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Impact and adaptation to flood

A focus on water supply, sanitation and health problems of rural community in Bangladesh

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Abstract

Purpose – This paper intends to examine the impacts of flood on water supply and sanitation condition along with flood induced health problems in a rural community of Bangladesh. It also aims to explore a rural community's adaptation approaches to flood.

Design/methodology/approach – This research relied on intensive field investigation where 120 households from different villages were selected randomly for questionnaire survey. Sampling was taken from different villages which were the most badly flood affected areas during all previous floods of Bangladesh. Field investigation was conducted in January 2007.

Findings – Flood is a common feature of the study area. Water supply and sanitation condition become severely disrupted during flood when it embraces various water borne diseases. During every flood about two-thirds of the tube-wells and all toilets become unusable. As an adaptation approach tube-wells have been either placed on an elevated base or raised with an extra pipe. But owing to using hanging latrines or a boat and defecating directly into water bodies most people pollute those water bodies. Although majority of the people suffer from different water borne diseases no remarkable adaptation approach is followed. Few people store any emergency medicine before a flood and sometimes take treatment from local rural doctors.

Practical implications – By highlighting the nature and extent of impacts of flood on water supply, sanitation and health condition along with the adaptation this study urges the need for special attention and improvement of these sectors of rural Bangladesh under flood management programs of government and non-government organizations.

Originality/value – This paper facilitates the understanding of the impact of floods on water supply, sanitation and health condition of rural people, which are not well addressed. At the same time its helps to learn lessons from their adaptation to flood.

Keywords Floods, Water supply, Bangladesh, Diseases, Sanitary engineering, Personal health

Paper type Research paper

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Introduction

It is well known that the geographical setting of Bangladesh has made it one of the most vulnerable countries to natural disaster. While tropical cyclones are the biggest

killers, in Bangladesh floods have by far the most widespread, prolonged and damaging effects and it affects the greatest number of people and disrupts all aspects of livelihood. About 80 per cent of the land of Bangladesh falls under the flood plain and as much as 34 per cent of its land area goes under water for about five to seven months in every year (MoEF, 2005; Islam, 2004). Studies also support that Bangladesh is suffering from flood on an increasing basis and with the climate change flooding is expected to increase (Mclean and Moore, 2005; Agrawala *et al.*, 2003; IPCC, 2001). Already Bangladesh had the experiences of the worst floods during the flood-events of 1988, 1998, 2004 and 2007 and is gradually becoming more vulnerable to flood disasters not only for change in nature but also for the rapid increase of population in the floodplains and for the pervasive poverty, that force people to live in floodplains.

Poverty is a significant contributor to people's vulnerability to flooding and frequent flood impact leads to increase in poverty and hence vulnerability (ADPC and UNDP, 2005). Land resources being scarce in this densely populated country and due to growing population pressure people, especially rural poor are forced to settle in the flood prone areas. Moreover, as Bangladesh is mainly an agricultural country and since the river basins as well as floodplains are alluvial, a large number of settlements have been developed along the riverside areas throughout the country. This practice has increased the amount of exposure of human beings to flood as well as their shelters and the resources essential for their livelihoods.

Flood deteriorates the normal functions of life, affecting homesteads, agricultural land, daily activities, water supply and sanitation condition and economic structure. Along with the numerous vulnerabilities, problems related to water supply, sanitation and health become acute during a flood. During a flood especially water supply and sanitation system are severely affected that boost the spreading of waterborne diseases causing stern health problems. Besides this, like other poor communities due to reduced incomes owing to losses of assets, rural poor experience increased difficulty in food that create relentless health and nutrition problems (Gaillard *et al.*, 2008).

The *British Medical Journal* reports that most of the floods occur in developing and tropical regions, where the impact on public health is substantial. These floods cause about half of the all deaths from natural disasters. But the flood related death and health problems are not only dependent on the characteristic of the flood but also determined by the privileging socio-economic and health status of the community (*BMJ*, 2000). Therefore, flood related health problems of Bangladesh are also accelerated by the poverty, poor state of public health infrastructure, low life expectancy, severe child malnutrition, low expenditure of government on health (US$2 per person per year, World Bank, 2002, cited in MoEF, 2005) and importantly poor water supply and sanitation condition of the country. According to World Health Organization (WHO), the major risk factor for outbreaks associated with flooding is the contamination of drinking water facilities. Flood affected people of Bangladesh are highly vulnerable to waterborne diseases during a flood. In Bangladesh 80 per cent diseases are related to inadequate water supply and sanitation. As water supply and sanitation are severely affected by flooding, the risk of spreading of water borne and fatal diseases increase during flood period (Mahmood, 2004). Eventually, the vulnerability of the rural poor to floods is increasing due to lack of effective initiatives to manage water supply, sanitation and health hazards during flood.

