
# INTERNATIONAL CENTRE FOR DIARRHOEAL DISEASE RESEARCH, BANGLADESH

# ANNUAL SCIENTIFIC CONFERENCE

26 - 28 OCTOBER 1991

## PROGRAMME & ABSTRACTS

BANGLADESH COLLEGE OF PHYSICIANS AND SURGEONS AND ICDDR,B
MOHAKHALI HEALTH COMPLEX,
DHAKA-1212


The **INTERNATIONAL CENTRE FOR DIARRHOEAL DISEASE RESEARCH, BANGLADESH** (ICDDR,B) is an autonomous, non-profit making organisation for research, education, training and clinical service. It was established in December 1978 as the successor to the Cholera Research Laboratory, which had been established in Bangladesh in 1960.

The mandate of the ICDDR,B is to undertake and promote research on diarrhoeal diseases and the related subjects of acute respiratory infections, nutrition and fertility, with the aim of preventing and controlling diarrhoeal diseases and improving health care. The ICDDR,B has also been given the mandate to disseminate knowledge in these fields of research, to provide training to people of all nationalities, and to collaborate with other institutions in its fields of research.

The Centre, as it is known, has its headquarters in Dhaka, the capital of Bangladesh, and operates a field station in Matlab Upazila of Chandpur District. The Centre is organised into four scientific Divisions: Population Science and Extension, Clinical Sciences, Community Health, and Laboratory Sciences. At the head of each Division is an Associate Director; the Associate Directors are responsible to the Director who in turn answers to an international Board of Trustees consisting of eminent scientists and physicians and representatives of the Government of Bangladesh.

The Centre is funded by organisations and nations which share its concern for the health problems of developing countries. At present the major donors to the Centre include: the aid agencies of the governments of Australia, Bangladesh, Belgium, Canada, Denmark, France, Japan, the Netherlands, Norway, Sweden, Switzerland, the United Kingdom, the United States; international organisations including the United Nations Capital Development Fund, the United Nations Development Programme, the United Nations Children's Fund, and the World Health Organization; and private foundations including the Ford Foundation and the Sasakawa Foundation.

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# International Centre for Diarrhoeal Disease Research, Bangladesh

# ANNUAL SCIENTIFIC CONFERENCE

## 26-28 October 1991

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## Programme & Abstracts

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BANGLADESH COLLEGE OF PHYSICIANS AND SURGEONS

AND

INTERNATIONAL CENTRE FOR DIARRHOEAL DISEASE RESEARCH, BANGLADESH

Mohakhali Health Complex
Dhaka-1212

**ACKNOWLEDGEMENTS**

I would like to acknowledge the support and cooperation of the Ministry of Health and Family Welfare and other Ministries in the preparation of this conference. I express my gratitude to the Director – General Health Services, Director – General Family Planning, Director – General NIPORT, Directors of National Institutes, semi – government, autonomous and non – government organizations for their kind cooperation and participation. Special thanks are extended to Mr. Enam Ahmed Chaudhury, Secretary, Economic Relations Division, Ministry of Finance, Government of Bangladesh and Member, Board of Trustees, ICDDR,B for consenting to chair the opening ceremony of the conference. I also offer my special thanks to Mr. M. Mokammel Haque, Secretary, Ministry of Health and Family Welfare, for assenting to be special guest in the opening ceremony.

Our heartfelt thanks are due to Mr. Chowdhury Kamal Ibne Yusuf, the Honourable Minister for Health and Family Welfare, Government of the People's Republic of Bangladesh, for making time out of his busy schedule to inaugurate and grace this first Annual Scientific Conference of ICDDR,B as the Chief Guest.

Demissie Habte, M.D.
Director, ICDDR,B

## GREETINGS

Dear Colleagues

The 1,000 million episodes of diarrhoea occurring annually in the developing world result in 4 – 5 million deaths. Bangladesh contributes a large number of diarrhoea episodes and deaths to these figures. Nearly 350,000 deaths, or one fifth of all deaths in Bangladesh, are directly or indirectly associated with diarrhoea. This is a heavy public health burden and hinders progress in medical, social, economic, and other related fields.

Diarrhoeal diseases have close biological and socio – economic links to the problems of malnutrition, poor maternal health, high fertility and indeed, to child survival. Further, these problems share many of the same social and economic causal factors and interact to reinforce each other. Therefore, solutions of the problems of diarrhoeal diseases re – quire consideration of nutrition and reproduction, demography and population, and maternal and child health. An integrated research effort should thus be carried out in locations where these problems can be addressed in their full contexts.

Noteworthy advances have been made in recent years towards an understanding of diarrhoeal diseases, problems associated with MCH – FP, population, nutrition and related areas. The ICDDR,B has made significant contributions in these fields and has organized several training courses for international and national participants. It has published over 1,177 papers, including at least 765 original research articles, in scientific journals all over the world. Some of our research findings will be presented in this conference.

Although you are busy with your own important work, your presence with us today underscores commonality of interest and promotes exchange of ideas. We would like to offer you our warmest welcome and we sincerely hope that your participation in the conference will be fruitful.

**Organizing Committee**

# COMMITTEES

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Dr. D. Mahalanabis
Dr. M. A. Strong
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Dr. M.U. Khan

*Assistant Secretary*

Dr. Z.U. Ahmed

## INTRODUCTION

The International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) was established in December 1978, succeeding the former Cholera Research Laboratory which was founded in 1960.

**The aims and objectives of the Centre are**

a) To function as an institution to undertake and promote study, research and dissemination of knowledge in diarrhoeal diseases and directly related subjects of nutrition and fertility with a view to developing improved methods of health care and for the prevention and control of diarrhoeal disease and improvement of public health programmes with special relevance to developing countries.

b) To provide facilities for training to Bangladeshi and other nations in areas of the Centre's competence in collaboration with national and international institutions, but not to include conferring of academic degrees.

Although our research findings have been published in national and international journals and these do reach the professional scientific community, dissemination of the findings to health care providers, programme planners and policy makers in Bangladesh has not been adequate. This scientific conference has been organized to respond to this felt need. It is planned henceforth to be held on a regular yearly basis.

**Goals and objectives of the scientific conference**

The objectives are to disseminate the research findings of ICDDR,B to health care providers, health planners, administrators, medical educators, policy and decision makers, the donor community and other development organizations and to open a forum for exchange of ideas.

## PARTICIPATING ORGANIZATIONS

Ministry of Health and Family Welfare
Ministry of Planning
Semi – government institutions
Autonomous national institutions
Non – governmental organizations
International agencies
Donor agencies
Press and media

## SPONSORING ORGANIZATION

**International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B)**

The ICDDR,B is an autonomous, non – profit organisation for research, education, training and clinical service. It was established in December 1978 as the successor to the Cholera Research Laboratory, which was established in 1960.

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## PROGRAMME SUMMARY

| DATE | EVENT | PLACE | TIME |
|---|---|---|---|
| **26 October** | **Inauguration** | BCPS | 8:00 a.m. |
| | **Plenary Session I: MCH and Nutrition** | BCPS | 11:00 a.m. |
| | Panel Discussion: MCH and Nutrition | BCPS | 2:00 p.m. |
| | Free Paper and Poster Presentation: MCH and Nutrition | BCPS | 3:30 p.m. |
| **27 October** | **Plenary Session II: Diarrhoeal Diseases** | BCPS | 8:30 a.m. |
| | Panel Discussion: Diarrhoeal Diseases | BCPS | 11:00 a.m. |
| | Free Paper and Poster: Diarrhoeal Diseases | BCPS | 2:00 p.m. |
| **28 October** | **Plenary Session III: Population and Family Planning** | BCPS | 8:30 a.m. |
| | Poster Session | BCPS | 10:30 a.m. |
| | Panel Discussion | BCPS | 11:00 a.m. |
| | Free Paper Session A: Population and Health | ICDDR,B | 2:00 p.m. |
| | Poster | BCPS | 3:15 p.m. |
| | Free Paper Session B: Family Planning | BCPS | 2:00 p.m. |
| | **Concluding remarks and a vote of thanks by Director, ICDDR,B** | BCPS | 5:30 p.m. |

## FREE PAPER AND POSTER PRESENTATIONS

### SESSION I: MCH AND NUTRITION: 26 OCTOBER

| | | |
|---|---|---|
| Free Presentation | Abstract nos. 1 – 11<br>3:30 – 5:30 p.m. | BCPS |
| Poster Presentation | Abstract nos. 12 – 41<br>9:00 a.m. – 5:00 p.m. | BCPS |

### SESSION II: DIARRHOEAL DISEASES: 27 OCTOBER

| | | |
|---|---|---|
| Free Presentation | Abstract nos. 42 – 55 & 89<br>2:00 – 3:30 p.m. | BCPS |
| Poster Presentation | Abstract # 56 – 74 & 88 & 90<br>9:00 – 5:00 p.m. | BCPS |

### SESSION III: POPULATION AND FAMILY PLANNING: 28 OCTOBER

**Free Presentation**

| | |
|---|---|
| Abstract nos. 75 – 80<br>2:00 – 5:00 p.m. | ICDDR,B |
| Abstract nos. 81 – 87<br>2:00 – 5:00 p.m. | BCPS |

**Poster Presentation**

| | | |
|---|---|---|
| 3:15 – 3:45 p.m. | Population and Health | BCPS |
| 3:15 – 3:45 p.m. | Family Planning | BCPS |

# PROGRAMME

## Annual Scientific Conference of ICDDR,B

## October 1991

## BCPS Auditorium, Mohakhali, Dhaka

**DAY 1 : October 26, 1991**

| Time | Event | Venue |
|---|---|---|
| 8:00 a.m. | **Registration of Delegates** | **Lobby Reception Counter** |
| 9:00 a.m | **Opening Ceremony**<br>- Recitation from the Holy Quoran<br>- Welcome address by the Director, ICDDR,B<br>- Address by the representative of the Board of Trustees (Chairman)<br>- Address by the Special Guest<br>- Address by the Chief Guest<br>- Vote of Thanks. | **Auditorium** |
| 10:30 a.m. | **TEA** | **Venue: Lobby Tea Room** |
| 11:00 a.m. | **Plenary Session I: MCH and Nutrition** | |
| | **Chairperson**<br>Prof. M. Khabiruddin<br>(NIPSOM) | **Rapporteur**<br>Dr. Kh. Z. Hasan<br>(ICDDR,B) |
| | **Co – Chairperson**<br>Dr. Rukhsana Haider | |

| | Speaker | Theme address |
|---|---|---|
| | Dr. M. A. Koenig (Population Council) | Impact of health intervention on child survival |
| | Dr. D. Mahalanabis | Role of micronutrients in growth and child survival |
| | Dr. L.A. de Francisco Serpa (ICDDR,B) | Community based maternity and child care programme |

12:30 p.m. **LUNCH** **Venue : Lobby Tea Room**

2:00 p.m. **PANEL DISCUSSION: MCH AND NUTRITION**

**Topic : Feeding and Child Survival**

| Chairperson | Rapporteur |
|---|---|
| Prof. D. Habte (ICDDR,B) | Dr. Shusila Zeitlyn (ICDDR,B) |

Participants

Prof. M.Q.K. Talukder (IPGM&R)

Dr. P. O'Brien (UNICEF)

Prof. Tahera Khanum (NIPSOM)

Dr. M.U. Khan (ICDDR,B)

3:15 p.m. **TEA** **Venue : Lobby Tea Room**

3:30 p.m. **FREE PAPER AND POSTER PRESENTATIONS: MCH AND NUTRITION**

| Chairperson | Rapporteur |
|---|---|
| Prof. M. R. Khan (Consultant, ICDDR,B) | Dr. S. K. Roy (ICDDR,B) |

**Co – Chairperson**

Dr. R.L. Akbar (ICDDR,B)

| | Authors | Paper Title |
|---|---|---|
| 3:30 p.m. | L.A. de Francisco Serpa M. Strong, V. Faveau, A.M. Sarder and M. Yunus | Measles surveillance system: age specific incidence and consequences for its control |
| 3:40 p.m. | M.A. Wahed, M. Begum, M. Rahman, A.S.G. Faruque and D. Mahalanabis | Amylase – rich wheat flour for preparation of energy dense liquid porridge for children with diarrhoea |
| 3:50 p.m. | L. A. de Francisco Serpa K. Stewart, Faveau, J.Chakraborty and S.A. Khan | Mortality impact of a community based programme to control acute lower respiratory tract infections. |
| 4:00 p.m. | N. Paljor, A.H. Baqui, C. Larman, K. Alvi and K. Dearden | Urban health research and extension project – An urban health initiative to improve the health status of slum residents in Bangladesh |
| 4:10 p.m. | A.H. Baqui, C. Lerman, M. Siddiqi, N.M. Jahangir and N. Paljor | Urban surveillance system |
| 4:20 p.m. | C. Lerman, A. H.Baqui, M. Siddiqi and N. Paljor | The impact of urban volunteer on contraceptive use and method – mix rates in Dhaka slums |
| 4:30 p.m. | A.H. Baqui, C.Lerman, M. Siddiqi and N.Paljor | The impact of urban volunteers on mothers' knowledge of diarr – hoea prevention, diarrhoea prevalence rates and ORT uti – lization rate in Dhaka slums |
| 4:40 p.m. | J. Khatun, N. Hughart, D. Silimperi and B. Stanton | A new EPI strategy to reach high risks urban children in Bangladesh : urban volunteers |

| | | |
|---|---|---|
| 4:50 p.m. | K.M.A. Aziz, B.A.Hoque, Kh. Z. Hasan, M.Y. Patwary, S.R.A. Huttly, M. Mujibur Rahaman and R.G. Feachem | Reduction of diarrhoeal diseases in children in rural Bangladesh by environmental and behavioral modifications |
| 5:00 p.m. | M. S. Islam, M. J. Alam, M.Z. Rahim and S.I. Khan | Faecal contamination of ponds in an around Dhaka city |
| 5:10 p.m. | B.A. Hoque, R.B. Sack, M. Siddiqi, J. Alam and N. Hazera | Water and sanitation in cyclone affected areas. Bangladesh cyclone of April 29, 1991 |
| 5:20 p.m. | *Summary and Comments by the Chairperson* | |

**DAY 2 : October 27, 1991**

8:30 a.m. **PLENARY SESSION II: DIARRHOEAL DISEASES**

| **Chairperson** | **Rapporteur** |
|---|---|
| Dr. A.N.A. Abeyesundere (WHO) | Dr. G.H. Rabbani (ICDDR,B) |
| **Co – Chairperson** | |
| Dr. K.M.A. Aziz (ICDDR,B) | |
| **Speaker** | **Theme address** |
| Dr. D. Mahalanabis (ICDDR,B) | Emerging problems in diarrhoeal diseases |
| Dr. R.B. Sack (ICDDR,B) | Preventive strategies in controlling diarrhoeal diseases: oral cholera vaccine |
| Dr. A.N. Alam (ICDDR,B) | New concepts in the management of acute diarrhoeal diseases |

10:30 a.m. **TEA** **Venue: Lobby Tea Room**

11:00 a.m. **PANEL DISCUSSION : DIARRHOEAL DISEASES**

**Topic : Issues in the Implementation of the National Diarrhoeal Disease Control Programme**

| **Chairperson** | **Rapporteur** |
|---|---|
| Prof. M.A.T.Siddique (Director General of Health Services) | Dr. M. Yunus (ICDDR,B) |

**Participants**

Dr. M. Anwarullah (CDD)

Dr. F. Sibanda (UNICEF)

Dr. A.M.R.Chowdhury (BRAC)

Dr. A.K.M. Siddique (ICDDR,B)

12:30 p.m. **LUNCH** **Venue: Lobby Tea Room**

2:00 p.m. **FREE PAPER AND POSTER PRESENTATIONS: DIARRHOEAL DISEASES**

| **Chairperson** | **Rapporteur** |
|---|---|
| Maj.Gen.(Rtd) M.R. Choudhury (Member, ERC, ICDDR,B) | Dr. P.K. Bardhan (ICDDR,B) |

Co – Chairperson

Dr. Firdausi Qadri (ICDDR,B)

| | **Authors** | **Paper Title** |
|---|---|---|
| 2:00 p.m. | S.K.Roy, R. Haider, S.M. Akramuzzaman, R. Behrens and A.M. Tomkins | Impact of zinc supplementation on subsequent growth and mor – bidity in Bangladeshi children presenting with acute diarrhoea |
| 2:10 p.m. | I. Kabir, D. Mahalanabis M. Rahman and M.A. Malek | Increased linear growth with a protein/high energy diet in children convalescing from shigellosis |

| | | |
|---|---|---|
| 2:20 p.m. | A.K. Mitra, D.Mahalanabis H. Ashraf, S.Tzipori, L. Unicomb and R. Eeckels | Hyperimmune bovine colostrum reduces diarrhoea due to rotavirus: a double – blind controlled clinical trial |
| 2:30 p.m. | A.N. Alam, M.R.Islam, S. Hossain, D.Mahalanabis and K.M.A. Hye | Comparative efficacy of oral pivmecillinum with nalidixic acid in treatment of acute shigellosis in children |
| 2:40 p.m. | L.A.de Francisco Serpa, V. Faveau and M. Yunus | Epidemiology of diarrhoea mortality in Matlab, rural Bangladesh |
| 2:50 p.m. | A.H.Baqui, R.B.Sack, R.E. Black, M. Yunus, H.R. Chowdhury and A.K. Siddique | Descriptive epidemiology of persistent diarrhoea and its association with nutri – tional status and immuno – competence in rural Bangla – deshi children |
| 3:00 p.m. | N.S.Shahid, N.N.Banu, F. Bingnan, S. Tzipori and L. Unicomb | Neonatal rotavirus infections in Dhaka |
| 3:10 p.m. | A.K.Siddique, A.S.M. Rahman and M.J. Albert | Cholera epidemic in South America: experience of ICDDR,B in Ecuador |
| 3:20 p.m. | M.J.Albert | *Escherichia coli* diarrhoea |
| 3:30 p.m. | **TEA** | **Venue : Lobby Tea Room** |
| 3:45 p.m. | S.M.Faruque, M.M.Rahman A.R.M.A. Alim, Q.S.Ahmad and K.M. Belayet Hossain | Molecular biology in the study of diarrhoeagenic organisms : a review of tech – nical facilities and achieve – ments |
| 3:55 p.m. | K.Haider, M.J.Albert, A.N. Alam, S. Nahar and A.N. Bhuiyan | Resistance of Shigella species to antimicrobial agents and its association with plasmids |
| 4:05 p.m. | L. Unicomb, F. Bingnan, K.Jerecki – Khan, N.N.Banu, A.Ali, S. Rahim, J.Gomes and S. Huda | Role of enteric viruses in diarrhoeal disease in Bangladesh |

| | | |
|---|---|---|
| 4:15 p.m. | M.S.Akbar, S.K.Roy and N. Banu | Efficacy of rice – based low – cost diet in the management of persistent diarrhoea in Bangladeshi children |
| 4:25 p.m. | T. Azim, F.Qadri, S.Saha R. Raqib, D. Islam and L.N. Islam | Immune response in diarrhoeal disease |
| 4:35 p.m. | G.H. Rabbani, F.P.L. Van Loon, K. Buhave and J. Rask – Madsen | Inhibition of jejunal prostag – landin E2 release by indome – thacin in adult patients with cholera |
| 4:45 p.m. | *Summary and Comments by the Chairperson* | |

