

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Md. Yunus<sup>1</sup>, N. Begum<sup>1</sup>, and Robert E. Black<sup>2</sup>

**Objective:** Evaluate the efficacy of weekly supplementation of different micronutrient formulations to Bangladeshi infants on diarrhoea and acute lower respiratory infection (ALRI)-associated morbidity.

**Methodology:** During July 1999-June 2001, a double-blind, randomized, controlled community-based trial was conducted among 799 infants in Matlab. Five groups of micronutrients were: (a) 20-mg elemental iron with riboflavin, (b) 20-mg elemental zinc with riboflavin, (c) both iron and zinc with riboflavin, (d) a micronutrient mix containing iron and zinc along with twice the recommended dietary allowance of vitamin C, D, E, K, niacin, B-1, B-6, B-12, folic acid, pantothenic acid, iodine, calcium, copper, manganese, selenium, and riboflavin, and (e) riboflavin only. The infants were supplemented for six months beginning at six months of age.

**Results:** Simultaneous supplementation with iron and zinc (Group c) was associated with a 30% lower incidence of severe diarrhoea and a 40% lower incidence of severe ALRI in less-nourished infants with weight-for-age z-score <-1. Zinc alone was also associated with lower morbidity due to diarrhoea and ALRI but was not significant. Supplementation of micronutrient mix was associated with a significantly higher incidence of diarrhoea.

**Conclusion:** The strategy of intermittent simultaneous supplementation with iron and zinc seems promising, and needs further evaluation. The reasons for the apparent increased risk of diarrhoea with supplementation of micronutrient mix could not be readily explained. The micronutrient mix was poorly accepted. Further studies with improved formulations are recommended to validate the findings.

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## Zinc Supplementation Started During Diarrhoea Reduces Morbidity and Mortality in Bangladeshi Infants: A Community-based Randomized Trial

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**Objective:** Evaluate the effect of supplementation of zinc to children during acute diarrhoea on: (a) the clinical course of diarrhoea, including severity, duration, and hospitalization rates, (b) subsequent morbidities due to diarrhoea and acute respiratory infections, and (c) childhood mortality.

**Methodology:** Thirty areas of Matlab covered by 30 community health workers (CHW) were randomly allocated to intervention or comparison. In total, 8,070 children aged 3-59 months were followed for 2 years yielding 11,880 child-years of observation. In the intervention clusters, the CHWs and community volunteers offered zinc syrup (20 mg daily for 14 days) and oral rehydration therapy (ORT) as the treatment for diarrhoea, while in the comparison clusters, only ORT was offered. Data on 2-week morbidity and compliance with zinc therapy were collected every 2 months in the first year and every 6 months in the second year. Hospitalization data were collected from the Matlab hospital. Verbal autopsy interviews were conducted to assign causes of deaths in the sample identified by demographic surveillance.

**Results:** The children in the intervention area had a 24% reduced probability of continuing diarrhoea, 15% lower prevalence of diarrhoea, 19% fewer diarrhoea-related hospitalizations, and 51% lower rate of non-injury deaths. The reduction in the duration of both non-bloody and bloody diarrhoea was similar. There was a downward trend in the prevalence of acute lower respiratory infection in the intervention area but not in the comparison area.

**Conclusion:** The lower rates of child morbidity, hospitalizations, and mortality in the intervention group represent substantial improvements in health from a simple and inexpensive intervention that can be easily incorporated within existing diarrhoeal disease control efforts.

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## Impact of Zinc Supplementation on Morbidity and Growth of Low-birth-weight Infants in Kolkata, India

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**Objective:** Assess the impact of zinc supplementation on diarrhoeal morbidity and growth pattern of low-birth-weight infants.

**Methodology:** This randomized, double-blind, placebo-controlled, community-based study was conducted in Tiljala slum of eastern Kolkata, India, during 1999-2001. A birth cohort of 100 low-birth-weight infants was randomly allocated either to intervention group receiving 1 mL daily dose of 5 mg elemental zinc as zinc sulphate in vitamin B complex-based syrup or to placebo group receiving identical placebo of 1 mL vitamin-based syrup, since birth up to one completed year of life. An active weekly surveillance was conducted for detection of diarrhoea. Anthropometric measurements of each child were recorded once every month as close to the birth date of child as possible. Data were analyzed using a statistical software package (SPSS/PC+ 4.0). For calculation of incidence rate ratio (IRR), 95% confidence interval (CI), and weight gain, the Epi Info Version 5.0 software package was used. Chi-square test and *t*-test were applied for comparing differences in proportions and means respectively.

**Results:** Sixty-six and 89 diarrhoeal episodes were observed, respectively, among the zinc-supplemented group and the placebo group, giving an IRR of 0.71,  $p=0.03$  ( $CI\ 0.52 \leq 0.71 \leq 0.98$ ). The mean weight gain in the supplemented group and in the placebo group was 6,085 g and 5,280 g respectively ( $p<0.0001$ ) at the end of one year.

**Conclusion:** The study showed that zinc supplementation had a beneficial impact on the incidence of diarrhoea and also on weight gain among the low-birth-weight babies.

## Impact of Zinc on Children with Cholera

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**Objective:** Evaluate the effect of zinc supplementation, in addition to antibiotics in cholera patients, on the duration and severity of cholera.

**Methodology:** During November 2000-May 2002, a double-blind randomized placebo-controlled clinical trial was conducted at the ICDDR,B: Centre for Health and Population Research, Dhaka, among children, aged 3–14 years, with cholera. A total of 138 children (69 in each group) of either sex having watery stool for not more than 24 hours and dark-field positive for cholera were enrolled into the study, and were randomly assigned to receive either 30-mg elemental zinc per day or placebo till recovery or a maximum of 7 days. Children were rehydrated with IV fluid (cholera saline) or oral rehydration solutions (ORS) based on the clinical condition of patients. Each patient, irrespective of study group, received syrup erythromycin 50 mg/kg.day divided into 4 doses for 3 days. In 96% of the children, erythromycin was sensitive to cholera.

**Results:** Baseline characteristics, such as age, sex, dehydration status on admission, mean duration of diarrhoea before enrollment, and time needed for rehydration, were comparable between the two groups ( $p < 0.05$ ). On recruitment, 90.6% of the children were severely dehydrated, of whom 48% were in the zinc group and 52% in the placebo group ( $p = 0.24$ ). A significant increase in the mean total stool volume (23%,  $277 \pm 24$  g/kg vs  $339 \pm 19$  g/kg, mean  $\pm$  SE,  $p = 0.04$ ) was observed in all children not supplemented with zinc. The duration of diarrhoea did not differ between the groups when data were analyzed for all children ( $48.4 \pm 1.6$  vs  $42.9 \pm 1.7$  hours). When the children were categorized into 2 subgroups according to their nutritional status, in the malnourished group (weight-for-age  $< 75\%$  of median National Centre for Health Statistics standard), the duration of diarrhoea reduced significantly ( $50.4 \pm 1.6$  vs  $38.9 \pm 1.7$  hours,  $p = 0.03$ ) in children who received zinc. Their stool volume (mean  $\pm$  SE) was also significantly lower compared to the placebo group ( $3,959 \pm 352$  vs  $5,623 \pm 475$ ,  $p = 0.006$ ).

**Conclusion:** Supplementation of zinc to the children with cholera reduced the stool volume. It reduced both stool volume and duration of diarrhoea among the malnourished children.

## Absorption of Dietary and Medicinal Zinc during Persistent Diarrhoea Measured by Stable Isotopes

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**Objective:** Measure the efficiency of absorption of zinc from two different therapeutic diets and supplementation of medicinal zinc during and after persistent diarrhoea.

**Methodology:** Forty-five moderately-malnourished male children (weight-for-height z-score  $-1.81 \pm 0.68$ ), aged 6-24 months, with persistent diarrhoea were supplemented with 20 mg elemental zinc per day for a 2-week period. Children were randomly allocated to 3 groups: (a) rice-based diet + zinc, (b) chicken diet + zinc, and (c) rice-based diet + placebo. A 7-day metabolic balance study was done. Absorption of zinc was measured from the diet and supplementation using  $Zn^{70}$  and  $Zn^{67}$  isotope respectively. Endogenous zinc, copper, and magnesium loss in stools during diarrhoea was also measured using an atomic absorption spectrophotometer. The study was conducted at the ICDDR,B, Hospital, during March 1998-March 2000.

**Results:** The average duration of clinical recovery was 5.4 days. There was no significant difference between absorption of supplemental zinc from the rice-based (46.8%) and chicken-based (48%) diets during the acute stage of diarrhoea. Absorption of zinc from the therapeutic diet was better whether the source was rice-suji (50.4%) or comminuted chicken (48.2%). Although the absorption of both therapeutic and dietary zinc improved slightly with recovery, the difference was not statistically significant. Excretion of copper and magnesium (median, range) in stools during diarrhoea was 21.48 mg (51-320) and 4518 mg (194-3,4428)/kg per day respectively.

**Conclusion:** The results showed that the moderately-malnourished children suffering from persistent diarrhoea had an adequate absorption of zinc from therapeutic supplementation and diet, either rice- or chicken-based. There was a substantial loss of other trace elements, such as copper and magnesium, in diarrhoeal stool.

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## Selected Findings from a Community-based Surveillance of Acute Lower Respiratory Infections in Children in Matlab, Bangladesh

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**Objective:** Study the epidemiology of acute lower respiratory infection (ALRI) and severe ALRI in children aged less than 5 years in Matlab.

**Methodology:** Data on ALRI and severe ALRI, using WHO definitions, were collected during July 1999-June 2001 from four different sources: (a) monthly recall by caretakers during home-visits by community health workers (CHWs), (b) cases managed by CHWs, (c) cases seen at the out-patients facilities of ICDDR,B, and (d) cases admitted to the Matlab hospital of ICDDR,B.

**Results:** Eighteen thousand nine hundred eighty-three children aged less than 5 years contributed to 24,907 child-years of observation. The incidences of ALRI and severe ALRI were 51/100 and 15/100 child-years respectively. The incidence was lowest in the first month of life, highest in 3-5-month old infants, and higher in males than in females. About 65% of the total episodes were captured in the monthly surveillance. In total, 12,186 cases were seen in the outpatient facilities; 90% of them were referred by the CHWs. Fifty-six percent of the cases referred by the CHWs had no ALRI.

**Conclusion:** The surveillance by CHWs missed about one-third of the ALRI/severe ALRI cases, indicating a substantial recall lapse. To improve quality of data, a shorter recall period should be considered. Over-referral by the CHWs was more than 50%; these cases could be managed at home with substantial cost savings to families and health programmes. It will be important to investigate the reasons for over-referral which may relate to this specificity of algorithm used, or workers' skills, or both.

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## Immunogenicity and Impact of Pneumococcal Polysaccharide Vaccine on Nasopharyngeal Carriage of *Pneumococcus* after Maternal Immunization

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**Objective:** Study the safety, immunogenicity, and impact of pneumococcal polysaccharide vaccine on carriage of *Pneumococcus* after maternal immunization.

**Methodology:** This double-blind, randomized controlled trial was conducted during May 1997-July 1998. Fifty-six healthy pregnant women in their third trimester were randomized to receive either a single-dose licensed polysaccharide 23-valent pneumococcal vaccine (study) or a tetra-valent meningococcal (control) vaccine with routine prenatal tetanus toxoid. Serum was collected from mothers at the time of immunization and at delivery. Cord blood was obtained. Infant sera were collected at age 6, 10, 14 and 20 weeks. Mothers provided colostrum and monthly milk samples up to 5 months of age of infants. Nasopharyngeal swabs were collected monthly from infants up to 5 months of age. Sera were assayed for specific serum IgG, IgG1, and IgG2, and milk IgA antibodies to pneumococcal serotype 6B and 14F. Nasopharyngeal swabs were cultured for *Pneumococci*.

**Results:** No serious local or systemic side-effects of the vaccination were observed. Significant antibody responses to pneumococcal serotypes were observed in both sera of infants (IgG, IgG1, and IgG2) and milk of mothers (IgA) in the study group compared to the control group. Although the pneumococcal carriage rates increased with the age of infants, isolations of *Pneumococci* among the infants of mothers of the study group were lower compared to rates of the control group up to 22 weeks of age.

**Conclusion:** The results suggest that maternal immunization with pneumococcal polysaccharide vaccine may reduce the burden of invasive pneumococcal infections in early infancy.

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## High Prevalence of Multidrug-resistant *Haemophilus influenzae* Type b Invasive Infections in Bangladeshi Infants: Implications for Therapy and Vaccination Policy

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**Objective:** Study the epidemiology and antibiotic resistance of *Haemophilus influenzae* type b (Hib) invasive infections in clinically-diagnosed hospitalized pneumonia and meningitis children aged less than 5 years.

**Methodology:** This prospective study was carried out at three hospitals in Dhaka during April 1999-March 2002. All patients had routine laboratory investigations, including cultures of blood and cerebrospinal fluid (CSF) and diagnostic analysis of CSF on admission. Data were collected in a standardized form. The isolation and antibiotic susceptibility of Hib isolates were performed by standard techniques.

**Results:** In total, 51 Hib isolates—36 from CSF of children with meningitis and 15 from blood of children with pneumonia—were cultured. It was the leading cause of bacterial meningitis and second cause of bacteraemic bacterial pneumonia. Ninety-two percent of invasive Hib infections (pneumonia and meningitis) clustered in infants aged 4-12 months. Nineteen (37.3%) of the 51 Hib isolates were multidrug-resistant, being simultaneously resistant to any three of four antimicrobial agents: ampicillin, chloramphenicol, co-trimoxazole, and erythromycin by the disc-diffusion test. None was resistant to ceftriaxone, which is an expensive and parental antimicrobial and is currently the drug of choice for empirical therapy for invasive Hib infections.

**Conclusion:** Hib is the leading cause of life-threatening infections in children, predominantly infants in Bangladesh. The emergence of multidrug-resistant Hib infections limits the use of first-line conventional antibiotics compelling the physicians to prescribe expensive parental antibiotics. The high prevalence of invasive Hib infections in infants shows the importance of the introduction of a cost-effective Hib vaccination programme in young children in Bangladesh that can prevent most of the serious infections.

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## Phenotypic and Genotypic Characterization of *Shigella flexneri* Serotype 1, with Special Emphasis on Subserotype 1c Isolated in Bangladesh

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**Objective:** Characterize the *Shigella flexneri* serotype 1 (1a, 1b, and 1c) at the phenotypic and genotypic levels, and determine the clonal diversity among these subserotypes.

**Methodology:** During 1997-2001, 144 strains of *S. flexneri* serotype 1 from patients admitted to the ICDDR,B's Dhaka Hospital were isolated following the standard methods. For extensive characterization, various techniques, such as plasmid profile, pulsed-field gel electrophoresis (PFGE), ribotyping, polymerase chain reaction, antibiogram, etc., were used.

**Results:** Most strains of subserotype 1a and 1c fermented maltose and arabinose, while none of the strains of subserotype 1b (n=70) fermented these sugars. All the strains of subserotype 1c (n=68) were sensitive to nalidixic acid and mecillinum, whereas 18% of the strains of serotype 1b were resistant to nalidixic acid. All the strains of subserotype 1a and 1b, and 88% of the strains of subserotype 1c harboured the 140-MDa plasmid, had the *ipaH* gene, and were positive for keratoconjunctivitis, attesting their invasive properties. Plasmid analysis showed that 26% of the strains of serotype 1 contained an identical pattern. Sixty-eight percent of the strains of subserotype 1c yielded the 1.6-MDa plasmid, which was not found either in subserotype 1a or 1b. A multiple antibiotic resistance marker was found in a self-transmissible middle-range plasmid (35-80 MDa). PFGE analysis yielded two types (A and B) with numerous subtypes in subserotype 1c, whereas subserotype 1b and 1a yielded only one type each with a couple of subtypes. Ribotyping analysis yielded three patterns in subserotype 1c, and one pattern each in subserotype 1a and 1b. However, PFGE and ribotyping pattern of subserotype 1b and 1a was identical with the PFGE type of A and B of serotype 1c respectively.

**Conclusion:** The subserotype 1a, 1b, and 1c are closely related tending to coincide within a number of clones in South-East Asia. The prevalence of subserotype 1c is increasing at an alarming rate, implying the production of commercial antibody against the serotype 1c as urgent to reduce the global burden of shigellosis.

## Detection and Characterization of New *Shigella boydii* Strains Isolated from Diarrhoeal Patients in Bangladesh

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G.B. Nair<sup>1</sup>, and D.A. Sack<sup>1</sup>

**Objective:** Characterize new strains which were phenotypically and genotypically identified as belonging to the genus *Shigella*.

**Methodology:** During January 1997-December 2001, 21 *Shigella*-like organisms were identified from stool cultures of diarrhoeal patients at the ICDDR,B diarrhoea treatment centre, following standard methods. To characterize these organisms, serotyping was done using antisera (commercial and antisera raised against these organisms), followed by molecular techniques, e.g. plasmid profile, pulsed-field gel electrophoresis (PFGE), and ribotyping.

**Results:** None of the isolates reacted to any antisera of the established *Shigella* serovars. Seven of the 21 strains had the typical biochemical characteristics of *Shigella* species, and were biochemically identical. All the strains harboured the 140-MDa invasive plasmid, had the presence of *ipaH* gene, and were positive for keratoconjunctivitis attesting their invasiveness. The acid tolerance response at p<sup>H</sup> -3.0 clearly distinguished these new organisms from enteroinvasive *E. coli*. Antisera developed against these strains in rabbit did not agglutinate with any existing serovars of *Shigella*. The plasmid profile of these strains was identical to *Shigella boydii* serotype 1, 8, and 11, but PFGE and ribotyping patterns were identical to *S. boydii* serotype 1. However, these strains were distinguished from *S. boydii* serotype 1 with absorbed sera. Use of the same molecular techniques confirmed that these strains were completely different from the enteroinvasive *E. coli*.

**Conclusion:** The strains apparently belong to the new serotype of *S. boydii*, which may be designated as serotype 19. This study also focuses on the diversity of serotypes in *S. boydii* in this part of the world.

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## Early Diagnosis of Dengue Virus Infection by Rapid Immunochromatographic Test Using Single Serum Samples

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A.K. Siddique<sup>1</sup>, G.B. Nair<sup>1</sup>, Ananda Nisaluk<sup>3</sup>, and Robert F. Breiman<sup>1</sup>

**Objective:** Compare a rapid immunochromatographic test with enzyme-linked immunosorbent assay (ELISA) for determination of dengue virus-specific immunoglobulin M (IgM) and IgG levels in serum samples obtained from patients suspected of dengue infection.

**Methodology:** Single serum samples (n=122) were collected from suspected dengue patients after 5 days of fever at a general hospital in Dhaka during July-October 2000 and were tested for dengue-specific IgM and IgG by rapid immunochromatographic test and ELISA in the ICDDR,B and Holy Family Hospital laboratories. A subset of serum samples (n=30) of patients with fever of less than 6 days duration was also tested for dengue virus by reverse transcription polymerase chain reaction (RT-PCR) and by tissue culture in the Armed Forces Research Institute of Medical Sciences, Bangkok, Thailand.

**Results:** Of the 122 patients studied, the rapid test, which requires less than 7 minutes to carry out, was positive for dengue infection in 92 (75.4%) cases compared to 95 (78%) by ELISA. The rapid test showed 91.6% sensitivity compared to ELISA and 81.5% specificity in non-flavivirus infections with an accuracy index, positive and negative predictive values of 89.3%, 90.6%, and 73.3% respectively. ELISA could detect primary infection and secondary infection in 18 and 77 patients, but could not detect any infection in 27 patients. The majority [12 of 18 (66%)] of the patients with primary infection by ELISA showed positive IgM but negative IgG (primary infection by rapid test), while two showed secondary infection (positive IgG), and four showed negative results. Forty-five (58%) of the 77 patients with secondary infection showed positive IgG only (suspected secondary infection by rapid test), while 21 patients showed positive IgM and IgG (secondary infection), 7 positive IgM only (primary infection), and 4 negative results. Dengue serotype 3 virus was detected in 8 (27%) of 30 sera tested by RT-PCR, 2 of them grew virus by mosquito inoculation, followed by tissue culture. Overall, the rapid test was unable to detect the type of infection in 9 (9.5%) cases and in 8 (8.4%) of the 95 dengue cases, but could detect 5 (18.5%) new cases among 27 ELISA-negative patients.

**Conclusion:** The single serum rapid test is a useful aid in early diagnosis of dengue virus infection after 5 days of fever among a population having a higher prevalence of secondary dengue infection, although it fails to detect the exact type of infections in some cases. It is less expensive and labour-intensive compared to testing paired serum samples from patients.

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**Thermostable Direct Haemolysin of *Vibrio parahaemolyticus* stimulates Chloride Secretion by Intermediate Conductance Chloride Channels in Human Epithelial Cell Line, Caco-2**

Shereen Shoma<sup>1</sup>, Kyoko Maeda<sup>2</sup>, Mahbubur Rahman<sup>1</sup>, G.B. Nair<sup>1</sup>, Akira Takahashi<sup>2</sup>, and Yutaka Nakaya<sup>2</sup>

**Objective:** Investigate chloride secretion and the type of chloride channel of Caco-2 cells induced by thermostable direct haemolysin (TDH) of *Vibrio parahaemolyticus*.

**Methodology:** Caco-2 cells (confluent) were grown on glass cover-slips and subjected to ion transport studies using the cell-attached mode patch clamp technique with and without TDH in cell bath solution. The effect of chloride channel inhibitor 4,4'-diisothiocyanostilbene-2,2'-disulphonic acid (DIDS) was measured by adding DIDS in pipette solution, followed by addition of TDH to bath solution containing Caco-2 cells.

**Results:** Kinetic analysis of cell-attached patches suggested that TDH increased the chloride channel activity by increasing channel open probability (via an increased channel open time and a decreased channel closed time). Chloride channels of Caco-2 cells were opened by TDH as detected by channel current (2.56 pA) using the Biopatch software. The conductance of chloride channels was 42.7 pS, suggesting these as intermediate conductance chloride channels. The opening of chloride channels by TDH was inhibited by DIDS.

**Conclusion:** The results demonstrate that TDH plays an important role in the pathogenesis of diarrhoea caused by *V. parahaemolyticus* by inducing transepithelial chloride secretion. Inhibitors of chloride channels, such as DIDS, may have a potential therapeutic role in the treatment of diarrhoea.

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## Evaluation of Premier Enterohaemorrhagic *Escherichia coli* Assay for Detection of Infection Due to *Shigella dysenteriae* Type 1

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**Objective:** Evaluate an enzyme-linked immunosorbent assay (ELISA) (Premier EHEC, Meridian Diagnostics Inc., Cincinnati, Ohio) for rapid diagnosis of infections due to *Shigella dysenteriae* type 1.

**Methodology:** The study was conducted at the Dhaka Hospital of ICDDR,B: Centre for Health and Population Research during May 1997-March 1999. Fresh stool specimens were obtained from patients with dysentery (visible blood in stool) of <72 hours duration who did not receive effective antimicrobial therapy, and from patients with acute watery diarrhoea. Stool specimens were subjected to EHEC-ELISA and culture.

**Results:** Of the 246 patients enrolled in the study, 196 (80%) had dysentery, of whom 57 (29%) were due to *S. dysenteriae* type 1, and 50 (20%) had acute watery diarrhoea. Premier EHEC detected shiga toxin from stool specimens of 54 (95%) of 57 *S. dysenteriae* type 1-infected patients, 7 (11%) of 62 patients infected with *Shigella* sp. other than *S. dysenteriae* type 1, 2 (20%) of 10 patients infected with *Vibrio cholerae*, and 16 (20%) of 82 of patients from whom no bacterial enteric pathogens were isolated. The sensitivity, specificity, and positive and negative predictive values of history of dysenteric illness, presence of visible blood in stool and EHEC-ELISA in diagnosing infection due to *S. dysenteriae* type 1 were 96%, 32%, 30%, and 97%; 88%, 37%, 30%, and 91%; 95%, 85%, 66%, and 98% respectively.

**Conclusion:** The results indicate that the Premier EHEC assay could be used in clinical settings for rapid diagnosis of infections due to *S. dysenteriae* type 1.

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## Recent Trends in Nutritional Status of Children in India

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**Objective:** Determine the recent trends in the nutritional status of children in India.

**Methodology:** The rates of prevalence of macronutrient and micronutrient deficiencies were compared. Data were extracted from representative surveys, particularly conducted on a national scale by the National Nutrition Monitoring Bureau, and national family health surveys.

**Results:** An overall positive trend in nutritional outcome during the past few decades was observed. The gain was, however, modest and predominant in terms of reduction of more severe varieties of nutritional problems, such as classical kwashiorkor (0.4% to 0.1%) and extreme forms of marasmus (1.3% to 0.1%). There was a distinct improvement in the prevalence of underweight (77.5% in 1975-1979 to 47% in 1998-1999) and stunting (78.6% to 45.5%) in the last twenty years, but there was virtually no change in the profile of wasting (18.1% to 15.5%) in this period. Data from relevant studies revealed a modest decline in the prevalence of low-birth-weights. There was an unambiguous evidence of appreciable decline in clinical vitamin A deficiency (Bitot's spots 0.21%) and iodine deficiency disorders in children aged less than 5 years in the country. Most (74%) young children aged less than 3 years and adolescent females were anaemic, and in a considerable proportion of young children, the anaemia was of a moderate (46%) to severe (5%) degree.

**Conclusion:** These observations in children, despite a steep increase in population and continued social and economic inequity, are inspiring indications that at long last India may be at the turning point with respect to nutrition. Despite the apparent gain, current magnitude of deficiencies in virtually all nutritional public-health indicators is nowhere near the international standards. There is an urgent need to intensify efforts to improve the nutritional profile of children to optimize human resource development.

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## High Risk of Low-birth-weight Children and Nutritional Status of Mothers in India

Srinivasan Soundararajan<sup>1</sup> and Palaniyandi Murugesan<sup>2</sup>

**Objective:** Study the relationship between nutritional levels of mothers and birth-weight of their children by rural-urban differentials.

**Methodology:** Data from the National Family Health Survey 1998-1999 (NFHS-2) were used. Nutritional parameters for about 78,000 women were measured. Similarly, 40% of 32,393 children from the two most recent births in three years preceding the survey were weighed at birth. Low birth-weight was defined as birth-weight of less than 2,500 g at the time of birth. Of the 32,393 children, 1,836 who had low birth-weight were included in the study. Low body mass index (BMI) ( $\text{kg}/\text{m}^2$ ) was defined as the index value which was less than 18.5. The important measures were BMI/weight-for-age. The standard measures were compared with the nutritional status of a WHO international reference population used in a nutritional study, which was also used by MICRO International for NFHS-2 in India. Further, statistical analysis correlations and logistic regressions were done to identify significance of relationships between the nutritional status of mothers and the birth-weight of children.

**Results:** About 36% of the mothers had low BMI, whereas the mean BMI of women in India is 20.3. The low-birth-weight babies born to low-BMI mothers were 14% in urban and 27% in rural areas. Twenty-eight and 33% of the low-birth-weight babies were born to high-BMI mothers in urban and rural areas respectively. Of the low-BMI mothers, 35% in urban and 65% in rural areas had low-birth-weight babies. Although the country has established the integrated nutrition programmes in most states and at block, village and anganwadi levels, there are still major obstacles which include poor outreach, less food intake, and distribution, resulting in adverse effect on the efforts to reduce malnutrition.

**Conclusion:** More than one-fifth of the children had low birth-weight. Nutritional programmes and policies should be focused on: (1) intervention from the early pregnancy period; (2) importance in rural areas; and (3) targeting younger women.

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## Child Nutrition Survey of Bangladesh 2000

Khurshid Talukder<sup>1</sup> and A.K.M. Abdus Salam<sup>2</sup>

**Objective:** Document the nutritional status of children and identify the determinants of malnutrition in Bangladesh.

**Methodology:** Six to seven teams surveyed 4,000 children, aged 6-71 months, from 252 rural and 190 urban Primary Sampling Units distributed all over Bangladesh. Of the 4,000 children, 2,850 were from rural areas and 1,150 from urban areas. The majority (1,083, i.e. 94%) of all urban children were from urban non-slum areas. In addition to anthropometric assessment of nutritional status, information on household demographic characteristics, environmental conditions, child-feeding and caring practices was also obtained.

**Results:** The national prevalence of wasting (WHZ<-2.00), stunting (HAZ<-2.00), and underweight (WAZ<-2.00) in the 6-71-month old children was 11.7%, 48.8%, and 51.1% respectively. There has been a statistically significant ( $p<0.05$ ) fall in all three of these parameters of malnutrition since the last survey done in 1995-1996. Twelve percent of the boys and 11.4% of the girls were wasted ( $p=0.56$ ), whereas 48.5% of the boys and 49.1% of the girls were stunted ( $p=0.71$ ). The prevalence of underweight was 51.4% in the boys and 50.9% in the girls ( $p=0.76$ ). There were statistically significant differences in the prevalence of malnutrition between the rural and urban populations. Wasting was 11.9% in the rural and 10.8% in the urban children. Stunting was found in 50.7% of the rural and 38.3% of the urban children. The prevalence of underweight was 52.8% in the rural and 42.2% in the urban areas.

**Conclusion:** The data of the Bangladesh Bureau of Statistics indicate an improving trend in nutritional status. Height-for-age, which is a more stable indicator of nutritional status, shows an improved trend over the period. The Child Nutrition Survey of Bangladesh 2000 shows a decline in the prevalence of stunting from 51.4% in 1995-1996 to 48.8% in 2000.

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## **Community Nutrition Research in the South Asian Nutrition Research-cum-Action Network Countries during 1995-2000: A Literature Review**

E.-C. Ekström

**Objective:** Describe and analyze the progress of community-based nutrition research performed in the South Asian region during 1995-2000.

**Methodology:** The Medline database was searched for literature on community-based nutrition research. The search was limited by year of publication (1995-2000) and to the 10-member countries of the South-East Asia Nutrition Research-cum-Action Network. The search encompassed three main categories of nutritional problems: micronutrient deficiencies, protein-energy deficiency, and diet and non-communicable diseases. A number of keywords were used for identifying relevant papers within each of these categories. The papers retrieved were further classified into 4 types of research: methodological, assessment of nutritional problem, intervention, and review.

**Results:** In total, 495 papers were identified. Of these papers, 43% were on energy-protein deficiency, 40% on micronutrient deficiency, and 17% on diet and non-communicable diseases. Over the time period covered, there was no particular trend in category of nutritional problem addressed. There was a marked difference in type of research. While about one-third of the papers on micronutrient deficiencies included an intervention, the proportion was much lower for energy-protein deficiency (10%) and for diet and non-communicable diseases (5%).

**Conclusion:** The research performed has been relevant inasmuch as it has reflected the existing nutritional problems in the region. However, the research appears to show limitations in evaluating efficacy and effectiveness of interventions to prevent and control the nutritional problems, and, thus, the research may be difficult to use in policy decisions.

## Nutrition Scenario in Bangladesh: Changes Over the Decades

M.A. Mannan, A.Z. Amanatullah, Md. Eshaque Ali, and Dilruba Akhter

**Objective:** Understand the trend in the nutrition situation of Bangladesh over three decades.

**Methodology:** A good number of pertinent journals, reports, periodicals, bulletins, books of abstracts, etc. were searched for collecting relevant information. Information was also obtained through personal communication. Analysis of the information was done to assess the nutrition situation in Bangladesh.

**Results:** The prevalence of stunting (49%) and underweight (51%) among children aged less than 6 years had reduced in 2000 compared to those of the previous years (stunting and underweight: 51.4% and 57.4% in 1995-1996, 65.5% and 66.5% in 1989-1990, and 68.7% and 71.5% in 1985-1986 respectively). The prevalence of third-degree malnutrition had also decreased from 9.2% in 1985-1986 to 7.3% in 1989-1990 to 4.3% in 1995-1996 and 2.4% in 2000. Improvement has also been achieved over three decades with regard to the problem of nightblindness among children (0.62% in 1999) due to vitamin A deficiency. At present, more than 2.7% of pregnant women, 2.4% of lactating, and 1.7% of non-pregnant/non-lactating women are nightblind. The proportion of angular stomatitis was less in 1975-1976 compared to that in 1981-1982 and 1995-1996. Although the prevalence of anaemia among children aged up to 4 years had reduced, it has increased among children above this age and among adolescents, pregnant and lactating women. The proportion of the population suffering from iodine deficiency disorders increased from 10.52% in 1981-1982 to 69% in 1993 and decreased to 43% in 2000. The consumption of cereals, pulses, non-leafy vegetables, milk, and milk products has decreased, while the intake of other foods, such as roots and tubers, leafy vegetables, and eggs has increased. Consumption of fruits, meat, fats, and oils remained almost unchanged. The intake of calorie, protein, fat, vitamin C, riboflavin, and niacin has decreased, while the intake of iron has increased over the decades.

