EFFICACY OF SHORT COURSE ANTIBIOTIC PROPHYLAXIS IN CONTROLLING CHOLERA IN CONTACTS DURING EPIDEMIC

Moslemuddin Khan

INTERNATIONAL CENTRE FOR
DIARRHOEAL DISEASE RESEARCH, BANGLADESH
Dacca, Bangladesh

June 1981

Scientific Report No. 49

EFFICACY OF SHORT COURSE ANTIBIOTIC PROPHYLAXIS IN CONTROLLING CHOLERA IN CONTACTS DURING EPIDEMIC

Moslemuddin Khan
Scientist

INTERNATIONAL CENTRE FOR
DIARRHOEAL DISEASE RESEARCH, BANGLADESH
G.P.O. Box 128, Dacca 2
Bangladesh

PREFACE

The International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) is an autonomous, international, philanthropic and non-profit centre for research, education and training as well as clinical service. The Centre is derived from the Cholera Research Laboratory (CRL). The activities of the institution are to undertake and promote study, research and dissemination of knowledge in diarrhoeal diseases and directly related subjects of nutrition and fertility with a view to develop improved methods of health care and for the prevention and control of diarrhoeal diseases and improvement of public health programmes with special relevance to developing countries. ICDDR,B issues two types of papers: scientific reports and working papers which demonstrate the type of research activity currently in progress at ICDDR,B. The views expressed in these papers are those of authors and do not necessarily represent views of International Centre for Diarrhoeal Disease Research, Bangladesh. They should not be quoted without the permission of the authors.

ABSTRACT

During an epidemic of cholera, vaccination has limited applicability in controlling its spread. It has been seen that one out of every 5-10 *V.cholerae* infected people develop diarrhoea severe enough to require hospital treatment. Most health authorities are concerned with this severely ill group in whom majority of deaths occur.

During the cholera epidemic of 1975 in Dacca two doses of tetracycline were administered to all family contacts of index cases. The control group of cholera cases did not receive the drug. The families were re-visited after 10-12 days and history of any diarrhoea and hospitalisation was obtained.

It was found that the subsequent diarrhoea or cholera cases occurring among the cholera contacts within 10-12 days were not different between the treated (13.5%) and the untreated (14.4%) groups. The occurrence of severe cases requiring hospitalisation was however, significantly reduced in the treated group (8.0% to 4.5%).

In view of the emergence of *V.cholerae* strains resistant to tetracycline, antibiotic sensitivity testing of epidemic strains would be needed before use of tetracycline for protecting cholera contacts as an immediate control measure.

INTRODUCTION

Epidemics of cholera have been reported in many urban areas and various measures have been advocated for its prevention. The first vaccine to prevent cholera was introduced by Ferran (Ferran, 1885). In early 1960s Mosley however, found the effectiveness to be only 60% for 4-6 months in a population where cholera is endemic (Mosley *et al.*, 1969). The usual incubation period of cholera is 2 to 2½ days, and as vaccination gives protection not before 8 days of inoculation, (Sommer *et al.*, 1973) the vaccine is probably, not effective in combating cholera epidemics. Sommer found that vaccination of 5000 contacts at a cost of 300 U.S. dollars can protect only one out of 20 cases (Sommer *et al.*, 1973). Black reported that 12 cases out of 100 acute diarrhoeal hospital admissions in rural Bangladesh are due to *Vibrio cholerae* (Black *et al.*, 1978). Thus according to Mosley's and Black's findings 92 out of 100 hospitalised diarrhoea cases are not protected by vaccination. Nevertheless, preventive measures are politically obligatory for every government, in the face of a cholera epidemic.

Over 16 years ago it was observed that Tetracycline was effective in treating cholera cases (Greenough *et al.*, 1964). Tetracycline was also found useful in Calcutta (Datta G. *et al.*, 1964). MacCormack used tetracycline successfully for preventing cholera among the contacts (MacCormack *et al.*, 1968). That trial was in classical cholera and a large dose for 5 days was used. This is not easy to enforce in epidemic conditions. Therefore, it was felt that the efficacy of a minimum dose of tetracycline prophylaxis should be evaluated against the present epidemic biotype of El Tor cholera. In Bangladesh one of every 5-10 infections with *V.cholerae* El Tor develops severe symptoms requiring hospitalisation (Khan M. *et al.*, 1980). Health authorities are most concerned with this severely ill group, in whom the majority of deaths occur.

