FOURTH ANNUAL SCIENTIFIC CONFERENCE

ASCON IV

21-22 January 1995

Programme and Abstracts

ICDDR,B
CENTRE
FOR HEALTH AND
POPULATION RESEARCH

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

What is the Centre for Health and Population Research (ICDDR,B) ?

ICDDR,B, or "The Centre", was established in 1978 as the successor to the Cholera Research Laboratory, which had been created in 1960 to study the epidemiology, treatment, and prevention of cholera. The Centre is an independent, international, non-profit organization for research, education, training, and clinical service.

Located in Dhaka, the capital of Bangladesh, the Centre is the only truly international health research institution based in a developing country. Research findings developed at the Centre provide guidelines for policy makers, implementing agencies, and health professionals in Bangladesh and around the globe. Researchers at the Centre have made major scientific achievements in diarrhoeal disease control, maternal and child health, nutrition, and population sciences. These significant contributions have been recognised worldwide.

How is the Centre Organized ?

The Centre is governed by a distinguished multinational Board of Trustees comprising researchers, educators, public health administrators, and representatives of the Government of Bangladesh. The Board appoints a Director and Division Directors who head the four scientific divisions and the support divisions of Finance and Administration.

The **Clinical Sciences Division** provides health services at two hospitals, undertakes clinical and nutrition research, and trains Bangladeshi physicians and other health professionals in the clinical management of diseases and in research methodology.

The **Community Health Division**, composed of public health professionals, anthropologists, economists, environmental engineers, and nutritionists, studies community-based approaches to improving health and reducing fertility. This Division is responsible for the Maternal and Child Health-Family Planning (MCH-FP) Project, which studies health service delivery systems in rural Matlab; the Centre's social and behavioural research programme; the Epidemic Control Preparedness Programme; the Environmental Health Programme; and the Matlab Clinical Research Programme.

The **Laboratory Sciences Division** has a research programme with branches in enteric bacteriology, molecular biology, bacterial genetics, environmental microbiology, histopathology, immunology, virology, parasitology, and biochemistry and nutrition; and a laboratory service programme with branches in bacteriology and clinical pathology, bio-chemistry and microbiology.

The **Population and Family Planning Division** includes the Demographic Surveillance System (DSS) which collects longitudinal data on a population of about 200,000 as a basis for a variety of health and family planning studies; the two (urban and rural) MCH-FP Extension Projects which undertake operations research and offer technical assistance to the Government of Bangladesh and Non-government Organizations in implementing the Centre's research findings; and the Population Studies Centre.

Computing Facilities

The Centre operates an IBM 4361 mainframe computer with eight megabytes (MB) of real memory and an on-line storage capacity of 3,000 MB. It is connected to 25 terminals. This system provides a capacity to

(see inside of the back cover....)

FOURTH ANNUAL SCIENTIFIC CONFERENCE

OF THE
INTERNATIONAL CENTRE FOR
DIARRHOEAL DISEASE RESEARCH, BANGLADESH

Sasakawa International Training Centre
21-22 January 1995

"Health Policy Challenges: Population and Cholera"

Programme and Abstracts

Editors
GH Rabbani
MA Rahim
Michael A Strong
Leanne Unicomb

Managing Editor
M Shamsul Islam Khan

Desktop Processing, Printing and Publication
MA Rahim

Cover Design
Najma Dey

ISBN 984-551-030-2

January 1995

Special Publication No. 38

Publisher
International Centre for Diarrhoeal Disease Research, Bangladesh
Mohakhali, Dhaka 1212 (GPO Box 128, Dhaka 1000), Bangladesh
Telephone: 600171-78, 600271-72; Cable: CHOLERA DHAKA
Telex: 675612 ICDD BJ; Fax: 880-2-883116, 880-2-886050

Acknowledgements

The International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) is supported by countries and agencies which share its concern for the health problems of developing countries. Current donors providing core support include: the aid agencies of the governments of Australia, Bangladesh, Belgium, Canada, China, Japan, Saudi Arabia, Sweden, Switzerland, the United Kingdom and the United States; international organizations, including the Arab Gulf Fund, the United Nations Children's Fund (UNICEF), the United Nations Development Programme (UNDP), the United Nations Population Fund (UNFPA), and the World Health Organization (WHO); private foundations, including Child Health Foundation, Ford Foundation, Population Council, Rockefeller Foundation and the Sasakawa Foundation; and private organizations, including American Express Bank, Bayer AG, CARE, Family Health International, Helen Keller International, the Johns Hopkins University, Procter Gamble, SANDOZ, Swiss Red Cross, the University of California-Davis and others.

ASCON IV Organizing Committee

D Habte, Director, ICDDR,B

R Bairagi, PFPD: Convener
Michael A Strong, PFPD
MM Hassan, Finance
M Shamsul Islam Khan, DISC
PK Bardhan, CSD
Bilqis Amin Hoque, CHD
F Anjuman Ara, TCB: Org. Secretary
MA Wahed, LSD
Md Yunus, CHD
Taqsem A Khan, A&P
R Maru, PFPD
Ziauddin Ahmed, LSD

Scientific Committee

Michael A Strong, PFPD: Convener
Barkat-e-Khuda, PFPD
Mizanur Rahman, PFPD
Andres de Francisco, CHD
GH Rabbani, CSD
SK Roy, CSD
Mahbubur Rahman, LSD
Md Sirajul Islam, LSD

Publication Committee

M Shamsul Islam Khan, DISC: Convener
O Massee Bateman, CHD
Bilqis Amin Hoque, CHD
GH Rabbani, CSD
MA Rahim, DISC
Asem Ansari, AVU
Leanne Unicomb, LSD

Registration and Public Relations Committee

MA Wahed, LSD: Convener
Nigar S Shahid, LSD
Ishtiaque A Zaman, Director's Bureau
Khorshed A Mozumder, PFPD
Sk AA Abdul Matin, Finance
M Kapil Ahmed, PFPD
M Ramjan Ali, CSD
Shameem Ahmed, PFPD

Finance Committee

MM Hassan, Finance: Convener
Shamima Moin, Finance
Sk AA Abdul Matin, Finance

Logistic Support Committee

Taqsem A Khan, A&P: Convener
Syed Saiful Huq, LSD
AM Alamgir, A&P
Mujibur Rahman, A&P
MA Matin, PFPD
Md Hamidullah, A&P
Mahbubul Alam, A&P

Coordination Committee for Field Stations

Md Yunus, CHD: Convener
Abbas Bhuiya, CHD
K Zahid Hasan, CHD
Md Mafizur Rahman, PFPD

Introduction

The International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) was established in 1978 as the successor to the Cholera Research Laboratory, which had been created in 1960 to study the epidemiology and treatment of cholera. The Centre is an international non-profit organization for research, education, training, and clinical service.

The Centre is one of the few truly international health and population research institutions in the world. Research findings of the Centre provide guidelines for policy-makers and implementing agencies in health and family planning around the globe. Researchers at the Centre have made major scientific achievements in diarrhoeal disease control, maternal and child health, nutrition and population sciences. The Centre has rural and urban community-based extension services and 30 years of experience in meticulous record-keeping and data management. Its surveillance systems for clinical, epidemiological, and demographic data yield opportunities for health, population and family planning studies. The research findings of the Centre have been extensively reported in the scientific literature, and have made a vital impact on health and population field. The Annual Scientific Conference (ASCON) of the Centre is one of the important channels to disseminate the research findings, and to exchange ideas with scientists, planners and policy-makers of different organizations. Each ASCON deals with a specific theme. The theme of ASCON IV is: "Health Policy Challenges: Population and Cholera."

Programme Highlights

This year annual lecture will be delivered by a leading population scientist Dr. Steven W Sinding, Director of Population Sciences Division of the Rockefeller Foundation. Besides two panels -- one on population and another on cholera -- there will be a symposium on Rwanda, three scientific sessions on population, three scientific sessions on cholera, and one scientific session on the recent findings in other areas of ICDDR,B research. The sessions will also include poster presentations. Floor discussion will be invited in each session. The concluding session will include summary and conclusions of all presentations and discussions.

Table of Contents

PROGRAMME

Fourth Annual Scientific Conference (ASCON IV)

21-22 January 1995

Sasakawa International Training Centre

Saturday, 21 January 1995

Time	Session # (Venue)	Event
8:00 a.m.	Lobby, Ground Floor	Registration of Delegates
9:00 a.m.	**Session 1 (Auditorium)**	Opening Ceremony
	1:1	Address of Welcome
	1:2	Address by the Representative of Donor Agencies
	1:3	Address by the Representative of International Agencies
	1:4	Address by the Special Guest
	1:5	Address by the Chief Guest
	1:5	Vote of Thanks
10:30	Tea	
11:00 a.m.	**Session 2 (Auditorium)**	Annual Lecture

The Politics of Rationale: Coercion and Quality of Care in Population Policy and Family Planning Programmes

Dr. Steven W Sinding, Rockefeller Foundation

12:00 noon Lunch

1:30 p.m. **Session 3 (Auditorium)** Symposium: Rwanda Experience of Cholera

Chairperson : Dr. KMA Aziz, ICDDR,B

The Rwandan Cholera Epidemic: Experiences of ICDDR,B Team in Goma, Zaire

AKM Siddique, MA Salam, MS Islam, RN Mazumder, K Akram, K Zaman, S Laston, NE Fronczak

3:00 p.m. Tea

3:30 p.m. **Session 4 (Auditorium)** Cholera in Bangladesh

Chairperson: Prof. AK Shamsuddin Siddiquey
Director General of Health Services, MOHFW

Co-chairperson: Dr. SK Roy, ICDDR,B

Discussant: Dr. GH Rabbani, ICDDR,B

4:1 Cholera Vaccine Trials in Matlab: Summary of the Findings
K Zaman and Md Yunus

4:2 Spatial Distribution of Watery Diarrhoea in Children of Less Than 5 Years from the Rural Community in Bangladesh
J Myaux, M Ali, A Felsenstein, J Chakraborty and Andres de Francisco

4:3 Surveillance of *Vibrio cholerae* O139 Patients Attending a Rural Diarrhoea Treatment Centre
Md Yunus, K Zaman, Eradul Haque Khan, HR Chowdhury, A Rahman, DS Alam and E Hoque

4:4 Isolation and Identification of *Vibrio cholerae* O139 from Faecal Samples of Diarrhoeal Patients
Mahbubur Rahman, SM Mostafa Kamal, AKMG Kibriya and MJ Albert

Session 4 continues....

4:5 Description of Clinical and Laboratory Features of Severe Cholera Due to *Vibrio cholerae* O139 (Bengal)
Shahadat Hossain, Rabi Biswas, GH Rabbani, MA Salam and D Mahalanabis

4:6 Serum Vibriocidal Antibody Responses in Patients with Cholera Due to *Vibrio cholerae* O139 and O1
Firdausi Qadri, Md Golam Mohi, Jaber Hossain, Tasnim Azim, AM Khan, MA Salam, RB Sack, MJ Albert and A-M Svennerholm

3:30 p.m. **Session 5** Fertility in Bangladesh
(Seminar Room)

Chairperson: Prof. M Kabir, Jahangirnagar University

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

Discussant: Dr. KB Allen, ICDDR,B

5:1 Does the Family Planning Programme Influence Desired Fertility in Bangladesh?
Mizanur Rahman

5:2 Desire for Additional Child and Subsequent Family Planning Practices in Matlab
Andreś de Francisco, Y Weili, R Bairagi and J Chakraborty

5:3 Determinants of Abortion in Rural Bangladesh
M Kapil Ahmed, Afzal Hossain Sarkar and Mizanur Rahman

5:4 Trends in Contraception and Gender Composition of Surviving Children: Examples from Two Rural Areas of Bangladesh
ABM Khorshed Alam Mozumder, Mizanur Rahman and Afzal Hossain Sarkar

Session 5 continues....

