

## **Epidemiological Analysis of Flood: A Case Study of July 2010 Flood in District Swat and Charsadda**

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**Abstract:** Disasters are abnormal public health events that engulf the coping capacity of the affected community. The study focus on the health problems faced by the flood affected people and damages to health centers in the study areas. A study was conducted in two Districts namely Swat and Charsadda of Khyber Pukhtoonkhwa (A province of Islamic Republic of Pakistan) to explore the health problems faced by internally displaced flood affected people in July 2010 flood. A random sample of 396 respondents was selected from both the districts. A pre-designed interview schedule was used to collect the data through field survey. All medical centers including Basic Health units, major and minor public and private hospitals were studied in the flood affected zone. The study findings show that affected people faced health problems like eye and skin infections, gastric problems some minor and major injuries and fractures. Almost all medical centers in the affected area were more or less damaged and were not in position to properly entertained patients. The study recommended that people should avoid unnecessary walking and drinking flood water that may cause health problems. Government and nongovernmental organization work on the emergency bases for the availability of basic health facilities through hospital and mobile health units to flood affectees.

**Key words:** Flood Affectees • Physical Health • Health Centers • Internal Displacement • Epidemiology • Swat • Charsadda • Pakistan

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### **INTRODUCTION**

More than 2/3 of the entire population in the world is directly and indirectly affected from natural disasters and particularly from flood, in the form of internal displacement, health related problems and financial loss in the field of agriculture, nevertheless deaths rate is very low from flood and 15 percent of deaths are due to flood disasters in the world [1]. Flood also severely affects physical and mental health of affected people and may cause of psychological problems such as anxiety, stress and depression [2].

Floods have both short and long term implication on human physical and mental health [3] and the extent of possible health impacts for a particular deluge event would be broader in nature, which are both directly and indirectly linked with the floodwaters [4]. The impacts of floods on the health are deeper than the direct physical threat to human life due to floodwaters. The floodwaters carry wastes and other toxic materials that cause diseases by exposing human to toxins and pathogens that may affect mental health [5].

The degree of floods' influence on the health issue depends upon a variety of factors that include the regularity of flood occurring, speed, velocity and depth of the floodwaters and scale of the deluge. The factors also include the socio-economic status of the individuals, construction of their houses, existing health status as well as the availability of healthcare facilities. Besides, the mental preparedness of the individuals, effective system of early warning and coping strategies. The table 1 explains the mechanism of how human health outcomes, which is affected by floodwaters. The health outcomes may be occurred at three levels such as pre-onset, onset and post-onset of flood [4].

The contaminated drinking water and stagnation of water due to floods cause a number of diseases such as cholera, malaria, yellow fever, dysentery and respiratory diseases etc [6]. The stagnation is usually caused by inadequate sewage system and access of insoluble materials such as plastic bags etc. that was banned by Bangladeshi government in 2002 to avoid blocking of drainage system [7]. The survey conducted in the wake of 1998 floods in Bangladesh which resulted that averagely

Table 1: Mechanisms through which humans may be affected by flooding

Health outcome	Flooding of house	Walking in or contact with floodwaters	Existence of flood nearby (but no direct contact with flood)
Death from drowning and trauma	Yes	Yes	No
Injuries	Yes	Yes	No
Diarrhea	Yes	Yes	Possible (e.g. flooding of water treatment works)
Malaria	Generally unlikely	Generally unlikely	Yes
Leptospirosis	Rarely	Yes	Possible
Mental Health (e.g. depression and anxiety)	Yes	Possible	Possible (e.g. if evacuated but not flooded)

Source: (Ahem and Kovats, 2006, p.29) (10)

31% of the affected people were found ill, however, the ratio is as higher as 40% in the areas exposed to awful flooding [8].

The internally displaced persons are susceptible to a number of diseases such as malaria, diarrhea, tuberculosis, cholera, measles, meningitis, polio, yellow fever and respiratory infections. These diseases are mostly caused by the unavailability of clean drinking water and inadequate sanitation, which is indispensable for the human health. Besides, the Internally Displaced Persons (IDPs) have little access to healthcare services [9].

The outbreak of these diseases is due to the massive dislocation of the affected people. The arrival of huge number of displaced persons in the new location cause overcrowding, which disturb the availability of adequate sanitation, proper condition of the residences, clean water for drinking and healthy food items to the displaced persons. The situation resulted in the vulnerability of the IDPs to various diseases, especially the young ones, the elderly people and those who are physically less resistant [10-11]. Realizing the dire need of healthcare, the guiding principles on internal displacement provide that the state authorities would ensure the availability of reasonable conditions of healthcare and hygiene to the displaced persons [12].