**Conclusion:** Although various programmes have been implemented by different agencies for the last few years, it has not yet been possible to alleviate malnutrition remarkably. Appropriate actions should be taken immediately as per the guidelines of the National Food and Nutrition Policy and National Plan of Action for Nutrition to save the nation from the silent curse of malnutrition.

## Prevalence and Determinants of Obesity among Women in India

M. Ubaidullah

**Objective:** Study the prevalence of obesity among Indian women by their socioeconomic and cultural background, and find out the determinants of obesity among them.

**Methodology:** Data pertaining to the nutritional status of women aged 15-49 years were obtained from the National Family Health Survey 1998-1999 (NFHS-2). The NFHS-2 sample covers more than 99% of the population of India living in 26 states. The NFHS-2 data were collected from 89,199 ever-married women aged 15-49 years. The body mass index (BMI) was used for assessing obesity among women. For the present study, women who were over-weight (BMI >25) were considered. Statistical techniques, such as means, standard deviations, bivariate cross-tabulations, chi-square test, and binary logistic regression were used for analyzing the data.

**Results:** The study revealed that obesity was high among the women who lived in urban areas and were well-educated. It differed by religion, age, caste, and work status. It also differed from region to region. Food habits, life styles, genetic factors, sedentary habits, and many other factors were the determinants of obesity.

**Conclusion:** Although India is in the traditional phase of health transition from communicable diseases to cardiovascular diseases, States, such as Punjab and Kerala, have already completed this phase of transition, and cardiovascular diseases are the major risk factor for adult mortality there. Therefore, to prevent the high risk of adult mortality and ensure higher longevity, obesity should be the major concern to be addressed for saving the life of the adult population.

## Prevalence and Determinants of Childhood Obesity in Dhaka City

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M.A. Malek<sup>4</sup>, and M.R. Khan<sup>6</sup>

**Objective:** Estimate the prevalence and determinants of obesity among children in Dhaka city.

**Methodology:** A case-control study, preceded by a cross-sectional survey, was conducted in Dhaka city during 2000-2001. A multi-stage probability proportionate to size (PPS) cluster-sampling method was used for obtaining the sample. Of 5,000 randomly selected children, aged 2-10 years, from 12 government primary and 23 private elementary schools, 4 hospitals, 8 health centres, and 12 immunization centres (on National Immunization Days) from all 12 upazilas of Dhaka, 380 (7.6%) were identified as obese using the criterion of weight-for-height >120% as a cut-off point. Data were collected from 220 of 380 obese children and 220 randomly-selected age- and sex-matched controls for identifying the risk factors associated for obesity among the children. Information was also collected from parents of both cases and controls.

**Results:** Of the 380 obese children, 216 (56.8%) were boys, and 164 (43.2%) were girls. Obesity was positively correlated with increase in age in both the sexes ( $r=0.76$ ). The prevalence of obesity was significantly higher among the boys than the girls ( $p=0.007$ ). Childhood obesity was not associated with family structure, family size and birth order, and working hours of parents outside households. Family income ( $p<0.001$ ) and expenditure on food ( $p<0.001$ ) were significantly higher among the cases. Obesity of parents was significantly associated with obesity of children. There was an association between obesity of the children and the educational status of the parents ( $p<0.001$ ). The mean energy intake ( $2056\pm751$  kcal/d) was significantly higher among the cases ( $p<0.001$ ) compared to the controls ( $1,508\pm529$  kcal/d). In addition, the mean total energy expenditure among the cases was significantly higher than the controls ( $p<0.001$ ). However, energy balance was significantly higher among the cases. A significant difference ( $p<0.001$ ) was found in hours of television-video viewing between the cases and the controls.

**Conclusion:** Obesity of urban children was positively associated with family income, expenditure on food, increased intake of energy, parental obesity, and duration of television watching. Appropriate intervention on public awareness, behavioural changes regarding food habits, and physical activities are recommended.

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## Treating Sick Children in Rural Bangladesh: Roles of Access to and Quality of Care

Nurul Alam

**Objective:** Examine the effects of access, as measured by the distance from the nearest doctor or paramedic, and of quality of health services on parents' choice of treatment and treatment providers for acute illnesses of their children in rural Bangladesh.

**Methodology:** The health and socioeconomic survey conducted in the Matlab treatment and comparison areas in 1996 collected data on acute (short-lasting) morbidity of children and health services used to combat morbidity. The treatment area is a proxy for better quality of care as it has more and better quality primary healthcare (PHC) facilities than the comparison area. Decision to seeking treatment for acute illnesses is modelled as a two-step process: seeking treatment from healthcare providers opposed to home-care (with or without medication), and then choice of doctors, paramedics, or traditional healers opposed to untrained village doctors. Logistic regression was used for estimating the effects of access to and quality of service, controlling for illness and characteristics of children, on the type of health providers used.

**Results:** The results revealed that children with acute illnesses were more likely to be treated by health providers, particularly by doctors and paramedics, in the treatment area than in the comparison area. The nearer the doctor the higher was the use of doctors opposed to untrained village doctors in the treatment area. Severe illnesses rather than non-severe illnesses were more likely to be treated by health providers, and the likelihood of treating was even higher in the treatment area than in the comparison area. Illnesses of boys and girls were treated by similar type of health providers in the treatment area but not in the comparison area.

**Conclusion:** The provision of better quality PHC services promotes the use of well-trained health providers for treating acute illnesses of children, and reduces gender inequality in treatment of acute illnesses.



## Means Testing for Inpatient Bill-recovery in a Rural Hospital in Bangladesh

M.A.C. Pietroni, Richard Butterworth, and Erik ter Haar

**Objective:** Assess the effectiveness of means testing in cost-recovery among patients admitted to the LAMB (Lutheran Aid to Medicine in Bangladesh) Hospital

**Methodology:** Patients are admitted to the LAMB Hospital and treated without deposit or payment. Full payment is due on discharge, but all patients are eligible to apply for a subsidy. The assessment occurs in one of two ways. Fifteen percent of the patients have been pre-assessed and assigned a grade (A-D) based on a house-to-house survey. A structured questionnaire is administered by a social worker to all other patients, and a grade is assigned. After determination of the grade, a discussion occurs between the social worker and the patient, and the amount of subsidy is agreed. This study was based on retrospective analysis of 4,671 bills from patients admitted to the hospital during 2000.

**Results:** Average fee-recovery decreased from just under 70% for bills of less than Tk 250 to around 40% for bills of over Tk 2,000. For bills of less than Tk 250 (524/4,671), 30% of the patients paid less than 5% of the bills, and 54% paid more than 95% of the bills. For bills of more than Tk 2,000 (737/4,671), 21% of the patients paid less than 5% of the bills, and 19% paid more than 95% of the bills. A sub-analysis of fee-recovery for caesarean sections (bill around Tk 6,000) over 3 years showed that a 20% increase in fees in 2002 was matched by a 20% absolute increase in fee-recovery, while the average subsidy remained the same.

**Conclusion:** Means testing at time of discharge can be used for maximizing fee collection while maintaining accessibility of services to the poorest of the poor.

## Who Is Vaccinated in Bangladesh? The Immunization Divide

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A.K.M. Abdus Salam<sup>4</sup>, and Fazlul Karim<sup>1</sup>

**Objective:** Examine the inequalities in accessing healthcare with a focus on vaccination services in Bangladesh.

**Methodology:** Published and unpublished data relevant to equity in immunization in Bangladesh were searched and used in the study. Some of these were national-level samples, and others were small-scale studies.

**Results:** Female children had lower immunization coverage rates than male children. The difference persisted for all antigens and widened against girls as the higher doses were given. The immunization coverage was higher for those children whose mothers were more educated. Children whose father had a higher-status occupation (salaried employment) were two and a half times more likely to be immunized than a child whose father held a lower-status job, e.g. day-labourers. The coverage for the poorest quintile was 70% of the well-to-do. Children residing in urban areas were more likely to be fully immunized than their rural counterparts (70% vs 59%, for children aged 12-23 months). Within urban areas, the situation in the slums was worse. Large differences existed between the various administrative regions of the country: the valid coverage for children aged less than 12 months in rural Sylhet was the lowest at 23%, and the highest coverage was in Khulna division with 65%. Large differences also existed between districts and within divisions. In Kishoreganj district, with a total coverage of 28%, there were pockets which had coverage as low as 5%. Ethnic minorities in the Chittagong Hill Tracts had a lower immunization coverage than Bengalis. In Sylhet, children of non-local workers in Bangladesh-owned tea estates had a higher coverage than their counterparts in foreign-owned tea estates.

**Conclusion:** Children of various disadvantaged groups have been identified as having lower coverage rates. Managers of immunization programmes must realize that only through removal of such disparities between groups will overall coverage be increased. Affirmative actions in targeting could be effective in reaching such groups. Geographic targeting and targeting of under-served areas should also be promoted.

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## Gender Inequity in Health and Healthcare in Rural Bangladesh: Does Health Insurance Make Any Difference?

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**Objective:** Examine the gender inequity in health status and use of healthcare resources and expenditure per illness, and evaluate the gender-inequity impact of a health insurance programme.

**Methodology:** A longitudinal survey of 4,071 persons in 675 households was conducted in 1997 in the catchment area of Gonoshasthaya Kendra healthcare systems in Savar and Gazipur. For all self-reported illnesses, trained interviewers collected data on the perceived severity of illness and healthcare options used. Health status was measured by incidence of illness observed during the 6-month follow-up. Access was measured by use of healthcare, controlling for the needs for medical care based on the severity and incidence of illness. Modern healthcare resources included public, private and NGO health facilities. Logistic regression models were used for analyzing the determinants of ill health, and ordinary least square regression models were used for examining the predictors of use of healthcare.

**Results:** Significant ( $p < 0.001$ ) gender differences in the health status and use of medical care services were observed. The rate of the average illness incidence was 3.80 per person per year for men, and for women, the rate was 5.15. The likelihood of using modern care was higher for males (17%) than for females (16%) in all disease categories. However, there was no significant difference in the likelihood of using modern care between genders. The use-rate of non-modern healthcare was 61% among males and 47% among females, and the gap in use among genders was highly significant ( $p < 0.001$ ), irrespective of the insurance status. A significant ( $p < 0.001$ ) sex disparity in expenditure per illness episode was observed for uninsured individuals. An uninsured male incurred, on an average, Tk 90, and a female incurred Tk 53 per illness episode. For insured persons, no significant gender disparity was observed. Along with gender, education, age, and house structure were the significant predictors of health status. Except for modern healthcare, gender was a significant predictor of use of alternative healthcare resources in multivariate analyses. Irrespective of disease and healthcare options, the duration of illness was a significant predictor of use of healthcare.

**Conclusion:** The results showed that the burden of ill health was higher among women than men, and they also face significant barriers to access healthcare. The insurance status did not make any change in the gender-gap in health or use of healthcare, although it reduces the inequality in healthcare expenditure. By improving access of women to education, together with gender-focused healthcare reform, might reduce the gender inequity in health and access to healthcare.

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## Breast-feeding Patterns during Diarrhoea and Healthy Periods in Rural Bangladesh: An Observational Study

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Md. Yunus<sup>1</sup>, Abdullah H. Baqui<sup>1,2</sup>, and Robert E. Black<sup>2</sup>

**Objective:** Observe the changes in breast-feeding patterns during acute watery diarrhoea and healthy periods.

**Methodology:** The study was conducted during August 1996-July 1997 in Matlab, Bangladesh. One hundred ninety-one breastfed children, aged 4-35 months, with acute watery diarrhoea of less than 24 hours duration, were observed at their homes over a 12-hour period (6 am to 6 pm) by a well-trained female field worker who did not influence the mothers. The children were observed again for the same duration two weeks later when they were healthy. During the observation, the field workers measured the frequency and duration of breast-feeding. The amount of breastmilk consumed by the children was calculated using regression coefficients from an analysis of a previous study conducted in the same community which used the test-weighing method. No children had any other systemic illnesses at the time of observation.

**Results:** The mean ( $\pm$ SD) age of the children was 14.4 months ( $\pm$ 8.6). The mean ( $\pm$ SD) frequency (11.2 $\pm$ 3.6 vs 8.4 $\pm$ 3.3), and duration (85.8 $\pm$ 36.3 minutes vs 49.1 $\pm$ 22.8 minutes) of breast-feeding, and the mean consumption of breastmilk (346.8 $\pm$ 117.9 mL vs 313.6 $\pm$ 115.4 mL) were significantly higher ( $p < 0.0001$ ) during diarrhoea than during the healthy period. About 90% of the children had a higher intake of breastmilk during diarrhoea, and 69% of the children during diarrhoea and 55% during the healthy period consumed more than 300 mL of breastmilk ( $p < 0.0001$ ). The frequencies and the duration of breast-feeding decreased with the increase in age both during diarrhoea and healthy period.

**Conclusion:** The study documents that children had a higher intake of breastmilk during acute episodes of diarrhoea. Breast-feeding, irrespective of any illness, should be continued to be encouraged at the policy level.

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## Infant-feeding Practices, Morbidity, and Growth during the First Six Months of Life in Rural Bangladesh

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**Objective:** Examine the feeding practices, morbidity, and growth during the first six months of life in rural Bangladeshi infants.

**Methodology:** Data on feeding practices, morbidity, and growth of 324 singleton infants from birth to 6 months were collected by weekly recall. Infants were classified either as exclusively breastfed (EBF) if they received only breastmilk with the exception of occasional sips of plain water or non-exclusively breastfed (NEBF) otherwise. Data on daily intake were summarized at three and six months. Growth parameters were compared between the groups at 1, 3, and 6 months, and morbidity data at 6 months.

**Results:** All the infants were observed to be breastfed at 6 months, although 30% at 3 months and 63% at 6 months also received local complementary foods. Diarrhoea, upper and lower respiratory infections did not differ significantly between the groups. Weight-for-length and length-for-age were comparable between the groups at all points in time, except at 6 months when length-for-age z-scores of the NEBF infants were slightly higher than those that of the EBF infants. However, the growth patterns of the EBF infants resembled that of WHO breastfed reference infants.

**Conclusion:** These findings confirm earlier observations that there is no growth advantage of introducing complementary foods earlier than 6 months. The similarity in growth patterns of the EBF infants with that of WHO breastfed reference infants indicate that these infants might have shown their optimal physiological growth potential.

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## Trends of Exclusive Breast-feeding Practices in Two Rural Areas of Bangladesh

Rukhsana Gazi, Ali Ashraf, Abdul Quaiyum, and Shubas Chandra Das

**Objective:** Assess the trend of exclusive breast-feeding (EBF) practices in rural Bangladesh.

**Methodology:** During 1997-2001, data on breast-feeding practices of 1,200 infants were obtained from the Demographic Surveillance System maintained by the Family Health Research Project of ICDDR,B: Centre for Health and Population Research in its two field sites (Abhoynagar of Jessore district and Mirsarai of Chittagong district), covering a population of about 69,584 from 13,000 sampled households, through quarterly rounds in each year.

**Results:** Although an overall increased trend in the percentage of exclusive breast-feeding was observed over time, exclusivity of breast-feeding declined significantly from 3 months of age of infants to 6 months, irrespective of study sites in each year. Exclusive breast-feeding increased from 45% to 59% at 3 months and 5% to 10% at 6 months during 1998-2001 in Abhoynagar. Similarly, in Mirsarai, exclusive breast-feeding increased from 53% to 79% at 3 months and 17% to 28% at 6 months during the same period. Of the infants aged 6 months, 11% in Abhoynagar and 14% in Mirsarai were either only bottle-fed or predominantly bottle-fed, and about 42% were given partial breast-feeding during the last quarter of 2001. Results of multivariate analysis showed that exclusive breast-feeding was associated with education of fathers and age of infants but was not associated with maternal age, parity, birth order, or a multiple birth.

**Conclusion:** Inappropriate breast-feeding practices are prevalent in the study areas, and the infants are, thus, at risk of malnutrition, short and long-term morbidity and mortality. Community-based initiatives need to be undertaken to promote exclusive breast-feeding for six months in the larger health system.

## Low Energy and Micronutrient Intake among Infants in Rural Bangladesh is Attributable to Low Intake and Micronutrient Density of Complementary Food

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Saskia J.M. Osendarp<sup>4</sup>, and Kenneth H. Brown<sup>2</sup>

**Objective:** Assess the adequacy of nutrient intake of breastfed infants aged 6-12 months, and examine the nutritional tradeoffs due to the possible displacement of breastmilk by complementary foods.

**Methodology:** The study was conducted in Matlab, Bangladesh, during June-September 1999. Observers completed daytime (12-hour) weighed-intake measurements of breastmilk and complementary food intake by 135 infants; data from maternal recall for the prior 12-hour intake were used for estimating 24-hour intake.

**Results:** The total energy intake by infant aged 6-8 and 9-12 months was, respectively, 83% and 79% of energy requirements. The energy intake per kg of body weight was 105% and 100% of requirements, and the energy intake per kg of ideal body weight-for-length was 95% and 90% of requirements by infants aged 6-8 and 9-12 months respectively. Breastmilk contributed about 78% and 76% of energy for children aged 6-8 and 9-12 months respectively. The low intake of energy could be attributed to small amounts served per meal and incomplete consumption by infants. The frequencies of meal and energy density were generally consistent with recommendations. The diets fell short of requirements for numerous vitamins and minerals. There was a significant inverse relationship between the frequency of complementary food meals (considering only meals >10 g) and the frequency of breast-feeding; the energy intake from complementary foods was inversely associated with energy from breastmilk.

**Conclusion:** Infant diets provided inadequate quantities of energy and numerous micronutrients. Larger intakes of complementary foods were associated with a higher total energy intake but did not improve micronutrient intake due to the partial displacement of breastmilk. Methods to increase the micronutrient density of complementary foods are needed.

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## Infant-feeding Practices from Birth to Two Years of Age and Nutritional Status of Children and Mothers in Bangladesh

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A. Rahman, and M.Q-K. Talukder

**Objective:** Observe the infant-feeding practices from birth to 2 years of age and assess the nutritional status of children and mothers in Bangladesh.

**Methodology:** Six nationwide cross-sectional surveys on infant-feeding practices and child and maternal nutritional status were conducted every six months from July 1998 to February 2001. One district from each division of the country and two upazilas from each selected district were randomly selected. Anthropometric measurements of children included measurement of weight and height/length. The nutritional status of mothers was assessed by taking height and weight and expressing as body mass index. Information on breast-feeding practices, complementary feeding, and anthropometric measurements was collected using two sets of pre-tested questionnaire.

**Results:** The prevalence of giving pre-lacteals in these surveys ranged from 73% to 87.8%. The vast majority (>78%) of the mothers fed colostrum to their babies. The overall prevalence of exclusive breast-feeding without any pre-lacteal feeds was 12.1%, 18.6%, 15.2%, 21.4%, 19.6%, and 16.3% in the first, second, third, fourth, fifth, and sixth surveys respectively. A gradual increase in the prevalence of exclusive breast-feeding, irrespective of pre-lacteal feeds, was observed from the first to the sixth survey 58%, 56.7%, 63.5%, 83.5%, 85.1%, and 85.1% in the first, second, third, fourth, fifth, and sixth surveys respectively ( $\chi^2$  linear trend 40,  $p \leq 0.0001$ ). An early introduction of additional/complementary foods was observed in all surveys. The prevalence of continuation of breast-feeding at one year in most surveys was more than 96%, and at 2 years, more than 85%. The mean BMI of the mother in the first, second, third, fourth, fifth, and sixth surveys was 18.98, 18.84, 19.37, 19.77, 19.58, and 19.77 respectively. About 45% of the mothers had their BMI <18.5. The prevalence of underweight, stunting, and wasting in these six surveys ranged from 30 to 40%, 37.4 to 47%, and 10.5 to 29.9% respectively.

**Conclusion:** Despite national efforts to improve breast-feeding and nutritional status of children and mothers in Bangladesh, the indicators have yet to reach an optimum level. These findings can help policy-planners understand the need for intensifying future programmes.



## Determinants of Exclusive Breast-feeding in a Rural Area of Bangladesh

J. Killewo, N. Alam, K. Gausia, F. Ahmed, Md. Yunus, J. Chakraborty, and L.Å. Persson

**Objective:** Study the determinants of exclusive breast-feeding in a rural area of Bangladesh.

**Methodology:** Data were analyzed as part of a large intervention project on male involvement in reproductive health that started in Matlab in 1999. The project survey had involved interviews of 4,171 randomly-selected adults from the intervention and comparison areas of Matlab using a structured questionnaire. The survey was to assess the baseline knowledge, attitudes, and practices toward family planning, including contraceptive benefits of breast-feeding. However, for the purpose of this analysis, only the responses from the women in the study sample were used.

**Results:** Of the 1,913 women in the sample, 1,008 had at least one child who had stopped breast-feeding. Of them, 21.7% had breastfed their last-born babies for at least 6 months, while 10.1% had exclusively breastfed them for 6 months. However, 80.8% of the women did not know the appropriate age of complementary feeding. Furthermore, perceptions of mothers regarding exclusive breast-feeding were incongruent with actual breast-feeding practices as 78.4% thought that weaning age should be before 6 months of age, while only 21.1% reported to have weaned their last-born children before that age. Results of multivariate analysis indicated that women with correct perception about exclusive breastfeeding and those in the comparison area were more likely to have practiced exclusive breast-feeding than others, while educational status of mothers was not a significant determinant of exclusive breast-feeding.

**Conclusion:** Behaviour change communication on promotion of exclusive breast-feeding should target mothers of lower parities, in all educational categories to bridge the gap between perceptions and practices regarding exclusive breast-feeding.

## Critical Review of Bangladesh Integrated Nutrition Project Mid-term Evaluation

S.M. Moazzem Hossain<sup>1</sup> and Anna Taylor<sup>2</sup>

**Objective:** Examine the effectiveness of the Bangladesh Integrated Nutrition Project (BINP), and critically review the conclusion or interpretations made to support expansion.

**Methodology:** The BINP has been implemented in phases since 1996, and is now operated in 59 upazilas. There has not been any final evaluation, although an expansion plan has been designed and agreed by the Government of Bangladesh and the World Bank based on the findings of the 1998 mid-term evaluation. The framework for analysis was to measure the achievements against the BINP nutrition-related objectives/targets through a desk review of a baseline survey, mid-term evaluation report, and other study reports relating to the BINP.

**Results:** One of the major targets for the BINP was to reduce severe malnutrition by 40% and moderate malnutrition by 25% (measured by weight-for-age). The results of the mid-term evaluation demonstrated a decline of severe underweight by 12% (from 30% to 18%) in the project upazilas compared to 7% (27% to 20%) in the control upazilas. The figures were 15% (36% to 21%) and 14% (34% to 20%), respectively, in the project and control upazilas in the case of severe wasting. In all categories, the prevalence of moderate malnutrition either remained static or declined both in project and control upazilas. There were unmatched figures between the project and control upazilas in terms of background characteristics that made the findings more inconsistent. Some reports also suggested evidence of poor-quality implementation. Furthermore, the study design, sample size, and sampling frames were different in the baseline and mid-term evaluation surveys for unknown reasons.

**Conclusion:** The results suggest that there are sufficient grounds to question the accepted impact of the BINP on malnutrition. A rigorous evaluation at the end of the Project is recommended, and the lessons learnt should be adequately addressed in the expansion plan if deemed necessary based on the evidence. Finally, it is suggested that transparency and greater consideration of the wider context in Bangladesh will enhance decision-making concerning such a large-scale investment in nutrition.

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## **Risk Factors for Relapse Back to Severe Malnutrition among Children in Bangladesh Who Underwent a Supplementary Feeding Programme**

**A.K.M. Fazlur Rahman**, F. Islam, A.R.M.L. Kabir, A. Hannan, A. Rahman, and Rowshan Ara

**Objective:** Identify the risk factors for relapse back to malnutrition among children, aged less than 2 years, who underwent food supplementation under the Bangladesh Integrated Nutrition Project.

**Methodology:** It was a community-based prospective cohort study. In total, 2,064 children, aged 6-24 months, eligible for supplementation were recruited for the study during September 1998-January 1999. These children were identified from the registers of nutrition workers of two Bangladesh Integrated Nutrition Project (BINP) areas. Data on the socioeconomic and health characteristics of these children were collected through a household survey using a structured questionnaire. These eligible children for the feeding programme were followed for outcome in terms of weight gain. Finally, the graduated children who were released from the supplementary feeding programme constituted the cohort, and were followed for identification of relapse cases for 6 months. The sociodemographic and other health factors were compared between the relapse and the non-relapse cases.

**Results:** Only 18 cases of 1,607 graduated children were identified as relapse-back cases. The proportion of relapse-back cases was significantly higher among children of illiterate mothers than that of literate mothers (2.6% vs 2%). Occupation of mothers and the economic status of families were associated with relapse back to malnutrition after they had recovered from malnutrition through the participating supplementary feeding programme.

**Conclusion:** The children of the illiterate and the low socioeconomic groups were prone to relapse back to malnutrition even after recovery through supplementary feeding. So, the Community-based Nutrition Programme should focus on illiterate and low-income families for better counselling to prevent relapse back to malnutrition.

## **Sociodemographic and Health Characteristics of Bangladeshi Malnourished Children Aged Less Than 2 Years Requiring Food Supplementation**

**F. Islam**, F. Rahman, ARML. Kabir, A. Hannan, A. Rahman, Rowshan Ara

**Objective:** Identify the socioeconomic, demographic and health characteristics of malnourished children who fail to exhibit adequate growth despite food supplementation.

**Methodology:** It was a community-based prospective cohort study. In total, 2064 children aged 6-24 months eligible for supplementation were considered as a cohort during September 1998-January 1999. These children were identified from the registers of nutrition workers in two areas under the Bangladesh Integrated Nutrition Project (BINP) and followed up for outcome. The socioeconomic and health risk factors of the graduated children who were released from the supplementary feeding programme were compared with the non-graduated group.

**Results:** The proportion of female children among non-graduated group was found significantly higher than that of male children. (5.7% vs 3.6%). The proportion of the non-graduated among children of illiterate mothers was 7.3% which was significantly higher than the proportion among the children of educated mothers (2.6%). Number of live-births in the family, economic status, and morbidity were found to be associated with the graduation after supplementation.

**Conclusion:** Illiterate and low-income families need to be paid much attention to attain the adequate growth among malnourished children through food supplementation.

## Comparison of High- and Low-intensity Nutrition Education in Reducing Moderate Malnutrition

S.K. Roy, Sohana Shafique, Ananya Laboni, Rabi Biswas,  
Aasma Afroz, and Syeda S. Akter

**Objective:** Determine a feasible and effective means of reducing the proportion of moderately-malnourished children through a specific intervention technique.

**Methodology:** As an earlier study showed a high effectiveness of nutrition education in reducing moderate malnutrition in a short period, since July 2001, a two-prong intervention study has been conducted among the mothers of 1,235 children, aged 6-24 months, in 131 community nutrition centres under the Bangladesh Integrated Nutrition Project (BINP) in four geographical regions (Nikli, Sherpur, Chakaria, and Dacope) of Bangladesh. Of the moderately-malnourished children, one group received intensive nutrition education (INE), and the other group received less-intensive nutrition education (LINE) with the intensity of twice and once a week respectively. A structured questionnaire was used for collecting data on food frequency, morbidity, and anthropometry.

**Results:** At the end of 6 months of the intervention, the nutritional status of a large number of moderately-malnourished children improved to mild and normal nutrition level. There was almost an equal improvement in both LINE and INE groups (39.9% vs 40.8%,  $p < 0.11$ ). At the end of the intervention, the mean ( $\pm$ SD) weight-for-age was  $72.6 \pm 5.4$  and  $72.5 \pm 5.3$  in the LINE and INE group respectively ( $p < 0.77$ ). About 40% of the moderately-malnourished children improved in nutrition after the intervention, and the frequency of feeding *khichuri* 3-5 times a day improved in both the groups but more in the INE group than in the LINE group (94% vs 85%,  $p < 0.19$ ). The mean  $\pm$ SD frequencies of feeding *khichuri* per day were  $3.4 \pm 1.4$  in the LINE and  $4.4 \pm 1.3$  in the INE groups. About 40% of the children in the LINE and 44% in the INE groups were given an egg in their daily diet after the intervention.

**Conclusion:** The results showed a significant improvement of moderately-malnourished children in the groups of mothers who received weekly or twice weekly nutrition education. Since there was no significant difference in the improvement of malnutrition between the two groups, it can be inferred that both LINE and INE were equally effective, cost-effective, and time-saving for implementation.

## Perceptions of Mothers about Child-caring Practices and Effect of a Nutrition-education Programme in a Rural District of Bangladesh

S.K. Roy<sup>1</sup>, Zeba Mahmood<sup>2</sup>, Syeda Sharmin Akter<sup>1</sup>, and Aasma Afroz<sup>1</sup>

**Objective:** Investigate the knowledge, perceptions, and practices of mothers about child-feeding, and test alternative means through appropriate feeding and nutrition education to reduce moderate malnutrition in children aged less than 2 years.

**Methodology:** Qualitative data for this study were collected through focus-group discussions (FGDs) conducted in Shahrasti upazila of Chandpur district. Eighteen FGDs sessions were arranged with groups of mothers of low-socioeconomic status in an interactive way to understand their views. Each session with 6-8 mothers continued for two hours in the village. Intervention with nutrition education and supplementation was developed based on FGD results. After 3 months of intervention, FGDs were repeated to measure the change in the knowledge and perceptions of mothers about child health and feeding.

**Results:** After 3 months of the intervention, a significant improvement in the negative ideas on addition of oil to child's food and addition of eggs to the preparation of home-made complementary food '*khichuri*' was observed. The improvement in child-feeding practices reflected the change in the nutritional status of children in the intervention group. Instead of consulting local healers and quacks, the parents took their children to local health service centres for treatment. A remarkable increase in purchasing oil and eggs was considered a significant change in the attitude of mothers toward child-feeding.

**Conclusion:** Counselling based on focus-group discussions improved the knowledge, perceptions, and practices of mothers, and led to behavioural changes.

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## What Should Be the Optimum Duration of Supplementation for Malnourished Children?

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M.Q-K. Talukder<sup>2</sup>, and A.K.M. Shahabuddin<sup>1</sup>

**Objective:** Assess the pattern of weight gain with different durations of supplementation, and identify the optimum duration of supplementation for growth-faltered children.

**Methodology:** A longitudinal study was conducted among 510 children aged 6-23 months showing growth faltering and enrolled for supplementation yielding 150 kcal/day in one Bangladesh Integrated Nutrition Project (BINP) upazila selected randomly during November 1998-May 1999 using an interviewer-administered questionnaire. The nutritional status of the children was assessed by measuring height and weight. The children were randomly assigned to 3 groups to receive supplementation for either 30, 60, (Intervention Group, A and B) or 90 days (control, Group C). For ethical reasons, children who had not reached 500 g weight gain after the assigned period were allowed to continue supplementation for the full 90 days. All children were followed up until 90 days. The groups were comparable, and did not differ in selected sociodemographic factors and anthropometric indices at enrollment. The outcome was measured in terms of graduation (500 g weight gain), and the optimum duration was defined as the minimum range of time to obtain a positive change at the minimum cost.

**Results:** The proportions of graduation were 21.1%, 48.4%, and 77.3% after 30, 60, and 90 days of supplementation respectively. The nutritional status of children who graduated early (after 30 days) was worse than those who graduated later or did not graduate at all. The total weight gain of the graduated children was significantly higher than those who failed to graduate at different durations of supplementation. Children showing graduation in Group A and B continued to gain weight without supplementation during the subsequent 90-day follow-up period.

**Conclusion:** The baseline nutritional status appears to be an important predictor of the potential to grow. Once the momentum of weight gain is reached, it could be maintained with a usual family diet without any supplementary feeding. Considering cost involvement for continuing supplementation and lack of significant difference of its effectiveness, it appears that 60 days of supplementation would be considered an optimum duration in the present context.

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## Promotion of Exclusive Breast-feeding at the Community Level: Programmatic Implications for Low-birth-weight Babies

Rukhsana Gazi, Ali Ashraf, and Jahanara Khatun

**Objective:** Understand the potential of the promotion of exclusive breast-feeding, with a special emphasis on low-birth-weight in rural Bangladesh.

**Methodology:** A review of the literature and programme documents was done, and interviews of key-informants conducted by the Family Health Research Project of ICDDR,B: Centre for Health and Population Research to better understand issues of exclusive breast-feeding in relation to low birth-weight in the home situation.

**Results:** The review showed that the high prevalence of low birth-weight is a potential threat to exclusive breast-feeding, since mothers with low-birth-weight babies are less likely to initiate breast-feeding earlier due to possible poor suckling reflexes and are more likely to introduce early weaning due to the belief that 'small' babies need additional foods for quick recovery. Such detrimental practices lead to hypoglycaemia, hypothermia, non-establishment of breast-feeding, growth faltering, and, thus, a vicious cycle of malnutrition. With limited exceptions, most breast-feeding initiatives are focused on hospital procedures that would not reach most women in Bangladesh due to the high prevalence of home deliveries. Whereas, low-birth-weight babies need special feeding as in the kangaroo mother methods. Exclusive breast-feeding through peer counsellors at home was found very effective both in urban and rural areas of Bangladesh in terms of distinctiveness and total duration of breast-feeding. Studies have shown that low-birth-weight infants have good catch-up growth with proper breast-feeding counselling, whereas without breast-feeding counselling, low-birth-weight infants tended to falter in growth, particularly at 8-9 months of age. However, limited work has been done to institutionalize such learning in larger systems, such as in the existing government set-up.

