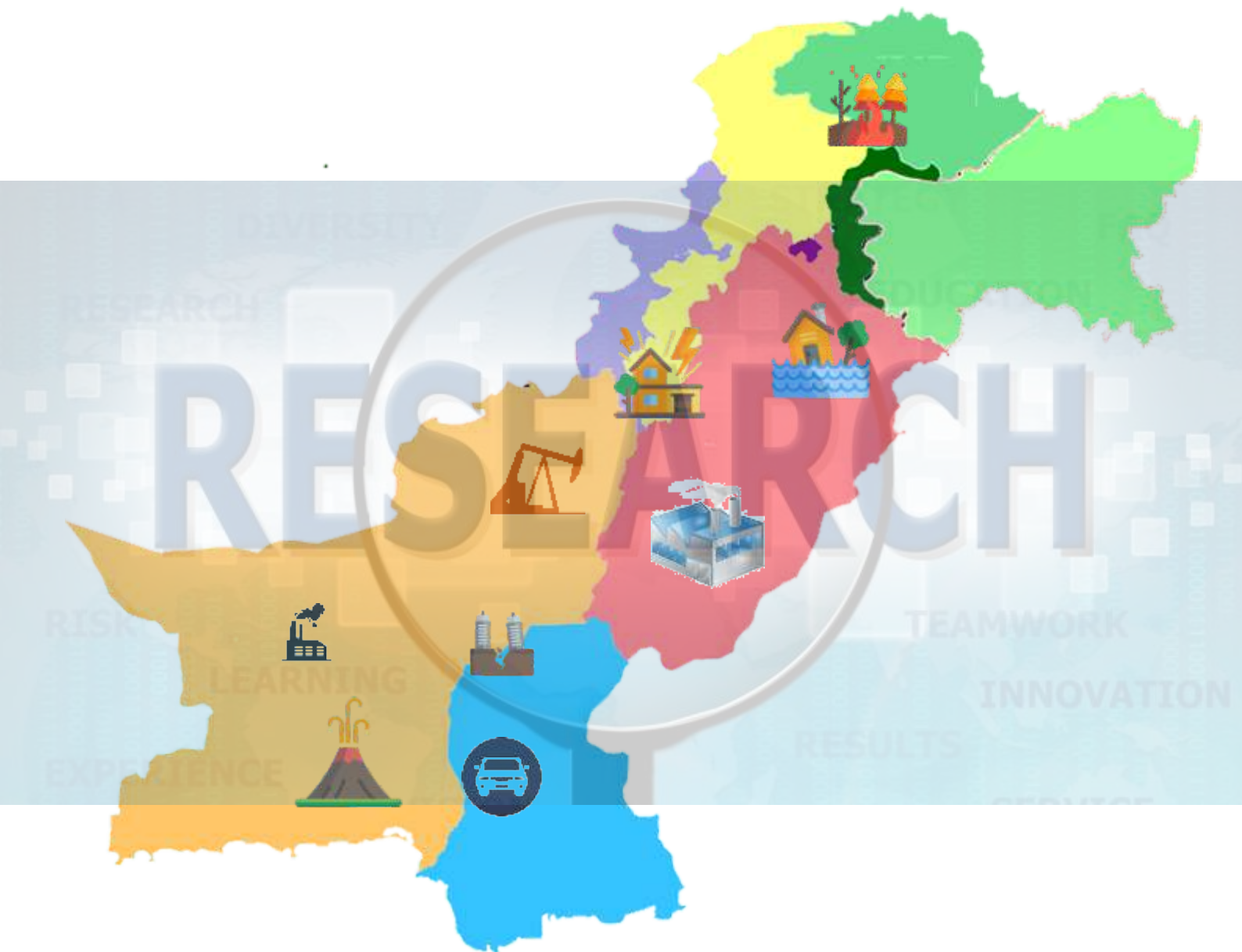




**Research Work by Students  
from  
Department of Development Studies,  
Comsats University**





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# **ASSESSING THE SOCIAL IMPACTS OF 2005 EARTHQUAKE**

**IN TEHSIL BALAKOT, DISTRICT MANSEHRA**

**By**

**Amir Ali**

## ABSTRACT

This study is aimed to examine the social impacts of 2005 earthquake on health and housing sector in Tehsil Balakot, District Mansehra. The primary data regarding health, housing and non-monetary services is collected through interviews, questionnaires and direct observations. The respondents were selected through simple random sampling technique as all the community members were equally effected by the 2005 earthquake. The primary data on the social implications of earthquake were collected through pre-structured questionnaire by interviewing 80 respondents. The results show that the 2005 earthquake has brought severe implications on the people, especially in housing and health sector. It was also found that in housing sector 31.25% of the people are still living in temporary shelters or they are living in the rent's house. Due to which most of the part of their income goes in the rent and they are not able to spend on their children's health and education. The health sector is still in poorest condition as no proper health facilities are available in the area which makes the people vulnerable to poor health conditions while monetary services sector showed some improvement with the interventions of international and local NGO'S. This study also finds that the role of government in the area was very poor and the people were really unsatisfied by the relief given by the government. This study recommends that in order reduce the disaster's social impacts government must undertake measures to reduce the physical impacts of disaster through structural and non-structural measures because the physical impacts create the social vulnerability which results to the social impacts in the long run.

**Keywords:** Non-monetary services, Health and housing sector, Social impacts, Vulnerability.

## CHAPTER 1

# INTRODUCTION

Social impacts can be defined as “The effect of disaster on the social fabric of the community and well-being of the individuals and families. As natural disasters are becoming more frequent, expensive and threatening worldwide, it has increased the global economic cost 14 times since the 1950s (Guha Sapir et al., 2004). The impacts of natural disasters are not equally distributed among nations, regions, communities and individuals as a result of differential exposures and vulnerability. Analysing the distributional impacts of natural disasters across income groups in a given country or community is critical for planning, mitigation and recovery from natural disasters. Although the policy has been changing in the last 15 years, from relief assistance to an emphasis on mitigation, the overall trend in disaster management has been to invest in natural disaster response (Board on Natural Disasters, 1999), rather than on mitigating pre-existing social vulnerabilities. While response and recovery have been the main strategies for many countries, including the US, and are critically important for humanitarian, economic and political purposes, they must be accompanied by increasing attention to reducing losses through effective mitigation programs (National Research Council, 1997). Therefore, improving mitigation and preparedness for natural disasters requires knowledge of how and why certain groups are vulnerable.

Globally, statistics show that disasters cause more socially significant and irreversible loss in developing countries, where the poorest and most vulnerable population groups feel the most severe impact. In the developed world, on the other hand, an increasing and significant degree of protection against disasters has been achieved over the years thanks to the availability of resources and technology for the introduction of effective prevention, mitigation and planning measures, together with vulnerability reduction schemes. Even in these countries however, damages have risen significantly as a result of the greater concentration and value of societal activities. To ensure vulnerability reduction, reconstruction programme and projects must be designed within a mitigation and prevention strategy that is part of the development process. Therefore, a set of diagnostic tools is needed to measure the type and amount of damage and losses caused by each type of disaster. Such working tools are not very abundant in the economic literature, especially since they must be able to gauge social, economic and environmental effects.

Social impact assessment can therefore play an important role in the understanding of the consequences and social outcome of projects that are meant to tackle poverty, enhance community development or designed to reduce vulnerability to disasters during environmental emergencies. According to the Inter-Organizational Committee of the U.S. Department of Commerce National Oceanic and Atmospheric Administration National Marine Fisheries Service (1994), “social impacts” refers to the consequences to human populations of any public or private actions that alter, or are capable of altering, the ways in which people live, work, play, relate to one another, organize to meet their needs and generally cope as members of society. The term also includes cultural impacts involving changes to the norms, values, and beliefs that guide and rationalize their cognition of themselves and their society. Social Impact Assessment (SIA) is the process of analyzing, monitoring and managing the social consequence of

policies, programs and projects. These consequences may be positive or negative, intended or unintended, direct or indirect; they may be short-term impacts or long-term changes. As well as helping to explain how a proposed action will change the lives of people in communities, SIA indicates how alternative actions might mitigate harmful changes or implement beneficial ones.

The extended ECLAC methodology recommends estimating sectorial as well as cross-sectorial impacts of disasters. As for the sectorial assessments, first, the sectors have to be identified that are affected by a disaster. For instance, disasters can influence social sectors (education, culture, health, and housing), infrastructure sectors (energy, drinking water and sanitation, transportation, communication) and economic sectors (agriculture, trade, industry, tourism). In addition, by categorising the damage in each sector into public and private sector, it is highlighted that the disaster impacts in each sector be estimated by comparing the situation that develops after the disaster with the situation that would have occurred without the disaster, i.e., 'with disaster' and 'without disaster' situation. This requires the need for data and information collection on each sector before the disaster event, including forecasts of how the sector was likely to have developed if the disaster had not occurred (UN-ECLAC/WB 2003).

### **1.1 Social Scientist's View**

Social scientists in particular, seem to agree that a disaster could mean different things to different people and thus lead to multiple definitions (Quadrantile 2005 cited in Stallings 2006; Perry 2006). Social scientists, usually focus on disasters' disruptive nature and define disaster as an event impacting an entire society or some subdivision and avoiding the essential functions of the society (Perry 2006). Similarly, physical scientists and engineers tend to focus more on physical structures including physical and infrastructure damages while economists tend to include disasters' disruption in the flows of economic activities in addition to impact on physical capital stock to arrive at total impact. Disaster researchers on the whole make an argument that the task of defining a disaster should begin with an examination of its fundamentals such as whether disasters are social phenomena or the result of some natural and/or technological process (Perry 2006).

Natural disasters, which are a frequent occurrence all over the world, have a major impact on countries' social, economic and political situation. Barely a month passes without some part of the world being afflicted by floods, earthquakes, volcanic eruptions, accidents, massive fires, droughts, famines or some other major disaster. Such phenomena cause massive loss of life, directly or indirectly affect large sectors of the population and wreak major damages.

However, research shows that natural disasters cause more devastation in developing countries and that they hit the most disadvantaged population groups hardest. Over the years, the developed countries have devised various ways of protecting themselves from the consequences of disasters by anticipating their risks through prevention and planning measures. Few such measures have been taken in the developing countries, however, where a large proportion of the population lives in precarious conditions, crowded together in flimsy, unprotected dwellings on hillsides subject to landslides or on low land are susceptible to massive flooding.

The geographical location and natural characteristics of the countries exposes the region to frequent natural disasters. Although these disasters may vary in intensity, they usually entail loss of life and damage to socio-economic infrastructures. They also have a serious and persistent impact on the functioning of national economies.



When a disaster occurs, along with the first emergency measures taken by the government and the community concerned, various national and international agencies offer relief, aid and assistance and are often even designated to coordinate the external cooperation received. However, this support, though important, represents only part of the total cost of the necessary process of post-disaster recovery. As a result, one of the most pressing tasks for the country concerned is to make an early, reliable preliminary assessment of the damage.

When a disaster has occurred and while the emergency is still at its height, it is absolutely essential to identify and quantify its effects as accurately as possible as a minimum guide for designing rehabilitation and reconstruction programmes and for identifying the international cooperation that will have to be channelled to the affected country for it to undertake such programmes. While the Office of the United Nations Disaster Relief Coordinator (UNDRO) deploys its programmes during the emergency or immediately after the disaster, ECLAC has often, particularly since the early 1970s, assisted the affected governments in the subsequent task of evaluating the disaster's direct and indirect effects and its impact on the main macroeconomic variables. The experience gained over the past two decades in evaluating the socio-economic effects of dozens of natural disasters of varying magnitude and intensity convinced the ECLAC authorities that it would be both advisable and desirable to conceptualize and standardize their findings in order to produce a manual or guide for general use in such situations.

## 1.2 Pakistan's 2005 Earthquake

On October 8, 2005, at 8:50 a.m. local time, a magnitude  $M_w = 7.6$  earthquake struck the Himalayan region of northern Pakistan and Kashmir. The earthquake epicentre was located approximately 9 km north northeast of the city of Muzaffarabad, the capital of the Pakistani administered part of Kashmir, known as Azad Jammu Kashmir (AJK). The Pakistani government's official death toll as of November 2005 stood at 87,350, although it is estimated that the death toll could reach over 100,000. Approximately 38,000 were injured and over 3.5 million rendered homeless. According to government figures, 19,000 children died in the earthquake, most of them in widespread collapses of school buildings. The earthquake affected more than 500,000 families. In addition, approximately 250,000 farm animals died due to collapse of stone barns, and more than 500,000 large animals required immediate shelter from the harsh winter. It is estimated that more than 780,000 buildings were either destroyed or damaged beyond repair, and many more were rendered unusable for extended periods of time. Out of these, approximately 7,000 school buildings and most major hospitals close to the epicentre were destroyed or severely damaged. Lifelines were adversely affected, especially the numerous vital roads and highways that were closed by landslides and bridge failures. Several areas remained cut off via land routes even three months after the main event. Power, water supply, and telecommunication services were down for varying lengths of time, although in most areas services were restored within a few weeks.

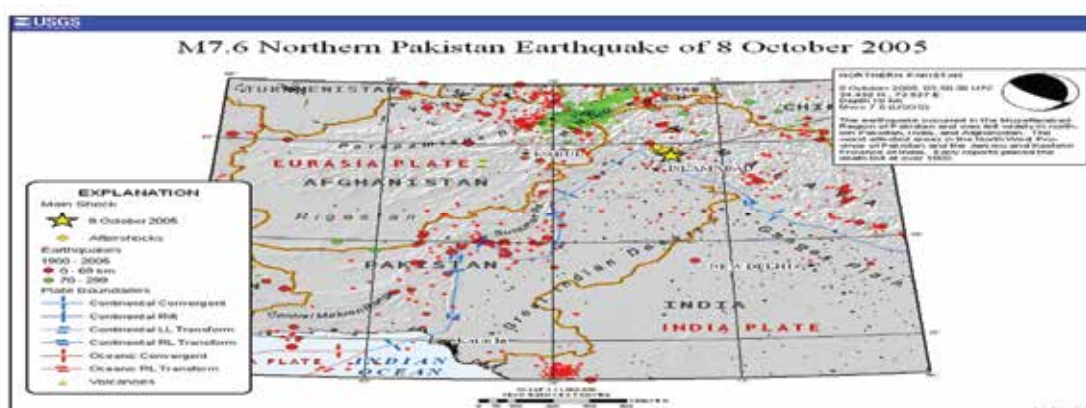


Figure 1 : General location map,  $M = 7.6$  Kashmir

### 1.3 Disaster Impact Model

A disaster occurs when an extreme event exceeds a community's ability to cope with that event. Understanding the process by which natural disasters produce community impacts is important for four reasons:

First, to identify the pre impact conditions that make communities vulnerable to disaster impacts,

Second, to identify specific segments of each community that will be affected disproportionately (e.g., low income HHs, ethnic minorities, or specific types of businesses),

Third, to identify the event-specific conditions that determine the level of disaster impact, & fourth, the understanding of disaster impact process allows planners to identify suitable emergency management interventions.

The pre-impact conditions act together with event-specific conditions to produce a disaster's physical and social impacts. These disaster impacts can be reduced by emergency management interventions. The process by which disasters produce community impacts can be explained in terms of models proposed by Cutter (1996), and Lindell and Prater (2003). Specifically, the diagram indicates the effects of a disaster are determined by three pre impact conditions hazard exposure, physical vulnerability, and social vulnerability. There also are three event-specific conditions, hazard event characteristics, improvised disaster responses, and improvised disaster recovery. Two of the event-specific conditions, hazard event characteristics and improvised disaster responses, combine with the pre impact conditions to produce a disaster's physical impacts. The physical impacts, in turn, combine with improvised disaster recovery to produce the disaster's social impacts. Communities can be engaged in three types of emergency management interventions to ameliorate disaster impacts. Physical impacts can be reduced by hazard mitigation practices and emergency preparedness practices, whereas social impacts can be reduced by recovery preparedness practices.

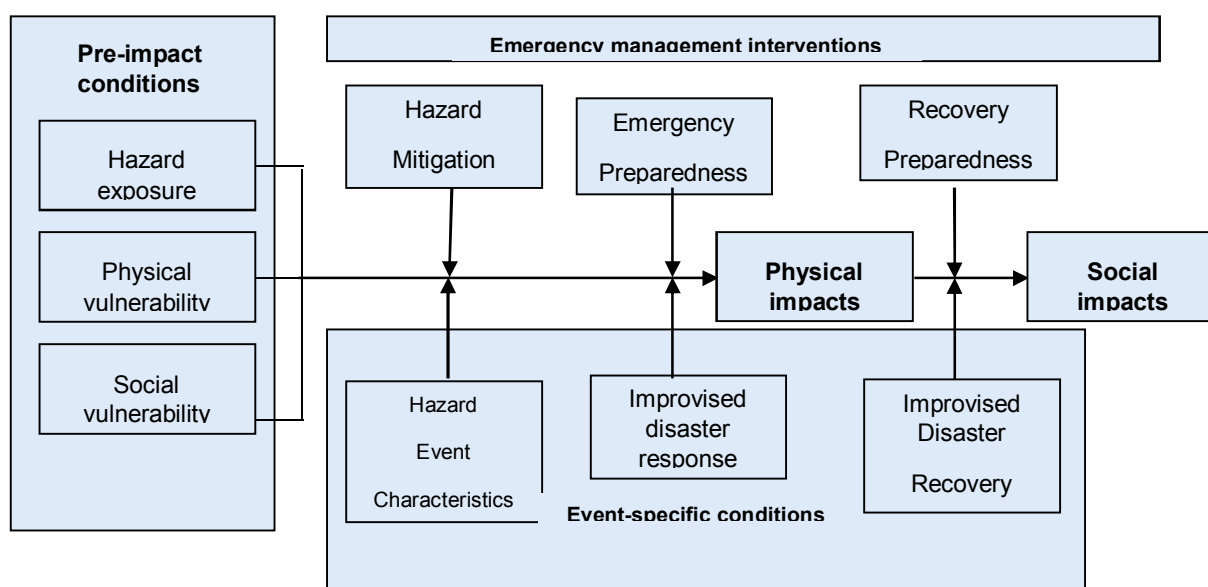


Figure 2: Disaster impact model ( Cutter (1996), and Lindell and Prater (2003)

### 1.4 Social Impacts of Disaster

Social impacts, which include psychosocial, socio-demographic, impacts on health sector, housing and non-monetary services, can develop over a long period of time and can be difficult to assess when they occur. Despite

the difficulty in measuring these social impacts, it is nonetheless important to monitor them because they can cause significant problems for the long-term functioning of specific types of households and businesses in an affected community. A better understanding of disasters' social impacts can provide a basis for pre impact prediction and the development of contingency plans to prevent adverse consequences from occurring.

#### **1.4.1 Psychosocial Impacts**

One type of social impact not measured by census data consists of psychosocial impacts and, indeed, research reviews conducted over a period of 25 years have concluded that disasters can cause a wide range of negative psychosocial responses (Perry and Lindell 1990; Bolin 1985; Houts et al. 1988; Gerrity and Flynn 1997). These include psychophysiological effects such as fatigue, gastrointestinal upset, and tics, as well as cognitive signs such as confusion, impaired concentration, and attention deficits. Psychosocial impacts include emotional signs such as anxiety, depression, and grief, as well as behavioural effects such as sleep and appetite changes, ritualistic behaviour, and substance abuse. In most cases, the effects that are observed are mild and transitory. The result of "normal people, responding normally, to a very abnormal situation" (Gerrity and Flynn 1997, p. 108). Few disaster victims require psychiatric diagnosis and most benefit more from a "crisis counselling" orientation than from a "mental health treatment" orientation, especially if their normal social support networks of friends, relatives, neighbours, and co-workers remain largely intact. However, there are population segments that require special attention and active outreach. These include children, frail elderly, and people with pre-existing mental illness, racial and ethnic minorities, and families of those who have died in the disaster. Emergency workers also need special attention because they often work long hours without rest, have witnessed horrific sights, and are members of organizations in which discussion of emotional issues may be regarded as a sign of weakness (Rubin 1991).

The negative psychosocial impacts described above, which Lazarus and Folkman 1984 call "emotion-focused coping" responses, generally disrupt the social functioning of only a very small portion of the victim population. Instead, the majority of disaster victims engage in adaptive "problem-focused coping" activities to save their own lives and those of their closest associates. Further, there is an increased incidence in prosaic behaviours such as donating material aid and a decreased incidence of antisocial behaviours such as crime (Mileti et al. 1975; Drabek 1986; Siegel et al. 1999).

There also are psychosocial impacts with long-term adaptive consequences, such as changes in risk perception, beliefs in the likelihood of the occurrence of a disaster and its personal consequences for the individuals. And increased hazard intrusiveness frequency of thought, discussion, and information received about a hazard. In turn, these beliefs can affect risk area residents' adoption of household hazard adjustments that reduce their vulnerability to future disasters. However, these cognitive impacts of disaster experience do not appear to be large in aggregate, resulting in modest effects on household hazard adjustment. (Lindell and Perry 2000).

#### **1.4.2 Socio-Demographic Impacts**

The most significant socio-demographic impact of a disaster on a stricken community is the destruction of households' dwellings. Such an event initiates what can be a very long process of disaster recovery for some population segments. According to Quarantelli 1982, People typically pass through four stages of housing recovery following a disaster. The

first stage is emergency shelter, which consists of unplanned and spontaneously sought locations that are intended only to provide protection from the elements. The next step is temporary shelter, which includes food preparation and sleeping facilities that usually are sought from friends and relatives or are found in commercial lodging, although “mass care” facilities in school gymnasiums or church auditoriums are acceptable as a last resort. The third step is temporary housing, which allows victims to re-establish household routines in non-preferred locations or structures. The last step is permanent housing, which establishes household routines in preferred locations and structures. Households vary in the progression and duration of each type of housing and the transition from one stage to another can be delayed unpredictably. Particularly significant are the problems faced by lower income households, which tend to be headed disproportionately by females and racial/ethnic minorities. Such households are more likely to experience destruction of their homes because of pre impact locational vulnerability (Rubin et al. 1985).

#### **1.4.3 Impacts on Health Sector**

After any disaster health sector becomes very vulnerable for lack of food and pure-drinking water and so on. Different water-borne diseases like acute diarrhoea, typhoid, various skin diseases, hepatitis etc. often spread out in the affected areas. It is mentionable that still many village people drink water from ponds, rivers and lakes. Again many people depend on rainwater, especially for agriculture. They preserve it in the rainy season and use it in the summer or hot seasons. But natural disasters pollute that water. “Contamination of safe water sources creates scarcity of safe water for drinking, washing and bathing. Unsafe drinking water often causes them suffer from different diseases. But the situation deteriorates immediately after any natural disasters, because that water cannot be drunk any more for saline and the contamination of dead bodies like cattle and human beings. There are not enough tube-wells so that rural people can drink safe water. On the other hand, poor sanitation system is also responsible to deteriorate the situation. Usually rural sanitation facilities are very poor. Any natural disasters make the situations worse (Peacock, 1987).