The situation become further worsen, when the affected person displaced from the flood affected areas and move to towns and cities with a hopeful optimism brought infection to the new location. The infection is then spread out in the new location where the diseases are already controlled due to persistent effort of the governmental and non-governmental organizations [7].

Pakistan veteran a most awful disaster ever in the history in the form of sever flood in the mid of 2010 (28 July 2010). In this disaster 17 million acres area was under flood water for long time period which leaving a miserable state of affairs across the country. Although this flood affects entire country nevertheless Khyber Pakhtunkhwa, was very much suffered where the flood started and

devastating the whole region. Infrastructure was severally affected and people faced problems regarding movement and basic necessities of life for long period of time. The flood also sever in the form of human physical aspect, where 1156 people were died and three million people were displaced creating an extreme emergency situation in different divisions and districts, a study was conducted with the following objectives:

#### Objectives of the Study

- To know the socio-economic characteristics of the respondents
- To study the health problems faced by the flood affectees
- To know the damages occurred to medical centers in the flood affected area
- To explore the health facilities provided in the camps

#### METHODS AND MATERIALS

Data was collected from two most flood affected districts of Khyber Pukhtoonkhwa namely Swat and Charsadda. A sample size of 396 was selected through random sampling technique from the sample frame provided by Non-governmental Organizations and Social Welfare Department of government sector. Respondents were selected from nine union councils of the two districts, where one the bases of proportionate sampling technique five UCs were chosen from Swat and four from Charsadda. A pre-designed interview schedule was constructed for collection of data comprises both open and closed ended question. All of the medical centers of the target area were incorporated in the study and information about these centers was collected from Doctors and medical officials. Different statistical techniques used for the analysis of the data like mean, Slander Deviation and for finding association between dependent and independent variables statistical tests like Chi-Square and Gamma test were utilized.

**RESULTS AND DISCUSSIONS**

The table 2 is about the district of residence of the respondent and union council, 396 respondents were selected from both districts, Swat and Charsadda. District Swat was more severely damaged than District Charsadda in the July 2010 flood that is why more respondents were being selected from District Swat than Charsadda through purposive sampling. According to Pakistan Disaster Management Authority [13], in Swat, 634,654 people were affected from 2010 flood while in Charsadda 502,732 were suffered. For this purpose four out of Nine Union Councils were selected from district Charsadda and five out of Nine union councils from district Swat on the basis of the proportion of affected people in the flood.

The table shows the age of the respondents in which 16.4% of the respondents were less than 30 years, 16.2% were from 30 to 35 years, 30.8% were from 36 to 40 years, 14.9% were from 41 to 45 years and 21.2% were above 45 years of age. The data was collected from the respondents whose age from 20 years to 60 years. Mean age of the respondent in the target area was 38.54, calculated median was 39, mode was 36, Standard Deviation was 8.835 and variance of age was 78.057. The data shows that majority of the respondents were 38 years old who have better understanding of their damages and rising social and psychological problems.

The table demonstrates that 89.9% of the respondents were married whose spouses were alive, 1.5% of the respondents were divorced from their spouses, 7.8% were those married people whose spouses had died, 8% of the respondents separated from living spouses. In the study only married people were the respondent so all of married people were selected in which negligible number of the respondents were divorced and living separately from their alive spouses due to the local culture of the Pukhtoon society.

Table shows the level of education gained by the respondents in which 7.2% of the educated respondents have primary education, 22% of the educated respondents have middle education, 45.5% of the educated respondents have higher secondary level of education which include matriculation and intermediate and 25.3% of the educated respondents have higher education such as Bachelors and, Master degree. The table also shows that mean of education level in the flood affected area was 5.72, median was 5.00, Standard Deviation was 5.869 and variance was 34.446. The table included only those respondents who have formal education.

