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FATAL DYSENTERY IN RURAL BANGLADESH

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Abstract

The purpose of this study was to find out the actual circumstances which lead to dysentery - related deaths in the rural Bangladesh. The Community Health Workers of the International Centre for Diarrhoeal Disease Research, Bangladesh have been collecting records of all deaths at the rural area of Matlab through a surveillance system since 1963. A review of existing data on dysentery - related deaths from this area during 1976 - 1981 suggests that deaths in children followed a recurring seasonal pattern with an increase during the post - monsoon season of August - November of each year. This seasonal pattern of death was not evident among adults. The overall dysenteric death rate during 1978 - 1981 was 13.3 per 10,000 population per year. The highest rates were in patients of the two extreme age groups. Deaths reported recently by the health workers were re - investigated. Although the causal agents producing fatal dysentery in most patients in the community remained unidentified, it was likely to be species of *Shigella* in childhood deaths. To identify clinical determinants of a fatal outcome, a case - control analysis was done with patients hospitalised with dysentery in 1980. The risk factors shown to be significantly associated with deaths were: longer median duration of illness ($p = < 0.001$), female sex ($p = 0.039$), signs of respiratory infection ($p = < 0.001$) and severe malnutrition ($p = 0.002$).

Key words: *Shigella*; Dysentery; Causes of death; Risk factors; Seasonality; Mortality.

Introduction

Since 1963, the ICDDR,B has been maintaining a system of demographic surveillance using lay - workers who reported the causes of all deaths in the residents of Matlab upazila, Bangladesh (1). Presently, dysentery is the most common cause of diarrhoea - related deaths in Bangladesh (2,3). Although many complications of dysentery have been described in hospitalised patients, the circumstances which lead to dysentery - related deaths in the rural community are poorly understood.

The objectives of the present study were: i) to document the magnitude of dysenteric mortality in the rural community of Matlab by reviewing the existing surveillance data, ii) to identify the circumstances which most commonly precede dysentery - related deaths in the rural community by re - investigation of the field workers' reports, and iii) to identify the clinical determinants of a fatal outcome by a case - control analysis of patients with dysentery at the Matlab Treatment Centre of ICDDR,B.

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Materials and methods

Mortality data from the Matlab Surveillance Area for 1976 - 1981 were obtained from computerised files at ICDDR,B in Dhaka. Deaths attributed to dysentery were analysed by month and year of death and by age of patients at death to measure mortality rates and to examine seasonal variations.

To characterise the circumstances preceding dysentery - related deaths, all incoming reports of dysentery - related deaths that

occurred within the previous two months (December 1981 to March 1982), were re-investigated. A team consisting of two physicians and a Health Assistant visited the houses of the deceased and interviewed family members who had direct knowledge of events leading to the patient's death, using a questionnaire. For purposes of our investigation, "dysentery" was defined as an illness with passing bloody-mucoid stools associated with either abdominal pain, fever, or tenesmus.

To identify risk factors for fatal illnesses, we reviewed the medical records for all patients with fatal bloody-mucoid diarrhoea admitted to the Matlab Treatment Centre of ICDDR,B in 1980. For each case, the next consecutive hospital admission for bloody-mucoid diarrhoea which was not fatal was selected as a control. The presence of lower respiratory tract infection or recent history of a febrile illness with skin rash was recorded from the medical history and physical findings of each patient on admission. These information were routinely entered on a standard admission form by the attending physician. Severe malnutrition of a patient was defined as having an admission body weight below 60% of the National Center for Health Statistics (NCHS) 50th percentile. Laboratory reports of stool microscopy for leukocyte count, detection of *Entamoeba histolytica, Giardia lamblia*, and stool culture for *Shigellae* and *Salmonellae* were analysed.

Statistical methods

Medical records of the cases and controls were compared for age, sex, duration of illness before admission, and for the presence of various signs and symptoms detected on admission, using Chi-square or Fisher's exact test, 2-tailed, for non-continuous data, depending on the smallest number of each cell, and the Mann-Whitney U test for continuous data. Odds ratios and 95% confidence limits were calculated by using Cornfield's approximation (4).