**DAY 3 : October 28, 1991**

8:30 a.m. **PLENARY SESSION III: POPULATION AND FAMILY PLANNING**
**[Venue: BCPS]**

| **Co – Chairpersons** | **Rapporteur** |
|---|---|
| Mr. Abdus Salam (Secretary, Statistics Division, Ministry of Planning) | Dr. A.M.R. Chowdhury (BRAC) |
| Dr. Mridul K. Chowdhury (ICDDR,B) | |

| **Speaker** | **Theme address** |
|---|---|
| Dr. Michael A. Strong (ICDDR,B) | Population studies at ICDDR,B |
| Dr. Abbas Bhuiya (ICDDR,B) | Demographic trends in Matlab, 1966 – 1990 |
| Dr. John G. Haaga and Dr. R. Maru (ICDDR,B) | Lessons in family planning |

10:30 a.m. **TEA AND POSTER SESSION** **Venue : Lobby Tea Room**

11:00 a.m. **PANEL DISCUSSION: POPULATION AND FAMILY PLANNING**

**Chairperson**

Dr. Mahabub Hossain
(DG, BIDS)

Rapporteur: Ms. Simeen Mahmud
(BIDS)

**Topic : The new Five Year Plan of Bangladesh and the Fourth World Bank Population and Health Project**

Participants

Dr. Philip Gowers (World Bank)

Dr. Aminul Islam (Family Planning Directorate)

Mr.A.K.M. Rafiquzzaman (NIPORT)

Dr. Halida H. Akhtar (BIRPERHT)

1:00 p.m. **LUNCH** **Venue : Lobby Tea Room**

**FREE PAPER AND POSTERS PRESENTATIONS: POPULATION AND FAMILY PLANNING**

**Free Paper Session A** **Venue : ICDDR,B Lecture Room #1**

**Population and Health**

**Co – Chairpersons**

Dr. R. Bairagi
(ICDDR,B)

Prof. M. Kabir
(Jahangirnagar University)

**Discussants**

Ms. Karen B. Allen
(University of Pennsylvania)

Prof. Barkat – e – Khuda
(Dhaka University)

| Time | Authors | Paper title |
|---|---|---|
| 2:00 p.m. | G. Mostafa, V. Faveau, B. Wojtyniak and A. Foster | The influence of socio – biological factors on perinatal mortality |
| 2:15 p.m. | K.A. Mozumder, F. Rahman and M.A. Koenig | Birth interval, prematurity, and childhood mortality: evidence from the MCH – FP Extension Project |
| 2:30 p.m. | N. Alam and L. Wai | Effects of previous birth interval and the death of a previous child on infant and child mortality in Teknaf |
| 2:45 p.m. | Karen B. Allen | Discussion |
| 3:00 p.m. | Open discussion | |
| 3:15 p.m.<br>3:45 p.m. | **TEA AND POSTER SESSION** | **Venue: BCPS Lobby** |
| | | **Venue : ICDDR,B Lecture Room #1** |
| 3:45 p.m. | M.K. Chowdhury | Discrimination against females and son preference: a review |
| 4:00 p.m. | Kashem Sheikh | The consequences of changing nuptiality in Bangladesh: evidence from Matlab |
| 4:15 p.m. | N.U. Khan and A. Riley | The relationship between adolescent pregnancy and poor pregnancy outcome |
| 4:30 p.m. | Barkat – e – Khuda | Discussion |

**Free Paper Session B** **Venue: BCPS Auditorium**

**Family Planning**

| Co – Chairpersons | Discussants |
|---|---|
| Mr. A.K.M. Rafiquzzaman (NIPORT) | Dr. Mehtab Currey (MOHFW) |
| Dr. R. Maru (ICDDR,B) | Mr. S.R. Choudhury (MOHFW and World Bank) |

| Time | Authors | Paper Title |
|---|---|---|
| 2:00 p.m. | M.B. Hussain, S. Salway and U. Rob | Trends in contraceptive use and continuation rates: implications for the national programme |
| 2:12 p.m. | F. Rahman and M. Islam | Home delivery of injectable contraceptives: field experience and plans for nationwide implementation |
| 2:24 p.m. | M.B. Hussain, R. Mita, M. Whittaker and M. A. Koenig | Quality of care and contraceptive adoption in rural Bangladesh: evidence from MCH – FP Extension Project areas |
| 2:36 p.m. | Halida H. Akhter | Contraceptive use – related physical ailments: myths and realities in rural Bangladesh |
| 2:48 p.m. | M. Currey | Discussion |
| 3:00 p.m. | Open Discussion | |
| 3:15 p.m. | **TEA AND POSTER SESSION** | **Venue: BCPS Lobby** |
| 4:00 p.m. | S. Hussain, M. Rahman and R. Maru | Recruiting appropriate field workers: Strategies and the process of technical assistance to the MOHFW |
| 4:15 p.m. | Y. Hasan and M. Koblinsky | Work schedules of family planning field workers |
| 4:30 p.m. | A. Ashraf, Y. Hasan, M. Islam and R. Maru | Management information for family planning : What is needed? How can it be obtained? |
| 4:45 p.m. | S.R. Choudhury | Discussion |
| 5:15 p.m. | ***Concluding remarks and a vote of thanks by the Director, ICDDR,B*** | **Venue: BCPS Auditorium** |

# SUMMARY OF PLENARY LECTURES AND ABSTRACTS OF FREE AND POSTER PRESENTATIONS

## *Plenary Lectures*

1

# ROLE OF MICRONUTRIENTS IN GROWTH AND CHILD SURVIVAL

**D. Mahalanabis**

*International Centre for Diarrhoeal Disease Research, Bangladesh*

Intake of energy and protein in children has received much attention by health authorities in relation to improvement in growth and nutrition of children. Identification of Protein Energy Malnutrition (PEM) with greater risk of morbidity and mortality are also done using anthropometric indices while nutritional rehabilitation of PEM children are generally based an increased intake of energy and protein. Information on micronutrient deficiency and consequence of their deficiency in growth , morbidity and mortality have not been adequately addressed. Until recently systematic studies have not been taken. Micronutrients essential for growth and morbidity include vitamin A, Zinc, Folate, Copper, Iron and Iodine. Deficiency of micronutrients not only occur in PEM but also in children with marginal malnutrition. Studies in Indonesia and India showed significantly higher morbidity among vitamin A deficient children and their mortality risk was also higher . Vitamin A supplementation has shown greater reduction in mortality. Zinc supplementation have shown increased linear growth in children of USA, Egypt and Iran. A recently completed study in Bangladesh shows reduced morbidity and mortality and increased subsequent linear growth among more malnourished children when zinc was supplemented during diarrhoea. Folate deficiency in experimental studies showed significant reduction in intestinal epithelium with reduced villus growth. Supplementation could reverse the situation. Copper deficiency has been shown to cause anemia, depression of immunedefence system leading to increased susceptibility to infection. Iron deficiency has shown to be associated with increased susceptibility to infection and high mortality in experimental animals. Iodine deficiency is also associated with growth faltering and endemic deficiency syndrome. More important role of vitamin E has been discovered as potent antioxidant agent which prevent from infection and mortality. Carotenoids have been found to have antioxidative property and anti-carcinogenic effects. Macronutrient deficiency does not occur alone during childhood growth faltering while micronutrients appear to play important role in preventing from growth faltering and may improve child survival and development. More attention is required to understand their role in morbidity and mortality. Adequate dietary intake of essential micronutrients may be one potential tool to improve child survival status of the less developed countries.

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# LESSONS FOR FAMILY PLANNING FROM THE MCH – FP EXTENSION PROJECT

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The MCH – FP Extension Project is a collaborative effort of the ICDDR,B and the Ministry of Health and Family Welfare of the Government of Bangladesh, supported by the Population Council, and funded by the U.S. Agency for International Development. Its purpose is to to improve the delivery of MCH and Family Planning services through the MOHFW system. To achieve this goal, project staff and their counterparts (1) Identify barriers to effective delivery of services, by working with MOHFW counterparts and by conducting applied research; (2) Test the feasibility of proposed solutions, in the actual conditions of the MOHFW system (usually, but not exclusively, in the two rural upazilas where the project has field stations);(3) Evaluate interventions, in terms of both process and impact; and (4) Assist the MOHFW to implement policy changes on a wider basis.

The Extension Project was designed to test whether some of the successful elements of small – scale or special – purpose research projects, such as those at the ICDDR,B field station in Matlab, could be replicated on a large scale within the regular government program, subject to its resource and management constraints.

Success in family planning in rural Bangladesh seemed to depend on the availability of well motivated, trained, female workers who were themselves married contraceptive users, working in their home areas; delegent, supportive supervision, high worker – to – population ratios and corresponding frequent home visits by workers; a separate, efficient supply and transportation system and feedback of information for use by workers and managers. The basic design of the Extension project is that it works through the government system, and draws lessons about the process of changing that system, rather than setting up a separate system of service delivery for research purposes.

The project has grown since 1982 beyond the original vision of large – scale replication of components of the Matlab project. In recent years the innovations tested in the project field sites include some that were "home – grown", based on ideas generated by MOHFW and Extension project staff.

The full model, of research results leading to small – scale experimentation leading to nationwide implementation, can be illustrated by the experience with recruitment of 10,000 additional Family Welfare Assistants. This decision was based in part on Extension project research on the effects of contact rates and visit length on contraceptive adoption and continuation. The project helped the MOHFW with the process of nationwide recruitment and devised means to monitor adherence to the plan of recuriting local women meeting educational and other criteria, and has also collected follow – up data.

Project staff developed a client – oriented record – keeping system for the FWAs, based on the sytem used in Matlab, and tested it in the project field sites. This record – keeping system was adopted nationwide in 1990 (perhaps prematurely, since little provision was made for training and analytic support). Project staff are now working on making the system more "user – friendly", as well as devloping training methods and working with several levels of the MOHFW to support capabilities for using information for program analysis. The project has also developed, and begun field – testing, similar means for

organizing the work of the FWAs immediate supervisors (Family Planning Assistants) and the Health Assistants.

Experience both in the MOHFW program in the project field sites and in non-government programs (Matlab, NGOs) has shown that family planning workers can deliver injectables safely to women in their homes, and that this method is popular and its availability leads to higher contraceptive use. But safe, uninterrupted delivery requires training of workers, good technical supervision, monitoring of destruction of disposable syringes after use, continuous supply, and many other support systems. Expansion of the program needs to be carefully phased. The Extension Project has proposed, and the MOHFW has accepted, an expanded test in eight additional upazilas to identify the problems and further develop training and monitoring methods.

Analyses of demographic and epidemiologic data collected by the Extension project, mainly in Matlab, have produced a number of results significant both for the national program in Bangaldesh and potentially for other countries. Examples include the findings that tetanus toxoid provides longer protection than had been expected, and that high measles mortality in infancy could necessitate revision of vaccintation schedules and testing of new vaccines.

As yet less well documented, but potentially significant, are changes introduced by the Project in the two field-site upazilas in MOHFW management -- the introduction of problem-solving meetings involving both health and family planning wings, for example. In recent years project staff have compiled a wealth of observational data on the activities of, and constraints faced by, supervisors, to complement an earlier emphasis on field workers.

Current priorities of the project are to:

(1) Expand and monitor the program of home delivery of injectable contraceptives.

Project staff will work on training; monitor implementation and quality of care in eight upazilas; and, if warranted, develop a plan for nationwide expansion.

(2) Develop methods to improve the use of information for management, at upazila, district, and national levels.

Project staff will continue to develop, and field-test, a revised version of FWA registers. They will work with managers to show how information can be used for problem identification, and feedback to the field, rather than just routine, unidirectional reporting. This effort will also address a longer-term concern with institutionalizing program analysis within the Ministry.

(3) Develop methods of measuring and monitoring quality of care in family planning, and test interventions to improve quality in satellite clinic and home delivery.

(4) Evaluate MCH interventions now implemented in project field sites, and develop and field-test new ones. These consist largely of "health" interventions (vitamin A, iron and folate distribution; side-effects management) added to the repertoire of the family planning workers.

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# COMMUNITY BASED MATERNITY AND CHILD CARE PROGRAMME

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The history of the Maternal and Child Health and Family Planning (MCH – FP) Programme has its origins in the Matlab Family Planning Health Services Programme (FPHSP) which was implemented in half of the Matlab Demographical Surveillance System (DSS) population in 1978 with the objective of reducing fertility and subsequently improving child survival. This Programme, in turn, was based on lessons learned from the less effective Contraceptive Distribution Project (CDP) operating in Matlab from 1975 to 77.

Community based activities implemented in 1978 – 79 included family planning, tetanus toxoid immunization of pregnant women and home based oral rehydration therapy. Activities were carried out by village women with at least eight grade education were hired and trained to provide services at the doorstep. Programme results showed significant increase in contraceptive prevalence (from 8% in 1977 to 40% in 1984) and moderate reductions in infant, child and maternal mortality.

As a result of this programme, the Total Fertility Rate was significantly lower in 1985 in the intervention area than in the neighbouring comparison area, but not to the point that might have been expected with a 45% contraceptive use. In order to decrease fertility and mortality further it was decided to put emphasis on maternal and child health interventions in 1986.

Studies were carried out in 1986 in order to disclose the relative contribution of different causes towards the high rates of infant, child and maternal mortality. Causes of death of children under five years of age detected by the verbal autopsy method were complications of small size at birth, vaccine preventable diseases and their complications, acute and persistent diarrhoea, acute lower respiratory infections and malnutrition. Interventions to avert these deaths were planned.

Health care interventions were then delivered to a population of 100,000 by 80 Community Health Workers (CHWs) trained by the Programme. A comprehensive Expanded Programme of Immunisation (EPI) was implemented in the four service blocks of the intervention MCH – FP area in 1986. EPI coverage increased steadily. Today the coverage of measles and BCG approach 95%, DPTP3 reached 77% and TT2 in women in reproductive age reached 96% of eligible women. Contraceptive use prevalence rates reached 60 percent of eligible couples in 1991 with half of the acceptors receiving injectable contraceptives, 25% oral contraceptives and the rest other forms of contraceptives. Surgical sterilisation services are now offered at the Matlab MCH – FP inpatient facility. Four subcentres were placed at the union level and staffed with paramedics. These subcentres refer patients to the Matlab Hospital for medical backup.

A Nutrition Rehabilitation Unit was set up at the Matlab Hospital. Regular three monthly monitoring of mid – upper arm circumference was introduced in 1988 as part of a nation wide Nutritional Surveillance System. In addition, four Nutritional Rehabilitation Centres were established for community based day time treatment. Children detected to have MUAC below 120 mm are referred and CHWs give nutritional and health education

to teach mothers to prepare inexpensive, nutritious food. Garden activities are implemented at Matlab and at some day care centres.

Based on the high mortality due to Acute Respiratory Infections (ARI) in children under the age of five years, an intervention to decrease mortality and morbidity of this condition was initiated in 1988. Training of Community Health Workers (CHWs) to recognise and treat or refer children with ARI was undertaken. The effectiveness of home treatment was established and currently those patients are treated with Co-trimoxazole according to the National ARI Programme Guidelines. Recent data report a reduction on ARI specific infant and child mortality rates. ARI specific activities have had an impact on infant and child mortality rates.

A qualitative study was conducted in Matlab to describe community perceptions of signs and symptoms of ARI, case management behaviour and constraints to service utilisation. Mothers identified laboured breathing, chest retractions, lethargy and inability to feed as signs of disease but did not recognise signs of moderate disease. Because ARI Programmes rely on the mother's identification of the disease and on the care seeking behaviour at the household level, health education is of paramount importance to further reduce ARI mortality. An intervention to transmit these messages through CHWs started in Matlab recently and the impact of health education to increase ARI detection and reporting by the mother will be quantified.

Currently ORS therapy is distributed through a system of Bari mothers. They supply every family at the first level of treatment. Currently an education intervention on ORS is planned. An intervention to reduce deaths of dysentery was launched in 1989 in order to assess the feasibility and impact of antibiotic treatment in children under 5 years of age with dysentery due to Shigella by CHWs. Subspecies of shigella and antibiotic sensitivity were tested. Preliminary analysis revealed that the maternal history of blood in the stool had a low positive predictive value for shigella. Isolation rates varied between 13 and 47%. At present activities are focusing on the referral pattern of cases and on antibiotic sensitivity of the isolates.

The Maternity Care Programme was implemented in 1987 within the MCH-FP structure in order to decrease maternal mortality. Studies in 1986 showed that 77% of maternal deaths were due to obstetrical causes, 68% of these deaths occurred during labour or the 48 hours following delivery and that 80% of these deaths occurred at home. Four professional midwives were posted at the union level in order to detect, treat, refer and prevent obstetrical complications. A chain of referral was established including the Matlab Hospital with physicians but with no surgical facilities. Antenatal, postnatal care and safe delivery kids are offered as well as iron and folic acid supplementation.

Recent analysis show that the Maternity Care Programme has reduced the maternal mortality ratio in the MCH-FP area with two nurse-midwives per union. The process by which this has been achieved is currently been studied. There was a low utilisation of midwifery services and most of the deliveries occurred at home. Women who lived closer to the subcentre where the midwifes were posted and those with a history of antenatal care were significantly more likely to call the midwife for delivery. The predictive values of some signs and symptoms have a low sensitivity.

Current activities focus on address issues of reproducibility of the achievements. The integration of TBAs on the system and the training of CHWs to conduct antenatal and postnatal care in order to increase coverage and enhance selection of high risk patients for referral is undergoing.

The Programme is currently focusing on maternal morbidity and maternal nutritional status. Studies on the prevalence of low birth weight in the community, risk factors for

low birth weight and on the feasibility of interventions to reduce low weight at birth are under way. Ethnophysiology and practices related to pregnancy are planned.

During 1990 the Project achieved a computerised record keeping system which provides feedback to the field workwes within one month of data collection for improved service delivery and supervision. Mothers and children at risk are targeted more efficiently by CHWs.

Vitamin A supplementation is currently carried out every six months. Studies to administer it through the EPI structure are considered.

At present, the CHWs are carrying out activities on the following areas: counselling on family planning, distribution of a variety of contraceptive methods, management of side effects, child and mother immunization, vitamin A supplementation, treatment of infectious diseases for mothers and children under the age of five years, safe birth kits distribution, screening and referral of malnourished children and nutritional education. In addition, they collect data on morbidity, reproductive and service related information and work with the Demographic Surveillance System recording births, deaths, migrations and changes in marital status. The recording of demographic data collected for the population they serve and also for a further 100,000 population which receives the normal government services. This infrastructure allows comparison of vital events in both the areas and provides an unique setting to evaluate health and family planning interventions. The cost – effectiveness of these interventions is currently been evaluated.

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## MANAGEMENT OF ACUTE DIARRHOEA

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More than a billion episodes of diarrhoea are estimated to occur each year in the under – 5 children in the developing world. About 4 million deaths in this age group are associated with diarrhoea, the highest mortality being in the first two years of life. It is dehydration that kills majority of patients with acute diarrhoea and adequate and timely use of oral rehydration therapy (ORT) can successfully rehydrate 90% of patients and reduce hospital case – fatality rates by 40 – 50%. Initial intravenous rehydration is essential in patients with severe dehydration and hypovolaemic shock. ORT, however, may not succeed in a small proportion of cases.

The discovery that sodium transport and glucose transport are coupled in the small intestine has paved the way to the development of oral rehydration treatment. Studies at the then CRL at Dhaka and almost simultaneously at JHCMR&T at Calcutta reported the successful use of oral glucose electrolyte solution in the treatment of cholera. These were followed by a series of observations including field trials.

