Health Impacts of Disaster: Case study of Bangladesh's Cyclone Sidr

Rajeeb Kumar Sarkar

Abstract

In recent years Bangladesh has made significant progress in disaster management. This article examines the health impacts of disaster in the context of Cyclone Sidr in Bangladesh. Due to its geographical location, topography, high population density and poverty Bangladesh is considered to be highly vulnerable to natural disasters in the world. The coastal part of the country is the most vulnerable and the southwestern part of the coastal area is identified as environmentally handicapped by natural disasters. Natural disasters pose a threat to the very existence of people's lives and livelihood in Bangladesh. There are direct health effects through various vector and waterborne diseases, but arguably more important indirect effects as well. So far, little is known about natural disasters and their impact on human health in Bangladesh. This study is based on the cyclone Sidr that hit Bangladesh in November 2007. This article aims to assess the impact of natural disaster on the health of the coastal population of Bangladesh. This article concludes that natural disasters largely affect human health in Bangladesh. Natural disasters are affecting the general and mental health of the population of the affected areas. Prevalence of diarrhoea, skin diseases, and other infectious diseases has increased after the cyclones. This article emphasizes on the importance of a wellplanned preparedness program to address the challenges of natural disasters. The experience of Sidr demonstrates the visible action of Bangladesh government to mitigate the risks of health. However significant changes in the national and international level are required to reduce health risks caused by natural disasters.

Introduction

This article aims at exploring the health impacts of disaster. For this purpose, it takes the case study of cyclone Sidr which hit Bangladesh in November, 2007. Cyclone Sidr struck the south-west coast of Bangladesh with winds up to 240 kilometres per hour. It slammed the highly vulnerable lowlying densely populated coastal areas of Bangladesh with heavy rain and a storm surge. Sidr eventually made landfall in Bangladesh, causing large scale evacuations. This article has three parts. Firstly, there is a general discussion on the relation between disaster and health impacts. Secondly, it highlights the practical scenario of that relation in the light of the case study of Sidr. Finally, it discusses the issue of possibilities for appropriate preparedness and actions . Living with physical hazards is an everyday issue for the people of Bangladesh. On some occasions, these hazards turn into catastrophic disasters causing deaths and bringing unbearable damages in different sectors. In most of the cases, these disasters injure the internal social organizations at different levels (for example, household, community, institution) and affect their assets. Cyclone Sidr caused innumerable losses to lives and assets of people of Bangladesh. Although, the death from

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Sidr number in the thousands but damage to homes, crops and livelihoods could be extensive and were reportedly worst. Effective early warning, cyclone shelters and disaster relief measure implementations helped reduce the death toll of Sidr in comparssion with previous natural disasters.Thisis why this article has taken Sidr as case study. It examines the health impacts of Sidr.

Health impacts of disaster: A theoretical framework

Disasters always have significant impacts on public health and well-being of affected population. Health has a direct resonance with disaster management, the two fields closely overlapping in approach. Disasters impact on health, and improving health reduces disaster (Noji, 1997). In terms of a conception of the meaning of 'health', the definition of WHO can be cited:

A state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity (WHO, 1948).

Emergency managers, public health personnel, and people fear large-scale epidemics in areas impacted by major disasters (de Goyet, 2007). The presence of dead bodies, both human and animal, and non-availability of pure drinking water are considered the main reasons for this prediction of post-disaster epidemics and diseases (Paul, 2007). The people and agencies who predict post disaster epidemics do not consider the disaster aid factor. For this reason, the prediction proves false and becomes a myth. Several such myths exist in disaster literature, which often direct the focus of emergency workers and responders away from the needs of survivors and towards combating false realities (McEntire, 2007).

Natural disasters produce a range of impacts, which are often broadly classified as 'direct' and 'indirect' impacts (Mileti1999; Tobin and Montz1997). Direct impacts are caused by physical contact of disaster with humans and property, whereas indirect impacts are caused by the ramifications of such physical contact during post-disaster period (Paul 2005).

