

UTILISATION OF A DIARRHOEA CLINIC IN RURAL BANGLADESH :  
INFLUENCE OF DISTANCE, AGE AND SEX ON ATTENDANCE  
AND DIARRHOEAL MORTALITY

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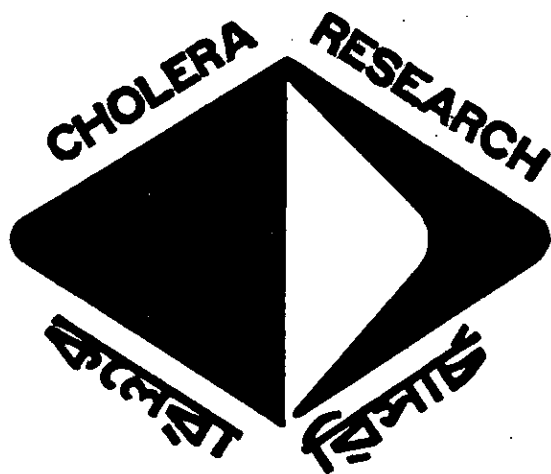
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Dacca, Bangladesh

June, 1980

Scientific Report No. 37

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## 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

Attendance rates at a diarrhoea clinic were monitored in a defined population in rural Bangladesh. Communities within seven miles of the clinic were followed. Within the first one mile radius, 90% of diarrhoeal cases came to the clinic for treatment. At three miles the attendance fell to 70% for males and 40% for females. On an average, greater the distance to the clinic, more severe was the degree of dehydration on presentation. Mortality secondary to diarrhoea was significantly reduced within four mile radius of the clinic.

## INTRODUCTION

Dehydration is the most frequent cause of death in diarrhoea. Recent developments in the management of cholera and other diarrhoeas with intravenous and oral rehydration fluids have shown that case fatality rates can be lowered to less than 1%.<sup>1</sup> In order to reduce diarrhoeal mortality in countries with a high endemicity, WHO and UNICEF, under the global diarrhoeal disease control programme are advocating extensive use of oral rehydration.<sup>2</sup> To achieve this objective the need for training on management of diarrhoea for physicians and paramedics of the rural health centres, sub-centres and health posts have been recognised. However, the population, obviously must utilise the facilities provided by the health services staff if it is to have an impact. An important variable in utilisation rates is the accessibility of the health personnel to the population. The pattern of utilisation of health centres by the rural population and determination of their impact on diarrhoeal mortality are considered important subjects deserving priority attention. This report presents the results of information collected in Teknaf, a remote area of Bangladesh where a diarrhoea-clinic was established after an outbreak of severe dysentery.<sup>3</sup> The demographic base surrounding the diarrhoea-clinic in Teknaf combined with a regular surveillance system to collect information on diarrhoeal mortality enabled us to answer the following questions: (a) What proportion of total diarrhoeal patients from a community attended the diarrhoea clinic? (b) Did the accessibility to the clinic affect the attendance rate? (c) Were there any other patient characteristics that affected attendance to the clinic? (d) Could accessibility of the clinic have an impact on mortality rates?

## MATERIALS AND METHODS

### Teknaf Diarrhoea Treatment Centre and the Surrounding Communities:

The diarrhoea treatment centre established in September 1974, provided free service to the community. It was staffed by a trained physician assisted by a nurse and other staffs. Diagnostic facilities like stool microscopy and bacteriological cultures were also available. The surrounding communities were connected to the clinic by a number of dirt roads. There are no natural barriers such as rivers or hills, which impeded the attendance

of the patients from the communities surrounding the treatment centre. No vehicles were available to transport the patients. Seriously ill patients were carried to the centre on a chair carried by several people, but most of the school-age children and adults walked to the centre, small children were carried by their parents or an older sibling. The clinic was open from the morning till late in the afternoon. Any emergency case requiring intravenous infusion was attended by a trained nurse or the physician, one of whom was always available near the centre.

