

Flood and health hazard: a seasonal environmental problem of Nagarbera revenue circle in Kamrup district of Assam, India

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SUMMARY : An attempt has been made in this paper to analyse the impact of flood on public health in Nagarbera revenue circle of Kamrup district, Assam. During monsoon period of 2010, an epidemiological survey was conducted in 9 purposefully selected sample revenue villages of the circle. Considering the health indicators - sanitary, drinking water and health care facilities of the villages, primary data/information were collected from 300 randomly selected households. Total 1,351 respondents were interviewed with specially designed questioner - cum - schedule. The study revealed that 45.50 per cent respondents were infected by dysentery, 30.86 per cent by viral fever, 20.70 per cent were suffering from gastroenteritis and 2.93 per cent were infected by jaundice. Dysentery and viral fevers are the major seasonal diseases of the flood prone villages. A village level health care awareness programme and need base plan is urgently necessary for public health care.

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Flood, Health hazard,
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Among the various natural hazards faced by man on this earth's surface, flood and its subsequent effects are the most universally, widely and often experienced devastating hazards. River floods are the most frequent and often the most devastating (Sinha, 2001). During flood, water flow rate of rivers is greater than common discharge rates. It has a limited duration and the water overflows the natural river's bed, occupies the lowlands and lands near the rivers and has financial and human damages (Ahmadi Nejad *et al.*, 2002). The most important factors affecting the intensity and flood return period in each region are: volume and time of upstream surface runoff and river or flood conditions, physical characteristics of watershed area, hydrological characteristics of the water shed and human activities causing and intensifying the flood flows. Investigations have shown that the cause of flood damages is neither the short term flood returns period or high flood intensity, but over use of flood plain around river (Bhadra *et al.*, 2011).

The flood hazards in Assam due to river Brahmaputra is much more devastating and widespread in proportion compared to any other state in India. As reported in the Economic Survey of Assam 2003-2004, Assam has accounted 9.4 per cent of total flood prone of the country. Flood hazard occurs regularly in the valley since time immemorial, but intensity of flood and destruction has increased since the great earthquake of August 15th, 1950. During rainy season, the rivers not only become filled up with water, but the excess amount of water also spillover their banks flooding the neighboring areas. Almost entire Assam get submerged twice or thrice yearly due to flood resulting loss of life and property. Flood causes severe damage to ecology and environment. During the last few decades, there were heavy floods in Assam in almost every alternate year, especially in 1954, 1957, 1962, 1966, 1968, 1978, 1988, 1990, 1991 and 1998 (Taher and Ahmed, 1998). About 3,150,000 hectares of land in Assam alone is flood prone. As per 2001 census one third of the total of Assam was affected by flood.

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Flood is a common natural hazard of the Brahmaputra valley, associated with various forms. Health hazard has risen during and after flood, especially in the water logging areas. District Disaster Management Authority, Kamrup reported in their District Disaster Management Plan 2012-2013 that the general reason of occurrence of flood in Kamrup district of Assam due to overflow of river Brahmaputra and its tributaries. During the period of May-August flood occurred in the district and created hazard.

The study area Nagarbera circle in Kamrup district of Assam is an active flood prone and water logging area, situated in between 90°55 E- 91°05 E longitude and 25°03' N- 26°08' N latitude. Annual rainfall of Kamrup district ranges between 1500 mm to 2600 mm. temperature ranges from 6° to 39° and relative humidity 75 per cent. The total geographical area in the circle is 109.61 sq. km., and number of revenue villages are 28 with population density 715 persons per sq.km. Physiography of the area is dominated by flood plain except a single hill. Nagarbera area of district has a long history of flood since the great Earthquake of 1897 and 1950 in Assam. The area falls in the flood plain zone of the river Brahmaputra. During summer, a couple of months paralyzed the developmental human activities in Nagarbera circle in Kamrup district of Assam (Bordoloi, 1995). Due to poor healthcare facilities, most of the people of the area have been infected by microbiological pollution. The major health problems are associated with seasonal food and water borne diseases. The objective of the study is to identify the major water borne diseases of the area and suggested some remedial measures.