Because of frequent floods and their devastating impacts, people in the flood prone areas have become used to dealing with the problems associated with flood through innovation of their own adaptation mechanism. From the study it is revealed that different adaptation mechanisms are sometimes very effective. Also sometimes people face much hardship to deal with the severe impacts of flood in their health and sanitation. Importantly it is noticed that due to absence of awareness and motivation people induce adverse impacts to the community as well as the environment through their different coping mechanisms. At the same time, intentionally or unintentionally they are exposing themselves to health and environmental hazard.

This research is an attempt to reduce health and environmental hazards due to flood by investigating the extent of impact of flood on water supply, sanitation and health of the rural poor. On the other hand, learning the community adaptation mechanism to flood would help to develop effective adaptation tools and strategies. It is expected that the outcomes of this research would alert the concern authorities as well as the community to deal with the health and sanitation problems in an effective and efficient way that would not only reduce their vulnerability but also be environment friendly.

Methodology

Through empirical study in one of the most flood vulnerable *upazila* (sub-district) of Bangladesh, named Goalanda Upazilla in Rajbari district this research intends to explore the water supply, health and sanitation problems of rural community during flood and their adaptation mechanism. This research relied on intensive field investigation where sampling was taken from different villages which were the most badly flood affected areas during all previous floods. For household questionnaire survey total 120 households from different villages have been selected randomly. During flood since it is hardly possible to communicate with the area and conduct household questionnaire survey, the field investigation was conducted in January 2007, which was not flooding season. Recalling their every year's experiences and specially the experiences of the floods in 1998 and 2004 people gave the answers related to impacts and adaptation to flood. Besides the structured questionnaire survey, semi-structured interviews and discussions with key informants like local NGO workers, health workers, members of Local Government, schoolteachers and *upazila* officials were conducted. Furthermore, focused group discussions were organized in different villages where people from different professions and strata attended and shared their experiences and sufferings during flood. Along with the questionnaire survey these discussion provided wide views and opinions of people at grass root level and enriched the data bank of this research.

Study area and its flood

Goalanda Upazilla in Rajbari District (see Figure 1) is located in southwest hydrological region of Bangladesh as a part of the Ganges Delta (BWDB (Bangladesh Water Development Board), 2006). It stands beside the river Padma and is one of the most adversely affected areas by flood almost every year. People living here have to pass their whole life struggling against flood and the most interesting thing is that they have to depend both directly and indirectly on river and flood for their livelihood.

Goalanda is a disaster prone area, the inhabitants are vulnerable to several natural hazards: flood, riverbank erosion, drought, and tropical storm. Among these, flood has

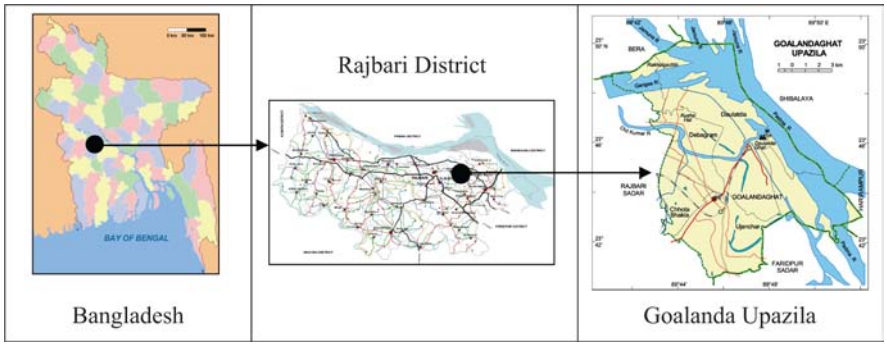
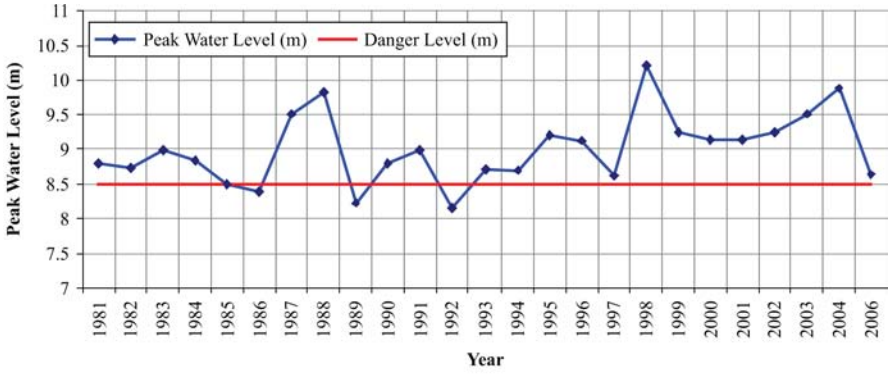


Figure 1.
Location map of the study area

been ranked as the number one hazard by the local people. According to them, after independence of the country, the most devastating flood occurred in 1998; the duration of this flood was also the longest, about two months. The second most severe flood event was in 2004.