Collection of Information on Diarrhoea and Dysentery at the Clinic and from the Communities:

A comprehensive census was carried out in 1975 in the villages in Teknaf. Each family was provided with a household card with an identifying number. If any member of the family developed diarrhoea or dysentery\* they attended the treatment centre with the card, to facilitate identification. At the clinic, the history of illness was recorded on a standard diarrhoea/dysentery reporting form and a sample of stool obtained for microscopic examination and bacteriological culture. Oral rehydration with glucose-electrolyte oral solution was used in cases with mild or moderate dehydration; intravenous "Dacca Solution"\*\*\* was used in dehydration with signs of shock like feeble or absent radial pulse, sunken eyes and poor skin turgor. Tetracycline and ampicillin were used in appropriate cases.

A trained field assistant, accompanied by a female village worker visited each family once a week to record incidences of diarrhoea and dysentery in the family. The diarrhoea/dysentery reporting form were used to report all diarrhoeal cases. Whenever possible rectal swabs or faecal samples were collected for bacteriological cultures. Patients with active symptoms were advised to attend the clinic by the field staff. The decision however, rested with the patients or their attendants. All the field staff carried UNICEF-supplied, glucose-electrolyte oral salt packets during the home visits and used it to combat dehydration before bringing the patients to the treatment centre.

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\* Diarrhoea was defined as three or more loose or watery effortless motions in 24 hours with or without vomiting but usually not accompanied by abdominal pain or fever. Dysentery was defined as frequent passage of mucoid and/or bloody stool with accompanying abdominal pain, tenesmus and in some cases, fever.

\*\* Dacca solution is a pyrogen-free intravenous fluid containing sodium 133 mEq/l; potassium 13 mEq/l; bicarbonate (as acetate) 48 mEq/l and chloride 98 mEq/l.

### Collection of Mortality Information:

All information on mortality was collected during the home visits from a responsible member of the family and recorded on a standard mortality reporting form. The report was scrutinized by the physician who visited the family to confirm the cause of death.

Reports on diarrhoea and dysentery, collected at the treatment centre and from home-visits were edited, scrutinized and analysed.

## RESULTS

Evaluation of the utilisation of the diarrhoea clinic in Teknaf was based on attendance during the calendar years 1977 and 1978. Table 1 shows the percentage of population, the attack rates from diarrhoea and attendance at the clinic in relationship to distances from the clinic. The demographic characteristics and the age-specific attendance rates are shown in Table 2. Five hundred and fifty of these patients were found to be shigella-positive and six were cholera positive in 1977. In 1978, 640 were shigella positive and 64 were cholera positive. The treatment centre was also attended by cases outside the communities under study but were excluded from this analysis.

### Relationship between Distance, Attendance and Sex:

The impact of distance on utilisation of the treatment centre is shown in Figure 1. Over 90% of all reported diarrhoeal patients of both sexes living within one mile of the treatment centre utilised the services. The attendance rate fell to nearly 70% for male patients and 45% for female patients located within two miles radius. Sixty percent of all male and 35% female diarrhoeal patients utilised the services of the centre if they were located within three miles.

### Relationship between Distance, Age and Sex on Attendance:

Figure 2 shows further analysis of age and sex-specific attendance at the clinic from a distance of three miles. Almost all male patients regardless of age came to the treatment centre

TABLE 1

PERSON-YEARS OF OBSERVATION, DIARRHOEAL EPISODES AND ATTENDANCE  
TO TEKNAF CLINIC BY DISTANCE DURING 1977 AND 1978

Distance	Person years of observation		Diarrhoeal episodes		Clinic attendance		
	Number	Percent	Number	Per 1000 pop.	Number	Per 1000 dia.	Per 1000 pop.
< 1	11844	26	1583	134	1507	952	127
1-3	20580	44	1689	82	1071	634	52
3+	13859	30	1270	92	408	321	29
All	46283	100	4542	98	2986	657	64



TABLE 2

PERSON YEARS OF OBSERVATION, DIARRHOEAL EPISODES AND  
CASE-ATTENDANCE BY AGE DURING 1977 AND 1978

Age	Population		Diarrhoeal episodes		Case-attendance	
	No.	Percent	No.	Per 1000 pop.	No.	Per 1000 pop.
< 1	2175	4.7	554	255	320	147
1-4	6711	14.5	1410	210	958	143
5-9	8423	18.2	631	75	409	49
10-14	6618	14.3	257	39	183	28
15+	22356	48.3	1690	76	1116	50
All ages	46283	100.0	4542	98	2986	64

FIGURE 1

Case attendance rate of diarrhoeal patients according to distance and sex in Teknaf during 1977 - 1978.