ORT use resulted in a significant reduction in the number of admissions for diarrhoea and decrease in case fatality rate. In subsequent years, the oral glucose – electrolyte solution was found to be equally effective in the vast majority of other acute diarrhoeal illnesses. Later on, less expensive sucrose and individual aminoacids (glycine, l – alanine, etc.) or glucose polymers (e.g. maltodextrin) have been used as carrier molecules instead of glucose. In further simplification, salt and unrefined brown sugar (molasses) have has been used in

place of glucose or sugar. More recently, cereal-based ORS have been developed and tested. Cereals contain starches that are gradually broken down into glucose. Case control studies, carried out at ICDDR,B and at other places used cooked cereal powder (e.g. rice powder ) replacing glucose in standard WHO and UNICEF recommended oral rehydration salt. Rice-based ORS was found to be effective in both children and adults to significantly decrease the stool volume and duration of diarrhoea. A field evaluation of packaged rice-ORS over a two year period in 3 communities in rural Bangladesh showed that the median duration of diarrhoea was significantly less in patients receiving rice-ORS compared with other tow groups. ORS formulations based on cereals (e.g. wheat, millet, sorghum, etc.). However, cereal-based ORS has its own logistic and operational constraints. Further re-search to overcome these is required. A formulation containing trisodium citrate instead of sodium bicarbonate was shown to be more stable but equally effective in treating dehydration and acidosis due to diarrhoea. Attempts should be made to replace fluid and electrolyte losses at home early in the course of diarrhoeal episode. This would prevent development of dehydration and substantially decrease the number of visits to hospitals and overall diarrhoeal disease mortality rates. Mothers should be encouraged to give, from the very first episode of diarrhoea, easily available foods at home. Breast feeding should never be stopped, even during early rehydration period as it is the most important nutrient source. Feeding is well tolerated and is essential to repair the nutritional deficits resulting from diarrhoea. Even during acute diarrhoea, 60% or more of nutrients continue to be absorbed.

Drugs e.g. antimicrobials, antisecretory agents are considered only secondary to adequate fluid therapy. The only specific indications for antimicrobial agents are cholera, shigellosis, acute intestinal amoebiasis and giardiasis. Antisecretory agents have not shown any promise so farand anti-mortality agents could be hazardous.

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## POPULATION STUDIES AT THE ICDDR,B

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Since the Centre's inception, population sciences have retained a prominent position in its research activities. This originally arose out of the need to maintain demographic surveillance for large populations in Matlab in order to evaluate early field trials of cholera vaccines. More recently, the inclusion of population sciences as an area of research priority has stemmed from the recognition that morbidity is to a considerable degree shaped and conditioned by the broader social, cultural, and demographic environment of the individual. The resulting data which have been collected are unique within the developing world in terms of opportunities for research to understand the determinants of, and interrelationships between, demographic and health processes. This research can be grouped under these broad headings:

### Fertility

Much of the basic endocrinological research on breastfeeding and the resumption of ovulation following pregnancy is a direct outgrowth of several Matlab studies. These started in 1969, when it was conclusively shown that there is a relationship between breastfeeding and resumption of menses. These studies were followed by work on the relationships

between nutritional status and fertility and breastfeeding patterns in relation to postpartum anovulation. Examinations of other correlates of fertility (such as socio-economic status, season, and contraception) have also been carried out.

**Family Planning**

The previous research on the determinants of natural fertility in Matlab, as well as the obvious need for a good family planning programme in Bangladesh and the availability of the DSS population framework for undertaking further investigations, led to the start of family planning research in Matlab. This work has evolved from a simple Contraceptive Distribution programme, through a Family Planning/Health Services Project, to the present Maternal and Child Health/Family Planning project. These have made remarkable progress in family planning and in understanding its relationship with child survival, and are discussed in another paper during this session.

**Mortality**

Beginning with the simple surveillance of cholera deaths, demographers have used Matlab data to study the relationships between various factors contributing to mortality (e.g. age, sex and socio-economic status) from various causes (especially diarrhoea, measles, and maternal causes) and health care interventions (ORS, several MCH programmes, and even the serendipitous use of tetanus toxoid as a placebo during a cholera vaccine trial).

**Methodology**

Using the Matlab framework, where all residents are carefully enumerated and followed, and where most ages are known (to researchers) with some precision, a number of important methodological studies have been carried out. These have examined simplified survey techniques for measuring fertility, lay reporting systems for obtaining information on cause of death when no medical personnel are present at death, and techniques to obtain better pregnancy history data and age reporting.

**Other topics**

Interesting studies on nuptiality, divorce and migration have also been carried out using Matlab DSS data, trying to better understand the social setting behind all of the Centre's health, behavioural, and programmatic research.

6

# DEMOGRAPHIC TRENDS IN MATLAB: 1966 – 1990

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The Demographic Surveillance System (DSS) of the International Centre for Diarrhoeal Disease Research, Bangladesh has been collecting data on births, deaths, and migrations in and out for the population living in villages of Matlab since 1966. It was started with a census of 132 villages containing 112,000 people. Subsequent censuses by the DSS after 1968 were carried out in 1974, 1978, and 1982. At the start, every household was visited every three days to collect demographic information. At a later stage the visitation cycle was changed to one week and was maintained till 1984 after which it was changed to a fortnight.

In 1968, 101 more villages were added to the system and a census of the new villages was carried out. The registration of marriages and divorces was introduced in 1975. In 1978 the villages covered by the DSS was reduced to 149 with a reduction of population to 173,000 from a 1977 population of 267,000. During the second half of 1977 a maternal and child health and family planning programme (MCH – FP) was introduced in 70 of the 149 DSS villages; the villages with the programme were termed as treatment area and those without MCH – FP programme from ICDDR,B as comparison.

The DSS has been providing us with quality registration data to monitor the dynamics of demographic situation in the area. In this paper a use of DSS data has been made to portray the observed trends in major demographic indicators for the area since 1966. Rates for the whole of Matlab DSS area, covering the entire period of study were examined; in addition rates for 1978 – 1990 were separately examined for the treatment and comparison areas.

Crude birth and death rates at the start of the surveillance demonstrated high levels of fertility and mortality in Matlab. The expected effects of crises, both political and natural on the fertility and mortality indicators were clearly discernible from the time trends of the indicators. A rise in mortality after the War of Liberation in 1971 and food shortages in 1975 was clearly noticed; an opposite tendency in fertility corresponding to the above periods was also discernible. After 1977 both fertility and mortality were lower in the treatment area than comparison area. There was a declining trend in mortality and fertility, especially after mid 1980s, however, the rate of decline was greater for the treatment area than the comparison.

An examination of the mean age at first marriage showed a tendency of rising age at marriage in Matlab during the period of investigation. Migration data revealed a net outflow of people from Matlab with occasional fluctuations.

1

## MEASLES SURVEILLANCE SYSTEM, AGE SPECIFIC INCIDENCE AND CONSEQUENCES FOR ITS CONTROL

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A community based Measles Surveillance System records cases of measles in a population of 100,000 at Matlab. Cases are reported by community health workers and a sub-sample of reported cases is reviewed by a medical officer and a medical assistant. The age specific morbidity of measles is reported in this paper, as well as the age specific seasonality and the age specific mortality. Values as high as 20 percent of confirmed cases of measles are reported in children below nine months of age, posing serious concern for the current immunization schedules.

2

## AMYLASE-RICH WHEAT FLOUR FOR PREPARING ENERGY-DENSE LIQUID PORRIDGE FOR TREATING CHILDREN WITH DIARRHOEA

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To provide recommended food energy to infants using rice, rice-gruels or `khichuri' is not feasible because of either high viscosity of the preparation or large volume needed. There are many ways to reduce viscosity. One of these is to use amylase-rich wheat flour (ARF). We have been able to prepare ARF by germinating wheat. In vitro tests were conducted to verify the effect of ARF on reduction of viscosity in rice porridge or "khichuri". There was more than 90% reduction in viscosity in ARF-treated porridge compared to untreated one. Macronutrient content, osmolality, and bacterial contamination of porridge with and without ARF were also studied.

In a controlled trial, 25 infants with diarrhoea were fed an energy-dense rice porridge liquefied by ARF in a 30-minute meal compared to 25 children offered normal thick porridge. Study infants ate 40% more porridge liquefied with ARF (7.7 g vs 5.5 g per kg body weight).

ARF preparation is feasible and may be a possible solution to formulate energy dense food. It does not favour bacterial multiplication. But ARF induces in vitro increase in osmolality. However, more studies are needed to evaluate the overall impact.

3

## MORTALITY IMPACT OF A COMMUNITY BASED PROGRAMME TO CONTROL ACUTE LOWER RESPIRATORY TRACT INFECTIONS (ALRI)

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This intervention study has been carried out to reduce the ALRI-specific mortality in the MCH-FP area of Matlab through specific activity. A targeted ALRI Programme was introduced in the area in 1988 after evaluating the impact of non-specific ALRI activities on ALRI mortality. This intervention was based on systematic ALRI case detection and management by community health workers who are linked to a referral system for medical support. The intervention was evaluated by comparing the ALRI-specific mortality between the intervention and a neighbouring comparison area before and after the initiation of the activities. Non-specific ALRI activities reduced the ALRI specific mortality by 28%, and specific activities reduced it by a further 32%. The overall under five year old mortality was reduced by as much as 30 percent.

4

## URBAN HEALTH RESEARCH AND EXTENSION PROJECT (UHREP) – AN URBAN HEALTH INITIATIVE TO IMPROVE THE HEALTH STATUS OF SLUM RESIDENTS IN BANGLADESH

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Statistical evidence from health surveys and observations by urban authorities suggest that the health of Dhaka city slum residents stands in need of vast improvement. If present trends continue, this problem will be compounded by Dhaka's high rate of population growth.

The Urban Volunteer Program (UVP), begun at the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) with USAID funding in 1986, was conceived as an operations research and service delivery project to test the feasibility and impact of using women from slum communities in Dhaka to furnish preventive health care and referral information to slum residents. It recruited and trained illiterate women to motivate mothers to use ORS, immunize their children, improve their nutrition, and adopt contraception. These women also distributed basic health commodities such as oral rehydration salts and soap. The UVP also developed an Urban Surveillance System (USS) to track demographic and epidemiologic events in the urban slums and conducted operations research to evaluate volunteer performance.

The five-year UVP pilot effort has identified several constraints on service delivery in

the urban slum environment. These include lack of reliable data about urban slum population characteristics, lack of stable community leadership, disruption in breastfeeding and child care due to changes in family composition and employment of mothers outside the home, erratic supplies of nutritious food, poor sanitation and hygiene, pollution, and violence. The five year pilot phase has brought experience and insight into the effective delivery of preventive health care to women and children in urban slums and has identified key areas for future research.

The Urban Health Research and Extension Project (UHREP) is conceived as a follow-on activity with three broad goals: (1) to conduct research to strengthen the ability of governmental and non-governmental agencies to provide effective and affordable MCH and family planning services to urban slums; (2) to disseminate the research findings and furnish technical assistance in their application; and (3) to develop urban public health research capacity with ICDDR,B. The UHREP's research will focus on three areas: (a) collecting valid information on current socioeconomic, demographic and epidemiologic characteristics of Dhaka slums and charting the changes in these characteristics through routine longitudinal statistics and special surveys; (b) testing the efficacy and cost-effectiveness of specific interventions to improve urban slum health conditions; and (c) conducting operations research studies to improve health service delivery to urban poor.

5

## URBAN SURVEILLANCE SYSTEM

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The Urban Volunteer Program (UVP) of the ICDDR,B has developed an Urban Surveillance System (USS). The primary objective of the USS is to collect statistical information (a) to conduct research on Urban health, and (b) to evaluate the effectiveness of the various MCH interventions. The system comprised of a multistage probability sample of the slum population of five metropolitan thana of Dhaka. The ultimate sampling units are clusters with well defined boundaries. At present there are 168 clusters and 4,500 households under surveillance. The surveillance population has been divided into intervention and comparison areas. The USS surveys, which track demographic and health events in both treatment and comparison areas, cover mothers with children under 5 years of age and women of child-bearing age. They are designed to monitor demographic rates and trends among urban poor and to assess knowledge and practice for diarrhoeal diseases prevention and treatment, nutrition, immunization and family planning in this population.

6

## THE IMPACT OF URBAN VOLUNTEERS ON CONTRACEPTIVE USE AND METHOD-MIX RATES IN DHAKA SLUMS

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Using 1990 data from the Urban Surveillance System (USS) and the Sample Volunteer Survey (SVS), this study evaluates both the gross and net impacts of Urban Volunteer Programme volunteers and NGO field workers on contraceptive prevalence and method-mix rates. Before controlling for confounding demographic and socioeconomic variables, the findings show that areas with only an urban volunteer presence or areas with a joint urban volunteer and NGO fieldworker presence had a significantly higher contraceptive prevalence rate than areas solely served by NGO fieldworkers or areas without volunteers or fieldworkers. These areas also had higher use of pills and condoms, the two community-distributed methods.

After controlling for age, education, relation to household head, religion, migration status, and household density, areas with a volunteer presence had a significantly higher probability of contraceptive use than comparison areas without a volunteer or fieldworker presence, a relationship which did not hold true for either joint field worker/NGO areas or NGO areas only. Volunteer only and joint volunteer/fieldworker areas were positively correlated with the probability of pill and condom use versus non-use, and volunteer only areas were positively correlated with the probability of IUD and injectable use versus non-use. In all areas with either a volunteer or field worker, there was a higher likelihood of pill or condom use rather than tubectomy or vasectomy.

The findings imply that urban volunteers can effectively influence couples to use community-based methods of contraception. This effectiveness has direct relevance for GOB, NGO, and social marketing policymakers and programme managers who may consider using volunteers as pill and condom depot holders or as motivators for doorstep injectables in urban slum areas.

7

## THE IMPACT OF URBAN VOLUNTEERS ON MOTHERS' KNOWLEDGE OF DIARRHOEA PREVENTION, DIARRHOEA PREVALENCE RATES AND ORT UTILIZATION RATE IN DHAKA SLUMS

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The Urban Volunteer Program (UVP) of the ICDDR,B provides basic information on diarrhoea prevention and treatment to Dhaka slum mothers and supplies ORS packets to diarrhoea patients through a network of volunteers. Using 1990 data from the Urban

Surveillance System (USS) and the Sample Volunteers Clusters (SVC), this study evaluates the impact of urban volunteers and NGO field workers on mothers' knowledge on diarrhoea prevention, prevalence and management. Overall, good food hygiene was considered the most important means to prevent diarrhoea (65%), followed by clean household environment (49%) and hand washing (21%). In general, knowledge level in UVP service areas was comparable to NGO areas and higher than comparison areas. The two-week prevalence (19.3%) and point prevalence (9.5%) rates of diarrhoea in under-five-year old children were similar in all the areas. However, the proportion of prevalent cases that were bloody was lower in UVP and NGO areas. The ORT utilization rate in UVP areas was significantly higher than comparison areas (48% vs 37%), but lower than NGO areas (57%). The impact of UVP and NGO services on ORT utilization rate persisted after controlling for age, sex, economic status, mothers' age, mothers' education and seasonality.

This study suggest that urban volunteers can effectively influence mothers knowledge on diarrhoea prevention and influence them to use ORT. This finding has relevance for GOB and NGO policy-makers and programme managers who may consider using volunteers in their program.

**8**

## A NEW EPI STRATEGY TO REACH HIGH RISK URBAN CHILDREN IN BANGLADESH: URBAN VOLUNTEERS

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Many community based outreach programmes in low income countries utilize illiterate women to provide health services. However, illiteracy may present special problems in immunization or other programmes requiring extensive record-keeping and follow-up. In a trial involving twenty-nine volunteers from urban slum communities in Dhaka, Bangladesh, a community-based referral and record-keeping system for use by semi-literate and illiterate volunteers in immunization outreach activities was evaluated over a thirteen month period. The women were uniformly, regardless of literacy, able to use the system to effectively refer and follow-up clients. Although volunteer performance as measured by numbers of referrals was below initial targets, completion rates were high; 87% of children and 96% of women referred completed the full series of immunizations. By facilitating active community participation, the system provides a feasible approach to reducing the high drop-out rates currently associated with immunization programmes.

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## REDUCTION IN DIARRHOEAL DISEASES IN CHILDREN IN RURAL BANGLADESH BY ENVIRONMENTAL AND BEHAVIOURAL MODIFICATIONS

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The impact of a water, sanitation and hygiene education intervention project on diarrhoeal morbidity in children under 5 years old was evaluated in a rural area of Bangladesh. Data were collected throughout 1984 – 1987, covering both pre – and post – intervention and a control area. The 2 areas were similar with respect to most socio – economic characteristics and baseline levels of diarrhoeal morbidity. The project showed a striking impact on the incidence of all cases of diarrhoea, including dysentery and persistent diarrhoea. By the end of the study period, children in the intervention area were experiencing 25% fewer episodes of diarrhoea than those in the control area. This impact was evident throughout the year, but particularly in the monsoon season, and in all age groups except those less than 6 months old. Within the intervention area, children from households living closer to handpumps or where better sanitation habits were practised experienced lower rates of diarrhoea. These results suggest that an integrated approach to environmental interventions can have a significant impact on diarrhoeal morbidity.

10

## FAECAL CONTAMINATION OF PONDS IN AND AROUND DHAKA CITY

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Pond is a manmade water ecosystem. The faecal pollution of water is determined by faecal coliform estimation. An investigation was carried out to determine the faecal contamination of five ponds in and around Dhaka city from May 1988 to April 1989. Water samples were collected in 500ml capacity narrow – mouth plastic bottles every 15 days interval and processed within 6 hr of collection following standard procedures. The highest faecal coliform was isolated from pond 1. The faecal coliform counts varied from 4.09 to 5.78 $\log_{10}$ cfu/ml in four ponds. These results demonstrated that all the studied ponds are heavily poluted by faecal matter. Therefore, these water sources are potential health hazards for those who use them without treatment for various purpose, e.g. bathing, washing, cooking, swimming, etc.

11

## WATER AND SANITATION IN CYCLONE AFFECTED AREAS: BANGLADESH CYCLONE OF APRIL 29, 1991

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To assess the role of water and sanitation in the transmission of diarrhoeal diseases, we visited some selected areas from May 12 – 27, 1991. We interviewed 80 people from the area to determine the condition of their water supply, and tested the quality of the distributed water purifying tablets (n = 16 lots). We also collected water samples from flooded tubewells (n = 12), flooded ponds (n = 7), non – flooded tubewells from cyclone affected areas (n = 3) and non – flooded ponds from the cyclone affected areas (n = 4).

Approximately 81% of the interviewed people reported scarcity of safe water/non – saline water. Sixty three percent of the tested water purifying tablets had lost potency. Faecal coliform counts of the flooded tubewells ($0 - 10^2$/100 ml) were slightly higher than those of the non – flooded tubewells (< 1/100/ml).

The faecal coliform counts of the flooded and non – flooded ponds were similar ($10^3 - 10^5$) although, their chemical and physical characteristics varied significantly, none of the flooded ponds was usable. Sanitation was hardly in any one's mind, as we did not see sanitary latrines in the field clinics (n = 3) or shelters (n = 2) or households (n = 80).

Based on our experience we offered two training courses to the relief personnel. Out of the 100 participants 84% thought that a similar briefing would be useful for personnel sent to do relief work. Observing the water – sanitation problems we agree with the participants that such training should be regularly organized, at least for a few years, as cyclones and floods are nearly annual events in this country, and the majority of the relief personnel should be made aware of the related problems.