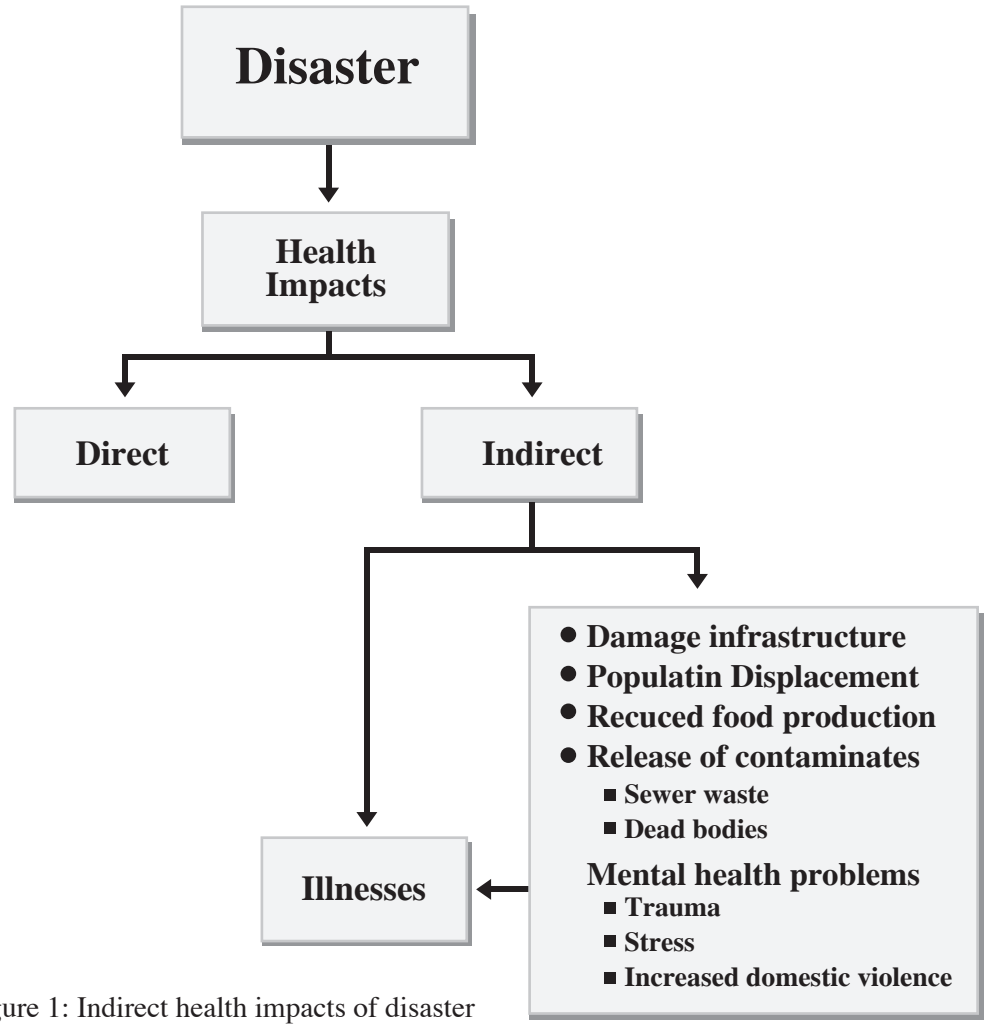

Figure 1: Indirect health impacts of disaster
Source: Paul (2009).

Like other disasters, direct health impacts of cyclones include deaths and injuries. Someof the important indirect health impacts include significant outbreaks of communicable, water-related, and other diseases, such as diarrhoea, hepatitis, malaria, fever, pneumonia, eye infections and skin diseases. Disaster survivors generally live in damp, dirty, and cramped conditions in their homes and temporary shelters. Such conditions facilitate spread of numerous adverse health effects from person to person's wellbeing within the household (Tapsell et al.2002).

Illnesses are also caused by other indirect impacts of extreme events such as damagedinfrastructure, population displacement, and reduced food production as well as

the release of contaminates into the waters and the air in disaster impacted areas (Fig.1). Damaged infrastructure primarily refers to health care facilities such as hospitals, medical clinics, and ambulatory services, and also to the electricity on which most of these facilities depend. Because of either complete or partial damage to such facilities caused by cyclones or other natural disasters, it is difficult to provide necessary care to the ill and the injured. Lack of proper medical attention may also result from the absence of physicians and insufficient supply of appropriate medicine.

	Most common effects on environmental health	Earthquake	Cyclone	Flood	Tsunami	Volcanic eruption
Water supply and wastewater disposal	Damage to civil engineering structures	1	1	1	3	1
	Broken mains	1	2	2	1	1
	Damage to water sources	1	2	2	3	1
	Power outages	1	1	2	2	1
	Contamination (biological or chemical)	2	1	1	1	1
	Transportation failures	1	1	1	2	1
	Personnel shortages	1	2	2	3	1
	System overload (due to population shifts)	3	1	1	3	1
	Equipment, parts, and supply shortages	1	1	1	2	1
Solid waste handling	Damage to civil engineering structures	1	2	2	3	1
	Transportation failures	1	1	1	2	1
	Equipment shortages	1	1	1	2	1
	Personnel shortages	1	1	1	3	1
	Water, soil, and air pollution	1	1	1	2	1
Food handling	Spoilage of refrigerated foods	1	1	2	2	1
	Damage to food preparation facilities	1	1	2	3	1
	Transportation failures	1	1	1	2	1
	Power outages	1	1	1	3	1
	Flooding of facilities	3	1	1	1	3
	Contamination/degradation of relief supplies	2	1	1	2	1
Vector control	Proliferation of vector breeding sites	1	1	1	1	3
	Increase in human/vector contacts	1	1	1	2	1
	Disruption of vector-borne disease control programmes	1	1	1	1	1
Home sanitation	Destruction or damage to structures	1	1	1	1	1
	Contamination of water and food	2	2	1	2	1
	Disruption of power, heating fuel, water supply or waste disposal services	1	1	1	2	1
	Overcrowding	3	3	3	3	2