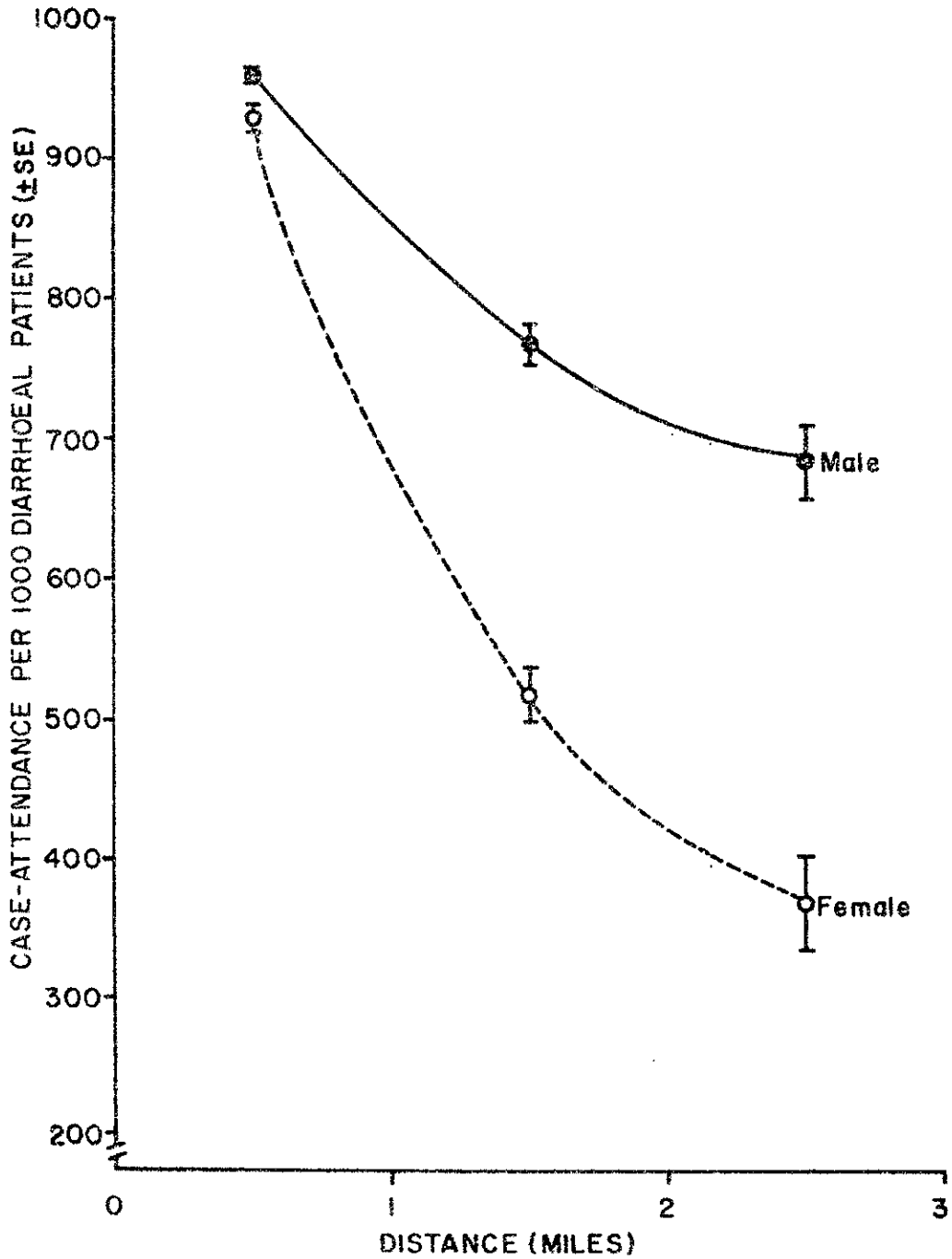
