

1988 Floods in Bangladesh: Pattern of Illness and Causes of Death

AK Siddique, AH Baqui, A Eusof, and K Zaman

International Centre for Diarrhoeal Disease Research, Bangladesh,
GPO Box 128, Dhaka 1000, Bangladesh

ABSTRACT

The worst flood in the history of Bangladesh affected millions of people in 1988. To determine morbidity and mortality during the flood, we investigated the causes of illness in 46,740 patients and causes of death in 154 persons while providing medical relief services in 72 flood affected upazilas (sub-districts). Diarrhoea was the most common illness (34.7%), followed by respiratory tract infections (17.4%). Watery diarrhoea was the most common type (47%) of diarrhoea and the most common cause of death for all age groups except those above 45-years of age. Respiratory disease was responsible for 13% of all reported deaths; only 7% of these were associated with acute respiratory tract infections. Accidental deaths accounted for 9.7% of the reported deaths; 5.8% of those were due to drowning, a figure twice as high as that reported previously. Our study suggests that floods have influenced the distribution of disease and death among the affected population.

Key words: Illness; Deaths; Causes of death; Bangladesh; Floods; Disaster.

INTRODUCTION

Of all the countries of the world, Bangladesh has experienced the most serious natural disasters: 13 out of the 19 'noteworthy' tropical disasters during a 250-year period occurred in what is now Bangladesh (1). Between 1960 and 1970, an average of 5,000 people died in natural disasters annually (2) excluding the estimated 500,000 deaths from the 1970 cyclones (3). Again in 1985, cyclones caused 11,000 deaths on an island in the Bay of Bengal (4).

Bangladesh is an alluvial plain delta created by three rivers; the Ganges, the Jamuna, and the Meghna. During the rainy season, increased upland flow of the rivers and the high tides in the Bay of Bengal result in an annual inundation affecting most of the 55,000 square-mile area of the country (2). In recent years, severe floods have caused extensive damage to property and loss of lives. In August 1988, the worst floods in the recent history of the region submerged two-thirds of the country (5). Very little is known about flood-related disease and disability in Bangladesh; accurate health information is hard to gather during a disaster,

particularly in developing countries. This makes the task of disaster health-care planning difficult.

This paper examines the causes of disability and deaths during the floods of 1988. The findings would be useful in making policies and priorities for future flood disaster management.

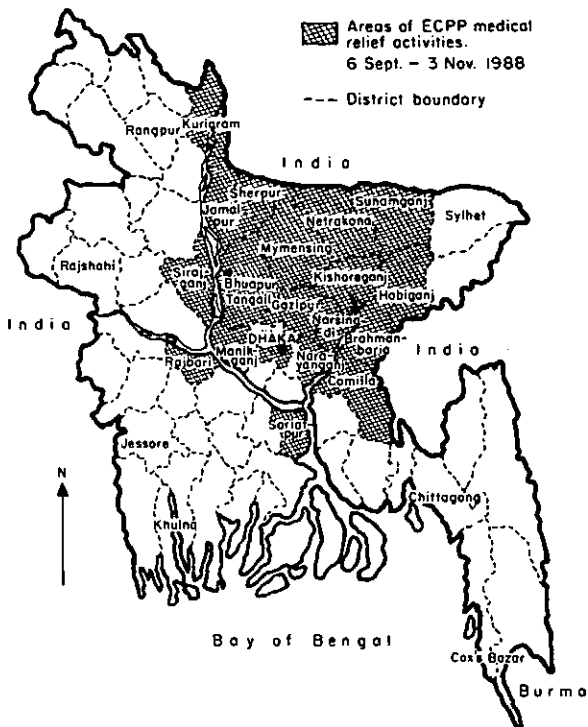
MATERIALS AND METHODS

During the 1988 floods, the Epidemic Control Preparedness Programme (ECPP) of the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B), in collaboration with the Government of Bangladesh (GOB), provided health care services in rural districts. Twenty-four physicians were sent by the ECPP. Between 6 September 1988 and 3 November 1988, ECPP mobile teams spent 850 man-days in 305 different locations in 72 upazilas (sub-districts) of 20 districts of Bangladesh (Figure). The flood there displaced many people who took shelter on upland areas, highways, and in other temporary shelters; the total number is unknown. A total of 46,740 patients, mostly the displaced persons, were seen during the medical relief services. Critically ill patients were also seen on boats and at home in some affected

Correspondence and reprint requests should be addressed to: Dr. AK Siddique.

villages. All patients were examined by physicians. Information including age, gender, and reasons for seeking treatment was recorded. Illness histories for infants and small children were obtained from mothers, accompanying adults, or older children.