**Conclusion:** The high prevalence of home deliveries with a high level of low birth-weight and proven benefits of peer counsellor at home for promoting exclusive breast-feeding re-emphasizes community-based protocolized management of exclusive breast-feeding in larger set-ups with special emphasis on low-birth-weight infants.



## **Effectiveness of a Baby-friendly Hospital Initiative on Promotion of Exclusive Breast-feeding among Mothers in Dhaka city in Bangladesh**

M. Alam

**Objective:** Assess the effectiveness of baby-friendly hospital initiative on the exclusive breast-feeding status.

**Methodology:** This longitudinal study, conducted during August 1997-July 1998, was designed to compare the incidence of exclusive breast-feeding at 30, 60, 90, 120, and 150 days postpartum for mothers who delivered at a baby-friendly hospital and those who delivered at a nearby non-baby-friendly hospital. All mothers who delivered during the 3-week period and fulfilled selection criteria were recruited from both the hospitals, and followed up for determining the duration of exclusive breast-feeding. Data were analyzed using the SPSS software.

**Results:** In total, 105 mothers from the baby-friendly hospital and 104 from the non-baby-friendly hospital were included in the study. Their sociodemographic characteristics were almost similar. The median survival time of exclusive breast-feeding was 73.85 days among the mothers of the baby-friendly hospital and 30 days among those of the non-baby-friendly hospital, with a difference of 43.85 days. Life-table cumulative surviving proportion for exclusive breast-feeding showed that 82% of the mothers of the baby-friendly hospital continued exclusive breast-feeding for 30 days compared to 50% of those of the non-baby-friendly hospital. At 150 days, 16% of the mothers of the baby-friendly hospital continued exclusive breast-feeding compared to 6% of those of the non-baby-friendly hospital. Finally, 8% of the mothers of the baby-friendly hospital continued exclusive breast-feeding compared to 6% of those of the non-baby-friendly hospital beyond 150 days. The difference in the duration of breast-feeding between mothers in the two hospitals was highly significant ( $p < 0.001$ ).

**Conclusion:** The duration of exclusive breast-feeding was longer among the mothers who delivered in a baby-friendly hospital than those who delivered in a non-baby-friendly hospital.

## Impact of Peer Counselling on Exclusive Breast-feeding: A Comparison of Individual and Group Counselling in Rural Bangladesh

I. Kabir<sup>1</sup>, R. Haider<sup>2</sup>, S. Banu<sup>1</sup>, T. Faruque<sup>1</sup>, and F.B. Firu<sup>1</sup>

**Objective:** Evaluate the peer-counselling method given either individually or in groups to promote exclusive breast-feeding practices in rural Bangladesh.

**Methodology:** The study was conducted in Anowara, a rural upazila in Chittagong district of Bangladesh during September 1999-March 2001. Three of 12 unions were randomized: mothers of one union received individual counselling, mothers of another union received both individual and group counselling (mixed), and mothers of the third union received no counselling and served as control. Peer counsellors, recruited from among the local mothers, received a 10-day breast-feeding counselling training (WHO/UNICEF module). Ten counselling visits were made in the intervention areas (both individual and group): 2 during the last trimester, one within 48 hours of delivery, on day 5, during 10-14 days, and then monthly for five months. Trained research assistants collected data on feeding status of infants.

**Results:** Of 329 mother-infant pairs available after delivery, 114 were in the individual category, 109 were in the indexed group, and 106 were in the control group. At the end of 6 months, 89% of the mothers in the individual group, 81% in the mixed group, and 11% in the control group were practising exclusive breast-feeding up to 6 months ( $p < 0.001$ ). For secondary outcomes, the mothers in the intervention group initiated breast-feeding earlier than the mothers in the control group ( $12.1 \pm 15.4$  vs  $6.2 \pm 12.0$  hours,  $p < 0.01$ ) and were more likely to feed colostrum as first food (48%, 29%, and 12% for individual, mixed, and control groups respectively,  $p = 0.001$ ). Fewer mothers in the intervention group fed prelacteals compared to the control group (52%, 71%, and 88% for individual, mixed, and control groups respectively,  $p = 0.001$ ).

**Conclusion:** Peer counsellors can effectively improve exclusive breast-feeding practices and early initiation of breast-feeding. This study has also shown that peer counselling, whether given individually or in a group, can achieve a similar rate of exclusive breast-feeding. Now the challenge is how to incorporate these findings into the national programmes and scale up breast-feeding activities to improve child survival.

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## Relactation and Diarrhoea in Infants Aged Less Than Four Months

Seema Alam, Akshay Batra, and Ashraf Malik

**Objective:** Assess the success rate in, and effect of relactation on admitted cases of diarrhoea.

**Methodology:** All cases of acute or persistent diarrhoea admitted to the Diarrheal Treatment and Training Unit of the J.N. Medical College, Aligarh, U.P., India, during May 2000-December 2001, were included in the study. The infants were aged less than 4 months. Relactation was done by encouraging mothers, supervised feeding, and encouraging lactogogues, and by indigenous lactaid. Relactation was considered successful if the mother and infant unit could achieve at least high partial breast-feeding. Supplementation of top milk was continued till the baby could be satiated and gained weight on breastfeeds alone. After recovery from diarrhoea, the baby was seen at 1 and 3 month(s) follow-up.

**Results:** Of the total admissions of 1,460, 120 were aged less than 4 months. Of these, 75 had persistent diarrhoea, and 45 had acute diarrhoea. The mean (SD) age was 10.47 (4.3) weeks with the mean (SD) duration of diarrhoea 22.07 (11.44) days and 2.83 (1.92) days in persistent diarrhoea and acute diarrhoea cases respectively. Forty-nine of the 75 persistent diarrhoea cases had low birth-weight, and of the total, 110 were receiving bottle feeds at admission. With a mean (SD) z-score for weight-for-length ( $-1.77 \pm 1.38$ ) and length-for-age ( $-1.80 \pm 1.18$ ), these cases had  $13.96 \pm 6.92$  loose watery stools per day, and 73 (60.8%) were dehydrated at admission. Sixty-three (84%) of the persistent diarrhoea and 21 (46.6%) of the acute diarrhoea cases were given antibiotics. Thirty (40%) of the persistent diarrhoea cases had urinary tract infections. After a mean (SD) stabilization period of 16.89 (17.86) hours, the dietary regimen was started. Of the 102 cases where relactation was attempted, 82 successfully recovered and 28 recovered on milk-cereal diet with low partial (where  $<20\%$  of the feeds are breastfeeds) or no breast-feeding. Five of the 6 infants who were given milk-free diet improved. Five infants left the study. The mean (SD) recovery duration for those patients who improved on relactation was 4.16 (2.34) days. By 1 and 3 month(s) follow-up, 50% and 80% of those who came had shown 10% increase in weight-for-length.

**Conclusion:** Relactation was successful in a high percentage of babies in the younger age group and should be tried. It can also speed up recovery and improve catch-up growth.

## A Community-based Intervention to Improve Breast-feeding and Complementary Feeding Practices through Nutritional Counselling in Rural Haryana, India

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**Objective:** Improve breast-feeding and complementary feeding practices through nutritional counselling.

**Methodology:** This randomized controlled effectiveness trial was conducted in 8 communities (4 intervention and 4 control) of rural Haryana, India, during February 1998-December 2001. Opportunities used for counselling were sick child contacts, immunization and weighing sessions, traditional birth attendants at delivery, home-visits for new births, meetings of health workers with the community, and IEC activities. Outcomes assessed were feeding practices and anthropometry through 3-monthly home-visits in a cohort of newborns (450 per group) till each child was aged 18 months. Exposure was ascertained at home-visits, and the proportion of those exposed to each channel and actually counselled was estimated.

**Results:** At 3 months of age, 78.9% of the 450 infants were exclusively breastfed in the intervention group compared to 48.8% in the control group. The mean 24-hour breast-feeding frequency was 9.4 ( $\pm$ SD 2.7) and 7.5 ( $\pm$ SD 2.5) [ $p < 0.01$ ] respectively. The average duration of exclusive breast-feeding was 123 days ( $\pm$ SD 63) in the intervention group and 43 days ( $\pm$ SD 65) in the control group. At the 3-month visit, there was a significant reduction in the 7-day diarrhoea prevalence [risk ratio 0.74, 95% confidence interval (CI) 0.59 to 0.94] and the proportion seeking treatment for diarrhoea (risk ratio 0.80, 95% CI 0.68 to 0.95) in the intervention group. At the age of 6 months, the risk ratio for 7-day diarrhoea prevalence was 0.89 (95% CI 0.71 to 1.11), and for the proportion seeking treatment for diarrhoea, it was 0.82 (95% CI 0.71 to 0.94). The median meal frequency at 9 months of age was 4.4 ( $\pm$ 1.5) in the intervention children vs 3.8 ( $\pm$ 1.7) in the control group; the median energy (kcal) intake was 326 vs 212 respectively. Of the foods promoted at 9 months of age, significant increases in the use of undiluted milk (60% vs 13%), bread (23% vs 11%), *khichuri* (28% vs 12%), and bananas (33% vs 28%) were noted. The mean changes in weight and length between 6 and 12 months and between 12 and 18 months were similar in the two groups.

**Conclusion:** Knowledge of mothers improved through counselling. Improvement in reported practices, especially exclusive breast-feeding also occurred, along with reduction in diarrhoeal morbidity.

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## Impact of Social Mobilization on Breast-feeding Practices in a Rural Area of Bangladesh

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**Objective:** Evaluate the impact of social mobilization on breast-feeding practices in a rural area of Bangladesh.

**Methodology:** In this community-based intervention, a 'social mobilization' was launched in one union of Bandar upazila (Kalagacchia), and another similar union (Musapur) was selected as control. In each area, 150 randomly-selected pregnant women were interviewed before and after the intervention. A social mobilization programme, including advocacy and group meetings, rallies, entertainment-education by folk songs and video show, was performed for six months. After the intervention, the outcome variables regarding breast-feeding performance were compared between the study and the control areas.

**Results:** After the intervention, initiation of breast-feeding within one hour increased more than 4 times in the intervention area compared to the control area. A 14% increase in the intake of colostrum from baseline after social mobilization was observed compared to a 4% increase in the control area. The intake of breastmilk as the first food significantly increased due to social mobilization in the intervention area than in the control area (60% vs 13%). There was an increase in the proportion of exclusive breast-feeding for 5 months in the intervention area, but the difference was not statistically significant compared to the control area.

**Conclusion:** There was a significant increase in early initiation of breast-feeding and intake of colostrum and breastmilk as the first food after social mobilization. However, no significant difference in the rate of exclusive breast-feeding was assessed.

## Rehabilitation of Severely-malnourished Children Using an Indigenous High-density Diet

Fatima Y. Bharmal<sup>1</sup> and D.S. Akram<sup>2</sup>

**Objective:** Demonstrate the effective use of a high-density diet made inexpensively from indigenous food.

**Methodology:** Malnourished patients were randomly allocated to one of three groups. Children of both sexes aged 4-60 months were included in the study. They were all severely malnourished. A calculated sample size of 30 children was assigned to each group. Group A was given only high-density diet for 7 days and then given routine diet plus HDD for the next 7 days. Group B was given routine diet plus HDD for 14 days. Group C was given routine diet only for 14 days, and served as the control group. The study was conducted during July 1996-December 1996 at the Nutrition Unit of the Civil Hospital, Karachi. The HDD diet consisted of rice and lentil-flour, milk-powder, sugar, oil, and water to give a caloric value of 1.5 cal/mL. The regular diet contained a KYB (*khichuri*, yogurt, and banana) diet with milk added to it (calories 1.1/mL). The two diets were comparable in cost (Rs 10.00/day) and can be prepared at home. The diet was given for 2 weeks.

**Results:** The results were best when the high-density diet was used as a supplement to routine diet (Group B). The weight (kg) for each group on day one of the study was: Group A=5.66±1.2, Group B=6.62±1.2, and Group C=6.07±1.6. On day 14, the respective weights (kg) were: Group A=6.07±1.4, and Group B=6.83±1.4, and Group C=6.13±1.5. The difference in weight gain between Group A and B was statistically significant ( $p < 0.001$ ). Similarly, the average caloric intake for the controls was very low throughout the 2-week period, while Group B had the best intake, which rose steadily from day one and reached 1,200 calories on day 14. The children of Group A had a maximum intake of 800 calories in the first week, and in the second week, it rose up to 1,200, equalling that of Group B. No cases of vomiting, abdominal pain, or cramps were reported.

**Conclusion:** The high-density diet is low in cost, easy to prepare at home by mothers, and effective in bringing about rapid weight gain in malnourished children.

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## Mortality among Malnourished Children Admitted to a Nutrition Rehabilitation Unit in Rural Matlab, Bangladesh: A Retrospective Cohort Study

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**Objective:** Assess the mortality patterns among malnourished children who were admitted to the Nutrition Rehabilitation Unit (NRU) compared to those who did not attend.

**Methodology:** This cohort study evaluated the mortality patterns of 598 children, aged 6-59 months, with mid-upper-arm-circumference (MUAC) of  $\leq 110$  mm on admission at the NRU during August 1986–December 1994 in rural Matlab, Bangladesh. For comparison, another group of 598 children having similar MUAC matched by sex and age ( $\pm 3$  months) and who did not attend the NRU were randomly selected. Children at the NRU received standardized treatment with low-cost, locally-available weaning food along with supplementation of iron and multivitamins. The major outcome variable was mortality over a 24-month period after discharge. Diarrhoea and pneumonia during that period and also socioeconomic factors of the family were compared between the groups for any difference. Statistical tests performed to assess the association and difference between the groups included chi-square, *t*-test, and Wilcoxon test.

**Results:** The mean duration of stay at the NRU was 18.5 days ( $\pm 15.8$ ) and weight-for-age z-score of the children on discharge was  $-4.00$  (CI:  $-4.12, -3.87$ ). The mean age of the children who attended the NRU and of the comparison group was 18.9 ( $\pm 10.9$ ) and 19.2 months ( $\pm 11.0$ ) respectively. Of the study children, 43% were boys and 57% were girls. The cumulative survival probability up to 24 months of follow-up was lower for the NRU group (0.94) than for the comparison group (0.87). The difference was statistically significant by Wilcoxon test ( $p < 0.001$ ). The difference in cumulative mortality was the highest in the first three months of follow-up (7.5% vs 1%). No difference was found in the incidence of diarrhoea and pneumonia and in the socioeconomic status of the family between the groups.

**Conclusion:** The NRU has showed no impact on survival after discharge. Further research is needed to explain this finding.

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## Home-based Nutritional Rehabilitation of Severely-malnourished Children Recovering from Diarrhoea and Other Acute Illnesses

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M.A. Salam<sup>1</sup>, Ann Ashworth<sup>2</sup>, and G.J. Fuchs<sup>3</sup>

**Objective:** Investigate the efficacy of home-based nutritional rehabilitation compared to hospital-based nutritional rehabilitation of severely-malnourished children recovering from diarrhoea and other acute illnesses.

**Methodology:** After treatment of acute illnesses, including diarrhoea, pneumonia, or septicaemia, severely-malnourished children (weight-for-length <70% or oedema), aged 6 months to 5 years, were randomized to three treatments: home-based nutritional rehabilitation with follow-up at home (Treatment A) or follow-up at outpatient clinic (Treatment B), and hospital-based nutritional rehabilitation (Treatment C). The study was conducted during January 2000-December 2001. Children on Treatment A and B stayed in the Nutritional Rehabilitation Unit (NRU) of ICDDR,B hospital for 7 days for stabilization of general condition and education of mothers on preparation of low-cost, nutritious diets after which they were followed until achievement of weight-for-length >80%. The children received only micronutrients but no food supplements from the hospital during follow-up. Children on Treatment C remained in the NRU until achievement of weight-for-length >80%. Outcome measures included rate of weight gain and days to achieve oedema-free weight-for-length >80%.

**Results:** In total, 225 children were randomized to the three treatment groups and were comparable in age, gender, weight, length, weight-for-length, and proportion with oedema on enrollment. One child in Treatment C died of a nosocomial infection, while another child died in Treatment A after withdrawal of consent. The case-fatality rate was 0.8%. Rates of weight gain of children differed between Treatment B and Treatment C, but not between Treatment A and Treatment C (median 9.9, 7.5, 11.9 g/kg per day for Treatment A, B and C respectively; Kruskal Wallis  $p=0.007$ ). The number of days required to achieve weight-for-length >80% also differed between Treatment B and Treatment C, but not between Treatment A and Treatment C (median days 20, 37, 17 for Treatment A, B and C respectively; Kruskal Wallis  $p=0.008$ ).

**Conclusion:** The preliminary results suggest that home-based nutritional rehabilitation, coupled with home visitation for follow-up, may be an effective alternative to hospital-based nutritional rehabilitation of severely-malnourished children recovering from acute illnesses.

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## Experience with Protocolized Treatment of Severe Malnutrition in a General Hospital Ward

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**Objective:** Apply protocolized treatment for severe malnutrition to reduce mortality due to severe malnutrition in a hospital.

**Methodology:** A longitudinal study was done at the Ad-din Hospital, Dhaka, where all children admitted with severe malnutrition were treated using the WHO guidelines adapted to the Bangladesh context. The hospital has 60 beds (of total 110 beds) for children, of which 20 beds are dedicated for malnourished children, and treatment is provided free of charge. Treatment is carried out by at least one paediatrician for 24 hours (working on rotation), one nurse (working on rotation for 24 hours), and one nutritionist (available during the daytime and on call at night). All children (n=559) treated during April 2000-March 2002 were included in the study. Data were collected using a standardized format (from the routine case records), and were analyzed using customized relational database software (RS1), SPSS, and Excel. The observed mortality was compared with the risk of death of admitted children. Risk of death was calculated using the Prudhon index derived from analyses of treatment outcomes in emergency programmes in Africa.

**Results:** The mean weight-for-height percentage of median of the children without oedema was 67.6. The observed overall mortality rate was 6% (5.5% for marasmus and 6.4% for kwashiorkor). The corresponding expected mortality rate was 12.2 (9.7% and 14.7% respectively). Thus, the mortality rate was half of that estimated using the Prudhon index. The mortality rate was the highest (15%) among the children aged 3-6 months (15%) and the lowest (2%) among the children aged 18-24 months. The rate of weight gain (average weight gained during the days between the day of minimum weight until the discharge) was 15.3 g/kg.day. About 11% of the patients defaulted early from care. The mean weight-for-height percentage of median at exit, excluding deaths and transfer, was 83.4.

**Conclusion:** The protocolized treatment in a routine hospital achieved a low mortality with a high rate of weight gain.

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## Daycare-based Management of Acutely-ill Severely-malnourished Children in an Urban Clinic in Dhaka

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**Objective:** Evaluate a management protocol for severely-malnourished children on a daycare basis.

**Methodology:** The study was conducted at the Radda MCH-FP Centre, Mirpur, Dhaka. Children, aged 6-23 months, with  $\leq -3$  SD weight-for-height or  $\leq -3$  SD weight-for-age with acute illness were enrolled. They were kept at the daycare centre from 8 am to 5 pm daily, and were provided with a study diet, antibiotics, and micronutrients. The same diet and drugs were continued at home during night hours. This management continued until referral of the children to the daycare-based Nutrition Rehabilitation Unit (NRU). They were kept at the NRU from 8 am to 5 pm daily and received the study diet and micronutrients which were also continued at home. This phase of management continued until the children achieved a weight-for-height of  $>80\%$  of the National Center for Health Statistics median. The study is still ongoing.

**Results:** One hundred children (46 males and 54 females) were enrolled during February 2001-January 2002. The mean age was  $13 \pm 5$  months, weight-for-age  $53 \pm 9\%$ , and weight-for-height  $75 \pm 8\%$ . Of these children, 81% were marasmic, 18% had marasmic kwashiorkor, and 1% had kwashiorkor. Only 11% had severe malnutrition without acute illness, 45% had associated pneumonia, and 44% had acute diarrhoea. The mean duration of acute phase of management was  $9 \pm 6$  days, and the NRU phase was  $17 \pm 14$  days. On discharge, they attained the weight-for-age of  $57 \pm 9\%$  and weight-for-height of  $81 \pm 6\%$ , and the mean daily weight gain was 7 g/kg. In total, 78% of the children completed the study successfully (weight-for-height  $>80\%$ ), and none died during the study.

**Conclusion:** Acutely-ill severely-malnourished children can be successfully managed on a daycare basis at established daycare clinics, provided adequately-trained and motivated staff is available.

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## Inequality in Severe Child Malnutrition between Nutritional Intervention and Comparison Areas

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**Objective:** Examine and compare the socioeconomic disparities in the prevalence of severe child malnutrition between the Bangladesh Integrated Nutrition Project (BINP) area and the control area.

**Methodology:** During May-June of 2000, 3,262 households of a randomly-selected union of the BINP area (Uttar Suchipara) and another 3,752 households of a randomly-selected union (Poschim Barkul) in the control area were surveyed. In the BINP area, the intervention was initiated in January 1997. Information on socioeconomic condition of the households and on the nutritional status of children was collected. A socioeconomic status (SES) index was calculated for each household by analyzing principal components of information on household assets, land ownership, and quality of housing. To estimate the degree of inequality in child malnutrition rates, ratios of prevalence of malnutrition for low- and high-SES were calculated for both BINP and control areas separately.

**Results:** Sixty-six percent of severely-malnourished children aged 6-59 months belonged to the lowest SES group in the project area, while the proportion was 54% for the control area. Sixty-one percent and 52% of the severe malnourished children aged 24-59 months were in the lowest SES in the project and control areas respectively. The ratios of malnutrition prevalence rates for the lowest and the highest SES groups were 3.84 in the BINP area and 5.01 in the control area for children aged 6-59 months. These were 2.78% and 5.43% for the children aged 24-59 months respectively. A statistically-significant coefficient for the interaction term between area and SES implied that the enormity of socioeconomic differentials observed was different between the project and the control areas.

**Conclusion:** The findings indicate that the socioeconomic differentials in the prevalence of severe child malnutrition are lower in the BINP intervention area compared to the control area. A high proportion of severe child-malnutrition prevalence among the lowest SES group in the project area is a significant concern, and the policy-makers should try to find mechanisms for better targeting the poor children.

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## Economic Cost of Mistargeting: A Case Study of Nutritional Intervention Programme for Pregnant Women

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**Objective:** Estimate the number of mistargeted women in the Bangladesh Integrated Nutrition Project (BINP) by matching enrollment criteria with characteristics of women, and calculate the economic cost associated with mistargeting to help improve resource use in the nutrition-intervention programme.

**Methodology:** Detailed costing was carried out to estimate the cost of delivering nutrition services through the BINP. The extent of mistargeting was defined by the number of women enrolled in the programme but who did not fulfill the stated criteria of enrollment and the number of women not in the programme who actually satisfied the enrollment criteria. A cross-sectional household survey was carried out during May-June 2000 to collect information on programme participation, nutritional and pregnancy status from 3,262 households in Shahrasti upazila of Chandpur district. To control for confounding factors, a matched subset of non-participants was compared with the participants.

**Results:** Thirty-nine percent of the pregnant women (n=12) in the programme were identified correctly. Of all malnourished pregnant women, only one-third was identified and enrolled in the programme. The cost of providing services to the mistargeted women in the programme was about Tk 539 thousand in 1999-2000. The societal cost of mistargeting should also include the economic loss due to non-enrollment of malnourished women. Even if a low societal cost of Tk 1,000 per year per malnourished woman due to the higher prevalence of illness of mothers and children, loss of productivity, etc., was assessed, the total economic loss of mistargeting became Tk 2,434 per mistargeted woman.

**Conclusion:** The economic cost of mistargeting is quite significant, i.e. more than 60% of the total cost of BINP activities on women. If the mistargeted proportion is reduced from 61% to 50%, society will save about Tk 5,392 per additional malnourished woman enrolled. From the programmatic point of view, allocating money to improve targeting mechanisms and identification of true cases will save a significant amount of resources and is economically justifiable.

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### **Prevention of Malnutrition: Efficacy of a New Strategy**

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**Objective:** Assess the impact of nutrition education on the prevention of malnutrition in either well-nourished or mildly-malnourished children in 4 upazilas under the Bangladesh Integrated Nutrition Project.

**Methodology:** During July 2001-March 2002, 607 children, aged 6-24 months, who were either well-nourished or mildly-malnourished, from 4 BINP upazilas of 4 divisions were studied. Mothers of 306 children received nutrition education and mothers of 301 comparable children received only the standard BINP advice on health and nutrition. The trained health assistants provided weekly nutrition education using information, education, and communication materials on food security, control of diseases, and caring practices, including food demonstration on cooking *khichuri* or addition of extra oil to the usual family diet for a 6-month period. After the intervention, children were observed for another 3 months. Data on growth by anthropometric measurements were collected at an interval of 3 months, and were analyzed for the change in nutritional status.

**Results:** After 3 months of nutrition education, 13.2% of the children in the intervention group and 24.6% in the control group deteriorated to moderate malnutrition. At the end of 6 months of the intervention, 10.3% in the study group compared to 22.1% in the control group had moderate malnutrition. At the end of 3 months of observation, this trend continued as the nutritional status of only 9.5% of the children in the study group, and 28.2% in the control group deteriorated to moderate malnutrition. The differences between the two groups, at all stages of the intervention were statistically significant ( $p < 0.05$ ), and were more pronounced at the end of 3 months of observation ( $p < 0.0001$ ).

**Conclusion:** Comprehensive nutrition education could prevent malnutrition in young children during and after intervention significantly better compared to standard BINP advice.

## Testing of Tubewell-water of Community Nutrition Centres under the Bangladesh Integrated Nutrition Project for Presence of Arsenic

Md. Jakariya

**Objective:** Assess the level of arsenic contamination in all water sources of the Community Nutrition Centres (CNCs) under the Bangladesh Integrated Nutrition Project.

**Methodology:** MERCK field-testing kit was used for testing tubewell water for presence of arsenic. A two-day long orientation was organized for testers of arsenic contamination. The field supervisors re-tested about 3% of total tested tubewell water. Focus-group discussions were held to assess the daily requirement of water and the preferred alternative water options by arsenic-contaminated members at CNCs. Testing of tubewell water for arsenic started in March 2001 and ended in June 2001.

**Results:** In total, water samples from 7,782 tubewells of different CNCs in 40 upazilas of Bangladesh were tested for the presence of arsenic. The test results showed that concentration of arsenic level in water samples of about 74% of the tubewells was found to be within the acceptable limit, i.e.  $\leq 0.05$  mg/L of water. Members of the CNCs where tubewell water tested positive for arsenic contamination ( $>0.05$  mg/L of arsenic) were very keen to have alternative safe water options, and their preferred option was the installation of deep handset tubewell. The results of all the re-tested tubewell water samples matched the field-testing results, which means that the performance of the field testers was excellent.

**Conclusion:** The percentage of population exposed to a high concentration of arsenic was very few in all the CNCs. Although the majority of members of CNCs preferred deep handset tubewell as their first alternative safe water choice, re-sinking of the existing wells to a deeper soil-stratum and distribution of 3-pitcher filtration device were also mentioned by many affected members as their next choice.

## Understanding of Mothers about Growth Monitoring and Promotion Card Used in the Bangladesh Integrated Nutrition Project

M.A. Mannan, A.Z. Amanatullah, and Md. Eshaque Ali

**Objective:** Assess the understanding of mothers about various components of the growth monitoring and promotion (GMP) card used in the Bangladesh Integrated Nutrition Project (BINP) upazilas.

**Methodology:** A cross-sectional study was carried out in 22 community nutrition centres from December 1998 to August 1999 in two BINP upazilas. The study included 918 respondents. Qualitative and quantitative methods were used for collecting information. The GMP card was divided into 10 components and some relevant sub-components. Guidelines were prepared and used during in-depth interview of key-informants and focus-group discussions with mothers to collect qualitative information, while pre-designed and pre-tested sets of questionnaire were used for collecting quantitative data.

**Results:** Forty-three percent of the respondents could understand the picture of weight-recording on the growth card. Bubble-like circles were understood by 6.7% only, while the meaning of rainbow-shaped coloured bands was not clear to 70% of the respondents. About 6% of the respondents could identify the various degrees of malnutrition among the children. Twenty-one percent understood the messages describing 'healthy child,' while about 22% understood its graphical representation. About two-thirds understood the message and pictures about additional foods for pregnant and lactating women. They also understood the importance of introducing colostrum and rest requirement during pregnancy and lactation. Less than half of them could follow the messages and pictures on different supplementary foods for the children. About 23% were able to identify growth faltering. Similar results were also obtained from the qualitative study.

**Conclusion:** The respondents did not understand the majority of the components of the GMP card, including pictures and messages. The card needs to be modified to make it more understandable.

## Perceptions and Practices of Adolescents about Iodized Salt and Iodine Nutriture in Rural Bangladesh

Sohana Shafique<sup>1</sup>, Md. Mohiduzzaman<sup>2</sup>, Cadi P. Banu<sup>2</sup>, and Quazi Salamatullah<sup>2</sup>

**Objective:** Investigate the knowledge, attitude, and practice (KAP) of adolescents with regard to iodized salt and iodine deficiency disorders (IDD), determine their iodine status and estimate iodine content of household salts.

**Methodology:** A cross-sectional study was conducted among 200 adolescents in Sundrahabi, a remote village of Lalmonirhat, during October-November 1999. Structured questionnaire, clinical examination of goitre and cretinism, biochemical estimation of urinary iodine, and estimation of iodine in salt constituted the data-collection tools. Urine and salt samples were analyzed at the IDD laboratory of the Institute of Nutrition and Food Science, University of Dhaka, Ramna, Dhaka.

**Results:** Eighty-three percent of the total respondents were not aware of iodine, and 68% did not know the causes of goitre. Only 9% were able to test iodine in salt. In the study area, people had a preference for open salt rather than packed salt (60% vs 40%). To store the salt, 64% of the respondents used containers without any lids. The prevalence of goitre (grade 1+2) was very high (43.5%) in this population. The female respondents were affected more than males (58% vs 30%,  $p < 0.001$ ). About 82% of the respondents were biochemically iodine-deficient (urinary iodine level  $< 100$  mg/L). The majority (68%) of the households consumed inadequate iodized salt (iodine content  $< 15$  ppm), and the mean iodine level in observed salt was only 13.07 ppm.

**Conclusion:** The high prevalence of clinical goitre and the low level of urinary iodine revealed that IDD is still a serious public-health problem in this area. Consumption of inadequate iodized salt indicates insufficient awareness-raising activities and knowledge in this regard.

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## Homestead Gardening as a Food Security Strategy in Rural Bangladesh

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**Objective:** Evaluate the impact of homestead gardening on increasing the availability, accessibility, and consumption of vitamin A-rich vegetables and fruits in rural Bangladesh.

**Methodology:** Data on the production and consumption of vegetables and fruits were collected during February-March 2002 from 2,400 randomly-selected households in 39 of 210 subdistricts under a homestead-gardening programme implemented by Helen Keller International in Bangladesh. Data on garden income were also collected. The selected households included two groups of beneficiaries, including households that are still receiving assistance and those that have completed the programme. The two groups of beneficiaries were compared with the control group to assess the impact of the programme. The control households were selected within the target subdistricts, but from unions where the programme has not yet been implemented.

**Results:** The beneficiary households of the programme produced 40-43.3 kg of vegetables and 8.3 kg of fruits per month compared to 13 kg of vegetables and 5 kg of fruits per month by the control group. The target households consumed 25.8 kg of vegetables from the garden compared to 10 kg by the control households. The beneficiary households also produced significantly more vitamin A-rich crops (3.3 for active households and 5.28 for households that completed the programme) compared to 1.85 by the control households. The weekly frequency of consumption of vegetables, including vitamin A-rich vegetables, by mothers and children of the target households was 5-7 days per week in the target households compared to 4 days per week in the control households. In addition, the median garden incomes of Tk 115 per month for active households and Tk 163 per month for households that completed the programme were reported by the target households compared to Tk 66 per month reported by the control households. The households were more likely to purchase foods from the garden income when the person in charge of the garden was a male opposed to a female.

**Conclusion:** The findings suggest that the homestead-gardening programme has increased the production and consumption of vegetables and fruits by its target households, thus contributing to the improvement of the food security status of households in rural Bangladesh.