Table 2: Distribution of respondent by age, marital status, education and monthly income

Age of the respondent		
Statement	Frequency	Percent
I. 20-29	65	16.2
ii. 30-35	64	30.8
iii. 36-40	122	14.9
iv. 41-45	59	21.2
v. Above 45	86	22
Total	396	100
Mean = 38.54, Median = 39, Mode =36, Std. Dev. = 8.835, Variance = 78.057		
Marital status of the respondent		
i. Married	356	89.9
ii. Divorced	6	1.5
iii. Widow/widower	31	7.8
iv. Separate	3	.8
Total	396	100.0
Educational attainments of the respondent		
i. Primary	15	7.2
ii. Middle	46	22
iii. Higher Secondary	95	45.5
iv. Graduation and post graduation	53	25.3
Total	209	100.0
Respondents' monthly income (Rs)		
i. Less than 10000	99	40.2
ii. 10000-15000	121	49.2
iii. Above 15000	26	10.6
Total	246*	100.0

Mean = 7321.97 Median = 8500.0 Std. Dev. = 6.360E3

\* Only those respondents who have some source of earning

Table 3: Distribution of respondent regarding gastric problems, i.e. diarrhea, cholera, esophagus inflammation and acidity

Gastric problems		
Statement	Frequency	Percent
I. Yes	322	81.3
ii. No	74	18.7
Total	396	100.0
Diarrhea		
i. Yes	271	68.4
ii. No	125	31.6
Total	396	100.0
Cholera		
i. Yes	236	59.6
ii. No	160	40.4
Total	396	100.0
Esophagus Inflammation		
i. Yes	225	56.8
ii. No	171	43.2
Total	396	100.0
Acidity		
i. Yes	263	66.4
ii. No	133	33.6
Total	396	100.0

The table 3 shows that gastric problems arose in the recent flood in the table 81.3% of the respondents confronted with the gastric problems and less than one fifth of the respondents faced no gastric problem in the recent flood. Gastric problems are due to the use and drinking of contaminated flood water, during flood non availability of clean drinking water increase gastric problems in the flood affected areas.

Table indicates that diarrhea is one of the most common gastric problems in the flood affected area 68.4% of the respondents had the problem of diarrhea during the flood time while about one third of the respondents avoid using and drinking of flood water were safeguarded themselves from the gastric problems. The above table also demonstrates one of widely spread gastric problems in flood area is Cholera which was faced by people six tenth of the respondent faced gastric problem of cholera by using contaminated flood water and four tenth of the respondents did not face such gastric problem of cholera. A similar type of study conduct by Howard, Brillman and Burkle that flood increased the rate of diarrhoea (including dysentery and cholera), hepatitis A and E, respiratory infections, leptospirosis, typhoid fever and diseases borne by insects have been described as occurring after floods in developing areas [15-16].

Table illustrates another gastric problems which is faced by the people in July 2010 flood is the inflammation and swelling of esophagus track, about six tenth of the respondents faced severe inflammation in their esophagus while four tenth of the respondents protected themselves from such type gastric disease by avoiding the use of flood water. The above table indicates acidity problems faced by the flood affected in the recent flood of July 2010 the data clearly shows that 66.4% of the respondents faced gastric problems of acidity by using flood contaminated water while one third of the respondents did not face acidity problems in the recent flood.

The table 4 shows that during flood in the area majority of people face skin problems, flood water was contaminated which affect human skin, the tables shows that more than eight tenth of the respondents faced skin infection in the form of scabies, while only 15.2% of the respondents did not face skin problem in recent flood. In the past flood people were less affected by flood in respect of skin problems, while in the recent flood they confront with such problems. Centers for Disease Control and Prevention carried out a search work on the skin infection that are caused by flood where Individuals who have been affected by flooding are more likely to present

Table 4: Distribution of respondent regarding skin infections, ie scabies, acne, erythroderma and eye infection ie eye inflammation and redness

Scabies		
i. Yes	336	84.8
ii. No	60	15.2
Total	396	100.0
Acne		
i. Yes	283	71.5
ii. No	113	28.5
Total	396	100.0
Erythroderma		
i. Yes	273	68.9
ii. No	123	31.1
Total	396	100.0
Eye inflammation		
i. Yes	214	54.0
ii. No	182	46.0
Eye redness		
i. Yes	325	82.1
ii. No	71	17.9
Total	396	100.0

to acute medical care facilities for skin rashes and exacerbation of asthma and for outpatient medical needs, such as dialysis or refills of prescriptions or oxygen [17].

Table indicates that skin infection like minor pimple and small Pitch. Among the respondent 71.5% of them faced minor pimples and small pitches and particularly those people severely affected from this skin infection who use and walk in the flood water and about one third of the respondents avoid from moving in the flood were somehow safe from minor pimple and small pitch. The above table demonstrates one of the skin infections, which is faced by people in the flood that is redness of all skin, majority 68.9% of the respondent faced skin infection like redness of their skin in the flood while only one third of the respondents did not face such problem of skin where all skin become red.