Nature and extent of flood in Goalanda Upazilla for several years has been described by observing water level of river Padma at Goalanda Station. Figure 2 shows that within the year from 1981 to 2006 flood did not occur only four years (1985, 1986, 1989, and 1992). It means that flood is a regular event for the people of this area. In the year 1987,1988,1998,2003 and 2004 water level above danger level was more than 1m, which cause huge damage to agricultural production and homestead. Early flood has been occurring in recent years where water level started to rise and cross danger level earlier during June. Monsoon flood is severe in the study area as the two main rivers: the Ganges and the Brahmaputra, confluence at Goalanda and flows in a wide, straight, trench like channel, which is named as river Padma.

In spite of being a regular event every year life and livelihood of the people of Golanda severely disrupt due to flood. Along with the damages and losses in their homestead, income and occupation the essential need water supply and sanitation condition become measurable and eventually every year they suffer from various health problems during and after flood. Here flowing sections illustrate the water



Source: Plotted data collected from BWDB (2006)

Figure 2.
Water level at Goalanda Station from 1981 to 2006

supply, sanitation and health problems of Goalanda *upazila* during flood and the adaptation approach of people.

Impact and adaptation to flood: water supply, sanitation and health problem

Though Goalanda *upazila* is one of the most flood vulnerable areas of Bangladesh, where people are bound to face flood every year (see Figure 2), the sufferings of people and their way of adaptation have not yet been depicted by any study. Therefore, here such an attempt has been taken. Since water supply, sanitation and health issues are the most sensitive and crucial during flood, this study concentrates on these issues only. Here, in this section focus has been given to the extent and types of impacts of flood on these crucial issues and people's adaptation to minimize the adverse impacts.

Impacts and adaptation related to water supply during flood

No body can disagree with the proverbs like "water is life and/or in water is health". But it is a matter of great regret that about half of the people of Bangladesh are deprived of such an urgent need of life. According to World Health Organization (WHO, 2008), 70 million people of Bangladesh are exposed to drinking water which does not comply with the standards of WHO. These large numbers of people mostly live in rural areas, where acute level of poverty, lack of clean drinking water and regular flooding and cyclone are identified as the most prominent types of problems (Mclean and Moore, 2005). Since flood related major risk factor is associated with water and rural people suffer from having access to safe drinking water, the vulnerability of rural community during flood can be easily realized. Following section tries to depict this picture of vulnerability and people's way of adaptation.

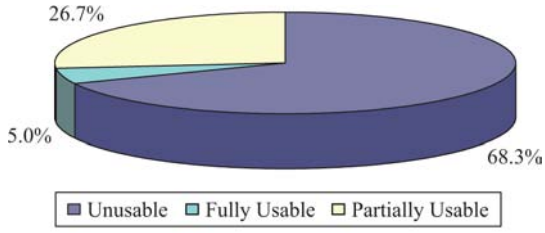
Impact on water supply

In rural Bangladesh during flood, most of the tube-well and other safe water sources become submerged; as a result, safe water becomes scarce. Human and animal excreta, rubbish and contaminated soil mix with floodwater and pollute both surface and ground water. People cannot boil water for decontamination due to shortage of dry cooking place as well as of fuel. Generally the impacts of flood on water sources are:

- inundation of water sources including tube-wells, ponds and channels by contaminated flood water;
- disruption of access to safe water sources; and
- deteriorated quality of water due to pollution and high level of bacteriological contamination.