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## Micronutrient Malnutrition in Children of North West Frontier Province of Pakistan

Parvez I. Paracha

**Objectives:** Assess the levels of iron, vitamin A, zinc, and sub-clinical infection in children.

**Methodology:** The study was carried out in North West Frontier Province of Pakistan in 1997. A two-stage cluster-sampling technique was followed to select 3,074 children, aged 6-60 months, from both urban and rural communities of the Province. Haemoglobin (Hb) and serum ferritin (SF) concentrations for iron, plasma retinol (PR) for vitamin A, plasma zinc (Zn) for zinc status and  $\alpha$ 1-antichymotrypsin (ACT) and  $\alpha$ 1-acidglycoprotein (AGP) for sub-clinical infection were determined in various laboratories within and outside the country.

**Results:** Sixty-nine percent of the children were iron-deficient (SF<12  $\mu$ g/L), 42% were anaemic due to iron deficiency (SF<12  $\mu$ g/L and Hb<110 g/L), and 50% were anaemic for other reasons (Hb<110 g/L). The results on plasma retinol showed that 32% of the children were marginally vitamin A-deficient (PR<0.70  $\mu$ mol/L), and 4% were severely vitamin A-deficient (PR<0.35  $\mu$ mol/L). Similarly, zinc deficiency (Zn<9.2  $\mu$ mol/L) was observed among 54% of the children. The prevalence of sub-clinical infection in apparently healthy children showed that 11% had elevated  $\alpha$ 1-antichymotrypsin, and 45% had raised  $\alpha$ 1-acidglycoprotein levels. The results by urban-rural classification showed that iron deficiency and anaemia were more prevalent in rural (71% and 51%) than in urban (64% and 48%) children respectively, while no significant differences were observed in the prevalence of zinc and plasma retinol deficiencies between urban (56% and 31%) and rural (54% and 32%) children respectively. Multiple regression analysis revealed that serum ferritin and plasma retinol were positively and significantly ( $p$ <0.05) correlated with haemoglobin levels, while  $\alpha$ 1-antichymotrypsin and  $\alpha$ 1-acidglycoprotein were negatively and significantly correlated with haemoglobin levels. No significant ( $p$ >0.05) association between haemoglobin and zinc levels was observed.

**Conclusion:** The study concludes that micronutrient malnutrition and sub-clinical infection are prevalent in magnitude to be considered as a public-health problem which needs to be addressed through integrated efforts, political commitment, and appropriate interventions.

## Nutritional Rickets in an Arab Country

Abdul Majid Molla<sup>1</sup>, Majeda Hamoud<sup>1</sup>, Mona Al-Badawi<sup>2</sup>, and Ayesha Molla<sup>3</sup>

**Objective:** Identify the risk factors of rickets.

**Methods and subjects:** The study was carried out during January 1995-January 1997 in one of the local hospitals in Kuwait (Adan Hospital). One hundred confirmed cases of nutritional rickets and 100 control children, matched for age and ethnicity, were included. Serum vitamin D level was determined from the patients, their mothers, and the controls by radio-immunassay. A structured questionnaire on sociocultural aspects was administered to the mothers of both patients and controls.

**Results:** The mean±SD age of the patients and the controls at the time of diagnosis was 14.47±5.18 and 15.15±6.28 months respectively. Complete wrapping of the child and lack of exposure to the sunlight was 70% and 45% among the case and the control respectively ( $p<0.001$ ). The mean±SD birth-weights of the cases and the controls were similar (3.20±.46 kg and 3.19±0.45 kg). At the time of diagnosis, the controls were heavier than the cases ( $p<0.01$ ). The vitamin D level of the cases and the controls was 26.5 nmo/L and 83.5 nmol/L respectively ( $p<0.001$ ). Breast-feeding up to 6 months was common in 95% of the cases compared to 31% of the controls ( $p<0.001$ ). The nutritional quality of the weaning food was adequate in 71.6% in the controls opposed to 13.6% of the cases ( $p<0.001$ ).

**Conclusion:** Nutritional rickets is a multi-factorial condition. Several factors, such as lack of exposure to sunlight, prolonged breast-feeding, and poor weaning practices, make important contribution. Further studies are necessary, including health education, to eliminate this condition in Kuwait.

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## Supplementation of Fish-oil to Pregnant Mothers during the Last Trimester Has No Effect on Birth-weight

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I. Hossain<sup>1</sup>, and T. Romana<sup>1</sup>

**Objective:** Evaluate the impact of supplementation of fish-oil to pregnant mothers in reducing low birth-weight.

**Methodology:** Four hundred pregnant women from a lower socioeconomic urban community in Dhaka were enrolled into the study. The women were randomized at 24-25 weeks of pregnancy to receive either 4 g of fish-oil (test) or soybean oil (control) in oral capsules daily for 90 days. The study was double-blinded, and the capsules were identical in appearance and colour. Everyday, one field worker visited the mothers at their homes and fed the capsules directly. A trained research assistant obtained body weight of newborns within 24 hours of delivery. Data were compared with Student's *t*-test and chi-square test whenever needed.

**Results:** The birth-weights of 148 newborns in the fish-oil group and 155 newborns in the control group were available. The mean±SD birth-weight of the newborns in the fish-oil group was 2,664±446 g compared to 2,717±388 g in the control group ( $p=0.27$ ). The proportion of low birth-weight (<2,500 g) was 31% in the fish-oil group and 25% in the control group ( $p=0.25$ ). The rates of premature delivery were 19% and 15% in the fish-oil and control groups respectively ( $p=0.35$ ).

**Conclusion:** The results showed that supplementation of fish-oil during the last trimester had no effect on reducing low birth-weight or prematurity in pregnant women of Bangladesh. The possible reason may be that any single nutrient or micronutrient is less likely to have a positive impact on birth-weight, where most women are chronic energy-deficient.

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## Anaemia during Pregnancy in Rural Bangladesh: Can It Be Controlled by Iron Supplements?

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B. Lönnerdal<sup>3</sup>, and L.Å. Persson<sup>1</sup>

**Objective:** Investigate three questions: (a) is a lower haemoglobin (Hb) level associated with lower iron status?; (b) is a larger dose of iron required for low Hb?; and (c) can iron supplements normalize Hb?

**Methodology:** Data from 140 pregnant women in rural Mymensingh, enrolled during 1997-1998 in a trial comparing weekly and daily supplementation of iron, were used for this analysis. Compliance was monitored using a pill bottle equipped with an electronic counting device. Hb (g/L), S-ferritin (SF µg/L), and soluble transferrin receptor (TfR mg/L) were measured at baseline and after 12 weeks of supplementation. Previous analyses did not show any difference in response between weekly and daily supplementation; thus, the frequency of dose was disregarded in further analyses.

**Results:** The women were divided into 3 initial Hb categories (110+, 100-109, and <100). At baseline, a significant ( $p<0.05$ ) trend in lower SF was shown with the lower Hb categories. After 12 weeks of supplementation, Hb had increased in all 3 categories. In the 2 highest Hb categories, a maximum response was achieved after about 50 tablets, but no significant dose response was seen in the lowest category. The final prevalence of anaemia was 3%, 28% and 48% respectively.

**Conclusion:** Despite that lower Hb was associated with lower iron stores, a maximum Hb response was achieved with a similar amount of iron. A maximum response in the 2 lowest categories did not produce a normal Hb, resulting in a high-remaining prevalence of anaemia after 12 weeks of supplementation.

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**Longer Duration of Food Supplementation to Malnourished  
Pregnant Women Does Not Increase Duration of Labour:  
A Study in Shaharasti, Bangladesh**

Rubina Shaheen

**Objective:** Determine whether longer duration of food supplementation to malnourished pregnant women increases the duration of labour by increasing birth-weight, since birth-weight is one of the predictors of prolonged labour and longer duration of food supplement increases birth-weight.

**Methodology:** An observational study was conducted in Shaharasti. In total, 777 women who had a body mass index of  $<18.5$  and received food supplementation (608 kcal/day) from the Bangladesh Integrated Nutrition Programme (BINP) were followed from November 1998 to October 1999. The intake of supplement was measured by interviewing the women. Information on the date and time when labour started and on the date and time when childbirth occurred was collected by interviewing the women within 72 hours of childbirth. Birth-weight was measured by SECA beam scales, and postpartum weight of mothers was measured by SECA electronic scales. After adjustment for the time passed since the baby was born and after excluding twins, 692 mother-newborn pairs had complete information. Logistic regression analysis was used for calculating crude and adjusted odds ratios (OR) for the effect of longer duration ( $\geq 120$  days) compared to shorter duration ( $<120$  days) of supplementation on the risk of prolonged labour ( $>24$  hours).

**Results:** The overall duration of food supplementation for  $\geq 120$  days did not increase the risk of prolonged labour for  $\geq 24$  hours (OR=0.929, 95% confidence interval: 0.699 to 1.233). This relationship was not modified by birth-weight but was significantly modified by gestational age at birth. Preterm birth decreased the risk of prolonged labour, although primiparity and short stature (maternal height  $<150$  cm) increased the risk. The final logistic regression model showed that after controlling for these factors and taking into account significant interaction term (parity\*supplement), longer duration of supplementation had no effect on prolonged labour.

**Conclusion:** This study refutes the proposition that food supplementation during pregnancy increases the risk of prolonged labour.

## Conceptualizing Pregnancy in Rural Bangladesh

Papreen Nahar and Lauren S. Blum

**Objective:** Explore indigenous beliefs relating to pregnancy in rural Bangladesh.

**Methodology:** Using a variety of qualitative instruments, including village mapping, key-informant and in-depth interviews, observations, small group discussions, and body mapping, an ethnographic approach was employed over a 5-week period during December 2000-January 2001 in Matlab. In-depth information was collected from a sample of 13 pregnant and other women of reproductive age and elderly women to examine perceptions relating to pregnancy stages, development of the foetus, desirable weight gain during pregnancy, risks of complications, and family decision-making regarding pregnancy care.

**Results:** The women perceived that pregnancy is divided into three stages, which combine the biomedical model with local beliefs. During the first five months, the foetus is believed to be a clot of blood, and beyond five months, the foetus takes a human shape, developing different body parts (face, legs, hands, and sexual organs) and five souls. While in the first two stages, women are ambivalent about weight gain, there are indications that women avoid putting on weight in the last phase. Delivery-related complications are attributed to a big baby, and particular importance is linked to the head size of baby. The study also uncovered strong beliefs relating to the susceptibility of pregnant women to *alga batash*, a supernatural power that preys on women and young children. The forces of *alga* are perceived to be both strong and unpredictable, causing miscarriages, stillbirths, and prolonged labour in pregnancy. Irrespective of family type, the mother-in-law plays a crucial role in controlling the care and activities of pregnant woman.

**Conclusion:** Pregnancy takes a special character in the context of rural Bangladesh. The results have important programmatic implications for strategies designed to enhance the health and nutritional status of pregnant women.

## Facilitating Healthy Pregnancies: Effect of Targeted Food Supplementation and Services on Weight Gains in Pregnancy and Birth-weights

Stephanie Ortolano, Zeba Mahmud, **Iqbal Kabir**, and F. James Levinson

**Objective:** Assess the extent to which supplementation of malnourished pregnant women has affected weight gain in pregnancy and birth-weights of the infants of at-risk group relative to their higher-BMI more advantaged neighbours.

**Methodology:** Data used include monitoring-data collected from 17 upazilas under Bangladesh Integrated Nutrition Project (BINP) during its mid-term evaluation. First-hand data were also collected in April-May 2001, on currently pregnant women in at least the sixth month of pregnancy, or on the most recent pregnancy of currently-lactating women who had delivered within the past 6 months. In total, 458 women were included, of whom 195 (low BMI) were supplemented, and 263 (adequate BMI) were non-supplemented. Average monthly weight gain was estimated. A monthly weight gain adequacy point of 1 kg was used. Birth-weights of 2.6 kg was used as a cut-off point to compensate for the common practice of increasing borderline estimates. Information on food supplementation and socioeconomic status was collected. Data were recorded on heights of the women (as a proxy for the pre-pregnancy), overall health and nutritional well-being of the women, age and numbers of pregnancies, and on spacing between the last two pregnancies and antenatal care services received. Data were collected on a sub-sample to assess other potential contributors to pregnancy outcomes, viz. overall food consumption during pregnancy relative to usual (non-pregnancy) consumption, and daytime rest during pregnancy, intake of iron-folate supplements. Data on food consumption and rest were also used for assessing the effect of repeated exposure to messages by mothers coming daily to the Community Nutrition Centre for food supplementation. Analysis was carried out using SPSS for Windows version 9.0. Two-sided t-tests with equal variances assumed were used for continuous variables. Chi-square analyses were done on categorical variables using Fisher's Exact Test for significance.

**Results:** The average age of the pregnant women was over 25 years, with 20 years for the primigravidae. The variables that were significantly different between the supplemented and non-supplemented groups were: BMI, gravida, and household landholding and tubewell ownership. It was found that despite shorter stature and lower economic status, the low-BMI women receiving food supplementation and intensified services were 1.8 times more likely to have adequate weight gain in pregnancy (1 kg/month) compared to their higher-BMI, more economically-advantaged neighbours. Primigravidae under supplementation were 4.6 times more likely to have adequate weight gain in pregnancy than the better-off non-supplemented primigravidae. Mean birth-weights of infants of the low-BMI supplemented women were unexpectedly comparable to those of the non-supplemented women.

**Conclusion:** The Bangladesh Integrated Nutrition Project is having a significant impact on pregnancy outcomes. The effect is more marked to primigravidae who are more at risk of low birth-weight of their infants.

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## Food Intake Behaviour and Anaemia among Floating Sex Workers in Dhaka City

Shaheda Islam and Rafiqul Islam

**Objective:** Assess the dietary pattern and level of haemoglobin among the floating sex workers in Dhaka city.

**Methodology:** One hundred floating female sex workers, aged 15-45 years, from Press Club, Kamalapur Railway Station and Ramna Park areas were selected for the study which was conducted during February-July 2001. Haemoglobin was estimated by the cyanmethemoglobin method. Information on food intake behaviour was collected through a structured questionnaire by in-depth interview. Anaemia was diagnosed taking a haemoglobin level of 12 mg/dL as the cut-off point as per WHO standard.

**Result:** Eighty-four percent of the study subjects were anaemic. They always felt weak, and tired, and their eyes looked pale. Besides this, 20% of them had skin diseases along with anaemia. About 10% of the sex workers had one or more meal(s) with meat products per week, whereas 90% had vegetable intake at least 3 days a week.

**Conclusion:** Improvement of nutritional status decreases the risk of anaemia. Proper counselling, awareness, and attention might improve the situation. The skin disease could be due to the fact that these floating sex workers do not have access to a hygienic environment and healthcare facilities.

## Rural Employment and Household Food Expenditure: An Exploratory Study

Carlo Del Ninno<sup>1</sup> and Dilip Kumar Roy<sup>2</sup>

**Objective:** Assess the situation of labour market participation and examine household food expenditure by welfare categories.

**Methodology:** Households were randomly selected from seven upazilas (Muladi, Barisal; Shibpur, Narsindhi; Shahrasti, Chandpur; Mohammadpur, Magura; Saturaia, Manikgonj; Madaripur, Madaripur; and Derai, Sunamgonj) using the multiple stages-probability sampling technique, except for one upazila, where random sample of another study was used. A total of 757 households (six households per village, 36 per union, 108 per upazila) in 126 villages were selected. The survey was carried out during April-May and November-December 1999.

**Results:** The labour participation rate at an aggregate level was very low due to low rate of female participation in income-earning activities. About 90% of the males and 80% of the females in the age group of 10-14 years were studying. In the age group of 15-24 years, about 80% of the males were students. A great majority of the females aged over 15 years were involved in housekeeping activities. The rural workers comprised dependent workers, daily labourers, self-employed and unpaid family labourers. The dependent workers represented only 15% of the rural employed persons. More than one-third of the rural male workers were daily labourers. Forty-five to 48% of the rural male workers were self-employed. The average monthly earning of a dependent worker was more than one and half times the earning of a daily labourer. The average earning of a self-employed person was lower than that of a dependent worker but much higher than that of a daily labourer. The average household expenditure on food during April-May 1999 was Tk 2,821.00, but it was Tk 4,112.37 for top 20% of the households, Tk 2,855.00 for middle 40% of the households, and Tk 2,132.00 for bottom 40% of the households. Overall, the percentage of households that had no food security was 18%, but it was 31% in bottom 40% of the households. More than two-thirds of all households were vulnerable, i.e. they had a high proportion of their budget share on food and consumed adequate amounts of calories. If their total expenditure was reduced, the level of their calorie consumption was reduced as well. They had little scope to increase the level of expenditure to meet their requirements.

**Conclusion:** Average income of casual and self-employed workers represented two-thirds and 70-80% of earnings of the dependent workers respectively. The food-secured households were only 4.4% of all households during October-November 1999. For top 20% of the households, the figure was above 8%. It is, therefore, necessary to generate jobs and income through government and NGO programmes on a short and long-term basis.

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## Effects of Agroeconomic Factors on Food Consumption \*

M.U. Mia<sup>1</sup>, C.A. Florencio<sup>2</sup>, and M. Hossain<sup>3</sup>

**Objective:** Determine the effects of agricultural and socioeconomic factors on the intake of nutrients.

**Methodology:** The study was conducted in two villages of high agricultural potential in the Isabela Province, northeastern part of the Philippines. All agricultural farm households which had at least one preschool child aged less than 6 years were included in the study. Forty-one households in the study areas had 64 preschool children. Information on demography, crop production, income, expenditure, and food intake at the household level and anthropometric measurements—weight and height of preschoolers—were collected in May 1996. A food-frequency questionnaire method was used for obtaining food-intake data. The housewives reported the average frequency of consumption of each food over a one-year period preceding the interview.

**Results:** Using the stepwise regression analysis, the socioeconomic factors, such as household size and per-capita food expenditure, were the significant determinants of per-capita energy intake. Agricultural factors, such as per-capita landholding, tenurial status, and crop production, did not show any significant effects on per-capita energy intake, but the agricultural variables explained 41% of variability in the model. The socioeconomic and agricultural factors altogether explained 77% of variability.

**Conclusion:** Based on the findings, it is concluded that the effects of agricultural factors of the farm households are evident at the individual level but not at the household level. The socioeconomic factors, such as household size and food expenditure, are the significant determinants of energy intake at the household level.

\*The work is a part of the PhD dissertation submitted to the University of the Philippines-Diliman, Quezon City 1101, Philippines

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## Process and Impact Study of BINP Garden and Poultry Activities

Rezaul Karim<sup>1</sup>, F. James Levinson<sup>2</sup>, and Sascha Lamstein<sup>2</sup>

**Objective:** Identify the benefits of the Bangladesh Integrated Nutrition Project (BINP) garden and poultry activities and assess the value added from these activities in the presence of community-based nutrition counselling .

**Methodology:** Data were collected through 2,606 household interviews (1,705 participants and 901 non-participants), 36 key-informant interviews of government and NGO officials, 19 focus-group discussions, and field observations from five BINP and seven non-BINP upazilas from February to April 2002 covering income generation, food consumption, nutritional status, perceptions of garden and poultry activities, and project design and management, and were analyzed using SPSS and descriptive techniques.

**Results:** Preliminary findings showed that project participants benefited from marginal cash income after costs: approximately, Tk 700 from home-gardening and not even Tk 500 from poultry rearing. Only 36% of garden participants and 44% of poultry participants met the established eligibility criteria, and less than half of the participants from the poultry project and slightly more from the garden project had sustained project implementation for one year or more. Coordination between the various implementing NGOs, collaboration between NGOs and government counterparts, and information flow within the government line-ministries were inadequate.

**Conclusion:** Projects involving credit do not effectively reach the poorest of the poor because of the NGOs' unwillingness to give loans to women likely to default and due to the women's own fear of business risk and loan default. Poultry projects involving foreign birds are often incompatible with the lifestyle and culture of the poorest of the poor. Until the management and financial capacity of these women is improved, rearing foreign birds is difficult, especially when support from project staff is limited. Finally, effective coordination, collaboration, and information flow are essential.

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## **Contextualizing Malnutrition: Cultural Perspectives on Child-feeding and Childhood Illness in Urban Slums of Dhaka**

**L. Blum** and P. Nahar

**Objective:** Examine the cultural and economic contexts in which child-rearing takes place and understand the explanatory model of malnutrition.

**Methodology:** Data were collected over a five-month period from March to July 2000 in the slums of Dhaka city. The research strategy involved a mix of qualitative methods, including in-depth interviews carried out in 30 slum households with primary caretakers of children aged 6-24 months. The sampling framework was designed so that half of the children were severely malnourished and the other half were designated as 'better-nourished.'

**Results:** The results showed polarized patterns of child-feeding in the malnourished group. If production of breastmilk was perceived as insufficient, the infant's diet was supplemented with alternate milk products or a semi-solid porridge as early as the first weeks of life. Mothers who considered their milk to be sufficient introduced solids dangerously late in infancy. In comparison, the children in the better-nourished group generally received semi-solids at an appropriate age. Other results demonstrated that care providers commonly did not associate severe malnutrition with lack of food. Causation was rather attributed to evil spirits that prey on women and young children. Correspondingly, remedies were frequently sought with magic-religious healers known to treat spirit possession. The data also indicated that involvement of fathers in childcare was linked to better child nutrition.

**Conclusion:** The findings confirm that perceptions relating to adequacy of production of breastmilk guide infant-feeding practices. The results have important programmatic implications for intervention strategies aimed at reducing malnutrition in the urban slum setting. Efforts designed to address severe malnutrition must take into consideration local causal explanations.

## Beyond Education: Social Benefits of Health Sessions

L. Blum and E. Ferdous

**Objective:** Develop and test strategies designed to improve the management of malnourished children at the community level.

**Methodology:** Qualitative research, consisting of in-depth interviews and observations of caring practices, was conducted in homes of 20 malnourished children living in the urban slums of Dhaka. The sample included participants enrolled in a broader study designed to enable caretakers to manage rehabilitation of severely-malnourished children in the home setting. Based on the research, three intervention strategies were identified and implemented at the field level. The strategies were tested over a six-month period and included the following: community-based preparation of *kitchuri*, health-education sessions with care providers, and group counselling of fathers and mothers.

**Results:** The weekly education sessions with the caretakers of malnourished children proved to be the most successful intervention. An unexpected finding was that the participants identified various social benefits gained through the sessions. Specifically, the new knowledge and skills that they acquired fostered respect, enhancing the social position of mothers both in the household and community, thereby boosting confidence in their ability to provide adequate care for the young children. Signs of amelioration in the health of the children also enhanced involvement of fathers in the provision of childcare.

**Conclusion:** Giving mothers of malnourished children the opportunity to share experiences with peers appears to boost self-esteem. The empowerment gained through weekly sessions enhanced the willingness of mothers to apply appropriate care-giving practices and facilitated the recognition of their capacity to influence the health status of children.

## Protocolized Management of Severe Child Malnutrition: Feasibility and Effectiveness of Primary Healthcare-based Child Nutrition Services for the Urban Poor

P. Osinski<sup>1</sup>, T. Ahmed<sup>1</sup>, T. Faruque<sup>1</sup>, G.J. Fuchs<sup>2</sup>, J. Hyderi<sup>3</sup>, and S.K. Roy<sup>1</sup>

**Objective:** Test protocolized management consisting of improved home-based feeding in combination with outpatient disease control, micronutrient supplementation, and required referrals as means of addressing severe malnutrition among weanling-age children in urban Bangladesh.

**Methodology:** This study was conducted from March to December 2001 in collaboration with three NGO-run urban primary-care clinics in the Dhaka metropolitan area. Clinic staff without previous involvement in the management of protein-energy malnutrition (PEM) was trained and technically supervised to identify and manage already prevalent severe malnutrition among attending children aged 6-23 months. Management consisted of (1) counselling on improved feeding in the home, (2) outpatient management of infectious disease; (3) micronutrient supplementation; and (4) scheduled weight-gain monitoring and follow-up until recovery from severe underweight (less than -3 SD weight-for-age) or exit from the protocol for other reasons. Severely underweight children with severe illness/complication or severe wasting or bipedal oedema were referred for facility-based management, followed by home-based management. Improvement from severe malnutrition was monitored with the aid of z-score-based growth cards designed for the protocol and by monthly assessments of changes in weight-for-age z-scores among enrolled children.

**Results:** From March to December 2001, one hundred seventy-seven severely-malnourished children were identified and enrolled for protocolized management—nearly 80% of them from slum households. By 31 March 2002, one hundred and six (59.9%) had recovered from severe underweight 33 (18.6%) remained under management, and another 22 (12.4%) had left the catchment areas of the clinic while still severely underweight. Recovery rates from severe underweight achieved by the intervention clinics ranged from as low as 44% to as high as 79%. Mean monthly weight-for-age improvements of 0.19 z-scores were achieved among all enrolled children. Children who did recover from severe to moderate underweight had improved at a mean monthly rate of 0.41 weight-for-age z-scores and took, on an average 72 days for recovery.

**Conclusion:** Integration of PEM identification and management with other child health services is a feasible and effective approach for addressing severe malnutrition among weanling-age children in urban Bangladesh, including children from urban slums.

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## Z-score-based Assessment, Target-setting, and Monitoring in Community-based Protocolized Management of Severe Child Malnutrition in Dhaka, Bangladesh

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**Objective:** Discuss and propose weight-for-age z-scores as a practical and internally and externally consistent tool for assessing the severity of child malnutrition and for monitoring improvements at the individual and clinic level

**Methodology:** Currently available PC-based software (Nutrition Module of Epi Info) was applied to compute weight-for-age z-scores of severely-malnourished weanling age children at enrollment, to set targets for their recovery, and to monitor monthly progress both for individual children and at the clinic level. Z-score-based target-setting and monitoring was combined with the use of z-score-based growth cards specially designed for the intervention.

**Results:** From March to December 2001, ICDDR,B collaborated with three NGO-run urban primary-care clinics in the Dhaka metropolitan area in a pilot intervention for the identification and management of severe malnutrition among weanling-age children attending the intervention clinics. One hundred seventy-seven severely-malnourished children were identified and enrolled for community-based protocolized management. For these children, weight-for-age z-scores were computed to measure their degree of malnutrition at enrollment and to establish monthly improvement targets and timeframes for their recovery. Feedback reports on monthly individual-level z-score changes (numerical and plotted values) were provided to clinics and used, i.e., for validity checks on implausible reported weight gains and for intensified follow-up on severely-malnourished children who failed to improve. Clinic-level mean monthly improvements in weight-for-age z-scores were used in monthly protocol performance reviews with clinic managers and child nutrition counsellors. Z-score-based monitoring complemented weight-gain monitoring with the aid of gender-specific z-score-based growth cards and use of z-score-based reference charts and was, therefore, fully consistent with progress monitoring by clinic staff as and when children were brought for scheduled weighing.

**Conclusion:** Weight-for-age z-scores were found to be a practical and internally and externally consistent tool for identification of severe child malnutrition and for monitoring improvements at the individual and clinic level.

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## Increase in ‘Demand-led’ (maternal/community pursuit of) Growth Monitoring Using Home-based Direct Recording Scales

M. Verkerk<sup>1</sup>, K. Prenger<sup>2</sup>, S. Pahan<sup>2</sup>, and S. Saha<sup>2</sup>

**Objective:** Assess the understanding of mothers and acceptance of growth monitoring and reflections of community workers on applications of direct recording scale (DRS).

**Methodology:** An evaluation of DRS use was piloted in early 2000 with 13 semi-illiterate female village health volunteers (VHVs) covering one ward with about 150 children aged less than 5 years in Fotejangpur union, Chirirbandar upazila, Dinajpur district. In 2 control wards, teaching about growth curves was increased or remained routine. A questionnaire asking significance of growth curve shapes (increasing, flat, falling) presented to a random sample of 325 mothers in all wards measured understanding at baseline and 6 months. Interviews and focus-group discussions with mothers and community workers identified issues and attitudes toward DRS use.

**Results:** At 6 months of post-DRS implementation, the mothers and VHVs in the intervention ward showed an increase in questionnaire score by a factor of 1.48 compared to the control wards (1.03 with increased teaching and 0.85 with routine). The community workers appreciated DRS, although the VHVs shouldered an increased workload. The mothers spontaneously approached the VHVs requesting children to be weighed, correctly named steps taken to improve nutrition when growth curves flattened or fell (including teaching husbands on good food purchasing choices), and noted how all members of the family could learn about growth curves with home weighing.

**Conclusion:** The use of DRS was key to increasing ‘demand-led’ growth monitoring, increased maternal understanding of the significance of growth curve, and associated teaching clarifies the responsibility of mothers for the nutrition of their children. DRS is a valuable tool to educate all members of the community.

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## Effect of Use of Direct Recording Scales on Maternal Understanding of Growth Charts in Northwest Bangladesh

J. Slot<sup>1</sup>, K. Prenger<sup>2</sup>, and E. Hasdak<sup>2</sup>

**Objective:** Assess the effect of introducing Direct Recording Scales (DRS) in northwestern Bangladesh on maternal understanding of growth curves and growth charts.

**Methodology:** This intervention study was conducted in 3 wards of Fotejangpur union, Chirirbandar upazila of Dinajpur district—all similar in population and economic situation: Ward 1: DRS and education on growth curves; Ward 2: Education on growth curves; and Ward 3: None. In total, 300 mothers of children aged less than 2 years (8 each from the work areas of approximately 40 village health volunteers) were questioned using a 6-point scale before the intervention and repeated with different mothers 3 months after the intervention. Outcomes assessed were: change in the questionnaire score and change in the score on individual questions.

**Results:** There was a significant increase in the questionnaire score from pre- to post-intervention in Ward 1 [95% confidence interval (CI): 70.2-77.6% vs 83.6-89.8%] and Ward 2 (95% CI: 69.0-76.7% vs 78.1-85.0%), but this improvement was not significantly different ( $p=0.270$ ). Ward 3 showed no improvement. In the pre- and post-intervention, there was no significant difference between Ward 1 and Ward 2 on the total questionnaire score, but both scored significantly higher than Ward 3. Improvement in the knowledge on shape of the growth curve was demonstrated in Ward 1.

**Conclusion:** Education on growth chart increases the maternal understanding of such charts, but the 3-month use of the DRS does not confer any additional significant increase in understanding. The use of the scale increases maternal participation in the growth-monitoring process. Long-term utility for helping mothers and families to prioritize nutrition needs of children should be studied.

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## Measurement of Mid-chest Circumference to Identify Low-birth-weight Newborns

Stacy Saha and Rekha Folia

**Objective:** Assess the validity of 30 cm mid-chest circumference as a cut-off point for the estimation of low birth-weight among newborns in Bangladesh.

**Methodology:** Mid-chest circumference was measured in 202 liveborn babies at the LAMB Hospital during March-April 2002. Measurement was done by midwives using a piece of non-elastic string with knots 30 cm apart put around chest of the newborns at the level of the nipples. Weights of infants were recorded. Incidence of weight of infants less than 2,500 g was correlated with infants whose mid-chest circumference was less than 30 cm (as evidenced by the knots overlapping).

**Results:** Of the 202 infants measured, 38 weighed less than 2,500 g, and 36 had a chest circumference of less than 30 cm. Of the 38 low-birth-weight infants, 35 had a chest circumference of less than 30 cm (sensitivity=0.92). Of the 3 false positives, 2 weighed 2,450 g, and one weighed 2,250 g. Of the infants who weighed 2,500 g or more, one infant, weighing 2,500 g, had a chest circumference of less than 30 cm (specificity=0.99). Distribution of overall weight was as follows: <1500 g=1, 1500-1999 g=8; 2000-2499 g=28, 2500-2999=95; 3000-3499 g=59, 3500-3999 g=9; >4000 g=2 infants.

**Conclusion:** Measurement of mid-chest circumference could be a reliable tool for use by home-based delivery care-givers (trained traditional birth attendants, health volunteers, female health assistants) in rural Bangladesh to screen for low birth-weight. A larger study with adequate sample size in each weight category is necessary to validate these results. Early detection and management of low-birth-weight infants in the community should improve overall nutrition and decrease morbidity and mortality among this vulnerable group.

## A Province-based Nutrition Support Programme: What Works and What Does Not

D.S. Akram<sup>1</sup> and S. Mustafa<sup>2</sup>

**Objective:** Assess the success of training healthcare providers (HCPs) on early detection and effective counselling regarding malnutrition and on how to improve the nutrition status of children and women by improving feeding practices through nutrition counselling.

**Methodology:** The working strategy of the Nutrition Support Programme (NSP) included advocacy, capacity-building, service-delivery, monitoring, evaluation, and dissemination of information. For advocacy, meetings with policy-makers in the public and private sectors were arranged to highlight the importance of nutrition for children and women, discuss issues relating to malnutrition, and evaluate ongoing and proposed activities, including constraints. Capacity-building was done by training 1,000 HCPs—both doctors and paramedics—on early detection and effective counselling for nutritional problems. Four-day workshops, followed by 2-day refreshers, were held every 4 months to update and refresh the knowledge of HCPs. The NSP has established 102 units for children and 87 for women for delivering services. In these ‘nutrition corners,’ trained professionals assess the nutritional status of children and mothers and counsel the target population. These nutrition corners are supervised by 1,000 HCPs. The field officers and Project Director monitor and evaluate the work by assessing monthly reports and regular physical monitoring. Information on progress of NSP is disseminated through annual reports and discussions in related fora.