5:5 Influence of *Bari* Characteristics on Contraceptive Use among Mothers in Matlab
Lutfun Nahar and Mizanur Rahman

5:6 The Patterns and Determinants of Contraceptive Acceptance and Continuation in Matlab
Indrani Haque and Mizanur Rahman

Sunday, 22 January 1995

Time	Session # (Venue)	Event
8:30 a.m.	**Session 6 (Auditorium)**	Panel Discussion on Cholera: Epidemiology, Clinical and Control Aspects

Chairperson: Dr. KA Mansur
Ex-Member, ICDDR,B Board of Trustees

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

Discussant: Dr. PK Bardhan, ICDDR,B

6:1 Epidemiology of *V. cholerae* 01 and 0139 with Special Reference to Bangladesh
AK Siddique

6:2 Pathophysiology and Clinical Aspects of Cholera
GH Rabbani

6:3 Detection and Molecular Basis of Drug Resistance of *V. cholerae*
Mahbubur Rahman

6:4 The Environment: The Last Frontier for Breaking the Transmission
MS Islam

6:5 Cholera Control: Prospects of Vaccine and Public Health Measures
MJ Albert and Firdausi Qadri

10:00 a.m. Tea

8:30 a.m. **Session 7 (Seminar Room)** Programmatic Impacts on Fertility

Chairperson: Mr. M Fazlur Rahman
Additional Secretary, MOHFW

Co-chairperson: Dr. Andreś de Francisco, ICDDR,B

Discussant: Dr. M Alauddin, Country Representative
The Pathfinder International

7:1 Acceptance of Contraceptive by the Poorest of the Poor: The Effect of an Intensive Family Planning Programme
Abbas Bhuiya, AMR Chowdhury and Monir Hossain

7:2 Impact of the Grameen Bank on Women's Status and Fertility in Bangladesh
Mizanur Rahman and Julie DaVanzo

7:3 Women's Empowerment and Fertility Regulation Behaviour in Rural Areas of Bangladesh
Afzal Hossain Sarkar, ABM Khorshed Alam Mozumder and Mizanur Rahman

7:4 Importance of Age and Sociodemographic Factors in Contraceptive Acceptance among Rural Women in Bangladesh: Lessons Learned from Matlab MCH-FP Project
J Chakraborty, Andreś de Francisco, Shamim A Khan and K Zaman

7:5 Service-delivery at Family Welfare Centres: the Clients' Perspective
Parveen Akhter, Helene Wirzba, Indrani Haque, Tanjina Mirza and Therese Juncker

7:6 Effects of Outreach Workers' Visits on Perceived Quality of Care in Two Rural Areas of Bangladesh
Mian Bazle Hossain, Barkat-e-Khuda and James F Phillips

10:00 a.m. Tea

10:30 a.m. **Session 8 (Auditorium)** Cholera: Laboratory and Clinical Aspects

Chairperson: Maj. Gen. (Retd.) MR Choudhury
Member, ICDDR,B Board of Trustees

Co-chairperson: Dr. Asma Islam, ICDDR,B

Discussant: Dr. MA Salam, ICDDR,B

8:1 Efficacy of Tetracycline in the Treatment of Cholera Due to *Vibrio cholerae* O139
Shahadat Hossain, MA Salam, GH Rabbani, Iqbal Kabir and D Mahalanabis

8:2 Comparison of the Efficacy of a Single-dose Ciprofloxacin and of a Single-dose Doxycycline in the Treatment of Cholera Due to *V. cholerae* O139
Wasif Ali Khan, Carlos Seas, Eradul Haque Khan, MA Salam and Michael L Bennish

8:3 Inhibition of Cholera Toxin-induced Salt and Water Secretion by Short-chain Fatty Acids *in vivo*
GH Rabbani, H Rahman and D Mahalanabis

8:4 Oxidative Stress in Patients with Severe Cholera
MA Khaled and GH Rabbani

8:5 Survival Potential of Non-culturable *Vibrio cholerae* O1 by Laboratory Microcosms Using Polymerase Chain Reaction and Fluorescent Antibody Methods
MS Islam, MA Miah, MS Moniruzzaman, S Begum, A Felsenstein, RB Sack and MJ Albert

8:6 Cholera Toxin Stimulates Absorption of D-glucose from the Adult Rabbit Small Intestine *in vivo*
MK Bhattacharya, GH Rabbani, RN Mazumder, AM Khan, Motaher Hossain and D Mahalanabis

12:00 noon Lunch

10:30 a.m. **Session 9 (Seminar Room)** Mortality in Bangladesh

Chairperson: Prof. Sadiqa Tahera Khanam, Director, NIPSOM

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

Discussant: Dr. Ataharul Islam, Dhaka University

9:1 Trends in and Determinants of Infant Mortality in Rural Bangladesh
Santosh Chandra Sutradhar, ABM Khorshed Alam Mozumder and Mizanur Rahman

9:2 Risk Factors and Causes of Death in Young Children after Discharge From an Urban Diarrhoea Treatment Centre
M Aminul Islam, M Mujibur Rahman, D Mahalanabis and AKS Mahmudur Rahman

9:3 Pregnancy Outcome and Child Survival among Divorced Women in Matlab, Bangladesh
Abbas Bhuiya and AMR Chowdhury

9:4 Mortality Pattern of Women of Reproductive Age in Rural Bangladesh
Shamim A Khan, Andres de Francisco and J Chakraborty

9:5 A Qualitative Study of the Problem-solving Process in Obstetric Complications: the Gap Between Home and Hospital
Therese Juncker and Parveen Akhter

9:6 Presence of a Daughter in the Family and Old-age Survival of Mothers in Matlab, Bangladesh
Golam Mostafa, Santosh Chandra Sutradhar and Mizanur Rahman

12:00 noon Lunch

1:30 p.m. **Session 10 (Seminar Room)** Panel Discussion: Scaling Up Innovation in the Population Sector

Chairperson: Mr. Khairuzzaman Chowdhury
Director General of Family Planning, MOHFW

10:1 Overview of the National Family Planning Programme: Past, Present and Future
Barkat-e-Khuda

10:2 Experience on Transferring Findings from Rural Extension Project to the National Level
Mizanur Rahman; Zakir Hossain (MOHFW); and Nawab Ali (MOHFW)

10:3 Scaling Up in Urban Dhaka: Experience and Plans
Nazmul Alam Siddiqui (MOLGRDC); Mufaweza Khan (Concerned Women for Family Planning); and AH Baqui

3:00 Tea

1:30 p.m. **Session 11 (Auditorium)** Recent ICDDR,B Findings

Chairperson: Dr. Halida Hanum Akhter, Director, BIRPERT

Co-chairperson: Dr. Bilqis Amin Hoque, ICDDR,B

Discussant: Dr. Eric LaRoche, UNICEF

11:1 Prevention of Diarrhoea in Rural Bangladesh: Evaluation of an Intervention for Hygiene Behaviour Change
O Massee Bateman, Sushila Zeitlyn, Sumana Brahman and Raquiba A Jahan

11:2 Factors Influencing Birth Weight in a Rural Community of Bangladesh
KZ Hasan, RB Sack, AK Siddique, E Roy, MN Rahman and M Ali

11:3 Effects of Age, Duration of Illness and Infecting Species on the Pathology of Fatal Childhood Shigellosis
AK Azad, M Islam, R Islam, MA Salam, AN Alam and T Butler

11:4 Awareness of Transmission and Prevention of Sexually-transmitted Diseases among Rural Women in Bangladesh
Mehrab Ali Khan, Mizanur Rahman and Parveen Akhter

11:5 The Pattern of Full and Complementary Breast-feeding in Rural Bangladesh
AI Chowdhury, Andreś de Francisco and KMA Aziz

3:00 Tea

3:30 p.m. **Session 12 (Auditorium)** Concluding Session

Chairperson: Prof. Demissie Habte, Director, ICDDR,B

Co-chairperson: Dr. Michael A Strong, ICDDR,B

12:1 Population: Summary and Conclusions
Syed Shamim Ahsan

12:2 Cholera: Summary and Conclusions
Maj. Gen. (Retd.) MR Choudhury

4:1 CHOLERA VACCINE TRIALS IN MATLAB: SUMMARY OF THE FINDINGS

K Zaman and Md Yunus

Objective: Describe the methodologies and results of the vaccine trials conducted in Matlab since 1963.

Methods: Between 1963 and 1974, five large field trials of parenteral cholera vaccines were conducted in Matlab, Bangladesh. The Matlab field site was established to test cholera vaccines, and its well-organized demographic surveillance system, clinical and laboratory facilities make it ideally suited to this task. The first vaccines tested were parenterally-administered, killed whole-cell *Vibrio cholerae* vaccines of classical and El Tor biotypes and Inaba and Ogawa serotypes. In 1974, a vaccine based on cholera toxoid was tested. The control vaccines used in these trials were typhoid and para-typhoid A or B, or tetanus diphtheria toxoids. The sample sizes in these early trials ranged from 14,000 to 93,000. An oral cholera vaccine containing either a combination of killed whole-cell and the B subunit of cholera toxin, or the killed whole-cell alone, was tested between 1985 and 1990. About 63,000 people received three doses of a cholera vaccine or the placebo, containing *Escherichia coli* K12 strains.

Results: The parenteral vaccines yielded a modest, short-term, and age-specific protection against cholera. Both types of oral vaccines provided 57 percent protection for two years and 50% to 52% protection for three years. The rate of protection was lower among children of less than 5 years and against the El Tor biotype of *V. cholerae*.

Conclusions: Development of a safe and effective cholera vaccine is a major public health goal, particularly in areas where cholera epidemics regularly occur. Since Matlab represents a unique site, many cholera vaccine trials have been conducted during the past three decades. While the recent oral vaccine shows some promise, further research is needed to develop a practical vaccine which is more effective in protecting children.

4:2 SPATIAL DISTRIBUTION OF WATERY DIARRHOEA IN CHILDREN OF LESS THAN 5 YEARS FROM THE RURAL COMMUNITY IN BANGLADESH

J Myaux, M Ali, A Felsenstein, J Chakraborty
and Andrés de Francisco

Objective: Present the geographic distribution of cholera cases from the community-based data.

Methods: Data were collected from the treatment area of the ICDDR,B's rural field site in Matlab, Bangladesh. In that area, the population receives health and family planning services through an improved health care delivery system, and are routinely monitored. Cases of watery diarrhoea in children of less than 5 years were identified during 1989. Among the 14,885 children in the study population, 520 cases were recorded in 298 *baris* by community workers. Socioeconomic, demographic, and hygiene indicators were analyzed to determine the risk factors.

Results: The results showed that the distribution of cases was highly clustered, and by plotting the cases on a computerized map of Matlab, 23 areas with high risk of watery diarrhoea were identified. Education status, household density, and the use of sanitary latrines were significant correlates ($p<=0.001$) of high risk in these areas. The difference in diarrhoea-related mortality between high and low risk areas, however, was not statistically significant.

Conclusions: The spatial clustering pattern could be useful in designing prospective studies or vaccine trials using smaller samples. Further efforts need to be undertaken to elucidate the specific epidemiological pattern of cholera in Matlab.