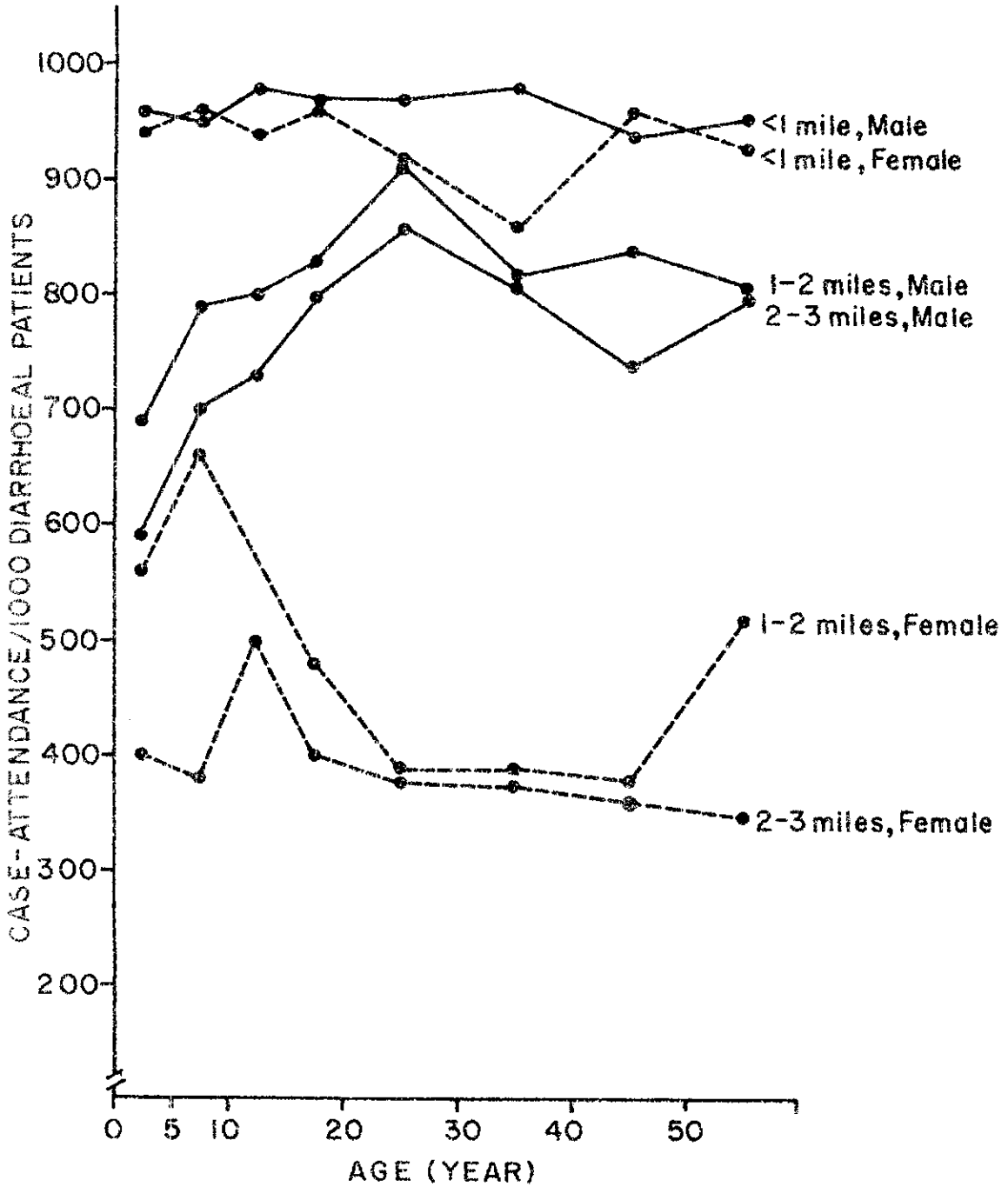