#### **1.4.4 Impacts on Housing Sector**

The way households operate offers insight into their response to crises and their effects; it also increases knowledge about the impact of relief and reconstruction initiatives, in terms of access to resources, the roles and responsibilities of individuals in their households, and changes in each person’s degree of well-being. Reconstruction initiatives may also impact on support systems and social norms. In addition, all such actions may have an effect on perceptions of one’s own contribution to the household, and therefore open up the possibility of changes, whether positive or negative, in the status of women (Bradshaw et al., 2001). One of the models that facilitates understanding of how households operate is that of “cooperative-conflict”, formulated by Sen (1987; 1990), in which negotiation plays a central role. This author contends that the members of a household seek to improve both their own situation and the collective “well-being” of the household, and establish different priorities for this. Resolving these differences is a function of each member’s ability to bargain. The factors that have a bearing on bargaining ability or position are each member’s self-perception with respect to his or her worth as a person and the perception of worth that other people in the household confer on him or her. Both, in turn, depend on the value placed on each member’s contribution to the household’s wellbeing, which often translates into the quantity of resources e.g., income that can be obtained. Women are

generally in a weaker bargaining position than men because their contribution is invisible, is not recognized or is considered less worthy, which affects their self-esteem.

### **1.5 Problem Statement**

Natural disaster brings more devastation in a developing country like Pakistan and has the potential to bring different impacts like social, Psychosocial and physical impacts. Social impacts often result in the disruption of social fabric, poor reproductive health, insecurity, lack of shelter and housing, distress, injuries and loss of employment. Therefore, this study connects the personal and collective social impacts to ensure the impact of disasters upon individuals and communities as a whole.

### **1.6 Objectives of the Study**

The aim of this study is to provide a systematic understanding of the social impact of 2005 earthquake on the communities in Balakot.

- To examine health and housing conditions of communities after earthquake.
- To assess the socio-demographic condition of respondents in the study area.
- To generate policy relevant recommendations for the betterment of the society.

### **1.7 Significance of Research**

Unfortunately, there has been relatively little research on the topic of the social impacts of severe earthquakes by sociologists. Except man-made disasters, Pakistan has faced its first ever-natural disaster with significant human and economic losses. Neither the state nor the citizens ever expected such grave circumstances nor such heavy causalities.

Since this is not the first or the last disaster in this country, there is a need of emergency preparedness and response for all types of disasters to cope with the impacts of disaster in the long run. This requires a new planning approach and extensive applied research on the topic that may help to channel and interlink the state machinery, households, private sector organizations, and international support agencies in a well-coordinated manner for post disaster management activities. Since 2005 many studies have been conducted on the assessment of economic losses in terms of monetary value but very few studies have been conducted on the social implications at community level. The results of this study will help in formulating the measures to cope the effects of earthquake. Final outcome will bring out new ideas and possible recommendations.

### **1.8 Organization of the Study**

The study has been organized into five chapters. Chapter 1 is about introducing the subject of study, provides the theoretical framework, highlighting problem statement and spells out the significance of the study. Chapter 2 provides the literature review. Chapter 3 describes the study area including methodology of the study. Chapter 4 describes the data and results of the study. While chapter 5 includes the conclusion and recommendations.

## CHAPTER 2

# REVIEW OF LITERATURE

Disaster events impact both developed and developing countries, in the latter, they can cause a sharp increase in poverty. As disasters pose an important challenge to the development and it is important to assess their global, regional, economic, and social impacts. Most economic assessments of the impacts of disasters have concentrated on direct losses—that is, the financial cost of physical damage. Equally important are indirect and secondary impacts of disasters, including the destruction of communities and their negative impacts on communities, individuals and families. The challenges posed by potential disasters in the developing countries like Pakistan require rapid action, and also an energetic risk-management strategy. To help reduce those negative impacts, countries need an overall evaluation of their risks, including: (i) risk identification, (ii) risk reduction, and (iii) risk transfer. It is expected that concerted action on risk management will help create an increased awareness of the economy—wide significance of natural disasters and the problems they pose for long—term development. Accordingly, this growing awareness will lead to an increased resilience in the developing countries. To better understand the social impacts it is important for a country to carry out the social impact assessment which provides the information about the impacts on overall social fabric with particular reference to the poor and marginalized sections of population. This assessment's findings will form the basis for the Continuous Social Impact Assessment, which will assess the social impacts of different interventions and programmes initiated by Government and different agencies on a regular basis to ensure maximum benefits for the target population.

### 2.1 Effects of Disaster on the Community

Disasters disrupt communities in many ways, including disruption to normal routines, physical harm and social disruption. In short, disasters are unexpected events and it is essential that the affected community is identified so that the needs of these groups of people can begin to be identified and then addressed. There are many definitions of community, a community can be considered as a social, religious, occupational, or other group sharing common characteristics or interests and perceived or perceiving itself as distinct in some respect from the larger society within which it exists. When identifying disaster affected communities or parts of a community, it is also important not to be restrictive in how affected communities are defined. Caution needs to be exercised so that the process does not alienate people who, although not appearing to be obviously affected, may be experiencing consequences from the disaster. These people may include those who have witnessed an event, helped others affected, become distressed by hearing information about the emergency or felt they were at potential risk of the emergency (even if that risk did not eventuate).

Within the social environment, the impacts of a disaster usually result in losses and/or disruptions to peoples' lives both individually and in terms of the social infrastructure. Each disaster is unique, varying along dimensions such as predictability, speed of onset, duration, degree of damage and so on. As a general rule, unpredictability, rapid onset,

long duration and severe damage are likely to be associated with greater adjustment difficulties for individuals and communities. Regardless of the disaster dimensions, loss of life, loss of shelter, injury, trauma and threats to safety (many of which may continue while the recovery operation is underway) all impact on community recovery.

## **2.2 Effects on the Natural Environment**

The effects of disaster on the natural environment that impact on the community may be a result of the disaster or they may be a secondary impact or flow on from the disaster response or recovery process. Examples include air quality, water quality, land degradation and contamination, bio-security, sense of place issues and impacts on the natural environment (State Government of Victoria 2010). Disasters may impact on all aspects of a community. The degree to which sustainable community recovery can be achieved depends on the disaster and on existing community and individual resilience and vulnerability. In creating a heightened awareness of the risks communities face, disasters afford communities the opportunity to adapt and reduce their exposure to potential future risks.

## **2.3 Housing and Shelter Conditions after 2005 Earthquake, Pakistan**

In order to reduce the social impacts of the disasters it is necessary to reduce the physical impacts of disasters because physical impacts produce the social impacts in the long run. Physical impacts of the disasters can be reduced through proper structural mitigation. The earthquake left an estimated 2.8 million people in need of shelter at the onset of a harsh winter, in a rural, difficult to access terrain. It is estimated that in October 2005 about 787,000 housing units were in the affected area, and that these were predominantly rural. According to the initial joint assessment by the World Bank and the ADB, 203,579 housing units were destroyed and 196,575 units were damaged. Some 84 percent of the total housing stock was damaged or destroyed in AJK, while 36 percent in KPK. However, these figures have grown in view of severe aftershocks and increased access to remote areas after the initial survey. Ninety percent of the destroyed or damaged housing is found in rural areas (EERI special earthquake report). Even when houses are damaged, loss of housing functionality may be difficult if there is massive disruption of infrastructure. In such cases, tent cities are necessary if undamaged housing is beyond the range of community e.g. Mass relocation has been attempted in the past, but it is usually undesirable because it creates social and psychological disruption and delays physical reconstruction and economic recovery.

## **2.4 Health Conditions after 2005 Earthquake in the Affected Areas of Pakistan**

According to a report by Asian development bank and World Bank. The earthquake's impact on the health sector includes severe damage to health infrastructure and health systems. About 574 health facilities were partially damaged or destroyed. Furthermore, were 21 confirmed deaths and 141 injuries sustained to staff, with incomplete information regarding the Lady Health Workers (LHW) residing among the affected communities. Many surviving staff members in the earthquake affected areas are away from work due in part to psychological trauma and to their assistance to family members in finding shelter and rebuilding houses. Moreover, health management was paralyzed at the central level in Mansehra and AJK, district, and at the facility level. These losses have resulted in a complete breakdown of the health system and a total disruption of both secondary and primary care service provision. Based on available information, the total damage to the health sector is estimated at approximately Rs. 7.1 billion. This figure does not include the cost of



damage to private health care system and indirect losses due to expenditure on treatment of survivors, public health interventions, loss of health staff and the impact of psychological trauma, which have not been computed.

## **2.5 Effects of Disaster on Social Environment**

It is important to understand the consequences of a disaster upon the social infrastructure because effective social recovery is the foundation for enabling the progression of recovery in all aspects of the community (including the economic, natural and built environments). In addition to the impacts of the disaster event, the response and the recovery effort (planning, management and service delivery) itself has potential to create negative social consequences for affected individuals and communities. These are discussed as secondary effects. Positive consequences can be enhanced and negative ones avoided, or at least alleviated by an effective recovery effort and the sound coordination of response and recovery. Other secondary impacts also briefly considered include the consequences of responding to emergency events on those within the community who help (such as the disaster workforce and volunteers).

It is clear that establishment of context in evaluating the degree of severity of impacts is of paramount importance. As risk analysis is essentially based on the possibility of a given event occurring and the degree of severity of resulting consequences, it is evident that the local socio-economic context must be assigned a determining role in the evaluation of the risk. (Kortenhaus e kaiser, 2009; Topuz et al., 2011).

To reduce the long-term impacts of disasters, affected countries must take such actions along parallel tracks. First, as an essential part of their economic and social development strategy, they should allocate financial resources for the prevention and mitigation of the foreseeable impact of a disaster. Such an assurance should be understood as a high-yield investment –in economic, social and political terms for achieving long-term growth. Second, once a disaster has occurred, they must ensure that reconstruction investments reduces the vulnerability with an adequate level of sustainable growth.

Disasters are natural phenomena, but their impacts are not. Rather, their impacts are the result of the human actions and are determined by the circumstances of the country i.e., poverty, social inequalities and among other factors. Blaikie et al. (1994:3) point out that there is a risk inherent in treating disasters as something unusual or as events detached from people's daily lives.

Watts and Bohle (1993), Blaikie et al. (1994), argue that people's vulnerability to natural hazards is determined not so much by the event itself, but rather is a function of social conditions and historical circumstances. Thus, protection from the social forces that create inequitable exposure to risk becomes just as important, if not more so, than protection from natural hazards.

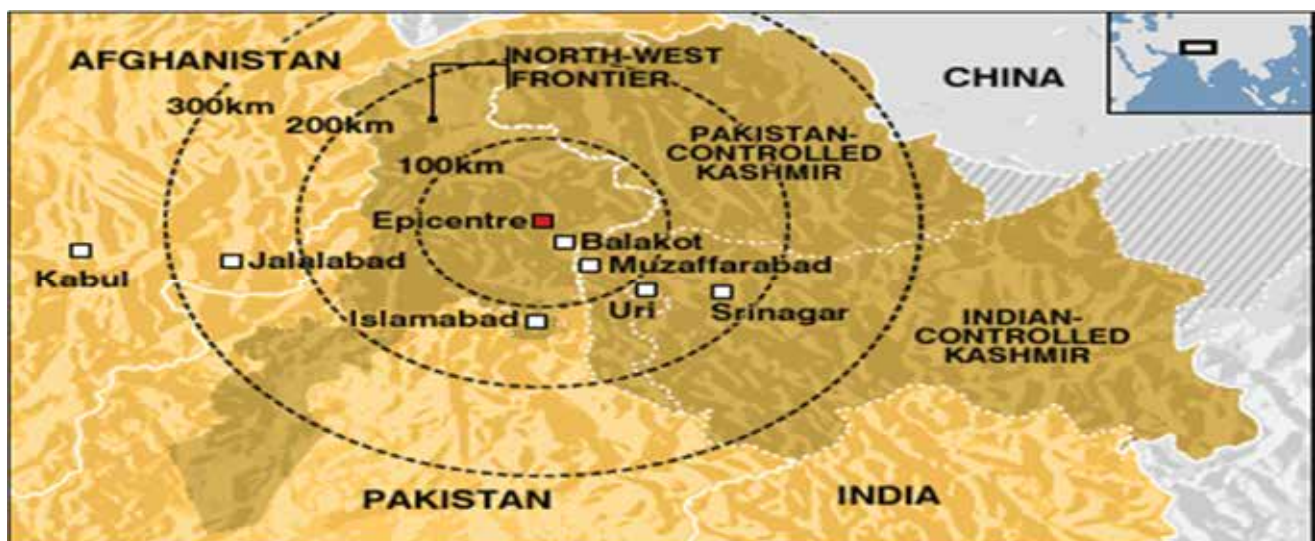


## CHAPTER 3

# RESAERCH METHODOLOGY

### 3.1 Study Area

Balakot is a town in Mansehra District in the Khyber-Pakhtunkhwa province of Pakistan. The town was destroyed during the 2005 Kashmir Earthquake, but was later rebuilt with the assistance of the Government of Pakistan and international humanitarian agencies. Total population of Balakot is 214,630 (District Mansehra finance and planning department, 2013). During the 2005 earthquake the entire town was destroyed. According to NWFP Government official site 80% of the buildings were destroyed and the death toll reached to almost 87,350. The United Arab Emirates volunteered to rebuild this town into an improved one with housing colonies, schools, hospitals, and other civic facilities. However, the Pakistan government has announced that the city will be relocated. The town is reconstructed about 20 km away at a safer spot with more earthquake-proof buildings. The hillside town of Balakot, comprising 12 union councils with a population of 30,000 people, was completely destroyed by the earthquake on October 8, 2005. Over 90 per cent of the houses were reduced to muddy smears. The survivors will be relocated to the New Balakot City, currently being developed near Mansehra.



(Source: Wikipedia) Location map of Balakot.

### 3.2 Geographical Features

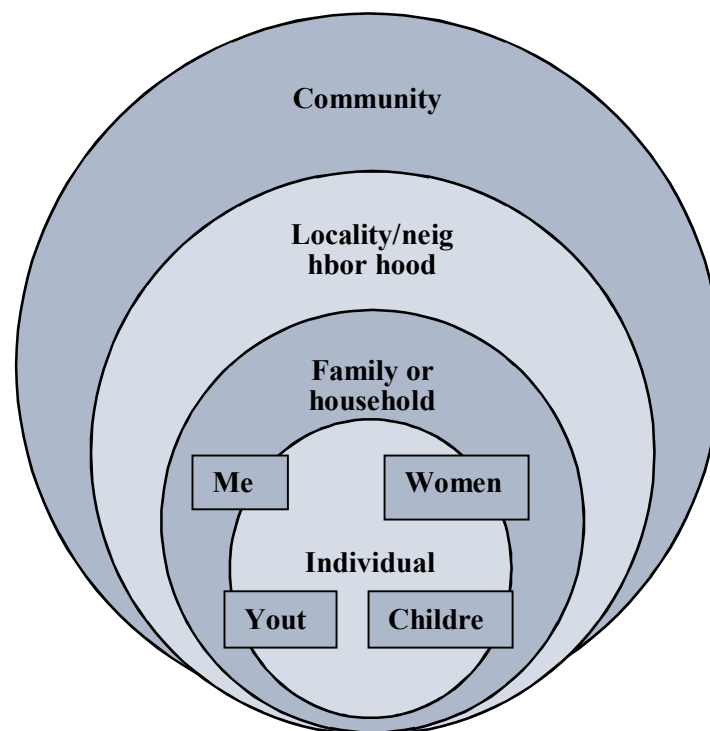
Balakot sub division is like wedge driven up between Azad Kashmir on the East and Kohistan District in West and North respectively. Crow-flight distance from South. West to the North East in 100 Km and by road from Batrasi Forest to Babusar top is 188 Km, within an average width of 25 KM. (Source: Wikipedia)

### 3.3 Administration

Balakot Tehsil consists of 16 Union Councils. (Source: Wikipedia)

- Atter Shisha
- Balakot
- Garhi Habibullah
- Garlat
- Ghanool
- Hangrai
- Kaghan
- Karnol
- Kewai
- Labar Kot
- Mahandri
- Pairan
- Sandaisar
- Satbani
- Shohal Mazullah
- Talhata

### 3.4 Research Design



**Figure 3: Assessed impact of earthquake on different entities.**

Understanding the impact of disasters upon the collective social environment recognizes that human beings do not function separately but within an array of social relationships with interdependence. Equally, each individual's unique strengths and weaknesses (or risk and protective factors) will influence their recovery. Therefore, this study connects the personal and collective social impacts to ensure the focus is on the impact of disasters upon communities as a whole.

### 3.5 Target Population

The target population were the residents of Balakot and specifically the people effected by earthquake 2005. Eighty respondents have been selected for the study from the main city of Balakot. The respondents selected were

those who directly or indirectly were affected by the 2005 earthquake and were still in processes of rehabilitating themselves after ten years of the earthquake.

### **3.6 Sampling Technique**

In order to select the respondent's simple random sampling technique is used. In this technique, each member of the population had an equal chance of being selected as subject. The entire process of sampling was done in a single step with each subject selected independently of the other members of the population. Because Random sampling eliminates biasness by giving all individuals an equal chance to be chosen. An unbiased random selection and a representative sample is important in drawing conclusions from the results of a study.

### **3.7 Data Collection**

Data for this study is gathered through primary sources, using survey questionnaires, face to face interviews were conducted from the respondents. As Gray (2004) identified the importance of these tools and found them a powerful way to bring the information from the respondents.

Main variables in primary data are socio-demographic includes (age, gender, marital status, occupation etc.) and social indicators such as health, housing and non-monetary services etc.

A pre-test is applied to examine and verify the questionnaire before putting into operation. This helped to minimize the errors and to restructure the questionnaire. 5-8 questionnaires are pretested.

### **3.8 Data Analysis and Reporting**

Data is presented in the form of tabulation and graphically. The data is transformed into proper tabulation using Excel. Results has been gathered through percentages and averages. Likert scale is also used in order to get the response of respondents. After the analysis of data results are incorporated and further recommendation are made.

### **3.9 Reliability and Validity of Research**

The principles of reliability and validity are important parts of the scientific method. When we talk about reliability we mean consistency or repeatability of results. Validity of a study means that the study is capable to measure for which it has been designed. According to Patton (2001), validity and reliability are two factors, which any qualitative researcher should be concerned about while designing a study, analyzing results and judging the quality of the study. However, the credibility in quantitative research depends upon the instrument construction while in qualitative research the researcher is the instrument (Patton, 2001, p. 14). Hence validity of the research is referring towards the researcher abilities in collecting and analyzing the data. The concept of a good quality research when reliability is a concept, evaluate quality in quantitative study with a "purpose of explaining" while quality concept in qualitative study has the purpose of "generating understanding" (Stenbacka, 2001, p. 551). To ensure reliability in qualitative research, examination of trustworthiness is essential (Seale, 1999).

In the present study care has been taken to ensure reliability and validity by giving a detailed account of all the processes involved in the research. To acquire valid, reliable multiple and diverse realities, multiple methods of search or gathering data are in order. Engaging multiple methods, such as, personal observation, and interviews lead to more

valid, reliable and diverse construction of realities. The study has constructed the reality and by engaging all such methods in collecting and analyzing the data.

### **3.10 How Biases were Removed in the Study**

It is not possible to conduct a completely unbiased research but what one can do to ensure accuracy of a study is to clearly become aware of one's own biases. In this study, the researcher took certain measures to deal with his own biases. For instance, simple and clear questions were asked from the respondents rather than making them complicated to understand. If the respondents were unable to understand the questions, they were made simpler at the moment. Moreover, the questions were kept neutral to reduce question bias and question order bias was also reduced. For instance, general questions were asked before specific questions.

### **3.11 Ethical Consideration**

The research ethics in the researcher-respondent relationship were followed, which was the need of the research. The researcher made sure and kept in view all the ethical issues regarding research. Researcher made sure that research was not biased. Confidentiality was ensured. The purpose of the study was clearly explained to the respondent, because it is the right of respondent to maintain privacy. All those questions which could possibly harm respondents were ignored or asked in a different way for the sake of their comfort.

## CHAPTER 4

# RESULTS AND DISCUSSIONS

### Introduction

This study provides an overview of the social implications of earthquake on the health, housing and nonmonetary services in the Balakot.

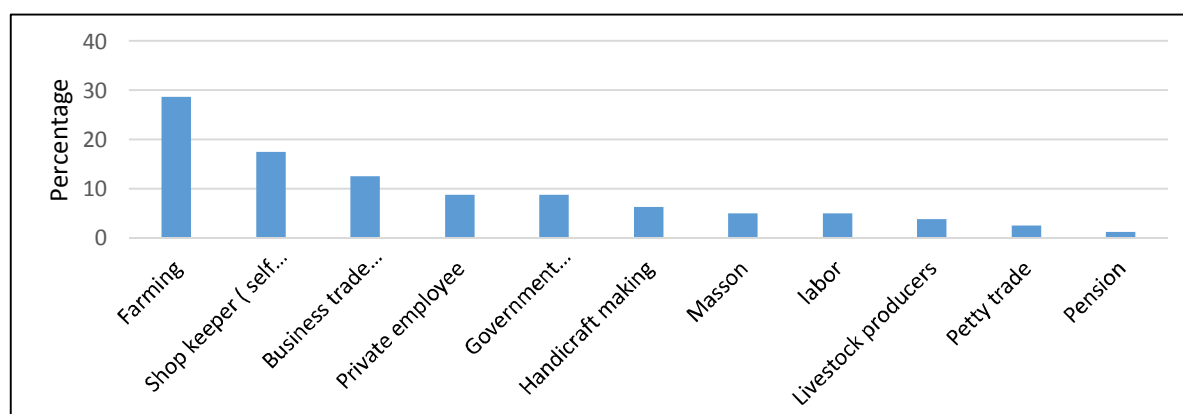
**Table 1: Socio-demographic variables**

Demographic variable	Mean values
Age of household	39
Average no of earners in the household	5
Average education (years)	10
Average family members (No.)	5
Average no of male	3
Average no of female	2

Source: Author field survey, 2015

### 4.1 Source of Income

Study showed that the 28.7% of the people in the area are dependent on farming, as farming has much importance on a smaller scale. Family farming provides local foods to the community when there is surplus produced, and it provides for much of the family's food consumption otherwise. This allows the family to save money and reduces dependence on industrial farming and 17.5% of the people said that they are Self-employed (Shopkeepers). 5% of the people were mason. 3.7% of the people were dependent on the livestock. 1.2% of the people were pensioners. 8.7% were private employee, 8.7% government employee, 6.2% of the people were generating their livelihood through handicraft making, 2.5% were dependent on petty trade, 12.5% of the people were having their own business and 5 % of the people were labour.



