

# AN ASSESSMENT OF HOUSEHOLD COPING RESPONSE OF THE VULNERABLE POPULATION OF FLOOD AFFECTED AREAS OF KOT ADDU, DISTRICT MUZAFFARGARH

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**ABSTRACT:** *Floods are the widespread phenomenon due to the climate change. Pakistan is one of the hazard prone countries in the world. The worst flood ever recorded in the history of Pakistan hit southern parts of the province Punjab during 2010. It was a great challenge for vulnerable population of the area to cope with the flood. This study was conducted to assess the households coping responses of vulnerable population of flood affected areas of Kot Addu, District Muzaffargarh (Punjab, Pakistan). A sample of 300 households (150 from occasional flooding area and 150 from seasonal flooding area) were selected randomly and surveyed. A semi-structured questionnaire was designed to collect information from the respondents about their socio-economic, socio-demographic information and preparedness and adaptability to flood. The results of the study showed that no significant difference was found in socio-demographic status of both areas whereas a strong significant difference was however found in the household income in seasonal flooding area and this was one of the major contributing factors in coping flood. The personal resources at household level were found the main coping response in seasonal flooding area. This has made these people adapted to the regular flood phenomenon. People living in the seasonal flooding area enhance their household income by indulging their all family members in daily wages. They migrate to safe places during flooding and after flood used their income in rehabilitation activities.*

**Keywords:** Climate change, Vulnerable, adaptability, household, flood

## INTRODUCTION

Many regions of the world face climatic hazards such as floods, droughts and tropical cyclones. About 75 percent of the total population of the world lives in areas affected at least once by such climatic hazards [1]. Flooding is one of the most repeated and extensive climatic hazard, account 40 percent of disasters worldwide [2]. The diverse precipitation pattern in South Asia has led to more frequent flooding during Monsoon season leading to increase vulnerability to this natural disaster [3].

Floods are permanent phenomenon of Pakistan. Several events of flooding occurred in Pakistan in different years in 1973, 1992, 2006 and 2010 [4]. The 2010 flood in the Indus basin of Pakistan was considered not only in Pakistan but also in the world the worst catastrophe [5]. These floods have excessively affected the poorest regions of Pakistan especially in rural Sindh and Southern Punjab, where deprivation level was very high and the infrastructure to handle the disaster was virtually nonexistent [6]. Although the death toll of more than 1700 people was fairly modest in comparison to other natural disasters such as the 2004 Indian Ocean Tsunami, the 2005 Kashmir earthquake and the 2010 Haiti earthquake. However, the extent of flooding and the material damage appeared to be greater in the scale than the combined three disasters of the 21<sup>st</sup> century [5]. According to International Monetary Fund, the overall economic impact of 2010 flooding in rural livelihood, industrial input and infrastructure, agricultural output, as well as the loss of economic productivity, was estimated to total US \$ 43 million [7].

During the past few decades, the increased amount of rainfall caused by climatic change has intensified the flooding in this part of the world. The population likely to be hardest hit by flood is mostly the poor people who do not have sufficient means to take protective measures and also have insufficient capacity to cope with the loss of income and property [8].

Most of the recent studies are focused on understanding how different socio-economic groups of people and communities perceive and act in response to flood risks [9,10].

One of the most potent methods to face disaster by vulnerable people is adaptation, which is defined as the “*adjustment in a system’s behavior and characteristics that enhance its ability to cope with external stresses*” [11]. Local coping strategies for managing disasters are often shifted from one generation to next generation within communities and household. They depend on the supposition that disasters follow the same pattern, and the same preparation is required or will be sufficient for similar event. Whereas, coping strategies are always subject to change because of dissimilar living conditions and standards that generally lead to dissimilar abilities of affected people to respond natural disaster [12].

Keeping in view the extent of danger in the form of flood and the fact that no comprehensive study has been done in this regard, this study has been planned to identify how socially vulnerable people are exposed to floods and how they adapt to such climatic hazard in the flood affected areas of Punjab province especially in Kot Addu, district Muzaffar Garh.