12

## FATAL DYSENTERY IN RURAL BANGLADESH

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A review of the existing data on dysentery – related deaths from the rural area of Matlab during 1976 – 81 suggested that death in children followed a recurring seasonal pattern with an increase during August – November each year. The overall dysenteric death rate during 1978 – 1981 was 13.3 per 10,000 population per year. The highest rate was in patients of the two extreme age groups. Deaths recently reported by the health workers were re – investigated. Although the causal agents producing fatal dysentery in most patients in the community remained unidentified, it was likely to be species of *Shigella* in childhood

deaths. To identify clinical determinants of death, a case – control analysis was done with patients hospitalised with dysentery during 1980. Patients who died with dysentery had significant association with longer median duration of illness ($p = < 0.001$), female sex ($p = 0.04$), signs of respiratory tract infection ($p = < 0.001$) and severe malnutrition ($p = 0.003$). We conclude that the risk group of patients with dysentery should be identified and properly treated to reduce childhood mortality.

**13**

## IMPACT OF VITAMIN A SUPPLEMENTATION DURING DELIVERY ON SUBSEQUENT GROWTH AND MORBIDITY OF THE BREASTFED INFANTS

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Vitamin A is essential for normal vision, growth, reproduction, immune response and the maintenance of integrity of epithelial structures. A close relationship between mild vitamin A deficiency and diarrhoeal morbidity has also been reported from Indonesia. The role of vitamin A deficiency in causing morbidity in vitamin a deficient breastfed infants is unknown.

To examine the possible impact on growth, we studied a group of mothers and children from very low income groups living in the periurban village of Nandiapara near Dhaka. Mothers were given a 200,000 unit dose of vitamin A or placebo at child birth and weekly morbidity and monthly anthropometric measurements were recorded for a year. Vitamin A concentrations in breastmilk remained significantly higher for 3 months in the supplemented mothers. More malnourished mothers tended to continue higher levels of vitamin A in serum and breastmilk for significantly longer period compared to their counterparts. The growth rate of the infants was not different between the groups. Infants of the supplemented mothers had significantly fewer episodes of respiratory tract infections and febrile days but diarrhoeal episodes were equal. The study suggests limited benefits of vitamin A supplementation in malnourished mothers for growth of their breastfed infants.

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## IMMUNIZATION OF CHILDREN IN A CURATIVE CONTEXT: FACTORS ASSOCIATED WITH COMPLIANCE WITH THE SECOND DOSE OF DPT IMMUNIZATION AND THEIR ROLE IN IDENTIFYING HIGH RISK GROUPS

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One way to reach unimmunized children is to offer immunization to those coming as patients for other reasons to a treatment centre. Completion of the immunization course, however, requires parents to bring their children to a centre two or three times after the first dose. This implies active parental motivation. Our study investigates factors associated with compliance and identifies those at risk of non-completion of the immunization course. It has important implications for preventive health care strategies in curative contexts. 136 children were immunized with the first dose of DPT on discharge from ICDDR,B and their parents were interviewed twice, once after immunization and secondly six weeks later in their homes, to assess the rate of compliance. This information is correlated with socio-economic variables and with levels of satisfaction with the curative treatment they received in hospital. Our initial hypothesis was that a good treatment experience and/or motivation would promote acceptance and completion of the vaccination course. We identify the socio-economic characteristics that differentiate those who return for the second dose from those who do not. Our findings indicate that maternal education and economic status are closely associated co-variates that relate strongly with compliance. Children of the poorest parents and mothers with no schooling are least likely to complete their course of immunization. There is a correlation between parents' education and knowledge about EPI (Expanded Programme of Immunization) and the second dose acceptance rate. The implication of these findings is that EPI and hospital staff need to emphasize motivation of poorer and less educated parents.

15

## FEEDING PRACTICES DURING AND AFTER ACUTE DIARRHOEA IN A RURAL AREA OF BANGLADESH

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This study continues research on feeding practices during and after diarrhoea carried out in Matlab, a rural area of Bangladesh. In an earlier study it was found that significant amounts of food were withdrawn from children during and after diarrhoea, contributing to weight loss due to diarrhoea. In the present study, mothers of 185 hospitalised and 139 non hospitalised children under 2 years of age who had watery diarrhoea were interviewed . In addition, 151 of the hospitalised cases were reinterviewed in their homes after discharge. The mothers were asked what foods should be given to children with diarrhoea and what

they actually gave to their sick children. Virtually all mothers of fully and partially breast feed children said that these children should continue to receive breast milk, and virtually all continued to breast feed their children. There was a noticeable shift in the supplemental foods which mothers recommended and gave to partially breast fed children. When asked what "should" be given, mothers emphasised softer weaning foods like bananas, cooked cereals, and rice, as well as green coconut water believed to be good for diarrhoea. In actual practice, however, they seemed to reduce the use of all foods, except breast milk. After the hospitalised children returned home, "normal" foods, such as fish and lentil soup were only slowly reintroduced into the diet. Promotional activities related to appropriate feeding during acute and convalescent stages of diarrhoea are recommended for dealing with the nutritional aspects of diarrhoea management.

**16**

## NUTRITIONAL IMPLICATIONS OF CULTURAL PRACTICES IN THE HOME MANAGEMENT OF DIARRHOEA IN A RURAL AREA OF BANGLADESH

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This paper examines the nutritional and treatment implications of cultural practices in the management of diarrhoea, specifically the nature of advice given to mothers of children with diarrhoea. This is part of a larger study investigating perceptions about diarrhoea and its home management in Matlab, a rural area in Bangladesh. Mothers of 185 hospitalised and 139 non-hospitalised children under 2 years of age who had watery diarrhoea were interviewed. The principal source of advice concerning the treatment of diarrhoea mentioned by these mothers was other female members of the extended and immediate family. Male family members and neighbours were also consulted. Advice given included: referral to the village practitioner; saying of incantations over the child; use of amulets; restriction or prescription on food intake by the patient's mother; and the use of herbal medicines. Some advised remedies were intended to drive away evil spirits possessing the mother or the child. Advice to the mother regarding diet and incantations was intended to provide relief from anxiety and to free the mother's breast milk from pollution. Virtually none of the advice given would be harmful to the sick child. In fact, fully 36% of mothers were advised to use ORS and 23% were advised to take their sick child to the hospital. Even as reported by the mothers, there were wide differences between the advised actions and those actually taken by the mothers. Only 21% gave their children ORS and the 139 mothers in the non-hospitalised sample had not used the free local diarrhoeal hospital, even when advised to do so. In designing effective community-based health education programmes it is essential to include in it both the decision makers and those who effectively influence them.

17

## BARRIERS TO HEALTH CARE FOR WOMEN IN RURAL BANGLADESH: EXPERIENCE FROM A COMMUNITY-BASED MCH/FP PROGRAMME

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Women's health is greatly affected by the experience of pregnancy and childbearing in Bangladesh, a country with a maternal mortality ratio 100 times higher than that seen in most developed countries. Factors contributing to this high risk of childbearing are complex and multifaceted. Chronic undernutrition, repeated pregnancies, and childbirth at an early age heighten a woman's risk of developing problems during pregnancy. Existing social and economic determinants limit women's access to quality health care services for complications developing during pregnancy and delivery, thus posing a major hazard for pregnant women. These determinants include the low status of women, high levels of poverty, insufficient knowledge among families and traditional healers, lack of rapport between modern health care providers and women, and inadequate referral facilities.

In 1987, The Maternity Care Project was initiated in Matlab through the Matlab Maternal and Child Health and Family Planning (MCH/FP) Program. The goal of this activity was to decrease maternal morbidity and mortality through the provision of maternal health care services at the household level by professionally trained nurse midwives. These women perform antenatal and postnatal visits, conduct deliveries, and give support and training to traditional birth attendants. This project has succeeded in improving women's choices for health care during pregnancy to some extent. After the first 21 months of operation, 64% of the 2500 pregnant women received at least one antenatal visit during pregnancy. Twenty percent of the women called a midwife to attend the delivery and 14% of all deliveries were conducted by a midwife. Four percent of those attended were referred for complications. Fifty percent of the mothers were visited just after birth or at some time during the post-natal period. In spite of these accomplishments, many barriers remain. We will describe the experience of this project and give case history examples of how socio-economic and cultural factors continue to circumscribe women and affect their health.

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## FOOD PREFERENCE AND AVOIDANCE BELIEFS DURING PREGNANCY AND AFTER CHILDBIRH IN MATLAB, BANGLADESH

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A total of 531 women were enrolled in a survey during various stages of pregnancy between February and April, 1982 to enquire about the availability and use of antenatal and

postnatal care. These women were subsequently followed every other month during pregnancy and on the 10th an 45th days of childbirth to find out what foods were preferred or avoided and the reasons for such actions. The results showed that the preferred foods during pregnancy and or after childbirth included foods most of which the mothers could not afford to eat – milk, eggs, cat fish, climbing perch, chicken, pigeon, orange, apple, pear, hot spices, refined butter and honey. The avoided foods were highly nutritious and or expensive, mostly of fish category, and included green coconut and some deep green/yellow vegetables like sweet pumpkin, gourd, pumpkin and gourd leaves etc.

Mothers' reason for food preference are based on their concern for the well-being of their fetuses and the newborns as well as of their own. Their reasons for avoidance of certain food for a long time even after the influence of pregnancy is over are based on traditional beliefs.

National nutritional policy formulation should take these factors into consideration.

**19**

## LACK OF IMPACT OF A WATER AND SANITATION INTERVENTION ON THE NUTRITIONAL STATUS OF CHILDREN IN RURAL BANGLADESH

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The nutritional impact of a water and sanitation intervention in a rural community of Bangladesh, comprising the provision of handpumps, construction of latrines and hygiene education was assessed. During 3 years, the quarterly anthropometric measures of about 200 children aged 12-35 months from the intervention community were compared with those of a similar number of children from a control area. The interventions reduced the incidence of diarrhoea by 25 per cent among children less than 5 years of age. There was no significant difference in nutritional status, however, between the two groups of children. Moreover, within the intervention area, indicators of water and latrine use were not significantly related to the children's nutritional status. This suggests that either the observed reduction of diarrhoea was not large enough to have an impact on nutritional status or that diarrhoea is not an important cause of malnutrition in this community.

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## MORTALITY IMPACT OF A COMMUNITY BASED MATERNITY CARE PROGRAMME IN MATLAB

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This paper reviews the reduction of maternal mortality achieved by the Maternity Care Programme introduced in Matlab in 1987. The activities carried out by nurse – midwives through which this impact was achieved are reviewed. The indicator measuring the impact of the intervention is the obstetric mortality ratio, or the risk of dying once pregnant, and it is expressed as the ratio per 1000 live births. Comparisons of obstetrical and non – obstetrical deaths with a neighbouring control area before and after the programme was initiated are presented. Obstetric mortality ratios (per 1,000 live births) before the initiation of the Project (1984 to 1986) were 3.8 in the control area and 4.4 in the intervention area. After the initiation of the Project (1987 to 1989) they were 3.8 and 1.4 in the control and intervention areas respectively ($p < 0.01$). Differences between obstetrical and non – obstetrical causes of death are also significant, showing that this was due to a reduction of direct obstetrical mortality. The Matlab Maternity Care Programme has been successful in reducing maternal mortality ratio.

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## HOSPITAL CARE IN A COMMUNITY BASED PROGRAMME FOR WOMEN IN REPRODUCTIVE AGE – PATIENT REFERRALS FROM THE FIELD FOR ADMISSION

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An analysis of data on female patients in reproductive age (referred by Community Health Workers) admitted to the Matlab Hospital show how the secondary level of care should be prepared to handle in a Primary Health Care setting. A review of the 1344 in – patient clinical records of females referred to the Matlab Hospital by the Community Health Workers for a period of five years between 1986 and 1990 was carried out. The MCH (Maternal and Child Health) and DTC (Diarrhoea Treatment Centre) in – patient records were systematically reviewed and analysed in the light of the final diagnosis. Of the 1344 in – patients at the Matlab Hospital, only 50 percent were referred by Community Health Workers. The analysis of the in – patient records of the 668 patients referred from the field by Community Health Workers revealed that 48 percent of causes were related to pregnancy and/or child birth. When combining data from referred and non referred patients, sixty six percent of all in – patient cases were due to conditions not related to pregnancy (50% diarrhoeal diseases, 16% urinary, reproductive tract and acute respiratory tract infections) and 34 percent was related to pregnancy (30% during pregnancy and

delivery and 5% during post – partum).

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## RISK DETECTION OF PREGNANCY IN A COMMUNITY BASED MATERNITY CARE PROGRAMME – WHAT DID WE DETECT?

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This study attempts to evaluate critically the predictive values of antenatal care activities carried out between 1987 and 1990 on maternity care in the light of maternal and infant evaluation. Antenatal care was carried out by midwives in 3,355 pregnant women, equivalent to one third of the pregnancies occurring in Matlab between 1987 and 1990. Information on the detection of risk of the pregnancy was reviewed retrospectively in the light of the outcome. Comparisons were done between women who received antenatal care and women who did not. The predictive value of parameters recorded during the pregnancy such as age, parity, anaemia and jaundice in relation with 13 maternal deaths and 44 stillbirths is reviewed. Low sensitivity of signs and symptoms is reported. Antenatal care and risk detection in pregnancy are of paramount importance for any maternity care programme. Recommendations to improve the detection of high risk pregnancies are suggested.

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## EVALUATION OF MATERNAL SERVICES: THE CLIENTS' PERSPECTIVE

**C. Jagdeo and K. Stewart**

In Bangladesh where the maternal mortality ratio is approximately 6 per 1000 live births, maternity services are still in their infancy. The Maternal Child Health and Family Planning Project in Matlab has, since 1987, been offering domiciliary maternity services. However, 44 months after implementation of this service, calls by clients for paramedics to conduct deliveries was only 20%.

This pilot study attempted to evaluate from the clients' perspective the relevance of maternity services provided by the project paramedics. Individualized client interviews (n = 124) using a pre – tested questionnaire were conducted from December, 1990 to March '91. The women belonged to four exclusive groups: antenatal women who had an antenatal check up and those who did not (n = 33); women whose deliveries were conducted by paramedic (n = 28); women those deliveries were conducted by the traditional birth attendant (n = 32); and postnatal women who received postnatal care (n = 31).

Results indicated that 72% of the antenatal women wanted to have routine antenatal check up and 85% thought it was important. Of the women whose deliveries were conducted by the traditional birth attendant, 75% thought it was important to have a paramedic attend the delivery and only 56% will call the same attendant for a subsequent delivery. This contrasts strongly with the women whose deliveries were conducted by the paramedics. In this group, 93% will summon the paramedic for a subsequent delivery.

Decision for choice of attendant by mother – in – law was 41% in the group whose delivery was conducted by traditional birth attendants and 11% in the group whose delivery was conducted by the paramedics. In the postnatal group, 100% thought that a postnatal check up was important. For all the groups, the most common reason for the importance of maternity services provided by the paramedics was their ability to detect and treat problems – 89% (n = 111). The most common reason for non importance of maternity services by paramedics was acceptance of the fate of mother and child being determined by Allah – 64% (n = 11). The most common reason for satisfaction with maternity services by women who had received some form of maternity services from the paramedics was having had a problem treated 49% (n = 76).

This study concludes that maternity services by trained paramedics are considered important and are desired by the this sample of women. However, the small sample size does not permit extrapolation of its findings. A similar study with a larger sample of women will shed further light on how rural women perceive modern maternity services.

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## NUTRIENT INTAKE IN DIABETES (DM), IMPAIRED GLUCOSE TOLERANCE (IGT) AND CONTROL SUBJECTS

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This paper reports the finding of a comparative study conducted to determine the nutrient intake among 13 DM, 19 IGT and 8 Control subjects. Average food intake (in g) from weighing and 24 hours recall method were 826±116 (mean±SD) and 793±11, respectively. Except calcium and Vit. C, other nutrients were statistically insignificant ($p > 0.05$). Food intake by current DM, IGT and control subjects were 852±136,789 ±105 and 826±116 respectively. Distribution of nutrients were also found to be a statistically insignificant ($p > 0.05$). food intake by previous DM, IGT and current DM, IGT and current DM, TGT were 1143±116, 1080±172 and 852±136, 789±105 respectively. Significant difference between previous and current food intake by DM and IGT were noted ($p < 0.0001$). Except fat and Vit. A, predicted nutrients from previous and current dietary survey of DM and IGT subjects were also found to be statistically significant. Consumption of Vit. A, Vit.C and Zn by current survey of DM were 506±809, 17.7±12.44 and 6.69±1.44, whereas requirements were 2013 (I.U.), 26.0 (mg) and 13 mg. It is observed that DM and IGT subjects have lower intake of Vit. A, Vit. C and Zn.

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## VITAMIN A DEFICIENCY AND DETERMINANTS OF KNOWLEDGE OF VITAMIN A OF DHAKA URBAN SLUM MOTHERS, BANGLADESH

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Using 1990 data from the Urban Slum Surveillance System (USS) and the Sample Volunteer Survey (SVS), this study examines the prevalence of Vitamin A deficiency and the determinants of knowledge of Vitamin A. The prevalence of night blindness was 0.6 percent while Vitamin A Capsule (VAC) coverage was 44 percent. 66% mothers could correctly describe night blindness. When inquired about the cause of night blindness, only 6% mothers mentioned Vitamin A deficiency and another 26% mentioned inadequate intake of green leafy vegetables (GLV). 33% said night blindness can be prevented by eating GLV. Only 6% could say that Vitamin A capsule is the treatment of night blindness. In a logistic regression analyses, knowledge of Vitamin A was significantly associated with better housing, migration, urban volunteer service, joint NGO/UVP activity and education. Age was negatively associated with knowledge. Poor knowledge of Vitamin A and low VAC coverage was observed in Dhaka City Slums.

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## MAPPING METHODOLOGY IN AREA SAMPLING – EXPERIENCE FROM THE URBAN SURVEILLANCE SYSTEM OF UVP

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The Urban Surveillance System (USS) is comprised of a multistage probability sample of the slum population of five metropolitan thanas of Dhaka city. The system is based on area sampling. The primary sampling unit (PSU) is an area of slum containing 20 to 200 households. The ultimate sampling unit is a slum area containing 20 to 55 households; all the households within selected clusters are in the sample. The sampling involved several phases of mapping. The maps of the first phase were individual slum maps containing location, external boundaries, estimated number of households, and the PSU boundaries if the size of the slum was more than 200 households. The maps of the second phase were PSU maps containing their external boundaries and the cluster boundaries. In the final phase each selected cluster was individually mapped with boundary identifiers, enumeration and distribution and type of the dwelling structures, and other prominent landmarks. The summary and distribution of all the slums were produced in the thana maps and the Dhaka city map. These maps are used to identify households under the USS. There were several problems encountered during the mapping. First, the information on the boundaries of the slums were rapidly going out of date. Second, the definitions of the unit of dwelling structure was not unique. Third, in some instances,the population estimates of the slums varied widely from the actual size of the population. In the course of the experience gained from

the systematic surveillance exercise, most of the problems have been resolved. Despite these problems, the maps have proven to be effective tools for the identification of the slums, the surveillance clusters, and the households in Dhaka slums which have a population of high area density and extreme mobility.

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## KNOWLEDGE ON PREPARATION, ADMINISTRATION AND USE OF ORS AMONG URBAN SLUM DWELLERS

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During October – December 1990, 2059 mothers who have children less then 5 years old were interviewed. They were asked on the preparation, administration and use of different types of ORS. 89% of the mothers stated that they knew how to prepare packet ORS, while 78.9% had prepared it at least once. However, only 68% were found to know the correct preparation. Almost all mothers' (99.6) were using tap/tubewell/boiled water to prepare ORS. Non Government Organisations (NGO) (40%), private sources (50%) and media(29%) were the source of instruction for packet ORS preparation. 71% of the mothers thought ORS should be started by onset of 1–3 stools. 89% said ORS should be continued until stool gets normal. 21% said ORS is supposed to prevent dehydration. Overall correct knowledge about ORS was only 16%.