The review of relevance literature reveals that many researchers have published their research works and reports on flood hazards and water born diseases. The works of (Bordoloi, 1995; Taher and Ahmed, 1998; Ahmadi Nejad *et al.*, 2002; Bhadra *et al.*, 2011) on flood hazards of Assam are directly and indirectly related to this study. The study is of significance for decision making and planning in the water logging flood prone areas of the Brahmaputra valley where seasonal flood and health hazard is a common problem.

EXPERIMENTAL METHODOLOGY

During 2010, a survey was conducted in Nagarbera revenue circle, Kamrup district of Assam. Both empirical and field survey methods were followed in the study. Out of the total 28 revenue villages of the study area, villages have been categorized into 3 groups as acutely flood affected villages (10 villages), moderately flood affected villages (10 villages) and partially flood affected villages (8 villages). Out of these 3 groups, 9 sample villages were selected in such a way that it represents the whole area. The sample villages were Sagunbahi, Badlapathar, Mandira Reserve NC, Jaljali Khola Reserve, Jamlai, Bhokhuradia, Tupamari, Nagarbera and Pijupara. Total

1,351 respondents were interviewed with specially designed questionnaire - cum - schedule from the 300 sample villages of the study area to assess the impact of seasonal flood hazard on human health.

EXPERIMENTAL FINDINGS AND DISCUSSION

From the study based investigation, it has been seen that the 9 sample villages were located within the range of 0 to 8 km. from the river Brahmaputra. It was again observed that due to extension of rural settlement in the flood prone areas, number of flood victims are increasing during last few decades. River Brahmaputra has its own channel and shifted towards south and north in time. After the great earthquake of 1950, it has again shifted its course for which villages located in the flood plain are created flood hazard every year in the study area. Rural communities and tribe of Nagarbera have been ecologically adapted in the water logging environment having seasonal flood and health hazards.

Sanitation problem:

The sanitary facilities in the flood prone area under investigation were relatively very poor in relation to other areas unaffected by the flood. Moreover, the existing facilities further deteriorate to an inhuman level during the flood period. The present survey shows the dismal sanitation facility prevailing during the flood in the area. It was found that out of 300 surveyed households, 153 households have been using tube well and 147 households have been using surface water or flood water for their washing and cleaning purposes. Thus, it became apparent that a sizable number of households *i.e.* 49 per cent households used surface water or flood water for various purposes which ultimately affect their health and hygiene. In case of the sanitary facility during the flood time, it was observed that only 17.33 per cent households have the ability to use sanitary latrine, 40 per cent households have Kachcha latrine and rest 42 per cent households have to defecate in the nearby embankment, flood water or any open land. This creates hazards to the health and hygiene, while 42 per cent people do not have the sanitary facility during flood. The water logging environment of the area polluted surface and ground water and developed various water borne diseases like malaria, dysentery, gastroenteritis, jaundice etc.

Drinking water problem:

Drinking water problem is another factor for which most of the water borne diseases are contaminated during flood period in the area. From the study based on investigation, it has been found that out of 300 households only 187 (63%) had the provision of using tube well water. But the rest 113(37%) households do not have such facility. During the time of flood, 140 households of acutely flood affected

villages, only 37 per cent households used tube well water for drinking purposes and the rest 63 per cent households have to collect their drinking water from various sources like from nearby villages or from flood water itself due to submersed of drinking water sources in flood water which ultimately severely affects the health and hygienic condition of the majority of the flood victims by the spread of water borne diseases. The survey regarding drinking water facility, shows that the insufficient source of collecting water for drinking and other purposes in day to day life and it is evident that the lack of drinking water and sanitation facilities are also other factors which compound the woes of the people during flood time aggravating the health hygienic problem further more.