FLOODS 1988 : BANGLADESH



To determine the number of deaths associated with the flood, information relating to 154 deaths reported during the flood period (between 28 August 1988 and 26 October 1988) was obtained from Bhuapur, a flooded upazila (area: 225 km², 60 miles northwest of the capital, Dhaka, on the eastern bank of the river Jamuna. Fishing and farming are the main sources of income for the 145,000 local inhabitants here. The Bhuapur Upazila Health Complex[*] is the only government-run health facility that provides major health care services in the area. Deaths were identified from the health complex records. The government village health-assistants normally collect death information from villages and the upazila Health Inspector (HI) confirms such deaths by home visits before registering the death at the health centre. At the

[*] An upazila health complex is a 31 bed health centre that offers free service (both inpatient and outpatient) primary health care and family planning through a number of categories of health personnel, although surgical and obstetric facilities offered in health centres are few.

time of floods, this effort was further activated and the local administrator also collected similar information. We compared these two sources, the health centre and the administrators' office, to ensure that no death reports were missed during the study period. The case histories of patients who died at the health complex were examined. Two physicians visited the household of those who died at home and conducted verbal autopsies by interviewing the mothers or family members who were present when the person died. A questionnaire was used and information including age, gender, symptoms preceding death, duration of illness, and other relevant data were collected. Documents related to illness and death were also examined. These were carefully evaluated before assigning a likely cause-of-death to each case.

RESULTS

Of the 46,740 patients treated during the floods, 56.2% were male. Children under 5-years old accounted for 27.5% and between 5- and 9-years, 16.4% of the total; the remaining 46.8% of patients were above 15-years of age. Table I shows the distribution of the type of illnesses that were observed. Diarrhoea was most common (34.7%), followed by respiratory tract infections (17.4%). The two illness taken together accounted for more than half of the patients seen by ECPP physicians. The third leading reason for seeking treatment was intestinal worms. Further analysis showed watery diarrhoea to be the most frequent (47%) type of diarrhoea; 11% had dysentery with blood in the stool, and the remaining 42% had mucoid diarrhoea. The distribution of illnesses by age group is presented in Table II. The 8 listed causes were responsible for 98% of the illnesses in children below 5-years of age, 96% in 5-9 years, and 92% between 10-14 years of age.

Table I. Rates of Illnesses Among 46,470 Persons During the 1988 Floods in Bangladesh

Illness	No. per 100 patients
Watery diarrhoea	16.3
Dysentery	3.8
Mucoid diarrhoea	14.6
Resp. tract infections	17.4
Intestinal worms	10.1
Fever	6.5
Skin infections	5.8
Injury with infections	5.1
Eye infections	2.2
Ear infections	1.8
Other diseases	16.3

Death studies revealed that more than half of the

154 deaths reported during the flood in Bhuapur were males (58%). Children under 5-years old accounted for 38% of all deaths and between 5-9 years accounted for 12%. Diarrhoeal disease was the most frequent (27.3%) cause of death (Table III). Respiratory disease was the second most common (13%) cause; slightly less than 6% of these deaths were due to chronic conditions (pulmonary tuberculosis 3.9%, other chronic diseases 1.9%). Acute respiratory tract infections caused 7% of deaths. **Accidental death was the fourth most common (9.7%) cause of death after old age (persons over 70 years of age) which was third.** Drowning was responsible for 5.8% of all deaths. This was more than twice as high as reported previously for all ages by a longitudinal survey in Matlab, Bangladesh (6).

Table II. Age-specific Proportion of Illness in Individuals Below 15 Years of Age During the 1988 Floods in Bangladesh

Illness	(Age in years)		
	< 5 (n=12,840)	5-9 (n=7,659)	10-14 (n=4,357)
	Percent		
Diarrhoea	41.3	40.4	36.6
Resp. tract infections	23.8	17.8	17.2
Intestinal worms	13.9	16.5	11.8
Skin infections	5.5	6.4	7.5
Fever	5.1	6.7	8.6
Injury with infections	4.0	4.3	5.4
Ear infections	2.9	1.8	2.1
Eye infections	1.5	1.9	3.2
Other diseases	2.1	4.3	7.5

Table III. Causes of 154 Deaths Among Persons of All Ages in Bhuapur During the 1988 Floods in Bangladesh