Table 1: Common levels of impact of natural disaster onenvironmental health.
Source: Pan American Health Organization (2000).
1-Severe possible effect, 2-Less severe effect, 3-Least or no effect

Damage to other infrastructures, such as roads, bridges, and culverts, may also impacthealth outcomes by causing serious delay. It is a barrier to emergencymedical supplies and personnel for treating acute injuries or for controlling disease outbreaks (Kuni et a, 2002). Restricted access may also prevent the initiation of emergency immunization measures and other health interventions that may be required subsequent to a disaster. Cyclone Sidr completely destroyed some 1,145 miles (1,714 km) of roads and those that were at least partially damaged, an estimated 4,240 miles (6,361 km). Additionally, 1,850 bridges and culverts were damaged by Sidr (GOB, 2008b). Release of contaminates poses serious health risks, including cancer for survivors of several natural disasters, such as floods. Flood waters often mix with raw sewage, toxic chemicals, and fuel from ruptured underground tanks. These not only pollute the water and air but also cause dangerous levels of mold in homes located in flood-impacted areas (Godsil, 2009). In one post-Katrina survey, 93% of all residents surveyed in New Orleans believed that mold in their homes could make them sick (Curtis and Mills, 2009).

Another indirect health impact of natural disasters, including cyclones, is associated with mental health (Fig.1). In those areas affected by natural disasters, the related traumatends to threat the population's well-being, both directly and indirectly.Direct consequences may be seen in the form of lifetime disabilities. Indirect outcomes manifest in society through individual breakdowns that lead to stress related illness. Additionally, disasters may exacerbate existing stress or contribute to acute stress—a condition that can lead to chronic illness and mortality, if not properly addressed (Curtis and Mills, 2009).

There are several different measures that might be indicative of assessing levels of stress. For example, suicide rates, coping mechanism behaviors including alcoholism, drug use, or even crime, increased spousal abuse, and even adverse pregnancy outcomes such as pre-term and low birth weight (LBW) babies (Buekens et al, 2006; Curtis and Mills, 2009). All these tend to increase during the post disaster period as a result of post-traumatic stress disorder and depression in the wake of death, destruction, and illness that usually accompany such catastrophes (Alexander, 1998 cited in Paul, 2009). However, urges caution in accepting these findings and states these are difficult to verify in both statistical and in causal terms.

Available evidence suggests that apart from stress, a pregnant woman is particularlyvulnerableduring the post-disaster period for a variety of reasons including healthcareavailability concerns, and fears for the subsequent health of her baby in the event of aforced relocation due to a disaster (Curtis and Leitner, 2006; Curtis and Mills, 2009). This is also true for already ill persons. Indirect health impacts of disasters may manifest months or even years after the event.

Data from Bangladesh generally agree with global statistics on the gender-specificmortality rates of natural disasters (Neumayer and Plumper, 2007). Such a difference inmortality rates is often linked to both biologic and physiologic differences between menand women. A relatively greater strength among males allows them to run faster, swimlonger, and hold onto steady objects for longer periods of time relative to females. Womenare relatively smaller and generally weigh less than men, suffer more from malnutritionand ill health, and therefore they are more easily swept away by water or by high windsassociated with cyclones (Neumayer and Plumper 2007). However, several researchers (e.g., Chowdhury et al. 1993; Ikeda 1995) questioned the legitimacy of such logic and concluded that biologic differences between men and women do not account for observed differences in mortality rates. Pre-existing social andreligious patterns of gender inequality are the root cause of this difference.

