Impact of Floods on Health of under five children: A study on Diarrhea in Bahraich district, Uttar Pradesh*

Joshi P.C[1]., Khattri P.[2], D'Aoust O[3], Singh M.M[4]. and Guha-Sapir D[5].

Diarrhea is one of the most important problem among the under five children in India. The stress caused due to flood is expected to aggravate this problem. In the present paper, we have tried to examine the impact of floods on the situation of diarrhea among under five children. The study design compares the probability sampled flood affected and non flood affected clusters in Fakharpur Block in the district of Bahraich, Uttar Pradesh. A total sample of 807 under five (6-59 months) were examined for the study consisting of 401 flood affected and 406 non-affected children. Overall, it is seen that the flood does not influence the presence of diarrhea in the long run, since there was no significant difference in the percentage of cases of diarrhea between exposed and unexposed. It has been found that the children who had 3 or more watery stools in any one day in the last two weeks from the date of the interview comes out to be approximately 54 percent.

Economic condition of the household is associated with the prevalence of diarrhea cases in both exposed and unexposed strata, as the households where members took loan, reported more cases than the ones where no loan was taken ($p<.05$). Cases of diarrhea were significantly higher in the children who reported difficulty in seeing at night, for both exposed and unexposed groups ($p<.05$). Also children who were suffering from cold in the last two weeks reported more diarrhea, than the children who did not suffer from cold, for both the groups. After analyzing cases of diarrhea against religion, it was found that more cases were reported among the Muslim community as compared to the Hindus, however this difference was not statistically significant ($p>.05$). There was also no significant difference found between male and female.

Key words: diarrhea, malnutrition, flood

---

* Abstract submitted to the 2nd Disaster Management Congress, New Delhi, November 4-6, 2009

[1] Professor and Asia Coordinator, Microdis, Department of Anthropology, University of Delhi, Delhi-110007 (email: pcjoshi@anthro.du.ac.in)

[2] Doctoral Candidate, Department of Anthropology, University of Delhi, Delhi-110007 (email: prashant_khattri2002@yahoo.co.in)

[3] Masters student, Center for Research in Epidemiology of Disasters, UCL, Brussels, Belgium (email: olivia.daoust@uclouvain.be)

[4] Professor of Community Medicine and Public Health at Maulana Azad Medical College, New Delhi, India

[5] Director and co-ordinator, Microdis, Center for Research in Epidemiology of Disaster, UCL, Brussels, Belgium (email: debby.sapir@uclouvain.be)

Introduction:

Diarrhea is a major cause of mortality among the under five children in India and thus it is considered as an important public health problem (Banerjee et al, 2004). The economic burden on health services caused due to diarrheal diseases is immense, as upto one third of total pediatric admissions are due to diarrheal diseases and upto 17% of all deaths in indoor pediatric patients are diarrhea related (Park, 2000). An estimation of mortality due to diarrhea in India was carried out by the National Institute of Cholera and Enteric Diseases, Kolkata (*internet*). According to their estimates, the crude death rate due to diarrhea in rural India is 9.3 per 1000 population. The total number of deaths due to diarrhea in the age group of 0-6 years accounted for 22% of total rural deaths. Owing to the gravity of the problem associated with diarrhea among the under five children in India, it was taken as one of the dependent variables in the study conducted on the nutrition status among the under five children in flood affected *Bahraich* district of Uttar Pradesh, India.

The objective of the present study is to understand the impact of floods on the morbidity pattern of the under five children. From previous research we know that the morbidity and mortality in a disaster situation is determined by the health of the affected community before the disaster, and the ability of the infrastructure to recover (Bourque et al, 2006). The argument is examined in the light of economic condition as a factor in determining the morbidity related to diarrhea. Vulnerability of certain specific group is also examined within the exposed and unexposed groups, which were not found to be significant. However when we analyze the results across exposed and unexposed groups, then we do see a significant difference according to socio-political, socio-religious and economic orientation and affiliations of these groups. Also, there was no significant difference in the diarrhea prevalence between the exposed and unexposed regions of the area studied. However, the limitations of the study, as a function of its temporal dimension, i.e. the time frame during which the study was conducted, cannot loose site while interpreting the results.