Causes of death	Number	Percent
Diarrhoea	42	27.3
Resp. tract infections	20	13.0
Old age	17	11.0
Accidents	15	9.7
Cardiac diseases	12	7.8
Fever	9	5.8
Other gastrointestinal diseases	7	4.6
Tetanus	6	3.9
Malnutrition	6	3.9
Obstetric problems	4	2.6
Renal diseases	2	1.3
Ill-defined	5	3.3
All others	9	5.8

The causes of death varied with age (Table IV);

nevertheless, diarrhoea, particularly watery diarrhoea, was the leading cause of death for all age groups except for those older than 45. Of the 21 reported infant deaths, 13 occurred within the first month of birth. Tetanus was responsible for 39% (5/13) of neonatal deaths. Dysentery caused deaths only in children under 1-year old (9.5%) and 1-4 years (8.1%). Drowning was responsible for 16% of deaths in children between 1-4 years; all but one of the 6 people who drowned were male. An analysis of the 12 deaths reported in women between 15-44 years of age revealed that one-third (4/12) of these deaths were associated with obstetric problems and a similar proportion were due to diarrhoea.

DISCUSSION

The information presented here is limited to flood-affected, displaced persons who sought treatment from us. Our experience suggests that the government system of death reporting functions better during the disasters than during normal periods. However, there remains some uncertainty about the accuracy of death reporting, since under-reporting of death is common in rural communities of developing countries (7).

Because of the absence of flood-related morbidity data, we compared our findings with the study by Black *et al.* in Bangladesh (8). We observed a higher proportion of diarrhoea in children below 5-years than reported by Black *et al.* (12.8%), although we saw a smaller proportion of respiratory tract infections than (60%) they reported. However, these two studies as such were not directly comparable. The study by Black *et al.* was an active surveillance report for a period of 1 year on children in a defined community. In contrast, our study covered the disaster only, mostly representing people affected by the flood. It was not clear whether the higher proportion of diarrhoea was due to the flood or due to the usual seasonal increase (9). Floods had previously been implicated as the cause of epidemics of diarrhoea in Bangladesh (10). Respiratory tract infections are more common in cool, dry months, which perhaps explains the lower proportion of respiratory tract infections in our study.

Watery diarrhoea was the most common cause of death in our study; the death rates were higher than reported previously (6,11-13). To explain the higher rates of death from watery diarrhoea, the time interval between the onset of symptoms and death was studied. We have used this indicator in the ECPPP[*] to identify diarrhoeal outbreaks, particularly of cholera. It was seen that 83% (35/42) of diarrhoeal deaths occurred less than 48

[*]ECPPP has collaborated with Government Health Services of Bangladesh in the investigations of major diarrhoeal epidemics since 1984.

hours after the onset of symptoms. Of particular significance was the higher percentage (80%) of adult-deaths in the same time interval, suggesting deaths were due to cholera which is endemic in Bangladesh. Death by drowning is common during monsoon months, and is an established cause of death in children in Bangladesh. A recent study in Matlab, Bangladesh showed 11.6% of deaths in children (1-4 year) were due to drowning (Personal communication). By contrast we observed 16% of deaths due to drowning in children in the same age group. This may have been influenced by the flood.

use of fundamental tenets of primary care such as training, use of local resources, assessment of local need, and epidemiological surveillance should be the objectives of disaster health planning. Assistance to develop a long-term public health approach to disaster health management would be greatly beneficial, as emergency care tends to offer only short-term benefits.

Table IV. Percentage Distribution of Causes of Death by Age Group in Bhuapur During the 1988 Floods in Bangladesh (N = 154)

Causes of death	Age group in years					
	<1 (n=21)	1-4 (n=37)	5-9 (n=18)	10-14 (n=04)	15-44 (n=24)	45 > (n=50)
Watery Diarrhoea	19.0	37.8	38.8	50.0	20.8	10.0
Dysentery	9.5	8.1	-	-	-	-
Resp. tract infections	4.7	16.2	16.7	-	8.3	18.0
Fever	9.5	8.1	16.7	-	-	-
Malnutrition	9.5	8.1	5.7	-	-	-
Drowning	-	16.2	11.1	25.0	-	-
Snake bite	-	-	5.7	25.0	-	-
Tetanus	23.8	-	-	-	-	-
Injury	-	-	-	-	16.6	-
Cardiac diseases	-	-	-	-	12.5	18.0
Obstetric problems	-	-	-	-	16.6	-
Renal diseases	-	-	-	-	4.2	2.0
Other gastrointestinal diseases	-	-	-	-	8.3	8.0
Old age	-	-	-	-	-	34.0
All others	-	5.4	5.6	-	12.5	10.0
Ill defined*	23.8	-	-	-	-	-

* all the 5 deaths were neonatal and died between 0-4 days of birth.