Results

Mortality Rates and Seasonal Variations

There was a decrease in the number of reported dysenteric deaths in the Matlab Surveillance Area since 1977 (Fig.) with childhood and adult deaths decreasing proportionately. Dysenteric deaths in children followed a recurring seasonal pattern with an increase during the post-monsoon season of August-November. Deaths in adults did not show this pattern. The overall dysenteric death rate from 1978 to 1981 was 13.3 per 10,000 population per year. The highest rates were in children aged under 4 years and in adults aged 45 years or older (Table I).

TABLE I - AGE-SPECIFIC DEATH RATES FOR DYSENTERY, MATLAB SURVEILLANCE AREA, 1978-1981

Age groups (year)	Number of dysenteric deaths	Death rate per 10,000 per year*
<1	53	24.8
1-4	441	47.6
5-9	55	5.1
10-14	9	0.9
15-29	4	0.2
30-44	17	1.6
45-59	98	15.3
60 & over	270	75.7
All	947	13.3

* Based on population data of January 1980

Preceding Circumstances in Dysenteric Deaths

The health workers recorded 27 deaths putatively associated with dysenteric illnesses in the field between December 1981 and March 1982. Nineteen (70%) of these reports showed dysentery as the principal cause of death. After re-investigation by the physicians, most (16 of 19) of these records were found valid, in the sense that a dysentery-like illness was clearly described by the family on re-questioning. Twelve of the 16 (75%) fatal illnesses were of two weeks' duration or longer. Most of the children who died had severe malnutrition with leg oedema (Table II). Symptoms of acute respiratory tract infection were present in about one-fourth of the children who died, but not in adults. Illness with fever and rash, probably measles, had occurred within one month of death in 20% of the children. Children who died with dysentery was also more likely than adults to have other family members with dysenteric illnesses (5 of 10 children vs 1 of 6 adults), although not statistically significant ($p = 0.22$, Fisher's exact test).