**Figure 4: Showing source of income of the respondents.**

Source: Author field survey, 2015

## 4.2 Housing Infrastructure Information

Total no of respondents was 80. Study shows that 68.7% of the people were having their own houses before the earthquake but after the earthquake due to the damages occurred to their houses only 31.2% of the people were having their own houses. Due to the damage to the houses 10% of the people who were receiving rent from their extra houses they lost their income which they mostly use for the education of their children. 48.7% of the houses were partially damaged while 51.2% of the houses were completely damaged due to which peoples were unwillingly living in tents and temporary shelters. When we asked them about the social linkages in the society and their response In their community after the earthquake for the effective social recovery 37.5% of the people said that their response was co-operative, 12.5% said responsive 26.25 communal and 23.7 said that they have shared response in the recovery phase which shows that the social linkages between the community was strong and if the social linkages between the communities are strong then it reduces the social vulnerability of the people to the disasters. 18.7% of the people helped in reconstruction and rehabilitation of the community through their contributing their money. 12.5% offered the laboured services and 68.7% of the people motivated others in the reconstruction and rehabilitation phase. These figure shows that instead of relying on the external aid local community itself contributed their part for the reconstruction and rehabilitation.

**Table 2: Table housing infrastructure information**

SECTION HOUSING (SHELTER)		before Earthquake	%age	After earthquake	%age
Do you have /had your own house?		55	68.75	25	31.25
Extra house from which you receives rent		8	10	4	5
Effects of earthquake 2005 on your house					
	1 Partially damaged	39	48.75		
	2 Fully Damaged	41	51.25		
Your response in the neighbourhood after the disaster					
	1 Co-operative	30	37.5		
	2 Responsive	10	12.5		
	3 Communal	21	26.25		
	4 Shared	19	23.75		
Your efforts you made in reconstruction and rehabilitation in terms of					
	1 Money	15	18.75		
	2 Labour	10	12.5		
	3 Motivating people etc.	55	68.75		

**Source: Author field survey, 2015**

## 4.3 Health Conditions

Better health is essential to human happiness and well-being. It also makes an important role to economic progress, as healthy populations live longer, are more productive, and can save more. Many factors influence health status and a country's ability to provide quality health services for its people. Ministries of health government departments, donor organizations, civil society groups and communities play important role in the provision of health facilities to the people in the normal conditions as well as in disastrous situation.

This study showed that people faced many diseases after the earthquake due to the lack of medicines and other health facilities, 16% of the people were having the respiratory diseases, 12% were suffering from the skin diseases, and 3.7% with measles, 1.2% with eye infection and 3.7% were having the malaria. Medical relief camps were established and then 66.2% of the people were treated and the rest 33.7% did the home medication. After the disaster people faced many difficulties in accessing the health facilities, the main reasons were the low income and poor infrastructure. 38.7% of the people are deprived from the health facilities due to the lack of income. Low income individuals will be less likely to recover from the material and health impacts of disasters. These individuals are less likely to have insurance to cover disaster losses, they may be on fixed or very limited incomes, they may struggle repaying low-interest disaster loans. Health conditions existing before disaster will likely be exacerbated by disaster, and lack of disposable income will make it very difficult for these low-income populations to afford health and mental health care and 26.2% of the people living in the remote areas faced difficulties to access the health facilities due to bad road conditions. The earthquake has damaged the health infrastructure and up till now there are no proper health facilities available in the area. Mostly people living in the remote areas due to poor road infrastructure do not have the health facilities in time of emergencies due to which most of the patients die on the way before reaching to the hospitals. Study also shows that the most effected group were the children. The earthquake had severe psychosocial impacts on the children. Due to the widespread collapses of school buildings many children died others injured and many suffered from the trauma, shock and psychological impacts.

**Table 3: Health conditions**

Health	frequency	%age
No of the children, aged or old in your Household suffered from following diseases after earthquake		
1 Respiratory infections (Cough, flu, pneumonia etc.)	13	16.25
2 Skin diseases	1	1.25
3 Diarrhoea	0	0
4 Measles	3	3.75
5 Eye infections	1	1.25
6 Malaria/dengue	3	3.75
Kind of difficulties faced by women, old and disabled members to access/go the nearest health facility?		
1 transport	8	10
2 income	31	38.75
3 Access	12	15
4 road condition	21	26.25
5 social hindrances	8	10
How you treated diarrhoea		
1 to see a doctor	53	66.25
2 home medication	27	33.75

#### Most effected group

1	children	41	51.25
2	Adults	8	10
3	Aged	11	13.75
4	women	20	25

#### Most frequent communicable diseases

1	measles	10	12.5
2	skin diseases	2	2.5
3	dirrhOea	23	28.75
4	acute respiratory disease	3	3.75
5	don't know	42	52.5

Source: Author field survey, 2015

#### 4.4 Non-Monetary Services

**Table 4: Non - Monetary services information**

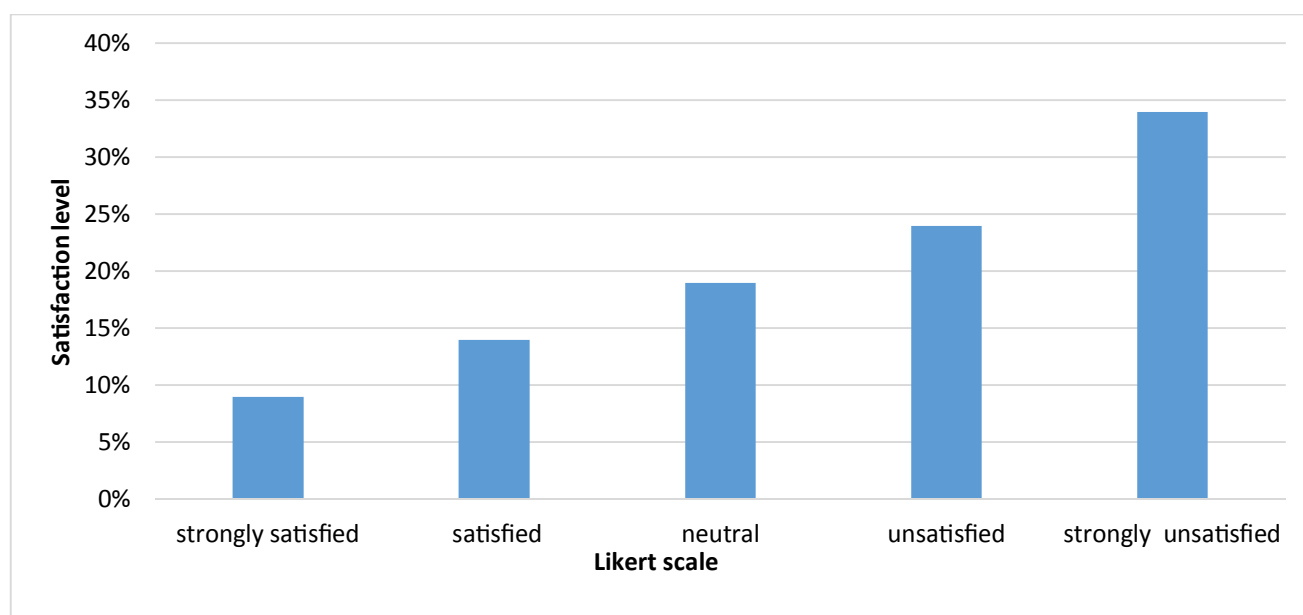
Non-monetary services	Before earthquake				After earthquake			
	Yes	%age	No	%age	Yes	%age	No	%age
Community organizations	17	21.25	63	78.75	30	37.5	50	62.5
former organizations	21	26.25	59	73.75	28	35	52	65
former training organizations	4	5	76	95	11	13.75	69	86.25
credit facilities	45	56.25	35	43.75	31	38.75	49	61.25

Source: Author field survey, 2015.

As the earthquake brought many social impacts which the community struggled to survive while on the other hand as the result of foreign aid the no of non-monetary services increases in the affected area with the help of international organizations. 21.2% of the people responded that there were few community organizations in the area while before the earthquake and 37.5% responded said that the no of community organizations increased after the earthquake. Similarly, 26.25% of the respondent said that there were less no of organizations before the earthquake as compared to after the earthquake. The no farmers training organizations were also increased as well. However, the credit facilities which are considered as important for running small businesses and which helps farmers to improve their production became low 56.2% of the people said that were having the access to the credit facilities before the earthquake while after the earthquake only 38.75% of the people said that they have the access to the credit facilities



#### 4.5 Satisfaction Level of the Community Towards Health Facilities



**Figure 5: Showing the satisfaction level of community**

**Source: Author field survey, 2015**

Figure 5 is showing the satisfaction level of people toward the health facilities provided by the government. The provision of health facilities after any disaster is the primary responsibility of any government. When asked from the people about the health facilities in the area 34% of the people said that that they are strongly unsatisfied by the health facilities provided by the government while only 9% of the people were satisfied by the facilities provide by government.

## **CHAPTER 5**

# **CONCLUSION AND RECOMENDATIONS**

### **5.1 Conclusion**

After the earthquake 2005 the people of Balakot faced many social implications in health and housing sector, however the monetary services sector has improved a bit by the interventions of INGO'S.

In the housing sector most of the people are still living in temporary shelters. The government promised to shift the people of Balakot to the Bakraiya city but now after ten years of earthquake, no significant steps has been taken to recover the losses of the people. Most of the people still has not got the money which the government promised to give them for the reconstruction of their houses.

The health sector was also destroyed in the earthquake 2005. Peoples faced many diseases due to the secondary effects of earthquake. Emergency medical camps provided the necessary treatment to all the effectives. But after the rehabilitation phase when these medical camps were taken off government didn't take any interest in providing the health facilities to the people there is only one government hospital in the area which also lack the necessary equipment's, medicines and doctors. Patients in serious conditions lost their lives due to the lack of life saving drugs and most of the times they are advised to go to other cities for the treatment which they cannot afford.

The monetary services sector has shown some improvements. Community organizations and the farmer training organizations increased after the earthquake with the help of NGO's. This improvement has provided the local farmers to enhance their skills in the field of production to increase their output. The increases no of community organizations has made the people easy to resolve their issues by consenting with each other.

### **5.2 Recommendations**

To create an awareness of the complexity of the disaster's social impacts it is necessary to impart awareness at all levels.

Community should have the strong social linkages, with the different social classes of the societies for building the strong social linkages between the community members, while it is being discussed that social linkages between the community plays an important role in determining the extent of impacts of disaster.

Planners and the government must focus on the structural and non-structural measures for reducing the physical impacts of earthquake like building codes etc., because social impacts are created due to the physical impacts in the long run, if these physical impacts are avoided then social impacts can be reduced.





**EXPLORING THE LINKAGES BETWEEN  
INDIGENOUS KNOWLEDGE AND REDUCTION  
OF FOOD VULNERABILITY  
IN DISTRICT CHARSADDA**

**By**

**M. Ali**

## ABSTRACT

This study investigates status of indigenous knowledge in disaster management to get a unified and dynamic picture of how local knowledge and flood vulnerability influence each other. The study area is rural. There are two spells of rainy season in a year in the study area. The winter rainfall occurs due to western disturbances shows a high record. The highest summer rainfall is in the month of August. The study area faces the problem of flash floods. Heavy rainfalls and tortuous course of the drain are the major natural causes of flood. Floods are the potential hazard of the area. They highly affect the agriculture sector and physical infrastructure in the area. People are having capability to predict and handle disaster with their indigenous knowledge. Flood hazard hinders the socio-economic development of the study area. The present study is carried out in the district Charsadda KPK, Pakistan. Two village councils are selected namely Sardaryab and Mirzagan and two villages from each village council for study due to rapid frequency of the flood in these area. A total number of 48 respondents were selected using multistage sampling plan technique. Both qualitative and quantitative data was collected for the study. Semi-Structured questionnaire was designed for quantitative data collection and focused group discussion also conducted for qualitative the data. A lot of human lives can save from disasters if the focus is on proactive strategies not reactive strategies, Government responds is very low and people have to respond themselves on the occurrence of disaster because their own knowledge is cost effective and easy to understand.

## CHAPTER 1

# INTRODUCTION

### 1.1 Background of the Study

The tropical typical weather and uneven landforms, including high population density, poverty, illiteracy and lack of satisfactory infrastructure, rates Islamic Republic of Pakistan as one of the foremost vulnerable developing countries to suffer fairly often from varied natural disasters, particularly drought, flood, cyclone, earthquake, landslide, eruption, etc. that strike inflicting a devastating impact on human life, economy and atmosphere. Recent estimates show that regarding 29,210 thousand individuals are affected in Islamic Republic of Pakistan from 1991 to 2014 owing to natural disasters and 83,4000 have died throughout this era and damages in USA \$ 3573.053 million (EM-DAT, 2014). In Islamic Republic of Pakistan 8,887 natural disasters reportable from 1980 to 2014 out of that 47 % are associated with floods and rains. The tolls are 3,541 persons each year by the disasters from the year 1990-2014. Islamic Republic of Pakistan is hierarchal tenth among high affected countries for deaths as a result of weather connected events like floods, rains, heat waves etc. (Disaster Mortality, 2015).

The province of Khyber Pakhtunkhwa (KPK) is smallest province in term of geographical region regarding 9.4% of the full space of Islamic Republic of Pakistan, placed on the bankside of watercourse Indus. There are two major watercourse systems existed in KP one is watercourse Indus and second watercourse that floats from Afghanistan. Throughout the monsoon downfall the riverine floods occur in these rivers and someday flash floods happens leading to severe losses of the population residing these areas. The reason behind these flash floods is targeted rainfalls within the watershed watercourse Indus swat and capital of Afghanistan. 3.8 million of the population are affected throughout the floods of 2010 and killed 1070 folks in recent history (GoKPK, 2012).

Floods have forever existed among the region. However, over the last few years their physical, social and economic impact has hyperbolic many folds. several studies ar taken to grasp flood vulnerability among the region. These studies ranged from studies of technical causes of physical vulnerability to those of relationship to sustenance, gender etc. Needleless to say, the agricultural communities among the region have a strong vernacular tradition as a results of that they have targeted an enormous wealth of endemic data and skills (Oludare hakeem Adedeji, 2012).

Indigenous knowledge is outlined as “It refers to the full system, as well as ideas, beliefs, and perception, and also the method whereby it's no inheritable, augmented, stored, and transmitted” (Riegl, B., 2003 p. 433-446). In ancient societies, folks learned from their atmosphere, from peers and communities wherever they were accustomed live and such data varies from space to space society-to-society, community to community and atmosphere to atmosphere. (Mwaura, 2008)

## **1.2 Purpose of the Study**

Flood has forever existed at intervals the region. However, over the previous couple of years their physical, social and economic impact has hyperbolic many folds. Several studies are taken to understand flood vulnerability inside the region. These studies ranged from studies of technical causes of physical vulnerability to those of relationship to sustenance, gender etc. Needless to say, the agricultural communities among the region have a strong vernacular tradition as a results of that they have focused an enormous wealth of indigenous information and skills (Oludare doctor Adedeji, 2012).

Flood has been the cause of tremendous loss of life and property in each urban and rural areas. In developing countries, their impact is extremely severe on rural communities due to many social and economic factors that have contributed towards their physical vulnerability. The current study deals with the problem of vulnerability to disasters generally in that context, it'll just check up on flood as one variety of natural disasters and highlights its linkages with indigenous knowledge of local people in reducing their vulnerability

The aim of the study is to explore the linkages between endemic information and reduction of flood vulnerability on native level in district Charsadda of KPK. The study conjointly plans to uncover the local knowledge in handling and predicting the occurrences of flood in the study area.

## **1.3 Scope of the Study**

The study has been inductive and it's developed over time in terms of main focus and problems at hand. First start my study with associate aim of local information, which is embodied in designed heritage. Eventually discover that substantial information has already got lost. No matter exists is generally to be found in ancient buildings and townscape, native and traditional institutional frameworks and land relations. On intensive study of literature on disaster topics, work out that vulnerability and capability is that the two closely connected key words and local knowledge in truth falls inside the reach of capacities of the individuals to mitigate the impact of disasters prepare for them and additionally recover within the aftermath. This somehow enlarged the scope of local information.

## **1.4 Limitations of the Study**

Start my thesis with such a perspective, hoping to discover Local knowledge, terribly before long completed that such information is incredibly tough to re-discover, as a result of the subsequent reasons:

1. This information of building method is thus dynamic that it's hard to limit this information temporally, as joy to at least one amount in time.
2. The dynamical context is additionally one issue as a result of that one might notice it tough to justify one equitably information over another.
3. It is discovered that almost all of the information has already disappeared, a minimum of from the people minds. Most of it's not living as clearly perceived skills for disaster mitigation.



## **1.5 Objectives**

1. To explore the physical vulnerability of the people from flood in study area
2. To gather the indigenous knowledge for predicting of flood
3. To identify linkages between indigenous knowledge and reduction of flood vulnerability

## **1.6 Layout of the Thesis**

### **Chapter 1**

Deals with the introduction of the research topic

### **Chapter 2**

Deals with conceptual framework of the topic which describes the useful terms and their significance.

### **Chapter 3**

Deals with extensive literature on disaster management especially flood through indigenous knowledge.

### **Chapter 4**

Deals with methods use for data collection and brief overview of the study area.

### **Chapter 5**

Deals with result and discussions that were find in the study area during research process

### **Chapter 6**

Deals with conclusion of the thesis

## CHAPTER 2

# CONCEPTUAL FRAMEWORK

This chapter deals with conceptualization of theoretical framework and highlights terms related to disaster management through indigenous knowledge. The purpose is to relate local knowledge in disaster management as an important factor, because rural communities mostly trust on their own wisdom experience that they learned through their past i.e. Local knowledge. This chapter gives conceptual clearance of Indigenous knowledge, disaster, disaster management, with theoretical discussion on vulnerability of the local communities.

### 2.1 Defining Indigenous Knowledge

Knowledge may be sub classified in to 2 major selections i.e. explicit knowledge and tacit Knowledge. Explicit knowledge is articulated data, expressed and recorded as words, numbers, codes, mathematical and scientific formulae, and musical notations. Explicit knowledge is simple to speak, store, and distribute and is that the data found in books, on the web, and different visual and oral suggests that. Whereas Tacit knowledge describing data is Unwritten, unspoken, and hidden huge depot of data command by much each traditional person, supported his or her emotions, experiences, insights, intuition, observations and internalized info (Fodor, 1981).

Indigenous knowledge is additionally called “traditional knowledge” and “Local knowledge.” native data may be a narrower term, for this, it's necessary for communities having all the innate members. Whereas these days, owing to modernization varied communities reformulated by new migrated members and onward, a few communities existed with innate members, so easy analysis the term “local knowledge” is victimization currently by varied researchers. The term indigenous knowledge includes those members conjointly World Health Organization be a part of recent communities when migration from alternative elements, tolerate them and adopt their cultural values. The term “traditional knowledge” typically used beside native knowledge in an exceedingly broader sense, well it may occupy a broader space than a “local knowledge” (Langill, 1999).

### 2.2 Disaster Management

The United Nations defines a disaster as a significant disruption of the functioning of a community or a society. Disasters involve widespread human, material, economic or environmental impacts, that exceed the power of the affected community or society to cope victimization its own resources (Therapy, 2014).

The NGO and Red Crescent societies outline disaster management because the organization and management of resources and responsibilities for coping with all humanitarian aspects of emergencies, above all readiness, response and recovery so as to minimize the impact of disasters (IBID).

There is no country that's immune from disaster, although vulnerability to disaster varies. There square measure four main styles of disaster. Natural disasters: together with floods, hurricanes, earthquakes and volcano eruptions that have immediate impacts on human health and secondary impacts inflicting any death and full of (for example) floods, landslides, fires, tsunamis (IBID).

Any disaster will interrupt essential services, like health care, electricity, water, sewage/garbage removal, transportation and communications. The interruption will seriously have an effect on the health, social and economic networks of native communities and countries. Disasters have a significant and durable impact on individuals long when the immediate result has been alleviated. Poorly planned relief activities will have a big negative impact not solely on the disaster victims however conjointly on donors and relief agencies. Therefore, it's vital that physical therapists be a part of established programs instead of making attempt individual efforts.

### **2.2.1 Disaster Prevention**

These are activities designed to provide permanent protection from disasters. Not all disasters, significantly natural disasters will be prevented, However the chance of loss of life and injury will be mitigated with smart evacuation plans, environmental designing and style standards. In Jan 2005, 168 Governments adopted a 10-year world arrange for natural disaster risk reduction referred to as the Hyogo Framework. It offers guiding principles, priorities for action, and sensible suggests that for achieving disaster resilience for vulnerable communities. (IBID)

### **2.2.2 Disaster Preparedness**

These activities are designed to reduce loss of life and injury – for instance by removing folks and property from a vulnerable location and by facilitating timely and effective rescue, relief and rehabilitation. State is that the main manner of reducing the impact of disasters. Community-based state and management ought to be a high priority in physiotherapy applies management (IBID).

### **2.2.3 Disaster Relief**

This is a coordinated multi-agency response to scale back the impact of a disaster and its long-run results. Relief activities embrace rescue, relocation, providing food and water, preventing sickness and incapacity, repairing important services like telecommunications and transport, providing temporary shelter and emergency health care (IBID).

### **2.2.4 Disaster Recovery**

Once emergency wants are met and therefore the initial crisis is over, the folks affected and therefore the communities that support them ar still vulnerable. Recovery activities embody reconstruction infrastructure, health care and rehabilitation. These ought to mix with development activities, like building human resources for health and developing policies and practices to avoid similar things in future (IBID).

## **2.3 Relationship Between Indigenous Knowledge and Disaster Management**

The relationship between indigenous knowledge and natural disasters has developed a lot of interest in recent years. The new discussions around indigenous knowledge highlight its potential to boost disaster risk reduction policies

through integration into disaster education and early warning systems. Throughout disaster risk reduction literature, four primary arguments are created for the worth of indigenous knowledge (Noralene Uy, 2008).