## MATERIALS AND METHODS

The study population was selected from occasional flooding and seasonal flooding areas on the basis of the frequency of flooding. People who experience flood every year were labeled as seasonal flooding area while people living in the area that experiences flood once in five year were labeled as occasional flooding area. A descriptive, household based comparative study in two different localities belonging to occasional flooding area (Dandy Wala) and seasonal flooding area (Esan Wala) in district Kot Addu was conducted to know the indigenous coping response to flooding. The data was collected through household (HH) interviews of family head about their socio-demographic, socio-economic conditions and indigenous coping response to flooding with the help of

semi-structured questionnaire. Simple random sampling technique was used to collect the data of 300 households (150 from occasional flooding and 150 from seasonal flooding).

The sample size of 300 households was calculated by following formula [13,14].

$$n = \left( \frac{Z_{\alpha/2}}{h} \right) \times PQ$$

Where

**n** = sample size

**Z** = confidence level about the limit of the error (95%)

**h** = accepted error margin in the estimates (5.5%)

**P** and **Q** are the probability of success and failure, taken as 50% and 50% respectively.

A semi-structured questionnaire was used to collect the data regarding socio-demographic and socio-economic information (level of education, source of income, dependency ratio, family size, household income, housing condition and basic facilities at household level), socio-economic information and health risks,) and information about indigenous coping response including emergency preparedness, availability of boats, multistory building, migration, flood warning, food and shelter, family safety, government assistant program, shelter, provision of important information at the time of disaster, training/information about household preparedness activities, training/information about coping responses at the time of disaster, household water bore/Tube-wells placed on the elevated base or raised with an extra pipe, temporary latrine built, training/information about personal hygiene, sanitation, voluntaries organizations/committee formed on self help basis and vaccination especially in children given, to know the indigenous coping response of households against flooding.

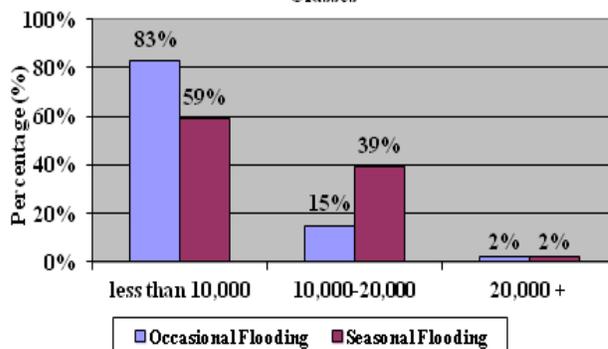
The obtained data from the questionnaire was analyzed in Graph Pad Prism 5 and SPSS Window version 16. The scrutiny of data was made by descriptive statistics, cross tabulation and test of association. The data was first analyzed through frequencies, percentage, mean and standard deviation. Cross tabulation was done by using chi-square. It was applied to study the relationship of the two variables at combine level. Q-coefficient test of association was applied to describe whether there is positive association or negative association present between two attributes.

**RESULTS**

Out of seven variables related to the socio demographic characteristics of both flood effected population including level of education, source of income, dependency ratio, family size, household income, housing condition and basic facilities at household level, only one variable showed a strong significant difference. Information regarding average household income showed that out of the 150 household interviewed belonging to occasional flooding area, 83% households had their combine income less than Rs. 10,000, 15% had between Rs. 10,000-20,000, 2% had more than Rs. 20,000 while out of 150 households belonging to seasonal flooding area, 59% households had their combine family income less than Rs. 10,000, 39% had between Rs. 10,000-

20,000, only 2% had more than Rs. 20,000. The data showed that there is strong significant difference between the income level of seasonal flooding area and occasional flooding area (Chi-square= 14.72 and p= 0.0006) (Table-01) (fig. 01). The information regarding indigenous coping response to flooding including emergency preparedness, availability of boats, multistory building, migration, flood warning, food