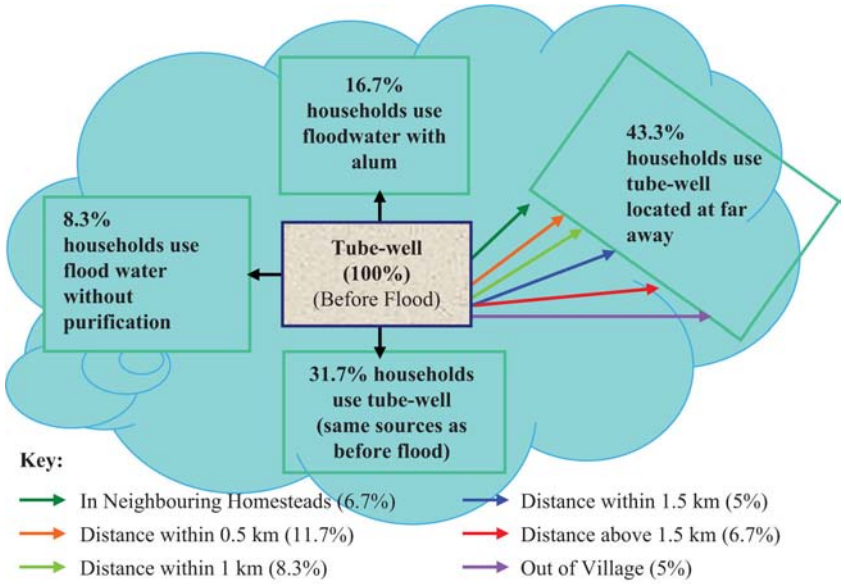
In normal situations, all households of Goalanda use tube-wells as a source of water for drinking and kitchen activities. These tube-wells are located either on homestead or nearby places. Though in every year's flood they need to face serious crisis of safe water they suffered most during flood in 1998 and 2004. Here they illustrated their suffering of those floods. During those floods more than two thirds of the tube-wells of the study were affected. Maximum tube-wells used by the households sunk fully or partially during flood and become unusable as well as polluted floodwater enter in the submerged tube-well (see Figure 3).

People claimed that during flood 2004 only 31.7 per cent households could use same water sources before and during flood; the rest, 68.3 per cent, had to find alternative sources due to the unusable condition of the previous water sources (see Figure 4). Hence water collection became a severe problem and quantity of water consumption decreased. Among the households that were needed to seek alternative water sources 43.3 per cent of them dependent on tube-well located about 1.5 km away from the households. Though it was not a very long distance in respect of rural areas in normal situation, it became very difficult for them to collect water repeatedly and in adequate amount for drinking and household activities from tube-wells of such locations as communication disrupted severely during flood and most of the areas remained submerged. Thereby, 25 per cent households used surrounding floodwater with or even without any purification and caused contamination of various water borne diseases. Here it should be noted that this is the common picture of their struggle for water during every year's flood. What people do to face this water crisis is discussed below.



Source: Field Survey, January (2007)

Figure 3.
Distribution of household according to the usability of tube-well during flood



Source: Field survey, January (2007)

Figure 4.
Changes in water source during flood

Adaptation measures regarding water supply

Water is not only the basic requirement for life, it is also essential to maintain proper sanitation and personal hygiene practices. Even adequate water supply and sanitation facilities cannot ensure healthy environment without proper management of those facilities, especially in flood situation. Realizing this fact, rural people who have both affordability and awareness have taken following measures regarding water and water source during flood.

(1) Measures with tube-well (mainly three measures):
   - The tube-wells have been set on raised base do not sink during flood.
   - Cementing the base so that polluted floodwater cannot enter inside the tube-well.
   - Height of tube-wells, those sunk during a flood, has been increased, using a pipe.

(2) Storing of drinking water in containers.

(3) Disinfection of water.
   - Water purifying pill was used to keep the tube well water safe.
   - Boiling of floodwater before use.
   - Use alum with floodwater before use (see Figure 5).

In the study area generally about one-third of the tube-wells remained fully or partially usable during flood and totally in the case of about 20 per cent tube-wells some kind of adaptation measure have been taken to keep it usable during flood. Among these one-fifth of the tube-wells have been placed on elevated base, which is higher than the average flood level and 15 per cent tube-wells have been raised with pipe, as those sunk partially during flood. Besides this, there are some households (about 17 per cent), which use floodwater purified by alum. Surprisingly still there are some people (8 per cent households) who use floodwater without any treatment/purification. These people are the most vulnerable group in case of waterborne diseases like diarrhoea and skin diseases. No households that use flood water after boiling has been found, since crisis of fuel is severe during flood.

Source: Author

Figure 5.
Cementing the base of tube-well

Impact and adaptation measures regarding sanitation

It is said by the scholars that lack of appropriate sanitation facilities in flood-prone and high water table areas of Bangladesh is one of the prime contributing factors of health and environmental degradation (Kazi and Rahman, 1999). Since last one decade this situation has been improved with the Government's ambitious target of "sanitation for all by 2010". Study conducted by WHO and UNICEF in 2004 (cited in UNDP, 2006) estimates the sanitation coverage of Bangladesh and found the figures as 39 per cent for rural and 75 per cent for urban population though Government claims better achievement. This estimate shows that rural people are far away from 100 per cent sanitation coverage. Furthermore, many of the rural communities have even less that 39 per cent sanitation coverage. Goalanda *upazila* is one of the rural areas where sanitation condition is very poor. Union-wise rural sanitation data of Bangladesh as on December-2005 published by Bangladesh Government shows that till October 2003, only 11 per cent people of the study area used hygienic latrine. This poor sanitation practice deteriorates during flood. In this area every year flood inundates water sources causing contamination to it, damage sanitation facilities, resulting contamination to water bodies, which in turn, degrades the environment.