Methodology:

Site for the study

The study was conducted in the most flood affected *Fakharpur* block of *Bahraich* district of Eastern Uttar Pradesh. This particular site was selected, since this study on the nutritional status of the under five children forms the annex part of the main study conducted on the Integrated Health, Social and Economic Impacts of Extreme Events: Evidence, Methods and Tools, funded by European Commission 6^{th} framework programme, in the same region. Also, Bahraich is one of the most flood affected districts in Uttar Pradesh. According to the Uttar Pradesh statistical report, Bahraich was the most flood affected district in the year 2007 with around 173 villages flooded. In the year 2008 around 183 villages got affected due to floods (period of floods in the district is from the

end of July till mid September). It is in this background that the present study was carried out in first half of July (from July 5-15), 2009.

The Fakharpur block consists of 74 Gram Panchayats or GPs (administrative division of villages into village panchayats or gram panchayats). Out of these, 12 GPs were affected by floods in 2008 and the rest 62 GPs remained non-affected. The total population of the block is 194183. The total population of the children under six years of age, according to the district official record is 41201 out of which there are 20314 females and 20887 males.

Sampling procedure

A sample size of 800 under five children was calculated using the ENA (Essential Nutritional Assessment) software. It was then decided that half of the sample size will come from the exposed (flood affected) households and the other half would comprise of the unexposed (unaffected by floods) to enable the researchers to compare the two groups. Cluster sampling was used as a sampling method for the survey. There were forty clusters in all, twenty each in exposed and unexposed areas. The size of each cluster was twenty. The task of assigning clusters to the villages was also done using the ENA software, in which the name and total population of the village was entered and it calculated the number of clusters per village, thus assigning the clusters to the village according to the population of the village (probability proportion to size).

For deciding on which children will form the part of the study, a systematic procedure was followed. On arriving at the village where the cluster was assigned, the research team went to the center of the village (by asking the people of the area). From the center, a bottle was rotated and the direction indicated by the mouth of the bottle was followed. After reaching the end of that direction, the bottle was again rotated and the direction which it indicated formed the area from which the research team took its sample. They visited the households of that direction and completed the survey on each child of the household till they completed twenty children of under five years of age. Following this procedure, 807 under five children (6-59 months) were examined, consisting of 401 exposed children and 406 unexposed children.

The tool

Questionnaire was used as a tool for collecting the data on prevalence of diarrhea among the under five children. However, in its entirety it was meant to capture the status of malnutrition in the exposed and unexposed areas of the region, prevalence of diarrhea as a dependent variable formed an important part of the questionnaire. The other socio-economic dimensions that were explored with the help of the questionnaire, were- annual income of the household, amount of land holding, caste of the children, religion, type of house, etc. other indicators of malnutrition, that formed a part of the questionnaire were- height, weight, age in months, MUAC (mid upper arm circumference), Vitamin A deficiency signs, presence/absence of bitot's spot.

Analysis

The analysis of the data obtained through questionnaire was done using the SPSS software. There are two levels of analysis that was carried out, viz- *a.) within the group and b.) between the groups.* In the first category exposed and unexposed groups were split and analysis was done to ascertain, if there is any significant difference between variables like caste, religion, gender, economic condition etc. for prevalence of diarrhea. On the other hand, in the second category, same variables were taken to ascertain if there is any significant difference between these variables across exposed and unexposed groups. Since we dealt with categorical data (nominal and ordinal data values), chi-square was used as a measure to establish the significance of difference.

Results

Within the group (exposed and unexposed) analysis

Table 1 below shows result of the study across different variables. It shows the difference within the exposed and unexposed groups across variables and their significance.