First, varied specific native practices and methods embedded within the information that prove valuable against natural disasters, are often transferred and adapted to different communities in similar situations. Second, associate incorporation of indigenous information in existing practices and policies encourages the participation of the affected community and empowers its members to require the leading role altogether disaster risk reduction activities. Third, the information contained in indigenous knowledge will facilitate improve project implementation by providing valuable information concerning the native context. Finally, the non-formal suggests that by that autochthonous information is disseminated provides a fortunate model for different education on disaster risk reduction. Whereas this publication focuses on collection specific autochthonous ways and mechanisms which may be transferred and custom-made to different communities, the teachings learned emphasize all of those four areas (Noralene Uy, 2008).

There is associate plain gap between the progress of scientific knowledge and also the increasing frequency of disasters. This, however, doesn't mean that apply of disaster risk reduction (DRR) is failing there are various samples of endeavors that have junction rectifier to significant enhancements within the ability of native communities to face natural and different hazards (Wisner et al. 2004). Collaboration between stakeholders is crucial for property DRR. Native communities, government authorities, non-government organizations (NGOs), scientists, college communities and religion teams all have a task to play. Communities (including citizen-based organizations, lecturers and pupils, and religion groups) ar a very important resource and represent the frontline of action since they're most severely laid low with, and also the first to reply to disaster (Delica-Willison 2004).

Achieving such a mixing of data and action in DRR, however, proves difficult. several scientists and government official typically underestimate the worth of native information and community activities (Mercer, 2010; Shaw, 2009). Similarly, native communities seldom have a close understanding of scientific information and organization staff typically claim that science is disconnected from reality. Such a spot between stakeholders, in terms of actions and information, is taken into account a significant obstacle for reducing the danger of disasters in a very property manner and on an outsized scale (Wisner 1995).

To bridge this gap, Mercer (2009) provides a helpful four-step method framework. First, it needs associate initial engagement with the community to create confidence and trust, and to know people's goals. Second, it involves associate assessment of the vulnerability of the community and its drivers, which can be internal or external. Third, the framework focuses on potential ways to cut back people's vulnerability within the face of natural hazards. These ways could also be exogenous or endogenous, and suppose a mix of scientific and native information. Fourth and finally, it provides house for each discussion and integration of antecedently identified ways so as to integrate bottom-up and top-down actions for reducing the danger of disasters. Initial applications of this framework to marginalized communities in island New Guinea tried triple-crown (Mercer et al. 2009)

## **2.4 Disaster Management Cycle**

Various organizations, researchers, and practitioners elaborate disaster management cycle in line with the requirements of their practicum or subjectiveness. However, the theme of the cycle is same altogether i.e. pre-disaster

activities, during-disaster and after. Numerous stages of disaster management cycle elaborate here following various references over it (Commonwealth, 2010)

#### **2.4.1 Pre-Disaster**

Pre-disaster activities discuss with activities that perform before the prevalence of disaster i.e. by anticipating natural hazards preventive measures should be adopted. It includes 2 main sets of activities i.e. prevention and mitigation

- I. Prevention: Prevention is to confirm that human activity or natural phenomena don't lead to disaster or emergency (Commonwealth, 2010).
- II. Mitigation: Mitigation means that to cut back the severity of the human and material injury caused by the disaster (IBID).
- III. Preparedness: Preparedness contains sets of activities that perform throughout the disaster. It consists of activities designed to reduce loss of life and injury, organize the suspension of individuals and property from vulnerable location (Kumar, 2008).

#### **2.4.2 Throughout Disaster**

Pre-disaster activities confer with activities that performed at the prevalence of disaster that embrace early response, rescue, and relief.

- I. Response: This section includes actions ought to perform straightaway throughout disasters i.e. to avoid wasting lives, stop property injury and to preserve the atmosphere. The amount of those activities might depend upon the severity of the disaster; it's going to be for 6 months or for a year (Commonwealth, 2010).
- II. Rescue: The imperative support to disaster victims among 1st three days of disaster occurrence; it includes the availability of basic desires solely i.e. Food, water, sorted temporary shelter and saving lives.
- III. Relief: The short term support to disaster victims to come to normal life i.e. Building suspension bridges for broken bridges, providing individual temporary shelters, launching medical camps, provision of hygiene facilities, provision of advanced basic facilities.

#### **2.4.3 Post-Disaster**

It includes activities to confirm complete come back of traditional life with no sign of disaster prevalence (David, 2004). It provides semi-permanent recovery through 2 main steps i.e. Rehabilitation and Reconstruction (Kumar, 2008).

- I. Rehabilitation: It includes operations and choices taken once a disaster with a read to restoring traditional life (IBID).
- II. Reconstruction: It includes actions to re-establish a community once an amount of rehabilitation. Actions would come with constructions of permanent homes to supply shelter, full permanent restoration of services, constructions of permanent roads and broken bridges, and complete commencement of pre-disaster state (IBID).

### **2.5 Concept of Vulnerability**

The IPCC Third Assessment Report (TAR) describes vulnerability as “The degree to that a system is prone to, or unable to address, adverse effects of global climate change, together with climate variability and extremes. Vulnerability could

be operating of the character, magnitude, and rate of climate variation to that a system is exposed, its sensitivity, and its adaptive capability.” (IPCC, 2001, p. 995)

Set of prevailing conditions that adversely have an effect on the community’s ability to stop, mitigate, steel oneself against or reply to a hazard. Absence of cope ways is additionally a neighborhood of vulnerability and must be thought of in vulnerability assessment e.g. living in hazard prone locations like just about an ocean or watercourse, on top of the fault lines, at the bottom of a mountain etc. (Studies, 2010).

### **2.5.1 Physical Vulnerability**

The physical vulnerability of a locality additionally depends on its geographic proximity to the supply and origin of the disasters e.g. if a locality lies close to the coast lines, fault lines, unstable hills etc. it makes the realm additional at risk of disasters as compared to a locality that's remote from the origin of the disaster. Physical vulnerability includes the issue in access to water resources, means that of communications, hospitals, police stations, hearth brigades, roads, bridges and exits of a building or/an space, just in case of disasters. Moreover, the shortage of correct designing and implementation in construction of residential and industrial buildings leads to buildings that are weaker and vulnerable in earthquakes, floods, landslides and different hazards (IBID).

### **2.5.2 Economic Vulnerability**

Economic vulnerability of a community may be assessed by determinant however varied its sources of financial gain are, the benefit of access and management over suggests that of production (e.g. farmland, livestock, irrigation, capital etc.), adequacy of economic fall back mechanisms and also the handiness of natural resources within the space (IBID).

### **2.5.3 Social Vulnerability**

A socially vulnerable community has weak family structures, lack of leadership for higher cognitive process and conflict resolution, unequal participation in higher cognitive process, weak or no community organizations, and also the one during which folks ar discriminated on racial, ethnic, linguistic or spiritual basis. Alternative social factors like culture, tradition, religion, local norms and values, economic normal, and political responsibility additionally play a significant role determinant the social vulnerability of a community

Social vulnerability to natural phenomena is greatest among the poorest folks in developing countries because of a scarcity of knowledge and resources with that to require the acceptable measures. Among this cluster, children, girls and also the older are thought of to be the foremost vulnerable. to cut back social vulnerability, all of the on top of factors should be addressed however this needs information and understanding of the native conditions, which might – in most cases – solely be provided by native actors (IBID).

### **2.5.4 Attitudinal Vulnerability**

Community that has negative perspective towards modification and lacks initiative in life resultantly become additional and additional captivated with external support. They cannot act severally. Their sources of living don't have selection, lacks entrepreneurship and don't possess the construct of collectivism. This brings regarding disagreement and individualism within the society. Thus, they become victims of conflicts, despair and pessimism that reduces their capability of dealing with a disaster (IBID).

## CHAPTER 3

### LITERATURE REVIEW

This chapter deals with an extensive review of literature on disaster management and the relation of indigenous knowledge in managing practices. Secondly it deals with reviewing flood and their destruction on human social and economic endeavors.

#### 3.1 Disaster Management and Indigenous Knowledge

Vivian Camacho, Quechua from Bolivia, signposts that we have a tendency to as endemic peoples ought to continue caring for the natural seeds, seeds that guard life info therefore we will have sensible food, genetically changed organisms are poison to life, they poison plants, soil, water with harmful agro used for its cultivation. Rediscovering and applying our ancestral sorts of organic production harmonized with Mother Earth will once more regenerate the living tissue of the disabled soil. Additionally, to respecting every cycle once more, hospitable the sun and therefore the seasons with songs, music and rituals, as we have invariably done, as a result of they hear North American nation, they additionally grieve, and rejoice once we convey them. Mother Earth is happy after we discuss with her through our sacred fires, our ancestors celebrate that life remains sacred to our folks, therefore it's necessary to strengthen this endogenous knowledge of each place, of each culture that is aware of life inside life, energy inside a bigger field of energy. For good terminate the employment of agro toxics as they contaminate the plants, fruits and vegetables we have a tendency to eat, still on poison and kill as well as underground aquifers, and kill the small species that in balance act on the skin of soil to form the desired feeding electronic equipment between land and plants, still as pollution in human bodies (Julián Burgos, 2011).

Indigenous peoples, AN calculable 370 million gift in some ninety countries throughout the globe, face systematic discrimination and exclusion from political and economic power and still be over-represented among the poorest, illiterate. Indigenous peoples are usually homeless of their ancestral lands and bereft of their resources for survival, each physical and cultural, additional weakening their capability to agitate hazards, each natural and manmade (John C. Scott, 2013).

Due to illiteracy and stupidity, several rural folks of countries couldn't perceive the signal system. Poor access to info and services is reinforcing by social systems. Therefore, a mixture of physical, economic and social factors lead to the foremost vulnerable individuals being the smallest amount forewarned and ready. Whereas documenting the older people's disaster experiences, Action Aid in 2000, incontestable data of native warning indicators supported animal behavior or phenomenon. This knowledge not continuously passed on to the younger generations, and unnoticed as

“unscientific.” The research worker suggests in his study that, there's a necessity to analysis, monitor native data to work out specifically which of them area unit reliable, and to what extent they will indicate the severity of an imminent disaster. Howell 2003 emphasize that an identification of indicators driving out from the natural behavior and mix with native data will validate and evidence warning signals (Howell, 2003).

An illustrious organization ICIMOD worked on local knowledge of the mountainous region of Himalaya underneath the project of disaster preparation. Under this project, the main target was solely on info gift relating to native data and knowledge. They solely gave summary of indigenous knowledge employed in all phases of disaster management from mitigation measures to rehabilitation. Project didn't directly involve the native folks and their knowledge and data in preparation, planning, policies, and implementation. Though ICIMOD study was sensitive towards use of native data of communities living within the space for disaster mitigation, however the study didn't cover properly the employment of native data in mitigation and preparation for disasters. observe that was inaugurated by Muslims and later adopted by numerous Hindus, particularly in Asian country, which involves the seclusion of ladies from public observation by suggests that of concealing covering (including the veil) and by the employment of high-walled enclosures, screens, and curtains inside the house (Kayani, 2009)

Therefore, it may be orientating that, local knowledge is helpful to empower distant communities towards disaster management. NCDM (National Center for Disaster Management) in conjunction with Oxfam-Nepal additionally highlighted and reviewed the entomb relationship between the employment of native information for estimating seemingly damages of future disasters, their focus was on victimization native knowledge in disaster cope methods at national level policies. Moreover, by involving such knowledge country get fast and immediate response as a result of these community's area unit 1st victim of any disaster (Dekens, 2007).

Australian researchers additionally acknowledge the importance of local information. Australian National University, ready a journal “Australian Journal of Emergency management” during which they highlighted the importance of native data for disaster management. They termed native data as “Traditional Ecological Knowledge” (TEK), this information developed by ecological experiences. The report counseled that native data can be effectively use to address a state of affairs that outsiders understand to be threatening, and customarily provides rather more detail of understanding of native environments. It is often valuable in predicting the threats display by hazards (Young, 1997).

In Africa, native communities had well-developed ancient indigenous data systems for environmental management and cope methods, creating them a lot of resilient to environmental amendment. This information had, and still has, a high degree of satisfactoriness amongst the bulk of populations during which it's been preserved. These communities will simply establish with this information and it facilitates their understanding of bound trendy scientific ideas for environmental management as well as disaster interference, preparation, response and mitigation. Indigenous data could be a precious national resource which will facilitate the method of disaster interference, preparation and response in cost-efficient, democratic and property ways that. Therefore, a mix of approaches and ways from science and technology and from content opens avenues towards higher disaster interference, preparation, response and mitigation (Kamara, 2013).



### **3.1.1 Use of Indigenous Knowledge in Disaster Management**

Indigenous peoples round the world have used their traditional knowledge to organize for, deal with and survive disasters. Their ways and practices have originated at intervals their communities and are maintained and passed down over generations (John C. Scott, 2013). Till recently, policy manufacturers have for the most part neglected this immense body of data, in favor of Western science and technology-based ways of disaster risk reduction and response. Today, however, several of those ancient practices square measure thought-about necessary and necessary contributions to the conservation of variety and environmental property. At constant time, this data is beneath constant threat of being scoured, lost or illegal, factors contributory to bigger community vulnerability as incontestable by the increasing levels of loss stemming from natural disasters in recent decades (John C. Scott, 2013)

Local capability, practice, information and tradition have helped communities that have developed a detailed relevancy their natural atmosphere deal with hazards and thrive for millennia in extremely at-risk areas. However, in several cases, these practices, otherwise extremely property, are lost as a result of social, political or economic modification, resulting in exaggerated vulnerability. Taking under consideration the benefits and challenges of this method, which can be mentioned later, there's a desire to adequately analysis and document ancient risk reduction and mitigation practices so as to grasp however they will be incorporated into thought local people and national designing. Through participative assessments (of each capacities and vulnerabilities) and political processes geared toward combining native data with scientific ways, communities should be sceptered to require advantage of their own content to develop integrated ways that square measure institutionalized and maybe even transferred to similar contexts elsewhere. (C. Scott, 2013).

Local communities had well-developed ancient autochthonic data systems for environmental management and cope ways, creating them additional resilient to environmental modification. This data had, and still has, a high degree of acceptableness amongst the bulk of populations within which it's been preserved. These communities will simply determine with this data and it facilitates their understanding of sure fashionable scientific ideas for environmental management together with disaster interference, readiness, response and mitigation (Kamara, 2013).

Indigenous information could be a precious national resource which will facilitate the method of disaster interference, readiness and response in cost-efficient, democratic and property ways in which. Therefore, a mix of approaches and ways from science and technology and from content opens avenues towards higher disaster interference, readiness, response and mitigation globally. There's increasing acknowledgement of the connectedness of autochthonic data as a useful and underused data reservoir that presents developing countries, notably Africa, with a strong quality in environmental conservation and natural disaster management. Specifically, from past times, natural disaster management in Africa has been deeply nonmoving in native communities that apply and use autochthonic data to master and monitor climate and different natural systems and establish early warning indicators for his or her own benefit and future generations (Kamara, 2013).

### **3.2 Indigenous Knowledge and Disaster Management in Asia**

After the 2004 Indian Ocean tidal wave, two success stories emerged, conveyance new interest to the construct of indigenous knowledge. The Simeulueans living off the coast of island, country and therefore the Moken, living within

the Surin Islands off the coast of Asian country and Asian country each used data passed on orally from their ancestors to survive the devastating tidal wave. Whereas these two cases scarf the limelight in recent years, there are several less conspicuous samples of communities United Nations agency have additionally used indigenous knowledge to survive fateful events and address tough environmental conditions. These communities' use of indigenous data to cut back risk, cope and survive recent natural disasters provides several lessons for practitioners and policy manufacturers on the worth of native information for disaster risk reduction (Noralene Uy, 2008).

Indigenous data refers to the ways and practices developed by a bunch of individuals from a complicated understanding of the native surrounding, that has shaped over various generations of habitation contains many alternative necessary characteristics that distinguish it from alternative sorts of knowledge. These embody originating inside the community, maintaining a non-formal suggests that of dissemination, together owned, developed over many generations and subject to adaptation, and imbedded during a community's approach of life as a way of survival (Noralene Uy, 2008)

### **3.3 Flood Management Through Indigenous Knowledge in Pakistan**

The communities in Pakistan have conjointly developed many different adaptation methods so as to extend their resilience to flash floods. as an example, locals have learned to interpret early signs of probably damaging flash floods (Dekens, 2007) . Such signs also the color, smell and behavior of mountain streams also as meteorological forecast skills. In 2005, 106 homes were destroyed in Brep village as a result of a Glacial Lake Outburst Flood (GLOF).

Knowledge concerning flood preparation is transmitted orally through learning by doing, daily observation of their native surroundings, story-telling, and therefore the learning of bound practices over generations. The dissemination of this information happens at two levels: among community members (i.e., early warning Circular mud repository 'chakka', with uncommon "pigeon hole" style to stay valuable belongings throughout floods possible to intervene in disasters influence however folks are getting to answer the interventions of these actors (Dekens, 2007). Technical adaptation methods to floods embrace measures associated with house construction and protection.

In several societies supported oral tradition, past events, together with flood crises, are embedded in memory through storytelling, songs, poems, proverbs, attend activities and ceremonies, rituals then forth. as an example, historically, songs and poems area unit a vital a part of the Nepali and Terai culture. One such example is that the proverb: "the snake and therefore the watercourse don't run straight".

The shape of the watercourse will be compared to the movement of a snake pertaining to the character of the rivers within the study sites: the water channels area unit terribly unstable, taking new directions and dynamic the landscape on an everyday basis. a number of the songs focus entirely on floods, whereas different mention floods among other necessary problems the villagers face. In some cases, songs and proverbs become the repository (as very much like the relay) of past floods event and might facilitate stimulate people's learning, memory and creativity (Komino, 2008).

Songs and proverbs additionally contribute to the transmission of flood-coping methods, produce public knowledge, and share a typical understanding of amendment associated with frequent and occasional flood events. Songs and proverbs may facilitate to create a way of community and commonness at intervals the village and/or at intervals the various teams affected. native singers or composers' area unit key data carriers and alter agents WHO play a significant

role at intervals the community in terms of building awareness. Some worships, sacrifices, and ceremonies facilitate the community to know and keep in mind past floods and relieve the anxiety associated with the threat of future disaster risks (IBID).

### **3.4 Floods around the World**

World statistics mirrors a rise within the pattern of disasters, starting from natural events like earthquakes, floods and cyclones, to disasters caused by human factors ('manmade') like oil spills, transport accidents, infrastructure collapses and large-scale population displacement as a result of conflict. The impact of such disasters on the populations and therefore the material losses aren't in any respect similar (Le Arthur, 2007). Over ninety fifth of all disaster connected deaths occur in developing countries. Losses as a result of natural disasters are twenty times larger within the developing world than those in industrialized countries. This differential impact depicts that disasters mustn't be thought of as isolated events at all: they're presumably connected to the physical, social, political and economic surroundings within which they occur specifically, the probabilities of a disaster happening and therefore the impact of a disaster rely upon exposure to hazards and vulnerability of populations (IFRC, 2001).

Floods are among the foremost powerful forces on earth. Human societies worldwide have lived and died with floods from the terribly starting, spawning a distinguished role for floods among legends, religions, and history, impressed by such accounts, geologists, hydrologists, and historians have studied the role of floods on humanity and its supporting ecosystems, leading to new appreciation for the many-faceted role of floods in shaping our world. However, the popularity of the necessary role of flooding in shaping our cultural and physical landscape additionally owes to accrued understanding of the variability of mechanisms that cause floods and the way the categories and magnitudes of floods will vary with time and house. The USGS has contributed to the current understanding through over a century of numerous analysis activities on several aspects of floods, as well as their causes, effects, and hazards. This Circular summarizes a aspect of this analysis by describing the causes and magnitudes of the world's largest floods, as well as those measured and represented by trendy ways in historic times, still as floods of prehistoric times, that the sole records are those left by the floods themselves (Costa, 2004).

Two complimentary varieties of info are employed in this outline of the world's largest floods. The primary may be a compilation of the world's largest known Quaternary floods. A number of these floods are known solely from geological proof and resulted from special circumstances throughout the course of Earth's history. Nonetheless, the records of such floods shed light-weight on the good diversity and scales of flood-producing mechanisms and their specific settings on earth and over time. The second supply of knowledge is historical measurements of the most important meteorological floods on the most important watercourse basins within the world. These floods, that are additional among the realm of every day human expertise, give a background for discussing the earth science, climatologic, and physiographic settings of enormous earth science floods on a worldwide basis (Costa, 2004).

Frequently, in terribly long-standing series cluster of maximum events becomes evident which ends in fluctuations of statistical characteristics. Trend analyses on flood harm are rare, as a result of the rarity of comprehensive knowledge bases. However, the ever present perception is that flood damages are growing quick or perhaps dramatically. Pielke and Downton (2000) study the US national flood harm record of the National Weather Service for the amount 1903–1997. the overall annual flood harm, adjusted for inflation, grew in this amount with a mean annual rate of two.92%.

Barredo (2009) compiles a statistic of economic damages of major floods in thirty-one European countries for the amount 1970–2006, supported the general public databases NATHAN of Munich Re and EM-DAT of Centre of analysis on medicine of Disasters).

Fifteen out of twenty-seven events occurred within the half of the study amount, and therefore the information clearly shows increasing losses. In an exceedingly additional step, each studies normalize flood harm to account for time-varying socio-economic factors. Forward that the annual US growth (1.26%) is representative for the growth in flood-prone areas, forty third of the rise high harm will be attributed to growth. If it's assumed that the wealth in flood-prone areas grows at constant rate of the nation's wealth (3.13%), then all of the rise high harm will be explained by the economic process. Similarly, Barredo (2009) normalizes the raw harm knowledge by considering inflation and changes in population and wealth. Further, inter-country worth variations are removed by adjusting the losses for buying power parity. Once the economic losses are normalized, a major trend isn't found. Each studies conclude that the ascertained increase within the raw flood loss knowledge is usually driven by social factors, though Pielke and Downton (2000) conjointly notice indications that accrued precipitation is related to raised flood damages. Analyses flash-floods in district and attribute the rise within the variety of extraordinary flash-floods inflicting harm to infrastructure on rivers to the expansion of urban development and, hence, to increasing exposure. Alternative studies, partly supported less reliable knowledge or on additional qualitative measures (Llasat et al. 2008)

### **3.5 Floods in Asia**

In the last decade of the twentieth century, floods killed 100,000 persons and affected over 1.4 billion individuals round the world (Jonkman 2005). It's calculable that the annual value to the globe economy thanks to flooding is regarding 50–60 billion U.S.A. greenbacks. In line with a study by the international organisation (UN), floods claimed an average of 22,800 lives annually and caused a calculable injury of US\$ 136 billion to the Asian economy. The losses incurred by developing countries area unit 5 times higher per unit of gross domestic product than those of made countries (IBID).