Seasonal flood and health hazard in the study area:

Effectively available health care centre and proper functioning of specific health and medical care from a particular health centre is an important indicator so as to optimize the use of public health care facilities as well as services to the

flood victims. From the field survey of purposive sample size it has been found that in the entire acutely flood affected four surveyed villages there was not a single health care centre, in case of moderately flood affected three surveyed villages there were two health centres, one MPHC at Tupamari village and another one, a sub-centre at village Jamlai while in two surveyed villages of partially flood affected category there was one PHC at Nagarbera. In respect of the medical staff, it was quite insufficient in relation to the number of people. There were only 4 of doctors, 1 of GNM, 3 of ANM in the PHC at Nagarbera while there was only one visiting doctor and one ANM each at village Tupamari and at Jamlai. This poor scenery of present health care facility in the area showed that the area under investigation was very poor which ultimately severely affects the flood victims by water borne diseases. In respect of availability of health care centre, the survey showed that only a dismal 3 numbers of health centres and health care facilities were in existence in the flood prone area covering nine villages, out of which only 1 health care centres, remained effectively functional during flood time. Because of this utterly

Table 1 : Epidemiological data of the sample villages of Nagarbera revenue circle of Kamrup district

Category of villages	Name of the village	No. of household surveyed	Population	H/H dentified with disease	Population identified with disease infection	Frequency of disease			
						Fever	Dysentery	Gastroenteritis	Jaundice
Acutely flood affected villages	1.Sagunbahi	30	131	12 (40%)	40 (30.5%)	12 (9.2%)	20 (15.3%)	7 (5.3%)	1 (0.8%)
	2.Badlapathar	40	194	28 (70%)	91 (46.9%)	27 (13.9%)	36 (18.6%)	25 (12.9%)	3 (1.6%)
	3.Jaljali Khola reserve	40	180	26 (65%)	90 (50%)	25 (13.9%)	34 (18.9%)	28 (15.6%)	3 (1.7%)
	4.Mandira reserve	30	132	18 (60%)	70 (53%)	21 (15.9%)	30 (22.7%)	17 (12.9%)	2 (1.5%)
	Total	140	637	84 (60%)	291 (45.7%)	85 (13.3%)	120 (18.8%)	77 (12.1%)	9 (1.4%)
Moderately flood affected villages	1.Jamlai	40	195	21 (52.5%)	66 (33.8%)	20 (10.3%)	35 (17.9%)	12 (6.2%)	1 (0.5%)
	2.Bhokhuradia	30	126	16 (53.3%)	48 (38.1%)	18 (14.3%)	22 (17.5%)	6 (4.8%)	2 (1.6%)
	3. Tupamari	30	128	14 (46.7%)	42 (32.8%)	17 (13.3%)	20 (15.6%)	4 (3.1%)	1 (%)
Total	100	449	51 (51%)	156 (34.7%)	55 (12.2%)	75 (16.7%)	22 (4.9%)	4 (0.9%)	
Partially flood affected villages	1.Pijupara	30	134	13 (43%)	39 (29.1%)	13 (9.7%)	21 (15.7%)	4 (2.9%)	1 (0.8%)
	2.Nagarbera	30	131	12 (40%)	26 (19.8%)	5 (3.8%)	17 (12.9%)	3 (2.3%)	1 (0.8%)
Total	60	265	25 (41%)	65 (24.5%)	18 (6.8%)	38 (14.3%)	7 (2.6%)	2 (0.8%)	
G. Total	300	1351	170 (56.7%)	512 (37.9%)	158 (11.7%)	233 (17.3%)	106 (7.9%)	15 (1.1%)	

Source: Primary data, collected during summer 2010.

insufficient availability of health care facilities, the toll of the people due to various water borne diseases was far greater in number which would have been otherwise if many such centres would have been operational during the time of flood in the area.