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## KNOWLEDGE OF URBAN SLUM WOMEN ON VITAMIN A AND NIGHTBLINDNESS

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To collect baseline data on knowledge of Vitamin A by slum dwellers, a survey was conducted in Urban Surveillance System (USS) of Urban Volunteer Program (UVP) of ICDDR,B. The USS is a probabilistic sample of Dhaka urban slum population and comprised of 4,500 households in 168 clusters. Between October and December 1990, 2059 mothers with one child under 5 were interviewed. They were asked on the definition, cause, prevention and treatment of night blindness. 64% mothers were able to define night blindness correctly. 4.7% knew that Vitamin A deficiency is the cause of night blindness. In reply to the question on prevention of night blindness 28% mothers said that intake of green leafy vegetables can prevent night blindness while 14% thought yellow fruits and 11% said that small fish intake can prevent night blindness. Regarding knowledge on treatment of night blindness only 4.9% mothers could say that Vitamin A capsule can prevent and/or cure night blindness.

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## ASSOCIATION OF WATER AND SANITARY CONDITION ON DIARRHOEA PREVALENCE IN DHAKA URBAN SLUMS

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During 1990, data were collected on the urban slum households' water and sanitary conditions and on the two-week prevalence of diarrhoeal diseases among children under 5 years of age. Preliminary findings indicate 66% of the households had access to tap water and the remaining 34% collected their drinking water from hand tube wells around the area. No significant difference was observed in diarrhoeal prevalence between the users of tap and tube well water. 21% households had access to sanitary latrines, 50% had hanging and 26% had pit latrines. About 81% of the slum children did not use any fixed site for defecation. Prevalence of diarrhoea among children is 15.8% for the households having access to sanitary latrines, 21.8% and 20.5% for hanging and pit latrine users, respectively. The prevalence of diarrhoea is significantly different between households using sanitary latrines and households using hanging or pit latrines.

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## HOUSING PATTERN IN DHAKA URBAN SLUMS, BANGLADESH

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During January – April 1990, the Urban Surveillance System (USS) of the Urban Volunteer Program (UVP) collected demographic and socioeconomic data that included information on housing used by the urban slum population of Dhaka. The average household size in the slum areas is 5.5 members per household. 81.7% of the households consist of one room only. Materials used for the construction of the roofs of the houses are tin (68.4%), bamboo (22.8%), jhupri (5.1%) and pucca (2.9%). Most of the walls of the house are made of bamboo (73.6%); 14.4% of the walls are pucca, 5.9 are tins and 5.1% are jhupris.

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## INTERACTIVE DATA MANAGEMENT SYSTEM FOR DEMOGRAPHIC SURVEILLANCE IN URBAN AREAS – LESSONS FROM UVP

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The Urban Surveillance System is comprised of a probabilistic sample of the slum population of the five metropolitan thanas of Dhaka city. An "interactive" data entry and management (DEM) system has been implemented to facilitate instant "response" regarding the validity of the data. The instant "checking" is comprised of the classical "range, consistency, linkage, and longitudinal" checks. The data entry system is built around a current working file (CWF) using DBMS tables. Data entry, edit, and display are insulated from one another. The choice of the functions are completely menu driven. The entry log is produced and used in the day to day audits. As a 90 day cycle is followed in field visitation, a corresponding schedule is maintained in the data entry system. The schedule also includes feedback and correction. The data processing job has been isolated from data entry system. The system has several extension nodes to incorporate DEM for other surveillances activities in the USS.

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## MULTI-STAGE POPULATION SAMPLING OF AREAL UNITS – EXPERIENCE FROM THE URBAN SURVEILLANCE SYSTEM OF UVP

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The Urban Surveillance System (USS) is comprised of a probabilistic sample of the slum population of the five metropolitan thanas of the Dhaka city. The sampling scheme is based on areal units and is described as a stratified multi-stage sampling. The slum area containing 20 to 200 households is defined as the primary sampling unit (PSU). This is either a slum within the size range, or a segment of a larger slum which have been divided nominally to form the PSUs. The ultimate sampling unit is an area of the PSU containing 20 to 55 households. The PSUs were divided into strata of approximately equal size, based on some aggregate information on water and sanitation conditions. Samples were then selected from each of the strata using PPS Sequential method. Finally, one cluster from each of the selected PSU was selected. The sampling methodology was suitable for defining areas as the sampling units in a mobile population like the slums. Several problems were encountered during the process. First, the boundaries of the PSUs and the clusters were rapidly becoming ambiguous. Second, there were some problems in the estimation of the population size of some of the slums. The problems were solved by formulating consistent rules.

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## GESTATIONAL AGE AND BIRTH WEIGHT AMONG URBAN POOR – A PILOT STUDY

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To examine the feasibility of collecting data on birth weight and gestational age, a pilot study was conducted in Research Cluster of Urban Volunteer Program of ICDDR'B. A volunteer network information system was developed. The volunteer informed the investigator whenever a child is born in her cluster within 72 hours. Thirty three newborns were examined between August and October 1989. Infants gestational age were estimated using modified Dubowitz method. Infants weight, length, head circumference, chest circumference were measured. Mean gestational age (GA) birth weight, length, head circumference and chest circumference were 38.5 weeks, 2.6 kg, 47.9cm, 33.6cm, 31.3cm, respectively. Eighteen percent of the babies had Intrauterine Growth Retardation (IUGR). Twenty four percent babies were low birth weight, half of them were preterm (GA $<37$ weeks). Sixty six percent of the IUGR cases were stunted (Adequate Ponderal Index) and 33% were wasted (Low Ponderal Index). No significant difference was observed in the mean birth weight between boys and girls.

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## PATTERN OF PREGNANCY OUTCOME AND BIRTH ATTENDANTS AMONG URBAN SLUM WOMEN

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The Urban Surveillance System (USS) collects demographic information that are updated quarterly. The sample population is 22,000 Dhaka slum dwellers consisting of 4500 households. 4269 women were identified to be in the childbearing age. During April – June '1991, 280 pregnancy outcomes were reported. Out of these 86.4% were live births, 5% still births, 6.4% and 2.1% were spontaneous and induced miscarriages, respectively. Induced miscarriage was highest (3.3%) among the 15 – 19 years age group, spontaneous miscarriage was highest (12.2%) among 30 – 34 year age group and still birth (14.2%) was highest in 35 – 49 year age group. 61% of the deliveries were attended by untrained birth attendants/neighbours; only 17.2% of the cases had assistance from trained attendants.

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## BREAST – FEEDING AND WEANING PATTERN AMONG THE CHILDREN OF URBAN SLUMS

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The objective of this study was to investigate the breast – feeding and weaning pattern and the reasons for discontinuation of breast – feeding in urban slum children. Data on breast – feeding were collected for the last child of 2041 mothers during September – November 1990 through a questionnaire survey. About 98% children were found to be breast – fed at least once. The proportion of bottle – feeding appears to be high (30%) among the slum families. Only 9% of slum mothers initiate breast – feeding immediately after birth. 30% of the children did not receive breast – milk within 3 days. The age – specific feeding pattern shows that only 22% of 0 – 5 months infants are exclusively breast – fed. About 20% of the mothers discontinue breast – feeding because of inadequate supply of milk and about 22% of the mothers discontinue due to pregnancy. 56% of the children are given plain water during the first six months. About 32% of children are given powdered milk during this age.

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## CHANGING WOMEN'S KNOWLEDGE: AN EVALUATION OF THE WOMEN'S EMPOWERMENT PILOT PROJECT OF UVP

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Women living in urban slums are among the most impoverished of society's members. In Bangladesh, as in many other parts of the world, such women eat less, receive little or no education, and often shoulder the double responsibility of income generation and child rearing. Many of these women die assetless at a young age. Seen as economic liabilities, women's dependence and low self – esteem are frequently reinforced by prevailing social and cultural forces. Consequently, life choices are often limited. This cycle of deprivation and discrimination can only be broken through efforts to empower women.

The Women's Empowerment Pilot Project (WEPP) has two purposes: to collect information on life choices available to women in Dhaka slums and to provide training and awareness concerning literacy, legal advocacy, health, and financial management. Between June of 1990 and August of 1991, 726 women (542 adults and 184 adolescents) participated in two to three months of instruction, accompanied by follow – up meetings, which occurred weekly.

The purpose of this study was to assess changes in attitudes about education, legal awareness, the treatment of sons and daughters, and management of household resources

(including savings). Since about half of all program participants only recently became affiliated with WEPP, this analysis is limited to those who began training between June and December of 1990. Because data on controls (women of similar background who did not participate in WEPP) are lacking, there is no attempt to compare WEPP affiliates with peers. However, there are plans for such a comparison in the future.

Preliminary results suggest that training does have a positive effect on women's knowledge in a number of areas. Only about a third of participants could read a sentence, write their names, and perform simple arithmetic prior to training. After two months of program participation, 80% or more accomplished these tasks successfully. With respect to legal rights, only 1% of women could identify that proportion of property which lawfully belonged to them after husband's death, while only 3% could identify proper procedures in cases of physical abuse. Alternatively, about three – quarters of all women answered these questions correctly on the post – test. Fifty eight percent of women said they would take a dowry for their son at pre – test, but less than 1% responded similarly after training. However, after participation in the program, women were more likely to feel that their income should be given to husbands (24% pre – test, 43% post – test). Nevertheless, women were at least twice as likely at post – test to deem the education of children, provision of household essentials, and emergency relief as appropriate uses of savings. Further analysis (including Chi – squares and odds ratios) will explore how class and education impact upon these differences.

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## AN EVALUATION OF THE COMMUNITY – BASED NUTRITION REHABILITATION CENTER (NRC) IN URBAN SLUMS

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The Urban Volunteer Program operates two Nutrition Rehabilitation Centers (NRCs) in the Dhaka Slums in collaboration with the respective Community Nutrition Councils from the community. Between November 1989 to April 1990, 149 children were admitted with a percent weight for height below 80%. Low cost locally available foods were distributed through 3 meals and 2 snacks a day. Mothers and attendants were given education on nutrition, hygiene, diarrhoea, immunization and family planning including participation in cooking, child feeding and cleaning the center. Of the children enrolled, 113 completed 3 weeks and 84 completed 5 weeks. Median weight gain 3 weeks after admission was 400 g and 5 weeks after admission 500 g. Children who had diarrhoea or lower respiratory tract infection had significantly lower weight gain than those who did not. Follow up showed median increase of 6% and 10% wt/ht 3 and 6 months after discharge. Mortality rate in the NRC was less than 1%.

The NRCs have been established based on the idea that community – based nutrition rehabilitation center is feasible with involvement and participation of the community and that such centers provide a viable vehicle in rehabilitating severely malnourished children as well as imparting nutrition education to attending mothers.

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## EFFECTS OF MATERNAL AND HOUSEHOLD FACTORS ON CHILD IMMUNIZATION STATUS AMONG THE URBAN POOR

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The Urban Volunteer Program's Urban Surveillance System (USS) baseline data is used to investigate the effects of maternal and household factors on child immunization status among the urban poor. A total of 785 children between 12 and 23 months were studied, out of which 302 (38.5%) children had received all doses (one dose of BCG and measles, and three doses of DPT and OPV). By multivariate logistic regression analysis, the effects of maternal factors such as age, birthplace, education and outside employment and the role of household factors (socioeconomic status, media exposure) on immunization status of child were estimated after adjusting for sex.

Maternal age was found to have a negative association with child immunization status ($p<0.05$). Among the maternal variables, birthplace was most strongly associated with immunization status; mothers born in the rural community were 0.51 times less likely to immunize their children than the mothers born in the city ($p<0.01$). Immunization status among children of mothers working at home or stayed home was 1.38 times higher than the children of mothers employed outside home. Educated mothers were 1.56 times more likely to immunize their children than illiterate mothers. Of the household factors, socioeconomic status and media exposure were found to have positive and statistically significant impact on child immunization status ($p<0.01$). The chance to be immunized was twice as much among children of higher socioeconomic status than the children of low socioeconomic status. Immunization status was found to be 2.66 times higher among the children of households who had access to mass media than the children having no access to such media ($p<0.05$). However, the effect of household factors on immunization status tend to reduce when maternal variables are controlled.

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## URBAN VOLUNTEER PROGRAM: VOLUNTEER PROFILE

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One of the objectives of the Urban Volunteer Program of ICDDR,B is the development of a health care delivery system for the urban slum population of Dhaka City on a pilot basis. The health services are provided in the area of diarrhoea, nutrition, family planning and immunization. These services are provided through volunteers. There are 468 such volunteers serving the slum residents in 5 thanas of Dhaka City. In order to find their profile between February and March 1991, these volunteers were interviewed. They were asked about their family size, number of children, age, marital status, birth

place, place of residence, education, occupation, income, water and sanitation conditions. 5.1% volunteers were less than 20 years, 20.7% between 20 – 24 year, 39.3% between 25 – 34 year, 23.6% between 35 – 44 year and 11.3% were 45 years and older. 66% of the volunteers are married, 13.7% widow, 8.7% separated, 8% never – married and 1.7% are divorced. Average family size is 5.6 and 30.1% volunteers have children under 5 years of age. 22.8% of these volunteers were born in a slum, 28.6% in non – slum area of Dhaka, while 44.8% were born in a rural area and the remaining 3.6% were from outside Bangladesh. 68.9% of the volunteers were residing in the slum and 31% in non – slum area during the time of interview. 35.7% of the volunteers had no education, 11.8% grade 1 – 3, 19.8% grade 4 – 5 and 30.4% grade 6 – 10 and 2.7% had up to higher secondary education. 48.9% of the volunteers are housewives, 13.9% maid servants and 23.3% are doing some type of job. About 8.5% of the volunteers have household income less than Tk. 1000 per month. About one third of the volunteers have income between Tk. 1000 – 2000, 43.1% between Tk. 2000 – 5000 and 14.5% have household earning more than Tk. 5000 per month.

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## MOTHERS KNOWLEDGE OF CAUSES AND PREVENTION OF DIARRHOEAL DISEASES IN URBAN SLUMS

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Data was collected between October – December 1990 from 2,059 mothers residing in the Urban Surveillance System (USS) areas of the Urban Volunteer Program to determine knowledge about the causes and prevention of diarrhoeal diseases among the mothers living in slum areas. When asked about the causes of diarrhoea, 5% of the mothers mentioned germ, 3% mentioned not washing hand after defecation, and 11% mentioned not washing hand before giving food to children. 36% mothers mentioned that dirty environment can cause diarrhoea. Only 5% mothers mentioned that drinking of contaminated water is a cause of diarrhoea. When the mothers were asked how diarrhoea can be prevented, few mothers mentioned hand washing after defecation (2%) or washing hand before giving food to children (13%). A significant proportion of mothers mentioned that diarrhoea could be prevented by keeping household clean (45%), not eating unwholesome food (40%), and keeping food under cover (33.1%).

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## GROWTH MONITRING OF RURAL CHILDREN: CONSTRATINTS AND RMEDIAL MEASURES

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This study, used for the evaluation of the impact of a nutrition intervention program, was conducted in four villages – Dasher Kandi, Babur Jaiga, Balur Par (control areas) and Gouro Nagar (experimental area), Baraid Union, Dhaka. A total of 221 children aged 2 – 57 months was weighed using NNC (National Nutrition Council, Bangladesh) bar scale. The age of the children were recorded by interviewing the mothers and family members. Heights were taken by using a locally made height scale. During these processes, problems were encountered. For instance, most of the mothers could not tell the accurate date of birth of their children. Furthermore some parents were greatly concerned about weighing their children as they thought this would make them sick.

This paper discusses various techniques used for determining the age of the children which were considered to be either exact or close enough to their actual age. Methodologies which helped to overcome with the obstacles associated with taking weights and heights of the children were also discussed.

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## IMPACT OF ZINC SUPPLEMENTATION ON SUBSEQUENT GROWTH AND MORBIDITY IN BANGLADESHI CHILDREN PRESENTING WITH ACUTE DIARRHOEA

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A double – blind `randomised' controlled clinical trial with zinc acetate (15mg/kg/d) and placebo was conducted for 2 weeks in 111 children aged between 3 and 24 months with acute diarrhoea (< 3 days) in the ICDDR,B. Enteropathogens isolated included rotavirus in 36.4%, enterotoxigenic *E. coli* in 8.2%, *Shigella* spp. in 5.3%, *V. cholerae* in 3.8%, *C. jejuni* in 12.4%, *Aeromonas* spp. in 10% and enteropathogenic *E. coli* in 7.2% of cases. No pathogen could be isolated in 33% of patients. There was 11.5% less stool output in the zinc supplemented group but this was not statistically significant. When the analysis was restricted to the patients with lower plasma zinc levels ($n = 55$), stool output was reduced by 17.3% and recovery period was shorter by 23% in the zinc supplemented group ($p < 0.05$ and $p < 0.04$ respectively). Significantly higher rates of linear growth were evident among all supplemented children continuing up to 7 weeks after diarrhoea ($p < 0.04$). Rates of diarrhoeal and respiratory infections were not significantly different between the two groups

as a whole, however, children below the median wt/age (n=33) showed significantly fewer attacks and shorter duration of diarrhoea after zinc supplementation (p=0.04). This study suggests that zinc supplementation may provide clinical and nutritional benefits to undernourished children with acute diarrhoea.

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## INCREASED LINEAR GROWTH WITH A HIGH-PROTEIN/HIGH-ENERGY DIET IN CHILDREN CONVALESCING FROM SHIGELLOSIS

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Linear growth faltering has been observed as a consequence of shigellosis in children. It was hypothesized that nutritional intervention with a high-protein/high-energy diet would cause a rapid catch-up growth. Sixty nine children aged 2-4 years were randomly assigned to either a high-protein diet containing 150 Kcal/kg/d with 15% of total calories as protein, or standard-control diet containing 150 Kcal/kg/d with 7.5% of total calories as protein. The children were fed the diets during convalescence from shigellosis for 21 days in the hospital. Body weight was measured daily and height was measured every 3rd day for 21 days. Serum proteins were assayed on admission and at the end of 21 days dietary intervention. Anthropometric data were analyzed using NCHS statistical package.The mean (SD) increases in height were 1.02 cm (0.44 cm) vs 0.69 cm (0.34 cm) for high-protein and standard-protein diet respectively ($p<0.001$). Similarly, body weight also increased significantly in test group compared to that of control group ($p=0.002$). The median weight/age, weight/height and height/age were significantly increased in test children compared to those of control. Serum proteins which were measured before and after the dietary intervention, increased significantly more in the test group compared to the control group ($p<0.01$). A significant increase of both body weight and height with significant increases in serum proteins of test children suggests that a high-protein/high-energy diet is beneficial for convalescent children with shigellosis and should be recommended for rapid catch-up growth.

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## HYPERIMMUNE BOVINE COLOSTRUM REDUCES DIARRHOEA DUE TO ROTAVIRUS: A DOUBLE-BLIND, CONTROLLED CLINICAL TRIAL

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The therapeutic efficacy of hyperimmune bovine colostrum (HBC) was evaluated in 75 boys aged 6 months to 24 months (mean 11 mo), hospitalized with rotavirus diarrhoea. HBC

was produced by immunising cows with 4 serotypes of rotavirus antigen with Freund's adjuvent both parenterally and by infusion into the mammary glands; first 2 days colostrum after calving was used. The treatment group received 100 ml of HBC every 8 hours for 3 consecutive days, and the control group received the same amount of bovine colostrum from unimmunised cows, in a double blind, randomised schedule. Before assigning to treatment the two groups were comparable. The intakes and outputs were measured every 8 hours until discharge. The end of diarrhoea was defined as the passage of soft stool or of no stool at least in two successive 8-hour periods. The treatment group had a significantly shorter duration of diarrhoea than the control after treatment (mean 64 vs 83 h; $p=0.016$). Although the total stool till cessation of diarrhoea (g/kg) was 28% less in the treatment group than the controls (median 208 vs 288), the difference did not achieve statistical significance. Eight hourly stool outputs were closely similar for the first five 8-h periods, after which the stool outputs were significantly less in the treatment group than the controls. No untoward effects were marked in either of the treatments. We conclude that hyperimmune bovine colostrum is clinically efficacious in reducing the duration and the stool output of patients with rotavirus diarrhoea.