Fig. 01 Monthly Household Income from two Flood Classes

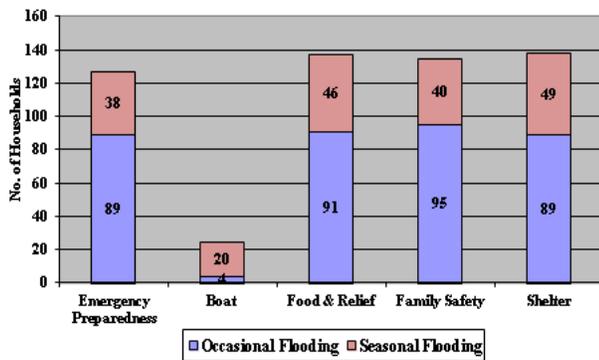


and safety, Govt. assistant program, shelter, provision of important information at the time of disaster, training/information about household preparedness activities, training/information about coping responses at the time of disaster, household water bore/tube-wells placed on the elevated base or raised with an extra pipe, temporary latrine built, training/information about personal hygiene, sanitation, voluntaries organizations/committee formed on self help basis and vaccination especially in children given, was collected. These variables were either related to personal efforts or community/government efforts to avoid from the damage caused by flooding. Some of the variables were related to the Governmental level.

The results given in table-02 show that a strong difference was found regarding emergency preparedness (Chi-square= 35.52 and p= <0.0001), availability of boats (Chi-square= 27.89 and p= <0.0001), food and relief (Chi-square= 27.20 and p= <0.0001), family safety (Chi-square= 40.74 and p= <0.0001), and shelter (Chi-square= 21.47 and p= <0.0001) during flooding. Whereas, there found a week significant difference regarding flood warning (Chi-square= 7.714 and p= 0.0055) and training/information about personal hygiene, sanitation provided (Chi-square= 5.085 and p= 0.0241) (fig. 2). No significant difference regarding migration, government assistant program, provision of important information at the time of disaster, raining/information about household preparedness activities provided, training/information about coping responses at the time of disaster provided, household water bore/Tube-wells placed on the elevated base or raised with an extra pipe, temporary latrine built, voluntaries organizations/committee formed on self help basis and vaccination especially in children given, was found.

A test of association was applied to the 9 variables out of 12 that showed significant difference to study whether these variables have positive or negative association. Data related to combine household income, emergency preparedness, availability of boats, migration in flooding, flood warning, food and relief during flooding, family safety, shelter and training/information about personal hygiene and sanitation

Fig. 2 Household Response to Flooding from two Flood Classes



during flooding was studied to assess their association with flooding.

In the association of combine household income with flooding (Table- 03), positive association was observed ( $Q= 0.545$ ). Emergency preparedness showed positive association with flooding ( $Q= 0.623$ ) (Table- 03). The results (Table-03) showed that availability of boats was negatively associated with flooding ( $-0.698$ ). Table-03 showed negative association of migration with flooding ( $Q= -0.078$ ). Flood warning was positively associated with flooding ( $Q= 0.627$ ) (Table- 03). In the association of food and relief with flooding (Table- 03), positive association was found ( $Q= 0.554$ ). The results (Table- 03) showed that family safety was positively associated with flooding ( $Q= 0.652$ ). Shelter was positively associated with flooding ( $Q= 0.501$ ). In the association of training/information about personal hygiene and sanitation, positive association was observed ( $Q= 1.000$ ).

**DISCUSSION**

The socio-economic status of households affects the flood preparedness. The percentage of flood occurrence in the world among other natural hazards is increasing day by day due to climatic variations. Although the developed countries have done a lot for the development of coping responses and household preparedness against flood but the developing countries, due to their poor economies, are still very vulnerable to floods and have weak coping mechanism.

The results of this study showed a strong association between socio-economic status of households and their coping response to flood. The core emphasis of this study was to identify the household coping response of low socio-economic population living in seasonal and occasional flooding areas by studying a variety of variables.

People living in seasonal flooding area had high household income as compare to occasional flooding area because they have to spend more money on the rehabilitation after flooding. Sugarcane is the main crop of that area, so the family heads usually send their family members for cutting and loading of sugarcane every year in sugarcane harvest season to increase their family income and later on this income is used for flood evacuation, migration and rehabilitation. Household income was found one of major contributing factors for their coping responses to flooding. The result of this study corresponded with the study conducted by Brouwerl *et al.*, 2006 who concluded that

people living in the flood plains earned higher income to take preventive measures and to meet the damage cost [15].