During the cholera epidemic in Dacca in 1975 we planned to test the efficacy of only two doses of tetracycline 250 mgm each in reducing secondary cholera among contacts of hospitalised confirmed cholera cases.

MATERIALS AND METHODS

Stool of all hospitalised diarrhoeal cases were tested by dark field microscope and then cultured using Monsur's method for *V.cholerae* (Monsur 1963). On receipt of positive dark field or culture results, the houses of patients were visited by field teams within 12-24 hours of hospitalisation. All *V.cholerae* were sensitive to tetracycline during the time of study. One dose of tetracycline (250 mgm) was administered to all family contacts immediately

and one dose (250 mgm) was supplied for the evening. The contacts of an identical group of cholera cases selected alternately, who were not given the drug and visited initially served as controls. The families were revisited after 10-12 days. History of use of second dose and subsequent diarrhoea were obtained. Three or more loose motion in 24 hours constituted diarrhoea. All hospital admissions with diarrhoeal illness from both the groups were recorded. We could not however revisit all the control families due to unavoidable circumstances. They have been excluded from analysis.

RESULTS

Comparability of study and control groups is shown in Table I. Although social economic status could not be included, over 90% of both the groups came from lower socioeconomic group. Other parameters like age and sex distribution and family size of the study and control groups were comparable and the differences were not significant.

TABLE I--COMPARABILITY OF STUDY AND CONTROL GROUPS

	Age of Index Cases			Sex of Index		Contacts		
Group	0 - 9 Years	10-19 Years	20 + Years	Male	Female	Male	Female	Family Size
Study	48%	17%	35%	46%	54%	44%	56%	6.2
Control	42%	20%	38%	49%	51%	49%	51%	6.7

The number of study and control families and the incidence of diarrhoea occurring within 10-12 days following admissions of the first cholera cases are shown in Table II. It shows that in the treated group there were 246 and in the untreated group 134 new diarrhoea cases. The rates of contacts affected were 13.5% and 14.5% respectively. This difference was not statistically significant.

The number of diarrhoea cases hospitalised from the study and control families within the same period of 10-12 days are also shown in Table II. It shows that 81 contacts were hospitalised from the treated group and 74 from the untreated control group. The rates of hospitalisation were 4.5% and 8.0% respectively for the study and control groups. This difference was statistically highly significant.

TABLE II--INCIDENCE AND HOSPITALIZED DIARRHOEA IN CONTACTS WITH TETRACYCLINE PROPHYLAXIS AND CONTROL FAMILIES

Groups	No. of Families	No. of Members	No. of All Diarrhoeas	Percent Diarrhoea	No. of Contacts Hospitalized	% Hospitalized
Tetracycline Prophylaxis Group	265	1817	246[A]	13.5	81[C]	4.5
Control Group	145	930	134[B]	14.5	74[D]	8.0

A Vs. B = not significant

C Vs. D = χ^2 = 13.5, highly significant

DISCUSSION

As immunization takes 7-8 days to build up protection, it is not a rapidly effective way to control cholera. Although antibiotics are very expensive for prophylaxis, there may be situation in some families, communities or countries where antibiotics could be used as an emergency measure. MacCormack's suggestion for 4 doses daily for 5 days, though effective is very expensive and difficult to practice on mass scale. We have found that the 2 dose treatment does not reduce moderate to mild diarrhoea cases many of which might be due to viral etiology. Mild or moderate cases are not however, of as great concern since they can easily be managed by oral rehydration. The procedure followed in this study was found effective in reducing the number of severe cases of diarrhoea and thus reducing hospitalisation of cholera contacts. With 2 doses of tetracycline the number of hospitalised cases was significantly reduced. We believe a larger dose could afford still better protection. However, in view of the emergence of *Vibrio cholerae* strains resistant to tetracycline (Mhalu *et al.*, 1979; Huq *et al.*, 1980) antibiotic sensitivity testing of epidemic strains would be needed before application of tetracycline as a control measure in special situation where immediate protection of cholera contacts is essential.