4:3 SURVEILLANCE OF VIBRIO CHOLERAE O139 PATIENTS ATTENDING A RURAL DIARRHOEA TREATMENT CENTRE

Md Yunus, K Zaman, Eradul Haque Khan, HR Chowdhury, A Rahman, DS Alam and E Hoque

Objective: Describe the clinical and epidemiological features of patients with *V. cholerae* O139 presenting at the Matlab Diarrhoea Treatment Centre between February 1993 and January 1994.

Methods: As part of its health and family planning research activities, ICDDR,B maintains a diarrhoea treatment centre in its field site in Matlab, a rural subdistrict in Bangladesh. The Demographic Surveillance System (DSS) records all vital events in a population of 203,000, and the treatment centre has appropriate clinical and laboratory facilities. All patients coming to the hospital are treated, but detailed laboratory studies are conducted only on patients from the DSS area.

Results: The new strain of cholera was first isolated in Matlab in mid-February 1993. Of the 4,373 patients admitted from the DSS area, *V. cholerae* O139 was isolated from 756 (17.3%) cases. Sixty-nine percent of these patients were aged 15 years or more. More than 97% of the *V. cholerae* O139 patients presented with watery diarrhoea, 28% with abdominal pain, and 86% with vomiting and moderate to severe dehydration. Prevalence of *V. cholerae* O139 infection had a large peak during the hot, dry months (March-April) and a smaller peak during the post-monsoon and pre-winter period (September-November). *V. cholerae* O139 patients came from 91 of the 142 villages currently under DSS surveillance. Most villages had less than 10 patients, but 3 villages had more than 40 patients. There was no family clustering of patients; of the 756 cases, 608 came from families with no other case. The hospitalization rate was 3.7/1000/year. The age-specific rate was the highest (8.9/1000/year) among people aged 50 years or more. All *V. cholerae* O139 isolates were sensitive to tetracycline, chloramphenicol, and erythromycin, but resistant to co-trimoxazole. Eight percent of the isolates were resistant to ampicillin. Patients were treated with an average of 3.4 litre of intravenous fluids, 6.5 litre of oral rehydration solution, and tetracycline. Only 2 patients died after hospitalization.

Conclusions: The clinical symptoms produced by *V. cholerae* O139 were indistinguishable from that of classsical cholera. Epidemiological differences in age distribution and seasonal patterns were observed. Further research is needed to describe the epidemiology of this new organism in detail to formulate strategies for controlling the disease.

4:4 ISOLATION AND IDENTIFICATION OF VIBRIO CHOLERAE O139 FROM FAECAL SAMPLES OF DIARRHOEAL PATIENTS

Mahbubur Rahman, SM Mostafa Kamal, AKMG Kibriya and MJ Albert

Objective: Examine the techniques of isolation and identification of *Vibrio cholerae* O139, a newly emerged non-O1 cholera vibrio associated with high morbidity and mortality in the Indian sub-continent.

Methods: More than 100,000 diarrhoea patients are seen annually at the ICDDR,B's Dhaka-based hospital, and the Clinical Research and Service Centre. During the period from July 1993 to June 1994, a total of 2,642 (14.17%) vibrios was isolated from 18,647 faecal samples from diarrhoeal patients.

Results: A total of 9.16% vibrios was detected by overnight faecal enrichment in bile peptone broth (BPB). The isolates included: *V. cholerae* O139 (44.55%), *V. cholerae* O1 Ogawa El Tor (42.28%), *V. cholerae* O1 Inaba El Tor (3.6%), *V. cholerae* non-O1, non-O139 (6.89%) and other vibrios (2.6%). When 400 watery stool samples were directly cultured on Taurocholate-tellurite gelatin agar (TTGA) and Thio sulphate citrate bile salts sucrose (TCBS) agar and following enrichment in BPB for 4 h, 6 h and overnight, 268 *Vibrionaceae* spp. (67.0%) were isolated which included *V. cholerae* O139 (36.5%), *V. cholerae* O1 (15.5%), *V. cholerae* non-O1, non O139 (1.75%), other vibrios (1.75%), *Aeromonas* sp. (6.5%), and *Plesiomonas shigelloides* (5.0%). Enrichment of watery stool for 6 h in BPB increased isolation rate of *V. cholerae* O139 in comparison with 4 h and overnight enrichment culture and direct plating. TTGA was superior to TCBS agar with respect to isolation efficiency (100% vs. 93.08%) and results of slide agglutination (100% vs. 54.55%) and oxidase tests (100% vs. 1.66%). When 285 watery stool samples were tested by dark-field microscopy, slide coagglutination test (COAG) and standard culture methods for the detection of *V. cholerae* O139, the sensitivity, specificity and accuracy of coagglutination test were 97%, 100% and 99% respectively. The dark-field microscopy showed similar results. Both tests had positive and negative predictive values of 100% and 98% respectively.

Conclusions: The findings indicate that *V. cholerae* O139 was the major aetiologic agent of cholera in Dhaka during the study period. TTGA appears to be superior to TCBS for the detection of *V. cholerae* O139. Faecal enrichment is essential for optimum isolation. Coagglutination test and the field microscopy are simple, rapid, low-cost and reliable for the detection of *V. cholerae* O139 from faecal samples.

4:5 DESCRIPTION OF CLINICAL AND LABORATORY FEATURES OF SEVERE CHOLERA DUE TO VIBRIO CHOLERAE O139 (BENGAL)

Shahadat Hossain, Rabi Biswas, GH Rabbani, MA Salam and D Mahalanabis

Objective: Describe the clinical and laboratory features of *Vibrio cholerae* O139 infection.

Methods: A large epidemic of cholera due to a newly-recognized strain of *V. cholerae*, designated as *V. cholerae* O139 was reported from south India and Bangladesh in late 1992 to mid-1993. During the epidemic, there had been a large influx of patients with severe cholera-like diarrhoea into the ICDDR,B hospital in Dhaka, Bangladesh. To describe the clinical course of illness due to this new strain of *V. cholerae*, 22 adults (age 18-60 years) with severe diarrhoea were studied at the ICDDR,B hospital in Dhaka. Patients were managed with intravenous (IV) or oral rehydration fluids during the study period. A course of tetracycline was prescribed at the time of discharge.

Results: The important features of patients were: presenting with frequent watery stools, vomiting, dehydration, and hypovolaemic shock. The mean (±SD) volume of stool (ml) during the 1st, 2nd, 3rd, 4th, and 5th day were : 8,768 ± 5,164; 4,734 ± 3,514; 3,544 ± 2,753; 1,387 ± 1,648; and 628 ± 1,107 respectively. The total volume of stool during the entire illness was (mean ± SD): 23,210 ± 13,944 ml. The total volumes of IV and ORS required for the treatment of patients were: 6,113 ± 2,649 and 18,934 ± 10,279 respectively. Stool became soft in 82% of the patients by day 3, and all patients recovered from diarrhoea by day 4 of hospitalization. Serum electrolyte (Na^+, K^+, Cl^-) concentrations were normal before hydration. TCO_2 mildly decreased (13 ± 3.7 mmol/l) indicating isotonic dehydration with mild acidosis. Faecal concentrations of Na^+ , K^+ and CO^-_2 were 120 ± 24, 26 ± 18 mmol/l and 37 ± 9 respectively. Mean haematocrit on admission was 56 ± 3.2 % which declined to normal after rehydration. All patients had moderate leucocytosis, and 23% to 50% of the stools contained red blood cells and leucocytes respectively. The mean duration of faecal excretion of *V. cholerae* O139 was 6.7 days. All patients recovered without any residual complications.

Conclusions: These findings indicate that the clinical and laboratory features of *V. cholerae* O139 are similar to those of *V. cholerae* O1, and that treatment can be based on clinical diagnosis.

4:6 SERUM VIBRIOCIDAL ANTIBODY RESPONSES IN PATIENTS WITH CHOLERA DUE TO VIBRIO CHOLERAE O139 AND O1

Firdausi Qadri, Md Golam Mohi, Jaber Hossain, Tasnim Azim, AM Khan, MA Salam, RB Sack, MJ Albert and A-M Svennerholm

Objective: Determine the vibriocidal antibody response in patients with cholera due to *V. cholerae* O139 compared to that in patients with *V. cholerae* O1.

Methods: Severe dehydrating cholera is now known to be caused by strains of *V. cholerae* O139 in addition to *V. cholerae* O1. Previous studies have shown that the antibacterial antibody response using the vibriocidal antibody assay is a useful proxy measure of the mucosal immune response generated after infection with *V. cholerae* O1 or after vaccination. The present study determined the vibriocidal antibody response in patients with cholera due to *V. cholerae* O139 (n=33) and compared it with the response in patients with *V. cholerae* O1 (n=18) infection. Vibriocidal antibodies were measured using strains of *V. cholerae* O139 and *V. cholerae* O1 and serum samples collected from patients early after onset of disease and at follow-up on day 7, 11 and 22. Because of the possession of a capsule by *V. cholerae* O139, which confers resistance to serum killing, the traditional vibriocidal assay for *V. cholerae* O1 was modified for *V. cholerae* O139 by increasing the concentration of complement and decreasing that of bacteria. For the assay, two-fold dilutions of serum were tested against the homologous and heterologous O-serogroup and a four-fold or greater increase in titre was used in signifying seroconversion. The Wilcoxon's matched pairs test was used for determining statistical difference in vibriocidal response in patients after onset of cholera.

Results: Patients with cholera due to *V. cholerae* O139 had a 46-fold increase in response to the homologous serogroup, which was highly significant ($p<0.0001$), whereas little or no response was detected against *V. cholerae* O1. A similar response (55-fold) to the homologous serogroup was seen in patients with *V. cholerae* O1 infection ($p<0.0001$) with no response to *V. cholerae* O139.

Conclusions: The vibriocidal antibody assay can also be used for measuring the immune response generated after cholera due to *V. cholerae* O139. These results also demonstrate that the vibriocidal antibody response is serogroup-specific suggesting that for a vaccine to be effective, it should possess protective antigens from both *V. cholerae* O139 and *V. cholerae* O1.

5:1 DOES THE FAMILY PLANNING PROGRAMME INFLUENCE DESIRED FERTILITY IN BANGLADESH?

Mizanur Rahman

Objective: Examine if the family planning programme has had any influence on desired fertility levels in Bangladesh.

Methods: A conceptual framework proposed by Easterlin (1975), and illustrated by Cleland, Phillips, Amin, and Kamal (1994), was imputed in explaining the achievement of family planning programme to reduce fertility in Bangladesh. The framework indicates that family planning programme can affect a couple's desire for children. Rural samples from the Contraceptive Prevalence Surveys of 1983 and 1991 that represent national data were analyzed to predict desired fertility, contraceptive use, and unmet contraceptive need. Effects of factors that capture programme interventions (home visits by family planning workers and women's knowledge of modern contraceptive methods), socioeconomic conditions, and regional variations were estimated in logistic regression models.

Results: Programme variables were not associated with desired fertility but were strongly related to contraceptive use and unmet need for contraception. Desired fertility was lower among the educated mothers and fathers. Women who worked for monetary income, who were members of NGOs, or who had higher mobility had lower desired fertility. Poorer women and Hindu women had lower desired fertility than better off or Muslim women. The results of the programmatic, socioeconomic, and demographic factors related to contraceptive use and unmet need were in the expected direction.

Conclusions: In a recent paper, Pritchett (1994) argues that fertility is principally determined by desired fertility, and that contraceptive supply or efforts of family planning programme are not major factors influencing fertility behaviour. Results of the study indicate that socioeconomic factors (education of both women and men, women's work, and women's participation in NGO activities), cultural factors (gender preference and religion), and diffusion of ideas are important determinants of desired fertility. Activities that affect these factors may change the pace of fertility decline by changing desired fertility and contraceptive use.