Most of the flood affected households were least prepared for flooding and its effects due to their association with their native area, laziness and to save money for other purposes instead of flood preparedness. Brouwerl *et al.*, 2006 in his study conducted at Bangladesh, concluded that the least prepared population to flooding faces the highest risks at both the household level and community level [15].

Flood warning enables people to respond effectively to hazards. People of studied areas did not respond to flood warning given to them well ahead of actual flood. Illiteracy was major constrain to understand the importance of flood warning. Heinz Center for Science, Economics, and the Environment, 2000 elucidated that illiteracy restricts the abilities of a certain population to understand warning information [16].

The major coping response to flooding was migration to safe places. Most of the houses were muddy with elevated base and the people stayed in their houses until the base was inundated. The people either went to their relatives or got shelter provided by government or non-governmental organizations. These findings corresponded to the study conducted by Makri, 2005 who elucidated that migration away from hazard area is considered one of the ways of coping mechanism [17].

No advance preparation about risk reduction (like training or information about household preparedness activities, coping responses at the time of disaster, personal hygiene, and sanitation) was provided to the people in the study area. No volunteer organization or committee formed on self help basis while at individual level, some of the households belonging to seasonal flooding area had prepared boats for evacuation. These findings corresponded with the study conducted by Lindsay, 2003 who stated that advance preparation of risk reduction measures minimize the impacts of hazards [18].

The present study showed that there was weak social network and institutional set-up in the vulnerable population of flood affected areas but the studied population responded effectively to hazard due to their personal resources. Results of this study were in line with the study conducted by Quassem, 2001 who stated that weak institutional set-up and social network add in the vulnerability of a hazard prone population [19].

This study also showed that people belonging to low socio-economic and socio-demographic class were more exposed to flood but argument that they have also weak coping response is rejected in our study. Personal resources like income and migration enhance the ability of the studied population to cope with the flood.

**CONCLUSION**

The results of this study revealed that the socio-economically and socio-demographically vulnerable population living in the seasonal flooding areas of Kot Addu, District Muzaffargarh (Punjab, Pakistan) was adapted to flood. They had good coping responses at individual level even though they had weak social network and institutional set-up. There was inverse relationship between poverty and coping

response in the studied areas. The large family size and the participation of family members in the combine household income have enabled them to respond and recover from flood. They built mud houses with elevated base and stayed there until the base was inundated. They found easy to rebuild the demolished mud houses. Migration was found another response to the disastrous effects of flood. This indigenous coping response had made them adapted to this natural hazard. Thus efforts should be made to educate and facilitate them to prevent from life and property losses and improve the coping mechanism.

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**Table – 01: Level of Significance of Socio-demographic Characteristics of Flood Effected Population**

Sr. #	Variables	Description	Value (Percentage)		Chi-square	df	P Value	Statistically significant? (alpha<0.05)
			Occasional Flooding	Seasonal Flooding				
1	Educational status of respondent	Literate	80	88	2.381	1	0.1228	No
		Illiterate	20	12				
2	Main occupation of the family head	Self employed farmer	82	88	1.412	1	0.2348	No
		Day labour	18	12				
3	Dependency ratio	Earning	23	25	0.1096	1	0.7405	No
		Dependent	77	75				
4	Average No of family members	1-5	57	50	1.648	2	0.4386	No
		6-10	40	44				
		< - 10	3	6				
5	Average HH income	< - 10,000	83	59	14.72	2	0.0006	Yes***
		10,000 – 20,000	15	39				
		20,000 +	2	2				
6	Hosing condition	Kacha	77	83	1.125	1	0.2888	No
		Pacca	23	17				
7	Basic facilities at HH level	Electricity	91	77	8.411	4	0.0776	No
		Television	13	3				
		Bicycle	55	39				
		Motor Cycle	23	20				
		Pacca Latrine	8	1				