Ikeda (1995) maintains that the excessive female deaths caused by the 1991 cyclone(relative to male mortalities) are primarily due to gender-specific roles and on restrictionsof women's spatial mobility imposed by the norm of purdah or veil. Purdah not only corelates with female lack of social dignity and empowerment as well as basic rights, but also hinders spatial mobility in times of cyclones which is the primary reason for the disparity in cyclone mortality rates between males and females in Bangladesh (Ikeda,1995). Because of gendered division of space, women have less access to information and knowledge regarding any disaster compared to males. Therefore, the combination of impeded mobility and lack of information created by the cultural and religious practice of purdah in Bangladesh places women at a higher risk for mortality in all situations (Ikeda, 1995). There is hopeful sign for this paradigm shift. Ahmad (2012) argues that during the cyclone of 1991, the number of death was over 140,000 and ratio of male: female death rate was 1:14. With gender-responsive disaster management, the male: female ratio has reduced to 1:5 and number of death to around 3000 (2007 Sidr).

Decreased nutrition is widely considered an important risk factor for malnutrition,which is widespread in developing countries (Reinhard and Wijayratne 2002). The nutritional situation in these countries further worsens after a disaster due to decreased food consumption (O'Donnell et al.2002; IFRC and RCS 2011). Natural disasters disrupt normal food production, increase food price, damage existing food stocks, and interrupt income-earning activities (O'Donnell et al.2002). All these lead to decreased food consumption, which decreases the nutritional status of disaster survivors. All disaster survivors suffer from lower nutritional intake in the aftermath of a natural disaster, but it is the women of reproductive age and under 5-year-old children who suffer the most. Any type of malnutrition and under-nutrition cause adverse health impacts of childbearing women and young children (Reinhard and Wijayratne 2002).

Case study of Sidr

The Bay of Bengal, which forms Bangladesh's coastline, is one of the world's most activeareas for the development of tropical low-pressure systems. Cyclones forming in the Bay of Bengal constitute only 5–6% of the globaltotal but they are the deadliest of all the cyclones, accounting for about 80–90% of globallosses in terms of lives and property, caused by cyclones (Chowdhury 2002). Fifty-threepercent of all the cyclones that have claimed more than 5,000 lives took place in Bangladesh (GOB, 2008). Nicholls et al.(1995) reported that during the past two centuries, 42% of tropical cyclone-associated deaths have occurred in Bangladesh.

Comparision of Sidr with the cyclones of 1970 and 1991

On the night of November 15, 2007, Cyclone Sidr, a Category IV storm, made landfallacross the southwestern coastal areas of Bangladesh, leaving 3,406 people dead andcausing damage totalling nearly US$ 1.7 billion (GOB, b2008).Despite being similar in severity, Sidr claimed far fewer lives than Cyclone Gorky, anotherCategory IV storm, which struck Bangladesh on April 29, 1991 and killed an estimated140,000 people (Bern et al. 1993). International media, donor countries, and foreign aidagencies claim that the relatively low number of fatalities as well as lower than expecteddamage caused by Sidr was the result of the Bangladesh Government's attempt to providetimely weather forecasting and advance warning systems, and the successful evacuation ofpeople living on the southwestern coast (Blake 2008; Shamsuddoha and Chowdhury 2007).

Heather Blackwell, head of Oxfam in Bangladesh claimed that ''Bangladesh's early warning and preparation saved up to 100,000 lives'' (Oxfam, 2008).

Bangladesh also experienced a devastating cyclone on November 12, 1970,which killed as many as 500,000 people (Shamsuddoha and Chowdhury, 2007). ThisCategory III cyclone is considered the deadliest cyclone in Bangladesh history and one of the worst natural disasters in terms of human fatalities in world history. Early warning systems and most other cyclone preparedness programs (CPPs) were initiated in Bangladesh after the1970 cyclone. Despite being poor and vulnerable to a range of natural hazards, Bangladesh has made significant progress in disaster management in recent years (Paul, 2009).

What really happened

The Joint Damage Loss and Needs Assessment mission, led by the World Bank, estimated losses caused by Cyclone Sidr at US $1.7 billion, a figure which represents about 3% of the country's gross national product (GOB, 2008a). Immediately after the cyclone, emergency and public health personnel both within Bangladesh and beyond its borders anticipated a massive outbreak of water-borne, Respiratory Tract Infection (RTI), and other related diseases in impacted areas.

According to the UN Rapid Initial Assessment, approximately 1.5 million people in thenine surveyed districts were at risk of communicable diseases—diarrhoea, dysentery, acuterespiratory infection, and pneumonia (GOB, 2008a). A district, in Bangladesh, is the second largestadministrative unit, with an average population of slightly over 2 million. Fortunately, health and emergency officials were wrong in their prediction and no significant outbreak of water-borne and other related diseases did occur. In fact, morbidity in most cyclone-impacted areas remained near the level that existed prior to the landfall of Cyclone Sidr(Paul, 2009).According to a rapid emergency assessment completed by UN officials, 2.6 million people were found to be in need of immediate food assistance across the affected areas (WFP, 2007). The officials highlighted the large-scale loss of standing crops, family food stocks, and livestock. Additionally, food commodity prices increased in the immediate aftermath of Cyclone Sidr in the affected areas. For example, wheat flour prices were up approximately 11%, lentils 11 %, imported rice 10 %, and local rice 8 % (WFP, 2007).