**Results:** The nutritional status of children with normal weight improved from 35% in 1992 to 50% in 1999 in the target areas. The follow-up also increased from less than 8% to 50% respectively during this period. In total, 85,000-90,000 children and 25,000-30,000 mothers had visited the reporting centres; of them, 70% were from the ‘child corners’ and 25% from the ‘maternal corners’. Awareness of mothers on better dietary practices improved by 50% during 1992-1999.

**Conclusion:** Facility-based nutrition counselling resulted in an increased awareness among a large number of mothers. This was reflected in better follow-up and in increased percentage of normally-nourished children. The NSP has already been initiated by NGOs.

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## **Sustainability of Nutrition Education on Consumption of Green Leafy Vegetables by Young Children in Poor Communities in Rural Bangladesh**

**Md. Yunus**<sup>1</sup>, D.S. Alam<sup>1</sup>, J.P. Vaughan<sup>1,2</sup>, K.M.A. Aziz<sup>1</sup>, and Abdullah H. Baqui<sup>1,3</sup>

**Objective:** Evaluate whether the earlier positive impact of a nutrition-education intervention on consumption of green-leafy vegetables by young children as a source of vitamin A had been sustained for four years after the termination of the intervention.

**Methodology:** The study, conducted in the Matlab field area of ICDDR,B: Centre for Health and Population Research during June-December 1999 included 118 and 124 households with very poor socioeconomic conditions having one child aged 6-59 months, respectively, from the previous intervention and the comparison area. The intervention households received intensive nutrition education for one year prior to 4 years of this evaluation study, whereas the comparison households were not given any nutrition education from the project. Both quantitative and qualitative methods were used in the study.

**Results:** The earlier results showed that a significant increase was achieved in the proportion of children fed with  $\beta$ -carotene-rich vegetables and in the mean frequency of consumption of relevant vegetables at the end of the intervention. At evaluation after four years, the difference between the intervention and the control groups did not reach statistical significance with respect to the proportion of children fed with beta-carotene-rich vegetables and the mean frequency of consumption. However, data showed a still-remaining positive effect in the intervention group.

**Conclusion:** The findings of this study indicate that the impact of nutrition education is poorly sustainable in this community. For a sustainable effect, nutrition education should be repeated at regular intervals.

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## **Enhancement of Nutritional Status among the Poorest of the Poor through Community Peer Educators in Andhra Pradesh, India**

Nasreen Sultana

**Objectives:** Assess the nutritional knowledge of the population living in the project area and measure the impact of nutritional educational programme on them.

**Methodology:** The Chittoor district in Andhra Pradesh, India, was selected for the present study. For a period of 12 months, trained peer educators provided knowledge to the people about the importance of nutrition, balanced diet, nutritional deficiency-related diseases, functional-3 and operational-5, with the help of pictorial illustrations and locally available foods.

**Results:** The programme increased not only the knowledge of the people about balanced diet, and nutritional deficiency-related diseases but also made them to eat balanced diet with the locally and cheaply-available foods in their community. They also became message-carriers to the neighbouring villages where this programme was not in operation.

**Conclusion:** The processes adopted in this study are very simple, easy and cost-effective. Thus, this experiment can be replicated in the rural areas of all the developing countries where similar situations exist. Many Indian states are planning to start similar programmes in their respective states.

## **Retention, Perceived Usefulness, and Use of the Family Health Card in the Health and Population Sector Programme of Bangladesh**

**Rukhsana Gazi, Jahanara Khatun, Ali Ashraf, and Mahbub ul Alam**

**Objective:** Assess the extent of retention and use of the Family Health Card (FHC) in the Health and Population Sector Programme (HPSP) of Bangladesh.

**Methodology:** The Family Health Research Project of ICDDR,B: Centre for Health and Population Research conducted a study in 19 subdistricts during February-March 2000 using quantitative and qualitative methods. Data were collected, after six months of distribution of FHCs, from 1,034 attendees/clients from different service-delivery tiers, such as EPI spots and Satellite Clinics (409), Health and Family Welfare Centres (387), and Upazila Health Complexes (247). Also, 1,130 client-provider observations and 613 interviews with service providers were conducted, and 10 focus-group discussions (FGDs) were held.

**Results:** Forty-nine percent of the 1,034 attendees retained the FHCs. Most card retainers were females, married, and educated, and sought services for their children or other family members rather than for themselves. A significant association was found between the retention of FHCs and the service providers from the lower-level ESP tiers. Multivariate analysis using three models confirmed that educational attainments, sex, clients' perceived importance of usefulness of FHCs, and enforcement of the service providers for bringing the FHCs were significantly associated with the retention of FHCs. Most providers found the FHC a useful tool: the card was convenient for record-keeping, identifying the met and unmet needs of clients, maintaining the continuity of treatment, and referring clients to higher tiers. The clients found it useful for obtaining quick service and a variety of services, remembering the due dates for follow-ups, and getting additional unexpressed services offered by the providers. About one-fifth of the clients were referred to other facilities through using the FHCs.

**Conclusion:** Both clients and service providers found the FHC a useful tool. They need more orientation on uses of the FHC for practical purposes, such as using it as a formal referral tool and for its enhanced utility. Ample opportunities exist for promoting the FHC for tapping missed opportunities to address the unmet needs of the whole family.

## Trafficking of Women and Children in Bangladesh: An Overview

Rukhsana Gazi<sup>1</sup>, Ziaul Haque Chowdhury<sup>1</sup>, and S.M. Nurul Alam<sup>2</sup>

**Objective:** Obtain information on the magnitude, procurement process, common routes, and underlying conditions linked with the trafficking of women and children in Bangladesh, and identify the research gaps.

**Methodology:** During February-August 2000, the Family Health Research Project of ICDDR,B: Centre for Health and Population Research conducted a comprehensive review on the trafficking of women and children in Bangladesh. In-depth interviews were conducted with key informants (n=10) from different organizations, rescued women and children (n=8) from shelters, and convicted prisoners (n=6) from the Dhaka and Jessore jails to collect information on the trafficking-related issues. Newspaper clippings, research reports, journals, inventories, booklets, and newsletters were also reviewed for the purpose.

**Results:** More than 400 women and children were smuggled each month from Bangladesh. During 1990-1992, 1,000 child-trafficking cases were documented in newspapers. Refugee camps (66), cross-border families, and pocketed enclaves by the neighbouring country were used as the common sites for trafficking. Traffickers used 18 transit points along the border areas, and procured victims through false marriage, parenting and love affair, and allurements for job opportunities. The underlying factors or causes linked with the trafficking problem included: 'push' and 'pull' factors and conditions linked with sending and receiving communities, low employment opportunities, unawareness of the problem, low social status of women and their vulnerability, including payment of dowry and unregistered marriage, broken family, urbanization, migration, wage employment, labour migration, and prostitution. Some findings were contrary to the previous notion that prostitutes were mostly forced; rather circumstances, such as divorce, deception by men, allurements by pimps, and sexual abuse, compelled them to join this business. Anti-trafficking activities in Bangladesh have been mostly focused on networking, capacity-building, protection, and prevention. Community-based research on deep-rooted trafficking antecedents are rare. Very little work on monitoring and evaluation of NGO interventions was done.

**Conclusion:** Gender discrimination, unemployment, unawareness, and well-organized networks of traffickers are some critical factors. A uniform plan of action, including mass-media campaign on the anti-trafficking issues using radio and TV, is needed at the national level. NGOs need to develop mechanisms and improve capacity for monitoring, evaluation, and community-based targeted research. The governments and NGOs of this region need to work in a coordinated approach and under a common legal framework to address the prevalent conditions.

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## EQ-5D<sub>index</sub>: A Measure of Health Status, and Health Inequalities in England

Md. Afzal Hossain Sarker

**Objective:** Examine how useful EQ-5D is as a tool for measuring inequality in health in a population, describe variations, and measure the extent of social inequalities in health across the population in England using illness scores, a complementary measure of EQ-5D<sub>index</sub>.

**Methodology:** Data collected from about 15,000 people as part of a health survey conducted in England in 1996 were used. The illness concentration index and relative inequality index (RII) of social class were estimated, and two-way analysis and multiple linear regression analysis of sociodemographic and geographic factors on illness scores were done.

**Results:** Social class V (lowest class), IV, IIIM, and IIIN had significantly lower health status than social class I. People with lower qualifications and women than men had significantly poorer health, everything else being the same. Being divorced, separated, older, having no access to a car, living in a rented house, and being Pakistani or Indian were also factors associated with lower health. People under the Local Health Authority of smaller geographical area or urban population had better health. The standardized illness concentration indices were  $-0.0888$ ,  $-0.1139$ , and  $-0.0611$ , and the standardized RIIs were  $-0.562$ ,  $-0.735$ , and  $-0.395$  for the whole sample, for male, and for female samples, respectively. Results of regression showed that social class had no significant effect on illness scores for female, while class IV and IIIM significantly affected the illness scores for male.

**Conclusion:** The results showed the existence of inequality in health across the population in England. The separate illness concentration indices (and RII) for men and women suggest that inequalities in men were more pronounced than those in women, although the mean illness scores for women were always higher than for men across the social classes. EQ-5D can be considered a good tool for measuring health status and health inequalities in a population.

## Roles of Women in Water and Sanitation Practices

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Md. Zahirul Islam<sup>4</sup>, Sheikh Masudur Rahman<sup>5</sup>, and Afsana Yasmeen<sup>6</sup>

**Objective:** Understand the diversity of roles of women in water and sanitation practices.

**Methodology:** The study was conducted in two villages of Dhaka and Comilla districts from June 1999 to June 2000. The study was designed to explore the differences in the development of the water and sanitation sector, in NGO intervention and non-intervention areas, both quantitative and qualitative methods were used.

**Results:** Community members living in the intervention areas were better informed about issues relating to the importance of a clean latrine and washing hands before eating and after defaecation compared to those living in the non-intervention areas. In all the sites studied, collection of water was viewed exclusively as the work of women. At the age of 6 or 7 years, girls participated in the collection of water, and the expectation was for women to carry out this chore throughout their life, even during pregnancy and lactation. Of 281 respondents, 48.4% mentioned that they faced physical problems during pregnancy while carrying water; of them, 60% referred to weakness and 23% to back-pain, and 3.8% reported bleeding. Across the study areas, the vast majority of female respondents suggested that daily cleaning of latrines was also the responsibility of women.

**Conclusion:** The results suggest that the tasks relating to obtaining water and cleaning latrines, which are perceived as household chores, fall strictly under the rubric of female responsibilities. The findings demonstrate the way in which the dichotomous gender relationship, which for women encompasses those chores relating to the maintenance of the household, influences the division of labour. Women are required to perform arduous tasks even during times of heightened physiological stress.

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## Organisms Causing Nosocomial Infection and their Antibiogram Isolated from Patients of Intensive Care Units

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**Objective:** Determine the common pathogens responsible for nosocomial infection, and find out the antibiogram patterns of isolated organisms.

**Methodology:** In total, 201 clinical samples were collected from 142 suspected cases of nosocomial infections admitted to the Intensive Care Units of the Combined Military Hospital, Bangabandhu Sheikh Mujib Medical University, and Dhaka Medical College Hospital from 1 May 2000 to 30 April 2001. The bacteriological study was carried out at the Armed Forces Institute of Pathology, Dhaka.

**Results:** One hundred thirty-nine (69.15%) samples yielded bacterial growth. *Staphylococcus aureus* was the most common nosocomial pathogen isolated in 30 (20.83%) samples, followed by *Klebsiella pneumoniae* in 29 (20.13%), *Pseudomonas aeruginosa* in 24 (16.67%), and *Escherichia coli* in 22 (15.27%) samples. Urinary tract infection was the most common nosocomial infection encountered in 51 (36.69%) cases, followed by wound infection in 37 (26.62%), lower respiratory tract infection in 28 (20.14%), and septicaemia in 11 (7.91%) cases. Over 72% (72.14%) of the isolated organisms were resistant to antibiotics prescribed by physicians. *S. aureus* was 100% resistant to penicillin, 86.7% to amoxicillin, 73.3% to cephalexin, and 70% to methicillin. Most methicillin-resistant *S. aureus* were sensitive to clindamycin and vancomycin. All the Gram-negative bacilli showed 100% resistance to amoxicillin and also increased resistance to other antimicrobial agents, but most Gram-negative bacilli were sensitive to amikacin.

**Conclusion:** The exact prevalence of nosocomial infection in Bangladesh is not known. An increased level of drug resistance of the isolated pathogens in the present study suggest carrying out a large-scale study to establish a surveillance system to determine the patterns of nosocomial infection, to report timely to the appropriate authority, and to maintain a proper antibiotic policy.

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## Health Issues of an Ageing Bangladeshi Population

Golam Mostafa and Peter Kim Streatfield

**Objective:** Examine the health status of population aged 60 years and over, their living arrangements, and care given by kin.

**Methodology:** Using data from the Matlab Health and Demographic Surveillance System (HDSS), the living arrangements of elderly people during 1974, 1982, and 1996, self-reported chronic and acute morbidities, and unhealthy status were examined through cross-tabular analysis. The method of Sullivan was used for calculating healthy life-expectancy and active life-expectancy.

**Results:** The elderly population of Bangladesh will increase from 6.8 million in 2000 to 65 million in 2100, whereas the total population will be about double, and the ratio of people of working-age to elderly people will decline from 11 to 2 at the end of the century. The prevalence of chronic morbidity was higher among females than males. Arthritis was the most prevalent chronic disease among both males and females, followed by gastric problems and anaemia. The most prevalent acute conditions among males and females were cough, fever, and cold, followed by headache and toothache. A significant gender disparity was noted as females were more unhealthy than males. Inability to carry out normal daily activities was more common among females than males. The living arrangements, in terms of propensity to live with children, did not change substantially during the two decades. Among the elderly couples, males were cared for by wives, but females were mostly cared for by daughters-in-law.

**Conclusion:** The working-age population will be called upon to provide support for a larger proportion of the aged in the future. Females rather than males are more likely to suffer from chronic and acute morbidity symptoms. The policy-makers should develop specific action plans for the well-being of elderly people.

## Prevalence and Risk Factors for Sexually Transmitted Infections among Females Working in a Truck-stand in Urban Bangladesh

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**Objective:** Explore the risk and prevalence rates of sexually transmitted infections (STIs) among people working in the Tejgaon truck-stand of Dhaka city.

**Methodology:** This cross-sectional study involved a random selection of adult males and females working in the truck-stand, except truck drivers and their helpers. During January 2000-October 2000, data were collected through field interviews using a structured questionnaire, clinical examinations, and laboratory investigations of collected specimens. Laboratory investigations were done for diagnosis of syphilis, gonorrhoea, chlamydial infection, trichomoniasis, bacterial vaginosis, and candidiasis. Only the subsample data of participating females were used in this analysis.

**Results:** Of 236 women approached, 208 were enrolled in the study, which is 23% of the total study population. The prevalence of syphilis, gonorrhoea, chlamydial infection, trichomoniasis, bacterial vaginosis, and candidiasis among the female participants was 3%, 8%, 5%, 4%, 19%, and 4% respectively. Husbands of only 3% of the women used condoms all the time. Five women had sexual relations in exchange for gifts. Bivariate analysis revealed that previous sex with two or more sex partners (polygamous marriage) was a risk factor for syphilis, gonorrhoea, chlamydial infection, and trichomoniasis.

**Conclusion:** A high prevalence of STIs among the females working in the truck-stand implies that unsafe sexual behaviour is also high among them. This suggests that workers in close proximity to so-called high-risk groups, such as truck drivers, are also at a high risk for STIs. Hence, an HIV/STI control/prevention programme should also include bridging populations working closely with so-called high-risk groups.

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## Influence of Gender Composition on Subsequent Fertility

Carel T. van Mels

**Objective:** Investigate from theoretical models and actual data from different regions of Bangladesh in which way the son preference results in higher fertility.

**Methodology:** This study tests the hypothesis that couples with only or mostly daughters will be more inclined to have additional children than couples with only or mostly sons. It looked at women from Matlab with two or three children in 1983 (9,282) and 1995 (14,057) and women from other ICDDR,B surveillance sites in 1995 (7,332), and determined the proportions that have another child within the next four years depending on the gender distribution of their children. In addition, a theoretical model was used for determining the effect on the total fertility.

**Results:** Couples with mostly sons had a much smaller chance of having another child in the next four years, especially in the late nineties, when the contraceptive prevalence was high. For instance, couples with three daughters had another child more than three times as often in the next four years than couples with two sons and one daughter in Matlab in 1995. The model shows that couples with a desired family size of, on an average, 2.5 children will have actually 2.82 children if they want at least one son.

**Conclusion:** If the son preference can be reduced, total fertility in Bangladesh will fall.

## Effect of Low-dose Oral Contraceptive Pills on Blood Glucose and Other Cardiovascular Risk Factors in Normal and Underweight Women

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K.B. Biswas<sup>2</sup>, R. Sultana<sup>4</sup>, T.A. Chowdhury<sup>1</sup>, and L. Ali<sup>2</sup>

**Objective:** Study the effects of low-dose oral contraceptive pills (OCPs) on blood glucose and cardiovascular risk factors.

**Methodology:** Eleven underweight [body mass index (BMI) <18.5] and 29 control (normal BMI) women using low-dose OCPs (30 µg of ethinyl estradiol and 150 µg of levonorgestrel), matched for age (range 25-45 years), socioeconomic condition, and duration of OCP use (range 6-60 months) were investigated in this cross-sectional study. All the subjects were drawn from the Department of Gynecology and Obstetrics of Dhaka Medical College Hospital during January-December 2001. Serum glucose, lipids [triglyceride (TG), total cholesterol, high-density lipoprotein (HDL), low-density lipoprotein (LDL), serum C-peptide, plasma fibrinogen, prothrombin time, platelet aggregation, and antithrombin III were measured at the Biomedical Research Group Laboratory of BIRDEM. Sensitivity and secretory capacity of insulin were calculated by homeostasis model assessment (HOMA). Statistical comparison between the groups was done by the Mann-Whitney test.

**Results:** The blood glucose values were similar in the two groups, but serum C-peptide was significantly higher in users with low BMI. A better sensitivity of insulin was observed in the low-BMI group compared to the normal BMI group. Platelet aggregation between the two groups was not different. Plasma fibrinogen (median value 450 mg/dL) just exceeded the upper limit of the reference range (normal range: 200-400 mg/dL) in the control BMI group. In contrast, the corresponding value in the low-BMI (318 mg/dL) group was almost at the middle of the reference range. A significantly-prolonged prothrombin time (13.80 seconds) was found in the low-BMI group ( $p=0.058$ ); the values were still within the reference range (10-14 seconds). Antithrombin III activity in the normal BMI group was 108%, whereas it was 105% in the low-BMI group.

**Conclusion:** The findings suggest that: (a) OCPs do not affect the glycaemic, insulinaemic, insulin-secretory, and sensitivity status of underweight subjects; (b) the reported risk of procoagulant or thromboembolic changes in pill users is lower in normal BMI; and (c) low-BMI users have a significantly longer prothrombin time.

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## Old Age, Poverty, and Community Support: Qualitative Evidence from a Village in Bangladesh

Ashraful Alam Neeloy

**Objective:** Explore the available sources of family and community support for the elderly population of extremely poor households of a rural area of Bangladesh.

**Methodology:** In-depth interviews were conducted with 20 elderly persons, aged 60 years and above, from poor households in a village under Chakaria upazila of Cox's Bazar district. Descriptive data on the social support mechanism of elderly-care were collected. Information on socioeconomic and cultural factors influencing elderly-care, on the sources of community support and on supportive activities for the elderly persons of government and non-government organizations (NGOs) was also collected. In addition, key-informant interviews were conducted. The data were collected during May-July 2000.

**Results:** At the family level, the spouse, son, daughter, and daughter-in-law were the most important providers of support than only sons who provided financial support. Support of daughters was limited, since the elderly parents were not likely to have unmarried daughters, and daughters needed the approval of their husbands to help their parents. The general perception that elderly people are taken care of well by the family was not the case in rural households. Poverty, breaking of the extended family, and decrease in filial piety were the major factors hindering family support. Neighbours and villagers were the most important support providers for extremely poor elderly people. Poor elderly persons obtained assistance from neighbours out of sympathy and in exchange for labour as well.

**Conclusion:** Since the family is no longer a dependable shelter, and elderly persons require social and community support, programmes should be designed for them to improve the social support mechanism especially through the community.



## Effect of Antiretroviral Therapy on the Rate of Disease Progression in People with Haemophilia and HIV Infection

Masuma Akter Khanam<sup>1</sup>, Lesley Ashton<sup>2</sup>, Roger Garsia<sup>3</sup>, and Jenny Learmont<sup>4</sup>

**Objective:** Investigate the influence of antiretroviral therapy on the rates of disease progression in people with haemophilia type A and HIV-1 infection and examine other factors contributing to the risk of progression.

**Methodology:** Data were collected through retrospective reviews of medical records and records held at the Haemophilia Treatment Centre (HTC), Royal Prince Alfred Hospital, Sydney. Eligible participants included people with haemophilia with a laboratory-confirmed HIV infection who received healthcare at the HTC after December 1983. All cases were followed to March 2001. Rate of progression to AIDS and death were estimated for these individuals, and the influence of potential factors associated with disease progression, such as age, year of diagnosis of HIV, severity of haemophilia, receipt of antiretroviral therapy, and CD4+ T-cell count at commencement of therapy were assessed.

**Results:** The results showed that individuals who received anti-retroviral therapy, particularly those receiving 3 drugs or more, were less likely to progress to AIDS or death ( $p < 0.003$ ). A higher CD4+ T-cell count at commencement of therapy was also strongly associated with delayed progression to AIDS and death after adjusting for the influence of anti-retroviral therapy and age ( $p < 0.0001$ ). The severity of haemophilia, year of diagnosis of HIV, and CD4+ T-cell count at diagnosis were not significantly associated with the risk of progression to AIDS or death after adjusting for receipt of anti-retroviral therapy, CD4+ T-cell count at commencement of anti-retroviral therapy and age at HIV infection ( $p < 0.196$ ). Although older age at HIV-1 infection was weakly associated with an increased risk of death, this was not significant after adjusting for anti-retroviral therapy and CD4+ T-cell count at commencement of anti-retroviral therapy ( $p = 0.916$ ). Significantly more cases of HIV wasting and *Mycobacterium avium* complex were recorded at diagnosis of AIDS compared to the distribution of first AIDS defining illnesses reported elsewhere in Australia ( $p < 0.05$ ).

**Conclusion:** This study shows that antiretroviral therapy, particularly combination therapy, including at least 3 anti-retroviral drugs, can effectively delay the progression of HIV disease to both AIDS and death. The study also highlights the importance of commencing anti-retroviral therapy before CD4+ T-cell counts decline to less than 200 cells/mL.

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## Correlates of Timing of Induced Abortion in Rural Bangladesh

Mamunur Rashid and M. Kapil Ahmed

**Objective:** Investigate some factors affecting the timing of induced abortion.

**Methods:** Data for this study (2,247 abortion cases) were obtained from a longitudinal Health and Demographic Surveillance System (HDSS) in Matlab, a rural area of Bangladesh, for the 1991-1998 period. Matlab is divided into two areas: treatment and comparison areas. The treatment area receives a series of carefully-designed health and family-planning interventions from ICDDR,B: Centre for Health and Population Research. The comparison area receives services from the regular government programme. Pregnancy terminations (livebirth, stillbirth, spontaneous abortions, and induced abortions), including other demographic events, are registered by the community health workers who make a monthly visit to every household and supervise them for accurate completion of vital events. The HDSS records the gestation period in a monthly basis instead of weekly basis, resulting in difficulty to make detailed analysis of the timing of induced abortion. Both bivariate and multivariate techniques were used for data analysis.

**Results:** The results suggest that the differences in the timing of induced abortion depend on different factors. Variations in the timing of abortions were found to be related with maternal age, number of living children, women's education, dwelling space, study area, religion, women's occupation, and age at marriage. Among these various factors, five variables indicated statistically significant associations with the timing of induced abortions performed in the third and later months of pregnancy: maternal age ( $p < 0.05$ ), number of living children ( $p < 0.05$ ), education ( $p < 0.01$ ), study area ( $p < 0.01$ ), and age at marriage ( $p < 0.05$ ).

**Conclusions:** The results demonstrated that education of women, higher age at marriage, and comprehensive MCH-FP services help in reducing the gestational age of abortion. Policy-makers need to take the points into consideration.

## Views of Mothers on Unmet Needs for Medical Services for Their Sick Children in Rural Bangladesh

Nurul Alam

**Objective:** Examine the levels and correlates of unmet needs perceived by mothers for medical services to manage chronic and acute illnesses of their children in rural Bangladesh.

**Methodology:** During the health and socioeconomic survey conducted in Matlab in 1996, mothers of 2,126 children who had acute illnesses in the past month or chronic illnesses in the past 3 months were interviewed to assess their unmet needs for medical services. The mothers were asked whether they felt the need of medical services for their sick children, which were not available to them on time. The correlates of the perceived unmet needs included type and severity of illness, age and sex of ill children, education of mothers, household economic condition, and quality of health services available in the area. Cross-tabulations and logistic regression were used for data analysis.

**Results:** The odds of unmet needs perceived by the mothers were 6.6 times higher for children who had chronic illnesses and 7.4 times higher for children who had both chronic and acute illnesses than for children who had acute illnesses only. The unmet needs were higher for illness episodes of boys than of girls, of older children than of younger children, and of children of poor households than of children of rich households. The mothers who expressed that there were unmet needs were more likely to adopt home-care for chronic but not acute illnesses, than the mothers who did not express that there were unmet needs.

**Conclusion:** The high unmet needs perceived by the mothers for their children suffering from chronic illnesses suggest that parents do not get needed medical services for their children for chronic illnesses. While modern medicine is less effective against chronic illnesses, parents need to be knowledgeable about preventive measures to lower the risk of repetition of illness symptoms and curative measures to assuage suffering.

## **Extent of Data-transfer Errors in the Unified Management Information System of the Health and Population Sector Programme of Bangladesh**

**Md. Jasim Uddin** and Ali Ashraf

**Objective:** Examine the extent of manual data-transfer errors at the upazila level and below and its implications in performance under the Unified Management Information System (UMIS), newly introduced by the Ministry of Health and Family Welfare, Government of Bangladesh.

**Methodology:** Data were collected through a review of completed, relevant and recorded tools and in-depth interviews with upazila managers and field staff in four upazilas of Chittagong and Jessore districts during December 2000-May 2001.

**Results:** The service providers made substantial over-reporting and under-reporting during data-transfer from record-keeping to reporting tools or from one level of reporting tools to another. Notable over-reporting was found at the ward level. The range of over-reporting of DPT3, tetanus toxoid, oral pill, and injectables varied from 15% to 43%, while the range of under-reporting of the indicators varied from 7% to 29%. The performance of DPT3, tetanus toxoid, oral pill, and injectables also varied in different months due to these data-transfer errors. The use of note books, white sheets, and diaries by the field workers during their field visits, instead of using the designated record-keeping tools, absence of adequate supervision, and limited use of data at the upazila level and below were the main reasons for data-transfer errors and fluctuation in the performance of ESP indicators.

**Conclusion:** More attention is needed in the use of the designated record-keeping tools by the field workers during their field visits and in maintaining accuracy during data-transfer. An effective mechanism for the regular use of data at the upazila level and below may reduce errors substantially.

## **Incorporating the Voice of the Community to Facilitate Transparency and Accountability in the Health System**

**Md. Jasim Uddin**, Ali Ashraf, A.K.M. Sirajuddin, and Mahbub-ul-Alam

**Objective:** Assess the effects of Stakeholder Committees formed by the Health and Population Sector Programme (HPSP) of Bangladesh for incorporating the voice of the community to facilitate transparency and accountability in healthcare.

**Methodology:** Ten committees from Dhaka, Rajshahi, and Sylhet divisions were selected. Data were collected through in-depth interviews with committee members and service providers, focus-group discussions (FGDs) and exit interviews of service users, and review of records in October 2000.

**Results:** Fifty-four percent of the committee members were poor, while 40% of them were females. About 92% of the members reported that they had an equal chance to be involved in committee activities and to express their views at meetings, and that their opinions were well-respected. Members indicated the usefulness of the committees in raising awareness among rural people about sources of health services and effects of adolescent marriage, removing unauthorized structures from the health centre compounds, and assisting in the organization of National Immunization Days. Monitoring of activities of the local health centres by the committees ensured regular attendance and a longer period of stay of the service providers, stopped the illegal charging of money from clients, and serving poor patients with respect. Most users in FGD sessions had observed improvements in terms of cleanliness, sitting arrangement, reduced waiting time, and service-providing hours at the health centres after the formation of committees. The committees ascertained the functioning of Upazila Health Complexes and Union Health and Family Welfare Centres by inquiring about staff strength, number of patients treated per day, stock of medicines, and regular availability of service providers at the facilities for establishing transparency and accountability.

**Conclusion:** The results showed that the stakeholder committees were useful in incorporating the voice of the community to facilitate transparency and accountability in the health system, but the Ministry of Health and Family Welfare has to develop a mechanism to merge or establish a linkage between the stakeholder committees and the existing committees.

## Unmet Reproductive and Child Health Needs of Clients of Urban NGO Clinics

Jahanara Khatun<sup>1</sup>, Nikhil Chandra Roy<sup>2</sup>, and Tariq Azim<sup>3</sup>

**Objective:** Identify the unmet health needs of clients for selected ESP services in the Urban Family Health Partnership (UFHP)-supported NGO clinics, including identification of the programmatic factors affecting the use of ESP services.

**Methodology:** A cross-sectional survey of the UFHP-supported six NGO clinics from six randomly-selected municipality areas was conducted during July-August 2000. In total, 1,478 clients were consecutively selected both from fixed and satellite clinics. The extent of unmet needs, reasons for not seeking treatment, and whether the providers addressed those unmet needs were determined through exit-point interviews of clients, using a structured questionnaire.

**Results:** The findings showed that the unmet health needs among female clients of reproductive age were: tetanus toxoid (54%), family planning (26%), postnatal care (16%), reproductive tract infections (15%), and antenatal care (11%). The unmet health needs among children aged less than 5 years, were the highest (42%) for acute respiratory infections, followed by diarrhoea (38%) and immunization (22%). Although clients had specific health needs, they did not perceive (over 50%) their importance, resulting in unmet health needs. Since the clients of antenatal care and family planning are required to go through the algorithm-based screening chart, the providers could identify and address the unmet health needs of RTI (35%) better through this routine screening. Most clients preferred the UFHP satellite clinics due to proximity (90%), less-expensive health services (45%), and availability of skilled service providers (32%).

**Conclusion:** The findings suggest that providing a broader range of health services alone is not enough to ensure their use. A systematic screening mechanism should be in place for regular appraisal of clients for their unmet needs. Systematic behaviour change communication also needs to be introduced to increase awareness among clients about the availability of all types of health services and about their own specific health needs to reduce their unmet health needs.

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## Understanding of Causes of Death in Children Aged Less Than 5 Years by Verbal Autopsy

K. Prenger

**Objective:** Determine the causes of death, by verbal autopsies and assess the associated factors such as sex, age, income, nutritional status, and medical care.

**Methodology:** In 12 unions of northwest Bangladesh, 108 deaths of children aged less than 5 years were reported to field staff over 18 months in 2000-2001. Families were interviewed using a verbal autopsy format developed by the Aga Khan University and ICDDR,B: Centre for Health and Population Research. A doctor used designated formulae to assign causes of death. If the results were unclear, a narrative was reviewed to clarify the outcomes further.

**Results:** Over 80% of the reported deaths occurred in children aged less than one year, 34% were in perinatal and 8% in premature or small-for-gestational age babies. Eighty-four percent of the deaths occurred in families with monthly household incomes of less than 2,000 taka per month and 32% less than 1,000 taka. The nutritional status was normal in 50% of the children, but 14% had growth faltering and 23% had third-degree malnutrition. While deaths due to diarrhoea had decreased from 30% in a 1991 survey to only 3% in this survey, 50% were associated with malnutrition. Of 11% of the deaths primarily attributable to malnutrition, 63% occurred in girls. Thirty percent of the total deaths were caused by acute respiratory infections (ARI), with 81% of those being aged less than one year. Drowning caused well over half the 14% of the accidental death toll.

**Conclusion:** Verbal autopsies increase the understanding of causes of preventable deaths. To avert some of these deaths, areas for development of simple, early intervention include detection of high-risk pregnant mothers and children, acute respiratory infection cases, and in gender issues relating to malnutrition. High mortality (14%) in children identified as 'growth faltering' shows the need for an early nutrition intervention.

## A Comparison of House-to-House Visit versus Fixed-site Centres for Delivery of Family-planning Services

Mehrab A. Khan, Moarrita Begum, M.K. Barua, J. Chakraborty, Mazharul Islam, and Radheshyam Bairagi

**Objective:** Investigate the impact of change in the family-planning service-delivery system from house-to-house to the fixed-site centre (FSC).