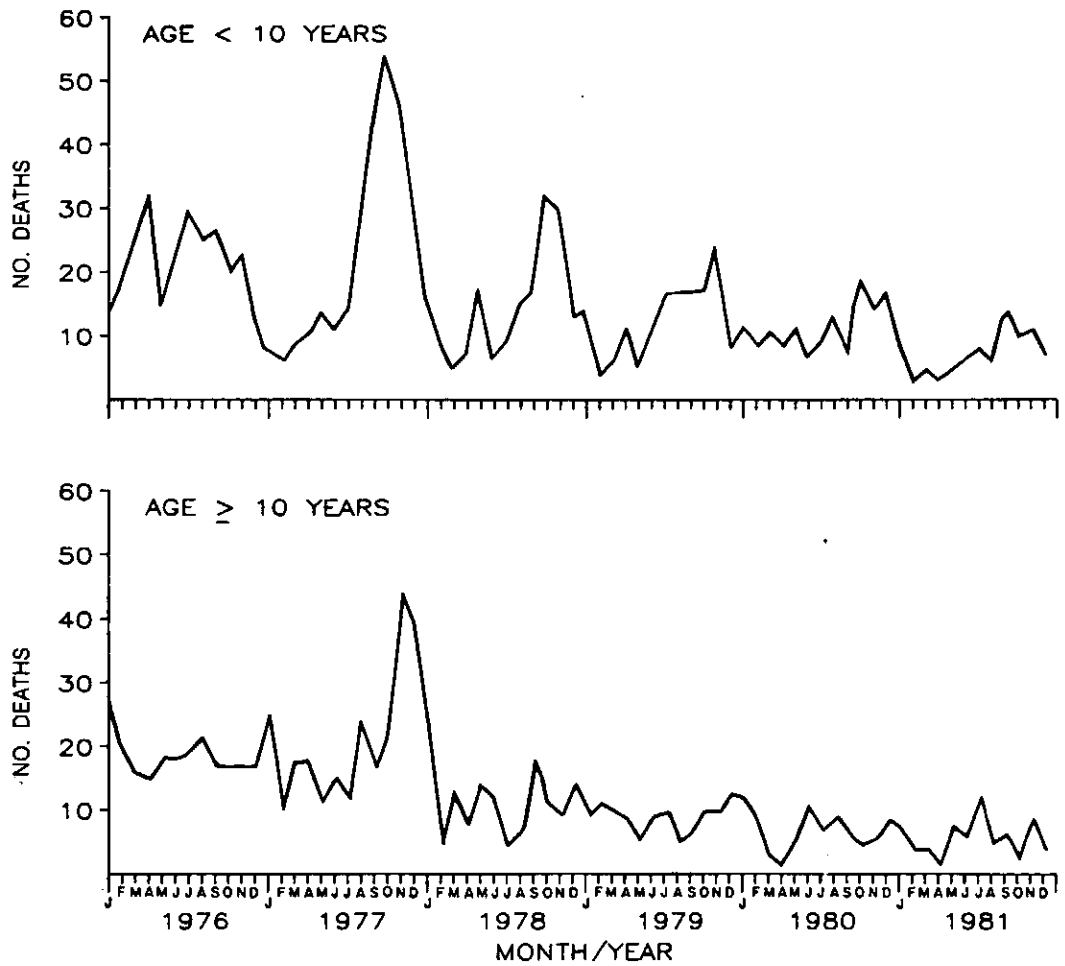

Fig. – Dysentery-related deaths in the rural community of Matlab, Bangladesh, by months and years, January 1976 to December 1981.

Clinical Features Associated with Fatal Dysentery

In 1980, 23 patients with bloody-mucoid diarrhoea died in the hospital after admission to the Matlab Treatment Centre. On admission, longer median duration of illness ($p = < 0.001$), female sex ($p = 0.039$), signs of lower respiratory tract infection ($p = < 0.001$), and severe malnutrition ($p = 0.002$) significantly predicted for subsequent deaths (Table III). Younger median age of the patient ($p = 0.08$) and a recent history of febrile illness with rash on skin within one month ($p = 0.13$) may be additional risk factors though these were found not significant in our study. A known invasive pathogen was isolated in equal proportions from faeces of both fatal and non-fatal patients; no individual pathogen occurred with significantly greater frequency in fatal patients.

Discussion

After re-investigation of the 27 deaths reportedly associated with dysentery, we found that 16 fulfilled our definition of dysentery. The field workers in Matlab reported 19 dysenteric deaths from among the same 27 patients. The three false-positive patients

TABLE II – CHARACTERISTICS OF 16 DYSENTERY-RELATED DEATHS REPORTED BY FIELD WORKERS AT MATLAB DURING DECEMBER 1981 – MARCH 1982, AND CONFIRMED BY RE-INVESTIGATION: Values are in median (range) or in number (%)

Patient characteristics	Children (n = 10)	Adults (n = 6)
Median age	3 years (3 mo – 5 yr)	73 years (54 yr – 84 yr)
Female sex	6 (60)	3 (50)
Median duration of illness	15 days (3 d – 5 wk)	1 month (15 d – 3 wk)
History of:		
Fever	7 (70)	1 (17)
Leg oedema	8 (80)	6 (100)
Malnutrition*	7 (88)	–
Acute respiratory symptoms+	2 (22)	–
Febrile illness with skin rash (within 1 mo)	2 (20)	–

* assessed in 8 patients
\+ assessed in 9 patients

were adults. Since we did not examine death reports having no mention of dysentery, we could not estimate the true number of false-negative reports from our data. Nevertheless, we expected this number to be small, and we concluded that the available information by the field workers probably reflected the magnitude of dysenteric mortality in Matlab with reasonable accuracy.