FIGURE 2

Case attendance rate of diarrhoeal patients according to age, distance and sex in 1976 and 1977 in Teknaf.



if they lived within one mile of the clinic. Female patients who lived within one mile of the clinic showed a lower rate of attendance, particularly in the ages between 15-45 years. For distances between 2-3 miles the attendance of male infants was over 60% but it reached a level of over 80% for adolescents. For female patients residing between 1-2 miles, the attendance at infancy was less than 50%. This rose to slightly over 60% for pre-adolescents, but subsequently dropped sharply to 40%. This level of attendance of female patients continued for the 15-45 year age period but increased again after 45 years of age. For female patients located between 2-3 miles the rate of attendance remained less than 40% irrespective of age. The pattern of attendance of the male patients located within 2-3 miles was similar to those located within 1-2 miles from infancy up to the age of 25 years. Subsequently there was a drop in the attendance rate from nearly 90% at 25 years to 60% at 45 years.

#### Distance, Attendance and Requirements of Intravenous Fluid:

Table 3 shows the requirement of intravenous infusion in relation to the distance from the centre. A higher number (8% of patients required intravenous infusion if they lived beyond two miles from the treatment centre compared to the number (3% when they came from < 1 mile.

#### Distance from the Clinic and Diarrhoeal Mortality:

Since there were only a few diarrhoea-related deaths in the communities surrounding the treatment centre all such mortality occurring during the three year period between 1976 and 1978 were pooled together to determine their relationship with the distance. A total of 111 deaths due to diarrhoea occurred during this period. Table 4 shows the breakdown according to age, sex and distance. It was noted that twice the number of male infants compared to female infants seemed to have died following attacks of diarrhoea but this large difference was not maintained at later ages despite the difference in attendance rates between male and female patients. Figure 3 shows the inverse relationship between attendance and diarrhoeal mortality. The annual mortality due to diarrhoea varied between 100 to 150 per 100,000 population for distances up to four miles but increased sharply beyond this distance and became 270 per 100,000 for the population living at distances of six miles from the centre. The villages located at and beyond six miles from the diarrhoeal clinic did not seem to utilise the services enough to make an impact on diarrhoeal

TABLE 3

REQUIREMENT OF INTRAVENOUS FLUID IN DIARRHOEAL PATIENTS  
ATTENDING THE TREATMENT CENTRE IN TEKNAF  
ACCORDING TO DISTANCE IN 1977 AND 1978

Distance (miles)	N u m b e r		% IV Administered
	Patients	IV Required	
< 1	1507	49	3
1-3	1071	63	6
3+	408	31	8
All	2986	143	5