Public Health Problem		Total cases	Cost per case (BDT)	Total cost (BDT)
A. Prompt Physical Morbidity				
Injury—Total Reported		15,045		2,515,524
	Severe	150	3,850	579,233
	Moderate	14,895	130	1,936,292
Diarrhea		13,967		4,190,100
	Severe	3,492	900	3,142,575
	Moderate	10,475	100	1,047,525
Respiratory tract infection		15,442	250	3,860,500
Skin disease		35,127	110	3,863,970
Eye infection		11,007	60	660,420
Typhoid/fever		50,249		9,933,570
	Typhoid	5,025		888,750
	Fever	45,224	200	9,044,820
TOTAL (Prompt physical morbidity)				**25,024,084**
B. Reduced Nutrition				
Protein energy malnutrition of children under 5		1,000,000	500	500,000,000
Micro nutrient powder to children under 5 and pregnant and lactating women		20,000,000 (no. of sachets)	1,035	20,700,000
TOTAL (Reduced nutrition)				**520,700,000**
C. Emergency Procurement Done using HNPSP Fund				
Protective equipment				111,000,000
Vitamin A				40,000,000
Disinfectant				6,350,000
Water purifying tablet				7,000,000
Medicine				301,938,000
Oinment				500,000
Nebulizer machine				400,000
TOTAL (Procurement)				**467,188,000**
D. Field Medical Teams				
Neighboring District Government Medical Teams				2,128,000
National Government Medical Teams				595,000
Military Medical Teams/Camps				1,600,000
Other and NGOs				20,400,000
TOTAL (Medical teams)				**24,723,000**
Grand total(A+B+C+D)				1,037,635,084

Table 2: Losses in the health sector.
Source: GOB(2008a).

More than 8.9 million people in 1,950 unions of 200 upazilas under 30 districts were affected by Cyclone Sidr. Of the affected districts, the Government classified four as ÔworstÕ affected — Bagerhat, Pirojpur, Patuakhali and Bargunawhere human loss and material damage had been particularly severe, with great immediate needs for relief and assistance. Eight further districts were classified as ÔbadlyaffectedÕ and they were Khulna, Madaripur, Sariatpur, Barisal, Bhola, Shatkhira, Gopalganj and Jhalakathidistricts(GOB, 2008a).

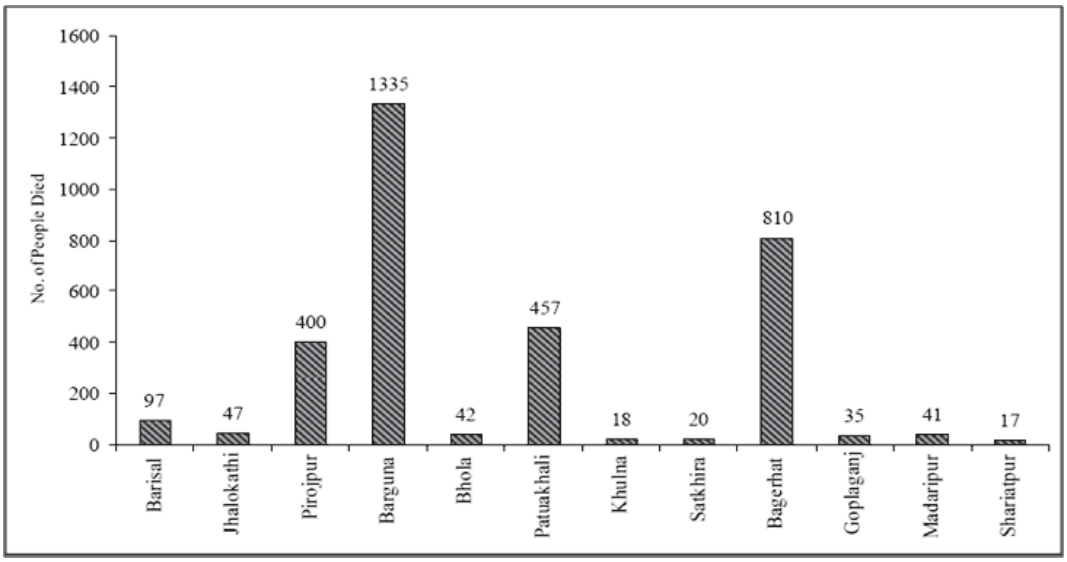

Figure 2: Ratio of death in 12 affected districts.
Source: GOB(2008a).