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## COMPARATIVE EFFICACY OF ORAL PIVMECILLINUM WITH NALIDIXIC ACID IN THE TREATMENT OF ACUTE SHIGELLOSIS IN CHILDREN

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Efficacy of oral pivmecillinum was compared with nalidixic acid in the treatment of acute shigellosis in children between one to eight years of age in a double blind randomized clinical trial conducted at Clinical Research Centre, ICDDR,B. Eighty children with bloody diarrhoea of less than three days duration were initially recruited for the study. *Shigella* was isolated in seventy one of them. Patients received either nalidixic acid, 60 mg/kg/day or pivmecillinum, 50 mg/kg/day orally in four equal doses for five days. All patients stayed in the hospital for six days. Admission and clinical characteristics on different study days of the two treatment groups were comparable. Progressive decrease in the stool frequencies was observed in both the groups. Clinical failure was observed in only two patients receiving nalidixic acid. Pivmecillinum was more effective in eradicating *Shigella dysenteriae* type 1 whereas nalidixic acid was found to be more effective against sensitive strains of *Shigella flexneri*. Oral pivmecillinum was found to be equally effective as standard therapy with nalidixic acid in patients with acute shigellosis. However, nalidixic acid was found to be a better choice in treatment of *Shigella flexneri* infection while pivmecillinum was more effective against *Shigella dysenteriae* type 1 infection.

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## EPIDEMIOLOGY OF DIARRHOEA MORTALITY IN MATLAB, RURAL BANGLADESH

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A Demographic Surveillance System has been recording data since 1966 in Matlab, a population of approximately 200,000 in an area representative of rural Bangladesh served by a diarrhoea hospital and basic health services. Every household is visited every two weeks by one Community Health Worker (CHW) recording vital statistics. Causes of death are determined through the verbal autopsy method by interviewing the family within six months of the death and reviewed by three physicians who assign causes of death according to a WHO classification. Causes of death of children under five years of age who died in two years of the study period are reported.

There were 520 diarrhoeal deaths in 60,669 under five child/years of exposure. Diarrhoea specific mortality accounted for 27 and 54 percent of deaths of post-neonates and children 1-4 years respectively. Acute watery diarrhoea accounted for 40 percent of the diarrhoea specific mortality in post-neonates and for 9 percent in children 1-4 years. Bloody/mucoid diarrhoea and persistent diarrhoea accounted for 16 and 63 percent of diarrhoeal deaths respectively in children 1-4 years of age. The following may be concluded:

- Diarrhoeal mortality is still a proportionally important cause of death in a population receiving health services.
- Acute watery diarrhoea is an important cause of death in infants but less important in children.
- Dysentery and persistent diarrhoeas continue to be a threat to children.

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## DESCRIPTIVE EPIDEMIOLOGY OF PERSISTNET DIARRHOEA AND ITS ASSOCIATION WITH NUTRITIONAL STATUS AND IMMUNOCOMPETENCE IN RURAL BANGLADESH CHILDREN

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To determine the magnitude of the problem of persistent diarrhoea and to identify its potentially important risk factors, a community-based longitudinal study was carried out at Matlab, Bangladesh. A cohort of 705 children under the age of five years were

prospectively followed; 512 children were followed for a complete year and the reminder for part of the year which yielded 7,300 child-months of observation. Socioeconomic and demographic data were collected from the study families at baseline. Morbidity data were collected from each study child every fourth day by home visit. Anthropometric status of the study children were assessed every month. Cell-mediated immune status of a sample of study children were assessed using a multiple antigen skin test every three month. The overall diarrhoeal incidence rate in the study children was 4.6 episodes per child per year. The incidence of persistent diarrhoea was 34 per 100 child-year. The rates were highest in infancy and lowest in the fifth year of life. The study children experienced diarrhoea for 9.5% of the days. 7.9% of the episodes became persistent. The results of anthropometry and multiple antigen skin test were used to categorize children in nutritional and immune categories for the subsequent three months and for the year. Then the association of persistent diarrhoea with nutritional status and immune status were examined. In logistic regression model, weight for height status and immune status were significant predictors of persistent diarrhoea. Unit change in Z-score weight for height status and immune status were significant predictors of persistent diarrhoea. Compared to immunocompetent children, immunodeficient children had about twice the risk of developing persistent diarrhoea. Controlling for socioeconomic status and prior diarrhoea did not change the regression coefficients for weight for height status or immune status. In conclusion, in this population nutritional status and cell-mediated immune status were important independent risk factors for persistent diarrhoea. As cell mediated immune deficiency independent of nutritional status was an important risk factor, interventions restricted to protein-calorie supplementation alone is unlikely to have an optimum impact on the control of persistent diarrhoea. Cell-mediated immune deficiency may play an important role and deserves further and more specific investigations.

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## NEONATAL ROTAVIRUS INFECTIONS IN DHAKA

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A pilot study conducted in January-March 1990 in Dhaka Shishu Hospital (DSH) neonatal ward and Holy Family Hospital (HFH) baby room found that 50% and 78% of newborns were infected with group A rotavirus (RV), respectively. Within each hospital, RV strains were of identical serotype and electropherotype but different between hospitals. Comparison of representative RVs from each hospital with those prevailing in the community suggested that these strains may be distinct from those that infect older children, as has been found in other parts of the world. To determine whether the same RV strains persisted in these hospitals, rectal swab was collected from 248 babies during February 1991. Forty of 168 (23.8%) from HFH and 20 of 80 (25%) from DSH were excreting rotaviruses asymptomatically. The same serotype was found in specimens from DSH as had previously been identified plus an additional mixed serotype. Specimens from HFH contained RVs which were different from those identified in the pilot study. The results suggest that neonatal rotavirus infection is maintained throughout the year in the nurseries of DSH and HFH and a follow-up study is underway to determine whether infections of neonates with such strains confer protection against subsequent RV infection.

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## CHOLERA EPIDEMIC IN SOUTH AMERICA: EXPERIENCE OF ICDDR,B IN ECUADOR

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This year, for the first time in this century cholera has broken out in Latin American countries. The epidemic which started in Peru spread to the neighbouring Ecuador, Colombia, Chile and Brazil. Between January and May 1991 over 200,000 cases and nearly 3000 deaths were reported. ICDDR,B responded to the call by Ecuadorian Government for assistance by sending scientists from the Centre who helped the Ecuadorian in epidemiological investigation, case management and laboratory diagnostic methods. During our stay, we have noted some of the interesting features of the cholera epidemic in Ecuador. The epidemic extended from Peru to Ecuador in late February 1991. The total number of cases recorded were over 5,000. Strikingly, only 140 deaths were reported. Few cholera deaths were investigated. An analysis of the age and sex distribution revealed that 86.2% of the cases were adults and 61% were male. By contrast, in Bangladesh we observed 36% cholera patients were ($p < 0002$) adults and 49% were male ($p < 0.001$). This substantiates the view that in a newly infected area cholera affects mainly male adult population. Laboratory identification revealed that the epidemic strains were *V. cholerae* 01 biotype EI Tor. The socio-economic and environmental status of Ecuador indicate that cholera will be a public health problem in this country for sometime.

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## *ESCHERICHIA COLI* DIARRHOEA

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*Escherichia coli* are the predominant members of the facultative anaerobic flora of the intestinal tract. Even though, they are part of the normal flora of the intestine, some members are, however, pathogenic giving rise to diarrhoea. Currently there are five recognized categories of *E. coli* that are known to cause diarrhoea. They are enteropathogenic *E.coli*, enterotoxigenic *E. coli*, enteroinvasive *E. coli*, enterohaemorrhagic *E.coli* and enteroaggregative *E. coli*. Each category has its own characteristic microbiological, epidemiological, clinical and pathological features that permit its differentiation from other categories. Studies undertaken in the past at the ICDDR,B have suggested that enterotoxigenic *E.coli* are an important cause of diarrhoea in Bangladesh. Current studies underway will unravel the importance of other categories of *E.coli* in the causation of diarrhoea. The understanding of proportion of diarrhoea caused by different categories of *E. coli* will have implications in the control of diarrhoea.

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## MOLECULAR BIOLOGY IN THE STUDY OF DIARRHOEAGENIC ORGANISMS : A REVIEW OF TECHNICAL FACILITIES AND ACHIEVEMENTS

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Identification of diarrhoeagenic pathogens based on the detection of genes for pathogenic determinants such as toxins, adhesins, invasion and colonization factors have facilitated epidemiological and clinical investigations in recent years. Specific nucleic acid probes have been developed and used to identify pathogenic genes, their location and evolutionary interrelationships. These studies have shown for the first time a high frequency of enteropathogenic *E.coli* infections among Bangladeshi children in addition to enterotoxigenic *E. coli* infections. Studies at the molecular level has demonstrated hyper-toxigeneicity of heat-labile toxin (LT) producing *E. coli* and unusual location of LT genes in these strains. Plasmid profile analysis and drug resistance patterns of different diarrhoeagenic bacteria have given new insight into the induction of drug resistance. Genetic fingerprinting of diarrhoeagenic bacteria has the potential to be a very useful epidemiological tool. Ribosomal RNA fingerprinting has been successfully utilized in studies involving the differentiation of strains and tracing the origin and distribution of diarrhoeagenic bacteria. Use of molecular biology techniques in studying diarrhoeal pathogens have been found to be productive.

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## RESISTANCE OF *SHIGELLA* SPECIES TO ANTIMICROBIAL AGENTS AND ITS ASSOCIATION WITH PLASMIDS

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Shigellosis continues to be a major public health problem all over the world. Although various antimicrobial agents have been used effectively in the treatment of shigellosis, it has been observed that in almost all the cases *Shigella* itself develop full or partial resistance to the drugs used. A large number of *Shigella* strains, resistant to different drugs, have been isolated from patients of all age groups attending the treatment centre of ICDDR,B. The study involved determination of the frequency of resistance of these organisms to different antimicrobial agents, analysis of common drug-resistant patterns, and characterization of drug resistance plasmids. *Shigella* strains isolated during January-December 1984 (n=339) and during November 1989-October 1990 (n=288), were studied. The isolation rates of the two most commonly isolated species of *Shigella, S. flexneri* and *S. dysenteriae* 1, during 1984 were 44 and 46%, respectively and during 1989-1990, 56 and 22%, respectively. Susceptibility of *Shigella* species to the following antibiotics was studied: ampicillin, chloramphenicol, streptomycin, tetracycline, trimethoprim sulfamethoxazole, nalidixic acid, kanamycin, and gentamycin. Certain drug-resistance patterns were observed

in *S. flexneri* and *S. dysenteriae* 1 during 1984. The pattern was different in 1989 – 1990 isolates. Minimum Inhibitory Concentration (MIC) of the antibiotics were determined. Although trimethoprim – sulfamethoxazole resistance was less frequent in *Shigella* species other than *S. dysenteriae* 1 the level of trimethoprim resistance in all species of *Shigella* was rather high (MIC ranges from >1600 µg/ml to >4500 µg/ml). Results of conjugation and curing experiments showed that plasmids ranging from 20 to 110 MD in *Shigella* species are associated with drug resistance. The plasmids, either selfconjugative or mobilizable by resistance transfer factor, code for either single or multiple antibiotic resistance.

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## ROLE OF ENTERIC VIRUSES IN DIARRHOEAL DISEASE IN BANGLADESH

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Group A rotaviruses (RV), the most common of A rotaviruses have been shown to be a cause of diarrhoea in infants throughout the developed and developing world. Since 1987, RVs have been well studied in Bangladesh and have been identified from approximately 15% of all diarrhoeal specimens tested from different parts of the country. RVs identified from 1987 – 1991 have been serotyped and strains prevailing in Bangladesh appear to fall within the major serotypes, as found throughout the world.

The role of enteric adenoviruses and astroviruses as causative agents of diarrhoea is still not clearly defined. Diarrhoeal specimens from 1987 – 1990 and from diarrhoeal cases and matched controls have been tested for the presence of enteric adenoviruses where about 5% of diarrhoeal stools from the Matlab area contained enteric adenoviruses . Astroviruses have been found in relatively low numbers from stool samples from infants with diarrhoea (about 3%) and among 2% of diarrhoeal and non – diarrhoeal stools from a community based study.

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## EFFICACY OF A RICE – BASED LOW COST DIET IN THE MANAGEMENT OF PERSISTENT DIARRHOEA IN BANGLADESHI CHILDREN

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Persistent diarrhoea is a significant clinical problem in Bangladesh. To test the clinical efficacy of an inexpensive and easy to prepare diet made up with rice powder, egg white, glucose and soya oil, we studied 100 children with persistent diarrhoea in Dhaka Shishu (Children) Hospital, Bangladesh during 1988. Of 100 children aged between 2 and 35 months 26 improved with a milk – based diet. Of the remaining 74, 65 (88%) improved with the rice – based diet within a week with mean recovery period of 4 days. Patients who did not improve with the rice based diet were weaned earlier compared to those who improved. 2 of 9 patients who failed to recover with rice – based diet responded to a soy formula and the remaining 7 patients improved with a comminuted chicken diet. 8 (8%) patients died in the hospital mainly due to speticaemia and bronchopneumonia. The study confirms success of this rice – based simple diet and provides a promising and means of management of persistent diarrhoea patients in underprivileged communities.

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## IMMUNE RESPONSE IN DIARRHOEAL DISEASES

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The immune status of an individual is an important health determinant. Compromised immunity can lead to severe or repeated infections and malnutrition which in turn affect immunity. In Bangladesh, the high prevalence rate of diarrhoea may be due to altered immune response. Normally, pathogens induce an immune response in the host which may be protective, e.g. antibodies against *Shigella* lipopolysaccharides, toxin and outer membrane proteins. In addition to the appearance of specific antibodies, non – specific changes in cellular and humoral immunity can occur, e.g. in measles. These changes in the host immune response are dependent both on the host and the pathogen. In order to determine the outcome of infection, it is, therefore, important to study the host immune response as well as the immunopathogenic ability of the organism. The host response is being examined in the Bangladeshi population (both children and adults) and include immunoglobulin levels, complement levels, lymphocyte phenotype in blood and gut, lymphocyte function and granulocyte function. Extensive studies on *S. dysenteriae* type 1 and *V. cholerae* are revealing important antigens and new mechanisms of immunopathogenesis. Monoclonal antibodies (MAbs) which are being produced against these

antigens will be used to further characterize them and along with other available MAbs are being used to develop rapid immunodiagnostic assays.

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## DETECTION OF ASCARIS SPECIFIC ANTIBODIES USING LARVAL ANTIGEN OF *ASCARIS LUMBRICOIDES*

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*A. lumbricoides* infection is still highly prevalent in developing countries with poor socioeconomic conditions and inadequate environmental sanitation. Bangladesh is also a highly endemic area for this infection. *A. lumbricoides* infection constitutes a public health problem and a problem of major potential nutritional significance from the point of view of prevalence. WHO has advocated chemotherapy as an immediate and effective measure for controlling ascariasis in communities. Community – oriented chemotherapy has been studied in different forms and periodic chemotherapy seems to be effective to control ascariasis. But in countries where 90% of its population < 15 years, are infected a more rational cost – effective chemotherapeutic regimen should be sought. Studies on the intensity of *A. lumbricoides* infection worldwide have shown that the frequency distribution of numbers of worms per host is overdispersed with a few people per community harbouring most of the worm, while most people harbour a few worms. For the determination of worm burdens existent parasitological techniques are laborious, inadequate and costly. Measures to prevent and control *A. lumbricoides* infection are unlikely to be introduced unless the vulnerable group of people is identified. In our laboratory we are trying to develop a simple assay which can be used to differentiate between heavy and light infections with *A. lumbricoides*. Recently we have developed an enzyme linked immunosorbent assay (ELISA) using crude larval antigen of *A. lumbricoides*. Antigen was prepared from 2nd stage larvae of *A. lumbricoides*. Initially, we tested plasma samples of children who were either repeatedly heavily or repeatedly lightly infected with *A. lumbricoides*. The results of our study are encouraging.

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## GREEN LEAFY VEGETABLES (GLV) PROVIDE ADEQUATE VITAMIN A FOR POOR COMMUNITIES

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Green leafy vegetables (GLV) containing β – carotene (provitamin A) may serve as an alternative inexpensive source of vitamin A for poor communities in developing countries. Previous studies showed conflicting results as to the amounts of β – carotene in vegetables destroyed by cooking. The present study was undertaken to assess the extent of β – carotene loss in vegetables subjected to three traditional methods of cooking practised in Bangladesh. Loss of β – carotene in Method I, was 31 to 43%; Method II, 11 to 14%; and Method III, 2.3 to 11%. The cause and implication of high loss of β – carotene are discussed. To avoid high loss of β – carotene during conventional cooking, another study was carried out to determine the loss of β – carotene from GLV after different methods of drying. In this study, two types of GLV, *lal sak* and *pat sak*, containing high amounts of β – carotene were dried in different conditions and preserved. Method I: oven drying at 80 °C for 2 – 3 hours; Method II, sun drying without cover on it; Method III, drying under the cover of a fine cloth to protect from direct sun light. These were then ground and preserved in a dry container. Estimation of β – carotene content in fresh vegetables and an equivalent weight of dried vegetables were analysed monthly up to two months. β – carotene content of 100 g dried ground *lal sak* and *pat sak* in Method I, Method II and Method III were 57840 µg, 49500 µg and 40430 µg. The corresponding values for *pat sak* were: 39000, 60130 and 51460 µg, respectively. The percentage loss of β – carotene for Method I was 2 to 4%; Method II, 34 to 36% and Method III, 16 to 18%. Only 5 g of dry *lal* or *pat sak* contains 418 – 492 µg retinol – equivalent, which is adequate to meet the daily requirement of a pre – school child. The results suggest that proper drying and storage of the GLV can meet the vitamin A requirement throughout the year for poor communities. Health planners of developing countries should educate people to use cooking methods similar to the Methods II and III and also teach them how to dry and store leafy vegetables for future use.

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## *ENTAMOEBA HISTOLYTICA* INFECTION IN BANGLADESH

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*E. histolytica* is a protozoan parasite, the causative agent of amoebiasis. Amoebiasis occurs worldwide and is endemic in Bangladesh. *E. histolytica* is capable of causing a wide range

of intestinal disease in human , including acute diarrhoea, fulminant dysentery, chronic non – dysenteric colitis and amoebic liver abscess. It is now generally accepted that there are at least two forms of *E. histolytica*: one is pathogenic which causes invasive form of disease in human and the other non – pathogenic. Twenty different mobility patterns for isoenzymes hexokinase (HK), phosphoglucomutase (PGM) and glucophosphate isomerase (GPI) are known. Distinct isoenzyme mobility pattern is referred to as zymodemes. At present there are 20 zymodemes, 8 of which are closely associated with invasive disease. The objectives of our present work were to determine the zymodemes of *E. histolytica* isolated from patients with diarrhoeal diseases and from asymptomatic carriers and to develop simple diagnostic methods for pathogenic and non – pathogenic strains of *E. histolytica*. For this purpose we have established axenic and xenic cultivation techniques of *E. histolytica*, techniques for isoenzyme characterisation and serological methods for diagnosis. In our preliminary work we have identified four zymodemes of *E. histolytica* in Bangladesh: zymodemes I, II, XIV and XVI. Zymodemes II and XIV are clearly associated with amoebic dysentery and non – pathogenic zymodemes I is widely prevalent in asymptomatic cyst carriers. Zymodeme characterisation of these *E. histolytica* isolates were performed using Cellulose Acetate Electrophoresis (CAE). Although isoenzyme characterisation appears to be a powerful and consistent means of distinguishing between pathogenic and non – pathogenic strains of *E. histolytica*, it is a time consuming and expensive tool for routine clinical use in the devoloping countries. Recently in collaboration with London School of Hygiene and Tropical Medicine (LSHTM) we have established immunofluroescent antibody test using monoclonal antibody( MAb) for differentiation of pathogenic and non – pathogenic *E. histolytica*. This technique also requires initial cultivation of *E. histolytica*. We have tested about 50 isolates of *E. histolytica*, of which 20 were with pathogenic zymodemes and gave positive results in the immunofluorescent antibody test. At present we are trying to develop an easier assay for differentiation of pathogenic non – pathogenic strains of *E. histolytica*.