**Methodology:** Data for this study were collected in 2000 from the Matlab MCH-FP project area. Two blocks (B and D)—each with about 25,000 population—were selected for FSC. The house-to-house delivery system has been continuing in other two blocks (A and C). An opinion survey of 300 male and 300 female family-planning users and 2 follow-up surveys of the same male and female family-planning users from the experiment area were conducted. Exit interviews were conducted, and some qualitative data were also collected. Data on different service statistics, such as contraceptive prevalence rate (CPR) and method-mix, obtained from the regular record-keeping system (RKS), formed the basis of this study.

**Results:** More than two-thirds (66.4%) of the family-planning users stated that the new service-delivery system would not affect the use of family-planning methods. If a current user was unable to come to the FSC for one reason or the other, she requested her neighbour to take the delivery of family-planning services for her, and the community health worker (CHW) honoured her request, particularly if the request was for pill or condom. The CHWs feared a decline in the use-rate among the newly-married women due to their shyness to visit and receive services from the FSCs. The effect of change in the family-planning service-delivery system either on the CPR or on method-mix was not substantial.

**Conclusion:** These initial results suggest that the family-planning users would accept the change in the family-planning service-delivery system from house-to-house to FSCs and that there will be no change in the CPR and method-mix different from those in the house-to-house service-delivery.



## **Studies on Street-food in Relation to Health Status of Consumers in Selected Locations of Dhaka Metropolitan City**

**M.A. Mannan** and F. Rahman

**Objectives:** Identify the health and nutritional status of street food consumers in Dhaka city.

**Methodology:** This cross-sectional study was carried out on 491 street-food consumers from 40 street-food vending shops of the Dhaka metropolitan city from May to December 1999. Street-food consumer was defined as one who consumed street-food regularly as a main meal at least for one month.

**Results:** The people of the low-income group with a monthly mean income of Tk 3,473 (SD±1,566.2) and having minimum education (56.4% illiterate) mostly consumed street-foods. Foods were mostly (75%) prepared at home, and 77.5% were available in temporary mobile shops. The street food vendors earned a mean (±SD) monthly income of Tk 6,111.53 (±3,271.63), whereas the national minimum wage is Tk 1,200.00. Results of the health status analysis showed that 11.4% of the consumers had angular stomatitis, 16.5% dental caries, 19.3% swollen red gums, 8.8% bleeding gums, 1% enlarged thyroid, and 42.4% at least one disease in last four weeks, including diarrhoeal diseases in 20.2% of the cases. The majority (63.8%) of the consumers took street-foods because of low cost. The mean (±SD) body mass index (BMI) of street-food consumers was 19.75 (±1.72), and the majority (80.5%) of them had BMI more than 18.5.

**Conclusion:** To maximize the benefits of street food, it is essential to create awareness among consumers and vendors through a health-education programme.

## Assessment of the Upazila-level Record-keeping and Reporting System of the Health and Population Sector Programme of Bangladesh

A.H. Nowsher Uddin and Ali Ashraf

**Objective:** Assess the extent to which the unified record-keeping and reporting tools introduced under the Health and Population Sector Programme were implemented and identify omissions in recording information and use of additional tools.

**Methodology:** Nine Field Research Officers of the Family Health Research Project of ICDDR,B: Centre for Health and Population Research paid monitoring visits to 14 upazilas of Chittagong district and 8 upazilas of Jessore district at least once per quarter, during February 2000-January 2001. They reviewed information on 3,818 clients recorded in different columns/sections of record-keeping registers and formats provided for use in different departments/units of the Upazila Health Complex (UHC) and use of unofficial record-keeping and reporting tools. In-depth interviews with service providers and a workshop with managers were also conducted to identify the strengths and weaknesses of the tools.

**Results:** The new record-keeping and reporting system was introduced in all 22 upazilas. Results of the review of records showed that the service providers made considerable omissions while recording information. For example, there was an overall omission rate of 32% in the recording of the serial numbers of patients, 11% in the registration numbers, 18% in age of patients, 5% in the purpose of visits, and 34% in the treatments given. Reluctance to follow the instructions in the training manual, workload, and inadequate supervision were the main reasons for such omissions. In several cases, information perceived to be necessary by management, such as number of clients referred for different contraceptive methods, type of patients with diarrhoea treated by type of dehydration, and types of all biochemical tests conducted in the pathological laboratory, was not included in the new system. Unofficial registers and formats were still used for meeting the sporadic needs of vertical programmes.

**Conclusion:** A close review of both approved and additional tools is required to make the new system more supportive to the delivery of the essential services package. Attention should be paid to integrating the record-keeping and reporting formats of the vertical programmes, such as tuberculosis and leprosy, with the mainstream of the Unified Management Information System. An adequate orientation of managers, service providers, and concerned staff is crucial.

## Effect of Organizational Support to Improve Nutritional Status of Street Children in Dhaka: A Comparative Study

Banibrota Nandy<sup>1</sup> and Malay Kanti Mridha<sup>2</sup>

**Objective:** Explore the nutrition and health status of street children in Dhaka city, compare organizationally-supported children and organizationally-not-supported children in terms of nutrition and health status, and assess the effect of organizational support in improving their health and nutrition status.

**Methodology:** This cross-sectional study was conducted among organizationally-supported (OSG, getting support from Aparajeyo Bangladesh) and organizationally-not-supported children (ONG) of Dhaka city. Fifty children were selected from both groups. A pre-tested questionnaire was used for collecting data. The differentials of nutrition and health status were determined by comparing socioeconomic, personal hygiene-related, anthropometric, dietary and clinical information from both the groups.

**Results:** The mean age of the ONG and OSG children was 11.5 ( $\pm 2.30$ ) and 12.06 ( $\pm 2.41$ ) years respectively. The mean daily income was Tk 31.08 ( $\pm 12.63$ ) and Tk 25.58 ( $\pm 15.92$ ) respectively. On an average, the ONG and OSG children spent 85.5% and 67.6% of their daily income on food respectively. The prevalence of moderate-to-severe underweight (weight-for-age  $\leq -2SD$ ), stunting (height-for-age  $\leq -2SD$ ), and wasting (weight-for-height  $\leq -2SD$ ) was 34% and 16%, 38% and 28%, and 18% and 14% among the ONG and OSG children respectively, indicating the better nutritional status of the OSG children compared to the ONG children. The mean duration of illness in the past three months was 7.24 ( $\pm 7.04$ ) days and 6.35 ( $\pm 4.78$ ) days for the ONG and OSG children respectively, indicating that the OSG children suffered less than the ONG children. Seventy percent of the ONG and 48% of the OSG children had clinical signs of malnutrition.

**Conclusion:** Organizational support in the way of training, non-formal education, treatment of diseases, supply of regular meals, and better sleeping and bathing facilities has a profound effect on the improvement of nutrition and health status of street children. These supports should be made available to all street children.

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## Reduced-osmolarity ORS versus WHO-ORS: A Clinical Study in Neonates for Treatment of Acute Watery Diarrhoea

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**Objective:** Evaluate the efficacy of reduced-osmolarity ORS (RO-ORS) in neonates with acute watery diarrhoea.

**Methodology:** This study was conducted at the Clinical Research and Service Centre of ICDDR,B: Centre for Health and Population Research, during 1998-1999. In a randomized, double-blind controlled clinical trial, 32 neonates with acute watery diarrhoea of <72 hours duration with no or some dehydration were assigned to standard WHO-ORS (Na<sup>+</sup> 90 and osmolarity 311 mmol/L) or RO-ORS (Na<sup>+</sup> 75, osmolarity 245 mmol/L) and were studied for 5 days. Stool output and frequency, intake of ORS, duration of diarrhoea and proportion of patients developing hyper- or hyponatraemia were the main outcome measures.

**Results:** Thirty-two neonates divided equally into two groups received standard WHO-ORS and RO-ORS respectively. Diarrhoea resolved within 5 days in 68% and 44% of the neonates receiving WHO-ORS and RO-ORS respectively (p=0.2). The median total stool volumes (mL/kg) during the entire study period were not significantly different between the two groups (WHO-ORS vs RO-ORS; 140 vs 121, p=0.6). There were no differences in the median stool frequency (WHO-ORS vs RO-ORS; 30 vs 28, p=0.7) or intake of ORS (mL/kg) (WHO-ORS vs RO-ORS; 217 vs 186, p=0.5). The duration of diarrhoea was also similar between the two groups of neonates (WHO-ORS vs RO-ORS; 2.3±1.4 vs 3.2±1.5 days, p=0.2) who recovered within 5 days. No infants developed hypernatraemia or hyponatraemia, irrespective of group.

**Conclusion:** The results demonstrate that reduced-osmolarity ORS and standard WHO-ORS are equally efficient in the treatment of acute watery diarrhoea in neonates. However, it is difficult to draw a definite conclusion from this small preliminary study. Further studies should be conducted with an adequate sample size.

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## Metronidazole Resistance in *Helicobacter pylori* in India

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**Objective:** Understand the mechanism of metronidazole resistance in *Helicobacter pylori*.

**Methodology:** In total, 130 strains were studied during October 1999-August 2001. Gastroscopic biopsies from dyspepsia patients presenting to the Institute of Post Graduate Medical Education and Research, Kolkata, were cultured in brain-heart infusion agar (BHI) at the National Institute of Cholera and Enteric Diseases, Kolkata. Susceptibility and resistance to metronidazole were defined by results of quantitative spot tests on solid agar medium. Cultures were diluted sufficiently for single cells to form discrete colonies. A culture was considered resistant if its survival in medium with 8 µg of metronidazole per mL was similar (within a factor of 10) to that of metronidazole-free medium. To determine the mechanism of metronidazole resistance in *H. pylori* strains, DNA transformation experiments were carried out by DNA electroporation using standard rdxA: : cam (chloramphenicol) and frxA: : kan (kanamycin) cassettes, followed by selection in BHI agar medium containing chloramphenicol and kanamycin. This was followed by culturing in presence of metronidazole to determine the effect of this reverse genetic manipulation and to see whether rdxA alone is sufficient or whether inactivation of rdxA and frxA each is needed to achieve resistance to metronidazole.

**Results:** Ninety percent of the *H. pylori* strains were resistant to metronidazole at 8 mg/mL. Each of 12 metronidazole-resistant strains that were examined contained a non-functional rdxA gene, capable of converting a metronidazole-sensitive strain to metronidazole-resistant strains after PCR amplification and DNA transformation. Each of 13 metronidazole-sensitive that were analyzed required only rdxA inactivation to become metronidazole-resistant.

**Conclusion:** Metronidazole resistance is very common in India and results from loss of function mutations in housekeeping genes. Inappropriate metronidazole use is far more common than its medically-indicated use, and this probably accounts for the high level of metronidazole resistance observed in *H. pylori* strains prevalent in India.

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## Diarrhoeal Morbidity in a Diarrhoea Treatment Unit in Urban Pakistan

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**Objective:** Assess morbidity among patients with diarrhoea attending the Diarrhoea Treatment Unit (DTU), Civil Hospital Karachi and review the co-morbid conditions.

**Methodology:** Children, aged 0-15 year(s), who attended the DTU from January 1998 to December 2001, with complaints of loose motion were weighed and graded for malnutrition according to modified Gomez classification. The patients were categorized following the WHO guidelines for their dehydration status and treated as per Plan A, B, and C. Information on each case was recorded in a register. When required, additional treatment was also given. Data on co-morbid conditions were also obtained.

**Results:** During four years, 392,285 patients visited the Pediatric Outpatients Department of the Civil Hospital Karachi. Of them, 37,197 (9.48%) visited the DTU during the same period. The hydration status of patients assessed by WHO criteria was: no dehydration 22,324 (60%), some dehydration 8,801 (23.6%), and severe dehydration 4,741 (12.7%). The co-morbid conditions encountered were: dysentery, persistent diarrhoea, pneumonia, severe pneumonia, very severe disease, rickets, and seizures. Sixty-three percent of the patients had normal nutrition, whereas 25% had moderate-to-severe malnutrition. The yearly mortality rates remained constant at 7%.

**Conclusion:** The total visits and mortality at the DTU over the years remained constant, but the proportion of severe dehydration cases rose by 60% possibly due to increased use of the public hospital and 24-hour availability of trained staff. The case-management strategy should be adhered to, and be continuously taught in, academic courses. The nutritional status of the patients registered at this facility had a similar nutritional status as reported in the national figures.

## Clonal Analysis of Enterotoxigenic *Escherichia coli* isolated from Diarrhoeal Patients in Bangladesh

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**Objective:** Understand the clonal distribution of enterotoxigenic *Escherichia coli* (ETEC) belonging to different O antigenic serogroups and expressing 12 different colonization factors (CFs).

**Methodology:** Colonization factor antigens and enterotoxin types of ETEC isolated from diarrhoeal patients attending the ICDDR,B hospital in Dhaka were prospectively analyzed during 1998-1999. Of 662 well-characterized strains, 100 expressing 12 different CFs and heat-stable (ST) and/or heat-labile (LT) enterotoxin, were selected. These were composed of coli surface antigens (CS4-6) of CFA/IV group (n=30), CFA/I (n=20), CS1-3 of CFA/II group (n=25), CS7 (n=6), CS12 (n=8), CS14 (n=7), CS17 (n=5), and CS8 (n=1) or those that did not express any CF (n=3). Using these strains, O antigenic serogrouping, (RAPD)-polymerase chain reaction, and biochemical fingerprinting (PhP) were carried out.

**Results:** The ETEC strains could be classified into nine O serogroups, with O6 (n=29), O128 (n=20), and O115 (n=20) being predominant, while the remaining serogroups were O159 (n=9), O25 (n=7), O114 (n=7), O142 (n=3), O15 (n=3), O8 (n=1), and O126 (n=1). Most strains of O6 (n=20; CS1, CS2, and CS3) belonged to the same PhP/RAPD type, whereas other strains of serogroup O6 (n=6; CS4+CS6) produced a separate cluster and belonged to the same PhP/RAPD type. Most strains of the O128 group (n=11; CFA/I) belonged to the same PhP/RAPD type, whereas the remaining strains of the O128 group (n=5; CS17) formed a different cluster. Most strains of the third dominant serogroup O115 (n=16; CS5 + CS6), along with other minor serogroups O114 (n=6; CS7), O25 (n=4, CS5+CS6), O142 (n=3; CFA/I) and O159 (n=2; CFA/I), produced a big complex and belonged to the same PhP/RAPD type. Three minor clusters, unrelated to those described above, were produced by O159 (n=5; CS12) + O128 (n=5; CS17) and O15 (n=3; CS14).

**Conclusion:** Three major clonal groups could be identified among the ETEC strains studied, and were mostly centred around the expression of a particular O antigenic type and CF expression pattern. The CFs expressed within each major cluster are those predominantly associated with childhood diarrhoea in Bangladesh. These results will help evaluate the epidemiological parameter and other related factors associated with ETEC strains causing diarrhoea in Bangladesh.

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## Epidemiological and Molecular Characterization of *Shigella flexneri* in Bangladesh

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**Objective:** Determine the prevalence and distribution of clones of *Shigella flexneri* isolated in Bangladesh and study the antibiotic resistance mechanism of these isolates.

**Methodology:** In total, 2,477 strains of *S. flexneri*, isolated from patients at ICDDR,B over the last 24 years (1978-2001), were serotyped using commercial antisera and monoclonal antibodies. A representative number of strains isolated in 1997-2001 was characterized genotypically by determining the resistance factor, analyzing the plasmid profile, pulsed-field gel electrophoresis (PFGE), and ribotyping.

**Results:** Results of serotyping of the strains of *S. flexneri* showed that serotype 2a (45%) was the dominant serotype in recent years (2000-2001), but serotype 2b was the dominant serotype in 1997-2000. Over 40% of the cases of infection due to *S. flexneri* over the last 24 years have been documented to be due to serotype 2 (serotype 2a and 2b). The plasmid profile, PFGE, and ribotyping analysis showed that serotype 2a and 2b are possibly genetically related. When applying the same techniques, other serotypes (serotype 1, 3, 4, 5, 6, X, Y, and 4X) showed different types with numerous subtypes. During 1997-2001, multidrug resistance was a common phenomenon in serotype 1b, 2a, and 2b in contrast to serotype 5a and X which were sensitive to all antibiotics. Serotype 3a was highly resistant (>80%) to sulphamethoxazole-trimethoprim only. Previously-reported atypical strains (23%) of serotype 1c, 4, and 4x were resistant to ampicillin and sulphamethoxazole-trimethoprim. A multiple antibiotic resistance marker was found in a self-transmissible middle-range plasmid (35-80 MDa). The incidence of serotype 1a, 5a, and X decreased drastically, and serotype 3b, 3c, 4a, and 5b have not been detected at all since 1997.

**Conclusion:** The findings suggest a changing pattern in the prevalence of various serotypes of *S. flexneri*. The study further suggests that additional studies will be needed to design a vaccine to prevent infection due to *Shigella*. The findings will also help clinicians to choose a better drug to cure patients with shigellosis.



***Cryptosporidium*-associated Diarrhoea in Pet Dogs and  
Their Attendants: A Report from a Pet Animal  
Clinic in Dhaka, Bangladesh**

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**Objective:** Determine the prevalence of *Cryptosporidium* oocysts in faecal samples of both diarrhoeal and non-diarrhoeal pet dogs and their attendants.

**Methodology:** The study was conducted with pet animals, particularly dogs, attending the Gulshan Pet Animal Clinic, Dhaka. Routine microscopy, along with modified Zielh-Nelsen staining, was performed for each sample to detect oocysts of *Cryptosporidium*. Diarrhoeal and non-diarrhoeal stool samples from dogs and of their attendants were collected round the year. Information on the health and nutritional status of dogs and the husbandry practices followed by pet owners/attendants was also recorded to assess the impact of malnutrition on cryptosporidial infection.

**Results:** *Cryptosporidium* oocysts were detected in 36 (8.37%) of 430 dogs examined. Thirty-four (15.11%) of the oocysts were excreted by 225 dogs with diarrhoea, while 2 (0.97%) were excreted by 205 dogs without diarrhoea ( $p < 0.01$ ). The protozoan was detected in dogs with diarrhoea throughout the year. The highest incidence (16.28%) was observed in the relatively warm-humid months (July-September) and the lowest (2.16%) in the dry and cold months (November-January). Fifteen of 74 pet animal attendants and their 170 family members who had diarrhoea were positive for cryptosporidial infection (6.14%), whereas the oocysts could not be detected ( $p < 0.01$ ) in any non-diarrhoeal members. Ten of the 15 oocyst excretors were the dog attendants themselves, and the other 5 were detected from stools of the family members who were not directly in contact with the ailing dogs. The severity and duration of illness were greater in malnourished pups than in healthy ones.

**Conclusion:** The results demonstrate that *Cryptosporidium* is prevalent in the pet dogs of the metropolitan city, and the infection poses a threat to the health of attendants and their family members.

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### **Pilus and O:34 Antigen of Cytotoxic Enterotoxin Gene-positive Isolates of *Aeromonas* spp.**

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**Objective:** Detect pili, associated with adhesion and pathogenic serotype O:34 antigen, from isolates of *Aeromonas* spp. having cytotoxic enterotoxin gene.

**Methodology:** Twenty-seven cytotoxic enterotoxin gene-positive strains, used in this study, were isolated from environmental samples, such as water (n=13), aquatic plants (n=10), gills (n=2), and intestinal contents (n=2) of fish. Pili were detected using the 420T transmission electron microscope, and O:34 antigen was detected by slide agglutination with serum raised in rabbit immunized with O:34-specific cell-wall antigen of *A. hydrophila* strain Aer223.

**Results:** Twenty-seven cytotoxic enterotoxin gene-positive isolates of *Aeromonas* spp. (8 *A. hydrophila* and 19 *A. sobria* isolates) were tested for pili and O:34 antigen. Pilus was detected from 13 isolates, and O:34 antigen was detected from 11 isolates.

**Conclusion:** Pilus and O:34 antigen were detected more from *A. sobria* than *A. hydrophila* isolates. The results suggest that some cytotoxic enterotoxin gene-positive isolates of *A. sobria* and *A. caviae* possess organs for adhering to the intestinal epithelium for initiating enteric infection. Further experiment in tissue culture and animal models is needed to confirm the pathogenic behaviour of these isolates having pili and cytotoxic enterotoxin gene. However, there is no relationship of pilus and O:34 serotype with the presence of cytotoxic enterotoxin gene in *Aeromonas* isolates.

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## Prevalence of Extra-pulmonary Tuberculosis in Hospital Patients

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**Objective:** Study the prevalence of extra-pulmonary tuberculosis in hospital patients in Bangladesh.

**Methodology:** The study was carried out at the Gonoshasthaya Vaccine Research Laboratory (GVRL), Savar, Dhaka, during January 1998-March 2002. Patients were selected based on common clinical symptoms for tuberculosis. Clinical specimens, such as pleural fluid, urine, pus, ascitic fluid, cerebrospinal fluids, etc., were centrifuged, and films were made from deposits stained with the Ziehl-Neelsen method and were examined microscopically. The same deposits were used for culture on Lowenstein-Jensen medium for growth of mycobacteria for up to 6 weeks at 37 °C. Sputum samples were treated with 4% sodium hydroxide and 3% hydrochloric acid for microscopy and culture.

**Result:** In total, 923 clinical samples were tested, of which 146 (15.8%) were from suspected cases of extra-pulmonary tuberculosis. The remaining 777 (84.2%) samples tested were sputum. Of different samples of extra-pulmonary tuberculosis, 44 (30.1%) were pleural fluid, 33 (22.6%) urine, 25 (17.1%) pus, 19 (13%) ascitic fluid, 16 (11%) cerebrospinal fluids, and 9 (6.2%) other samples, such as joint fluid (4), laryngeal swab (2), gastric lavage (1), skin scraping (1), and cervical swab (1). Only 7 (4.8%) samples (4 pleural fluid, 2 cerebrospinal fluid, and 1 pus) of extra-pulmonary tuberculosis were positive either by microscopy and/or by culture for *Mycobacterium tuberculosis*. Age of the positive cases (1 female, 6 males) ranged from 1 to 65 year(s) (mean 31.9 years).

**Conclusion:** The prevalence of extra-pulmonary tuberculosis was 4.8% [7 of 146 positive specimens compared to 138 (17.8%) of 777 positive sputum samples]. The results suggest that, besides pulmonary tuberculosis, emphasis should be placed on laboratory diagnosis and treatment of extra-pulmonary tuberculosis.

## **Aetiology of Pneumonia in a Cohort of Newborns from Birth to 24 Months of Age in Rural Mirzapur, Bangladesh**

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**Objective:** Examine the aetiology of pneumonia among young children living in rural Mirzapur, Bangladesh.

**Methodology:** During 1994-1997, a cohort of 252 newborns was prospectively followed from birth to 24 months of age in Mirzapur, Bangladesh. Community health workers identified cases of acute lower respiratory infections during the routine surveillance of households and referred them to a physician. All pneumonia cases were recommended for hospital admission for investigation and treatment. After hospitalization, nasopharyngeal aspirates and blood samples were collected for identification of bacteria and virus, and chest x-rays were done. Multiple regression analysis identified the factors associated with viral aetiology.

**Results:** There were 67 cases of physician-diagnosed pneumonia; 45% of nasopharyngeal aspirates were positive for viral agents of pneumonia, and respiratory syncytial virus was predominant (81%). Bacteria were isolated in 12.5% of the blood cultures, with a few isolations of *Streptococcus pneumoniae* and *Staphylococcus aureus*. Of the cases of respiratory syncytial virus, 33% were children whose chest x-rays had no pneumonic consolidation. Bacterial isolation was few from the chest x-rays that showed pneumonic consolidation. Children living in a one-room house were more than 3 times more likely to develop viral pneumonia [odds ratio (OR)=3.67, confidence interval 1.05-12.83] than children living in a larger house.

**Conclusion:** Treatment of pneumonia cases should be based on clinical judgement. Reduction in incidence of pneumonia may be achieved by education intervention at the household level to reduce crowding when there is a newborn infant in the house. Attention has to be given for vaccine development to reduce the incidence of pneumonia.

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## Bronchiolitis and Nutritional Status

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**Objective:** Evaluate the nutritional status and outcome of consecutively hospitalized young children with bronchiolitis.

**Methodology:** Three hundred and forty-eight children, aged less than 2 years, with bronchiolitis were studied in different hospitals of Dhaka city. Diagnosis of bronchiolitis was made on the basis of the first attack of wheeze in previously healthy children aged less than 2 years. Immediate medical history was collected from their mothers through a structured questionnaire. The weight of each child was measured and the weight-for-age z-score calculated to find out the nutritional status. Chest X-ray was done in each case to find out the radiological changes. Blood samples of 80 patients were studied for RSV IgM and IgG antibody by ELISA. The children were followed up till discharge.

**Results:** There were 66% male and 34% female children. The median age of the children was 3.0 months. Fifty-five percent of the cases came from rural areas and 45% from urban areas. Forty-seven (58.7%) children were positive for IgM antibody, and 14 (17.5%) were positive for IgG antibody giving rise to 76.2% RSV virus positivity. Most (72%) children had good nutritional status (WAZ -2.0 through the highest), and a minority had either moderate underweight (21%) (WAZ -2.01 to -3.0) or severe underweight (7.5%) (WAZ <-3.0 through the lowest). There was no difference in the mean respiration rate among three groups of children (66.8, 66.4, and 67.1 in well-nourished, moderate underweight, and severe underweight groups respectively). The hospital stay had the trend of increasing duration with the decrease of body weight (4.5, 5.3 and 6.0 days respectively,  $p < 0.009$ ).

**Conclusion:** Bronchiolitis is responsible for significant morbidity in young children. The duration of hospital stay increases with the decrease of nutritional status.

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## Evaluation of Potential Use of an Osmotically-driven Ultrafiltration Device for Preparation of Therapeutic Feeds for Home Management of Malnourished Children

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**Objective:** Determine the ability of mothers to prepare microbiologically-safe therapeutic milk for malnourished children using osmotic sachets.

**Methodology:** UCB Osmotics Limited of UK have developed an osmotically-driven ultrafiltration sachet which was tested by mothers of low-socioeconomic status living in a slum of Dhaka city to prepare microbiologically-safe therapeutic milk for malnourished children under household conditions. The sachet consists of two compartments: (1) a waterproof upper compartment containing dry therapeutic milk-powder, and (2) a semi-permeable lower compartment containing sucrose, which acts as an osmotic driver to exclude pathogens during the hydration process. Thirty-five mothers were trained in the preparation of therapeutic milk at the household level using these sachets. The study was conducted during June 1999–August 2000.

**Results:** Household water used for submerging the sachet for the preparation of milk had contamination levels of total coliform and total heterotrophic bacteria of up to  $10^6$  CFU/100 mL and  $10^6$  CFU/mL respectively. None of the prepared milk samples had any detectable coliform, and only 2 (6%) had total heterotrophic bacteria with a contamination level of  $10^1$  CFU/mL, which is within the limit recommended by the World Health Organization. All (100%) study subjects showed their interest to use osmotic sachets for the preparation of therapeutic milk for their children.

**Conclusion:** The results indicate that safe therapeutic milk can be produced from unsafe domestic water using osmotic sachets.

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## Epidemiological Study of Diabetic and Non-diabetic Pregnant Mothers in Terms of Height, Birth-weight, and Type of Delivery

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**Objective:** Assess the relationship of maternal height with type of delivery and birth-weight of neonates.

**Methodology:** A prospective study was conducted among 424 pregnant women who attended the BIRDEM Hospital during December 1998-July 1999 for antenatal care. Pregnant women were recruited at their second trimester and were followed up until delivery. They were matched by parity. Maternal heights and birth-weights of babies were recorded following the standard techniques. Birth-weights of the newborns were taken within 12 hours of delivery.

**Results:** Of the 424 mothers enrolled, 358 attended for delivery. Of them, 57% were diabetic, and 43% were non-diabetic. The mean age of the diabetic mothers was significantly higher (31.0 years) than that of the non-diabetic group (26.8 years;  $p<0.001$ ). The non-diabetic mothers were more educated than the diabetic group (61% vs 39%;  $p<0.001$ ). The diabetic women were mostly housewife (90% vs 68%) and were from large families (48% vs 26%). Husbands of the non-diabetic women were more educated compared to the husbands of the diabetic women (84.5% vs 56.0%), and the total monthly income was significantly higher ( $p<0.01$ ) for the non-diabetic group. Expenditure on food during the last month prior to delivery differed significantly ( $p<0.5$ ) between the groups in favour of the non-diabetic mothers. The mean $\pm$ SD heights were 153.8 $\pm$ 2.4 cm for the non-diabetic and 153.5 $\pm$ 3.6 cm for the diabetic mothers. The diabetic mothers had more operative deliveries (36.2% vs 12.45%,  $p<0.001$ ). Maternal height was significantly related with birth-weight for both diabetic ( $r=0.53$ ) and non-diabetic ( $r=0.64$ ) mothers.

**Conclusion:** There was a statistical association between maternal height and caesarean section and birth-weight in both diabetic and non-diabetic groups in this study. A large-scale longitudinal study is needed to establish the causal association.

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## Blood Glucose, Non-esterified Fatty Acid, and Insulin Response to Banana and Jackfruit in Type 2 Diabetic Subjects

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**Objective:** Rank Bangladeshi jackfruit and banana in terms of their glycaemic index (GI), non-esterified fatty acid (NEFA), and insulin (as measured by C-peptide) responses which are useful to create healthy dietary guidelines.

**Methodology:** Twelve patients (male 8 and female 4) who attended the Outpatients Department of BIRDEM during January-May 2001 participated in the study under a cross-over design. Their mean ( $\pm$ SD) age was 41 years ( $\pm$ 5), and they had the mean plasma HbA<sub>1c</sub> of 6.89 ( $\pm$ 1.09). They consumed equicarbohydrate amount of the test-meal and white bread (the reference food) with a run-in period of 7 days between the consecutive items. Blood samples were drawn at 0, 30, 60, 120, and 180 minutes. HbA<sub>1c</sub> was measured by high-pressure liquid chromatography, and C-peptide was measured by an ELISA method. The difference between any two groups was calculated by one way ANOVA or by Mann-Whitney U-test as appropriate.

**Results:** The glycaemic response of banana and jackfruit did not differ significantly with that of bread (area under the curve: 1556 $\pm$ 257 in banana, 1390 $\pm$ 278 in jackfruit, and 1538 $\pm$ 195 in bread, mean $\pm$ SD). The similar glycaemic responses were also reflected in their GI values (banana 98.10 $\pm$ 16.29 and jackfruit 91.53 $\pm$ 21.81). Plasma NEFA increased by 0.12 $\pm$ 0.44 mmol/L from 0 to 180 minutes in the case of bread. On the contrary, the same values were reduced by 0.33 $\pm$ 0.19 and 0.25 $\pm$ 0.29 respectively in the case of banana and jackfruit. A significantly lower ( $p < 0.05$ ) NEFA-glucose ratio was observed in the case of jackfruit compared to banana. The serum C-peptide values increased at 180 minutes compared to 0 minute in all 3 diets, but there was no difference among them in the absolute increment of C-peptide. Serum C-peptide per unit of NEFA was significantly higher in jackfruit than in banana or bread.

**Conclusion:** An equicarbohydrate amount of banana and jackfruit produces almost similar glycaemic responses compared to bread, but analysis of NEFA and C-peptide responses suggests significant health benefits in consuming banana and jackfruit.

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## Comparison of Nutritional Characteristics of Type 2 Diabetic Subjects With or Without Micro-albuminuria

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**Objective:** Assess some key nutritional indicators in type 2 diabetic subjects with or without micro-albuminuria, a strong predictor for development of renal failure in type 2 diabetics.

**Methodology:** In a cross-sectional study, 86 consecutive newly-diagnosed type 2 diabetic male subjects having no diabetic complications, such as diabetic nephropathy, diabetic retinopathy, etc., were investigated during January-February 2002 at the Outpatients Department of BIRDEM, Dhaka, for height, weight, waist, and hip circumference. As for obesity index, their body mass index (BMI) and waist-to-hip ratio (WHR) were calculated. Spot urine samples were assayed for assessment of micro-albuminuria. Micro-albuminuria was addressed as urinary albumin-to-creatinine (UAC) ratio. Two groups were defined upon cut-off value of UAC ratio (30 mg/g). UAC ratios of  $\geq 30$  mg/g and  $< 30$  mg/g were defined, with micro-albuminuria (n=21) and without micro-albuminuria (n=65) respectively.

**Results:** The proportions of the respondents falling into the BMI category of 25.0-29.9 were 42.9% and 36.9% of the with micro-albuminuria and without micro-albuminuria groups respectively, whereas for the BMI category of 20.0-24.9, the proportions of the respondents were 47.6% and 52.3% of the groups respectively. The proportion of the respondents having WHR of  $\geq 0.95$ , associated with a disease risk of abdominal obesity, e.g. atherosclerosis, hypertension, etc., was 71% and 52% of the with micro-albuminuria and without micro-albuminuria group respectively, whereas for WHR of  $< 0.95$ , the proportion was 29% and 48% of the groups respectively.