5:2 DESIRE FOR ADDITIONAL CHILD AND SUBSEQUENT FAMILY PLANNING PRACTICES IN MATLAB

Andrés de Francisco, Y Weili*, R Bairagi
and J Chakraborty

Objective: Evaluate desire for additional child as reflected in information given by women of reproductive age and relate it to socioeconomic variables and adoption of family planning practices.

Methods: Data for this study came from the ICDDR,B's Maternal and Child Health-Family Planning (MCH-FP) Project in Matlab, Bangladesh. In the project area, improved health and family planning services were provided and relevant data were collected. Every 18 months, all women of reproductive age were questioned about their preferences for additional children. Each woman was asked if she wanted to have another child (and if so, whether sooner or later) or not. In the present investigation, these answers have been compared with sociodemographic variables, including family size and sex composition of living children; births and deaths occurring between the surveys; and subsequent contraceptive use, by method. Data from 1990 to 1993 were used in this study.

Results: Subsequent contraceptive use was related to desire for additional child. Number, sex composition of children in the family, and maternal age and education, were important correlates of desire for an additional child.

Conclusions: The desire for an additional child as expressed by women in the Matlab MCH-FP intervention area usually has a strong positive relationship with subsequent contraceptive use. A woman who reports that she wants no more children, or that she wants the next child "later" rather than "sooner", is likely to become a contraceptive user.

*Ministry of Public Health, People's Republic of China

5:3 DETERMINANTS OF ABORTION IN RURAL BANGLADESH

M Kapil Ahmed, Afzal Hossain Sarkar
and Mizanur Rahman

Objective: Examine the trends in induced abortion and attempt to identify associated risk factors since induced abortion contributes to a substantial proportion of maternal mortality in Bangladesh.

Methods: Data for this study came from the Demographic Surveillance Systems of three ICDDR,B field sites: Matlab, Abhoynagar, and Sirajgonj. Although these data collection systems are extremely thorough, it is recognized that there may have problems in the quality of data with an outcome as sensitive as abortion. Several hypotheses developed by the authors were tested using the data on over 80,000 pregnancy terminations during 1982-1991. Induced abortion was defined as any voluntary termination of pregnancy. The study included bivariate analyses, using the ratio of abortions per 1,000 live-births, and estimating the effects of multiple factors in logistic and hazard models.

Results: The induced abortion ratio increased over the study period, while miscarriage and still-birth ratios did not change. Induced abortion increased with the number of surviving children but decreased with maternal age and pregnancy interval. Abortion ratios were higher among the educated, better off, and Hindu women. Abortion ratios were also higher among the contraceptive users, particularly condom and pill users, than among the non-users, whereas injectable users had abortion ratios similar to those of the non-users.

Conclusions: The findings of the study suggest that abortion is common among women who want to limit or space childbearing. The small family is becoming a norm, and family planning programmes are fully committed to help couples achieve their reproductive goal. There may be unplanned pregnancies due to failure of methods used and inaccessibility to services, and it is expected that many abortions may occur in the developing stage of the family planning programme. To help couples achieve their desired reproductive goal and reduce maternity-related deaths, MCH-FP programmes should provide safe abortion services and management of abortion-related complications.

5:4 TRENDS IN CONTRACEPTION AND GENDER COMPOSITION OF SURVIVING CHILDREN: EXAMPLES FROM TWO RURAL AREAS OF BANGLADESH

ABM Khorshed Alam Mozumder, Mizanur Rahman
and Afzal Hossain Sarkar

Objective: Describe contraceptive use over the last ten years and its relationship to the gender composition of living children in a family, and investigate whether gender composition could inhibit a further decline in fertility.

Methods: The MCH-FP Extension Project of ICDDR,B has experiment sites at Sirajgonj and Abhoynagar in Bangladesh. Working within the government system, the Project conducts operations research to improve health and family planning service-delivery in these two sites. Data obtained from the Sample Registration System which conducted interviews at 90 days interval since 1982 of a sample of villagers residing in 10,000 households were used. Using data from 1982 through 1992, descriptive results are presented, followed by multivariate analysis.

Results: Contraceptive prevalence rates (CPR) in both areas increased. Sirajgonj being a more remote and traditional area, CPR rose from 11 in 1982 to 39 in 1992. At Abhoynagar, CPR rose from 22 in 1982 to 47 in 1992. By comparison, the national CPR was 19 in 1983 and 40 in 1991. Gender composition of a couple's living children appeared to be important factor determining their contraceptive use. Women having at least one boy and one girl had a higher CPR over the period compared to women having only boys or only girls. However, even when all children were girls, the couple's contraceptive use had increased over time.

Conclusions: These findings suggest that preference for sons persists in Bangladesh, and that couples also desire a daughter. The fact that couples who have only girls are also inclined to contraceptive use indicates that the use of family planning practices, and desires for having smaller families are becoming behavioural norms.

5:5

INFLUENCE OF BARI CHARACTERISTICS ON CONTRACEPTIVE USE AMONG MOTHERS IN MATLAB

Lutfun Nahar and Mizanur Rahman

Objective: Examine whether there are any characteristics of *bari*, the smallest rural community in Bangladesh, which affect contraceptive acceptance and cost-effectiveness of services.

Methods: Data for this study came from the ICDDR,B's Demographic Surveillance System which records all vital events in Matlab, a rural area of Bangladesh. Data on contraceptive use came from service statistics collected by the Maternal and Child Health-Family Planning (MCH-FP) Project. The cohort of women who gave birth in 1981-1982 in the MCH-FP area was followed up for five years to record their contraceptive acceptance pattern. *Bari* and individual-level information was matched with demographic and reproductive events. Logistic regression was used in estimating the net effect of selected independent variables in relation to individual and *bari* characteristics.

Results: Results of the study showed that education of a woman influenced the acceptance of contraception by herself as well as by other women living in the same *bari*, even if they were not educated. Demographic variables of individuals (maternal age and number of surviving children) and socioeconomic variables (maternal and household education) had significant influence on contraceptive acceptance. The findings were in the expected direction.

Conclusions: The door-step delivery of family planning, and maternal and child health services has been a key factor for success of the national programme in Bangladesh. This may not be the most cost-effective service-delivery system. Therefore, as an alternative, contraceptives and some health care supplies can be provided at the community level. This study indicates that *bari* characteristics which affect individual fertility behaviour can be used by programme managers. For example, they could identify women who can be used as links between family planning and health workers and their clients to deliver services in a less expensive manner, or to enhance accessibility of services.

5:6 THE PATTERNS AND DETERMINANTS OF CONTRACEPTIVE ACCEPTANCE AND CONTINUATION IN MATLAB

Indrani Haque and Mizanur Rahman

Objective: Examine changes in the timing of contraceptive use after a birth and its impact on fertility.

Methods: Data from the ICDDR,B's Demographic Surveillance System which records all vital events in Matlab, a rural area of Bangladesh, were used in this analysis. Data on contraceptive use were collected by the Maternal and Child Health-Family Planning (MCH-FP) Project. Over 6,000 women who gave birth during 1981-1982 and 1986-1987 were followed up for five years for recording their contraceptive acceptance and continuation, reproduction status, and migration. Life-table techniques were applied to study the acceptance and continuation of contraception.

Results: For the cohorts of 1982 and 1987, the median waiting time to accept contraception following the birth of a child were approximately 23 and 15 months respectively. The duration of contraceptive use was 21 months for the 1982 cohort and 32 months for the 1987 cohort. Although the duration of contraceptive use has increased by about 11 months, actual protection against the risk of pregnancy has increased only by about 4 months. This is mainly because the waiting time to accept contraception has decreased by about 8 months, although women were partially protected during this period due to post-partum amenorrhoea resulting from breast-feeding. Determinants of acceptance and continuation were similar for both cohorts, as expected. For example, educated women were found to start using contraceptives earlier and also to use for a longer period than others. Younger women start earlier than older women, but the latter use contraception for longer period than younger ones.

Conclusions: These results indicate that a rise in the contraceptive prevalence rate does not necessarily lead to a corresponding decline in fertility. Since post-partum amenorrhoea is prolonged in Bangladesh because of long breast-feeding duration, contraceptive use during the early post-partum period is probably unnecessary and wasteful. These findings, particularly on the reduction of waiting time for acceptance of contraception, have strong policy implications. Programmes should consider cultural practices, such as breast-feeding duration that lead to low fertility. Promotion of contraceptive supply without these considerations may lead to wastage of resources.

7:1 ACCEPTANCE OF CONTRACEPTIVE BY THE POOREST OF THE POOR: THE EFFECT OF AN INTENSIVE FAMILY PLANNING PROGRAMME

Abbas Bhuiya, AMR Chowdhury*
and Monir Hossain*

Objective: Assess whether the impact of an intensive family planning service-delivery programme for the rich is similar to that for the poor.

Methods: The site for this study was Matlab, a rural area of Bangladesh where ICDDR,B conducts health and family planning research and where BRAC has launched several social and economic interventions. In the Maternal and Child Health-Family Planning (MCH-FP) Project area, improved health and family planning services are provided; in the comparison area, normal government services are provided. Data for this study were collected through interviews in 60 villages in Matlab from July 1992 through November 1992 as part of the BRAC-ICDDR,B baseline survey. Eight thousand seven hundred and seventy-eight newly-married women of reproductive age were the respondents and units of analysis. Univariate and multivariate statistical analyses were performed, with acceptance of a modern contraceptive method as the main outcome measure.

Results: Contraceptive acceptance was higher among women from households owning less than 50 decimal of land (0.4 hectare) and having at least one member who sells at least 100 days of manual labour a year (these households are BRAC's target group). However, the difference was observed only in the MCH-FP area. In addition, it was found that there was a difference in method use between the rich and the poor, and women from relatively richer households in both areas were more likely to use oral contraceptives. In the MCH-FP area, better off women were less likely to use injectable contraceptives. In the comparison area, female sterilization was more common among the women from poorer households.

Conclusions: Contraceptive acceptance in Matlab is poverty-dependent. Differential acceptance of various methods by the rich and the poor needs to be studied further.

*Bangladesh Rural Advancement Committee (BRAC)

7:2 IMPACT OF THE GRAMEEN BANK ON WOMEN'S STATUS AND FERTILITY IN BANGLADESH

Mizanur Rahman and Julie DaVanzo*

Objective: Examine the two major pathways: effects of income and social development, through which the Grameen Bank's credit programme can affect women's status and fertility.

Methods: The Grameen Bank (GB) is a highly innovative and well-supervised credit programme for the rural poor in Bangladesh. About 95% of over two million participants are women. A family life survey was carried out during 1993-1994 among married women of reproductive age in landless households, who are eligible for membership in the Grameen Bank. The survey was conducted in three thanas of Tangail and one thana of Mymensingh district. A sample of about 2,500 women was randomly selected regardless of GB membership. These thanas had different durations of exposure to the programme. Attempts were made to minimize selectivity bias by modelling fertility, with the effects of membership in the Grameen Bank and NGOs and of income-earning work as parity-varying covariates in a hazard regression.

Results: The Grameen Bank had a positive effect on woman's status as measured by marital stability, hygienic practices, decision-making and purchasing power, and other empowerment indices. Fertility was significantly lower among GB and NGO members than among non-members, other factors being the same. However, the effect on fertility of GB membership was consistently and markedly higher than that of NGO membership. Woman's income-generating work also had a net negative impact on fertility.