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## FAILURE OF ASYSTEMATIC HOME TREATMENT STRATEGY AGAINST DYSENTERY

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A systematic home-based program to treat children under five years of age with nalidixic acid for clinically diagnosed dysentery was set up in 1989 in Matlab, rural Bangladesh. The dysentery surveillance system in the community was also reinforced, and 1, 420 rectal swabs collected until May 1991.

Shigella isolation rates were 25% in the community, while it was 31% in the Diarrhoea Treatment Centre (DTC). Amongst them, *Shigella flexneri* represents 65.1% and *Shigella dysenteriae* type 1 8.7%, respectively (63.7% and 18.7% in the DTC). *Shigella flexneri* was resistant to ampicillin, cotrimoxazole and nalidixic acid respectively in 57% and 45% and 3% of the samples (n=255), while values for *Shigella dysenteriae* 1 were 85% and 68% respectively (n=34), resembling Dhaka Hospital data. Patients referred to the DTC fron non-intervention area show significantly lower resistance to nalidixic acid.

In a public health perspective, a systematic strategy based on antibiotics is unacceptable due to low isolation rate of *Shigella*, cost, side effects and possible resistance induced by drugs. Because of strong interdependence between malnutrition and persistent diarrhoea, stress should be given on investigations and interventions in preventive care by education programs on effective and well targeted risk factors, and the development of an efficient vaccines.

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## MOTHERS' KNOWLEDGE AND USE OF ORAL REHYDRATION SALT FOR TREATMENT OF CHILDREN WITH DIARRHOEA IN RURAL BANGLADESH

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The impact of education programs on mothers' knowledge of packaged oral rehydration salt and its use was assessed through a survey in 1988 and compared between 3 areas of Matlab in rural Bangladesh. Community health workers of the International Centre for Diarrhoeal Disease Research, Bangladesh were the major source of knowledge of ORS in the Maternal and Child Health and Family Planning Project and its comparison area. Workers of Bangladesh Rural Advancement Committee were the principal source of information in an adjacent control area. 80 to 90 per cent of mothers in the three areas knew the correct quantity of water required to prepare oral rehydration solution. 68 to 85 per cent knew that oral rehydration solution could cure or stop diarrhoea. Only 10 to 18 per

cent claimed that it could replace the fluid loss due to dehydration. ORS use for diarrhoea episodes was 78 per cent in the Maternal and Child Health and Family Planning Project, 57 per cent in the comparison area and 56 per cent in the control area. At least one half of mothers in the three areas used medicine to treat children with diarrhoea.

Mothers' belief that ORS stops diarrhoea may impede its required use for effective treatment of dehydration. Educational messages must focus on the functional and efficiency aspects of oral rehydration therapy.

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## COMPARATIVE EFFICACY OF ORAL GENTAMICIN AND NALIDIXIC ACID IN THE TREATMENT OF ACUTE SHIGELLOSIS IN CHILDREN

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To compare the efficacy of oral gentamicin with nalidixic acid in the treatment of acute shigellosis in children less than 8 years of age, a double – blind randomized clinical trial was conducted. Eighty children with bloody diarrhoea of less than 72 hours duration were initially recruited for the study. Of them, *Shigella* was isolated in 70 patients. Patients were randomly assigned to receive either nalidixic acid 60 mg/kg/day or gentamicin, 30 mg/kg/day orally in four equal divided doses for 5 days. All patients stayed in the hospital for six days.

Admission characteristics of the two treatment groups were comparable. The stool frequency, however, differed significantly between the groups from day two until completion of the study. Treatment failure was observed in 14 (42%) patients receiving gentamicin compared to only two (8%) in nalidixic acid – sensitive strains of *Shigella* species ($p = 0.0007$). Twenty one (64%) patients on gentamicin therapy failed to eliminate *Shigella* species from stool compared to only one (4%) in the nalidixic acid group ($p = 0.0001$). Oral gentamicin was found to be ineffective in treating patients with acute shigellosis.

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## RANDOMIZED DOUBLE BLIND TRIAL OF SINGLE DOSE DOXYCYCLINE FOR TREATING CHOLERA IN ADULTS

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To compare the efficacy of a single dose of doxycycline (200 or 300 mg) with the standard multiple doses of tetracycline in patients with cholera, a randomized double blind controlled trial was conducted. Patients were given a single 200 mg dose of doxycycline, a single 300 mg dose of doxycycline, or multiple doses of tetracycline (500 mg at six hourly intervals). Two hundred and sixty one patients aged over 15 years admitted to

the hospital with severe dehydration due to acute watery diarrhoea associated with *Vibrio cholerae*. All vibrios isolated from the stools and rectal swabs of patients, including those patients with prolonged excretion of vibrios, were sensitive to tetracycline. Stools of all patients at admission were negative for *Shigella* and *Salmonella*. All patients received rapid intravenous acetate solution for the first four hours after admission. They were then entered in the study and randomised. Oral rehydration was started immediately after the intravenous treatment. If signs of severe dehydration reappeared during oral treatment, patients were given rapid intravenous acetate solution until dehydration was fully corrected.

The median stool output during the first 24 hours (275 ml/kg body weight) and till diarrhoea stopped (296 ml/kg body weight) were significantly higher in patients receiving 200 mg doxycycline as a single dose than in patients receiving either standard tetracycline (242 ml/kg body weight and 254 ml/kg body weight) or 300 mg doxycycline (226 ml/kg body weight and 255 ml/kg body weight). Similarly, median consumption of oral rehydration solution (18.45 L) was significantly higher in patients receiving 200 mg doxycycline than in patients receiving either 300 mg doxycycline (16.10) or standard tetracycline (14.80 L). Almost equal numbers of patients in each group required unscheduled intravenous acetate solution to correct dehydration during antibiotic treatment. Patients treated with doxycycline (low or high dose), however, had more prolonged excretion of bacteria.

A single 300 mg dose of doxycycline is as effective as the standard multiple dose tetracycline treatment for cholera in terms of stool output, duration of diarrhoea, vomiting, and requirement for oral rehydration solution.

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## TREATMENT OF TYPHOID FEVER WITH CEFTRIAXONE (CFT) FOR 5 DAYS OR CHLORAMPHENICOL (CHL) FOR 14 DAYS

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The emergence of multiple drug resistant *Salmonella typhi* in developing countries has prompted us to evaluate the efficacy of a new antibiotic, ceftriaxone in typhoid fever. In a randomized clinical trial, 64 patients with culture positive enteric fever were given either CFT once daily for 5 days or CHL 4 times daily for 14 days. CFT was given to 31 patients in daily I.V. doses of 75 mg/kg/d in children and 4 g/d in adults. CHL was given to 33 patients in doses of 60 mg/kg/d to complete 14 day. All *Salmonella* isolates were susceptible to CFT and CHL. All patients were cured and discharged without complications. On the third day of treatment blood cultures were positive for *S. typhi* in 61% of patients in the CHL group vs 6% in the CFT group ($p<0.05$). The median time from start of treatment to defervescence was 6 day for both groups, but on the tenth day of treatment more patients (39%) remained febrile in the CFT group than in CHL group (16%) ($p<0.05$). In the CHL group 14 day after the start of treatment, the means of hematocrits, white blood cell counts, and platelet counts were lower than in the CFT group. These results indicated that a 5 day course of once daily CFT is effective against typhoid fever and differed from CHL by rendering blood cultures negative earlier, giving prolonged fever in some patients, and causing less bone marrow suppression. Hence CFT is an alternative drug that could be used only in areas where chloramphenicol and other antibiotic resistance has emerged.

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## PLANTAIN – BASED ORAL REHYDRATION SOLUTION IN THE MANAGEMENT OF ACUTE DIARRHOEA IN CHILDREN

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Children aged 4 months to 5 years with acute diarrhoea of less than 48 hours duration and mild to moderate degree of dehydration were randomly assigned to receive treatment with standard glucose electrolyte solution (ORS, n = 50) and Plantain – salt Solution (PSS, n = 56) containing 250 g/l of cooked plantain, 5 g/l of NaCl and had 1 g/l of K from plantain. The two groups had similar baseline characteristics. The results indicate that PSS treated children had significantly lower stool volume than those treated with ORS over first 24 hours of therapy (mean ± SD, ml/kg 72.0 ± 50.0 vs 96.0 ± 65.0, $p < 0.05$). Similarly children in the PSS group drank significantly less PSS than did children in the ORS group (mean ± SD, ml/kg 131.1 ± 59.3 vs 173.8 ± 80.9, $p < 0.05$). Children in both treatment groups achieved similar serum bicarbonate concentration at 24 hours (mean ± SD, mEq/l 17.9 ± 3.6 vs 19.1 ± 3.6, $p > .05$) despite the absence of bicarbonate in PSS and had no signs of acidosis. We conclude that an incomplete formula like plantain – salt solution is safe and effective in rehydration and prevention of dehydration. However plantain – salt solution has better stool reducing effect which may be due to the availability of pectin and polymerized glucose from starch present in plantain.

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## RANDOMIZED, DOUBLE – BLIND COMPARISON OF CIPROFLOXACIN WITH STANDARD FIVE DAY THERAPY IN THE TREATMENT OF SHIGELLOSIS

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We compared oral ciprofloxacin given as a single 1 g dose, two 1 gram doses given 24 hours apart, or 500 mg given every 12 h for five days, in achieving clinical and bacteriologic cure of dysenteric form of shigellosis in adult males. Patients with dysentery suspected of having shigellosis, without trophozoites of *E. histolytica* on stool examination who did not take an effective drug for the illness and gave written consent, were hospitalized for 6 days and randomly assigned to a treatment regimen. Stools were collected separately and stool cultures were performed daily. Therapy was considered to have failed in patients who on day 5 had >9 stools, or had >3 watery stools or were febrile; therapy was also considered to have failed if there was no improvement in symptoms after 72 h of therapy. Bacteriologic failure was defined as recovery of *Shigella* from stool cultures 72 h or more after initiation of therapy. *Shigella* was isolated from 128 of the 162 patients entered into the study; 118 were eligible for analysis. Treatment failed in 4 (10%) of 40 patients in the 1 dose group, 2 (5%) of 43 patients in the 2 dose group, and 0 of 35 patients in the 10 dose

group (p=NS). Bacteriologic failure occurred in only 1 patient, in the 1 dose group. All clinical failures occurred in patients infected with *S. dysenteriae* type 1; 4 of 10 patients in the 1 dose group, 2 of 15 in the 2 dose group, and 0 of 15 in the 10 dose group (p=0.017, 1 dose vs. 10 dose group; p=0.241, 2 dose vs. 10 dose group). We conclude that 1 dose ciprofloxacin therapy of shigellosis is effective in patients infected by species of *Shigella* strains other than *S. dysenteriae* type 1.

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## EXOCRINE PANCREATIC FUNCTION IN CHOLERA AND ACUTE SHIGELLOSIS

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High molecular weight cereal based oral rehydration therapy has been suggested for management of dehydration during acute diarrhoea. Also, nutritional intervention, particularly with high protein diets at the beginning of diarrhoeal illness may alter the associated malnutrition and growth faltering. However, normal exocrine pancreatic function is necessary for these therapeutic modifications. This study was designed to examine exocrine pancreatic function in 12 cholera patients, 12 patients with acute shigellosis and 10 healthy volunteers. Pancreas was stimulated exogenously by intravenous infusion of secretin (0.5 CU/kg/hr) and caerulin (40 ng/kg/hr), and endogenously by Lundh meal. Pancreatic secretion was assessed for 6 hours by marker perfusion technique using PEG 4000. During secretin and caerulin infusion, the incremental peak trypsin outputs were 48.1 ± 18.3, 50.1 ± 19.6, and 41.7 ± 19.6 units/30 mins in controls, cholera and shigella patients, respectively. After the Lundh meal, the peak incremental trypsin outputs were 50.3 ± 18.2, 52.1 ± 19.6, and 46.4 ± 18.6 units/30 mins, respectively. No significant differences were noted between the three groups of subjects. Exocrine pancreatic response to exogenous stimulation as well as a liquid meal stimulation in patients with cholera and acute shigellosis remains intact when compared to healthy controls.

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## COMPLICATIONS AND OUTCOME OF DISEASE IN PATIENTS ADMITTED TO THE INTENSIVE CARE UNIT OF A DIARRHOEAL DISEASES HOSPITAL IN BANGLADESH

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A retrospective analysis of the medical records of 1,970 patients admitted to the Intensive Care Unit of the Clinical Research Centre of ICDDR,B was made to identify various complications and outcome. All patients were admitted with a history of diarrhoea. Children under 5 years comprised 90% of these patients. Seventy five percent of these seriously ill patients recovered and 21% died; the remaining 4% were referred to

other facilities for specialized treatment or left the hospital against advice. The principal causes of death were recorded as septicaemia (79%) and pneumonia (28%); multiple conditions contributing to the death were present in 90% of patients. None of the 405 deaths could be attributed to dehydration. Severe malnutrition was noted as an associated underlying disorder contributing to the death in 74% of the children. Recognition of these complications or illnesses in seriously ill diarrhoeal patients, and their timely and energetic management are vital in achieving a low hospital mortality.

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## A DOUBLE-BLIND CONTROLLED TRIAL OF BIOFLORIN$^{R}$ (*STREPTOCOCCUS FAECIUM* SF68) IN ADULTS WITH ACUTE DIARRHEA DUE TO *VIBRIO CHOLERAE* AND ENTEROTOXIGENIC *ESCHERICHIA COLI*

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The therapeutic efficacy of Bioflorin$^{R}$ (*Streptococcus faecium* SF68; Gipharmex, Milan, Italy) in acute watery diarrhea was evaluated in 183 Bangladeshi adults. *Vibrio cholerae* organisms were isolated from stool cultures in 114 patients, and enterotoxigenic *Escherichia coli* organisms were isolated in 41. In addition to intravenous rehydration, patients were randomly assigned to receive either capsules of Bioflorin$^{R}$ containing $1x10^{9}$ of live SF68 or capsules of placebo containing killed SF68 once every 8 hours for 3 days. No other drugs were allowed during this period. Bioflorin$^{R}$ was well tolerated. It was found that Bioflorin$^{R}$ has no demonstrable antidiarrheal property in adults with acute diarrhoea due to *V. cholerae* and enterotoxigenic *E. coli* infections.

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## PIVMECILLINAM-RESISTANT *SHIGELLA DYSENTERIAE* TYPE 1 INFECTION IN BANGLADESH

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The study aimed to find the antibiotic sensitivity pattern of bacteriologically confirmed *Shigella* cases in the Dhaka Hospital of the International Centre for Diarrhoeal Disease Research, Bangladesh during 1989. A total 2,005 patients had *Shigella* isolates from stool. Thirty one percent of them had *S. dysenteriae* type 1, 53% *S. flexneri*, 8% *S. boydii*, 5% *S. sonnei* and 3% other species. *S. dysenteriae* 1 and *S. flexneri* were 99% and 64% resistant to ampicillin, 96% and 47% to co-trimoxazole, and 69% and 4% to nalidixic acid, respectively. It is noteworthy that 5 (1%) patients with *S. dysenteriae* 1 were resistant to pivmecillinam. The outcome of one patient could not be ascertained since the parents removed the child after there was no improvement within 48 hours of treatment with pivmecillinam. One patient showed a delayed response to pivmecillinam. Two patients improved with ciprofloxacin, and one patient on ceftriaxone. Although resistance to

pivmecillinam was not very high, its emergence should be carefully monitored.

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## RELATIONSHIP BETWEEN THE NUTRITIONAL STATUS OF CHILDREN AND THEIR MOTHERS

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Malnutrition is one of the major risk factors of childhood mortality and morbidity in developing countries. Determinants of malnutrition and the relationship between nutritional status of the mother and that of the child are not precisely known. To determine this, 339 children ranging in age from 3 to 36 months and their mothers were studied at ICDDR,B Dhaka hospital, Dhaka Shishu Hospital and Nandipara (a peri – urban area adjacent to Dhaka city). Weight, height and mid upper arm circumference (MUAC) of the children, weight and height of the mothers were measured and body mass index (BMI) of the mothers were calculated. Socio – economic status was recorded in a pre – tested questionnaire. The nutritional status of the children was found to be directly related to that of the mothers weight ($p < 0.001$) or height ($p < 0.005$) or BMI ($p < 0.001$), in all but high socio – economic class. However the socio – economic status of the family had significant relationship ($P < 0.001$) with the nutritional status of the child. The results indicate that improvement of maternal nutritional status and socio – economic status should be considered in programs aiming at improvement of the nutritional status of the children.

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## IMPACT OF ZINC SUPPLEMENTATION ON INTESTINAL PERMEABILITY IN BANGLADESHI CHILDREN WITH ACUTE DIARRHOEA (AD) OR PERSISTENT DIARRHOEA SYNDROME (PDS)

**[1]S.K. Roy, [1]R. Haider, [2]R. Behrens and [2]A.M. Tomkins**

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One hundred and eleven children with acute diarrhoea (AD) and 190 children with persistent diarrhoea syndrome (PDS) were randomly allocated in a double blind controlled clinical trial to receive placebo or zinc acetate (15 mg/kg/d) ($zn^+$) for 2 weeks. Each child received an oral dose of lactulose and mannitol (5g:1g) in a 20 ml solution on admission (day 1), after the 1st week (day 8) and at the end of 2nd week (day 15). Excretion of lactulose was higher in AD (0.54%) and PD (0.45%) compared with age – matched healthy controls (0.34%) ($p < 0.005$ and $p < 0.03$, respectively). Lactulose excretion significantly decreased by day 15 in the AD group ($p < 0.01$) and by day 8 in the PDS group ($p < 0.0001$) from the initial value of the $zn^+$ group, whereas lactulose excretion in the placebo group remained elevated. Excretion of mannitol on day 1 was lower in AD

(1.14%) and PDS (1.16%) when compared to matched controls (2.67%) ($p<0.0001$). Mannitol excretion increased with recovery in both treatment and control groups ($p<0.0001$). This suggests that zinc has little effect on mannitol excretion which probably correlates to mucosal surface area, whereas zinc has a significant impact on lactulose excretion, reflecting mucosal integrity. The effect of supplementation on mucosal integrity may explain the favourable clinical impact seen in children with diarrhoea.