Like many other localities in Bangladesh, in the study area every year usual impacts of flood on sanitation are:

- inundation of toilets by flood water;
- disruption of entrance to toilets;
- drop out of toilet users as latrines get damaged; and
- disposal of solid waste in surroundings that degrades environment.

Owing to these impacts people need to change their normal defecation practices. Figure 6 presents a comparative picture of the defecation practices before and during the flood.

With a view to have privacy and to avoid odour, in the rural areas usually the toilets are located relatively far away from the dwelling place, in a corner, at a lower place than the ground level of homestead and preferably near the water body. Locations of the toilets in the study area are not exception of this. Therefore, every year during flood most of the toilets become inundated. During flood in 1998 and 2004 about 97 per cent of the toilets became unusable due to inundation with flood water and only 3 per cent toilets within households were found to be usable partially (see Figure 6). These large numbers of people defecated directly to water. During flood 48 per cent people practiced defecation openly using boats or floats, 42 per cent built temporary hanging latrines, which were connected to water bodies and rest of them (7 per cent) shared neighbors' or relatives' latrines those were useable. Thus overwhelming percentage of people of the study area (90 per cent) polluted water bodies by defecation during last two major floods (see Figure 7).

Since most toilets in the study area became unusable during previous floods, people have started to take some measures to minimize the problem. Both the key informants and general people reported that mainly two types of structural measures are taken regarding toilets to avoid submerging during flood. These are:

(1) Raising the base of toilet or placing it on an upward location.

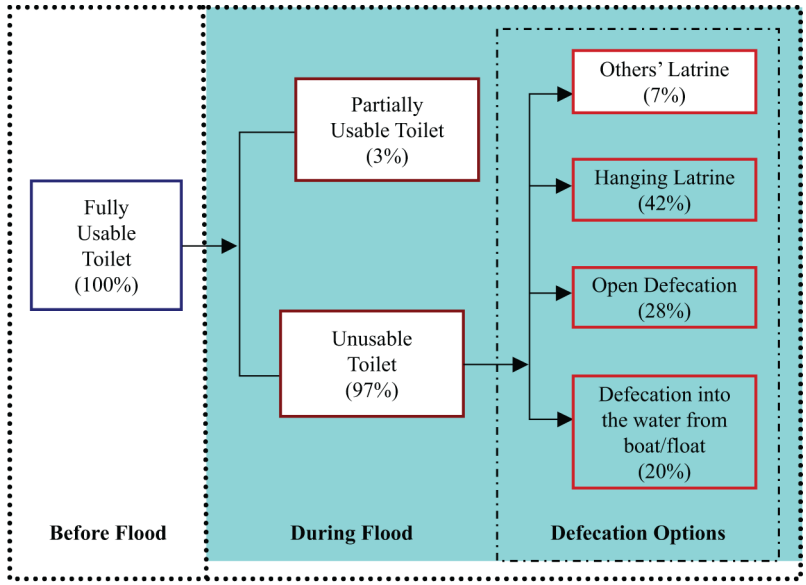


Figure 6.
Defecation practices before and during flood

Source: Field survey, January (2007)

Figure 7.
Unhygienic hanging latrine near water body

Source: Author

(2) Increasing the base height of the toilet using more than one sanitary ring, which raise the height of the toilet about 1.5ft.

Impact and adaptation measures regarding health

Howard, Brilman and Burkle (cited in *BMJ*, 2000) identified that in developing areas after flood different diseases like diarrhoea (including cholera and dysentery), respiratory infections, hepatitis A and E, typhoid fever, leptospirosis and insects borne diseases occurred in an increased rate. Other studies (Ahern *et al.* 2005) related to flood in low-income countries have also reported diarrhoeal death. In fact, lack of proper sanitation facilities coupled with polluted drinking water and lack of awareness about hygiene lead to diarrhoeal diseases and such other water and insects borne diseases (Heierli, 2007). According to the report of UNICEF 1999 (cited in Galway, 2000), diarrhoea and dysentery continue to be the major causes of sickness and 15 per cent of all deaths in Bangladesh due to poor water supply and sanitation facilities. Though Bangladesh is praised for its great progress both in water supply and sanitation many of the rural areas are still in measurable condition at this regard (mentioned earlier).