The above table shows the information about eye infections such as eye inflammation, eye redness and puffy eyes and type of injuries in the form of wounds and fractures such as simple, compound or complex and spiral fractures in recent July 2010 flood, the table shows that more than half of the respondents faced eye infection in the form of eye inflammation and swelling in their eye using contaminated flood water while 46% of the respondents had no eye inflammation.

Table indicates that eye redness is one of the most common eye infection in the flood affected area more than eight tenth of the respondents had eye infection in the form of eye redness, while less than one fifth of the respondents had no eye redness infection. The above table demonstrates that majority of the respondents had confronted with an eye infected called puffy eyes in which the affected person swollen eyelid and inflate entire eye, the table shows that eight tenth of the respondent faced eye infection in the form of the swelling in the eye, while one fifth of the respondents did not face eye swelling.

The data shows that flood affected people face skin infection in the July 2010 flood, while before this flood they did not face such intensity of skin infections. Among skin infections most of the people faced scabies and dry and dehydrated skin then other problems. Most of the skin infections were because of frequent and unnecessary moving and using of flood water.

Data about medical centers is collected from the officials of medical centers. The above table shows one third of the medical centre render great harm to the clinics, offices and hospital building, 42.9% of the medical centre give less harm to the clinics, offices and hospital building, while one fifth of the medical centre had no harm to the clinics, offices and hospital building of the medical centre. The table indicates, Laboratories and its equipments condition in the basic health units and medical centers in the flood affected area, which shows that 28.6% of the respondents area medical centre had no laboratories and apparatus, 28.6% of the respondents area medical centers were greatly affected from the flood, 28.6% of the respondents area medical centre were less affected while only 14.3% of the respondents' area medical centre were not affected from recent flood.

The table 5 shows 35.7% of the stuff chairs, office tables and patient beds were severely affected by the flood water in the medical centre, 42.9% of the stuff chairs, office tables and patient beds were less affected by the flood water in the medical centre, while 21.4% of the stuff chairs, office tables and patient beds were not affected by the flood water in the medical centre.

The above table illustrates that 42.9% of the medical centre representatives were of the view that stuff attendance registers, admit and discharge registers and stock registers were very badly affected in the flood, 28.6% of the medical centre's stuff attendance registers, admit and discharge registers and stock registers were less affected from the flood, while 28.6% of the medical centre's stuff attendance registers, admit and discharge

Table 5: Distribution of respondents' area medical centre damage such as clinics, Laboratories, stuff chairs, tables, stature and lab equipments

Statements	Frequency	Percent
<b>Clinics, offices</b>		
I. To great extent	5	35.7
ii. To some extent	6	42.9
iii. Not at all	3	21.4
Total	14	100.0
<b>Lab equipments</b>		
i. Not Available	4	28.6
ii. To great extent	4	28.6
iii. To some extent	4	28.6
iv. Not at all	2	14.3
Total	14	100.0
<b>Stuff Chairs, tables, patient bed</b>		
i. To great extent	5	35.7
ii. To some extent	6	42.9
iii. Not at all	3	21.4
Total	14	100.0
<b>Stuff Attendance, Admit/Discharge, Stock Register</b>		
i. To great extent	6	42.9
ii. To some extent	4	28.6
iii. Not at all	4	28.6
Total	14	100.0
<b>Medicines affected</b>		
i. To great extent	6	42.9
ii. To some extent	6	42.9
iii. Not at all	2	14.3
Total	14	100.0

Table 6: Distribution of respondents by the provision of medical facilities

Medical Centers were established	Frequency	Percent
<b>Formal Education</b>		
I. To great extent	40	10.1
ii. To some extent	159	40.2
iii. Not at all	197	49.7
Total	396	100.0
<b>Doctors were available in the centers</b>		
i. To great extent	31	7.8
ii. To some extent	140	35.4
iii. Not at all	225	56.8
Total	396	100.0
<b>Adequate paramedical stuff</b>		
i. To great extent	32	8.1
ii. To some extent	171	43.2
iii. Not at all	193	48.7
Total	396	100.0
<b>Maternity services was available</b>		
i. To great extent	37	9.3
ii. To some extent	196	49.5
iii. Not at all	163	41.2
Total	396	100.0
<b>Female doctors were available</b>		
i. To great extent	26	6.6
ii. To some extent	158	39.9
iii. Not at all	212	53.5
Total	396	100.0
<b>Medicines were provided free of cost</b>		
i. To great extent	29	7.3
ii. To some extent	245	61.9
iii. Not at all	122	30.8
Total	396	100.0

registers and stock registers were not affected in the flood. These registers were very much important for smooth working of medical centre, but flood damage these documents which disturb the working of medical centre in proper way.