South Asia covers regarding 3.2% of the globe area and 100 percent of Asia, with over a population of over 1.46 billion accounting for twenty fifth of the globe population (Singh, 2008). South Asia includes eight countries, viz. Afghanistan, Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan and Sri Lanka and homes regarding four-hundredth of the world's poor. The key rivers of South Asia area unit the Indus, Ganges, river and therefore the Meghna. The stream originates in Pakistan and flows through Afghanistan. It's one in all the key tributaries of the Indus. The Indus and its tributaries flow south and west to empty into the Arabian Sea. The Ganges and therefore the river and their tributaries flow south and east to enter the Bay of geographic area. These rivers offer sustenance to over five hundred million individuals of the region, activity water for drinking, irrigation, hydropower generation, fisheries, and interior navigation, furthermore as for the upkeep of wetlands and diversity. However, these rivers also are the supply of various forms of floods that adversely have an effect on the socioeconomic development of the region (Singh, 2008).

The climate of South Asia is dominated by the South-West monsoon, with important abstraction and temporal variations in precipitation and temperature throughout the region. The heaviest average annual precipitation of eleven, 873 millimeters has been recorded at Mawsynram, a tiny low city close to Shillong, within the Meghalaya Hills in Asian country (Bandyopadhyay 2006). From the east to the west of the region, the precipitation decreases, with some areas having with but four hundred millimeter of precipitation annually. Given the varied topography, geographical location

and environmental condition from North to South and East to West, floods of varied sorts occur together with flash floods, junk flow, landslides, and glacial lake outburst floods, etc. Most of the countries during this region have an oversized rural population passionate about agriculture and with high population density. Regarding twenty eighth of the full population is urban. The economic process is comparatively low compared to it of alternative regions of the globe. The per capita financial gain varies from a minimum of US\$ 250 in Asian nation to US\$ 2,390 within the Maldives. Compared to the event indicators of alternative regions, South Asia occupies a grim image. Besides the prevailing physical and environmental factors in South Asia, these poor social and economic conditions more increase the vulnerability to differing types of disasters like floods, landslides, earthquakes, and others. The key development indicators of South Asia that contribute to inflated vulnerability. Disaster information area unit important for distinctive trends within the impacts of disaster and trailing relationships between development and disaster risk (IFRCRCS 2005). For any flood event, loss of lives, total variety of individuals affected furthermore because the economic injury is thought-about as indicators for assessing flood impacts.

### **3.5.1 Total Range of Flood Disasters in Asia**

The reportable range of flood disasters has dramatically increased over the last three decades an identical increasing trend has conjointly been determined for Europe (Hoyois and Guha 2003) furthermore as globally (Jonkman 2005). To some extent, this increased flooding disaster may be attributed to improved data communication technology (ICT), resulting in increase in coverage activities; but, this in itself isn't the sole the cause. It may even be attributed to the increased socioeconomic vulnerability and development processes resulting in increased range of disasters.

The impacts of population and economic process, speedy urbanization, environmental degradation, and temperature change ar a number of the factors that contribute to the present increased trend, It should be recalled here that the United Nations World Conference on Disaster Risk Reduction was conjointly control in January 2005 in Kobe, Japan. It provided recommendations and therefore the Hyogo Framework for Action (HFA) to call manufacturers and risk managers for disaster risk reduction, together with flood disasters. The HFA has highlighted the necessity for improved compilation of knowledge on disaster risk and impact in the least scales for property development. The recent 2005 report entitled Case studies launched by United Nations agency claims 2005 to be a record year of natural disaster-related incidents, that killed quite ninety,000 individuals and affected quite one hundred fifty million lives worldwide (Singh, 2008).

### **3.5.2 Total Range of Individuals Killed by Flood**

Throughout the last three decades a complete of 491,074 deaths has been reportable because of natural disasters in South Asia. Hydro meteorological disasters resulted in 337,917 deaths (~70%), out of that floods account for 64,658 numbers of deaths (~20%). The loss of life because of the 2004 tidal wave has skew the proportion. Over the amount 1976–2005, on a mean two,154 individuals were killed annually because of floods in South Asia. tho' there's a variation within the range of individuals killed annually, normally there's associate degree increasing, the 5 flood events that killed the foremost range of individuals in South Asia over the thirty-year amount are given in Table half-dozen.3. The floods in Northeast Republic of India in 1978 and therefore the floods in Bangladesh in 1988 stand out conspicuously. Here it ought to be noted that a number of the flood reports within the EM-DAT are a mix of many individual events lumped into one record. this is often the case for the 1994 furthermore because the 1998 events reportable in Republic

of India, which mixes the floods from completely different components of the country occurring within the same month below one record (Singh, 2008).

### **3.5.3 Economic Losses because of Floods**

The entire economic loss reportable for the 30-year amount from 1976 to 2005 is concerning thirty-two billion greenbacks. reportable economic losses because of floods.in 1988, Bangladesh knowledgeable one amongst the worst floods in living memory, that resulted during a total price of roughly North American country \$2 billion to the economic system of roughly North American country \$2 billion killing two440 around 2,400 people. In 2004, Bangladesh is reportable to possess knowledgeable an enormous economic loss because of floods to the tune folks \$7 billion. This large economic loss compared to previous years may be attributed to increased population density, higher per sq. metric linear unit GDP and infrastructural development in floodplains and concrete centers. This steep rise in economic loss for 2004-5 can also be attributed to the unity within the information recorded in previous years as compared to 2004.

World Disasters Report 2005, revealed by the International Federation of NGO and Red Crescent societies conjointly reports that information ar most incomplete for economic losses for natural disasters (IFRCRS 2005). It any states that because of lack of standardized methodology, loss estimates from Iran's Bam earthquake in 2003 ranged from US\$ thirty-two.7 million to US\$ one billion support losses, particularly within the informal sector, also are poorly understood and infrequently recorded. The reports accessible on the EMDAT info on economic losses because of floods in South Asia are restricted. A number of the countries haven't any reports on economic losses, for instance, Asian nation whereas those accessible seem to be incomplete, because of the unity within the recorded information furthermore as lack of standardized methodology, caution ought to be exercised in victimization the info for any reasonably interpretation.

### **3.6 Floods in Pakistan**

By means that of proof from the 2010-11 floods in Islamic Republic of Pakistan, we tend to demonstrate that natural disasters will impact a spread of politically relevant variables higher than and on the far side citizens' material well-being. The 2010 flood affected quite 20 million individuals, caused between 1,800 and 2,000 deaths, and broken or destroyed more or less 1.7 million homes, creating it the worst flood in Pakistan's trendy history (EM-DAT, 2010). The 2010 floods were driven by an uncommon monsoon storm that born traditionally new levels of wetness on the mountainous northwest regions of the country. in keeping with government accounts, Khyber Pakhtunkhwa (KPK) received twelve feet of rain from July twenty-eight to August three, fourfold the province's average annual total (Gronewold, 2010).

Those exceptionally high downfall rates in mountainous areas combined what was already a strangely fast snowmelt to trigger flash floods that immensely exceeded something in historical memory because the water drained from KPK throughout the first week of August, a a lot of typical monsoon storm inundated the Indus flood plain, rendering it incapable of riveting the dramatic inflows from the mountainous regions and overwhelming several water-management structures. The subsequent year Pakistan got hit by a strangely sturdy monsoon storm, inflicting another spherical of devastating floods within the southern plains. The stormy waters hit some places quite others due partly to the random

combination of act, previous differences in soil wetness, micro-topographic differences, and complicated fluid dynamics.

Pakistanis living in flood-affected places clothed to vote at abundant higher rates, that those hit onerous by the floods have a lot of aggressive attitudes regarding hard government services, which they apprehend a lot of regarding politics (C. Christine truthful, 2013). The EM-DAT International Disaster info records more or less 20.4 million individual affected and 1,985 killed from the 2010 floods. The ninety fifth confidence interval on this effect ranges from seven-membered to thirty first of the amendment. 3This is sort of 0.5 the 5.4 percentage point increase between the 2000 and 2004.

Overall, this major natural disaster that clearly created a transient economic shock, additionally light-emitting diode to major changes in citizens' attitudes and civic engagement. These results decision into question the interpretation of a broad set of papers and tie into an upscale literature in government showing that disasters will have difficult political effects that area unit typically quite unmarried from economic impacts (C. Christine truthful, 2013).

Artless localized assist efforts that emerged throughout the initial section of the crisis and continued throughout. These enclosed victims and their kin's own efforts to avoid wasting their belongings however additionally enclosed survivor-led repair of native access roads and bridges when the floods receded. This was additionally to a massive civil society response that attended ad lib coalescing at terribly native levels (mohallas, union councils, villages, etc.). Such native teams collected and distributed truckloads of relief things. Countless native furthermore as national organizations created assortment sites for donations of products and money then undertook the distribution of an equivalent. Individual philanthropists, skilled bodies, and even chambers of commerce given cash and provides to the victims. students related to Pakistan's property Development Policy Institute note the importance of those native types of help however contend that they're just about unknown (and therefore poorly documented) on the far side the native level (Shahbaz et al., 2012).

Such volunteerism wasn't distinctive to the 2010 flood rather it's a standard feature in Pakistan's domestic response to such calamities. Halvorson and Hamilton (2010), for instance, document very high levels of volunteerism following the 2005 geographic region earthquake. By the top of July 2010 the govt. had appealed to international donors for facilitate in responding to the disaster, when having deployed military troops altogether affected areas beside twenty-one helicopters and a hundred and fifty boats to help affected individuals (Khan and Mughal, 2010).

Disaster management in Asian country primarily revolves around flooded areas with a primary target rescue and relief. When every disaster episode is over the govt. spends their resources at rescue, relief and rehabilitation (United Nation Pakistan, 2010). Disasters are viewed in isolation from the method since price effective strategies don't influence disaster management policy and responses. After 1992 floods, a comprehensive flood statement and warning system were established underneath the auspices of the FFC and also the PMD. The Indus flood monitoring system includes weather radars, an HF radio system for communication, gauges at intervals the watercourse system to observe water flow, development of coaching and user manuals, and preparation of simulation models. The PMD problems warnings to the PDMA's and district authorities frequently supported this method (Sayeeda Amber Sayed, 2014).



However, there's a requirement to distribute data mistreatment less technical hydrological data for an acceptable and ascendable response from district authorities. Moreover, flash floods are inherently troublesome to predict. Moreover, even with rive floods, the scope of the floods caused by breaches within the irrigation system could also be troublesome to predict, as was the case throughout the harmful 2010 floods (Sayeeda Amber Sayed, 2014). Thus, there's a requirement to boost the technical capacities of the system any and enhance its ability to produce easy data to district authorities, additionally, district authorities typically lack the resources to transmit the knowledge right down to communities. Thus, but 100% of the affected villages in 2010 floods had received advanced warning which too was sometimes from mass media sources or word of mouth. The flood warning system is that the most comprehensive one in Islamic Republic of Pakistan despite all its weaknesses. There are unit pilot action systems on the coast for tsunamis and cyclones. However, these systems don't seem to be absolutely purposeful.

Flood-Disaster Risk Reduction, bar and Mitigation though individual flood events cannot be joined with certainty to global climate change, an increase in international floods area unit more and more seen as a partial issue to international climate changes. As such, a discount in their frequency would force international coordination by all countries (GNCSO, 2010). Given its high vulnerability to floods, Pakistan should play a vigorous and significant role in international global climate change negotiations and increase its contribution. the govt. of Asian country had created a global climate change Ministry in 2010 and also the NDMA has been incorporated into it recently (NDRMF, 2007). However, the ministry is just too new at the instant to possess taken any major steps to upset global climate change. The high degree of deforestation that has occurred throughout Asian country is additionally tributary to exaggerated prevalence of floods. in depth deforestation within the upland drainage basin for timber and fuel wood reduces the water-retention capability of the forest eco-systems, this could increase surface water runoff and wearing away, increasing the number, speed and sediment load of the root age getting into the watercourse system successively this causes recurrent landslides, damages riverine infrastructure and ends up in any siltation of the downstream water channels, whereas some small-scale renewal programs exist, major steps area unit required to reverse the deforestation (Sayeeda Amber Sayed, 2014) .

Another major issue undermining people's strength is that the social organization in rural Asian country since resources area unit controlled by native elites, like landlords and social group leaders. Land possession is heavily targeted in Asian country and poor communities are typically pushed into cultivating marginal land that is a smaller amount productive and additionally situated in areas a lot of at risk of disasters (Sabates R, 2008). Throughout the 2010 floods, there have been varied complaints against landlords and administration conspiring to divert floods far from the lands of rural elites and towards their lands.

Flood mitigation activities do occur annually in Pakistan underneath the auspices of the FFC and also the provincial irrigation departments. These departments set up, design, construct, and maintain flood protection works through flow activity at specific sites on rivers, canals, and 'nullah' and construction, and maintenance of flood protection irrigation channels, little dams and protecting works (Michael J, 2010). However, there's no simply accessible program joined to a national hazard and vulnerability atlas that may highlight the most points of vulnerability throughout the country and facilitate in analyzing whether or not these departments area unit targeted on the foremost crucial points of vulnerability and the way effectively and with efficiency they're addressing them additionally, reduction of mitigation



could be a serious issue in Asian country as a result of the development of large-scale development project while not adequate analysis of their impact on disaster risks (World Bank, 2006)

### **3.7 Floods in Khyber Pakhtunkhwa**

During monsoon period serious rainfall could be a routine event in Islamic Republic of Pakistan however within the last week of July 2010 the intensity of downfall inflated staggeringly within the mountainous spaces of the KPK and Azad Jammu and Kashmir that result flash flood in the upstream area. Owing to prolonged rains of monsoon, tremendous runoff was generated, inflicting harmful floods that unfold through-out the country. Flood are natural events that cause nice losses in terms of human life, properties and infrastructure (Montgomery, 2006).

The effects in term of losses to life and property are unprecedented. The infrastructure like, roads, bridges, houses, schools, water, gas and electricity activity lines and power homes are severely broken or destroyed, the land containing crops over several acres were utterly or part broken. a number of the adverse effects of the flood square measure as follows. Losses of human life and farm animal in keeping with the initial assessment by the Provincial Disaster Management Cell of KPK The devastating flood of 2010 forced to displaced nine, 12,999 folks out of that quite seventy-five the troubles (6,07,366 people) were from the greatly affected areas of Charsadda, Nowshera, Swat and Dir higher (Muhammad, 2011).

The number of oxen death is incredibly high i.e. 52,750 and crops over a region of 5,07,423 acres were utterly destroyed throughout the flood (Muhammad, 2011). the ability offer system was conjointly washed out at variety of places which has 605 transformers, 305 poles and five grid stations within the province. Damages to the villages and infrastructure The damages to the opposite infrastructure within the province highlights that over all 544 villages were accomplished wherever within the households were or so (PDMA, 2010).

Flood affected areas of Pakistan in monsoon flood of 2010 are 546,003. Total homes accomplished were 191215 and out of those paka developed homes were 82551 and kacha developed homes were 108664. In alternative infrastructure broken owing to flood square measure 283 roads, 278 bridges, twenty-three culverts, 885 education facilities, and 178 Government buildings were conjointly destroyed. The aborning relief to the affected areas is greatly coupled with the supply of the transportation link. The standing link roads throughout the month of Sep 2010 show that only 50% might be partly opened for light-weight traffic solely (PDMA, 2010).

## CHAPTER 4

# RESEARCH METHODOLOGY

This chapter addresses the research methodology and procedure used in this study to investigate the research problems. The main purpose of this study is to find out the linkages between Indigenous knowledge and reduction of flood vulnerability.

### 4.1 Study Universe

The universe of the study is district Charsadda, 17 miles from Peshawar. Charsadda district is located in west of Khyber Pakhtunkhwa province, spread over an area of 996 sq km. It is bounded by Malakand district on its north, district Mardan on its east, and district Nowshera & Peshawar on its south and Mohmand Agency & other tribal regions on its west.

Three rivers pass through the district Jindi, Kabul and Swat. It is chiefly a fertile plain, mainly producing crops of tobacco, sugarcane, sugar beet, wheat and maize According to SMEDA in 2000, District Charsadda has a population of 1.7million. In the rural area, the number of persons per housing unit is about 10. Around 81.1% population lives in rural areas (Go KPK, 2012). Charsadda have the density 1081 persons per Sq.Km. Its Literacy rate is 43.09%. All major infrastructures are available for communication in which 352.Km as high type Road in district Charsadda. But the Railway facility are still awakened Water and Electricity facility are available. The main languages are Urdu and Pashto.

### 4.2 Study Area

Two village Councils namely Sardaryab and Mirzagan selected for conducting this study. The population of village council Mirzagan is almost 5000 with affected population of 3000 people and hundreds of damages. However, the population of village council Sardaryab is 2,997 with numerous damages.

#### 4.2.1 Sardaryab Village Council

Sardaryab village council is located on the bankside of river Kabul, and hit every year with flood. This area is very fertile, people were used to work in their lands, some of them are related with fishing sector, and other has employments for their livelihood generation. House structures are mix of kacha, semi kacha and pakka with a lot of livestock in this area. There is a one BHU in the village council and have one primary school for boys and girls primary school. Secondary school also exists in the area. Number of private schools also provides their services in education sector.

#### 4.2.2 Mirzagan Village Council

Mirzagan village council is located on the bank side of River Jindi. This area is very close to urban area. Services availability is much better than the Sardaryab Village council. This area also hit with flood every year. House structures are concreted and have such houses which are made up of mud. The people are working in the fields and have involved in services sector for the livelihoods. Livestock in this area is comparatively less than Sardaryab village council. There are schools (1 primary boys school and a girl's school) in this area both public and private.

The reason behind choosing this region is the location i.e. the bank side of the river and has been prone to several natural disasters especially floods almost every year flood hits this region. Vulnerability of the people in this region is high as compared to other area of the districts because of most affected households in this area.

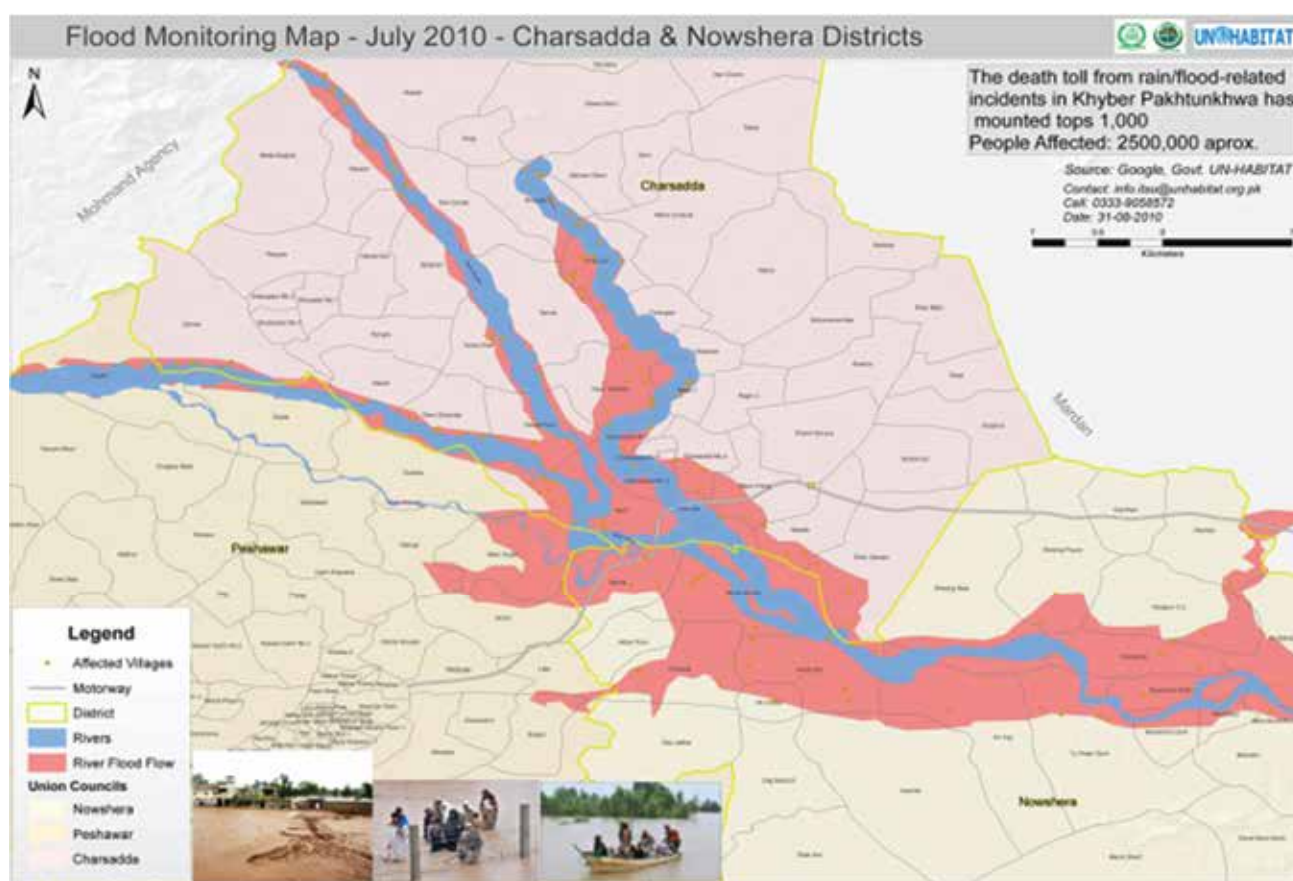


Figure 1: Map of Charsadda

#### 4.3 Sampling Technique

Multistage sampling plan will be used to select households as given in the table 1.1. The reason is this technique reduces the population by cutting in to smaller groups and it allows researcher to provide option for either using random sampling or cluster sampling. The multistage sampling will provide decision making process involved in choosing groups.

#### 4.4 Sample Size

A sample size of 48 households is selected from the study area (25% respondents will be female headed houses). Two village councils have been selected for data collection, alongside two villages will be selected from each village council

and finally from each village 10 households will be selected for conducting the study. Sampling plan is depicting in the table 4.1

**Table 4.1: Sample size**

District	Tehsil	Villages Council	Village/ village council	Household/Village	Total
Charsadda	Charsadda	Sardayryab	2 villages	12	40
		Mirzagan	2 villages	12	

#### 4.5 Data Collection

For current study, data obtained through primary as well as secondary sources.

Primary data collection well semi-structured questionnaire is designed contained open and closed ended questions for the households as well as focused group discussion conducted from the community for qualitative data and quantitative data. A pre-test was conducted to validate the questionnaire. The questionnaire will be based on following variables:

- Section 1: Demographic data such as age, education, family size, gender, occupation
- Section 2: Socio economic data such as living standards, livelihood, source of income, income distribution,
- Section 3: Flood destruction in past
- Section 4: Traditional ways for mitigation measures

For corroborating information collected through formal methods, qualitative tools such as the visit among the local villages and conducting focus group interviews with participatory members along with open-ended questions and answers through checklist also used. It mentions that formal methods supplemented through smart close-ended questionnaire that based on recording qualitative as well as quantitative information from the sample respondents.