All this discussion related to the association among health, water supply and sanitation gives an image of rural people's health related vulnerability during flood. In addition to this, occurrence of flood is always a serious threat to the food security of the poor households in Bangladesh that cause serious health problems and malnutrition. In order to live with flood people have to change their eating habit as well as take some affordable measures to combat with diseases.

Impact on health due to food crisis during flood and adaptation

Foods become scarce during every flood and most households have to suffer for lack of adequate food due to failure of income source. During flood expenses for food also increase. Therefore, it deteriorates food consumption, especially for the rural poor both in quality and quantity and eventually leads them to the malnutrition and health problem. Field investigation revealed that during most of the previous floods in the case of about 70 per cent households the quantity of food consumption was highly reduced, which mean they had to consume the food quantity that was less than half of the normal time. Furthermore, about 88 per cent of the households claimed that the quality of the food was also deteriorated due to flood.

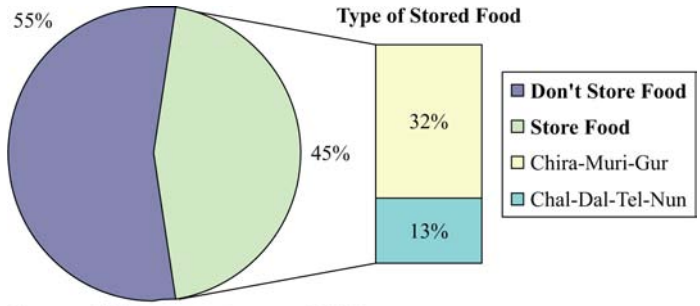
Like many other cases, in this study too women were found as the most sufferers during flood in terms of all aspects specially taking food during flood. They gave up food consumption for managing meals for other members of the household. Women had to take fewer calories by reducing number of meal. The frequency and quantity of meals for women reduced highly and simultaneously the quality was highly deteriorated in general.

Generally in every locality of Bangladesh as a preparation for flood, households store dry food such as *chira-muri*, *gur* (molasses) and *chal* (rice), *dal* (pulse), *tel* (oil), *nun* (salt) etc. In this study about 45 per cent households arranged some dry food before flood. Among those who stored some foods before flood 32 per cent households collected food from surroundings shops on credit basis and another 10 per cent borrowed or exchanged food from neighbors. Rest majority of the households (55 per cent) households could not afford to store food before flood (see Figure 8). These

people had to follow different adaptation mechanisms to face this food crisis. At the time of flood, if there was no alternative means of managing food people of the study area started to consume their productive assets, mainly poultry as their food. Since during flood arranging safe-dry places for poultry is difficult, death of hens and ducks is the most common matter and this is another reason behind consuming their poultry assts.

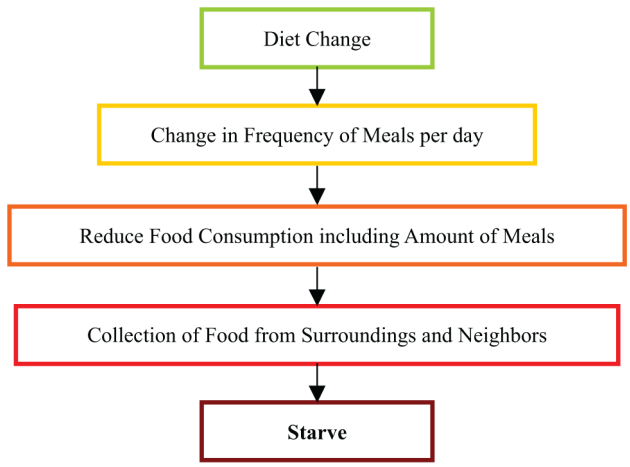
To cope with the increasing severity of flood people of this study area changed their eating habit sequentially adapting following measures mainly; shown by Figure 9.