The table 6 explains that 42.9% of the medical centre officials were of the view that pharmacy, medicines and surgical equipment were severely affected from the recent flood and same number of the medical centre officials were of the view that pharmacy, medicines and surgical equipment were less affected from the recent flood, while only 14.3% of the medical centre officials were of the view that July 2010 flood render no harm to pharmacy, medicines and surgical equipment. In the flood the local hospitals and medical centre and basic health units were very much affected from the flood by which people confront with terrible situation regarding health facilities.

The variation in the availability of facilities, sensitivity and exposure to risk factors mainly determined the implications of natural disasters. The disadvantaged quarters of the society suffer a lot in the case of natural disasters [14]. The above table is about the medical facilities provided in the camps such as medical centers, free of cost medicines, male and female doctors, paramedical stuff and maternity homes, the table shows that 10.1% of the respondents had the access to the medical centre and they were satisfied up to great extent from medical centers, 40.2% of the respondent had the access to the medical centre and they were partial satisfied from medical centers, 49.7% of the respondent had no access to the medical centre and they were not satisfied from medical centers provided by different organization in the camp.

The table indicates that 7.8% of the respondents were of the views that doctors in camp of medical centre were available up to great extent, 35.4% of the respondents were of the views that doctors in camp of medical centre were not sufficient for the entire population the refuge place, while majority 56.4% of the respondents were searching for doctor but in vain. The data shows that doctors were short in number for medical services to all of the internally displaced people of the camp.

The table 7 is about the availability of paramedical stuff in the affected area in general and camp in particular, table shows 8.1% of the respondents were very much satisfied on the availability of paramedical stuff, 43.2% of the affected respondents were satisfied up to some extent on the availability of paramedical stuff in their camp, while 48.7% of the victims were not satisfied on the availability of paramedical stuff in their camp and area.

Table 7: Relationship between respondent's age and their health problems

Respondent's Age (Years)	Health Problems		
	No	Yes	Total
20-29	60% (39)	40% (26)	16.4% (65)
30-35	18.7% (12)	81.3% (52)	16.2% (64)
36-40	19.6% (24)	80.4% (98)	30.8% (122)
41-45	10.2% (6)	89.8% (53)	14.9% (59)
46-60	0% (0)	100% (86)	21.7% (86)
Total	20.4% (81)	79.6% (315)	100% (396)

Chi Square value = 88.585    df = 4    Significance = 0.000

Gamma value = 0.694    Significance = 0.000

The above table illustrates that 9.3% of the medical centre in the camps had maternity services up to great extent and they render their services to the female, 49.5% of the medical centre in the camps had maternity services up to some extent and they render their services to the female only in delivery cases and not for general medical checkup, 41.2% of the medical centre in the camps had no maternity services and female face great problems in this regard.

The above table explains that 6.6% of the internally displaced people were of the view that female doctors were available in the camp by different organization and even in private and personal capacity, 39.9% of the internally displaced people were of the view that female doctors were available but not sufficient and female felt hesitation with male doctors, 53.5% of the internally displaced people imparted their idea that female doctors were not available in the camp for general check up of the female.

The above table shows that 7.3% of the internally displaced people had received medicines free of cost and were easily available in the camp, 61.9% of the internally displaced people had received medicines free of cost and they were of the view that some time availability become problem while 30.8% of the internally displaced people had not received medicines free of cost and they face problems in availability of medicines in the camp.

Table shows that a strong relation occur between age of respondents and their physical health condition, as the age increase vulnerability to health problems goes up. Lacks of strong immunity power to control diseases raise the level of vulnerability in old age. Health problems are measure in the form of flood borne diseases such as eye and skin infections and gastric problems.

$$x^2 = \sum \frac{(o-e)^2}{e}$$

Chi square and Gamma test statistics verified relationship between age and diseases. Chi square value for the above cross table is 88.585 and highly significant at 1% level of significance and gamma value is 0.694 and highly significant at 1% level of significance which shows that there is very strong relation between age of the respondents and flood related diseases.