CONCLUSION

Two single doses of tetracycline significantly reduced the number of severe cases of diarrhoea and hospitalisation rate of cholera contacts with diarrhoea during epidemic period. Treatment with four doses of tetracycline may afford better protection to the cholera contacts during epidemic. Further testing with a higher dose and convenient time schedule may be worthwhile. Less costly measures such as hand washing should also be investigated (Khan MU, 1981).

ACKNOWLEDGEMENTS

I would like to thank Drs. A.R. Samadi, D. Sack and L. Gothefors for their kind revision and suggestions for improvement of this manuscript. Dr. W.B. Greenough III, Director, ICDDR,B deserves special thanks for revision, comments and encouraging publication of this work.

REFERENCES

1. Black RE, Merson MH, Rowe B, Tailor PR, Rahman ASMM, Huq MI, Aleem ARMA, Sack DA, Curlin GT. Epidemiology of enterotoxigenic *Escherichia coli* in rural Bangladesh. Japan: Proceeding of symposium on cholera Kuratsu, 1978; 292-301.

2. Datta G, Saha TK. Tetracycline therapy in cholera. Bull Calcutta Sch Trop Med 1964; 12:30-33.

3. Ferran J. Nota sobre la profilaxis del colera por medio de invecciones hipodermicas de cultivo puro del bacilo virgula. Siglo med 1885; 32:480.

4. Greenough WB III, Gordon RS Jr, Rosenberg IS, Davies BI, Benenson AS. Tetracycline in the treatment of cholera. Lancet 1964; 1:355-57.

5. Huq MI, Alim ARMA, Mutanda LN, Yunus M, Khan MU. Multiply antibiotic resistant O-group 1 *Vibrio cholerae*-Bangladesh. Morbid Mortal Wkly Rep 1980; 29(10):109-10.

6. Khan M, Shahidullah M. Cholera due to the El Tor biotype equals the classical biotype in severity and attack rates. J Trop Med Hyg 1980; 83:35-39.

7. Khan M. Intervention of shigellosis by hand washing. (submitted for publication to Trans Roy Soc Trop Med Hyg)

8. McCormack WM, Chowdhury AM, Jahangir N, Fariduddin AB, Mosley WH. Tetracycline prophylaxis in families of cholera patients. Bull WHO 1968; 38:787-92.

9. Mhalu FS, Mmari PW, Ijumba J. Rapid emergence of El Tor *Vibrio cholerae* resistant to antimicrobial agents during first six months of fourth cholera epidemic in Tanzania. Lancet 1979; 1:345-47.

10. Monsur KA. Bacteriological diagnosis of cholera under field conditions. Bull WHO 1963; 28:387-89.

11. Mosley WH, McCormack WM, Fahimuddin M *et al.* Report of the 1966-67 cholera vaccine field trial in rural East Pakistan. Bull WHO 1969; 40:177-85.

12. Sommer A, Khan M, Mosley WH. Efficacy of vaccination of family contacts of cholera cases. Lancet 1973; 1:1230-232.

13. Sommer A, Mosley WH. Ineffectiveness of cholera vaccination as an epidemic control measure. Lancet 1973; 1:1232-235.

ICDDR,B publications can be obtained from Head, Library and Publication Branch, International Centre for Diarrhoeal Disease Research, Bangladesh, G.P.O. Box 128, Dacca 2, Bangladesh.

A. CRL Annual Report 1976.

CRL Annual Report 1977.

CRL Annual Report 1978.

ICDDR,B Annual Report 1979.

ICDDR,B Annual Report 1980.

B. Working Paper:

No. 1. The influence of drinking tubewell water on diarrhoea rates in Matlab Thana, Bangladesh by George T. Curlin, K.M.A. Aziz, M.R. Khan. June 1977 (2nd Rep. Sept 1980). 21 p.

No. 2. Water and the transmission of El Tor cholera in rural Bangladesh by James M. Hughes, John M. Boyce, Richard J. Levine, Moslemuddin Khan, George T. Curlin. Dec 1977 (Rep. Mar 1980). 27 p.