**Conclusion:** In the study, a higher proportion of micro-albuminuric subjects were overweight. Hence, overweight type 2 diabetic subjects were in general more likely to have earlier renal failure.

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## Lack of Correlation between Paternal Insulin Sensitivity and Anthropometry at Birth

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**Objectives:** Investigate the relationship between paternal insulin sensitivity and growth parameters of offspring.

**Methodology:** The study was performed on 30 healthy fathers and their babies born from non-diabetic mothers attending the Department of Gynecology and Obstetrics, BIRDEM, Dhaka. Samples were analyzed at the Biomedical Research Group Laboratory of BIRDEM. Each father underwent a low-dose short insulin tolerance test (ITT) for measuring insulin sensitivity. Placental weight was recorded, and a blood sample was collected from the umbilical cord at birth for measuring insulin. Birth-weight, length, and head circumference were recorded, and ponderal index was calculated from weight (kg)/length (cm)<sup>3</sup>. Genetic link between maternal insulin sensitivity and foetal birth-weight was not examined, since the correlation could be confounded by insulin resistance imposed by the pregnancy itself.

**Results:** The degree of insulin sensitivity,  $K_m$  (constant for insulin tolerance test) did not correlate with the foetal growth parameters (for ponderal index  $r=0.031$ ,  $p=0.870$ ; for weight of baby  $r=0.010$ ,  $p=0.959$ ; for length of baby  $r=0.087$ ,  $p=0.464$ ; and for head circumference  $r=0.280$ ,  $p=0.142$ ).

**Conclusion:** Mechanism linking insulin resistance with low birth-weight is not a genetically-determined defect transmitted from the father.

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## Perceptions of Adolescent Boys about Conception and Contraception in a Rural Area of Bangladesh

Didarul Alam

**Objective:** Understand the perceptions and practices of adolescent boys regarding conception and contraception in a rural society.

**Methodology:** Data were collected from 38 male adolescents aged 14-19 years through 18 in-depth interviews, 4 focus-group discussions (FGDs), and 25 self-written narratives of respondents. The study was conducted in a union of Chakaria upazila of Cox's Bazar district during May-July 2001. The researcher followed the standardized flexible in-depth interview and FGD guidelines developed under the supervision of a professor of the Medical Anthropology Unit of the University of Amsterdam. All respondents who seemed to be informed on the research subject were selected purposefully and were interested in participating in the study. In each FGD, there were 6-10 participants who had already taken part in the interview and/or narrative writing.

**Results:** The majority of the adolescents were sexually active. It was commonly believed that sexual intercourse must take place several times before conception can occur and also that sexual intercourse with an adolescent girl was unlikely to result in a pregnancy as adolescent girls are not physically mature enough to become pregnant. Lack of knowledge on how conception takes place led them to be reluctant to use contraception. The majority of them were not aware of any other contraceptive methods apart from pill and condom. There was also a misunderstanding regarding the correct use of contraceptives. Those who were aware of contraception considered it unpleasant, or the responsibility of the girl. Unwanted pregnancies were reported, but abortion was perceived as an easy, low-cost procedure.

**Conclusion:** Common misperceptions regarding conception and contraceptive use are putting young people at risk of sexually transmitted diseases and unwanted pregnancies, which have many socioeconomic and health consequences. Educational programmes are needed for these groups to increase awareness on conception, contraception, and safe sexual practices.

## Adolescent Sexuality in Rural Bangladesh

Didarul Alam

**Objective:** Understand the sexual involvement of different categories of adolescents in rural Bangladesh for an early intervention.

**Methodology:** The study was conducted in a union of Chakaria upazila of Cox's Bazar district. Data were collected directly by the researcher from 38 male adolescents aged 14-19 years through 18 in-depth interviews, 4 focus-group discussions (FGDs), and 25 self-written narratives of respondents, made during May-July 2001. The researcher followed standardized flexible in-depth interview and FGD guidelines developed under the supervision of a professor of the Medical Anthropology Unit of the University of Amsterdam. All respondents were purposefully selected who seemed to be informed on the research subject, and were interested in participating in the study. In each FGD, there were 6-10 participants who had already taken part in the interview and/or narrative-writing.

**Results:** The majority of the respondents reported that they had enjoyed sex at least once or more times. It was also perceived by the respondents that non-schooling boys were more sexually active than those who were in formal education. Boys of rich families and/or boys of less-educated fathers were more sexually active than their counterparts. Those who had a personal income and those who travelled frequently to town were more likely to be sexually active than boys who did not. Adolescent boys who stayed as lodgers with families were more likely to be sexually active than those who did not. Boys whose fathers were absent or who were less supervised were more likely to be sexually active than others. Sexual activity increased with age from early adolescence to late adolescence.

**Conclusion:** Many respondents were sexually active. Some categories of adolescent boys were more involved in sex than their opposite categories. Therefore, sex education and awareness regarding safe sex practice are urgently needed, and more sexually active groups should be intervened earlier or get priority as they are at more risk of contracting and transmitting sexual diseases.

## Sexually Transmitted Diseases: Healthcare-seeking Behaviour of Male Adolescents in Rural Bangladesh

Didarul Alam

**Objective:** Understand the sexually transmitted diseases (STDs)-related healthcare-seeking behaviour of young male adolescents in rural Bangladesh.

**Methodology:** The study was conducted in a union of Chakaria upazila of Cox's Bazar district. During May-July 2001, data were collected from 38 male adolescents aged 14-19 years through 18 in-depth interviews, 4 focus-group discussions, 25 self-written narratives of respondents, and observation made on the participants. In addition, 21 key informants (local health personnel, teachers, parents, youth leaders) were also interviewed. All respondents were selected using a purposeful sampling technique, and were interviewed following a standard flexible guideline prepared under the supervision of a professor of the University of Amsterdam.

**Results:** Many sexually-active adolescents mentioned symptoms of STDs that they had experienced or were experiencing without knowing that these were STD-related symptoms. They were unaware of the harmful health consequences of STDs. Boys mostly sought advice from friends who lacked the correct knowledge and who practised self-medication. In the majority of cases, they did not seek any healthcare for such symptoms until the problem became intolerable. Reasons for not seeking healthcare were: (i) feeling shy or embarrassment to talk to doctors or parents about the problem as it occurred in the *gopan onga* (private parts of the body); (ii) assuming that doctors might ask them to show their *gopan onga* (genitalia) to see the affected organ which they considered embarrassing; (iii) parents and some biomedical doctors behave 'unfairly' toward adolescents with the disease; (iv) cultural norms discourage the discussion of sexual problems or sexual organs between parents and children; (v) "don't care mentality" or "wait and see whether it cures automatically" due to lack of awareness about STDs; (vi) lack of money for treatment or feeling shy to ask money from parents for the diseases that occurred in the private parts of the body; (viii) lack of availability and easy accessibility to youth-friendly (sexual) health services in the area, etc. Even when they did discuss with parents/guardians, they described it as bodily discomfort or other health problems. Those seeking healthcare preferred homeopath/traditional healers, as they are more sympathetic and provide more detailed explanations than biomedical (MBBS) doctors; their treatment was also considered to be more effective in such cases, and was less expensive.

**Conclusion:** Lack of awareness about STDs, attitudes and behaviour of biomedical personnel and guardians, and lack of youth-friendly (sexual) affordable health services are the main barriers to seeking appropriate treatment by adolescents for STDs. The government and non-government organizations should take steps to increase awareness of adolescents about STDs, and should introduce youth-friendly confidential, sexual health services at the union level. At the same time, development organizations should take necessary steps to increase awareness of parents and biomedical personnel about the reality of adolescent sexuality so that they assist adolescents when they seek treatment for STDs.

## **Arsenic Calamity: Projected Risk of Cancer among People of Bangladesh**

**Shakeel Ahmed Ibne Mahmood<sup>1</sup>**, Azharul Islam Khan<sup>1</sup>, Rukhsana Gazi<sup>1</sup>,  
and Belal Ahmed Ibne Mahmood<sup>2</sup>

**Objective:** Explore the susceptibility of people of Bangladesh to arsenic, assess the current arsenic consumption, and recommend measures for its prevention.

**Methodology:** The methodology included a literature search in the Internet for the latest global and regional information on the environment, analysis of the existing situation in Bangladesh, and discussions with experts.

**Results:** Results of the review of literature showed that, according to a recent UN report, about 57 million people in Bangladesh are at risk of cancer because of contamination of tubewell-water with arsenic. According to a WHO report, there are about 100,000 estimated cases of debilitating skin lesions. In Bangladesh, more than 10,000 people suffer from arsenic-related diseases, and an estimated 28-35 million could be at risk. Deaths have occurred due to arsenic-related diseases. Other heavy metals used in the agro-industry have also caused many deaths. Arsenic was found above the permissible limits in vegetables, fruits, and cereal crops grown in soils irrigated with contaminated water, and the nutritive value of food has been decreasing due to arsenic. Factors, such as ignorance, low income, etc., have been reported to be responsible for drinking arsenic-contaminated water.

**Conclusion:** The findings suggest taking immediate appropriate measures to contain the calamity and increase public awareness to overcome the problems.

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## **Arsenic induces Nitric Oxide-mediated Oxidative Injury in Rabbits: Role of Antioxidants in Detoxification**

**M. Akhtar<sup>1</sup>**, S.K. Saha<sup>1</sup>, F. Marni<sup>1</sup>, A.K.A. Choudhury<sup>2</sup>, and G.H. Rabbani<sup>1</sup>

**Objective:** Evaluate the oxidative injuries in rabbits, caused by arsenic and the role of exogenous antioxidants in detoxification.

**Methodology:** The study was done from July 2001 to November 2001. Forty adult rabbits were intoxicated with arsenic trioxide (As<sub>2</sub>O<sub>3</sub>; 3-5 mg/kg) given orally once daily for 7 days. The intoxicated rabbits were treated with plant polyphenols or VMS-6, a recipe of vitamins, zinc, and selenium or placebo for next 7 days. Blood samples were collected from ear-vein for spectrophotometric assay of reduced glutathione (GSH), thiobarbituric acid-reacting substances (TBARS), and nitrite/nitrate (NOx). These assays were done for basal, post-intoxication and post-antioxidant treatment values.

**Results:** Arsenic intoxication of rabbits significantly reduced the whole blood GSH level compared to the basal level (17.5±0.81 vs 32.0±0.76 mg/dL, p=0). Treatment with polyphenols, VMS-6, or placebo increased the GSH levels in the arsenic-intoxicated rabbits (polyphenols 77%, VMS 67%, and placebo 36%). The TBARS and NOx levels were greater in the intoxicated rabbits compared to the basal levels (TBARS: 8±1.1 mM vs 5±0.7 mM, p<0.05; NOx: 465±38.5 mM vs 320±24.7 mM, p<0.001). A strong positive correlation was observed between the NOx and the TBARS levels (r=0.4, p<0.01), indicating nitric oxide-mediated oxidative injury. Treatment with VMS-6 reversed the TBARS level toward the basal levels greater than that caused by placebo treatment (63% vs 40%, p<0.05). Polyphenols reversed the NOx levels greater than that caused by placebo treatment (60% vs 17%, p<0.001).

**Conclusion:** Exogenous antioxidants, such as polyphenols and vitamins, zinc, and selenium, are useful for arsenic detoxification.

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## **Air Pollution Is More Deadly than Traffic Crashes in Bangladesh**

**Shakeel Ahmed Ibne Mahmood**, Azharul Islam Khan, Shamima Jahan,  
Md. Shahjahan Ali, and Md. Moniruzzaman Miah

**Objective:** Explore the susceptibility of the urban population of Bangladesh to air pollution, and recommend measures for its prevention.

**Methodology:** The study was done through the latest Internet, seminar and literature surveys of global and regional information on the environment, analysis of the existing situation in Bangladesh, and discussion with national experts.

**Results:** According to a World Bank report, air pollution kills 15,000 Bangladeshis each year. Two-stroke automobiles, industrial emissions, and bad civic practices are some of the factors causing air pollution in Bangladesh. The concentration of particulate matter and lead, carbon monoxide, and hydrocarbon in the air of Dhaka city is probably the highest in the world. The lead content of dust in Dhaka, determined by atomic absorption spectrophotometry, ranged from 7 to 240 parts per million, which is 10 times higher than the standard level. Young children are mostly exposed to cadmium through inhalation of smoke, contaminated soil, and dust from industrial emissions and sewage sludge. The high lead in the environment from gasoline, paint, ceramics, batteries, etc., also increases the risk of polluted air.

**Conclusion:** Air pollution is causing a serious health problem. Appropriate measures should be taken, otherwise the sufferings of children from various patho-physiological problems, may affect the nation in the future.



## **The Disadvantaged Are the Most Likely to Face the Menace of Tobacco Consumption in a Remote Rural Area of Bangladesh**

**Kaneta K. Choudhury**, S.M.A. Hanifi, and Abbas Bhuiya

**Objective:** Identify the socioeconomic groups who are more prone to consumption of tobacco vis-à-vis tobacco-related health consequences in a remote rural area of Bangladesh.

**Methodology:** During October-December 1994, interviews were conducted to collect information on consumption of tobacco by 6,618 individuals (52.1% males, 47.9% females), aged over 15 years from a systematic random sample of 12% of households from the villages of 5 purposively-selected unions of Chakaria upazila of Cox's Bazar district. Individuals were categorized as consumers if they consumed tobacco in any form at all, i.e. smoking or chewing. Both univariate and multivariate analyses of data were carried out. The independent variables included various characteristics of individuals and households.

**Results:** Overall, 43.4% of the subjects consumed tobacco. The males were more than 9 times more likely to consume tobacco than their female counterparts. The individuals with no education were 2.49 times more likely to consume tobacco than those who had completed 6 or more years of schooling. The daily wage-earners were almost twice as likely to consume tobacco than others. Education of the household heads also had a significant relationship with consumption of tobacco. The individuals from households where the head had received no schooling were 1.79 times more likely to consume tobacco than those from households where the head had received six or more years of schooling.

**Conclusion:** Consumption of tobacco in both smoking and chewing forms has been a part of household consumption in Bangladesh from time immemorial. Only aggressive anti-tobacco campaign may prevent the poorest from the menace of tobacco consumption in Bangladesh.

## Perceptions of Villagers about Water Qualities and Health in the Context of Arsenic Contamination in Matlab, Bangladesh

S.M.A. Hanifi<sup>1</sup>, Shamim Ara Begum<sup>2</sup>, Sabrina Rashid<sup>1</sup>, and Abbas Bhuiya<sup>1</sup>

**Objective:** Understand the perceptions of villagers about the qualities and taste of drinking water in relation to arsenic contamination and health.

**Methodology:** An ethnographic study was conducted during August-September 2001 in two villages of Matlab. Eight focus-group discussions, 9 in-depth interviews, timeline, and observational techniques were applied to collect relevant information.

**Results:** In the study villages, tubewells were the main source of drinking water, after shifting from surface water in the early 1980s. The villagers believed that tubewell water contains iron and is tasty; canal or river water is iron- and arsenic-free but contaminated with germs; pond-water is muddy, greenish, and unpleasant to drink. Canal- or pond-water was mainly used for cooking and washing. Housewives made the decision regarding the source and use of water collected. Young and literate villagers reported that tubewell-water contains arsenic and causes blackening of the skin and hardening of the palms and soles. Old and illiterate people reported that tubewell-water causes arthritis. Some villagers believed that boiling or filtering or using water-purifying tablets removes arsenic from water. Several women reported that arsenic-contaminated water smells like kerosene. Some villagers were planning to install deep-drilled tubewells as they provide arsenic-free water. Most key informants reported that, without seeing any arsenic patients, the villagers would not believe the consequence of drinking arsenic-contaminated water.

**Conclusion:** Creation of awareness among villagers about arsenic contamination and its effects is an urgent need.

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## Impact of Breast-feeding Behaviour on Nutritional Status of Children Attending an Urban Clinic

Musleh Uddin Ahmed<sup>1</sup>, Md. Aminul Haque Bhuyan<sup>1</sup>, and T.M. Alamgir Azad<sup>2</sup>

**Objective:** Investigate the relationship of breast-feeding practices with the occurrence of malnutrition in children.

**Methodology:** This cross-sectional study was conducted in an MCH clinic at Mirpur, Dhaka. In total, 508 children aged less than 2 years, who attended the clinic for treatment of malnutrition, were purposively selected for the study. Only those who were on breast-feeding during the study period were included. Of the 508 children, 348 malnourished and 160 well-nourished children were included in the study and control groups respectively. The cut-off point for malnutrition was weight-for-age <75% of the reference standard as per Gomez classification. A pre-tested structured questionnaire was used for collecting data by face-to-face interview during 1999-2000.

**Results:** The mothers of the well-nourished group (40.76%) fed breastmilk earlier (within 6 hours after birth) than the mothers of the malnourished group (20.24%). Giving colostrum to the children showed a positive association with nutritional status of children. In the malnutrition group, 3.54% had exclusive breast-feeding against 9.33% in the well-nourished group. The duration of exclusive breast-feeding had a significant impact on the nutritional status of children. The large majority (73.38%) of the mothers in the malnourished group stated that insufficient secretion of breastmilk was the reason for giving other milks to their children. Over 58% of the malnourished children were given adult formula, whereas 67.50% of the well-nourished children were given infant formula. The majority (56.98%) of the mothers in the malnourished group stopped breast-feeding on or before 6 months, whereas the majority (54.07%) of the mothers in the well-nourished group continued breast-feeding up to 7-12 months and 40.74% beyond 12 months.

**Conclusion:** Based on the findings, it may be concluded that emphasis should be placed on proper breast-feeding behaviour for maintaining sound nutrition in young children.

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## Breast-feeding Patterns among Working Female Doctors in Dhaka City

Syeda Kheleda Ferdousi<sup>1</sup>, Rowshan Ara Begum<sup>2</sup>, and Ferdousi Islam<sup>3</sup>

**Objective:** Assess the breast-feeding patterns among female doctors working in different hospitals in Dhaka city.

**Methodology:** During March-June 2000, a cross-sectional study was conducted among 65 female doctors, having at least one child aged less than 2 years, working at different hospitals in Dhaka city. The sample was purposively selected. A semi-structured questionnaire was used for interviewing them at their workplaces. Data were analyzed using the SPSS 9.05 software. The statistical significance level was 0.05.

**Results:** Of the 65 respondents, 44.6% initiated breast-feeding within half an hour after birth. Caesarean section, lack of support, and maternal illnesses were the reasons for delayed initiation of breast-feeding. A high percentage (46.2%) had prelacteal feeding. Honey and water were widely used as the main prelacteals. Only 16.9% of the mothers breastfed their babies exclusively for 5 months. The median duration of exclusive breast-feeding was 2 months. The doctors having an MBBS degree and who belonged to the extended family had a significant positive influence on exclusive breast-feeding for 5 months ( $p < 0.05$ ). Over 64% of the mothers currently breastfed their babies. The doctors having an MBBS degree, husband with non-medical profession, extended family, and caesarian section positively influenced current breast-feeding ( $p < 0.05$ ). Sixty percent of the doctors bottlefed their babies. Bottle-feeding was significantly higher among the younger doctors ( $p < 0.01$ ). Only 26.2% of the mothers fed expressed milk during working hours.

**Conclusion:** Breast-feeding practices were not satisfactory, particularly among the highly-qualified doctors. An intensive programme needs to be launched for the promotion and protection of breast-feeding for working doctors, and a breast-feeding-friendly working environment should be ensured at the work place.

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## An Educational Intervention Designed to Improve Child-feeding and Caring Practices of Mothers in Four Rural Areas of Bangladesh

S.K. Roy, Rabi Biswas, **Aasma Afroz**, and S.S. Akter

**Objective:** Explore the perceptions and practices of rural mothers on child-feeding and caring practices and develop interventions to improve their attitudes through education and information.

**Methodology:** During March 2001-April 2002, 1231 mild-, moderately-, and well-nourished children aged 6-24 months from 4 Bangladesh Integrated Nutrition Project upazilas (Nikli, Chokoria, Dacope, and Sherpur) from 4 divisions of Bangladesh were studied. Mothers received either intensive nutrition education (INE) or less-intensive nutrition education (LINE), and the third group served as control. Nutrition education and counselling were provided weekly (LINE) or twice a week (INE) on food security, disease control, and caring practices to improve knowledge, attitudes, and practices of mothers on child-feeding and caring practices. In two rounds (at baseline and after 6 months of intervention), 48 focus-group discussions (FGDs)–6 in each upazila and 2 in each study group–were conducted to identify the existing beliefs, practices, and attitudes on child-feeding, cleaning and hygiene, and caring practices. Each session was attended by 6-8 mothers, and the session continued for one and a half hours. Behavioural change communication materials were developed for intervention based on the findings from baseline FGDs.

**Results:** At baseline, the mothers had incorrect conceptions and restrictions regarding some foods and frequency of feeding. They thought that time constraint was a major obstacle in caring for children. Their perceptions on hygiene practices and care during illness were also incorrect and inadequate. After the education intervention, child-feeding practices, particularly frequent feeding of *khichuri*, and restrictions on adding fish, oil, and eggs to home-made complementary food, changed in both INE and LINE groups. The perceptions and practices of the mothers on childcare improved in the intervention groups compared to the control group.

**Conclusion:** Appropriately-designed educational interventions, along with adequate information, remarkably improves the perceptions and practices of mothers on child-feeding and caring practices.

## Mothers' Perceptions and Practices about Giving Breastmilk and Breastmilk Substitutes to Infants in Dhaka

S.K. Roy<sup>1</sup>, Sebastian de Groot<sup>2</sup>, Sohana Shafique<sup>1</sup>,  
G.J. Fuchs<sup>3</sup>, Syeda S. Akter<sup>1</sup>, and Aasma Afroz<sup>1</sup>

**Objective:** Explore the practices and perceptions of mothers of different socioeconomic status about giving breastmilk and breastmilk substitutes to their infants.

**Methodology:** During February-April 2001, a cross-sectional study was conducted among 326 mothers of low (income <Tk 4,000, n=163) and middle (income >Tk 4,000, n=163) socioeconomic status with infants aged 6-12 months in Dhaka city. Qualitative data on appropriate practices and perceptions of mothers about breast-feeding were also collected through focus-group discussions (FGDs).

**Results:** The prevalence of exclusive breast-feeding was low in both the socioeconomic groups but was comparatively higher in the mothers of middle socioeconomic status (3.1% vs 12.3%,  $p<0.001$ ). In addition, the prevalence of introduction of breastmilk substitutes was higher in the mothers of middle socioeconomic status than in the mothers of low socioeconomic status (55.8% vs 43.5%,  $p<0.001$ ). The majority (62.3%) of the mothers reported insufficiency of breastmilk as the main reason for introducing breastmilk substitutes. Perception about the use of breastmilk substitutes and appropriate breast-feeding was also significantly different between the two socioeconomic status groups. Approximately, 90% of the mothers of low socioeconomic status could not differentiate between infant formula and powdered milk compared to 70% of the mothers of middle socioeconomic status ( $p<0.001$ ). The highest proportion (36%) of advice on using breastmilk substitutes came from the medical practitioners. Findings of FGDs revealed that some middle-class mothers still thought that infant formula was the best food for their infants.

**Conclusion:** There was not much difference in perception regarding breastmilk substitutes with different levels of education and socioeconomic status. Mass campaign on proper knowledge of breast-feeding practices should be strengthened and continued. Further studies on exploring strategies for removing the use of breastmilk substitutes should be undertaken.

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## Assessment of Breast-feeding Activities in Baby-friendly and Other Hospital Environments

Md. Eshaque Ali, A.Z. Amanatullah, and M.A. Mannan

**Objective:** Compare how successfully 10 steps of breast-feeding have been implemented at different baby-friendly hospital initiatives (BFHI) and non-BFHI centres.

**Methodology:** The BFHI is a movement to convert hospitals, clinics, and maternities into baby-friendly environments where successful breast-feeding is promoted. A retrospective cohort study was conducted from mid-February to mid-August 1999 to assess the knowledge, attitudes, performance, and practices (KAPP) relating to successful breast-feeding by administering a pre-set questionnaire and a pre-designed checklist among statistically-calculated cross-sectional population (physicians, matrons, nurses, paramedics, and others concerned) from randomly-selected BFHI and non-BFHI hospitals/clinics throughout 6 administrative divisions of Bangladesh. The sample included 473 and 404 professionals in BFHI and non-BFHI centres respectively.

**Results:** Significantly more professionals (30.9%) from the BFHI centres had a sound knowledge on the 10 steps of breast-feeding which are known as breast-feeding regulations than those from the non-BFHI centres (4.7%,  $\chi^2=152.94$ ,  $p<0.00$ ). Promotional materials on breastmilk substitutes and use of bottles, teats, formula milk, etc. , were displayed more at the non-BFHI centres than at the BFHI centres ( $\chi^2=23.54$ ,  $p<0.00$  and  $\chi^2=53.45$ ,  $p<0.00$  respectively). More maternity staff from the BFHI centres explained the benefits of breast-feeding (90.3%) and supported the introduction of colostrum (93.4%) than those of the non-BFHI centres (63.6% and 73.8%; where  $\chi^2=100.07$ ,  $p<0.00$  and  $\chi^2=64.17$ ,  $p<0.00$  respectively). More mothers from the BFHI centres were told about exclusive breast-feeding (97.3%), encouraged for rooming in (92.6%) of their newborn babies, and demand feeding (95.8%) than those of the non-BFHI mothers (79.7%, 70.5%, and 71.3%; where  $\chi^2=74.06$ ,  $p<0.00$ ;  $\chi^2=77.34$ ,  $p<0.00$  and  $\chi^2=106.33$ ,  $p<0.00$  respectively). Only 32% of the respondents mentioned that assessment of successful breast-feeding was carried out by the Bangladesh Breastfeeding Foundation.

**Conclusion:** The performance of breast-feeding promotion in the BFHI centres was significantly better than that in the non-BFHI centres. However, the proportion of respondents from the BFHI who had sound knowledge on overall breast-feeding regulations was not satisfactory. Regular and strong monitoring and assessment of activities relating to successful breast-feeding is, thus, required.

## Status of Women and Early Pregnancy Behaviour

S. Ramachandran, A. Subbiah, and A.K. Ravishankar

**Objective:** Examine the association between the status of women and early pregnancy behaviour.

**Methodology:** Data were drawn from a micro-level investigation on the “status of women and fertility,” undertaken by researchers in the Union Territory of Pondicherry, India, in 2001. Women were categorized into three status groups: low, middle, and high, based on the position of each woman in terms of 18 status indicators measured by a composite index developed using the Sudarshan and Iyengar technique.

**Results:** Many women die untimely or remain sick throughout their life after childbirth due to pregnancy and childbirth-related complications. The risk of complications is related to the status of women and is more probable for women pregnant at early ages (such pregnancies being 43.19%, 34.42%, and 14.19% in the three status categories from low to high). Reproductive loss (stillbirth, miscarriage, or abortion) was the most probable outcome of teen-age pregnancies, particularly in the low- and middle-status categories. About 42% (41.67%) of the total stillbirths and 61.76% of the total abortions were the outcomes of the first and second pregnancies. Many women who experienced early pregnancy reported health complications, such as pre-eclampsia and eclampsia, obstructed labour, and malaria, during the antenatal, natal and postnatal periods. Education and employment of women were identified as the principal determinants of early pregnancy.

**Conclusion:** Improving the status of women at least in terms of educational development is expected to reduce the occurrence of early pregnancy associated with more pregnancy risk.



## Nutritional Status of Women in India

M. Ubaidullah

**Objective:** Study the food-consumption practices of women, assess their nutritional status, using different indices, such as body mass index, anaemia, height and weight and examine the differentials in their nutritional status by socioeconomic factors.

**Methodology:** The study was based on data from the National Family Health Survey 1998-1999 (NFHS-2). The NFHS-2 sample covers more than 99% of the population of India living in 26 states. The NFHS-2 data were collected from 89,199 ever-married women aged 15-49 years. In this survey, the nutritional status, height, and weight of women were measured, and blood samples were collected to assess the prevalence of anaemia. Bivariate analysis (cross-tabulation) and logistic regression techniques were used for analyzing the data.

**Results:** There were substantial differentials in the food-consumption practices, with particular reference to selected background characteristics of women. Thirty-six of the women had a body mass index below 18.5, indicating a high prevalence of nutritional deficiency. Nutritional problems were particularly serious among rural and illiterate women, and among women belonging to the Scheduled Castes and Scheduled Tribes.

**Conclusion:** Suitable nutrition-education programmes (institutionalization of nutrition education from Class I to X at the school level, nutrition and health education for adults, and continuing education and non-formal education programmes for women and children in rural areas, and approaches, such as child-to-child approach and women-to-women approach) and applied nutrition programmes (Integrated Child Development Scheme, Balwadi and mid-day meal programme) for the vulnerable rural and poor women would go a long way in enhancing their nutritional status.

## Effect of Supplementation of Fish-oil and Soybean-oil during Pregnancy on Psychomotor Development of Infants

F. Tofail<sup>1</sup>, I. Kabir<sup>1</sup>, J.D. Hamadani<sup>1</sup>, S.N. Huda<sup>2</sup>, F. Chowdhury<sup>1</sup>, S. Yesmin<sup>1</sup>, F. Mehreen<sup>1</sup>, G.J. Fuchs<sup>3</sup>, and T. Romana<sup>1</sup>

**Objective:** Assess the effect of supplementation of fish-oil to pregnant women during the last trimester on psychomotor development of their infants.

**Methodology:** The current study was a cohort of a large study carried out with a lower middle-class population in urban Dhaka, during April 2000-October 2001. In the original study, 400 pregnant women were randomly allocated to either fish-oil (4 g/day) containing 120 mg of docosahexaenoic acid (DHA) and 180 mg of eicosapentaenoic acid (EPA) or soybean-oil capsule (4 g/day), beginning at 24±1.2 weeks of pregnancy until delivery. Six months after birth, 249 (62%) infants from the original study could be located. These infants aged about 10 months were brought to the ICDDR,B Child Development Clinic in Dhaka for assessing child development indices and for behavioural rating. Trained psychologists (testers) assessed their psychomotor development index (PDI) and mental development index (MDI) using the Bayley Scales of Infant Development-II, and made behaviour assessment using a modified version of Wolke's scales. Each session was conducted for 45-60 minutes.

**Results:** In total, 125 infants were tested in the fish-oil group and 124 infants in the soybean-oil group. At enrollment, there were no significant differences in most of maternal or infantile biological or socioeconomic characteristics. The MDI score (mean±SD) was 103±8 vs 101±8 for the fish-oil and soybean-oil groups respectively (p=NS). Similarly, the PDI score (mean±SD) was 102±11 vs 100±10 in the fish-oil and soybean-oil groups respectively (p=NS). After controlling for possible confounders and loss from the study, no significant differences in psychomotor development and behaviour of infants were observed between the two groups.

**Conclusion:** Supplementation of fish-oil to moderately-malnourished mothers during the last trimester of pregnancy had no additional benefit over supplementation of soybean-oil in regard to psychomotor development of their infants.

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## Effect of Age, Parity, and Menopause on Bone-mineral Density in a Group of Bangladeshi Women

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**Objective:** Study the effect of age, parity, and menopause on bone-mineral density (BMD) in a group of Bangladeshi women.

**Methodology:** During 1995-1996, a cross-sectional study was conducted on 400 Bangladeshi women, aged 20-81 years, at the Institute of Post-graduate Medicine and Research (now Bangabandhu Sheikh Mujib Medical University). The BMD of distal end of radius and ulna of the women was measured using a bone densitometer, DTX (100), USA.

**Results:** The mean ( $\pm$ SD) age of the women was  $41.9\pm 14.6$  years, and the mean ( $\pm$ SD) parity was  $4.5\pm 2.9$ . There were 114 menopausal women who had a mean ( $\pm$ SD) age of  $48.8\pm 3.2$  years. The mean ( $\pm$ SD) BMD of radius and ulna ( $\text{g}/\text{cm}^2$ ) was  $0.42\pm 0.07$ . The BMD was significantly and negatively correlated with the age of the women ( $r=0.87$ ,  $p<0.001$ ) and also parity ( $r=-0.71$ ,  $p<0.001$ ). The menopausal women had a lower BMD than the non-menopausal women. The BMD started declining after the age of 40 years, and sharply declined after menopause. The BMD of the women was negatively associated with the duration of total months of breast-feeding. The mean BMD reduced significantly with increase in parity ( $p<0.001$ ). When the BMD was compared between women with a heavier and lighter workload, it was higher among the women who had a heavy workload. Controlling for education and workload, the BMD correlated with the age (slope  $-0.69$ ,  $p<0.0001$ ) and mid-arm circumference (slope  $0.14$ ,  $p<0.002$ ).