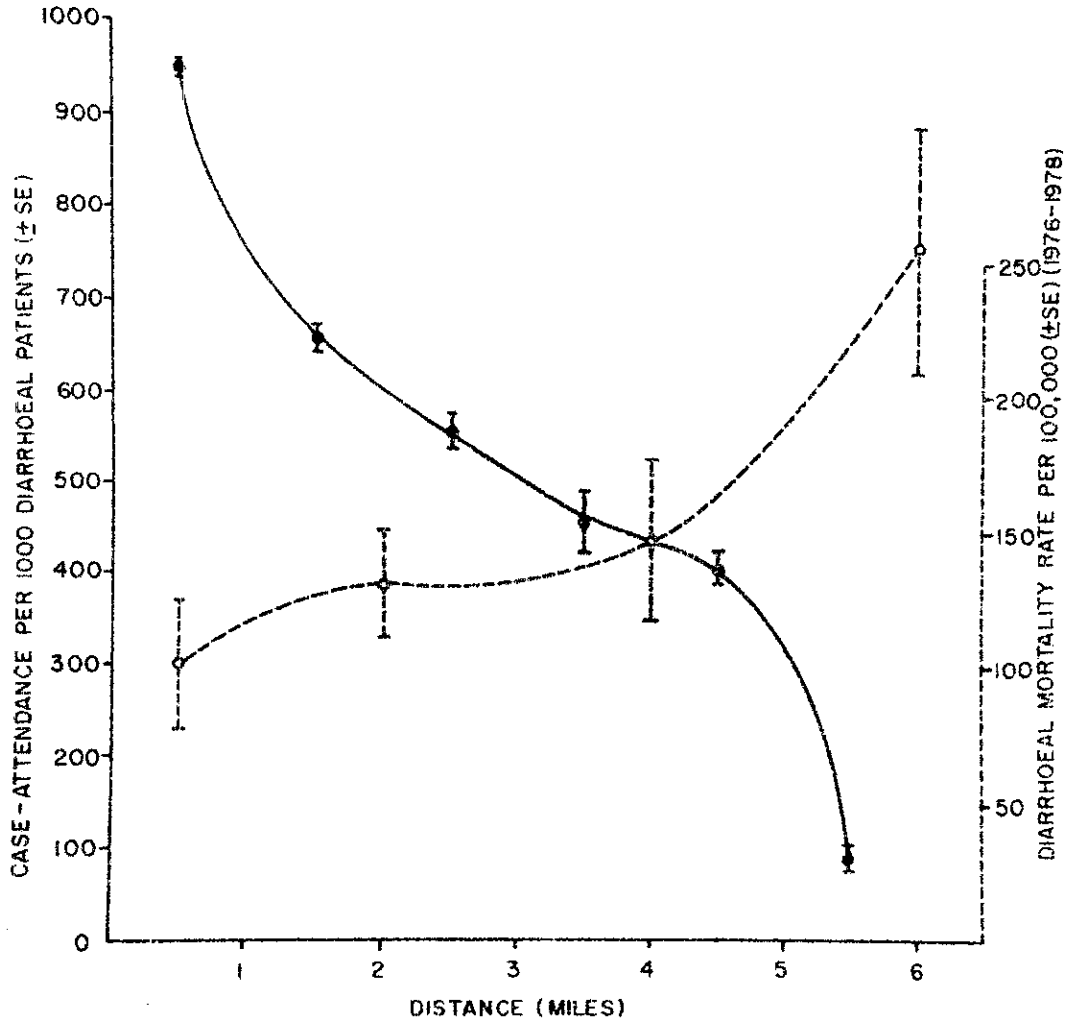
TABLE 4

DIARRHOEAL MORTALITY ACCORDING TO AGE, SEX AND DISTANCE FROM THE  
TEKNAF DIARRHOEAL TREATMENT CENTRE DURING 1976 - 1978

Age	Distance (miles)						All distances	
	< 1		1 - 3		3+		Males	Females
	Males	Females	Males	Females	Males	Females		
< 1	0	3	7	2	12	4	19	9
1-4	4	3	7	13	8	9	19	25
5+	2	6	5	6	13	7	20	19
All ages	6	12	19	21	33	20	58	53

FIGURE 3

Relationship between distance, case-attendance rates and diarrhoeal mortality in Teknaf. (Due to small number of diarrhoeal deaths mortality rates were calculated for greater intervals than case-attendance rates).



mortality. Areas of Teknaf without any medical facilities also showed a diarrhoeal mortality between 250 to 300 per 100,000 population per year. The trend of mortality in relation to distances was statistically significant ( $P < 0.01$ ) as was also the attendance ( $P < 0.001$ )<sup>4</sup>. However the crude mortality rates from all causes in these communities varied between 15-18 per 1000 population and the trend in crude mortality was not statistically significant.

## DISCUSSION

Many factors have been known to affect the rates of attendance to a treatment centre. Earlier observations based on hospitalisation rates have shown the simple relationship of distance on utilisation rate<sup>5,6,7</sup>. These studies, however, were not based on a definite denominator or longitudinal surveillance of morbidities and mortalities like those in Teknaf.

Large majority of the inhabitants of Teknaf are poor and the free-service at the clinic assured that ability to pay for services would not be a factor. The quality of services at the centre was considered adequate and no other comparable treatment facilities for diarrhoea were available in the area. No natural barriers (like a river or a hill) could have physically affected the movement of the patients. Road communication with the centre from the surrounding communities was poor and often difficult, particularly during the rainy season. This, however, did not seem to impede the movements of the population between villages or to the local markets. In Teknaf the buses were used exclusively, to go to the nearest town, Cox's Bazar, 60 miles away. Attendance at the centre therefore was presumably determined by the patient's or his attendant's assessment of the need and convenience.

When a male adult had a diarrhoeal attack and it was sufficiently discomforting, he could walk to the treatment centre without much difficulty. On the otherhand, a child suffering from diarrhoea had to depend on his parents decision and then someone had to carry the child to the clinic. This required considerable physical effort if the distance was long. The effort may have competed with more pressing household commitments or wage-earning activities like farming or fishing. The drop in case-attendance rate with distance was therefore not a surprising finding. The high rate of attendance within one mile radius indicates that many mild cases probably have utilised the services of the centre due to its location.