No. 3. Recent trends in fertility and mortality in rural Bangladesh 1966-1975 by A.K.M. Alauddin Chowdhury, George T. Curlin. Jan 1978 (Rep. Oct 1979). 14 p.

No. 4. Assessment of the Matlab contraceptive distribution project - implications for program strategy by T. Osteria, Makhlisur Rahman, R. Langsten, Atiqur R. Khan, Douglas H. Huber, W. Henry Mosley. Apr 1978 (Rep. Feb 1981). 25 p.

No. 5. A study of the field worker performance in the Matlab contraceptive distribution project by Makhlisur Rahman, T. Osteria, J. Chakraborty, Douglas H. Huber, W. Henry Mosley. Jul 1978 (Rep. Feb 1981). 17 p.

No. 6. Constraints on use and impact of contraceptives in rural Bangladesh: Some preliminary speculations by R. Langsten, J. Chakraborty. Aug 1978 (Rep. Feb 1981). 23 p.

No. 7. The demographic impact of the contraceptive distribution project by T. Osteria, W.H. Mosley, A.I. Chowdhury. Sept 1978. 17 p.

No. 8. Development of milk teeth in rural Meheran children of Bangladesh by Moslemuddin Khan, George T. Curlin. Sept 1978. 23 p.

No. 9. A follow-up survey of sterilization acceptors in Matlab, Bangladesh by Makhlisur Rahman, Douglas Huber, J. Chakraborty. Oct 1978 (Rep. Jul 1980). 31 p.

No. 10. The demographic impact of sterilization in the Matlab village - based MCH-FP program by T. Osteria, S. Bhatia, J. Chakraborty, A.I. Chowdhury. Nov 1978 (Rep. June 1980). 23 p.

No. 11. Parental dependency on children in Matlab, Bangladesh by Makhlisur Rahman. Dec 1978. 28 p.

No. 12. An areal analysis of family planning program performance in rural Bangladesh by T. Osteria, S. Bhatia, A.S.G. Faruque, J. Chakraborty. May 1979. 19 p.

No. 13. The people of Teknaf: births, deaths and migrations (1976-1977) by Mizanur Rahman, M. Mujibur Rahaman, K.M.S. Aziz, Yakub Patwari, M.H. Munshi, M. Shafiqul Islam. May 1979. 46 p.

No. 14. Pilot study of the calendar rhythm method in the Matlab area of Bangladesh by Stan Becker, Rasheda Akhter. Nov 1980. 23 p.

No. 15. Comparison of measures of childbearing: patterns by age and parity in Matlab, Bangladesh by Stan Becker, Helen Hiltabidle. Mar 1981. 29 p.

No. 16. Demographic studies in rural Bangladesh - May 1969-April 1970 by A.I. Chowdhury, K.M.A. Aziz, Kashem Shaikh. April 1981. 28 p.

No. 17. Demographic studies in rural Bangladesh - May 1970 - April 1971 by A.I. Chowdhury, K.M.A. Aziz, Kashem Shaikh. April 1981. 31 p.

No. 18. Interrelationships among certain socioeconomic variables in a rural population of Bangladesh by M. Shafiqul Islam, Stan Becker. May 1981. 24 p.

No. 19. Effects of diarrhoea on absorption of macronutrients during acute stage and after recovery by Ayesha Molla, Abdul Majid Molla, Shafiqul Alam Sarker, Makhduma Khatoon, M. Mujibur Rahaman. June 1981. 25 p.

No. 20. Intake of nutrient during and after recovery from diarrhoea in children by A.M. Molla, Ayesha Molla, S.A. Sarker, M.M. Rahaman. June 1981. 31 p.

No. 21. Epidemiologic pattern of diarrhoea caused by non-agglutinating vibrio (NAG) and EF-6 organisms in Dacca by Moslemuddin Khan, M. Shahidullah. June 1981. 29 p.

C. Scientific Report:

No. 1. Double round survey on pregnancy and estimate of traditional fertility rates by A.K.M. Alauddin Chowdhury. Jul 1977 (Rep. May 1978). 28 p.