### CONCLUSION

Flood have direct as well as indirect effects on the human health, direct effects on human like, Injuries (e.g. cuts, sprains, fractures, punctures, electric shock), drowning, Diarrheal disease, Vector-borne and rodent-borne diseases (e.g. malaria, leptospirosis), Chemical contamination (e.g. of water, food), Respiratory infections Skin/Eye infections and Mental Health and as well indirect effects including damage to health care infrastructure and loss of essential drugs, damage to water and sanitation infrastructure, damage to crops and/or disruption of food supplies, damage/destruction of property (e.g. lack of shelter may lead to increased exposure to disease vectors), disruption of livelihood and income, population displacement.

### REFERENCES

1. IFRC, 2001. World Disasters Report. International Federation of Red Cross and Red Crescent Societies: [http://www.ifrc.org/publicat/wdr2001/\[Geo-2-334\]/](http://www.ifrc.org/publicat/wdr2001/[Geo-2-334]/)
2. Norwegian Refugee Council, 2009. 'Natural' Disasters and Forced Displacement in the Context of Climate Change. RPA., 2005. The appraisal of human-related intangible impacts of flooding. Technical.
3. Tunstall, S., S. Tapsell, C. Green, P. Floyd and C. George, 2006. The Health Effects of Flooding: Social Research Results from England and Wales. *J. Water and Health*, 4(3): 365-380, doi: 10.2166/wh.2006.031.
4. Ahern, M. and S. Kovats, 2006. The Health Impacts of Floods. In R. Few and F. Matthies (Eds.). *Flood Hazards and Health: Responding to Present and Future Risks*, pp: 28-53, London: Earthscan.
5. Few, R., 2006. Introduction. In R. Few and F. Matthies (Eds.). *Flood Hazards and Health: Responding to Present and Future Risks*, pp: 1-7, London: Earthscan.
6. Watson, J.T., M. Gayer and M.A. Connolly, 2007. Epidemics after Natural Disasters. *Emerging Infectious Diseases*, 13(1): 1-5. Available at [www.cdc.gov/eid](http://www.cdc.gov/eid) retrieved on 27/11/2011
7. Wisner, B., P. Blaikie, T. Cannon and I. Davis, 2004. *At Risk-Natural Hazards, people's Vulnerability and Disasters*. Wiltshire: Routledge.
8. Del-Ninno, C. P.A. Dorosh and L.C. Smith and D.K. Roy, 2001. *The 1998 Floods in Bangladesh: Disaster Impacts, Household Coping Strategies and Response*. Washington DC: International Food Policy Research Institute.
9. Internal Displacement Monitoring Centre (IDMC), 2011. Briefing Paper on Flood-Displaced Women in Sindh Province, Pakistan. Presented at the Nansen Conference on Climate Change and Displacement in the 21st Century; 5-7 June, 2011, Oslo, Norway
10. Ahern, M. and S. Kovats, 2006. The Health Impacts of Floods. In R. Few and F. Matthies (Eds.). *Flood Hazards and Health: Responding to Present and Future Risks*, pp: 28-53, London: Earthscan.
11. Risser, G., O. Kher and S. Htun, 2003. Running the Gauntlet: The impact of internal displacement in Southern Shan State. Humanitarian Affairs Research Project, Asian Research Center for Migration, Institute of Asian Studies, Chulalongkorn University, Bangkok.
12. UN Office for the Coordination of Humanitarian Affairs (UNOCHA), 1998. *Guiding Principles on Internal Displacement*. New York: Author available at <http://www.idpguidingprinciples.org/> retrieved on 23/11/2011
13. Provincial Disaster Management Authority (PDMA). Government of Khyber Pakhtunkhwa
14. Baez, J., 2009. Do Natural Disasters Affect Human Capital? An Assessment Based on Existing Empirical Evidence. World Bank and IZA. Alejandro de la Fuente World Bank. Indhira Santos Bruegel March.
15. Howard, M.J., M.D. Brillman and F.M. Burkle, 1996. Infectious disease emergencies in disasters. *Emerg Med. Clin. North Am.*, 14: 413-428.
16. Centers for Disease Control and Prevention, 1989. Health assessment of the population affected by flood conditions-Khartoum, Sudan. *MMWR Morbid Mortal Wkly Rep.*, 37: 785-788.
17. Centers for Disease Control and Prevention, 2000. Morbidity and mortality associated with Hurricane Floyd-North Carolina, Sept-Oct 1999. *MMWR Morbid Mortal Wkly Rep.*, 49: 369-370.