**Conclusion:** The findings suggest that the BMD of Bangladeshi women is related to their membrane attack complications, and declines toward their older age.

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## Relationship of Placental Weight with Birth-weight

Nazneen Begum<sup>1</sup>, C.A. Kawser<sup>2</sup>, A.K.M. Fazlur Rahman<sup>1</sup>

**Objective:** See if any relationship exists between placental weight of women entering pregnancy with different birth-weights.

**Methodology:** Two hundred forty-six pregnant mothers, who were otherwise healthy, were prospectively followed in a city hospital during antenatal period until delivery and immediate post-partum period. Height of mothers was measured initially and weight measured at each visit of every woman during the antenatal check-up. Placental weight and birth weight of babies were measured immediately after delivery by a weighing scale.

**Results:** Eighty-one percent of the mothers were between the age of 20 and 29 years. The BMI of 88% mothers was 18 and above. In 75% cases, mothers came either with primigravida (42%) or second gravida (33%), and in 25% cases, 3<sup>rd</sup> or onward. In 49% cases, the placental weight was between 401-500 g, in 30% cases >500 g, and in 21% cases 400 g or less. Babies with appropriate birth-weight were born in 85% cases, and low-birth-weight babies in 15% cases. It was observed that a very strong correlation existed between placental weight and birth-weight ( $r=0.391$ ,  $p<0.001$ ). However, there was no correlation between placental weight and APGAR score at one minute ( $r=0.079$ ,  $p=0.216$ ).

**Conclusion:** It is concluded that increment of birth-weight occurs with increase in placental weight.

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## Nutritional Status of Pregnant Women Who Attended a Periurban Antenatal Outpatient Clinic

S. Tasnim, S. Chowdhury, and F. Rahman

**Objective:** Determine the anthropometric characteristics and changes in weight among pregnant women who attended a periurban antenatal clinic.

**Methodology:** Clinical records of 1,722 pregnant women who had two or more antenatal visits to the antenatal clinic at Jalkuri, a branch of the Institute of Child and Mother Health in a periurban area, from January 97 to December 97 were retrospectively analyzed. Of the 1,722 women, 246 were included in this study.

**Results:** Characteristics of the study sample (n=246) showed the mean age was  $22.68 \pm 4.51$  years, and primigravida was 45.5%. The mean height and weight was  $150.36 \pm 4.6$  cm and  $45.87 \pm 7.5$  kg respectively. The mean mid-upper arm circumference (MUAC) was  $22.39 \pm 2.9$  cm. Anaemia was clinically detected in 80% of the cases, but haemoglobin estimation report of 138 cases (58.5%) was available. Of them, 4.3% had severe anaemia ( $<7$  g/dL). The mean body mass index (BMI) was  $20.34 \pm 3.5$ , and 48.4% had the BMI below 19.5. The pattern of antenatal visits showed that 84.5% of those (n=1,722) availing of antenatal care had a single visit, 6.4% had 3-4 visits, and 39.4% came within the first trimester of gestation for antenatal check-up.

**Conclusion:** Nearly half of the pregnant women were moderately malnourished, and 4.3% were severely anaemic, and the compliance to antenatal visits was poor.

## Nutrition Challenge and Prevalence of Anaemia in India

A.K. Ravishankar<sup>1</sup>, S. Ramachandran<sup>1</sup>, and V. Selvam<sup>2</sup>

**Objective:** Assess the nutritional status of women and preschool children and the prevalence of anaemia in India.

**Methodology:** Data for this study were drawn from the National Family Health Survey 1998-1999 (NFHS-2). The NFHS assessed the nutritional status of women for which data on food intake by family members were collected. Based on this information, the level of malnutrition was assessed using a technique to relate to the present state of health of women and preschool children. This section provided information required for the study purpose.

**Results:** Chronic illness was associated with poor nutrition of children. The proportion of severely-undernourished children was estimated to be 18% according to weight-for-age and to be 23% according to height-for-age criteria. Some problems associated with malnutrition were anaemia and iron deficiency which affected pregnant women and preschool children. The study found that, overall, 52% of the 70,916 women and 74% of the 58,273 children had some level of anaemia, and the difference was particularly pronounced in the case of moderate-to-severe anaemia. Nutritional anaemia affected 60-70% of the pregnant women. The prevalence of anaemia was slightly higher (56%) among the breast-feeding women than among other groups. Intervention programmes, such as antenatal care, promotion of breast-feeding, and proper weaning of children benefited the women and children protecting them from anaemia.

**Conclusion:** Further progress in human development in India will be difficult to achieve unless malnutrition is tackled with greater vigour and more rapid improvement in the future than in the past.

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## **Effect of Micronutrient Supplementation during Pregnancy on Maternal Anaemia, Birth-weight, and APGAR Score of Infants**

S. Ahmed, S. Salahuddin, and M. Begum

**Objective:** Assess the effect of micronutrient supplementation during pregnancy on reducing maternal anaemia and increasing birth-weight of infants and APGAR score.

**Methodology:** Two hundred pregnant women of low socio-economic status attending city clinics were purposively selected for the study. One hundred mothers were routinely given iron folate, vitamin B supplements for 4-5 months (i.e. the time they registered ) till delivery. They formed the experiment group. The other 100 mothers were routinely checked and advised but were not given any supplements. They formed the control group. Blood Hb levels of women in both the groups were determined by Acid Hematin method at the beginning and end of the term. Birth-weight (using hospital pan balance) and APGAR score were determined soon after birth of the babies.

**Results:** 8.5% of babies born to supplemented women and 28.3% born to control women had birth-weight of less than 2.5 kg. (WHO cut-off point for low birth-weight). At the beginning of the study, 95% of the control women and 96% of women in the experiment group had Hb level below 68%, which is an indication of anaemia. At the end of the term, 78% of women in the experiment group and 97% of the control women had Hb level below 68%. Infants of 55% of the control women and 10% of the experiment women had APGAR score of less than 8, which is considered to be below normal.

**Conclusion:** Supplementation led to significant increase in birth-weight, Hb level of mothers and APGAR score of infants. It is, thus, recommended that routine supplementation of several micronutrients be incorporated in all interventions, and all women of the low-income groups be covered.

## Serum Concentrations of Trace Elements in Cholera Toxin-treated Animals

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**Objective:** Determine the status of trace elements, such as copper, zinc, iron, and copper oxidase ceruloplasmin, in cholera toxin-treated animals.

**Methodology:** Cholera toxin (1-10 µg) was directly injected into a segment of the intestine of rabbit (n=10), rat (n=10), and guinea pig (n=10) to induce intestinal secretion, and venous blood samples were taken 5 hours after incubation. Blood samples were also collected from an equal number of animals which served as control. The trace elements were analyzed by atomic absorption spectrophotometry and ceruloplasmin by ultraviolet-visible spectrophotometry.

**Results:** The mean (±SD) serum concentrations of copper were significantly lower in the cholera toxin-treated animals than in the control animals (rabbit: 16.9±5.16 vs 21.6±6.22 µM, rat: 26.6±5.95 vs 31.8±4.98 µM, guinea pig: 9.8±2.92 vs 17.0±2.52 µM). Serum concentrations of copper oxidase ceruloplasmin were also lower in the cholera toxin-treated animals than in the control animals (rabbit: 11.9±3.22 vs. 21.7±4.77 mg/dL, rat: 19.6±1.70 vs 23.2±1.93 mg/dL, guinea pig: 5.3±2.39 vs 12.4±3.90 mg/dL). Similar changes were observed in serum concentrations of zinc. However, serum concentrations of iron were higher in the cholera toxin-treated animals than in the control animals.

**Conclusion:** Cholera toxin-induced secretion of intestinal fluid may contain a large amount of trace elements, which may ultimately result in reduced serum concentrations. A decrease in absorption of trace elements may also reduce serum concentrations of trace elements. Although there is a species variation in the mean concentrations, the cholera toxin-induced changes in trace elements and ceruloplasmin were similar in all species.

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## Iodized Salt: Knowledge, Attitude and Practice of Mothers from Northern Bangladesh

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and Md. Aminul Haque Bhuyan<sup>3</sup>

**Objective:** Estimate the prevalence of iodine deficiency disorders among mothers in northern Bangladesh and their perceptions about iodized salt and consequences of deficiency.

**Methodology:** The multistage sampling technique was used for selecting villages from 5 upazilas of 16 districts of Rajshahi division. During August 1997-May 1998, a structured questionnaire was used for collecting data for this cross-sectional study from 500 mothers, aged 19-49 years, who were able to answer questions independently. Subjects, selected by random sampling, were examined for palpable goitre, and the extent of association of knowledge, attitudes, and practices with IDD was critically observed.

**Results:** The prevalence of iodine deficiency disorders in the form of palpable goitre among the study population was 12%. The study revealed that 93% of the mothers were housewife. Of the 93% mothers, 7% had not heard about iodized salt, 60% had heard about it from television and radio. Seventy-one percent of the respondents had knowledge about the symptoms of goitre. Only 28% were aware that goitre is a preventable disease, and 3% knew how to test iodine in salt. The majority of the households had open containers to store salt. About 56% of the households consumed iodized salt. The main cause of non-use of iodized salt was that it was not bought by their husbands as it was more costly than non-iodized salt, and it was not available in nearby shops and village markets (*hat*).

**Conclusion:** An integrated approach is essential to make iodized salt popular and acceptable to the general mass through behaviour change communication (BCC). Greater awareness through BCC needs to be created among husbands and other members of households who actually buy salt.

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## Prevalence of Iodine Deficiency and Perception and Practice of Urban Pregnant Women Regarding Iodized Salt

Santhia Ireen<sup>1</sup>, Md. Mohiduzzaman<sup>2</sup>, Cadi P. Banu<sup>2</sup>, and Quazi Salamatullah<sup>2</sup>

**Objective:** Assess the knowledge and practice of pregnant women in Dhaka city regarding iodized salt and iodine deficiency disorders (IDD), and estimate the prevalence of iodine deficiency.

**Methodology:** A cross-sectional study was conducted among 504 pregnant women who attended the Maternal and Child Health Training Institute and the Dhaka Medical College Hospital for antenatal check-up during January-May 2001. Data-collection tools included a pretested structured questionnaire, clinical examination of goitre, and biochemical estimation of urinary iodine. Urine samples were analyzed in the IDD Laboratory at the Institute of Nutrition and Food Science, University of Dhaka, Bangladesh.

**Results:** Seventy-seven percent of the respondents did not have adequate knowledge on iodine, 80% were not aware of the consequences of iodine deficiency during pregnancy. Most (89%) respondents did not know the benefits of iodized salt. Ninety-nine percent consumed 'iodized'-labelled packet salt, and 94% stored salt in bottles with caps. The prevalence of goitre (grade 1 + grade 2) was 29%, indicating the prevalence of moderate goitre (WHO/UNICEF/ICCIDD criteria). Only one respondent (0.2%) had visible (irreversible) and the rest had palpable (reversible) goitre. Over one-fourth (29%) of the respondents had biochemical iodine deficiency (urinary iodine level <100 µg/L); of them, only 4% were severely deficient.

**Conclusion:** Although most respondents used iodized salt, their perception about iodine and its importance was not satisfactory. Despite the prevalence of moderate goitre, iodine deficiency assessed by urinary iodine estimation was not alarming among the study population.

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## Rickets: an Ignored Micronutrient Deficiency Disorder

Iqbal Ahmad Memon

**Objective:** Study the prevalence of rickets in patients admitted to the Pediatric Unit II of a Public Hospital.

**Methodology:** During January 1999-December 2001, records of patients were reviewed for admissions to the Pediatric Unit II of the Civil Hospital Karachi, a 2,200-bed major teaching hospital, for diagnosis of rickets. The diagnosis was based on the presence of clinical features and radiological evidence. Data on age, sex, weight, primary and associated diagnoses, and different risk factors for rickets were reviewed.

**Results:** Of 3,260 reviewable files of admitted cases, 148 (2.6%) patients had clinical and radiological diagnosis of rickets. All these patients were primarily admitted for some other clinical diagnosis: acute watery diarrhoea (44), persistent diarrhoea (10), pneumonia (29), seizures-hypocalcaemic (14), cerebral palsy (6), sepsis (31), pyogenic meningitis (3), and severe anaemia (7). One-third of the patients had normal weight-for-age, as with overall admissions of the unit. Fifty percent of the children were aged 1-3 year(s). Poor weaning was the most common associated parameter, whereas the presence or absence of breast-feeding, low birth-weight, use of drug [anticonvulsants], developmental delay, and family history had negligible associations. Other micronutrient deficiencies present were: iron deficiency (129), vitamin A deficiency (33), and zinc deficiency (06).

**Conclusion:** The presentation of rickets is often subtle and non-emergent, hence when diagnosed patients are treated as outpatients. The diagnosis of rickets in 2.6% of cases of admitted patients as associated diagnosis probably indicates the high prevalence of this micronutrient deficiency in the public at large. It is important to have a high index of suspicion and awareness. Surveys in the community should be undertaken to assess the prevalence of rickets and its impact on health, growth, and development of children.

## Prevalence of Anaemia among Children in Bangladesh: Time to Act

A.Z. Amanatullah, M.A. Mannan, and Md. Eshaque Ali

**Objective:** Study the prevalence of iron-deficiency anaemia among children in Bangladesh.

**Methodology:** The MEDLINE and POPLINE databases were searched for relevant literature. Information was also collected from relevant journals, books of abstracts, reports, and bulletins, and through personal communication.

**Results:** The prevalence of anaemia among children aged 6-59 months (preschool children) was 47%. The highest proportion (76%) of anaemic children belonged to the 6-11-month age group. Children of rural areas, aged 0-4 year(s), were more anaemic (male: 60%, female: 79%) than those of urban areas (male: 29%, female: 47%). Similar trends were observed among children aged 6-71 months. Female rather than male children suffered more from anaemia. The percentages of children aged 0-4 year(s) suffering from anaemia were 82.0 in 1975-1976, 73.0 in 1981-1982, and 70.0 in 1995-1996 which indicate that anaemia had declined in 2 decades in the case of children aged less than 5 years. The intake of iron by children aged 1-3 year(s) is 4.2 mg per day, while the consumption of this nutrient is 7.4 mg per day among children aged 4-6 years. This result indicates that the intake of iron by these two groups of children is well below the required amount [0-12 month(s): 10 mg, 24-60 months: 11 mg].

**Conclusion:** Anaemia is a major health and nutritional problem among children in Bangladesh. The production, availability, and accessibility of foods, e.g. meat, fish, poultry, iron-rich fruits, and vegetables, need to be increased. Food fortification and preservation technologies and facilities should be developed down to the household level. The motivation and communication strategies should be specifically aimed at enhancing the consumption of iron-rich foods with active community participation. Periodic surveys to identify the target population should be conducted.

## Improvements in Nutritional Status of Mothers in a Rural Area of the Bangladesh Integrated Nutrition Project

Azizul Haque

**Objective:** Assess the acceptability of community-based nutrition components promoted by Community Nutrition Promoters under the Bangladesh Integrated Nutrition Project.

**Methodology:** The study covered 20 of 212 Community Nutrition Centres in Sherpur upazila of Bogra district where pregnant women, lactating mothers, and newborn babies attended for measurement of height and weight and body mass index (BMI) under the programme of growth-monitoring promotion, nutrition education, supplementary feeding, and supplementation of micronutrients. Twenty Community Nutrition Promoters collected data by interviewing mothers at home using a structured questionnaire in December 2001, and Monitoring Officers rechecked the data for accuracy.

**Results:** Results of a comparison between the baseline data (survey conducted during October 1999-March 2000) and post-project data showed that most mothers in the project areas were enlightened with nutritional knowledge. Their learning contributed to a reduction in low birth-weight from 29.99% to 10.30%, severe malnutrition from 9% to 0.52% (60% weight-for-age), infant mortality rate from 53.9/1,000 to 38.6/1,000, maternal mortality rate from 4.4 to 3.6, increasing breast-feeding with colostrum from 53.1% to 79.74%, and gaining 7–10.5 kg of weight by women during pregnancy from 19.64% to 80.36%. Antenatal check-up by pregnant women increased from 76.57% to 88.07%. The pregnant women became accustomed to eat supplementary and additional food and more vegetables and fruits. They became more conscious about their personal hygiene and immunization and growth monitoring of their children after the project service.

**Conclusion:** Significant changes in dietary and healthcare practices of mothers occurred after the BINP intervention. The BINP activity should be scaled up all over Bangladesh to reduce maternal malnutrition and low birth-weight.

## Nutritive Value and Cultural Acceptability of Pupae of Mulberry and Non-mulberry Silkworms in Northeast of India

Neelima Mishra, N.C. Hazarika, K. Narain, and J. Mahanta

**Objective:** Evaluate the cultural acceptability of traditionally-consumed unconventional food items, such as pupae of *Attacus ricinii* (Eri), *Antherae assama* (Muga), and *Bombyx mori* (mulberry silkworm) and determine the proximate compositions of pupae of Eri and Muga (non-mulberry) silkworms.

**Methodology:** Proximate compositions, such as total fat, protein, carbohydrate, moisture, ash, and fibre contents, were determined following the method of Association of Official Analytical Chemists. The acceptability and consumption patterns were evaluated among a group of population (n=1,022) randomly selected from 3 major communities predominant in the villages of upper Assam using a pre-tested questionnaire through nutritional surveys. This study was carried out from July 2001 to April 2002.

**Results:** The proximate compositions (%) for non-mulberry silkworm were total fat (Muga  $17.82 \pm 0.94$  and Eri  $11.81 \pm 0.41$ ), moisture (Muga  $74.80 \pm 0.40$  and Eri  $76.60 \pm 0.51$ ), ash ( $0.91 \pm 0.07$  to  $1.37 \pm 0.07$ ), and fibre contents (Muga  $0.15 \pm 0.02$  and Eri  $0.18 \pm 0.01$ ). The highest consumption of pupae was in the Ahom community (Eri 91% and Muga 63%). The consumption pattern was the highest for *Attacus ricinii* pupae (Eri 87.7%), followed by *Antherae assama* (Muga 57.4%) and *Bombyx mori* (mulberry silkworm 24.6%). The consumption of Eri was the highest in the age group of 31-40 years among males (97.7%,  $p < 0.05$ ) and in the age group of 21-30 years in females (90.1%,  $p < 0.05$ ). However, the consumption pattern of Muga and mulberry silkworm pupae was same in both the sexes in the age group of 21-30 years and above ( $p > 0.05$ ). The factors that determined the acceptability of pupae by the respondents were: traditionally accepted (82.4%), taste (70.3%), adding variety to the diet (55.0%), and availability (43.9%).

**Conclusion:** In view of providing locally-available substitute food items with high cultural acceptability and nutritive value, these unconventional food items may be used as potential alternate recipe for malnourished population.

## Prevalence and Determinants of Anaemia among Indian Children

M. Ubaidullah

**Objective:** Explore the prevalence and identify the determinants of anaemia among Indian children by selected background characteristics.

**Methodology:** Measurement of haemoglobin is the primary method to screen the level of anaemia. The Hemocue instrument has been used for estimating the haemoglobin level among children. The study drew data from the National Family Health Survey 1998-1999 (NFHS-2) conducted in India. As part of this survey, the haemoglobin levels of 20,016 children aged 6-35 months were tested. Statistical techniques, such as means, standard deviations, bivariate cross tabulations, chi-square test, and binary logistic regression, were used for analyzing data.

**Results:** Over 74% of the children were anaemic (mild anaemia [10.0-10.9 g/dL] 22.9%; moderate anaemia [7.0-9.9 g/dL] 45.9%, and severe anaemia [ $<7.0$  g/dL] 5.4%). Anaemia was highly prevalent among children aged 12-23 months and among male children, children of higher birth order, rural children, illiterate children, children of Hindus, Muslims, Sikhs, Jains, and of the Scheduled Castes and Scheduled Tribes. Children of moderately- or severely-anaemic mothers and whose standard of living was low were also anaemic.

**Conclusion:** In the iron-fortification programme, the vulnerable children should be given special attention. Further, information, education, and communication through mass-media and personal contact should be initiated to educate them about the importance of iron in human nutrition. The Integrated Child Development Programme should be extended to all of them to reduce the prevalence of anaemia.

## **Malnutrition and Sociocultural Variation among the Lepcha Children of Kalimpong, India**

Barun Mukhopadhyay

**Objective:** Examine possible variation of the nature and extent of malnutrition among the Lepcha children of Kalimpong, Darjeeling district, India, in relation to sociocultural factors.

**Methodology:** Eight hundred twenty-five children, aged 4-19 years, belonging to the indigenous Lepcha tribal population, participated in the study. The study children (Buddhist and Christian) were inhabitants of both Kalimpong town and its neighbourhood and of remote rural areas. Indices of malnutrition, such as weight-for-age and body mass index, were analyzed. Age was estimated by the help of traditional Lepcha calendar in the absence of date of birth.

**Results:** The study reveal that, although energy-malnutrition exists among the study children, it did not pose a major health problem for the community. An overwhelming majority of children, irrespective of rural-urban residence and religious affiliation, remained normal as determined by the weight-for-age classification recommended by the Indian Academy of Paediatrics. However, of those who suffered from malnutrition, children aged 8-15 years were relatively more vulnerable than were children in the other age groups. Further, urban children tended to be less malnourished compared to their rural counterparts, irrespective of religious category. Gender differences in relation to malnutrition were not marked.

**Conclusion:** Interventions for improving the nutritional status of children in the study population should be designed for 8-15-year old rural children.



## Relationship between School Achievement and Nutritional Status of School Children in 20 Primary Schools in Rural Bangladesh

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**Objective:** Identify the relationship between school achievement and nutritional indicators among school children in rural Bangladesh.

**Methodology:** It is a descriptive study of health (weight, height, MUAC, haemoglobin level and stool parasite load), school achievement (reading, writing, and arithmetic), along with socioeconomic variables. The study was carried out on 600 school children (6 to 15 years of age with equal number of males and females) in a rural sub-district Rupganj (population 300,000) near Dhaka. Twenty primary schools were randomly selected, and 30 children were selected randomly from Grade 3 (Class 3) in each school. School test results were analyzed, and children with marks in the lowest 33 centiles (score <30% defined as lower school achiever) were compared with those with marks in the upper 50 centiles (score >50% defined as higher school achiever).

**Results:** In children below nine years of age (n=178), prevalence of wasting (WHZ<-2.00) was 14%, stunting (HAZ<-2.00) was 14% and underweight (WAZ<-2.00) was 24%. Children aged 9-15 years (n=422) showed 51% stunting and 70% thinness (BMI for age <5th centile of NCHS reference). Anaemia (haemoglobin <120 g/L) was present in 92% of the children. Stool microscopy showed *Ascaris lumbricoides* in 69%, *Trichuris trichiura* in 39%, and *Ancylostoma duodenale* in 8%. The variables whose mean values were significantly different between lower and higher school achievers were number of siblings (p<0.01), parents' education, insufficient food intake in last days, whether has gone to sleep hungry. It was observed that presence of *Ascaris lumbricoides*/*Ancylostoma duodenale* (p<0.01) and underweight (p<0.04) were associated with lower school achievement, and there was no significant association between stunting, wasting, and school achievement. Multivariate analysis shows strong relationship between school achievement and sex (p<0.01), father's year of education (p<0.01), and also, the presence of food for education (p<0.00) in school (food for education programme was ongoing in those schools which were situated comparatively in more remote and poor areas).

**Conclusion:** Anthropometric indices except underweight, anaemia, and presence of *Trichuris trichiura* were not associated with school achievement.

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## Dietary Assessment in Developing Countries: Issues Around Validity

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**Objective:** Find out the feasible, cost-effective, and valid dietary assessment methods to determine the habitual dietary intake of people in developing countries.

**Methods:** Information on relevant literature was collected from Medline, Popline, Pubmed, and Chocrane databases, and was reviewed. Data from both developed and developing countries were collected. Due to limited data on dietary assessment methods available in developing countries, those collected in a study conducted in India were analyzed, and the major findings are reported.

**Results:** Results of review of literature review showed that, since 1960s, numerous validation studies were done in developed countries, but very little was done in developing countries. Based on the results of different validation studies, it was observed that a self-administered food frequency questionnaire (FFQ) can be accepted as a method of choice for use in epidemiological studies, since it is recommended by many investigators to be valid and comparatively simpler than other methods. However, this method is also not beyond limitations. One of the major limitations of the FFQ method that has been identified by several investigators is over-estimation of dietary intake, especially fruits and vegetables. Similar results have been derived from a case study. Results of a case study showed that both FFQ and 24-hour recall methods produced similar findings (81% vs 94%) as regard to main foods, but in the case of intake of vegetables, there was a significant difference between data derived from the two methods (56% vs 3%). However, in respect to developing countries, both 24-hour recall and FFQ methods produced reliable information by many, and some of them recommended a combination of these two methods.

**Conclusion:** In developing countries where diet is relatively simpler than developed countries, well-designed interviewer-administered FFQ and/or 24-hour recall methods can produce reliable information on habitual dietary intake.

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## **Sociodemographic Correlates of Anaemia among Adolescent Girls in Rural Area of Agra District, Uttar Pradesh, India**

V. Dutta and D. Nandan

**Objective:** Study the prevalence of anaemia in rural adolescent girls and the sociodemographic characteristics affecting anaemia.

**Methodology:** This cross-sectional study was conducted in the catchment area of the Bichpuri subcentre of primary healthcare. The area is a rural development block under the Department of Social and Preventive Medicine, S.N. Medical College, Agra, India. Two hundred twenty-four adolescent girls, aged 13-18 years, living in the catchment area of the subcentre, were studied. The study variables included age, religion, caste, socioeconomic status, parental education and occupation, family size, and haemoglobin (Haemocue instrument). Simple percentages and mean were calculated and analyzed.

**Results:** Of the 224 adolescent girls, 118 (52.6%) were anaemic. The mean haemoglobin level in girls aged 13-18 years was 11.68 g/dL. Of the anaemic girls, 94 (79.6%) had mild anaemia, whereas 24 (20.4%) had moderate anaemia. Socioeconomic status, occupation of fathers, education of mothers, and family size were significantly ( $p < 0.01$ ) associated with anaemia in the adolescent girls. Religion, caste, and working status of mothers did not show any significant relationship with the prevalence of anaemia in these adolescent girls ( $p = 0.05$ ).

**Conclusion:** Most adolescent girls in the study area were moderately anaemic. Father's occupation and mother's education, socioeconomic status, and family size were significantly associated with prevalence of anaemia.

## Effect of Nutrition Education and Specific Nutritious Food on Improvement of Growth of Young Children

S.S. Akter<sup>1</sup>, S.K. Roy<sup>1</sup>, G.J. Fuchs<sup>2</sup>, and Zeba Mahmood<sup>3</sup>

**Objective:** Assess whether correctly-prepared home-made complementary food given regularly can contribute to the growth of children aged less than 2 years.

**Methodology:** During January-August 1999, 183 moderately-malnourished children aged 6-24 months from 3 unions of a Bangladesh Integrated Nutrition Project upazilla were studied. Mothers of 93 children received nutrition education and mothers of another 90 children received the standard BINP advice only. Trained health assistants provided nutrition education twice a week on food security, caring practice, and disease control, including advice on how to prepare home-made complementary food (*khichuri*) with rice, pulse, oil, egg, and vegetables. After 3 months of the intervention, the children were observed for the subsequent 3 months.

**Results:** During and after the intervention period, rates of weight and length gain were significantly higher in the group who took *khichuri* for more than 50 days (median) than the group who took *khichuri* for less than 50 days (181.3 vs 115.0 g/kg,  $p<0.000$  and 5.6 cm vs 4.6 cm,  $p<0.000$ ). The weight-for-height z-score was also significantly different (-1.65 vs -0.92,  $p<0.04$ ) between the two groups. The growth was higher among the children (weight gain 170.7 vs 126.5 g/kg and length gain 2.7 vs 2.6 cm respectively) who took extra egg and oil-mixed potato. At the end of the observation, the net length gain was also significantly higher (5.3 vs 4.8 cm,  $p<0.02$ ) in children who took *khichuri*.

**Conclusion:** Properly-formulated home-made complementary food (*khichuri*) with nutrition education can improve the nutritional status of moderately-malnourished children.

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## Review of Efficacy and Effectiveness of Interventions to Improve Nutritional Status

M.A. Mannan

**Objective:** Review the evidence on the efficacy (potential effect) and large-scale effectiveness of nutrition interventions to reduce selected nutritional problems (low birth-weight, stunting, and three main micronutrient deficiencies—iron, vitamin A, and iodine) for improving nutritional status.

**Methodology:** Data were collected from secondary sources, library, Medline, and Popline databases, and personal communication was used for collecting information on the efficacy and effectiveness of most common direct nutrition interventions. Information was reviewed and analyzed.

**Results:** Intrauterine growth retardation (IUGR) was highly prevalent in Asia: Bangladesh (50%), India (28%), and Pakistan (25%). Fifty percent of all IUGR in developing countries was due to low maternal weight, height, and low weight gain in pregnancy. Less than 25% of energy as protein supplements increased maternal weight gain and birth-weight. The third trimester of pregnancy was the most effective for intervention. Stunting could be reduced by promotion of breast-feeding and energy-dense complementary feeding, supplementary feeding, and supplementation of micronutrients. The intake of iron lowered the risk of maternal mortality, decreased preterm delivery and low birth-weight, and improved maternal and infant iron status. Iron fortification of wheat, salt, and dry milk was effective. Supplementation of vitamin A during pregnancy reduced maternal mortality (40%) and morbidity, and increased the growth of deficient children. Iodine deficiency impaired learning, motivation, school performance, and cognitive functions. Supplementation of iodine during the first and the second trimester prevents cretinism. The intake of iodized oil by 6-week infants can reduce mortality by up to 72%. There are problems of transfer of interventions of known efficacy when scaled up to real-world environments (effectiveness).

**Conclusion:** Success of interventions depends on awareness and understanding, involvement and ownership, outcome and process orientation, community-government partnership, good management, and use of best practice guidelines.

## Nutritional Status of Children and Mothers in Bangladesh

A. Hannan, M.Q. Hassan, A.K.M. Fazlur Rahman,  
A. Rahman, and M.Q-K. Talukder

**Objective:** Assess the nutritional status of children and mothers in Bangladesh.

**Methodology:** Six nationwide cross-sectional surveys were conducted to assess the nutritional status of children aged less than two years and mothers every six months from July 1998 to February 2001. One district from each division and two upazilas from each selected district were randomly selected. A representative sample of about 250 children and their mothers was assessed from the randomly-selected two unions of each selected upazila. The children and their mothers in the selected areas and the population were different in each survey. Anthropometric measurements of children included measurement of weight and height/length. The nutritional status of mothers were assessed by taking their height and weight and expressing as body mass index (BMI). Anthropometric measurements were collected and analyzed using EPI nut programme in computer.

**Results:** In total, 3,000-3,200 children and their mothers were assessed in each survey. The mean maternal height ranged from 148.5 to 150.2 cm, and the mean maternal weight from 41.8 to 44.6 kg. The mean BMI of the mother in the first, second, third, fourth, fifth, and sixth surveys was 18.98, 18.84, 19.37, 19.77, 19.58, and 19.77 respectively. The means of BMI, height, and weight of the mothers were not compared. About 45% of the mothers had their BMI <18.5. The cut-off values for moderate and severe malnutrition were <-2 and -3 z-scores respectively. The rates of prevalence of moderate-to-severe underweight were 27-41%, whereas the rates of prevalence of moderate-to-severe wasting were 10.5-29.9%. The rates of prevalence of moderate-to-severe stunting were 35.7-47%.

**Conclusion:** Despite national efforts to improve the nutritional status of children and mothers in Bangladesh, the indicators are yet to reach an optimum level. These findings can help the policy-planners to understand the need of intensifying future programmes.

## Agroeconomic Determinants of Nutritional Status of Preschool Children\*

M.U. Mia<sup>1</sup>, C.A. Florencio<sup>2</sup>, and M. Hossain<sup>3</sup>

**Objective:** Identify the agricultural and socioeconomic determinants that influence the nutritional status of preschool children.

**Methodology:** This study was conducted in two villages of high agricultural potential in the Isabela Province, northeastern part of the Philippines. All farm households which had at least one preschool child aged less than 6 years were included in the study. Forty-one households in the study areas had 64 preschool children. Information on demography, crop production, income, expenditure, and food intake of farm households at the household level, and biological factors, such as age, sex, and anthropometric measures, e.g. weight and height, were collected in May 1996.

**Results:** Stepwise regression analysis was done to identify the significant determinants of nutritional status of preschool children. Per-capita landholding, tenurial status, crop production, size of farm households, age, and sex were the significant determinants of nutritional status in children. The variabilities explained by the model were 30% and 37% in relation to the local and international standards respectively. The children aged less than 2 years were significantly heavier compared to other age groups.

**Conclusion:** The results demonstrate that agricultural factors influenced the nutritional status of preschool children of the study farm households. In addition to socioeconomic and child's biological factors, these are significant determinants of the nutritional status of preschool children.

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