Conclusions: Fertility in Bangladesh has been declining at unprecedented rates, given the poor socioeconomic conditions. Participation of women in the Grameen Bank, in NGOs, and in income-generating activities is also increasing remarkably. These are neither coincidences nor only correlates. Rather, the findings suggest that participation of women in these economic and social development programmes has a causal effect on the reduction of fertility in Bangladesh.

*RAND Corporation, USA

7:3 WOMEN'S EMPOWERMENT AND FERTILITY REGULATION BEHAVIOUR IN RURAL AREAS OF BANGLADESH

Afzal Hossain Sarkar, ABM Khorshed Alam Mozumder
and Mizanur Rahman

Objective: Identify socioeconomic and demographic factors that may affect women's empowerment and eventually their desired fertility and contraceptive use.

Methods: Data for this study came from the MCH-FP Extension Project of ICDDR,B. Working within the government system, the Project conducts operations research to improve health and family planning service-delivery in Bangladesh. A survey among over 10,000 married women aged less than 50 years was conducted during 1993-1994 in four project areas. Three types of variables: mobility, decision-making power, and support for family planning activities were considered to be indicators of women's empowerment. Fertility regulation behaviour was measured by desired fertility (additional children desired by women) and contraceptive use.

Results: Several demographic and socioeconomic factors were found to be related to desired fertility and contraceptive use. Middle-aged women of the sample had higher empowerment than others, measured by all three indicators. Decision-making power and support for family planning were higher among educated than uneducated mothers. Both mobility and decision-making power were lower in better off households, while support for family planning was not related to income. Women who had income-earning activities, who handled cash, or who were members of NGOs ranked high on all indicators. These three empowerment indicators were, in turn, associated with desired fertility and contraceptive use. Mobility was not related to desired fertility, but was positively related to contraceptive use. Women with higher decision-making power had a lower desire for additional children and higher contraceptive use. As expected, family planning supporters had lower desires for children and higher contraceptive use. There were large variations of empowerment and fertility regulation behaviour between the four study areas.

Conclusions: Women's empowerment has been found to influence desired fertility. To formulate policies to enhance women's status, policy planners require information on the socioeconomic and demographic factors that are associated with women's empowerment.

7:4 IMPORTANCE OF AGE AND SOCIODEMOGRAPHIC FACTORS IN CONTRACEPTIVE ACCEPTANCE AMONG RURAL WOMEN IN BANGLADESH: LESSONS LEARNED FROM MATLAB MCH-FP PROJECT

J Chakraborty, Andrés de Francisco, Shamim A Khan and K Zaman

Objective: Compare selected sociodemographic variables of first-time acceptors of modern contraceptive methods with those of never-users during the same period.

Methods: Data for this study came from the ICDDR,B's Maternal and Child Health-Family Planning (MCH-FP) Project in Matlab, Bangladesh. In the project area, improved health and family planning services are provided and relevant data are collected. Sociodemographic information on women's age, parity, education, and occupation, the size of dwelling house and its construction material was recorded between 1984 and 1993 for contraceptive acceptors on the date of acceptance. This information was compared with data on non-users after the first pregnancy outcome date.

Results: Contraceptive prevalence rates in the Matlab MCH-FP Project area increased from 40% in 1985 to 63% in 1993. Modern methods accounted for almost all contraceptive use (97%), with injectables having the highest prevalence (52%) followed by oral contraceptives (30%) and female sterilization (10%). Eight thousand six hundred and fifty-one women aged less than 29 years constituted the largest group of new acceptors (80% of new users) and the number of those over 34 years of age was 852 who constituted the lowest group (8%). Among non-users, 3,950 (74%) were below 29 years and 940 (18%) above 35 years. Injectable contraceptives were the most popular in all ages. Highest oral contraceptive use was observed among women aged 28 years and below (22%). The data showed no significant difference of contraceptive acceptance among educated and non-educated group. No association was observed between contraceptive prevalence rate and household area or type.

Conclusions: This study suggests that the most appropriate group of women to be targeted for family planning in rural Bangladesh consists of the youngest group of women who are easy to reach and demographically important.

7:5 SERVICE-DELIVERY AT FAMILY WELFARE CENTRES: THE CLIENTS' PERSPECTIVE

Parveen Akhter, Helene Wirzba, Indrani Haque, Tanjina Mirza and Therese Juncker

Objective: Evaluate the types and quality of services provided at Family Welfare Centres (FWCs) and determine client satisfaction with these services.

Methods: The MCH-FP Extension Project of ICDDR,B has experiment sites at Sirajgonj and Abhoynagar in Bangladesh. Working within the government system, the Project conducts operations research to improve health and family planning service-delivery in these two sites. This is a study on FWCs, the primary fixed centres for provision of maternal and child health care and family planning services, and the treatment of minor illnesses. This study conducted interviews of 650 FWC clients using a structured questionnaire between July and September 1993. Clients were asked about the services they had received and their knowledge on and satisfaction over these services.

Results: Most respondents were married women aged 20 to 40 years, living less than one kilometer away from FWC. They had an average of 3.75 previous pregnancies; 55% of them were using a contraceptive method. Curative services were offered to 97% of the respondents. There were differences between drugs recorded in the register and those actually dispensed. Many respondents did not remember or were not told the dosage of drugs. Antenatal care was provided to 8% and family planning services to 6% of the respondents. Half of the family planning complications was found among IUD users, who make up only 6% of all users. For 30% of the clients, privacy, clinical examination, availability of drugs, and counselling were not satisfactory. Their knowledge about services offered at FWC was poor: over 80% knew about curative care, but only 60% were aware of family planning services and 20% of antenatal care.

Conclusions: Curative care is the most frequent service offered at FWC; clients are not fully aware of other services available. Treatment practices and communication between clients and providers are not satisfactory. There is an urgent need to redefine the standards of care at FWC and take appropriate action to implement them.

7:6 EFFECTS OF OUTREACH WORKERS' VISITS ON PERCEIVED QUALITY OF CARE IN TWO RURAL AREAS OF BANGLADESH

Mian Bazle Hossain, Barkat-e-Khuda
and James F Phillips*

Objective: Provide information on rural women's perceptions of the regularity and the quality of care provided by the government family planning programme, especially by the female field workers.

Methods: Working within the government system, the MCH-FP Extension Project of ICDDR,B conducts operations research at Sirajgonj and Abhoynagar in Bangladesh to improve health and family planning service-delivery. The Project has been maintaining a surveillance system in these field sites since 1982. In the spring of 1989, a special survey was conducted among married women of reproductive age. Using previous longitudinal data on field workers' visits to rural women, the impact of this programmatic factor on perceived quality of care was evaluated. Additional information on the socioeconomic, behavioural and attitudinal characteristics was obtained from previous surveys. Five different indicators of the quality of service-delivery were studied, based upon each client's assessments of her worker's responsiveness, helpfulness, concern for privacy, sympathetic manner, and ability to provide enough information.

Results: Descriptive statistics of the population under study showed that their characteristics were similar to married women in national surveys. Three multiple regression models of the determinants of quality of care by selected programmatic and client characteristics were evaluated. Results showed that visit by one additional worker significantly increased the quality of care index. Rural women's perceptions of the standards of care provided to them by family planning field workers were significantly related to routine home visits by outreach workers. This indicates that if a woman is exposed to a household visit in a 90-day period by a female family planning worker, it is likely that the woman scores her as a better worker, irrespective of other factors or client characteristics.

Conclusions: This study provides some of the first empirical evidences from a developing country on the importance of workers' visits on quality of care.

*Population Council, New York, USA

8:1 EFFICACY OF TETRACYCLINE IN THE TREATMENT OF CHOLERA DUE TO VIBRIO CHOLERAE O139

Shahadat Hossain, MA Salam, GH Rabbani, Iqbal Kabir and D Mahalanabis

Objective: Evaluate the effectiveness of tetracycline in the treatment of acute watery diarrhoea due to *V. cholerae* O139.

Methods: A randomized placebo-controlled double-blind clinical trial was carried out during September through November 1993. Fory-three males with severe cholera (22 placebo and 21 tetracycline group) attending the ICDDR,B's hospital in Dhaka, Bangladesh were studied. Patients were randomized to receive either capsule tetracycline 500 mg six hourly for three days or an identical placebo.

Results: Results showed that stool weights were similar in two groups during the first 24 hours (drug 8,437 ± 5,601 g and placebo 8,767 ± 5,164 g, p=0.67). During the second 24 hours, there was a significant reduction of stool weight in the tetracycline group compared to placebo group (1,394 ± 1,512 g vs. 4,519 ± 3,574 g, p=0.0012). During the 3rd 24 hours, the difference of stool weight was more striking (drug 560 ± 1,010 g, placebo 3,587 ± 2,791 g, p=0.0001). Significant difference was also observed in the total weights of stool between start of treatment and end of diarrhoea (drug 9,527 ± 6,863 g and placebo 18,185 ± 11,695 g, p=0.015) The mean duration (h) of diarrhoea was reduced by 58% (32 ± 17 h vs. 77 ± 38 h, p=0.010). Tetracycline significantly reduced the faecal positivity rate of *V. cholerae* O139 at 48 hours (76% vs. 01%, p=<0.001). Tetracycline also reduced total amount of intravenous fluid required compared to placebo (drug 8,219 ± 4,165 ml and placebo 12,019 ± 8,401 ml, p=0.014).

Conclusions: These results suggest that tetracycline is an effective drug for the treatment of acute watery diarrhoea due to *V. cholerae* O139.

8:2 COMPARISON OF THE EFFICACY OF A SINGLE-DOSE CIPROFLOXACIN AND OF A SINGLE-DOSE DOXYCYCLINE IN THE TREATMENT OF CHOLERA DUE TO VIBRIO CHOLERAE O139

Wasif Ali Khan, Carlos Seas, Eradul Haque Khan, MA Salam and Michael L Bennish

Objective: Compare the efficacy of a single 1 g dose of ciprofloxacin with that of a single 300 mg dose of doxycycline in the treatment of cholera due to *V. cholerae* 0139.

Methods: More than 100,000 diarrhoea patients are seen annually at the ICDDR,B's Dhaka-based hospital, and the Clinical Research and Service Centre. Cases were selected from these patients. Of 129 evaluable adult males with severe diarrhoea due to *V. cholerae* O139, fifty-nine were randomly assigned to receive ciprofloxacin and 70 to receive doxycycline.

Results: Treatment was considered to be clinically successful in 54 (91.5%) and 64 (91.4%) of the patients in the ciprofloxacin and doxycycline group respectively. However, the difference was not statistically significant. Similarly, the total volumes of watery stool during the entire period of the study were comparable in the treatment groups. However, only 1 (1.7%) patient in the ciprofloxacin group had bacteriologic failure compared to 15 (21.4%) patients in the doxycycline group (p=0.002).

Conclusions: Efficient management of dehydration remains the cornerstone in the management of patients with cholera. However, treatment with effective antimicrobial agents is useful in significantly shortening the duration of diarrhoea and the volume of watery stools, and in shortening the duration of faecal excretion of the pathogen. From this study, it is concluded that a single 1 g dose of ciprofloxacin is as effective as a single 300 mg dose of doxycycline in terms of clinical response, and that ciprofloxacin is more efficient in eradicating *V. cholerae* from faeces.

8:3 INHIBITION OF CHOLERA TOXIN-INDUCED SALT AND WATER SECRETION BY SHORT-CHAIN FATTY ACIDS IN VIVO

GH Rabbani, H Rahman and D Mahalanabis

Objective: Determine the effect of SCFAs on cholera toxin-induced colonic secretion. Short-chain fatty acids (acetate, propionate, butyrate) produced by the fermentation of unabsorbed carbohydrates by the colonic bacteria have been shown to stimulate Sodium chloride absorption in the isolated colonic epithelium *in vitro*.