Table 1

Variables	Did your child suffer from 3 or more watery stools in one day in the past 2 weeks					
	Exposed (% saying yes)	Exposed (% saying no)	Unexposed (% saying yes)	Unexposed (% saying no)	Exposed (p value)	Unexposed (p value)
					Pearson chi-square asymp. Sig (2-sided)	
Did your family ever received loan or microcredit						
Yes	61.1	38.9	60.8	39.2	.009	.05
No	47.7	52.3	51.4	48.6		
Has you child coughing, sneezing or cold in the last 2 weeks?						
Yes	74.1	25.9	73.9	26.1	.00	.00
No	31.2	68.8	33.0	67.0		
Age group (months)						
6-17	71.3	28.7	67.4	32.6		
18-29	55.6	44.4	64.6	35.4		
30-41	50.0	50.0	51.9	48.1	.00	.00
42-53	45.0	55.0	42.1	57.9		
54-59	56.2	43.8	45.5	54.5		
Stunting						
Normal	53.6	46.4	48.1	51.9	.77	.01

Moderate	54.5	45.5	52.6	47.4		
Severe	57.6	42.4	64.2	35.8		
Do you think your child has difficulty to see at night (night blindness)						
Yes	65.2	34.8	72.7	27.3	.19	.01
No	52.1	47.9	52.3	47.7		

1.) From the above table it implies that in families that received loans, more children suffered from diarrhea than in the families that did not receive loan. This was true for both the exposed and unexposed groups and the difference was significant for both the groups.

2.) Another factor that seem to be affecting the prevalence of diarrhea is the ARI (Acute Resperatory Infection) in both exposed and unexposed populations. Children who suffered from ARI in the last two weeks also suffered from diarrhea more than children who did not suffer from ARI.

3.) Age group is also one such variable that showed significant difference in the prevalence of diarrheal disease. Children in the age group of 6-17 months were the one that suffered from diarrhea the most, in both exposed and unexposed groups. Also as the age is increasing from 18-53 months the prevalence of diarrhea is decreasing in both the groups.

4.) Stunted children show more cases of diarrhea in both the groups, however this difference was only significant for the unexposed group and not for the exposed group.

5.) Night blindness was found to be associated with increased prevalence of diarrhea for both the groups, as people who said that there child has difficulty in seeing at night also said that their child suffer from diarrhea, however it was significant only for the unexposed group and not for the exposed.

6.) There were also variables for which the analysis was carried out but they did not show any significant difference within the exposed and unexposed groups. These variables include- gender, religion, caste, malnutrition, underweight, occupation of parents, education of parents and place of delivery of child (home vs hospital).

Between the group (exposed and unexposed) analysis.

For doing this kind of analysis, first the data was split on the basis of responses, for the variable diarrhea. After this the procedure for cross tabulation was applied to get results between the exposed and unexposed for different variables that were taken up for the within group analysis. The results generated from this analysis are as follows:

1.) The variable “did you receive any loan” was cross tabulated against exposed and unexposed groups within the category of people who said that their child suffered from diarrhea. It was found that the percentage of children who had diarrhea was greater in exposed (55.9%) groups who received loan as compared to the unexposed group where it was 44.1% and this difference was very significant (asymp. Sig. 2-sided= .002).

2.) Cases of diarrhea were not found to be significantly different between the caste groups within the exposed and unexposed strata. However, when the caste groups were analyzed across the exposed and unexposed strata then the difference in the cases of diarrhea emerged which were significant. It was found that within the scheduled caste (SC) population, 59.1% of the people said that their child suffered from diarrhea in the exposed group, whereas in the unexposed group only 40.9% said that their child had diarrhea. Within the OBC (other backward caste) population 59.2% in exposed group said that their child had diarrhea, whereas in the unexposed group 40.8% children had diarrhea. This difference was also significant (asymp. Sig 2-sided= .000). However, results for the people belonging to general category were just opposite, where in exposed group only 38.5% children had diarrhea and in unexposed it was 61.5%.