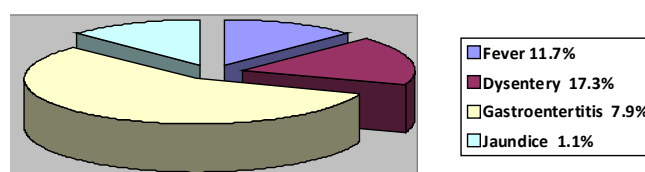
Major water borne diseases:

From the study based on investigation in the sample villages, it was found that 170 households were faced with various water borne diseases while out of the total 1351 respondents, 512 persons were identified with various water borne diseases. The percentage of house hold identified with water borne diseases was 56.67 per cent and the percentage of people identified with infected various water borne disease was 37.90 per cent of the whole sample size. Another variation was observed in case of house hold as well as persons identified with diseases in respect of categories villages vulnerable to flood hazards. In acutely flood affected villages, the percentage of households identified with diseases was 60 per cent while percentage of people identified with various water borne diseases was 45.68 per cent. In moderately flood affected villages, the percentage of households identified 51 per cent while percentage of people identified was 34.74 per cent. In partially flood affected villages, the percentage of households identified 41 per cent while percentage of people identified with various water borne diseases was 24.53 per cent.

There is a variation in house hold as well as people identified with disease in different villages with respect to the vulnerability of flood hazards. In case of acutely flood affected villages, Sagunbahi, Badlapathar, Jaljali Khola reserved and Mandira reserved the percentage of house hold identified with diseases were 40, 70, 65 and 60 per cent, respectively and their percentage of people identified with disease were 30.50, 46.91, 50 and 53 per cent, respectively (Table 1). In case of moderately flood affected villages, Jamlai, Bhokhuradia and Tupamari, the percentage of house hold identified with diseases were 52.5, 53.3 and 46.67 per cent, respectively while percentage of people identified with diseases were 33.85, 38.09 and 32.8 per cent, respectively. In case of partially flood affected villages Pijupara and Nagarbera the percentage of house hold identified with diseases were 43 and 40 per cent, respectively while percentage of people identified with diseases were 29.10 and 19.84 per cent, respectively.

In respect of frequency of various diseases, it was observed that out of 1351 people of the whole sample size, 158 people were identified with fever, 233 people were identified with dysentery, 106 people were identified with gastrointestinal disease and 15 people were identified with jaundice while the percentage of people identified with various water borne diseases were fever, dysentery, gastrointestinal and jaundice were found to be 30.86, 45.50, 20.70 and 2.93 per cent, respectively of the whole sample size.

As has been discussed above, it showed that flood is the most vital agent in chronically affecting the health and hygienic conditions of the people of the flood prone area under investigation. The data analysis of the above table boils down to the facts that out of 300 surveyed households of nine villages, 56.7 per cent households was severely affected by the flood prone diseases during the study period. Again, 37.9 per cent of the surveyed people were direct flood victim of the health hazard caused by flood. The data regarding the category of water borne diseases affecting the people clearly indicated that dysentery was the most common forms of diseases which affected almost 17.3 per cent of the total surveyed people. Along with dysentery the other water borne diseases which affected the people were fever 11.7 per cent, gastroenteritis 7.9 per cent and jaundice 1.1 per cent of the whole sample size (Fig. 1).



Source: Primary data, collected during summer 2010

Fig. 1 : Infection of water borne diseases in sample villages of the study area

Provisions of proper health care centres and adequate medical staff for looking after the health and hygiene problems of the people should be increased during flood season. The central Government of India as well as state Government of Assam should take appropriate steps in the flood prone areas. NGOs and literate section of people should come forward and conduct awareness programmes by arranging meetings and popular talks, which will be helpful for flood victims. During flood, personal sanitation systems of families become paralyzed for which Government developed one public community sanitary system in each should flood affected villages. In the acutely flood affected villages, at least a couple of tube wells should be installed on such a height which could not generally submerged by the level of the flood water. People should be made aware of using treated water particularly using the boil water during the time of flood to avoid attack of any kind of water borne diseases during the flood period. Special emphasis should be given upon innovative reorientation of the economy of the flood affected villages of area to minimize the threat of environmental vulnerability and to ensure economic sustainability to the possible extent.

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