Methods: The effects of SCFAs on cholera toxin (CT)-induced colonic ion and water secretion in adult rabbit have been determined in this study using a perfusion technique with polyethylene glycol as a non-absorbable marker. Facilities of the ICDDR,B's Dhaka-based hospital, the Clinical Research and Service Centre, and its Animal Resources Branch, were used for this study.

Results: The study indicates that an 18-hour exposure to purified cholera toxin (5-100 μg) resulted in colonic water and electrolyte secretion in a dose-dependent manner. Perfusion with different SCFAs significantly ($p<0.001$) inhibited net colonic water secretion; the rates ($\mu l/min^{-1}.cm^{-1}$) of inhibition being 99%, 94%, and 86% for butyrate (30 mM), propionate (60 mM), and acetate (90 mM) respectively. The rates of net sodium secretion were also significantly less ($p<0.01$) in the SCFA-treated colon than those treated with SCFA-free solution (Na^+, mean ± SD, $\mu M/min^{-1}.cm^{-1}$: 5.17 ± 0.95, 7.31 ± 0.65, 12.7 ± 0.8 for butyrate, propionate, and acetate respectively; and 80.2 ± 20.6 for controls). Butyrate (30 mM) induced the highest inhibition of Na^+ and water secretion followed by propionate and acetate. All 3 SCFAs significantly ($p<0.01$) inhibited Cl^- secretion, whereas only butyrate and propionate inhibited K^+ secretion. There was no significant alteration of the colonic $HCO3^-$ secretion by the SCFAs, and none was able to reverse colonic secretion into net absorption.

Conclusions: SCFAs stimulate salt and water absorption from CT-stimulated colon and may be useful as absorption-promoting agents in oral rehydration solutions.

8:4 OXIDATIVE STRESS IN PATIENTS WITH SEVERE CHOLERA

MA Khaled and GH Rabbani

Objective: Determine the adverse metabolic effects of oxidative stress in cholera. Oxidative stress is an adverse metabolic condition induced by the Reactive Oxygen Species (ROS). These ROS are produced and catabolized by specific enzymes during the normal course of metabolism. Lipid peroxidation due to ROS occurs during infection and malnutrition leading to oxidative stress and chemical injuries to the tissues. However, nothing is known about the adverse metabolic effects of oxidative stress in cholera.

Methods: To assess the degree of oxidative stress and lipid peroxidation in patients with severe cholera, the present investigators determined the faecal contents of thiobarbituric acid-reacting substances (TBARS), an index of lipid peroxidation, in 6 adults with severe dehydrating diarrhoea due to *Vibrio cholerae* infections and in 5 healthy adult volunteers. These volunteers were drawn each year from the 100,000 diarrhoea patients attending the ICDDR,B's Dhaka-based hospital, the Clinical Research and Service Centre.

Results: The preliminary results showed that the patients with acute cholera had significantly higher faecal concentrations of TBARS than had the healthy volunteers (9.56 ± 4.41 µmol/l for cholera patients vs. 4.03 ± 1.86 µmol/l for the controls). This observation indicates that patients with active cholera may be associated with varying degrees of oxidative stress probably due to toxin-induced alteration of mucosal metabolism involving xanthine production leading to loss of fluid and electrolytes in the diarrhoeal stool.

Conclusions: Further studies will be required to characterize the metabolic abnormalities in cholera patients which may have important therapeutic implications.

8:5 SURVIVAL POTENTIAL OF NON-CULTURABLE VIBRIO CHOLERAE O1 BY LABORATORY MICROCOSMS USING POLYMERASE CHAIN REACTION AND FLUORESCENT ANTIBODY METHODS

MS Islam, MA Miah, MS Moniruzzaman, S Begum, A Felsenstein, RB Sack and MJ Albert

Objective: Assess the survival potential of *V. cholerae* O1 using conventional cultural, fluorescent antibody and recently developed polymerase chain reaction techniques. In Bangladesh, cholera is endemic in certain areas and flares into seasonal epidemics. *V. cholerae* O1 is one of the causative agents of cholera. The survival potential of *V. cholerae* O1 was carried out in various environmental samples by using conventional techniques.

Methods: The strain *V. cholerae* O1 biotype El Tor serotype Ogawa was used in this study carried out at the ICDDR,B's laboratories in Dhaka, Bangladesh. A measured inoculum of about 10^5 *V. cholerae* O1 per ml was added to 100 ml autoclaved pond water in a 500-ml conical flask, mixed and stored at room temperature. Culturable cells were counted on gelatin agar (GA) and taurocholate tellurite gelatin agar at various time intervals until the bacteria were no longer culturable.

Results: The non-culturable *V. cholerae* O1 was detected by fluorescent antibody and PCR techniques. The culturable *V. cholerae* O1 was isolated up to 44 days from the pond water microcosms. The non-culturable *V. cholerae* O1 was detected up to 7 weeks by FA and PCR techniques after they lost their culturability.

Conclusions: The non-culturable stage reported here for *V. cholerae* O1 is significant for understanding the epidemiology of cholera because the non-culturable state of *V. cholerae* O1 may pose health problems. Volunteer studies have shown that non-culturable *V. cholerae* O1 became culturable in volunteers intestine. This study demonstrated the survival of non-culturable *V. cholerae* O1 in surface water which may be important from the view point of public health.

8:6 CHOLERA TOXIN STIMULATES ABSORPTION OF D-GLUCOSE FROM THE ADULT RABBIT SMALL INTESTINE IN VIVO

MK Bhattacharya, GH Rabbani, RN Mazumder, AM Khan, Motaher Hossain and D Mahalanabis

Objective: Determine the effects of purified cholera toxin (CT) on intestinal absorption of glucose. Glucose is known to stimulate intestinal sodium absorption which provides the basis for the glucose-containing oral rehydration solution for the treatment of diarrhoea. Although this physiologic mechanism is well-preserved during severe cholera, the effects of purified cholera toxin on intestinal absorption of glucose itself has not been evaluated.

Methods: In this study, carried out in the facilities of the ICDDR,B's Dhaka-based Animal Resources Branch, the effects of CT on the absorption of glucose from the small intestine of anaesthetized rabbits were evaluated. In the duodenum, 1-2 microgram of purified CT (Sigma) was added after laparotomy and was incubated for 18 hours. After the incubation period, the segment was flushed with phosphate-buffered solution; 10 ml of the soultion containing 0.25 g of D-glucose was injected into the duodenum, and peripheral blood glucose was monitored every 10-15 minutes using specific method for detection of D-glucose.

Results: The results indicate that there was a progressive increase in the concentrations of glucose in the CT-treated rabbits over a period of 120 minutes, and the concentrations were significantly higher ($p<0.001$) than that in the control rabbits not treated with CT (blood glucose: 103 ± 3.5, 260 ± 13.9, 274 ± 18.0, 317 ± 18.8, 415 ± 38.6, 375 ± 22.5, 350 ± 18.4, 327 ± 7.1 mmol/l (mean ± SD) for CT-treated rabbits vs. 109 ± 5.5, 156 ± 4.9, 187 ± 4.7, 224 ± 4.6, 260 ± 6.9, 257 ± 5.7, 243 ± 4.8, 228 ± 5.7 mmol/l for the control rabbits across all periods). A higher dose of CT (1 µg vs. 2 µg) significantly produced better stimulation ($p<0.01$) of intestinal glucose absorption. The CT-specific rises in glucose concentrations ranged between 41.5% and 66.6% during the 120 minutes.

Conclusions: These preliminary results indicate that CT induces dose-dependent glucose absorption from the small intestine of rabbits. To explain these effects of CT, it is speculated that this action may be mediated through the stimulation of glucose transport mechanism in apical membrane, involving the carrier proteins. Further studies will be needed to explore these hypotheses.

9:1 TRENDS IN AND DETERMINANTS OF INFANT MORTALITY IN RURAL BANGLADESH

Santosh Chandra Sutradhar, ABM Khorshed Alam Mozumder and Mizanur Rahman

Objective: Study the trends in and determinants of infant mortality in rural Bangladesh.

Methods: About 48,000 infants born during 1984-1990 were followed up for one year in the Demographic Surveillance Systems of three ICDDR,B field sites (Matlab, Abhoynagar, and Sirajgonj). Logistic regression was used in modelling mortality risks during infancy, evaluating deaths during the first 28 days of life (neonatal mortality) and during the rest of the first year (post-neonatal mortality).

Results: Neonatal and post-neonatal mortality declined in the Matlab treatment area (receiving improved health and family planning services) and the Matlab comparison area. The mortality decline was concentrated between 4 and 14 days for neonates, and 1 and 5 months for post-neonates, which were the ages when the treatment area had lower mortality than the comparison area. There was no significant decline in neonatal mortality, and a modest reduction in post-neonatal mortality was observed at Sirajgonj, a more remote and traditional area. There was significant decline in post-neonatal mortality in Abhoynagar, although neonatal mortality did not decline during this period. In Matlab, risk factors for neonatal and post-neonatal mortality include lack of mothers' formal education and a short preceding birth interval. Additional risk factors include age of mother (young and old), religion (Hindu), sex (male), and birth order (2+) for neonates; and size of dwelling house (small) for post-neonates.

Conclusions: Reductions in neonatal mortality in three field sites have been modest except in the Matlab treatment area, where maternal tetanus immunization has improved. Reductions in post-neonatal mortality have, however, been more substantial and widespread.

9:2 RISK FACTORS AND CAUSES OF DEATH IN YOUNG CHILDREN AFTER DISCHARGE FROM AN URBAN DIARRHOEA TREATMENT CENTRE

M Aminul Islam, M Mujibur Rahman, D Mahalanabis
and AKS Mahmudur Rahman

Objective: Assess mortality patterns, causes of death, and risk factors in infants and young children discharged from a diarrhoea treatment centre.

Methods: Five hundred children aged 1 to 24 months were followed up at home 6 and 12 weeks after discharge from the ICDDR,B's urban diarrhoeal treatment centre in Dhaka, Bangladesh. The main outcome measure in this cohort was death. The causes of death were ascertained by a verbal autopsy.

Results: The homes of 427 (85%) children could be located 6 weeks after discharge; the rest had changed addresses and could not be traced. Of the children whose homes were located, 61% were boys; 77% were of less than 1 year; and 61% had siblings present. The median (range) of family members present was 5 (2-13). Monthly family income was Tk 3,000 or US$ 75.00 (Tk 600-30,000). Of the 427 children, 30 (7%) had died within 6 weeks of discharge; 2 more children died between 6 and 12 weeks of discharge. Of the children who died, the mean survival time after discharge was 10.9 days. Age, malnutrition, and lack of immunization were the main risk factors associated with death. The main underlying causes of death were respiratory diseases and watery diarrhoea. Malnutrition was the main associated cause.

Conclusions: Hospitalized children, especially malnourished infants, should be advised to return for a follow-up visit within a week of discharge. Hospitals should also provide preventive measures like immunizations, nutrition education, and dietary management in diarrhoea.

9:3 PREGNANCY OUTCOME AND CHILD SURVIVAL AMONG DIVORCED WOMEN IN MATLAB, BANGLADESH

Abbas Bhuiya and AMR Chowdhury*

Objective: Assess relationship of the quality of women's family life with pregnancy outcome and survival of children.