Unlike the sudden floods caused by breached dams or tidal surges, floods in Bangladesh usually start slowly and gradually progress to severity. The water level rises over days before it overflows the riverbanks. Therefore, injury and death from the direct impact of sudden disasters, including cyclones (13) and tidal surges (4,13) are less likely to occur during floods such as this one. However, health status was affected, possibly by an increase in the number of prevalent diseases, such as diarrhoea and acute respiratory tract infections. The occurrence of many such cases in a short time created a demand on health service delivery that could not be met effectively by the national health service without assistance; resources needed to meet health demands of disasters were obviously limited. The international community responded generously during this crisis, as they have in the past. This substantially assisted the disaster management efforts of the government health services to prevent deaths.

It was clear from our study that the types of health care activities needed during the floods were essentially those of primary health care. Health workers are trained to perform most of the activities and only require orientation to adjust these activities to meet the peculiar demands of a crisis. Therefore,

ACKNOWLEDGMENTS

The disaster relief health care activities were supported by special grants from American Express/International Child Health Foundation, Australia, Belgium, Canada, Denmark, European Economic Commission, France, Japan, The Netherlands, Switzerland and US/AID.

The ECPP was supported by the Ford Foundation Grant No. 840-0715A and the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B). The ICDDR,B is supported by countries and agencies which share its concern about the impact of diarrhoeal diseases on the developing world.

We are thankful to the Government of Bangladesh for providing the physicians and other services. In the field, the works of Dr. P. Mutsuddy, Dr. I. Bashir, Dr. Q. Islam, Dr. K. Akram, and Dr. Y. Majumder proved invaluable. We also thank Prof. Demissie Habte and Prof. R.B. Sack for reviewing this manuscript.

REFERENCES

1. Frank NI, Hussain SA. The deadliest tropical cyclone in history. *Bull Am Met Soc* 1971;52:444-483
2. Seaman J, Leivesley S, Hogg C. Epidemiology of natural disasters. Basel: S. Karger, 1984.
3. Skeet M. Manual of disaster relief work. Edinburgh: Churchill Livingstone, 1977.
4. Siddique AK, Eusof A. Cyclone death in Bangladesh, May,

- 1985: who was at risk. *Trop Geogr Med* 1987;39:3-8.
5. Ahamad M. Flood in Bangladesh. Dhaka: Community Development Library, 1989.
 6. Chen LC, Rahman M, Sarder AM. Epidemiology and causes of death among children in a rural area of Bangladesh. *Int J Epidemiol* 1980;9:25-33.
 7. Behar M, Ascoli W, Scrimshaw NS. An investigation into the cause of death in children in four rural communities in Guatemala. *Bull WHO* 1958;19:1093-102.
 8. Black RE, Brown KH, Becker S, Yunus M. Longitudinal studies of infectious diseases and physical growth of children in rural Bangladesh: 1. Patterns of morbidity. *Am J Epidemiol* 1982;115:305-14.
 9. Black RE, Merson MH, Rahman ASMM, Yunus M, Alim ARMA, Huq I, *et al.* A two-year study of bacterial, viral, and parasitic agents associated with diarrhea in rural Bangladesh. *J Infect Dis* 1980;142:660-4.
 10. Siddique AK, Islam Q, Akram K, Mazumder Y, Mitra A, Eusof A. Cholera epidemic and natural disasters; where is the link. *Trop Geogr Med* 1989;41:377-82.
 11. Shaikh K, Wojtyniak B, Mostafa G, Khan MU. Pattern of diarrhoeal deaths during 1966-1987 in a demographic surveillance area in rural Bangladesh. *J Diarrhoeal Dis Res* 1990;8:147-58.
 12. Bhatia S. Patterns and causes of neonatal and post-neonatal mortality in rural Bangladesh. *Stud Fam Plann* 1989;20:136-46.
 13. Sommer A, Mosley WH. East Bengal cyclone of November, 1970: Epidemiological approach to disaster assessment. *Lancet* 1972;2:1227-36.
 14. Fauveau V. Assessment of cause of death in the Matlab Demographic Surveillance System (personal communication).