The highest death rates in children aged under 4 years and in adults aged 45 years or older is consistent with previous reports (5,6). From this limited study, we cannot say precisely what causal agent(s) led to the syndrome of dysentery in most fatal patients. In adults, the historical information offered no clue as to whether the primary illness was infectious, inflammatory, neoplastic, or a combination of such disorders. In children, however, two items of circumstantial evidence supported the notion that *Shigella* or a similar infectious agent, was of aetiological importance in many of the deaths. First, the recurrent peak of childhood mortality observed during August-November of each year (Fig.) corresponds with the peak period of *Shigella* isolations from hospitalised patients in Dhaka (6,7) and Matlab (8). Second, the secondary attack rates in households of the deceased children with dysentery suggested a high rate of intrafamilial spread of the putative causal agent(s); 5 of 10 (50%) household-contacts came down with dysentery at the same time as the deceased children, but only one household contact in the families of the 6 deceased adults had dysentery. A similar high secondary infection rate of shigellosis was observed earlier in a family study in Dhaka (9).

In hospital-based studies, severe shigellosis has been associated with a range of haematological disorders including leukaemoid reactions (10,11), disseminated intravascular coagulation (12), and haemolytic-uremic syndrome (10,13-15). Since our field study consisted of postmortem histories only, we had no way of estimating the prevalence of these complications in fatal non-hospitalised patients.

Measles and dysentery may act synergistically to cause death in children (16). We documented a history of febrile illness with skin rash within one month of death in 5 of the 22 (23%) children who died with dysentery in the hospital and in 2 of the 10 (20%) dysentery-related deaths in children that occurred in the community. Severe malnutrition was a risk factor for death in hospitalised patients with dysentery and similarly 7 of the 8 (88%) childhood deaths in the field had malnutrition as revealed from the verbal autopsies, a finding consistent with previous studies (17-19). But from our retrospective data, we cannot resolve whether malnutrition preceded the onset of dysentery or resulted from the illness.

We conclude that: i) the magnitude of dysenteric mortality is probably as great as the existing data suggest, ii) the actual causal agent(s) producing dysentery in patients with a fatal outcome in the community remains undefined, but likely to be an infectious agent (probably *Shigella*) in most children, iii) longer median duration of illness, female sex, signs of lower respiratory tract infection and severe malnutrition may be useful in identifying patients at risk of fatal outcome, and iv) the frequent presence of oedema in fatal patients may reflect nutritional hypoproteinaemia or protein-losing enteropathy or both.

TABLE III – ASSOCIATED FACTORS OF HOSPITALISED PATIENTS WITH DYSENTERY BY OUTCOME IN THE MATLAB TREATMENT CENTRE IN 1980

Associated factors on admission	Outcome		Odds ratio (95% confidence interval)	p value
	Died (n = 23)	Recovered (n = 23)		
Median duration of illness before admission (range)	7 days (5 – 15 d)	2 days (1 – 4 d)	–	<0.001*
Median age (range)	30 mo (14 – 48 mo)	44 mo (24 – 60 mo)	–	0.08*
Female sex (%)	15 (65)	7 (30)	4.3 (1.07 – 18.09)	0.039+
Signs of lower respiratory tract infection (%)	16 (70)	2 (9)	24.0 (3.71 – 117.22)	<0.001++
Severe malnutrition (%) (<60% wt for age of NCHS standard)	15 (65)	4 (17)	8.9 (1.90 – 45.86)	0.002++
Febrile illness with skin rash within 1 mo (%)**	5 (23)	0	*+	0.13++

* Mann – Whitney U – test, 2 – tailed.
\+ X^2 for 2x2 table, 2 – tailed, Yates' corrected.
++ Fisher's exact test, 2 – tailed.
** Calculated for 22 deaths and 14 survivors who were < 10 years of age.
*+ One of the cell – frequencies having been zero, odds ratio and its confidence interval are not computed.

Source: Case – control Study.

The various risk factors that we have identified in dysenteric patients could be used as a prognostic guide by physicians treating such patients.

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