Secondary data was obtained through literature, from published research articles related to the study and related Government offices.

#### 4.6 Data Analysis

The data treated and analyzed by using Excel, ANOVA and SPSS 21. The vulnerability assessment Matrix used in order to find the vulnerability of local people from flood. A practical and diagnostic tool in the form of a simple matrix which measures vulnerabilities and capacities in three broad and interrelated areas (i.e., physical/material, social/organizational, and motivational/attitudinal) Other factors are added to the matrix to reflect a complex reality such as disaggregation by gender or economic factors, changes over time, different scales etc. The benefits of the matrix are that it is practical and broad-based, linking the many different aspects of vulnerabilities and capacities

## CHAPTER 5

# RESULTS AND DISCUSSION

This chapter contains results and findings of the research study, this chapter is divided in to four sections through which focusing upon Demography, Physical vulnerability, Prediction and handling of Flood and gathered indigenous knowledge regarding flood from study area

### 5.1 Demographic Trends of the Study Area

Demographic trends are the characteristics of the population of the study area in terms of age, education, family size, gender, occupation and the income of household. Mean, Median and standard deviation of the demographic traits of the study are shown in table 5.1

**Table 5.1: Demographic trends**

Statistics	Gender	age in years	respondent education	household size	occupation	monthly income by all
Valid	48	48	48	48	48	48
Missing	0	0	0	0	0	0
Mean	1.25	3.79	2.35	2.10	6.48	2.96
Median	1.00	4.00	2.00	2.00	7.00	3.00
Std. Deviation	.438	.944	1.158	.751	2.492	1.304

#### 5.1.1 Age and Sex of Respondent

Men and women are important segments of any society. During flood management both these segments have defined roles and responsibilities in traditional societies. Above table 4.1 showing that 25 percent of the total respondents were female. Data was collected from different age groups of people to check the validity of indigenous knowledge in the study area. Above table shows gender-age distribution of respondents in the study area. Age limit starts from 16 years to 75 years. However, mostly respondents lie in the 46 to 60 years.

**Table 5.2: Gender and age in years cross-tabulation**

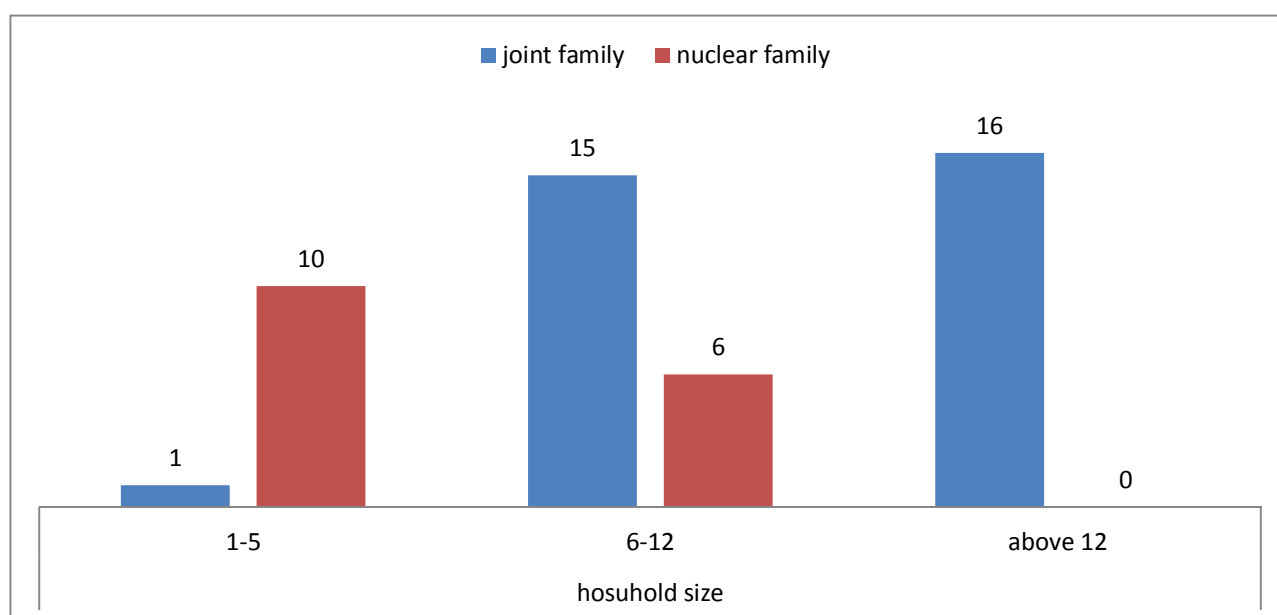
Gender	Age in years				Total
	16-30	31-45	46-60	61-75	
Male	5	8	16	7	36
Female	0	4	3	5	12
Total	5	12	19	12	48

Source: Study Survey, 2016

### 5.1.2 Family System and Size in the Study Area

A family may be defined as a group of persons related to a specific degree, through blood, adoption, or marriage. A household is defined in many surveys as a person or a group of persons that usually live and eat together. It is important to distinguish between a family, where members related either by blood or by marriage, and a household, which involves the sharing of a housing unit, facilities and food (World Bank, 2005). Household size refers to the number of persons per family and family structure refers to whether they are in joint family or nuclear family structure (Dekens, 2007). The graph in figure 2 shows the household size and structure in the study area.

N=48



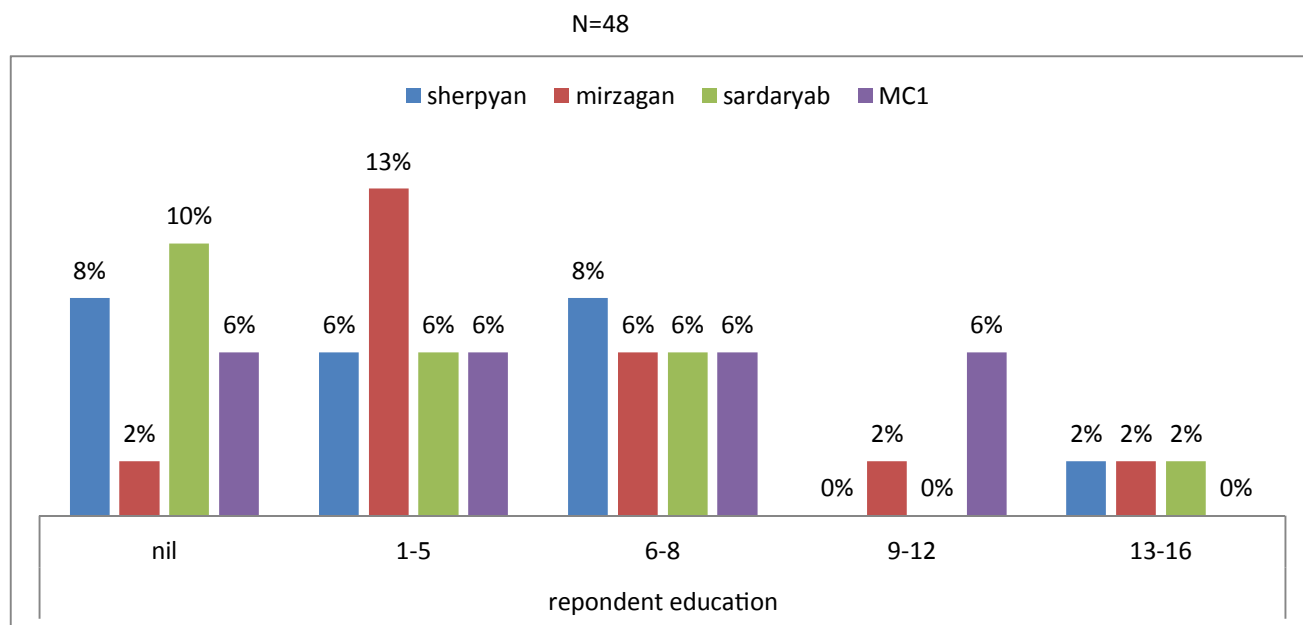
**Figure 2: Family structure and household size**

Source: Study survey 2016

According to the study, the household size of KPK is more than 8. The same results obtained by Household Integrated Economic Index 2013-2014, Study reveal that in the study area household size of about 78% of the population is more than eight. Moreover, most of the families live in joint family system in the area. The decrease of the family size could be endorsing partly to economic difficulties, the high cost of living, cost of children's education and keeping the better standard of living, which is only possible within the more reasonable smaller size family. Consequently, both of these, household size and the joint family system, increase the vulnerability of these people against disasters (Howell, 2003).

### 5.1.3 Education and Schooling in the Study Area

For the development of any area, the first thing is the provision of excellent education that is seemed very low in the study area. Because the primary and middle education provided there is also of no quality. The observed schools were mostly just in one room or just in the open air with one blackboard. Only one or two teachers facilitated schools. Hence, such education is just equal to no education. In the study area, most of the people are illiterate. Modern techniques and and updated knowledge for them is a fantasy for managing floods.

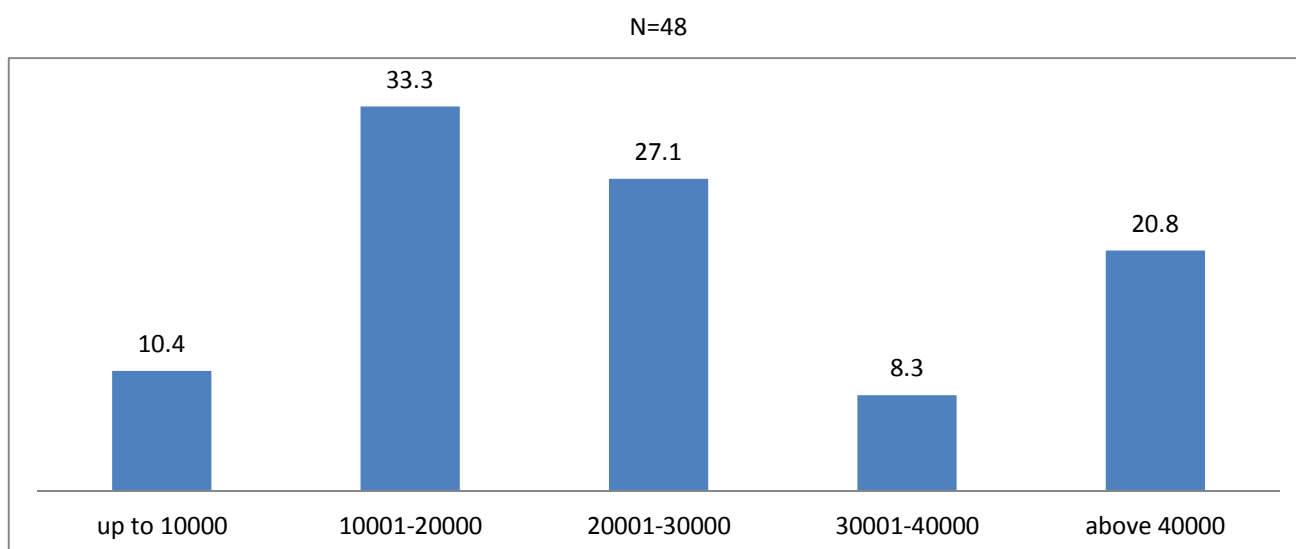


**Figure 3: Village wise education**

**Source: Study survey, 2016**

### 5.1.4 Monthly Income by the Respondents

The provision of monthly family income depends on skills and opportunities in the area. Skill development depends on provision of education that has discussed earlier. The income opportunities are low in this area this raises unemployment there because of lack of skills. The results show very low levels of income even at extreme level i.e. Rs.10000-20000 PM. This is very less amount to become secure enough from annual disasters hence will increase their vulnerability as there is a direct relationship between income and vulnerability.

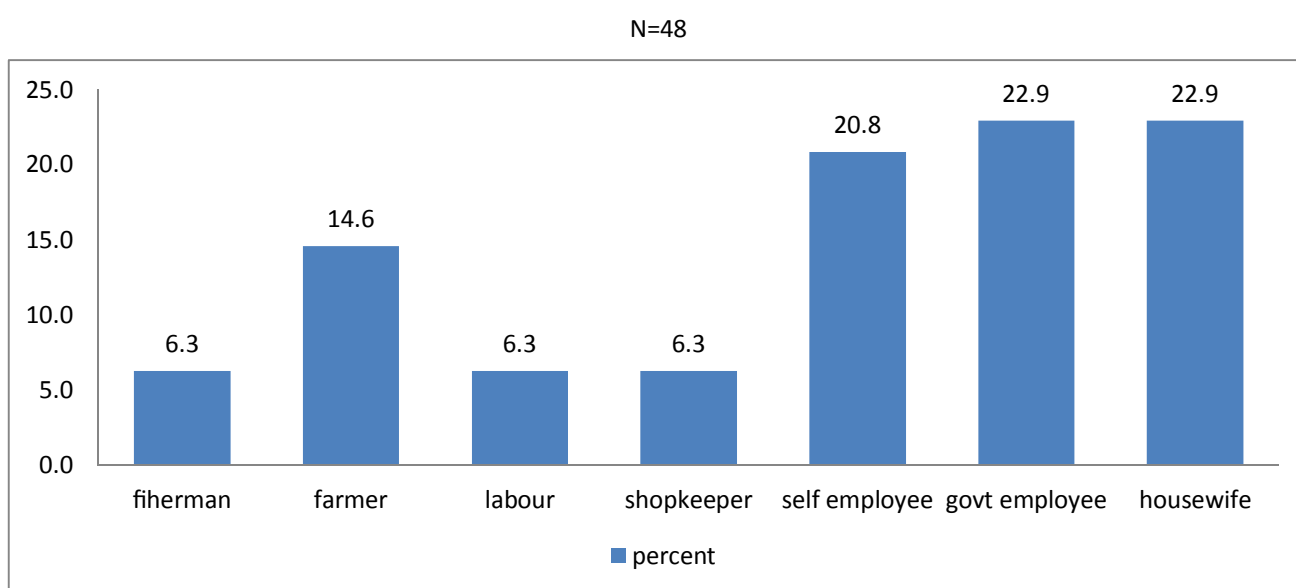


**Figure 4: Monthly income**  
Source: Study survey, 2016

#### 5.1.5 Occupations of the Respondents

Occupation of the resident of these villages is mostly in services sector and agriculture sector. A larger pool is also engage in their own business for earning their income or livelihood. Literature shows that people in the study area relied on multiple source of income in the past depending on household resource ownership. Farming was the major component of their livelihood survival because of, each family had access to some land as owner or tenant.

Livestock and woodcutting were an additional strategy to meet the day-to-day challenges. With the passage of time increase in salinity and decrease in availability of fresh water source of income gradually diminishing and household becoming dependent on other source of income



**Figure 5: Occupation of respondents**  
Source: Study survey, 2016



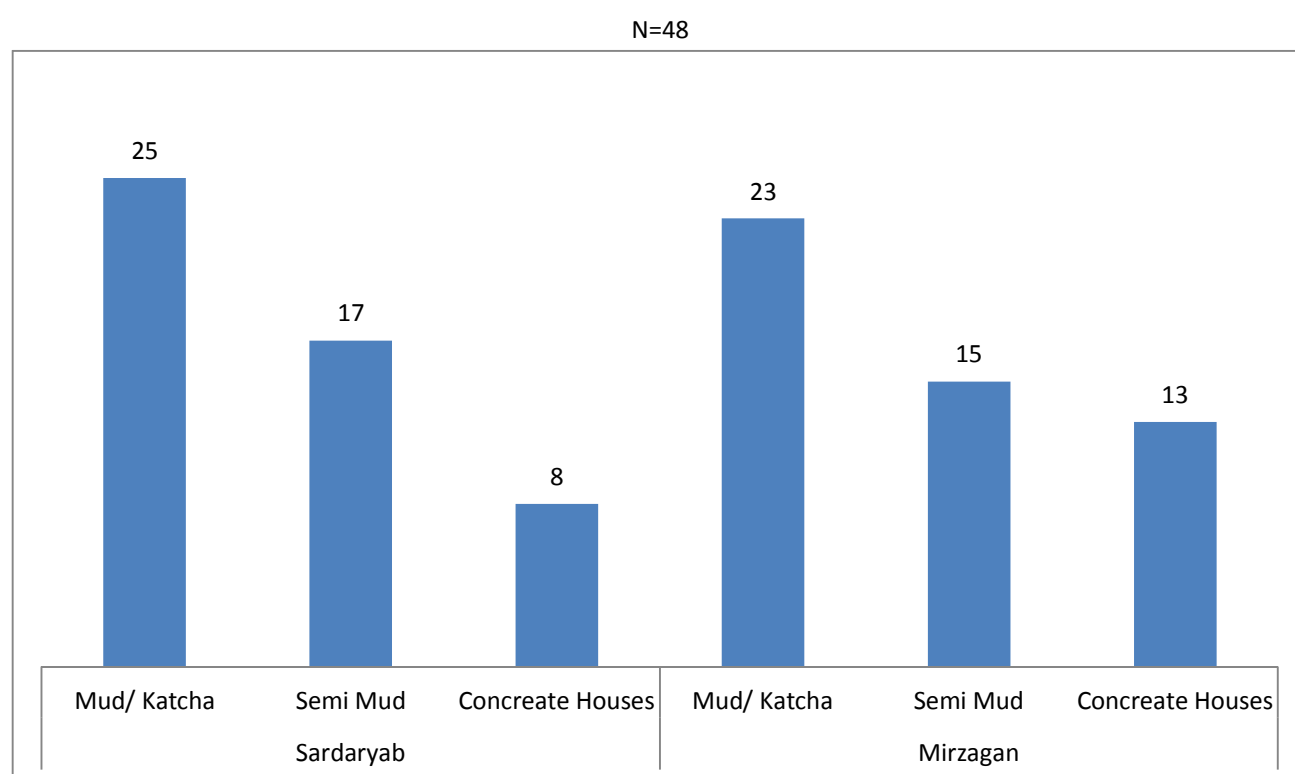
## 5.2 Physical Vulnerability

Physical vulnerability refers to the properties of physical structures that determine their potential damage in case of disaster i.e. material type and construction quality (Ebert, 2008). Physical vulnerability represents the culmination of human vulnerability and structural vulnerability. In principle human are susceptible to actions that intimidate their physical body and near location.

### 5.2.1 House Situation

Physically, in flooding zones, vulnerable or unsafe conditions of houses are commonly exposed through the height of the ground floor being lower than the average flood level and lack of upper or heightened floor to protect people and assets from flooding.

In the study area House structure of study area is composed of mud houses semi-mud houses and concreted houses. Most of the houses in the study area of Sardaryab are mud houses and are high vulnerable to floods while in Mirzagan Village council there is a mix structure of houses.



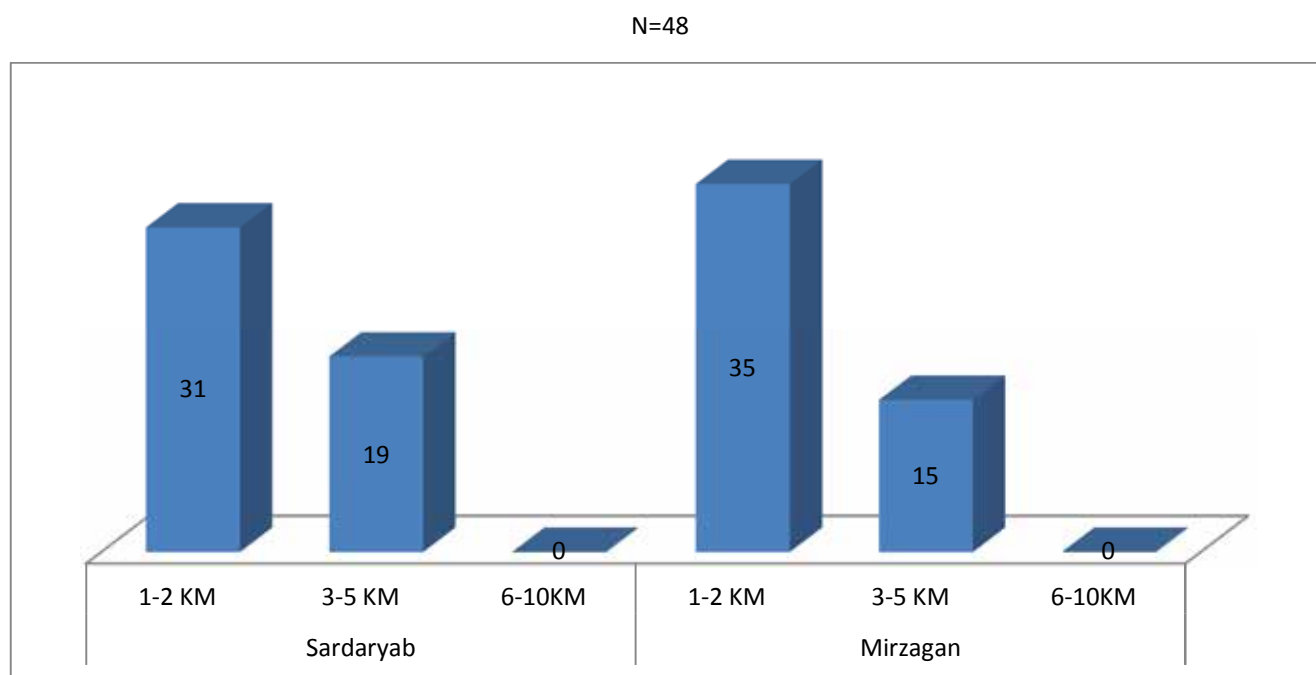
**Figure 6: Condition of houses**

**Source: Study survey, 2016**

Above figure illustrates that both village councils almost half of the houses is made up of Mud/Katcha houses that leads to enhance their vulnerability from flood because mud houses are not enough to sustain or protective even in high rainfall areas. The mud bricks are very weak in cut, tension and compression. In case of floods, walls separate at the corners and the shear cracks develop across the wall, causing breakdown of the structure. Extensive destruction was detected during flood especially if it occurs after a rainfall. When flood hit the region the most collapse building are the mud houses that is a supreme reason of the injuries and deaths in humans and their livestock as well.

### 5.2.2. Houses Distance from River

The distance from bank of the river is also a major source to minimize the effect of flood in the area. Larger the distance low will be the damages and vice-versa. In the study area 66% of the houses are located on the bankside of the river Jindi and river Kabul. People are residing near the edges of the river and during flood they affect. People attitude is quite important for reducing their vulnerabilities as government not allowed to make house on the bankside of the rivers. People violate the laws and make their house on the bankside of the river.