3.) In Hindu families, children suffered from diarrhea more in exposed (53.7%) than in unexposed group (46.3%). However, this was not true for Muslim families, where less children suffered from diarrhea in exposed group (35.7%) than in unexposed group (64.3%). Asymp. Sig 2-sided= .000

4.) Within the occupational category, children in the households of laborers and farmers were found to be suffering from diarrhea more in the exposed group than in the unexposed group.

Occupation	**% of children suffering from diarrhea in Exposed**
Unskilled laborer	56.2
Skilled laborer	55.0
Farmer	50.3
	Asymp. Sig 2-sided= .016

Discussion

Economic condition seems to be the underlying factor that affects morbidity related to diarrhea. It was found that within the exposed and unexposed groups, families/households that received loans, their children suffered from diarrhea more than those that did not receive loans. Receiving loan is equivalent to not having sufficient resources. Floods, also has an impact on the morbidity pattern of diarrhea. It was found that households that received loans, in the flood affected areas, reported more diarrhea in their children than the households that received loans but were in the non flood affected area. It has been documented in several studies that one of the underlying cause of diarrhea is malnutrition among children (Francis et al, 2000). It was also found to be true in this study which suggests that prevalence of "inability to see in the dark (result of vitamin A deficiency)" among the children is associated with diarrhea morbidity for both exposed and unexposed groups. Also, economic condition and malnutrition are closely related (Osmani, 1992). There also exists a strong relationship between economic condition and the condition and standard of living and environmental and personal hygiene (Costello and Haggart, 2003). These battery of factors are responsible for greater morbidity as a result of poor economic condition.

The greater morbidity across exposed and unexposed groups, as a result of poor economic condition can be explained on the basis of understanding the '*process'* that leads to poor economic condition (Osmani, 1992). It is a fact in the flood prone district of Bahraich that, floods wash away the land holdings of the people. People who generally are farmers, had to work as laborers on daily wages as a result of land erosion. Results of this study indicate that skilled and unskilled laborers households in the flood affected areas reported more diarrhea among children. This indicates that flood adds to the process of poor economic condition and hence a difference between flood affected and unaffected households.

There is a consensus that vulnerable population, such as women, children, poor, elderly and underrepresented groups are differentially and negatively affected by disasters (eg., Bolin, 1976; Bolin and Bolton, 1986; Kaniasty and Norris, 1994; Tierney, Lindell and Perry, 2001). However, research on physical morbidity and mortality associated with natural hazards, generally does not support this perception (Bourque et al, 2006). This line of argument mostly came from several studies on earthquake that not only showed a lack of differential effect on the population due to underlying vulnerability (Shoaf, Nguyen, Sareen and Bourque, 1998) but also reported results that were opposite to the common held perception. This argument is further supported by the findings of the Northridge earthquake, where newer homes inhabited by middle class whites were damaged more than the older homes that were inhabited by African-American, group which is more often considered vulnerable (Comerio, 1995; Shoaf and Bourque, 1999). This finding falls in line with the pathogenic morbidity related with the prevalence of diarrhea in the flood affected area, in the light of the study conducted in *Bahraich*. It was found that there is no significant difference in the prevalence of diarrhea in under five children, between the groups that were traditionally considered vulnerable (Bourque et al, 2006) in the exposed regions. Traditionally considered vulnerable caste groups and

religious minorities did not show significant difference in the prevalence of diarrhea within the exposed and unexposed groups. However, the Scheduled caste (SC) and Other Backward Caste (OBC) groups showed more diarrhea related morbidity in the exposed group as compared to the unexposed group. Hindus as a religious group showed more morbidity in the exposed group whereas Muslims, considered as religious minorities showed more morbidity in the unexposed group. Thus floods have an impact on vulnerable caste groups but does not show an impact on religious minorities, which are considered as a vulnerable group.