Outbreak of post-sidr diseases and reasons

Post-Sidr outbreaks of water-borne and communicable diseases were anticipated for severalreasons. First, available surface water (e.g., ponds, canals, and rivers), which are themain sources of drinking water in the coastal zone of Bangladesh, were highly contaminatedby saline intrusion, carcasses of domestic animals, and dead fish. Trees uprooted by the cyclone also made surface water sources unusable for drinking and household purposes.

More than four million trees were destroyed or damaged and almost two million head of livestock and poultry were killed by Cyclone Sidr (GOB, 2008a).

Name of Disease	Total
Injury	1,787
Diarrhea	3,572
RTI	3,210
Skin Disease	7,538
Eye Infection	2,309
Typhoid/Fever	10,359
Jaundice	44

Table 3: Recorded disease burden between 27 December and 15 January 2008.
Source: GOB(2008a).

Additionally, many tubewells in the cyclone-affected areas malfunctioned either because these tubewells were destroyed or damaged by the cyclone or were submergedunder saline water. It was estimated that only about 1,500 out of a total of 18,000 tube wells were functioning in cyclone-affected localities (GOB, 2008a). Consequently, manydrinking and domestic water sources were highly polluted.

Another reason for the anticipatedmajor outbreak of disease was that people in Sidr-affected areas were defecating everywhereindiscriminately. Physical damage to household latrines in some of the mostseverely affected areas was common, with one estimate putting the percentage of slablatrines damaged or destroyed as high as 70% (GOB, 2008a). According to official information from the Department of Public Health Engineering (DPHE) of the BangladeshGovernment, as of January 21, 2008, as many as 55,279 latrines were partially damaged orfully destroyed in 12 severely impacted districts (GOB, 2008a).

Among all sectors, the impact of Cyclone Sidr on the housing sector had beenthe most extreme with over 500,000 homes totally destroyed and more than 900,000heavily damaged (SCG,2007). This means that the number of homes destroyed by CycloneSidr in Bangladesh was higher than the total number of homes completed destroyed by the2004 Indian Ocean Tsunami—reported at 400,000 (Paul,2007). The total value of damageto the housing sector was estimated at US$ 839 million (GOB, 2008a). An outbreak of RTI wassuspected primarily because many Sidr survivors were living without shelter in cold winterweather and in make-shift temporary shelters, including tents. Living in such crowded and non-hygienic conditions, and sleeping on damp floors also caused several different illnesses such as fever and skin diseases. The most important reason for expecting an epidemic during the aftermath of Sidr was that Bangladesh had experienced two back to back floods in 2007 only 3 months prior to Cyclone Sidr. Although both monetary losses and the number of fatalities were much lower in these 2007 floods compared to the three most devastating floods (1987, 1988, and 1998) of the last century (Haque, 2007).

Experience of response

Immediately after Cyclone Sidr, the Bangladesh Red Crescent Society (BDRCS) and International Federation responded to the disaster swiftly. Together they met the needs of families and persons most in need in terms of medical services, food, drinking water, clothing, shelter relief, and household and hygiene items. Following more detailed assessments and as a result of coordination with the government and other humanitarian agencies, the BDRCS and International Federation identified following sectors to be addressed immediately (IFRC RCS, 2011):

- The most urgent need was the supply of potable water as drinking water ponds were contaminated with saline water.
- Longer term needs included clothing, shelter, livelihoods restoration and psychosocial support.
- Health needs were being covered by the medical teams deployed by BDRCS, other humanitarian agencies and the government of Bangladesh. (Some medical supplies were needed).

The Government was prompt in deploying medical personnel to affected areas. Initially, medical personnel from public facilities in neighboring districts were sent. They were followed by nationally formed medical teams. In addition, the military set up their own medical camps to provide health care services, and NGOs, Development Partners, and other organizations also provided medical teams.

The Government had procured emergency medicines and accessories worth BDT 472 million(US$ 6.8 million) within a few days of the cyclone, using funds from the health sector-wideprogram (Health, Nutrition and Population Sector Program – HNPSP) (GOB, 2008b).

The cyclone eroded the household capacity to access adequate food supplies—due to thedestruction of standing crops and gardens, household food stocks and assets, and livelihoodsthat poor households depend on to purchase food. Under these circumstances, infants, youngchildren, and pregnant and lactating women (PLW) were vulnerable to malnutrition andmicronutrient deficiencies.

Many people were missing and thousands of others were suffering from physical trauma andmental setbacks; it was impossible to quantify these associated losses at this time. The WorldHealth Organization initiated a training program for health workers to counsel mentally illPatients(GOB,2008a). There were other costs associated that had not been quantified: reduced productivity, the effects on reproductive health, increased snake bites, long term disability,increased morbidity, and other longer-term effects of under-nutrition and mental stigma.