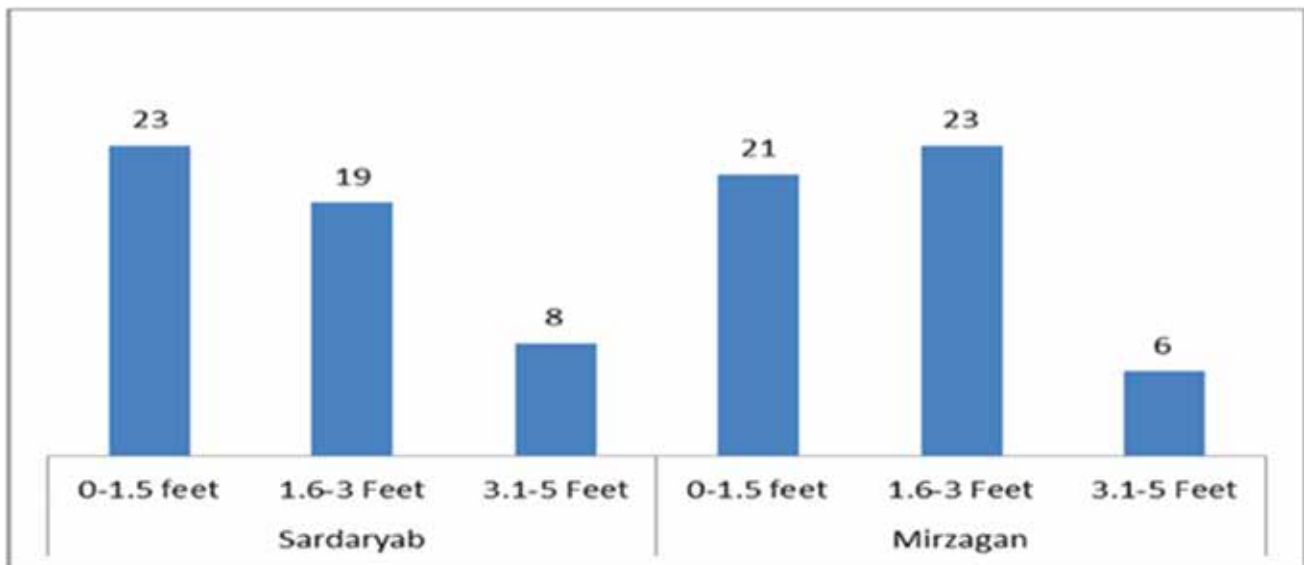
**Figure 7: House distance from river**

**Source: Study survey, 2016**

### 5.2.3 Height of the Houses

Height of the house from the ground surface is a common practice to lower the effect of the flood and to stop the flood water enters in to their houses. But in the case of study area 44% of the respondent's houses are below than 1.5 feet height that is really a severe to increase their vulnerability from flood. 41% of the houses having a height range between 1.5-3 feet. The set standards or the code of the houses are the platform must be raised at least 1ft above to regular flood level with compacted earth and extend the edges minimum 3ft away from building footprint. The slope of platform may be maintained for sandy soil at 1V to 2H (For each vertical ft height, horizontal width of 2 feet) and for clayey soil, (1V:1.5H). The water must be drained away from the building. For control of erosion of platform, deep rooted edge plants, bushes or grass may be grown on edge. The depth of foundation may be taken as min 4 feet for soft soil and 2 feet for hard soil. The width of foundation may be taken as twice the width of wall for soft soil and 1.5 times the wall width for hard soil.

N=48



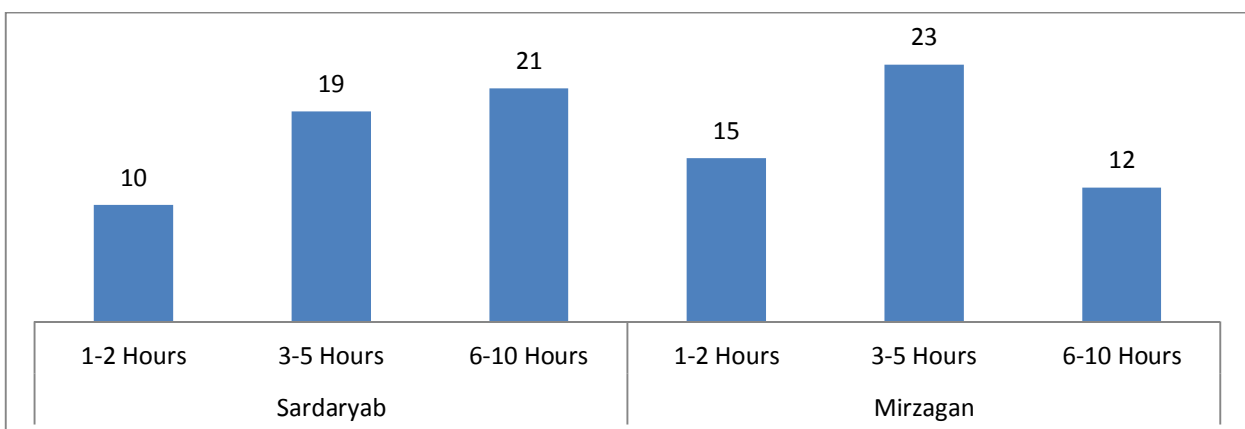
**Figure 8: Height of house from the ground surface**

Source: Study survey, 2016

#### 5.2.4 Distance from Main Market of Study Area

Remoteness from the community centers contributes to uplifting vulnerable communities to become more vulnerable in a way the more remote area lower infrastructural development take place in the area. Access to basic facilities is very low in remote areas like health and education. Above figure describes in study area 42% of the respondents are having a view that time required to reach the main city is almost of 3-5 hours approximately, which increase their vulnerability because if the person hit by flood time span is much higher and the chance of the survival of the patient is very low due to maximum time required to reach the modern equipment that is only available in the hospital of the city area.

N=48

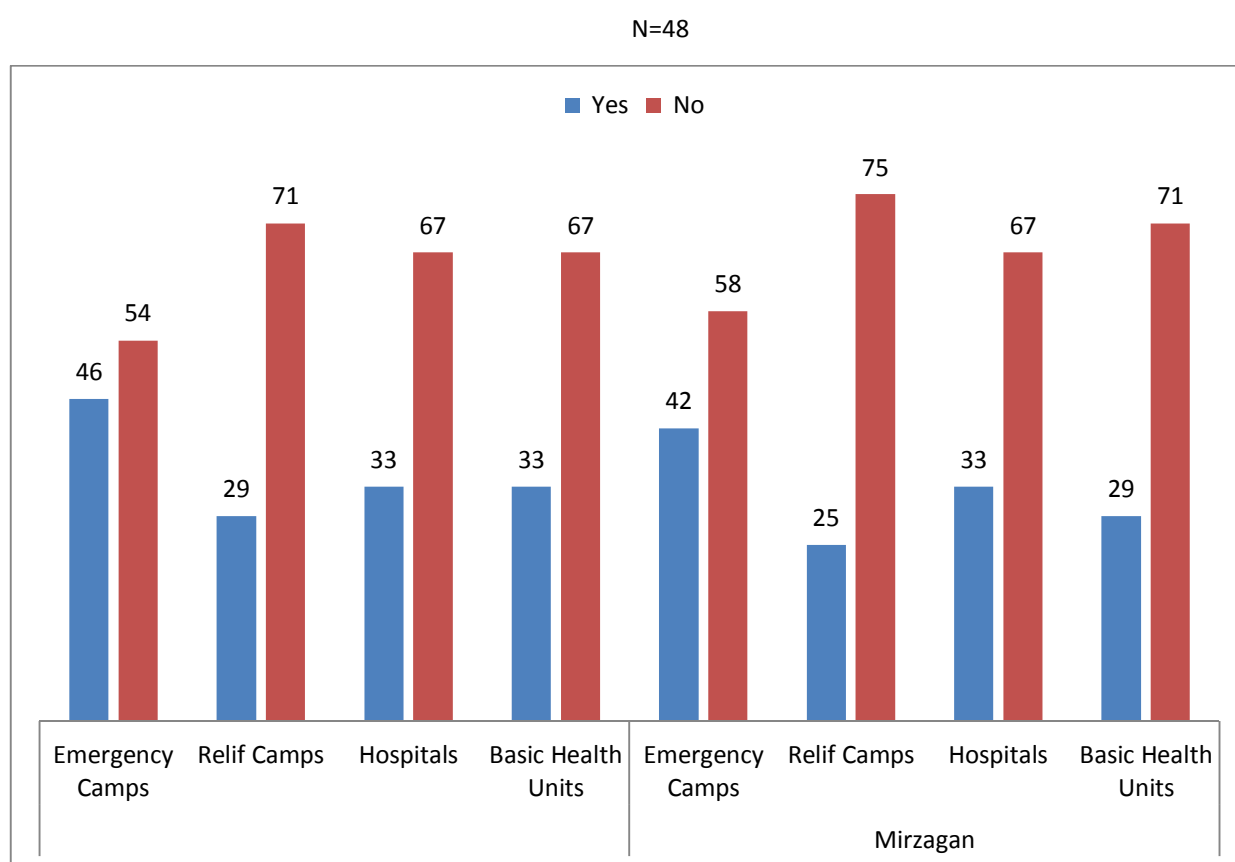


**Figure 9: Time required for reaching main market**

Source: Study survey, 2016

### 5.2.5 Crises Management Cell

In disaster prone areas or disastrous situation occur in any locality some of the segments of the health institution are very important to be existed in the area and provide very basic facilities to the flood victim i.e. emergency camp, relief camps and basic health units for the survival of the people. Above figure tells that there is a lack of all above mentioned necessary segments. In village council sardaryab the availability of the emergency camp, relief camp and the basic health units is very low as maximum respondents goes with 'NO' of the statement. Same is the case with village council Mirzagan. With these low quality facilities people of these village council are highly vulnerable to flood and that's why the cause of damages is high in these area.

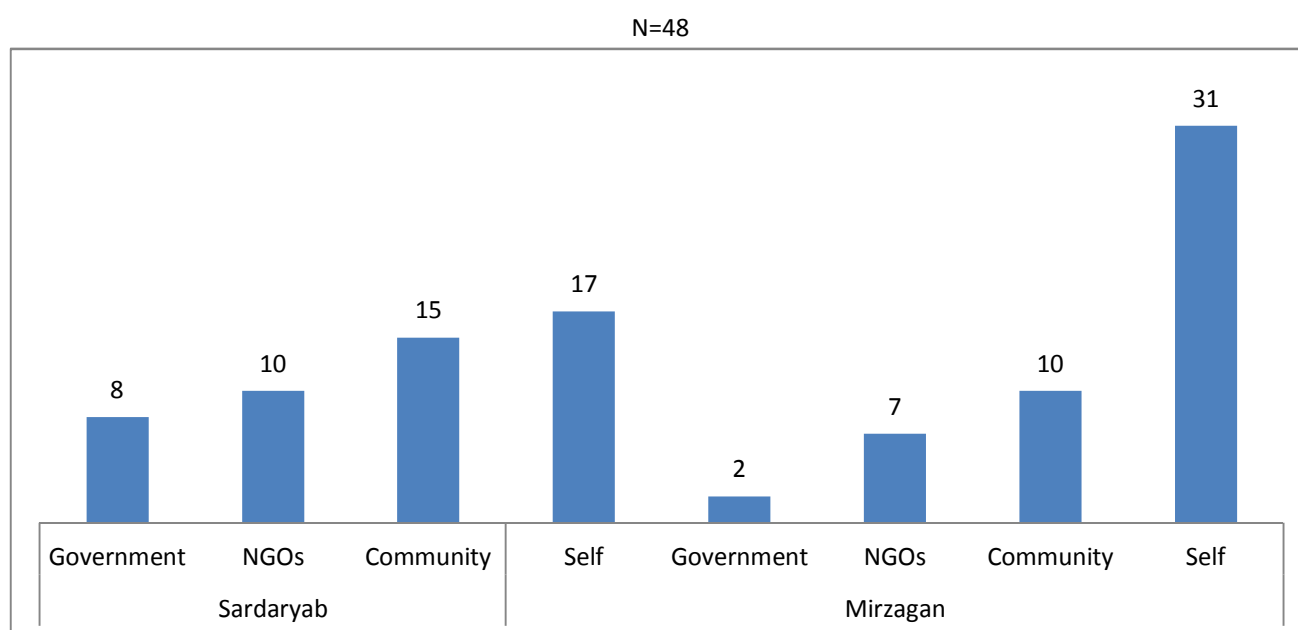


**Figure 10: Crises management cell**

**Source: Study survey, 2016.**

### 5.2.6 Rehabilitation and Reconstruction after Destruction Due to Flood

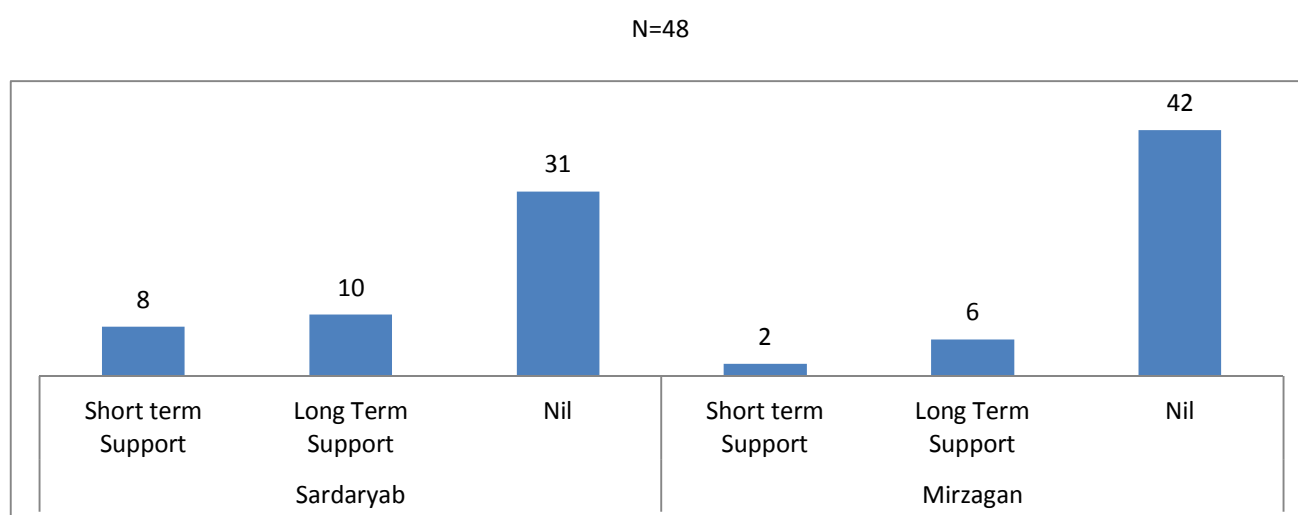
After immediate threat to the human lives, the next most vulnerable are the homes. The impact of earthquakes and floods on homes has been enormous and therefore the reconstruction of homes after these natural disasters is usually a tough task for the communities. Above figure show that 48% of the respondents stated that they rebuilt their houses with their own self help. 25% are having a view they can rebuilt their houses with the assistance of their communities. Role of NGO is 17% according to respondents for making houses for the flood affected communities. Governments are only able to provide assistance for 10% of the respondents of the study area.



**Figure 11: House rehabilitation**  
**Source: Study survey, 2016.**

### 5.2.7 Training for Rehabilitation

Under extreme pressure, decisions are made in extraordinary circumstances. In flood affected areas the need of emergency responders is going high. In such situation a group of local people are the first who manage and have most responsibilities. They play an important role to rebuild their communities. Through training these respondents are quite able to respond in crises situation equitably because exercises make them skillful and develop techniques to tackle the situation. Above figure shows that highest proportion about 73% of the respondents from the study area are never go through from training process and they don't have skilled techniques for countering the flood impacts.

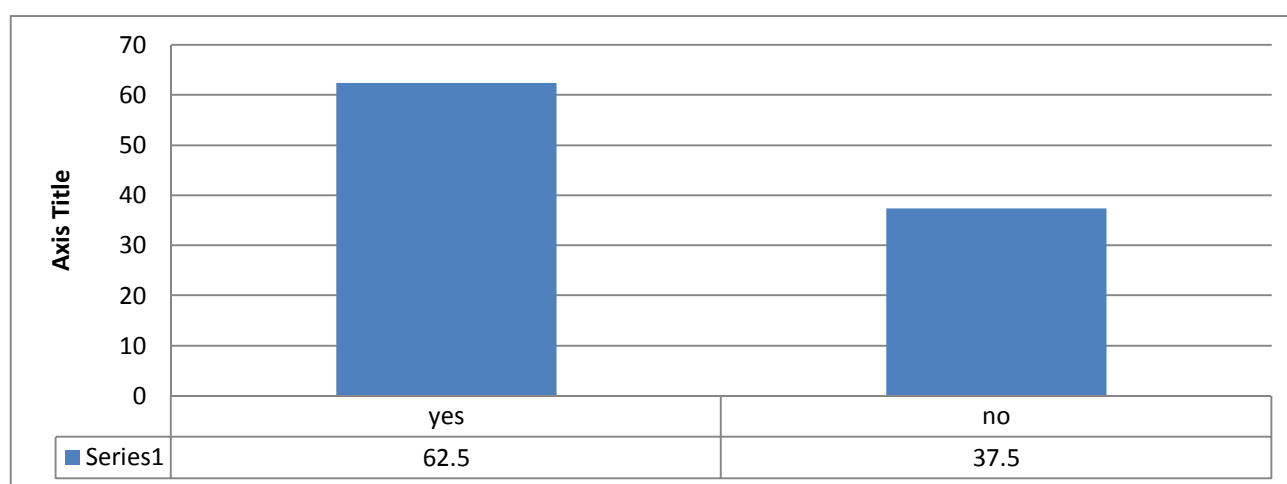


**Figure 12: Training for rehabilitation**  
**Source: Study survey, 2016**

### 5.3 Prediction of Flood Indigenously

Figure shows that above 60% of the respondents is able to predict the flood without any external assistance provided to them. Lesser proportion of the respondents is not being able to predict flood without external. Respondents of the view that an announcement in the television, radio or newspaper enables him to predict floods in coming days. After their ability to predict the question arises how they predict flood their number of practices or knowledge available indigenously available in the study area. Majority of vote goes in the basket of rain patterns in a way, fluctuations in the rain during flood season warns them to be aware that flood is may arise the area. Other knowledge related to their predictions is surface of water is going to high, drainage problem started, edges of water changes, flow of river changes, change in the color of water etc.

N=48



**Figure 13: Prediction of flood without any assistance**

**Source: Study survey, 2016**

#### 5.3.1 Estimation of Local Knowledge in Study Area

As discussed earlier Local knowledge is a knowledge, which needs no schooling and certificates; it is developed by long and revives experiences of communities living in a certain geological and meteorological surroundings. With the passage of time and modernization, many of such knowledge became extinct. Based on previous literature and ground realities here for conceptualizing local knowledge measured.

**Table 5.3: Age (in years) status of living cross-tabulation**

Age in years	status of living	Total
	full time	
16-30	5	5
31-45	12	12
46-60	19	19
above 60	12	12
Total	48	48

Source: Study survey, 2016.

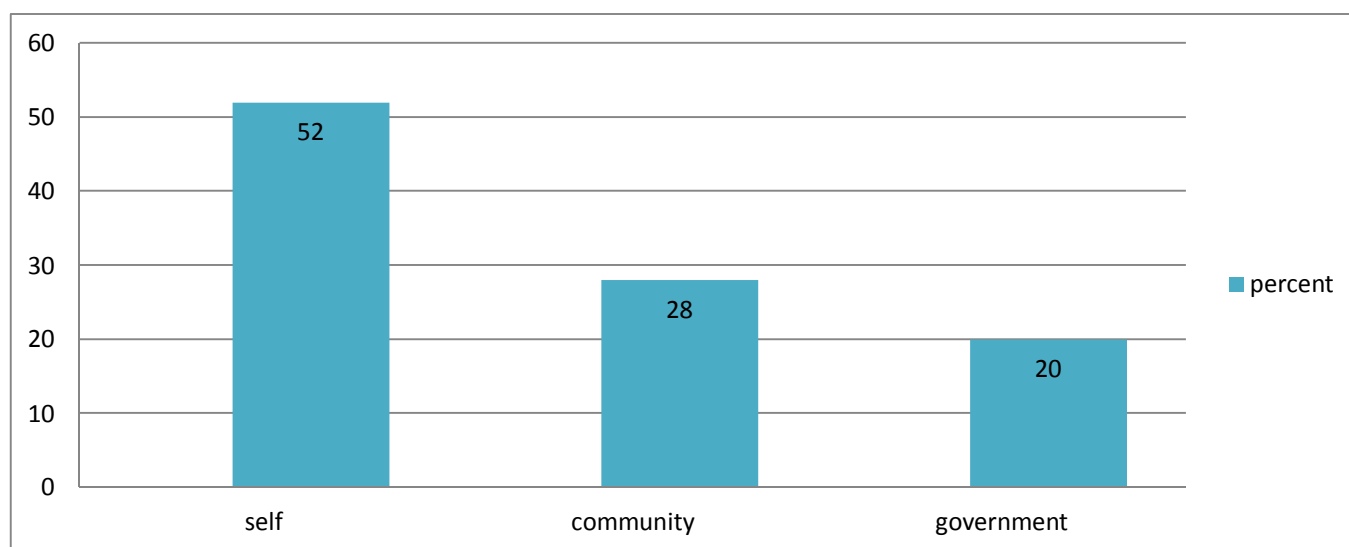
Given table 5.3 shows that from total respondent all are living from very long time in the area and these respondents are well aware of the environment and surroundings of their own locality from anyone else. Moreover, due to very old relation with the environment of these people they can not only predict any future coming event very easily but also can manage and tackle it.

### 5.3.2 Use of Local Knowledge in Forecasting Flood

Local communities are living in the area from years and they are much more familiar than anyone else about their surroundings is and environmental change is. Local communities use their wisdom and indigenous knowledge in all stages of disaster management to prevent their selves from maximum destruction

Figure shows that most of the people prefer self-forecasting 52 percent of the total respondents from the study area rely on their own forecasting for flood by using their own knowledge about their surroundings. Second leading source for future events is community. Hence, most of the community depends on their own self-forecasting.