Examining the previous practices it was found that during flood the coping strategies regarding food habit were mainly modification of their eating habits and a reduction in the frequency of meals. This is especially when households suffered income loss and failed to get enough credit to purchase same amount of food. In the step of reduction of food consumption initially women reduced food consumption for



Source: Field survey, January (2007)

Figure 8.
Distribution of households according to storage of food



Source: Field survey, January (2007)

Figure 9.
Changing sequence of food habit due to flood

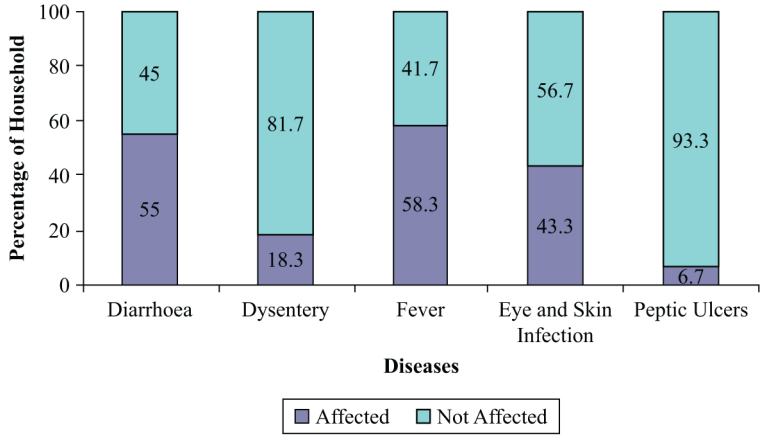
managing food for other members. When people failed to have any dry food or could not buy any food to cook then the female members of the household also tried to collect food such as leafy vegetables and kind of roots from surroundings and boiled them to eat. But the regretting matter was sometimes even having food it was difficult to have fuel and dry place to cook. So sometimes they collected fuel from far away and cooked on the bed or on boat. If there were no alternative means of managing food or cooking people had to starve.

Impact on health due to water borne diseases and adaptation

Vulnerability of rural people in water supply and sanitation condition, especially during flood was mentioned earlier and it gave an image of their vulnerability to water borne diseases during flood. It was also said that more that two-thirds of the tube-wells of the study area become unusable during almost all previous floods. In spite of this, majority of the people tried to collect safe water for drinking. But there were some households who used floodwater without proper purification. Moreover almost every household was needed to depend on floodwater for washing, bathing and cleaning and even sometimes cooking. Therefore, water borne diseases such as diarrhoea, dysentery, fever, jaundice, eye and skin infection, etc. were very common during all previous floods. Even those who used tube-well water for every purpose of washing and cleaning also became victim of diarrhoea, as floodwater seeping from surroundings contaminated water in tube-wells as well as groundwater. People from more than 50 per cent households claimed that they were affected by diarrhoea and fever in most of the previous floods. Besides, a large number of people suffered from dysentery, eye and skin infection and some people faced peptic ulcers (see Figure 10).

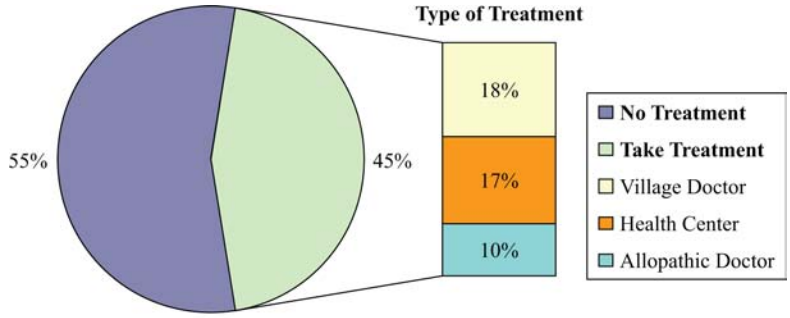
Though overwhelming majority suffered from different health problems more that half of the households (55 per cent) did not receive any treatment for the diseases that occurred during flood (see Figure 11). The reasons behind this were:

- Inability to afford treatment due to unemployment and decreased income.



Source: Field Survey, January (2007)

Figure 10.
Comparison among diseases according to affected household



Source: Field survey, January (2007)

Figure 11.
Distribution of households according to treatment

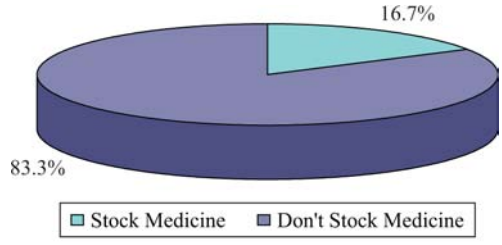
- Unavailability of proper medical treatment during floods because of absence of physicians due to flooding condition and communication difficulties.
- Carelessness about health or lack of awareness and knowledge about health and personal hygiene.

Those who took treatment, used to go to mostly either to village doctor or to the health center. Majority prefer to take treatment from village doctor because they could avail this easily during flood. Only 10 per cent of the families were able to afford treatment from allopathic doctor (doctor who passes from medical college).