No. 2. Pattern of medical care for diarrheal patients in Dacca urban area by Moslemuddin Khan, George T. Curlin, Md. Shahidullah. Aug 1977 (Rep. June 1978). 20 p.

No. 3. The effects of nutrition on natural fertility by W. Henry Mosley. Aug 1977 (2nd Rep. Dec 1980). 25 p.

No. 4. Early childhood survivorship related to the subsequent interpregnancy interval and outcome of the subsequent pregnancy by Ingrid Swenson. Aug 1977 (Rep. Apr 1979). 18 p.

No. 5. Household distribution of contraceptives in Bangladesh - the rural experience by Atiqur R. Khan, Douglas H. Huber, Makhlisur Rahman. Sept 1977 (Rep. Dec 1979). 19 p.

No. 6. The role of water supply in improving health in poor countries (with special reference to Bangladesh) by John Briscoe. Sept 1977 (Rep. Feb 1979). 37 p.

No. 7. Urban cholera study, 1974 and 1975, Dacca by Moslemuddin Khan, George T. Curlin. Dec 1977 (Rep. May 1980). 24 p.

No. 8. Immunological aspects of a cholera toxoid field trial in Bangladesh by George T. Curlin, Richard J. Levine, Ansaruddin Ahmed, K.M.A. Aziz, A.S.M. Mizanur Rahman, Willard F. Verwey. Mar 1978. 16 p.

No. 9. Demographic Surveillance System - Matlab. Volume One. Methods and procedures. Mar 1976. 28 p.

No. 10. Demographic Surveillance System - Matlab. Volume Two. Census 1974 by Lado T. Ruzicka, A.K.M. Alauddin Chowdhury. Mar 1978. 48 p.

No. 11. Demographic Surveillance System - Matlab. Volume Three. Vital events and migration, 1975 by Lado T. Ruzicka, A.K.M. Alauddin Chowdhury. Mar 1978. 45 p.

No. 12. Demographic Surveillance System - Matlab. Volume Four. Vital events and migration, 1975 by Lado T. Ruzicka, A.K.M. Alauddin Chowdhury. Mar 1978. 48 p.

No. 13. Demographic Surveillance System - Matlab. Volume Five. Vital events, migration and marriages - 1976 by Lado T. Ruzicka, A.K.M. Alauddin Chowdhury. Mar 1978. 55 p.

No. 14. Ten years review of the age and sex of cholera patients by Moslemuddin Khan, A.K.M. Jamiul Alam, A.S.M. Mizanur Rahman. May 1978. 18 p.

No. 15. A study of selected intestinal bacteria from adult pilgrims by M.I. Huq, G. Kibriya. Aug 1978 (Rep. Feb 1980). 15 p.

No. 16. Water sources and the incidence of cholera in rural Bangladesh by Moslemuddin Khan, W. Henry Mosley, J. Chakraborty, A. Majid Sarder, M.R. Khan. Dec 1978. 19 p.

No. 17. Principles and prospects in the treatment of cholera and related dehydrating diarrheas by William B. Greenough, III. Jan 1979. 20 p.

No. 18. Demographic Surveillance System - Matlab. Volume Six. Vital events and migration 1977 by Aporn Samad, Kashem Sheikh, A.M. Sarder, Stanley Becker and Lincoln C. Chen. Feb 1979. 65 p.

No. 19. A follow-up survey of sterilization acceptors in the modified contraceptive distribution projects by Shushum Bhatia, Trinidad Osteria, J. Chakraborty, and A.S.G. Faruque. Feb 1979. 25 p.

No. 20. Cholera due to the El Tor biotype equals the classical biotype in severity and attack rates by Moslemuddin Khan and Md. Shahidullah. Mar 1979. 20 p.

No. 21. An estimation of response bias of literacy in a census of rural Bangladesh by M. Shafiqul Islam, George T. Curlin and K.M.A. Aziz. Mar 1979. 26 p.

No. 22. *Vibrio cholerae* by William B. Greenough, III. Apr 1979. 43 p.

No. 23. M.R. Clients in a village based family planning programme by Shushum Bhatia and Lado T. Ruzicka. Apr 1979. 26 p.