Methods: Data for this study came from the ICDDR,B's Demographic Surveillance System which records all vital events in Matlab, a rural area of Bangladesh. A total of 13,561 first marriages among Muslims that took place during 1975-1987 was followed up till the end of 1989. A logit regression analysis was used for studying the relationship between divorce and pregnancy outcome (live-birth, still-birth, miscarriage, and abortion). A hazard analysis was used for studying the impact of divorce on the survival of first child.

Results: The odds of having a miscarriage, abortion, or still-birth were 2.2 times higher among women who were divorced than those who were not when the effects of other variables were controlled. The net odds of death among children of divorced mothers during the neonatal and post-neonatal periods, and during childhood were, respectively 3.3, 4.6 and 2.7 times higher than those of mothers who were not divorced.

Conclusions: Divorce is a marker of poor quality of family life. The poor pregnancy outcomes seen among divorced women indicate the extent of oppression that women in this society undergo before divorce. Divorce also puts children in a highly vulnerable condition. Thus divorced women and their children belong to one of the most disadvantaged groups in this society. Attempts to alleviate the problems of women should place special emphasis on the well-being of divorced women and their children.

*Bangladesh Rural Advancement Committee (BRAC)

9:4 MORTALITY PATTERN OF WOMEN OF REPRODUCTIVE AGE IN RURAL BANGLADESH

Shamim A Khan, Andrés de Francisco
and J Chakraborty

Objective: Analyze the causes of death of women of reproductive age in rural Bangladesh and interpret results in the light of the contraceptive prevalence rate.

Methods: Causes of death for all women dying between January 1976 and December 1990 were determined by verbal autopsy and detailed interviews in the Demographic Surveillance System in Matlab. Data on contraceptive use came from service statistics collected by the MCH-FP Project area, and from the surveys conducted in the remaining comparison area which receives normal government health care services.

Results: A total of 1,526 women aged 15 to 44 years died in the 15-year period from 1976 to 1990. Of these, 742 (49%) died in the MCH-FP Project area and 784 (51%) in the comparison area giving mortality rates of 2.3 and 2.7 per 1000 women respectively. Direct obstetric causes accounted for a diminishing proportion of all adult female deaths in both areas during this period. The most common causes of death were direct obstetric complications (including abortion), injuries, intestinal infectious diseases, and diseases of the respiratory system. Contraceptive use among married women aged 15-44 years in the MCH-FP Project area increased from 5% in 1975 to 39% in 1984 and to 57% in 1990; in the comparison area, it increased from 5% to 16% and to 27% during the same years (Fauveau 1994). Deaths possibly associated with contraceptive use (cardiovascular diseases, peptic ulcer, diseases of the genitourinary tract, and malignant neoplasms of breast and uterus) accounted for 3% of all deaths in both MCH-FP Project area and the comparison area, indicating no relationship between increased contraceptive use and these causes.

Conclusions: Adult female mortality due to direct obstetric causes and abortion has declined in the MCH-FP Project area during a time when the use of contraceptives has increased. However, there may be other factors accounting for mortality differences over time and between the two areas. Moreover, the prevalence of some diseases possibly associated with contraceptive use were similar in both areas. Further study is needed to evaluate the relationship between specific contraceptive methods and their health consequences.

9:5 A QUALITATIVE STUDY OF THE PROBLEM-SOLVING PROCESS IN OBSTETRIC COMPLICATIONS: THE GAP BETWEEN HOME AND HOSPITAL

Therese Juncker and Parveen Akhter

Objective: Evaluate the health care-seeking process for obstetric complications, referring to the sequence of events prior to admission in the hospital, and assess the clients' satisfaction with hospital services.

Methods: Twenty-one subjects were selected from the list of women with serious obstetrical complications who came to the Thana Health Complex (THC) of Abhoynagar, a thana in Bangladesh with over 200,000 people. In-depth interviews were conducted within four weeks after the women left the hospital. The study period was January through September 1992.

Results: Most of the patients sought help from several types of qualified or unqualified people before going to the THC. Recourse to hospital was seen among many as the last resort after a delay ranging from few hours to seven days. The decision to go to the hospital was made mainly by the patients' relatives or by the woman herself, but it was greatly influenced by the advice of "quack" (village doctor), traditional birth attendant, or paramedic. The cost for transport, medicines, and hospital services ranged from Tk 300 to over Tk 4,500 (US$ 7.50 to 112). The vast majority of the patients had to borrow money to cover their expenses. There were mixed feelings about satisfaction with the services provided at the hospital. Reasons for satisfaction and dissatisfaction were investigated. The cost of hospital services and the behaviour of hospital staff discouraged women from going to hospitals.

Conclusions: Pregnancy remains a major health risk for the women in many developing countries. Deaths and sufferings can be prevented by timely referral to hospital. Women in Bangladesh rely very much on services provided by trained or untrained persons in their neighbourhood yet. Knowledge of the signs of emergency, requiring timely and adequate services, is lacking in the community. Cost of services and behaviour of hospital staff are also important issues that influence the decision-making process. These findings will help design interventions to reduce the delay between the onset of complications and the arrival at the hospital, and improve quality of care at the THC level.

9:6 PRESENCE OF A DAUGHTER IN THE FAMILY AND OLD-AGE SURVIVAL OF MOTHERS IN MATLAB, BANGLADESH

Golam Mostafa, Santosh Chandra Sutradhar
and Mizanur Rahman

Objective: Examine if having a daughter in the household improves the survival of older women in Bangladesh.

Methods: Data for this study came from the ICDDR,B's Demographic Surveillance System (DSS) which records all vital events in Matlab, a rural area of Bangladesh. A cohort of more than 4,500 women aged 60 years and over in the 1982 DSS census of Matlab was followed up for ten years to record survival, marital status, and presence of sons and daughters in the family. The effect of these variables on survival was modelled by using discrete-time hazards regression. Independent variables, obtained from the DSS database, were included in the models as time-varying covariates.

Results: A woman with at least one son living with the family had 17% lower risk of mortality than a woman with no son present. Living with a daughter reduced the risk of mortality by about 24%. The positive effects of living with a son or daughter on old-age survival are similar for both married and widowed women. A woman who is married, household head, literate, Muslim, or who lives in the intervention area (where maternal and child health services are provided) has lower risk of mortality than a woman who is a widow, not a household head, illiterate, Hindu, or lives in the comparison area (where normal government health services are provided).

Conclusions: Previous studies have shown that Bangladeshi parents have a preference for sons, and that a widow living with her adult son has better survival chances. Research has also shown that parents desire at least one daughter. Our findings that women living with daughters have a higher survival probability provide a justification of parents' preference for having at least one daughter. Since preference for a son has a negative effect on contraceptive use, the family planning programme could use our findings to show parents that a daughter can provide the same old-age security as a son can. This may reduce preference for sons and thereby enhance the pace of fertility decline.

11:1 PREVENTION OF DIARRHOEA IN RURAL BANGLADESH: EVALUATION OF AN INTERVENTION FOR HYGIENE BEHAVIOUR CHANGE

O Massee Bateman, Sushila Zeitlyn, Sumana Brahman* and Raquiba A Jahan*

Objective: Evaluate the SAFE Pilot Project, an intervention to change hygiene behaviour implemented by CARE Bangladesh.

Methods: This intervention took place in rural Chittagong, southeastern Bangladesh. Priorities and interventions were developed for hygiene behaviour change based on initial quantitative and qualitative studies. Two models of participatory extension programme were compared: Model 1 represented "limited model" working through community meetings organized by tubewell caretakers; and Model 2 represented "expanded model" working through caretaker groups plus school programmes, child to child activities, and key community persons. The baseline and final surveys took place in May 1993 and May 1994 respectively. Baseline and final cross-sectional survey data were compared in the two intervention areas and two contiguous control areas. Subjects for this analysis were from 720 households in 120 tubewell-user areas (180 households in each of the 4 study areas), respondents (mothers), and other family members as reported by the respondents. The main outcome measures were observed, demonstrated, and reported hygiene behaviours of the respondent and other family members. Reported two-week and 24-hour diarrhoea prevalence rates in children of less than 5 years were also used.

Results: The baseline survey of the four study areas showed that there was initially no significant difference between the intervention and the control areas. Access to hygienic latrines and latrine use was poor, knowledge of the causes of diarrhoea and of prevention was low, and hand-washing behaviour was poor. Environmental contamination with faeces and diarrhoea rates in children of less than 5 years were high. The final survey, after nine months of SAFE intervention, showed dramatic effects of the SAFE Pilot Project in the intervention areas on the improvement in latrine use, water use, hand-washing behaviour, and environmental sanitation. There was little change in the control areas. Two-week and 24-hour diarrhoea prevalence rates in children below 5 years of age decreased by almost two-thirds in the intervention areas compared to the control areas.

Conclusions: These results show that the SAFE approach to hygiene behaviour change can have significant beneficial effects on knowledge and behaviour, as well as on risk of diarrhoea in children. Where prevention of diarrhoea is the concern, programmes and policies should focus on the identifications of locally important risk behaviour and locally developed interventions, rather than general messages and hardware targets.

*CARE Bangladesh

11:2 FACTORS INFLUENCING BIRTH WEIGHT IN A RURAL COMMUNITY OF BANGLADESH

KZ Hasan, RB Sack, AK Siddique, E Roy, MN Rahman and M Ali

Objective: Describe the characteristics of birth weights of children in rural Bangladesh.

Methods: A cohort of newborn children with respiratory infections and diarrhoea was studied. A census was conducted in 10 villages of Mirzapur, and over 2,200 prospective mothers were listed. Pregnant women were identified and followed up by a female health worker. Women were encouraged to have an antenatal check-up and hospital deliveries. Home deliveries were reported either by the traditional birth attendant or family members. A group of 288 children was enrolled at birth. Birth weights were measured with a Salter scale and recorded from 280 newborns. Most weights (71%) were recorded within 36 hours of birth.

Results: Forty-one percent of the newborns had weight below 2.5 kg. Weights taken at different intervals after birth varied. The mean weight was 2.84 kg (± SD 0.50) for those taken in less than 1 hour of birth. Averages of those recorded within 1-24 hour(s) were: 2.47 kg (± SD 0.44), and 2.31 kg (± SD 0.41) for the time interval between 24 and 36 hours. There was a significant difference ($p<0.04$) in the mean weights between male (2.6 kg ± SD 0.5) and female infants (2.4 kg ± SD 0.5). A highly significant difference ($p<0.003$) was also observed in respect of birth weights of children and years of schooling of mothers. The average birth weight of infants whose mothers had 6 or more years of schooling was higher (mean 2.83 kg ± SD 0.5) than those with 5 or less years of schooling (mean 2.48 kg ± SD 0.5). The difference in the birth weights of infants of mothers with no schooling compared to those with less than 5 years of schooling was not significant. Infants born before full term had significantly ($p<0.001$) lower birth weights than those born at full term.

Conclusions: In underprivileged communities, many children are born with low birth weights. Except births in hospitals, however, very few studies describing birth weight in Bangladesh have been carried out. Findings of this study suggest that low birth weight is still a problem, and that lack of mothers' education and sponteneous premature delivery are associated with low birth weight in rural Bangladesh.

11:3 EFFECTS OF AGE, DURATION OF ILLNESS AND INFECTING SPECIES ON THE PATHOLOGY OF FATAL CHILDHOOD SHIGELLOSIS

AK Azad, M Islam, R Islam, MA Salam, AN Alam and T Butler*

Objective: Understand the pathogenesis of the complications and the pathophysiologic mechanisms involved in the persistence of the diarrhoeal illness, and determine the severity of colitis associated with infection due to different species of *Shigella*, on the basis of results from the recent series of autopsies.