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## PERSISTENT DIARRHOEA: ROLE OF NUTRITION IN PROGNOSIS AND NUTRIENT ABSORPTION IN BANGLADESHI CHILDREN PRESENTING WITH ACUTE DIARRHOEA

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A diet based on rice powder, soya oil, glucose, egg-white and salts was given to 26 persistent diarrhoea patients aged 4 to 18 months. Clinical response was examined during a week of dietary treatment, and absorption of macronutrients was estimated during a 72-hour balance study. Twenty one patients (81%) recovered from diarrhoea within 7 days. Anthropometric indices had significant relationships with absorption of total energy, fat and nitrogen. Period of recovery negatively correlated with the coefficient of absorption of fat ($p<0.001$), total energy intake ($p<0.01$) and mid-upper-arm circumference (MUAC) ($p<0.05$). Recovery period was significantly longer in lighter patients (weight-for-age <7, 65% of standard), in wasted patients (Wt/Ht <80% of NCHS standard) and those with MUAC <11 cm. Co-efficients of absorption for total energy, fat and nitrogen were significantly higher among the children with better nutritional status. Weight-for-age and MUAC showed most effective discriminative power for absorption of nutrients. Coefficient of absorption of carbohydrate was not different between any pair of nutritional groups. Absorption of all nutrients correlated negatively with initial stool weight or stool frequencies and positively with MUAC. The results indicate that nutritional status and initial purging rate are significant determinants of clinical prognosis and nutrient absorption in persistent diarrhoea.

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## PREVALENCE OF ENTERIC PATHOGENS IN BANGLADESHI CHILDREN WITH ACUTE (AD) OR PERSISTENT DIARRHOEA (PD)

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A study of children aged between 3 and 24 months of age with acute diarrhoea (AD, less than 72 hours duration) and similarly aged children with persistent diarrhoea (PD, >14 days duration) was conducted in Dhaka, Bangladesh. Stool samples were collected and subjected to microbiological analysis for detection of enteropathogenic *E. coli* (EPEC), enterotoxigenic *E. coli* (ETEC), *V. cholerae*, *Shigella* spp, *Campylobacter jejuni*, *Salmonella* spp and *Aeromonas* (*hydrophilia* and *sobria*). An ELISA assay was used to detect Rotavirus and ST and LT toxins. Pathogens were isolated in 67% of AD patients and 57% of PD patients. Single pathogens, two pathogens only or multiple pathogens were observed in AD and PD patients: single (51% vs 38%), two (11% vs 17%) and multiple (4% vs 2%). ETEC and EPEC were more frequently isolated in PD patients than the AD group (26% vs 10% and 27% vs 9% respectively). Rotaviral antigen was detected in 37% of AD patients and 11% of PD. *Aeromonas* (*hydrophilia* or *sobria*) and *V. cholerae* were present in AD patients (10% and 4% respectively) but none were isolated in PD. The study suggests that interpretation of physiological function and response to therapy should take careful account of the range of enteric pathogens present in acute or persistent diarrhoea.

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## CLINICAL STUDY OF LOCALLY USED INDIGENOUS PLANTS IN SHIGELLOSIS

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The clinical and bacteriological responses to three locally used indigenous plants were studied in shigellosis and compared to ampicillin and a placebo. Eighty two men with culture positive shigellosis were studied in a randomized double blind clinical trial in five groups. Sixteen patients received dried unripe fruit powder of "bel" (*Aegle marmelos*), 19 received dried powdered leaves of "thankuni" (*Hydrocotyle asiatica*), and 15 received "gandhavadulia" (*Paederia foetida*) in dosages derived from ayurvedic practice. 15 received ampicillin 1g per day for 3 days and 17 received placebo. These were dispensed eight hourly in identical capsules for three days. Stool culture and stool frequency were done and recorded daily for four days. Results showed that those treated with the indigenous plants did not differ clinically or bacteriologically from those given the placebo. There was significant reduction in stool frequency ($p<0.02$), and earlier bacteriological cure ($p<0.05$) in the ampicillin

treated group as compared to the other groups. It is concluded that though these indigenous plants maybe beneficial in shigellosis in their traditionally used forms, they are not effective when given in the dried state as capsules.

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## THE INFLUENCE OF SOCIO – DEMOGRAPHIC FACTORS ON PERINATAL MORTALITY

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Demographic information on the 22,122 pregnancy outcomes recorded in Matlab during 1982 – 1984 were analyzed to determine the risk of perinatal mortality, that is, late foetal death and death of live – born infants during the first week of life. Multivariate analysis identified several significant risk factors: a history of previous foetal wastage; parity one; and an interval since the previous pregnancy of less than 24 months or more than 60 months. Socio – economic factors, as measured by parental education and father's occupation, were not found to be significant risk factors for perinatal mortality.

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## BIRTH INTERVAL, PREMATURITY AND CHILDHOOD MORTALITY: EVIDENCE FROM MCH – FP EXTENSION PROJECT

**[1]Khorshed A. Mozumder, [1]Fazlur Rahman, and [2]Michael A. Koenig**

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*[2]Population Council (Dhaka)*

The overall objective of this study is to provide information to policy makers interested in evaluating the potential impact of family planning on child health in Bangladesh. The impact of birth interval on infant and childhood mortality has been explored. The data for this analysis are drawn from the Sample Registration System of the MCH – FP Extension Project. The data set consists of 9,553 singleton live birth born during the 1985 – 1989 period. Two multivariate proportional hazard models are estimated, first for the preceding birth interval and second for the subsequent birth interval. The results show that children who are born within 24 months of a preceding sibling's birth are at higher risk of death during neonate and post – neonate stages of life even after gestational age and other socio – demographic and maternal factors are controlled. In the second analysis, it is revealed that the impact of the subsequent birth interval on childhood mortality is over – estimated and that its impact is concentrated on the post – infancy period of life. These findings have implications for family planning programs. Significant gains in child survival could be achieved with emphasis on the continuation of an extensive family planning program in the country.

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## EFFECTS OF PREVIOUS BIRTH INTERVAL AND DEATH OF A PREVIOUS CHILD ON INFANT AND CHILD MORTALITY IN TEKNAF

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The effects of short previous birth intervals and of familial risks, as indicated by previous child deaths, on a child's chances of survival were analyzed using longitudinally collected data from Teknaf, an area of exceptionally high fertility. It was found that a child's chances of dying in the post – neonatal period were: 3.5 times higher if the preceding birth interval was less than 15 months than after an interval of 24 or more months; and they were 70% lower if his previously born sibling died than if the older sibling was born less than 15 months earlier and survived. A child's chances of dying at ages 1 – 2 years were: 1.85 times higher if the mother became pregnant within 12 months of giving birth than if she became pregnant after more than 12 months; and they were 6.1 times higher if exposed to the effects of a short previous birth interval and a short following pregnancy interval. A child's chances of dying in the neonatal and post – neonatal periods were twice as high if there was a concurrent death of the previous sibling.

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## DISCRIMINATION AGAINST FEMALES AND SON PREFERENCE: A REVIEW

**Mridul K. Chowdhury**

*International Centre for Diarrhoeal Disease Research, Bangladesh*

This paper reviews the research conducted on son preference and its demographic impact, especially those studies focusing on Bangladesh. The results suggest that while son preference has not changed much over the past decade its impact on fertility has changed considerably. Excess mortality of females over males during childhood has not shown any evidence of diminishing over time, and has displayed variations over both geographic areas and population subgroups. Results are presented on the possible behavioural mechanism by which the observed patterns of excess mortality might have occurred.

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## THE CONSEQUENCES OF CHANGING NUPTIALITY PATTERNS IN BANGLADESH: EVIDENCE FROM MATLAB

**A. Kashem Shaikh**

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Age at marriage is one of the most important variables associated with fertility and population growth. This paper reviews the findings of various studies related to the age at marriage in Bangladesh, including those using data from Matlab. Over the past 30 years there has been an increase in the age at first marriage for both males and females in Bangladesh. Between 1975 and 1987 the mean age at first marriage of women increased from 16.0 to 18.9 years (and the median from 15.9 to 18.3). During this same period men's age at first marriage remained almost constant at 24 years. This paper discusses how differentials in the age at marriage and in mortality are responsible for the differences in the incidence of widowhood observed between men and women. The influence of education, occupation, and religion on age at marriage and on marital stability are also explored.

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## THE RELATIONSHIP BETWEEN ADOLESCENT PREGNANCY AND POOR PREGNANCY OUTCOME

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*[1]International Centre for Diarrhoeal Disease Research, Bangladesh*
*[2]Georgetown University*

The relationship between menarcheal age and the timing and outcome of subsequent reproductive events is not well understood, particularly in under-nourished women. This research examines this relationship in rural Bangladeshi women, where malnutrition is widespread and age at menarche is considerably later than in well-nourished girls. Data for this study came from: (i) a 1976-77 age at menarche study in which about 1,500 Matlab girls 10 to 20 years old were interviewed monthly for 18 months; (ii) a follow-up survey of 724 of these women conducted in 1989-90; and (iii) census and vital registration information (marriage, births, deaths, and out-migration) on these women and their children. The average age at menarche in Matlab is 15.8 years, compared to 12.7 years in U.S. girls. Analyses to date provide little evidence to support the hypothesis that biological immaturity plays an important role in the higher risks associated with early childbearing in Bangladeshi women. Likewise, early pregnancy does not appear to interfere with the completion of adolescent growth in height or weight. However, these data do suggest that young age at first pregnancy and short intervals between menarche and first pregnancy are associated with poor birth outcome. The multivariate analysis needed to fully understand these complex relationships is currently being carried out.

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## TRENDS IN CONTRACEPTIVE USE AND CONTINUATION RATES: IMPLICATIONS FOR THE NATIONAL PROGRAMME

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This paper analyzes trends in contraceptive use over the last nine years in the extension project field sites in rural Bangladesh. It identifies differences in contraceptive continuation rates by selected client characteristics, including health services utilization, their awareness of a range of contraceptive methods, and survival status of children ever-born. Multivariate hazard analysis is used to investigate whether regular contact of Family Welfare Assistants and time spent with them are important factors in determining the continuation rates. It concludes with a discussion of the implications of the findings for family planning program managers, such as the trade-off between coverage and frequency of visits by field workers and the extent of choice of methods that best suit clients' needs.

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## HOME DELIVERY OF INJECTABLE CONTRACEPTIVES: FIELD EXPERIENCE AND PLANS FOR NATIONWIDE IMPLEMENTATION

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Following the experience of the Matlab MCH-FP Project, and other family planning programs in Bangladesh as well as other Asian countries, the MCH-FP Extension Project tested door-step delivery of injectable contraceptives by Family Welfare Assistants (FWA) through the MOHFW program in two Upazilas. Data from the extension project's demographic surveillance system showed that injectables accounted for much of the large increase in contraceptive prevalence observed in these upazilas. The Directorate of Family Planning now plans to conduct a pilot test of programme expansion in eight Upazilas, to be followed by nationwide implementation if the results are successful. This paper reviews the evidence that supports this decision, and discusses what was learned from the experience in the Extension sites about logistics, training, side-effects management and supervision needs. It next presents the plans for implementing and monitoring the expansion of the programme.

of presence of these ailments and their severity. A significantly larger proportion of contraceptive users with a particular ailment did not attribute it to contraceptive use.

The study result have interesting implication for family planning program developers in that there are no differences in physical ailments experienced by contraceptive users and non-users in rural Bangladesh, and most users do not attribute their ailments to contraceptive use.

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## RECRUITING APPROPRIATE FIELD WORKERS: STRATEGIES AND PROCESSES OF TECHNICAL ASSISTANCE TO THE MOHFW

**[1]Sajjad Hussain, [1]Mafizur Rahman and [1,2]Rushikesh Maru**

*[1]International Centre for Diarrhoeal Disease Research, Bangladesh*
*[2]University of Michigan*

Based in part on findings from ICDDR,B research, the GOB decided to recruit an additional 10,000 Family Welfare Assistants to increase the worker-client density. This paper presents findings of research on the effects of density on contraceptive use, and then describes the strategy developed and implemented by Extension project staff and their government counterparts for ensuring open recruitment of FWAs with the appropriate qualifications, including residence in the area to be served. The paper analyses the process of implementation and presents data from managers and workers on the effects of the recruitment on the family planning programme. It concludes with a discussion of training and supervision needs and of lessons for future recruitment of health workers.

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## WORK SCHEDULES OF FAMILY PLANNING FIELD WORKERS

**Yousuf Hasan and Marjorie Koblinsky**

*International Centre for Diarrhoeal Disease Research, Bangladesh*

The work of Family Welfare Assistants (FWAs), the female family planning field workers, was observed to determine the duration and frequency of their home visits with village women and the content of their exchanges. While many factors influence the FWA's work, it is possible to manipulate the preplanned monthly work schedules to improve the duration and frequency of their contact with village women. This paper presents the results of observational studies and discusses their implications in the management of the national family planning programme.

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## MANAGEMENT INFORMATION FOR FAMILY PLANNING: WHAT IS NEEDED? HOW CAN IT BE OBTAINED?

[1]Ali Ashraf, [1]Yousuf Hasan, [1]Mahidul Islam, and [1,2]Rushikesh Maru

[1]*International Centre for Diarrhoeal Disease Research, Bangladesh*
[2]*University of Michigan*

The lack of information about service delivery and utilization is a critical constraint at several levels of the national family planning and MCH programmes. Field-level workers need information about clients and services to structure their own work. Managers at all levels need information to set priorities, identify low-performing areas, isolate problems, and propose solutions, as well as to be held accountable for their own performance. This paper reviews the experience of the Extension Project in identifying information needs at several levels in both the health and family planning wings of MOHFW, and assesses field experience with record-keeping, reporting, and analysis systems developed by the Project. The FWA registers recently implemented nationally are discussed. These were based on a management-oriented system developed in Matlab and modified and tested in the government system. The paper analyses the process of diffusion of a management innovation from a NGO pilot project to larger government system. Priorities for future work are proposed.

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## ORAL MAGNESIUM BREATH HYDROGEN TEST (OMBH2) : A NEW NON-INVASIVE TEST FOR MEASURING GASTRIC ACID IN CHOLERA PATIENTS

G.H. Rabbani, F.P.L. Van Loon, J.D. Clemens, D.A. Sack and C. Stephensen

*International Centre for Diarrhoeal Disease Research, Bangladesh and Johns Hopkins University School of Medicine*

Because low gastric acid output (GAO) is a risk factor for cholera, we evaluated a new non-invasive test which estimates GAO by measuring breath hydrogen excess after ingestion of metallic magnesium and a stimulant for gastric acid secretion. After taking 150 mg magnesium by mouth, all expired gases were collected by a rubber facial mask for 90 minutes. Concentrations of hydrogen gas in the expired air was determined by using Quintron Analyser before and after gastric stimulation by meat extract. Individuals also had their gastric juice aspirated by nasal tube and gastric acid determined by titration. Fifteen age-matched pairs from the Matlab cholera vaccine trial were tested. In each pair the `case' was a person who recovered from severe cholera at least 6 months before testing and the control was a person who resided in the home of a cholera patient but remained uninfected. The stimulated breath hydrogen was higher in controls (median hydrogen excess = 369 μmol/80 min) than in cases (median hydrogen excess = 150 μmol/80 min, $p<0.05$) and was higher in controls in 12 out of 15 pairs. The results which are consistent with

intubation assessment of the association between hypochlorhydria and cholera, suggest that this non – invasive test may be useful in evaluating GAO in epidemiologic field studies.

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## INHIBITION OF JEJUNAL PROSTAGLANDIN E2 RELEASE BY INDOMETHACIN IN ADULT PATIENTS WITH CHOLERA

**G.H. Rabbani, F.P.L. Van Loon, K. Bukhave and J. Rask – Madsen**

*International Centre for Diarrhoeal Disease Research, Bangladesh and Copenhagen University, Denamrk*

Human cholera has been shown to be associated with an increased luminal release of prostaglandin E2 (PGE2), but it still remains to be demonstrated that inhibition of increased PG – synthatase will reduce or control intestinal secretion. We have therefore performed `steady state' perfusions (10 ml/min) in 12 patients with acute cholera, and repeat perfusions in nine of these patients during the convalescent phase, using a triple lumen technique. The proximal jejunum was perfused with isotonic saline containing sodium sulphobromophthalein as a non – absorbable marker. Following the administration of indomethacin (1 mg/kg iv), the jejunal net transfer of fluid and the jejunal flow rate (JFR) of PGE2 were determined in 30 – min periods for 120 minutes after a 120 – min control period. Indomethacin decreased net fluid secretion (2.1,0.3 – 4.2 vs 4.5,2.5 – 8.4 ml/h x cm, medians, Q50 – ranges, $p < 0.01$) and the JFR of PGE2 (1.5,1.2 – 2.7 vs 2.2,1.4 – 4.9 ng/min, $p < 0.05$). The results of similar perfusion studies in 22 patients with acute cholera, used to establish the spontaneous time – related change in fluid secretion, revealed no significant change in net fluid transfer (3.5,2.2 – 6.2 to 3.5,2.6 – 11.6 ml/h x cm, $p > 0.25$) during 240 minutes. The data provide further evidence in favour of the hypothesis that PGs are involved in the cholera toxin – induced intestinal fluid secretion in man.

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## SINGLE – DOSE FURAZOLIDONE AND TETRACYCLINE IN THE TREATMENT OF CHOLERA IN CHILDREN

**G.H. Rabbani, M.R. Islam, T. Butler and M. Shahriar**

*International Centre for Diarrhoeal Disease Research, Bangladesh*

To test the efficacy and safety of furazolidone given as a single dose for childhood cholera, a randomized double – blind placebo – controlled trial was carried out in 118 culture – positive dehydrated diarrhoeal children. Patients were randomly assigned to one of 4 groups to receive medication orally in liquid suspension: furazolidone 7 mg/kg.d once, furazolidone 7 mg/kg.d divided into 4 doses for 3 d, placebo once, or placebo for 3 d. After 12 patients with furazolidone – resistant infections were excluded from analysis, the groups receiving furazolidone 1 d, furazolidone 3 d, placebo 1 d, and placebo 3 d, respectively, showed means of total stool volumes after start of treatment in L of 6.1, 5.2, 16.2, and 13.5; mean durations of diarrhoea after start of treatment in hrs of 72.9, 56.0,

If sex preference was eliminated, the percentage of women desiring no more children in 1977 and 1984 would increase by 14.6 and 16.4 percent, respectively, and the percentage using contraception would increase by 20.4 and 9.9 percent, respectively. Subsequent fertility during the 1978–82 and 1984–88 periods would decline by 9.5 and 10.5 percent, respectively.

The results of this study suggest that while sex preference remained largely unchanged in the Matlab area during the study period, its effect on contraceptive use declined. Its impact upon actual fertility, on the other hand, remained modest and fairly stable.

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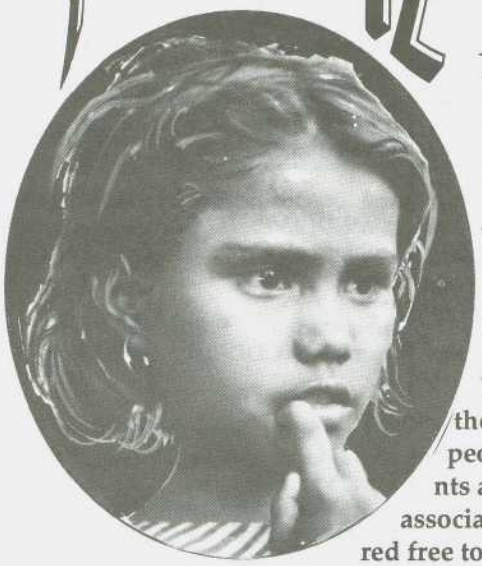

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**Since these services are entirely dependent on financial support from a number of donors, now we at the ICDDR,B are establishing an entirely new endeavour: an ENDOWMENT FUND. We feel that, given securely implanted roots, the future of the hospitals can confidently depend upon the harvest of fruit from perpetually bearing vines.**

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