No. 24. Passive hemagglutination assays for quantitation of cholera antitoxin: gluteraldehyde and chromium chloride used as coupling reagents to sensitize human erythrocytes with purified choleragen by Ansaruddin Ahmed, Kh. Abdullah Al Mahmud, George T. Curlin. June 1979. 25 p.

No. 25. Investigation of outbreak of dysentery due to *Shigella sonnei* in a small community in Dacca by M.I. Huq. June 1979. 21 p.

No. 26. Indigenous birth practices in rural Bangladesh and their implications for a maternal and child health programme by Shushum Bhatia, J. Chakraborty, A.S.G. Faruque. July 1979. 24 p.

No. 27. Isolation, purification and characterization of a Shigella phage by M.I. Huq, M.A. Salek. July 1979. 18 p.

No. 28. Growth and development studies: Meheran by Moslemuddin Khan, George T. Curlin, J. Chakraborty. July 1979. 33 p.

No. 29. Report on reactigenicity and immunogenicity of Wellcome Cholera Toxoids in Bangladeshi volunteers by Robert E. Black, Md. Yunus, Abu Eusof, Ansaruddin Ahmed, M.R. Khan, David A. Sack. July 1979. 55 p.

No. 30. Strongyloides Stercorális Larvae recovered from patients with diarrhoea and dysentery by G.H. Rabbani, Robert H. Gillman, Asma Islam. July 1979. 18 p.

No. 31. The condom in rural Bangladesh - A special effort is needed by Douglas Huber, Makhlisur Rahman, J. Chakraborty. Aug 1979. 14 p.

No. 32. The Matlab contraceptive distribution project by Makhlisur Rahman, W.H. Mosley, Atiqur Rahman Khan, A.I. Chowdhury, J. Chakraborty. Dec 1979. 119 p.

No. 33. Epidemiologic study of dysentery cases of Dacca Urban Area by Moslemuddin Khan, Md. Shahidullah. Jan 1980. 30 p.

No. 34. The gut as an immune organ by A.M. Molla. Feb 1980. 51 p.

No. 35. Microbiological surveillance of intra-neighbourhood El Tor cholera transmission in rural Bangladesh by W.M. Spira, Y.A. Saeed, M.U. Khan, M.A. Sattar. Mar 1980. 39 p.

No. 36. Lobon-gur (common salt and brown sugar) oral rehydration solution in the diarrhoea of adults by M.R. Islam, W.B. Greenough III, M.M. Rahaman, A.K. Azad Chowdhury, D.A. Sack. Apr 1980. 19 p.

No. 37. Utilisation of a diarrhoea clinic in rural Bangladesh: Influence of distance, age and sex on attendance and diarrhoeal mortality by M. Mujibur Rahaman, K.M.S. Aziz, M.H. Munshi, Yakub Patwari, Mizanur Rahman. June 1980. 22 p.

No. 38. Birth care practice and neonatal tetanus in a rural area of Bangladesh by M. Shafiqul Islam, M. Mujibur Rahaman, K.M.S. Aziz, M.H. Munshi, Mizanur Rahman, Yakub Patwari. Jul 1980. 19 p.

No. 39. Hours of onset of cholera classical and El Tor and diarrhoea by Moslemuddin Khan. Aug 1980. 18 p.

No. 40. Socio-economic differentials in mortality in a rural area of Bangladesh by Stan D'Souza, Abbas Bhuiya, Mizanur Rahman. Nov 1980. 31 p.

No. 41. Reduction of neonatal mortality by immunization of non-pregnant women and women during pregnancy with aluminum adsorbed tetanus toxoid by Makhlisur Rahman, Lincoln C. Chen, J. Chakraborty, Md. Yunus, A.I. Chowdhury, A.M. Sarder, Shushum Bhatia, George T. Curlin. Jan 1981. 25 p.

No. 42. Are there barefoot doctors in Bangladesh: A study of non-government rural health practitioners by A.M. Sarder, Lincoln C. Chen. Jan 1981. 28 p.