For female patients, travelling presented not only a physical but also a social barrier. The inhabitants of Teknaf are predominantly conservative Muslim. Adolescent girls and young adult women are not expected to move about freely. When they have to do so, a "burqa" or a veil is used to cover their body and face. Although many women attended the diarrhoea clinic, majority of them came from a very short distance. A male child (in this society) is considered more valuable than a female child which might explain the difference in attendance rate at the clinic during the infancy and early childhood.

The impact of a static treatment centre in reducing mortality from serious diseases has not, to our knowledge, been documented in longitudinal studies. The diarrhoea related deaths in this three year observation (Figure 3) showed that the impact of the treatment centre was greatest within a distance of four miles. This appears to be a reflection of the pattern of utilisation of the centre. Early attendance of diarrhoea patients located within a short distance probably saved lives by preventing shock and other complications. The inevitable delay before treatment of patients who lived further from the treatment centre might have made them more vulnerable to deaths from dehydration or other complications. The longer the distance of the centre from the community the greater was the likelihood of mortality from diarrhoea.

The programmatic implications of this observation in the rural community of Teknaf are many: (1) Is it feasible to establish treatment centres at interval of eight miles? (2) Would better communication or mode of travel increase the attendance rate? (3) Would emphasis on prevention of dehydration by extensive use of glucose-electrolyte oral rehydration therapy through community based health workers be more effective in saving lives in diarrhoeal patients? Whatever the answers to these questions might be, it is clear that static treatment-centres by themselves may have limited impact in the developing countries, although they might be effective in reducing the diarrhoeal mortality around the immediate vicinity of such centres. A mobile unit may not be very satisfactory as diarrhoea tends to occur at infrequent intervals and often requires immediate attention.

The control of diarrhoeal deaths will depend on improvement of water supply and environmental sanitation. As a short-term measure oral rehydration at the community level should produce a desired impact on diarrhoeal mortality<sup>8</sup>. An appropriate approach for reducing mortality in the highly endemic areas

Therefore might be the provision of early oral rehydration at the household or neighbourhood level so that rehydration could be initiated soon after the onset of diarrhoea. Those cases which could not be managed at the community level might be referred to the static treatment-centre where more energetic therapy including intravenous rehydration and antibiotics may be used. Establishment of an effective referral chain as envisaged under the primary health care concept that is advocated at present might help to reduce deaths in the rural areas of the developing countries<sup>9</sup>.

REFERENCES

1. Nalin DR, Cash RA, Islam R, et al: Oral maintenance therapy for cholera in adults. *Lancet* 2:370-372, 1968
2. Anonymus. The control of acute diarrhoeal diseases: WHO and UNICEF collaborate in country programmes. *WHO Chron* 33:131-134, 1979
3. Rahaman MM, Khan MU, Aziz KMS, et al: An outbreak of dysentery caused by *Shigella dysenteriae* type 1 on a coral island in the Bay of Bengal. *J Infect Dis* 132:15-19, 1975
4. Snedecor GW, Cochran WG: Statistical methods. Ames, The Iowa State University Press, 1967: 246-48
5. Fendall NRE: Medical planning and the training of personnel in Kenya. *J Trop Med Hyg* 68:12-20, 1965
6. Jolly R, King M: The organization of health services. In: King M, ed: Medical care in developing countries. Nairobi, Oxford University Press; 2:1 - 2:12, 1966
7. Gish O, Walker G: Transport and communication system in health services. *Trop Doct* 7(3):119-122, 1977
8. Rahaman MM, Aziz KMS, Patwari Y, et al: Diarrhoeal mortality in two Bangladeshi villages with and without community-based oral rehydration therapy. *Lancet* 2(8147):809-812, 1979
9. Anonymus. Primary health care. Geneva: World Health Organization, 1978

ICDDR,B (CRL) publications can be obtained from Publications Unit, 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.

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 and M.R. Khan. June 1977 (Rep. Sept. 1978). 21 p.
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Special Publication:

No. 1. Management of cholera and other acute diarrhoeas in adults and children - World Health Organization. Sept 1977. 26 p.

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No. 5. ICDDR,B Progress Report 1979-80. Apr 1980. 60 p.

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