Table – 02: Level of Significance of HH Response to Flooding

Sr. #	Variables	Description	Value (Proportion)		Chi-square	df	P value	Statistically significant? (alpha<0.05)
			Occasional Flooding	Seasonal Flooding				
1	Emergency Preparedness	Yes	89	38	35.52	1	< 0.0001	Yes***
		No	61	112				
2	HH Response	Boat	4	20	27.89	2	< 0.0001	Yes***
		Multi story Building	0	0				
		Migration	126	129				
		No Movement	20	1				
3	Flood Warning	Yes	146	134	7.714	1	0.0055	Yes**
		No	4	16				
4	Temporary Movement	Yes	130	139	2.914	1	0.0878	No
		No	20	11				
5	Food & Relief	Yes	91	46	27.20	1	< 0.0001	Yes***
		No	59	104				
6	Family Safety	Yes	95	40	40.74	1	< 0.0001	Yes***
		No	55	110				
7	Govt. Assistant Program	Yes	34	27	0.4506	1	0.5020	No
		No	116	123				
8	Shelter	Yes	89	49	21.47	1	< 0.0001	Yes***
		No	61	101				
9	PIITD	Yes	48	53	0.3732	1	0.5413	No
		No	102	97				
10	THHPA	Yes	0	0	0	0	0	No
		No	150	150				
11	TCRD	Yes	2	0	2.013	1	0.1559	No
		No	148	150				
12	HHWBE	Yes	0	0	0	0	0	No
		No	150	150				
13	TLB	Yes	0	0	0	0	0	No
		No	150	150				
14	TPHS	Yes	5	0	5.085	1	0.0241	Yes*
		No	145	150				
15	VO	Yes	0	1	1.003	1	0.3165	No
		No	150	149				
16	VCH	Yes	103	97	0.5400	1	0.4624	No
		No	47	53				

**PIITD** Provision of important information at the time of disaster

**THHPA** Training/information about household preparedness activities provided

**TCRD** Training/information about coping responses at the time of disaster provided

**HHWBE** Household water bore/Tube-wells placed on the elevated base or raised with an extra pipe

**TLB** Temporary latrine built

**TPHS** Training/information about personal hygiene, sanitation provided

**VO** Voluntaries organizations/committee formed on self help basis

**VCH** Vaccination especially in children given

<b>Association of Combine Household Income with Flooding</b>				
<b>Variables</b>	<b>Description</b>	<b>Occasional Flooding (A)</b>	<b>Seasonal Flooding (<math>\alpha</math>)</b>	<b>Q. Value</b>
HH Income	<10,000 (B)	125	89	0.545
	10,000 + ( $\beta$ )	25	61	
<b>Association of Emergency Preparedness with Flooding</b>				
Emergency Preparedness during Flooding	Yes (B)	89	38	0.623
	No ( $\beta$ )	61	112	
<b>Association of Boats with Flooding</b>				
Availability of Boats	Yes (B)	4	20	-0.698
	No ( $\beta$ )	146	130	
<b>Association of Migration with Flooding</b>				
Migration	Yes (B)	126	129	-0.078
	No ( $\beta$ )	24	21	
<b>Association of Flood Warning with Flooding</b>				
Flood Warning	Yes (B)	146	134	0.627
	No ( $\beta$ )	04	16	
<b>Association of Food &amp; Relief with Flooding</b>				
Food and Relief during Flooding	Yes (B)	91	46	0.554
	No ( $\beta$ )	59	104	

Table – 03: Test of Association

<b>Association of Family Safety with Flooding</b>				
Family Safety during Flooding	Yes (B)	95	40	0.652
	No ( $\beta$ )	55	110	
<b>Association of Shelter with Flooding</b>				
Shelter during Flooding	Yes (B)	89	49	0.501
	No ( $\beta$ )	61	101	
<b>Association of Training/information about Personal Hygiene and sanitation with Flooding</b>				
Training/information about Personal Hygiene & Sanitation during Flooding	Yes (B)	5	0	1.000
	No ( $\beta$ )	145	150	