Relief efforts had concentrated on measures to prevent and control outbreaks of disease. Abasic disease surveillance system was created in and around cyclone-affected areas. Casedefinitions and disease surveillance formats were revised with special emphasis on age andgender segregation to identify vulnerable groups. As a result, no significant outbreaks hadoccurred.

A number of agencies worked on safe drinking water andgood progress were made, includingestablishing four water treatment plans provided by the Government of Norway (GOB, 2008b). However, sanitation and waste disposal remained major problems. Adequate staff to continue provision of basic health care services was also important at this stage of recovery. Fortunately, there were relatively few casualties among health personnel, contributing to the quick overall recovery of the services in response to the disaster. The response was a joint effort by the public sector, the army, and individual philanthropists, together with staff from relief agencies.

The study of Paul and Routray (2012) suggests that food aid coming from outside sources to the study villages contributed to maintaining regular nutritional intake despite experienced food shortages due to the cyclone.Fortunately, the study villages also did not experience any serious outbreak of disease orillness in the aftermath of the cyclone. Such an outbreak could cause a severe shortage ofclean drinking water, and unhygienic living conditions. The non-experience of epidemicwas associated with proper and timely distribution of food and relief goods, includingbottled water and water-purifying tablets (Paul, 2011). They also indicated there were improvements in the availabilityof pure drinking water and sanitary facilities subsequent to Sidr due to the timelyprovision of humanitarian, medical, and other assistance by the government agencies,NGOs and others.

Possibilities for appropriate preparedness and actions

Better response is achieved through appropriate preparedness. Preparedness is based on an analysis of risks and is well linked to early warning systems.Preparedness includes emergency assessments, contingency planning, stockpiling of equipment and supplies, establishment of emergency services, communications, personnel training , community level planning and coordination arrangements (The Sphere Project, 2000). Emergency assessment lays the foundation of better preparedness and actions. Emergency assessments should allow the following (Adams, 1999):

— an initial decision to be made on whether assistance is needed;
— a decision to be made on whether local capacity is adequate or external resources are required;
— priorities for intervention to be established and an intervention strategy identified;
— necessary resources to be identified;

— base-line data to be collected, to facilitate monitoring;
— information to be collected for fund-raising and advocacy work.

Recommendations of WHO

Disaster Management in Bangladesh is mainly focused on disaster response rather than acomprehensive approach comprising of preparedness and mitigation measures (WHO, 2007). Following problems must be addressed to ensure appropriate preparedness:

- Lack of incorporation within the national plan, vulnerability of existing health facilities against future flood & cyclones;
- Absence of Field Ambulance (river ambulance, air ambulance/Helicopter) in healthfacilities including availability of paramedics, and rapid response teams.
- Shortage of trained manpower in search, rescue, first aid and mass casualty management.

Preparedness Lessons Learnt

Initial observations on preparedness measures are :

- The warning signals not properly understood by all and some communities did not believe the warnings.
- Difficult for district, upazila officials and communities to translate warning messages into on ground risk scenarios.
- The number of shelters and cyclone shelter house was inadequate and many were in a state of disrepair.
- People were unwilling to take refuge at the shelter leaving their cattle behind.
- A number of CPP volunteers lacked resources and training.
- Communities had little knowledge of storm surge.
- Embankment protection system was not properly maintained.
- Needs improved and coordinated monitoring system to collect information on post disaster damage and losses from field offices.

Lessons need to be learnt

Some unaddressed lessons and recommendations have been outlined by Department of Public Health and Engineering considering two aspects (GOB,2008a):

1. Restoring water supply to pre-cyclone conditions and further development of services, and
2. Emergency preparedness to address future natural disasters.

Following these aspects the recommendations include:

- The conditions of better preparedness will require not only prioritizinginvestment, but also identifying appropriate institutional arrangements between central government and municipal governments in line with the current decentralization trend being promoted on many fronts by the Government of Bangladesh;
- In areas where surface water sources are the only option for drinking water, rehabilitation or reconstruction of pond sand filters is required;
- For users of sanitary latrines, replacement of slabs and other infrastructural rehabilitation is required;
- To mitigate future crises at times of natural calamities, construction of water points is to be carried out in schools, community facilities and cyclone shelters;
- De-watering of ponds and removal of sludge before the monsoon is required;
- Establishment of water quality testing and monitoring systems;
- Hygiene promotional program for communities;
- Development of water source having protection from natural disaster e.g. ponds withraised embankment;
- Raised community latrines;
- Capacity building of the community and Local Government Institutions (LGI) in terms of water supply and sanitation to cope with the crisis and emergency response period during natural disasters.