Before starting of flood taking preventive measure for health problem is not common among rural people. Few of those who are a bit aware and careful about health try to store some simple medicines and first aid. Specially medicine for fever, oral saline for diarrhoea are the common medicines that they store. In this area it was found that only 17 per cent households stocked emergency medicine before flood starting (see Figure 12). Rest of the household did not store any type of emergency medicine, even oral saline though most of the people suffered from diarrhoea, dysentery, fevers, eye and skin infections, etc. during flood.

Conclusion

Flooding of different magnitude is not only a major disaster in this locality but also a common feature of every year. Impacts of flood and people's sufferings have been understood with the discussion in the previous sections. It reveals that generally flood sub-merges two-thirds of the tube-wells and during flood only about one-third of the households can use safe drinking water without much hardship. On the other hand,



Source: Field survey, January (2007)

Figure 12.
Distribution of households according to stocking of emergency medicine

people's hardship and sufferings due to flood is more severe in the case of sanitation, since only 3 per cent of their toilets remain usable during flood. So, almost all people pollute water bodies by defecating openly or from hanging latrine or boat. Due to using polluted water and living in unsanitary conditions more than half of the people suffer from diarrhoea, fever and skin infection. In addition with these, due to lack of income they had to go for food shortage, which lead to malnutrition and health problem during flood. Thus the impact of floods is compounded by and has exacerbated the extremely high incidence of poverty.

It has been noticed that almost all people in the study area take temporary short-term measures regarding water supply, sanitation and health to cope with floods. People just try to pass the days of flood anyhow and do the same every year; they do not do any thing that will support them during the next flood. Through these coping mechanisms though the people could survive they could not have any pace to upward mobility rather sometimes their efforts go in vain due to natural disaster. This rural poor community cannot take any long-term measures due to lack of awareness as well as lack of financial support. But awareness generation and provision of financial support should not be a big issue, where along with a large number of Non-Government Organizations (NGOs) Department of Public Health (DPHE) and Local Government and Engineering Department (LGED) of Bangladesh Government are working for rural water supply and sanitation with high priority. UNICEF, DFID, ADB, World Bank and such other donor agencies are also prioritizing these sectors of Bangladesh.

It has been noticed that prioritization of different national and international organizations along with Government has promoted the safe water sources and latrines in rural areas. But yet could not change in sanitary practice relating to hand washing and safe disposal of children's feces. Most of the rural people still use polluted water of ponds, rivers and canals to bathe and wash, specially during flood (SACOSAN (Second South Asian Conference on Sanitation), 2005). It is also said that rather poverty low priority to sanitation is often the cause of using unsanitary latrine. A sanitary latrine costs between US$2 and US$20, which is often less than the amount rural people need to spend for diarrhoeal diseases and the income loss due to it ((Heierli, 2007). Rural people are needed to realized this fact and make them motivated to use sanitary latrine. DPHE, LGED and NGOs working in the rural areas can take the responsibility to aware and motivate people in sanitation practices and to construct their latrine and tube-well on a raised platform to protect from flood. Micro-credit programs of NGOs should incorporate low interest or interest free credit component for water supply and sanitation so that their members can have easy financial support for these facilities. If the individual household cannot afford group based credit can be provided so that four to six families can take group loan and build common toilet and tube-well. In fact, the pace of achievement in poverty alleviation by micro-credit programs of different NGOs often become sluggish due to the sufferings of their beneficiaries from different health problems primarily caused by unsafe water and sanitation condition during flood and other natural disasters.

In some parts of Bangladesh few NGOs like Grameen Bank, Proshika, BRAC and some other small NGOs too are trying to incorporate health and hygiene related motivational activities for their beneficiaries and giving terms and conditions of having sanitary latrine and use of safe water to have micro-credit for income

generation. But provision of credit or financial support for water supply and sanitary latrine is not so common. Furthermore, Hygiene Awareness and Product Information Campaign program supported by DFID is working for social mobilization and communication with the involvement of NGOs as facilitating agency.

Poverty alleviation programs of NGOs and water supply and sanitation programs of Government should prioritize health and hygiene education, awareness generation and motivation programs along with financial supports for safe water supply and sanitation facilities for rural poor. Importantly, these programs should have special attention to the disaster prone areas. But it is regretting that though Government's strategies and policies related to safe water and sanitation has incorporated pro-poor strategies these policy-strategies have no special attention to disaster prone vulnerable areas.

Most important thing is to guide as well as motivate vulnerable rural communities to take environment friendly measures, build their awareness for responding accordingly during flood, make their ways easy to cope with flood and thereby, mitigate the vulnerability due to floods. Present study area Goaland should be treated as a priority area, since this is not only one of the most flood vulnerable areas of Bangladesh and but water supply and sanitation condition of the people are measurable.

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Further reading

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