This kind of result raises question on the defining characteristics of what is vulnerable and what is not vulnerable. This implies that vulnerability is a vague concept (Costello and Haggart, 2003). As individuals, we all are vulnerable, but some members of society are more vulnerable than others. The term has been used to describe how an individuals or groups characteristics and their relationship to environment factors may influence health (Rose and Killien, 1983). Rogers (1997) states that "the use of the term vulnerability implies that an individual, family unit or social group is susceptible to health problems." However the definition and understanding of vulnerability can be given more meaning, if it is conceptualized as a *'continuum'* that is dynamic and constantly changing, with individuals and groups at different points on the continuum at different times (Rose and Killien, 1983; Copp, 1986; Rogers, 1997). Bringing in the dimension of continuum to the concept of vulnerability implies that a group is not vulnerable all the time, everywhere, rather a groups vulnerability is subject to change depending upon the situation and time. This explains the finding that suggests a lack of significant difference among the caste and religious groups within the flood affected areas, before the floods occur. This also entails within itself, a limitation of the present study which was carried out before the floods hit the area. It can be a possibility that will need further research that after the floods, there might occur a significant difference between the caste groups and religious groups in the flood affected area.

Acknowledgement
This research was conducted as part of the MICRODIS project funded by the European Commission under the 6th Framework Programme.

Conflict of interest
The authors declare that they have no conflict of interest.

References

1.) Banerjee B., Hazara S., and Bandopadhyaya D. 2004. Diarrhea Management among under fives. *Indian Pediatrics*. Vol.41. pp. 255-60.

2.) Bolin R.C. 1976. Family recovery from natural disasters: A preliminary model. *Mass Emergencies*,1, 267-77.

3.) Bolin R.C. and Bolton P. 1986. Race religion and ethnicity in disaster recovery. Monograph No. 42. Boulder, CO: University of Colorado.

4.) Bourque L.B., Siegel J.M., Kano M., and Wood M.M. 2006. Morbidity and Mortality Associated with Disasters. In *Handbook of Disaster Research*. Ed by. H. Rodriguez, E.L. Quarantelli and R.R. Dynes. Springer.

5.) Comerio M.C. 1995. *Northridge Housing Losses: A study of California Governors office of emergency services*. Berkeley CA: University of California, Berkeley, Center for Environmental Design Research.

6.) Copp L.A. 1986. The nurse as advocate for vulnerable persons. *Journal of advanced nursing.* Vol.11.No.3.pp 255-63.

7.) Costello J. and Haggart M. 2003. *Public Health and Society*. Palgrave MacMillan. New York.

8.) Francis C.M., Narayan R., Patil R.R. and Umesh C. 2000. *Epidemics: Diseases as Disasters. In India Disasters Report: Towards a Policy Initiative*. Ed by. Parasuraman S. and Unnikrishnan P.V. Oxford University Press. New Delhi.

9.) Kaniasty K. and Norris F.H. 1994. *Social support from family and friends following catastrophic events: The role of cultural factors*. Paper presented at the 7th International Conference on Personal Relationships, Groningen, Netherlands.

10.) Osmani S.R (ed). 1992. *Nutrition and Poverty*. Clarendon Press. Oxford.

11.) Park K. 2000. *Park's textbook of Preventive and Social Medicine*. Banarsidas Bhanot publishers. Jabalpur.India

12.) Rogers A.C. 1997. Vulnerability health and health care. *Journal of Advanced Nursing*. Vol.26. pp. 65-72.

13.) Rose M.H. and Killien M. 1983. Risk and Vulnerability: A case for differentiation between personal and environmental factors that influence health and development. *Advances in Nursing Science*. Vol.5. No.3. pp. 60-73.

14.) Shoaf K.I. and Bourque L.B. 1999. Correlates of Damage to residences following the Northridge earthquake, as reported in a population-based survey of Los Angeles County residents. *Earthquake Spectra*. Vol.15. pp. 145-72

15.) Shoaf K.I., Nguyen L.H., Sareen H.R. and Bourque L.B. 1998. Injuries as a result of California earthquakes in the past decade. *Disasters*. Vol.22. pp. 218-35

16.) Tierney K.J., Lindell M.K. and Perry R.W. 2001. *Facing the unexpected: Disaster preparedness and response in the United States*. Washington D.C.: Joseph Henry Press.