No. 43. Factors related to acceptance of tetanus toxoid immunization among pregnant women in a maternal-child health programme in rural Bangladesh by Makhlisur Rahman, Lincoln C. Chen, J. Chakraborty, Md. Yunus, A.S.G. Faruque, A.I. Chowdhury. Jan 1981. 33 p.

No. 44. Infant mortality in rural Bangladesh: an analysis of causes during neonatal and postneonatal period by M. Shafiqul Islam, M. Mujibur Rahaman, K.M.S. Aziz, Mizanur Rahman, M.H. Munshi, Yakub Patwari. April 1981. 21 p.

No. 45. Role of water supply and sanitation in the incidence of cholera in refugee camps by Moslemuddin Khan. May 1981. 21 p.

No. 46. Infant deaths, determinants and dilemmas (A cohort analysis for rural Bangladesh) by A.K.M. Alauddin Chowdhury. May 1981. 30 p.

No. 47. Demographic surveillance system - Matlab. Volume Seven. Vital events and migration - 1978 by Mridul K. Chowdhury, Stan Becker, Abdur Razzaque, A.M. Sarder, Kashem Shaikh, Lincoln C. Chen. May 1981. 80 p.

No. 48. Determinants of natural fertility study. Volume One. Methods and descriptive tables for the prospective study 1975-1978 by A.K.M. Alauddin Chowdhury, Stan Becker. May 1981. 55 p.

D. Special Publication:

No. 1. Management of cholera and other acute diarrhoeas in adults and children - World Health Organization. Sept 1977 (2nd Rep. Nov 1980). 26 p.

No. 2. Index to CRL publications and scientific presentations 1960-1976 by Susan Fuller Alamgir, M. Shamsul Islam Khan, H.A. Spira. Aug 1978. 70 p.

No. 3. Working manual for *E.coli* enterotoxin assay and Elisa assay for rota virus antigen by M.I. Huq, D.A. Sack, R.E. Black. Apr 1979. 32 p.

No. 4. Index to CRL publications and scientific presentations 1977-1978 and addenda for 1962, 1964-1976 by M. Shamsul Islam Khan. Jan 1980. 69 p.

No. 5. ICDDR,B Progress report 1979-1980. Apr 1980. 60 p.

No. 6. The treatment of acute diarrhoea in children: an historical and physiological perspective by Norbert Hirschhorn. May 1980. 68 p.

No. 7. Campylobacter Fetus SSP Jejuni: a laboratory manual by Martin J. Blaser. June 1980. 40 p.

No. 8. Standing orders for evaluation and treatment of patients with diarrhoea symptoms who come to the Travellers Clinic at ICDDR,B. Sept. 1980. 11 p.

No. 9. Proceedings of the National Workshop on Oral Rehydration. Oct 1980. 32 p.

No. 10. Proceedings of the Consultative Group meeting of the International Centre for Diarrhoeal Disease Research, Bangladesh. Nov 1980. 58 p.

No. 11. A review of findings on the impact of health intervention programme in two rural areas of Bangladesh Makhlisur Rahman, Stan D'Souza. Nov 1980. 30 p.

No. 12. Training manual on treatment and prevention of diarrhoea-instruction to trainers. Dec 1980. 20 p. (English and Bengali)

No. 13. A population laboratory for studying disease processes and mortality - The demographic surveillance system, Matlab, Comilla, Bangladesh by Stan D'Souza. June 1981. 45 p.

E. Monograph Series:

No. 1. Kinship in Bangladesh by K.M. Ashraful Aziz. May 1979. 250 p. (Price Tk. 85.00/£5.00/US $10.00).

F. Thesis and Dissertation:

No. 1. Chlorpromazine as a therapeutic antisecretory agent in cholera and related diarrhoeas by G.H. Rabbani. Dec 1980. 73 p.

No. 2. Village practitioners of Bangladesh: their characteristics and role in an oral rehydration programme by A.S.M. Mizanur Rahman. Feb 1981. 72 p.

No. 3. Complications of measles in rural Bangladesh (Long term complications in the under-two) by Niger S. Shahid. June 1981. 49 p.

G. GLIMPSE: ICDDR,B Monthly Newsletter. Vol. 1, No. 1, Jan 1979-