Methods: At the ICDDR,B's Dhaka-based hospital, the Clinical Research and Service Centre, over 100,000 diarrhoea patients are seen annually. At the histopathology laboratory, autopsies are conducted on a sub-sample of patients who die in the hospital.

Results: Infants with infection due to *Shigella flexneri* more often presented with watery stool and bacteraemia than did the older children. Large areas of deep ulceration of the colonic mucosa and even ulceration involving the entire colonic mucosa were common in infantile *S. flexneri* infection. Hypoproteinaemia and bacteraemia in such cases may be the consequences of exudation of proteins through the denuded colonic mucosa and loss of the protective mucosal barrier. Cases with a prolonged course of diarrhoeal illness were found to have persistent mucosal abnormalities, including large areas of deep ulceration of the colonic mucosa. In contrast to *S. flexneri* infection, *S. dysenteriae* type 1 infection was generally associated with higher instances of shock, leukocytosis, azotaemia, severe hypoproteinaemia, intestinal obstruction associated with transmural inflammation of colon, and disseminated intravascular coagulation. They also had significantly higher frequencies of pseudomembranous inflammation of the terminal ileum and colon, severe necrotizing haemorrhagic colitis, microvascular thrombosis of the mucosa and submucosa of colon, and glomerular capillary thrombosis. An association of infantile *S. dysenteriae* 1 infection with severe necrotizing haemorrhagic colitis, leukaemoid reaction, and development of glomerular capillary thrombosis with or without haemolytic-uraemic syndrome was apparent.

Conclusions: A routine programme of autopsies helps clinicians better understand the underlying complications associated with fatal cases of diarrhoeal illnesses.

*Texas Technical University, Texas, USA

11:4 AWARENESS OF TRANSMISSION AND PREVENTION OF SEXUALLY-TRANSMITTED DISEASES AMONG RURAL WOMEN IN BANGLADESH

Mehrab Ali Khan, Mizanur Rahman and Parveen Akhter

Objective: Study the awareness of sexually-transmitted diseases (STDs) among rural women and family planning field workers.

Methods: The MCH-FP Extension Project of ICDDR,B works with the Government of Bangladesh, conducting operations research to improve health and family planning service-delivery. A sample of over 6,000 married women of reproductive age in three project sites was surveyed during 1994 to examine their awareness of STDs. Both bivariate and multivariate analyses were done to examine the effects of some socio-demographic factors associated with the awareness of STDs. Family planning workers were interviewed through focus group discussions to determine their attitudes, beliefs, and knowledge about condom use and its effect on STDs.

Results: About 30% of the sample women knew about syphilis and/or gonorrhoea. Among them, about 30% stated that syphilis, and 13% stated that gonorrhoea, are transmitted through sexual activities and contact with previously infected persons. The remaining 57% were not aware of the transmission mechanisms. Although condom use was low, 37% of condom users reported that condom use can prevent STDs. Awareness and knowledge of transmission of STDs were significantly higher among educated and relatively older women than others. The focus group discussions indicated that family planning and health care service providers have some knowledge of the mechanism of transmission of STDs. They think that condom use should be promoted as a method of fertility regulation as well as for prevention of STDs.

Conclusions: Very little is known about STDs in rural Bangladesh. The incidence of STDs may increase with the increase in employment-related migrations. Findings of the study suggest that health and family planning workers already have some knowledge about STDs, and should undertake activities to provide counselling about the mechanisms of transmission and prevention of STDs.

11:5 THE PATTERN OF FULL AND COMPLEMENTARY BREAST-FEEDING IN RURAL BANGLADESH

AI Chowdhury, Andreś de Francisco and KMA Aziz

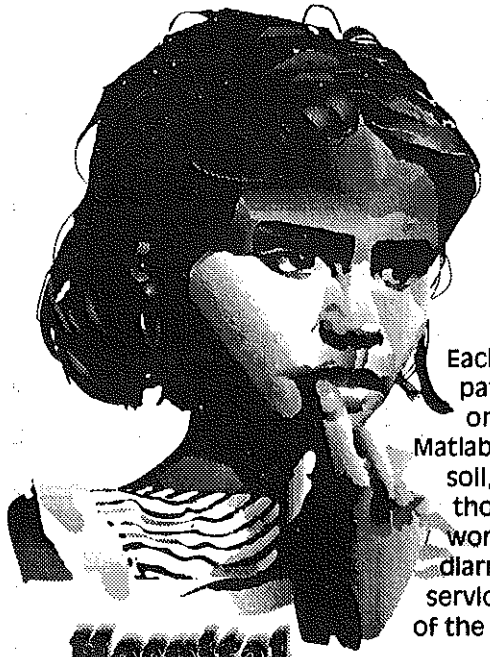
Objective: Examine the sociodemographic characteristics of mothers in relation to the varying durations of breast-feeding.

Methods: The source of data was the Maternal and Child Health-Family Planning Project in Matlab, Bangladesh. In the project area, improved health and family planning services were provided and relevant data were collected. This analysis is based on 6,033 births which took place in 1985 and 1986.

Results: It is hypothesized that the durations of full and complementary breast-feeding are not uniform across socioeconomic levels, which might have an influence on the health of the child and subsequent timing of conception by the mother. The mean durations of full and complementary breast-feeding were 4.8 and 28.8 months respectively. The durations of full and complementary breast-feeding were shorter for younger mothers and those having fewer living children. Mother's level of education had a significant impact on the duration of breast-feeding; educated mothers had fully and complementarily breastfed, respectively, 1.5 and 5 months shorter than uneducated mothers.

Conclusions: Programmes related to infant health and nutrition, and family planning, need to be undertaken in such a way that the pattern of prolonged breast-feeding observed among older mothers, mothers with more living children, and among the uneducated mothers can be used as a good example for other women.

INDEX TO AUTHORS AND SUBJECTS



An Appeal

Hospital Endowment Fund

Each year, ICDDR,B treats over 70,000 patients attending its two hospitals, one in urban Dhaka, the other in rural Matlab. Though they are planted in Bangladeshi soil, they grow because of the dedication of thousands of concerned people throughout the world. The patients are mostly children with diarrhoea and associated illnesses and the services are offered free to the poorer section of the community

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.

To generate enough income to cover most of the patient costs of the hospitals, the fund will need about five million dollars. That's a lot of money, but look at it this way:

JUST $150 IN THE FUND WILL COVER THE COST OF TREATMENT FOR ONE CHILD EVERY YEAR FOREVER!

We hope you will come forward with your contribution so that we can keep this effort growing forever or until the world is free of life-threatening diarrhoea. IT IS NOT AN IMPOSSIBLE GOAL.

Cheques may be made out to: ICDDR,B Hospital Endowment Fund.

For more information please call or write to:
Chairman, Hospital Endowment Fund Committee
GPO Box 128 · Dhaka, 1000, Bangladesh

Telephone: 600-171 through 600-178
Fax: (880-2) 883116

Designed and Produced by Asem Ansari/Audio-Visual Unit, ICDDR,B

Go Ahead

with

AHEAD

CD-ROM On Health & Environmental Information

Whether you are an industrialist or a researcher, a medical practitioner or an environmental specialist, an academician or a policy planner, a student or a pharmaceutical chemist, AHEAD's CD-ROM series will be an indispensable information tool for you. AHEAD (Asian Health, Environmental & Allied Databases) is an international consortium of eight major database owners in five Asian countries, sponsored and supported by International Development Research Centre (IDRC), Canada.

This CD-ROM series will allow fast and efficient data retrieval through convenient easy-to-use search strategies in-built in the CD-ROM. It will also allow full text searching, display of text, illustrations and tables.

The series contains three titles, one each in the areas of Environmental & Resource Management (Disk D1); Traditional Asian Medicines & Natural Products (Disk D2); and Occupational Safety & Health, Natural Toxins and Tropical Diseases (Disk D3). The Disks D1, D2 and D3 are slated to be released in May 95, July 95 and September 95 respectively. Each disk will be updated every six months to include additional information.

Disk D1

- **Collection, treatment, use & recycling of water, waste-water and solid waste**
- **Clean technologies**
- **Environment policies, regulations and EIA data**
- **Pollution control**

Disk D2

- **Traditional Asian medicines**
- **Cultivation, biological activities and utilization of medicinal & aromatic plants**
- **Indian raw materials**

Disk D3

- **Safety & health in the workplace**
- **Plants & animals producing natural toxin**
- **Mosquito-borne & diarrhoeal diseases**

Pricing structure

Each title	:	US $ 400
Two titles	:	US $ 700
Three titles	:	US $ 1000

50% discount will be available to subscribers from the developing countries.

Ordering & Other Information

Please contact: The Executive Director, AHEAD
Publications & Information Directorate, K.S. Krishnan Marg, New Delhi-110 012, India
Tel: 5728385; Fax: 5731353; Telex: 031-77271; e.mail: pid @ simetd.ernet.in

(continued from inside of the front cover....)

analyze large data sets and is complemented by over 250 personal computers scattered throughout the Centre. New e-mail facilities have been established in the Centre.

Diarrhoeal Diseases Information Services Centre (DISC)

DISC provides access to the scientific literature on diarrhoeal diseases, nutrition, population studies, and health in general by means of MEDLINE, AIDS and POPLINE databases on CD-ROMs, and Current Contents on diskettes, 26,230 (as of 31 December 1994) books and bound journals, 11,609 reprints and documents, and 403 current periodicals. DISC publishes the quarterly Journal of Diarrhoeal Diseases Research; two bi-monthly newsletters Glimpse, and ICDDR,B News; a 4-monthly newsletter Shasthya Sanglap in Bangla, working papers, special publications, and monographs.

Staff

The Centre currently has over 200 researchers and medical staff from more than nine countries doing research and providing expertise in many disciplines related to the Centre's areas of research.

What is the Centre's Plan for the Future ?

In the 34 years of its existence ICDDR,B has evolved into a busy cosmopolitan research centre whose scientists have wide-ranging expertise. Future research will be directed towards finding cost-effective solutions to the health and population problems of the most disadvantaged people in the world. The Centre's Strategic Plan "To The Year 2000" outlines work in three key areas:

Child Survival: Diarrhoeal diseases are responsible for the deaths of 3-4 million children every year. Acute and persistent diarrhoea and dysentery will remain priority areas for research on strategies for prevention including behavioural modification in personal and domestic hygiene, provision of appropriate water supply and sanitation to the household, and the development of effective vaccines. The Centre's scientists will contribute to the improvement of the case management of diarrhoea based on better understanding of basic mechanisms, and national and international responses to epidemics. Acute respiratory infections, nutritional deficiency states (including micro-nutrients) and immunization-preventable infectious diseases will also be examined, particularly as they interact with diarrhoea.

Population and Reproductive Health: The Centre has a long history of conducting pioneering research in the areas of population and family planning. The Centre played a key role in raising the contraceptive use rate among women of reproductive age in Bangladesh to almost 45% through technical assistance and operations research. Matlab is now the model for MCH-FP programmes throughout the world, and the Centre is poised to make important contributions to maternal health and safe motherhood. In addition to continuing work in these three areas, the Centre has recently initiated community-based research into STD/RTI/HIV infections.

Application and Policy: The Centre will continue to play a major part in improving both the supply of and demand for existing health technologies, and in replicating the successful interventions piloted in its projects through health systems research. The Centre will increase its communication, dissemination and training efforts to influence international and national health policies in the areas of its expertise. ICDDR,B recognises, and has given a high priority to, the need to transform research findings into action.

BRAC Printers