  To mitigate recurrent storm damage (from cyclones and floods) and the potential spread of waterborne diseases, a long-term program is required that includes a focus on safe water supply and sanitation facilities. It is also recommended to work towards institutional decentralization to increase effectiveness of services.

Hierarchy of disaster management plan

To ensure appropriate preparedness and actions the hierarchy of disaster management plan must be followed(Wisner and Adams 2002). They also suggest that all agencies dealing with health impacts of disaster should be able to liaison with other health organizations and with other appropriate emergency body.

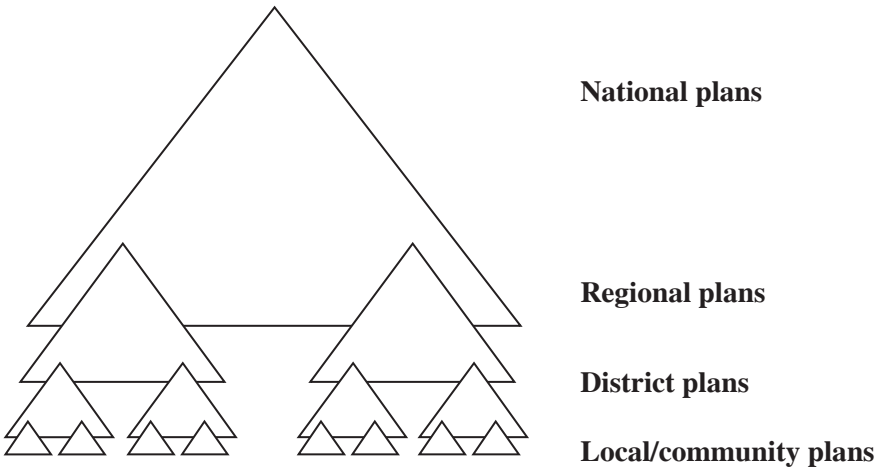

Figure: 3 Hierarchy of disaster management plan
Source: Wisner and Adams (2002).

Environmental health staff in an area should be able to provide information on the following (Wisner and Adams, 2002):

— the location and magnitude of known damage;
— any structural or functional damage to water-supply and waste-disposal systems,etc.;
— the size and location of populations with inadequate water, shelter, and sanitaryfacilities;
— the repair resources available;
— estimates of repair times;
— estimates of special needs for physical and mental health at hospitals and otherinstitutions;
— building local capacity for disaster response.

The extraordinary differences in mortality from similar disasters should alert planners, citizens, activists and development agencies to significant differences in preparedness, response and actions. Wisner, Blaikie, Cannon and Davis (2004) argue that Australia suffered two very similar cyclones shortly after the catastrophic 1970 storm in the Bay of Bengal that killed at least 500,000 in Bangladesh. Yet the death toll in Australia was less than 100 and this is not simply because of the lower population densities, but also for socio-political context. They emphasize that socio-political organization is significant as

national wealth in disaster preparedness. In 1971, North Vietnam survived a combination of coastal storm surge and torrential rain in the Red River delta that could have cost as many lives as in Bangladesh in 1970. But only a few hundred lives were lost in North Vietnam, because of highly efficient war-time village-level organisation that allowed rapid evacuation and provision of first aid.

Conclusion

Without a properly plannedpreparednessprogram, the performance of a successful disastermitigation strategy is challenged. To develop a successful disaster response plan, the framework must be compact enough to be recognizable, strong enough to be resilient to thebuffering of the disaster and flexible enough to expand and contract as the need arises. Toreduce the health risks of a disaster, the cooperation of the public is very important aspect ofany preparedness program. No matter how good a disaster mitigation plan is, if there is noassistance from those expected to follow the plan, then it is doomed to failure. Disasterpreparedness requires the actors-governments, humanitarian agencies, communities andindividuals to have the capacities, communication skill and knowledge to prepare for andrespond effectively to disasters. Before and during a response, they should start taking actionsthat will improve preparedness and reduce risk for future. The experience of sidr shows thatBangladesh Government was sincere to provide appropriate medical treatments to injuredpeople and took necessary steps to mitigate the risks of health. However, better preparednessand actions must be taken by planners and leaders to mitigate future disaster more successfully. A disaster does not read any textbook. It has no responsibility to act logically or predictably(Goldschmitt and Bonvino,2009). Therefore, one must be creative enough to have the effortsto solve the problems that arise from the particular circumstances presented and the resourcesavailable. Without significant changes in the national and internationalfactors that affect Bangladesh ,these efforts at the local level are likely to remain inadequate.

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