N=48

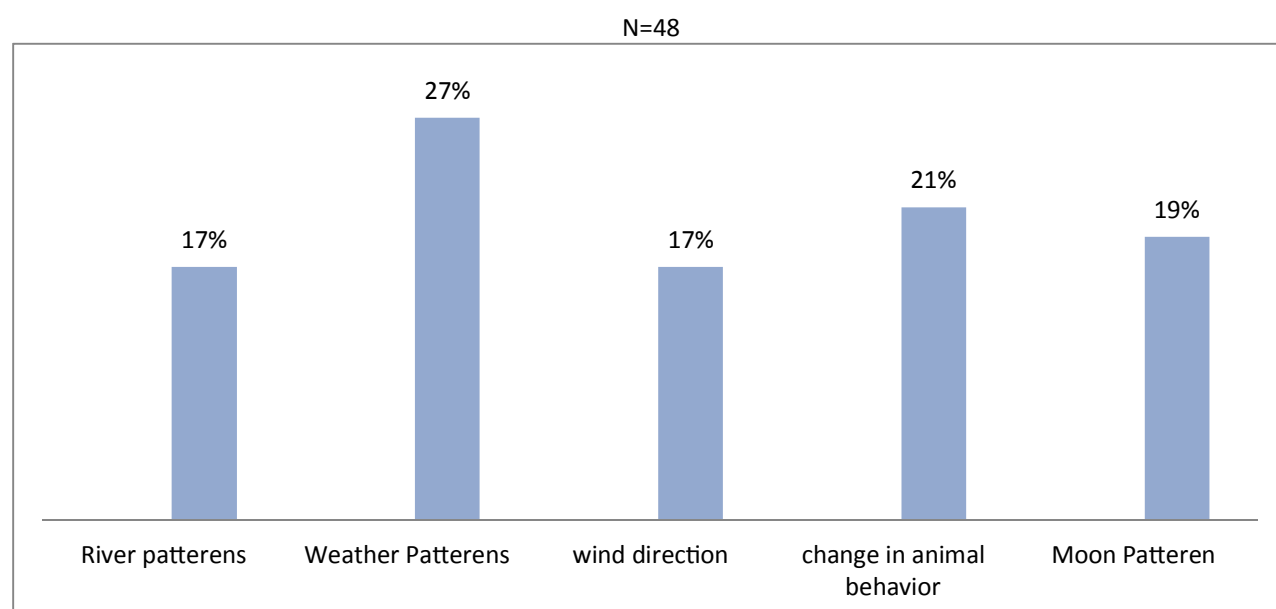
**Figure 14: Use of local knowledge**

Source: Study survey, 2016.

### 5.3.3 Local Knowledge Methods for Predicting of Flood in Study Area

Figure shows 27% of the respondents use weather patterns for predicting of flood in advance, because the areas are cloud very often and the intensity of being cloudy and depressed dark environment tells them about the intensity of the flood. 21% believe on the animal behaviors enables them to predict flood indigenously because information about animal behaviors mostly provided by the women and they still rely on them because they live within their homes and observe their cattle's movement and behavior continuously

As for as Weather Patterns are concerned they are Sky turns gloomy and Black rolls of cloud Weather unusually hot and humid/ hot spell after rain. For Wind Direction strong wind blows from the south, strong wind blows from north/, east wind blows at full moon, mud Smell in the wind. River patterns dark rolls of water, Noise in the river, river water becomes hot. Animals Behavior cattle become restless and stop grazing, Cattle wail continuously, Ants climb trees with eggs on their back, Bees move around in cluster, Birds fly without destination, Increased number of flies and mosquitoes, Insects attack cattle, Fish jump in the river and pounds, Crows fly at night Frogs call constantly. Moon patterns are red half-moon, full red moon, Red circle around moon, and dark shades on moon.



**Figure 15: Local knowledge methods use by respondents**

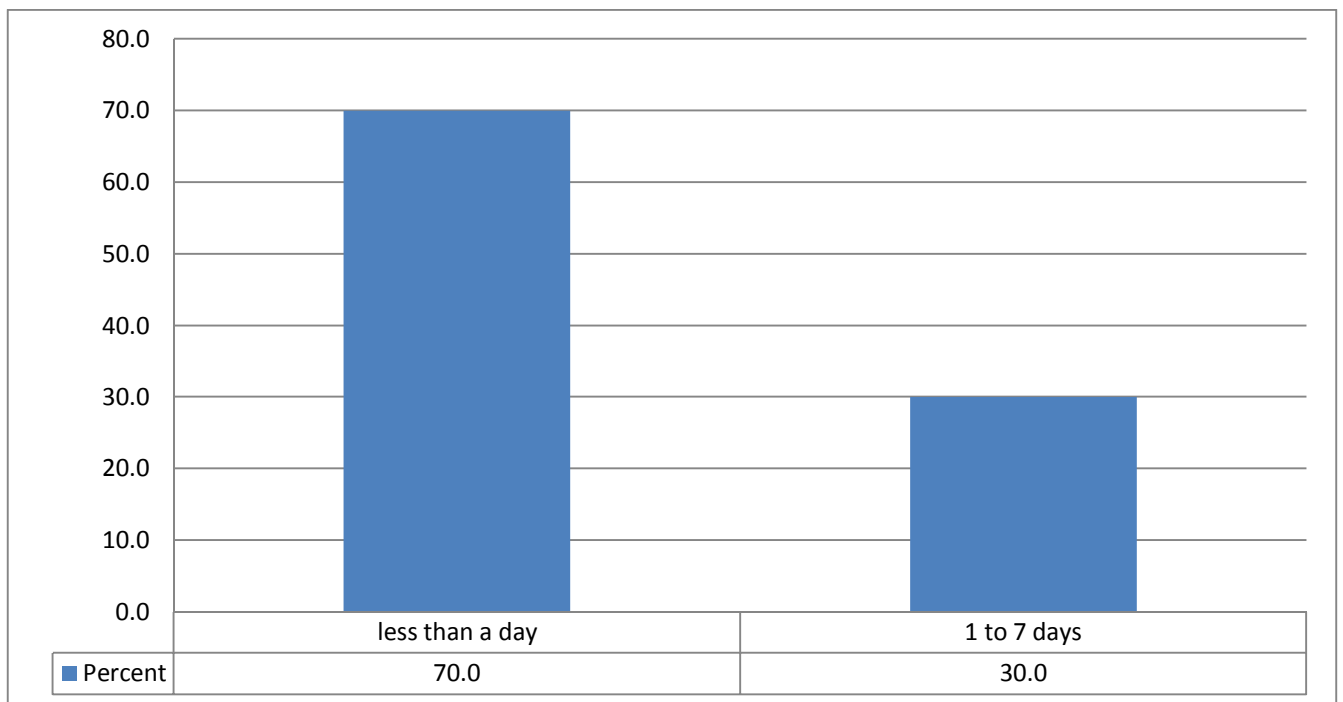
**Source: Study survey, 2016**

### 5.3.4 Time Required Predicting the Flood

Major portion of the respondents 70% having a view that they are able to predict flood in less than a day while there are respondents also exist who can be able to predict flood more than one day earlier. Early prediction helps in preparing themselves for countering the effects of flood. These predictions are also serving as an early warning indigenously, means that through self-prediction they have less need to provide early warning and they are able to take precautionary measures to save them from flood. These practices are helping them to reduce their vulnerability from flood. The use these historical knowledge and practices can save maximum lives, their livestock land and their productive assets.



N=48



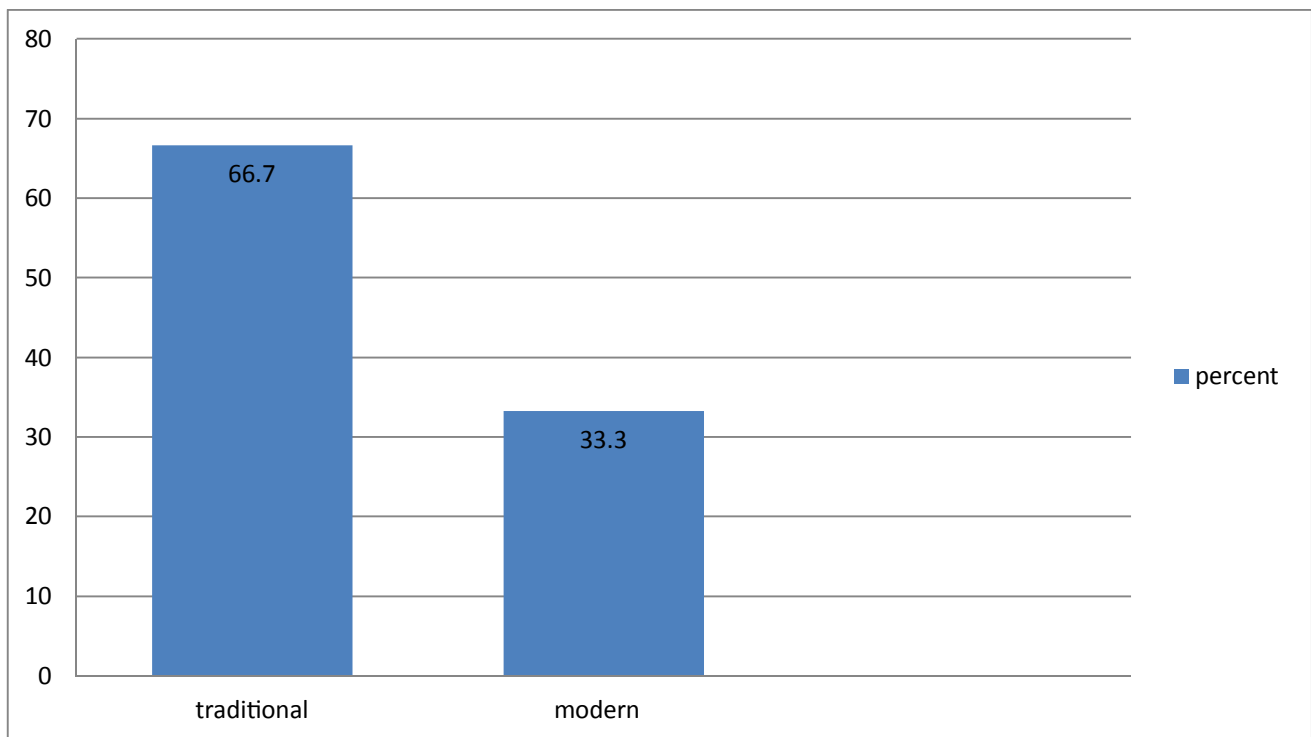
**Figure 16: Time required to predict flood**

**Source: Study survey, 2016**

### 5.3.5 Pattern Followed by Local People to Prevent Flood

67% of the respondents are in the favor of traditional ways that they are using is good to mitigate the consequences of the flood. While 33% are in the favor of modern ways to mitigate the effects of flood. Two schools of thoughts are prevailing in the study area, as majority of the respondents in the favor of traditional ways to mitigate flood. Traditional school of thought are having view that know-how of circumstances and the geographical understanding is best known by the local elites and we best manage it and they are against the government respond because according to the respondents' government did not respond in time. Second view they are having that modern knowledge is not accessible to every individual of the area so they easily manage and help him by using their own knowledge at time of flood.

N=48



**Figure 17: Pattern followed to predict flood**  
**Source Study survey, 2016**

Modernist are having view that that government respond in best possible way they have modern, scientific and updated knowledge in all aspects of disaster and they are better respond during and after the flood period. Science proven knowledge is best in regard of flood prevention during flood and post flood recovery period.

## CHAPTER 6

# CONCLUSIONS AND RECOMMENDATIONS

### 6.1 Conclusion

The review of policies and approaches from a global perspective of disaster management concludes that the globe is giving special concern to save lots of the human from disasters destruction. Withal, their focus was and is on post disaster activities. These establishments and organizations are managing a pre disaster state of affairs as a core and central purpose. These organizations are implementing their ways on the vulnerable teams while not involving local individuals and their knowledge and don't seem to be focusing wants of those native communities. The situation isn't a lot of totally different in Pakistan's strategy for disaster management. There's a requirement to focus these problems as a core issue.

Over time native folks usually have developed appreciable local information and practices on flood state that contribute to enhance survival and mitigate property losses. Social relationships, and particularly caste arrangements, are necessary parts that facilitate within the understanding of local knowledge.

Coping contains a cost-financial, social and chance. Monetary ability is that the key. Vulnerable charsadda people have very little or no surplus financial gain to take a position on the measures that may defend them from flood. As a result, people's header is proscribed to touch upon immediate circumstances rather to undertake measures that are future in nature. Social capital e.g. reciprocal support among the neighbors, support from immediate relations, larger kinship internetwork are the very important safety net for the char individuals in addressing perennial flooding. However, individuals are more and more addicted to the formal establishments, notably within the context of fixing nature of flood. Philosophy formal institutional setting is nice for individuals to cope, as this will increase probability of obtaining access to data and services. Therefore, targeted governance wherever vulnerable people have access to should be promoted.

Indigenous information, provides necessary mechanisms to scale back disaster risk, and is particularly valuable for community level disaster management. Policy manufacturers ought to think about protective such effective, traditional cope mechanisms and improve on them to make sure that development doesn't increase vulnerability to natural hazards. Further, encouraging community involvement through the utilization of ancient practices provides a a lot of realistic and local-specific strategy since the community understands the case because of past disaster expertise.

Nature of floods as individuals is dynamical in terms of their frequency, intensity, time of prevalence (relation to cropping season) and certainty. This dynamical nature has an impression on people's ability to cope. though the community has used its own science and humanities to predict floods, this ancient tool is changing into of very little

facilitate owing to the dynamical nature of floods and departure the community with no selection however to believe no matter early warning system is in place.

The discussion of traditional knowledge that means, why and the way it ought to be protected, continues to have interaction traditional knowledge holders, governments, non-governmental organizations, academics, practitioners, and every one different conceivable stakeholders, and can most likely interact all involved for a really long term. Opinions dissent among and among communities and countries. This could not be seen as a rational motive however as a part of the method of and a chance for shaping agreement.

## **6.2 Recommendations:**

1. Strategy for Flood management practices should be proactive rather than reactive.
2. Indigenous knowledge should incorporate in all the aspect of disaster management as well as in policy matters.
3. Further studies also conducted on indigenous knowledge so that disasters sepecifically flood will be managed properly and cost effectively.





# **ASSESSING THE FLOOD INDUCED CONFLICTS ON THE AGRICULTURAL LAND RESOURCES:**

**A CASE STUDY OF TEHSIL BALAKOT, DISTRICT MANSEHRA**

**By**

**M. Shoaib Raffique**

## ABSTRACT

Floods can occur in almost any river valley at almost any time. They are unpredictable. Worldly, the average annual potential damage to property because of flood disaster is estimated at nearly a billion dollars. Even though floods are no worse or more frequent than formerly, they are costlier as the flood plains increase in population and economic development. The study is mainly emphasized on to explore the flood induced conflicts on the agricultural land resources in village Kashtara which is located on active flood plain of Balakot. A total of 40 respondents were selected for the interview. The results show that a high agricultural land resource of the study area was exposed to the floods which eventually hit their agricultural lands and ultimately conflicts arise on the boundary settings of the lands. More than 80% people found difficulties to cope with the floods and their consequences although maximum respondents in groups, practiced safety measures according to their economic power. The role of government line agencies was found very poor in minimizing the vulnerabilities of people, less training and education and not following the building codes reduce their adaptive capacity and make them susceptible. There is an essential need of government initiatives/projects and scientifically sound awareness programs that must highlight the importance of flood risk management in the study area.



## CHAPTER 1

# INTRODUCTION

### 1.1 Introduction

Flood is among the most common and frequent natural hazards, devastating to societies worldwide (Jongman, B. et al., 2015). Flood risk is referred to the combination of the likelihood of flooding and the consequences of the incident (UNSDR 2015, Glosin, E., 2014). The consequences are again determined by the exposure level of the hazard and vulnerability of people, belongings and infrastructure that are sensitive or unable to cope with the consequences (Maaskant, B, et al., 2009, Jongman, B. et al., 2012, Kron, W., 2005). Flood possibility is a common threat to many populated areas, both in the lowland river basin and coastal areas of the world (Maaskant, B, et al., 2009). Exposure depends on the severity of the hazard, population settlement patterns and size, networks and land use (Winsemius, HC, et al., 2013), while susceptibility of a particular community can be assessed by economic, socio-cultural and environmental areas (Krishnamourthy, P.K., et al., 2011). Flooding is among the most expensive natural disasters in terms of human oppression and loss in economics. About 90 percent of destructions associated with natural disasters (except droughts) are due to flooding and related waste/debris flow. Floods have potential to damage and destroy accommodations, farms, crops, domestic animals and disrupt agricultural lands and businesses (Handmer Jand Dovers S, 2007).

Flooding resulting from extreme hydro and meteorological events and taking place in unexpected magnitudes and frequencies can cause loss of lives, livelihoods and infrastructure. They can also damage the environment (Integrated flood management tools series flood forecasting and early warning, 2013). In general, it was analyzed that worldwide flood is the most destructive natural hazards causing extensive damage to the built and natural environment, and devastation to human settlements. Economic losses due to the effects of damaging floods have increased significantly around the world (Integrated Flood Risk Management in Asia, 2005).

The frequency of natural disasters has been increasing over the years, resulting in loss of life, damage to property and destruction of the environment (Living with Risk, 2000). Flood losses reduce the assets of households, communities and societies through the destruction of standing crops, dwellings, infrastructure, machinery and buildings, apart from the tragic loss of life. In some cases, the effect of extreme flooding is dramatic, not only at the individual household level, but also in the country as a whole (Integrated Flood Management Concept Paper, 2009). The Fourth Assessment Report (2007) of the Intergovernmental Panel on Climate Change (IPCC) predicts “heavy precipitation events, which are very likely to increase in frequency, will augment flood risk”. These floods will affect life and livelihoods in human settlements in all areas, such as flood plains, coastal zones, river deltas and mountains.

Climatologists are now starting to identify and attribute changes in severe events to human pressure on the worldwide climate system (Zwiers and Zhang, 2003). For instance, the risk of a heat wave like to that experienced by Europe in 2003 would have doubled because of historical emission of greenhouse gas (Stott et al., 2004). Risk of further extremes such as severe rain (Groisman et al., 1999), disparaging cyclones (Emanuel, 2005) and floods (Milly et al., 2002) are also predictable to increase. It has been observed for the long term that the intensity and frequency of heavy rainfall has increased in many areas during the 20th century (Groisman et al., 1999), and the climate models of different regions indicate that intensity will continue to increase over the next decades (Ekstrom et al., 2005).

The environmental impact creates great uncertainty, frustration, resource scarcity and weak law enforcement and order, which often suggests increasing the likelihood of conflict (Burke et al., 2009, Brancati, 2007, Homer Dixel, 1999, Nel and Righarts, 2008, Miguel Satyanath & Sergenti, 2004). While no one discussed about the serious consequences caused by the environmental shock suffering, there is no consent on how people should respond to this kind of challenges. Environmental factors of climate change can trigger the risk of conflict, and resource scarcity plays a major role. Most of the natural calamity occur quite suddenly (except drought), but the after effect may last long, causing supply shortages caused by reduced offerings, skew distribution or an increased demand, and suggested equally important future basis of conflict (Homer Doxon, 1999).

Quarantile and Dynes (1976) observed that the disputes associated to the resource allocation or distribution, rights tends to occur right after the hit of natural calamity. Resource rights refer to an inforcable authority to undertake particular action with regards to resources (Ostron Elinor, 1999). Goldstone (2001) advise that the political outcomes of natural calamity pivot on how they are tackled, poor management of disasters in developing countries are argued to raise the risk of political unrest and conflict, while proficient disaster management may in fact increase the government support. Conflict relations always include the starving for the control of scarce resources, or to influence the behaviors of others in a desired direction. This means that in a conflict relationship there is always an attempt to attain or use power, or the actual attainment of power (Sheppard, 1954).

Natural calamities disturb the economy and devastate infrastructure, interfere with livelihood, routine services and health services. Flooding can be predominantly disturbing, triggering to a major breakdown of infrastructure and are the leading reason of death from natural calamities in the world, with approximately 6.8 million deaths in twentieth century. Asia is the region which is most affected by flooding, accounting for almost 50% of deaths in the past 25 years. Flooding and its impact will most likely to increase in the future as a result of urbanization and changes in land use, high concentrations of poverty and marginalized populations, and lack of regulatory and emergency preparedness work (Jonkman SN, Kelman I, 2005).

The common impact of flooding incidents has been formerly described, but there is minute knowledge about the flooding impacts on the natural settings in the context of resource scarcity and conflicts on scarce resource. This study explores the management of land resource conflicts which are mainly caused because of floods. In addition, how local community is involved in management if these conflicts and what are the coping strategies they have used.

## 1.2 Importance of the Study

Pakistan is subject to periodic flooding of rivers. Glacier melting, monsoon rains, deforestation in watershed, and salinization are among the principal drivers of riverine floods. In the last few decades, climate change has emerged as an important driving force behind floods in Pakistan, primarily by affecting glacier melting, by interfering in monsoon patterns. Many factors including population growth, dense population living in hazard prone areas, global warming, environmental degradation, and unsustainable development patterns have contributed to this trend. This often leads to high level of susceptibility, as well as fast and spontaneous urbanization, among others. Worldwide, the risk reduction interventions are unsuccessful to keep pace with increase in contact to natural hazards or calamities and advanced level of susceptibility. In Pakistan, like other developing countries, there is less focus on the issues which ultimately are responsible for the destruction and losses because of disasters; therefore, refocusing on human activities to minimize the risk of disaster and ultimately the conflicts and the natural resources needs careful consideration. Keeping in view the importance of the issue the present research study is designed which besides identifying reasons and understand the land conflicts which are mainly caused because of climate related disasters of the study area but also will analyze the extent of understanding and realization of the coping strategies of government line agencies and the local communities in the reduction and management of these conflicts. Furthermore, the present study will contribute and influence policies and practices for the planning and development department for future developmental projects.

## 1.3 Theoretical Framework

A theoretical framework provides guidance to a research study i.e. it is concerned with the past researches that readily defines the core concepts and theory of a research study (Richard, 2013). The theory of Homer Dixon will be used as a theoretical framework for guiding this research. He argued that environmental factors of climate change can affect conflict risk, and the lack of important resources holds an important place. Acute deficiencies caused by reduction in supply, asymmetric distribution or increased demand are considered as an important current and future source of conflict (Homer Dixon, 1999). The majority of natural disasters occur relatively suddenly, but the aftermath can last for a long time, which leads to worsening deficiencies.

Social vulnerable communities are more prone to be affected by the climate related bad events i.e. the extent to which a system is vulnerable to or unable to deal with the harmful effects of climatic extremes and variability. Susceptibility is nature's function, frequency and size of climatic variations to which a system is exposed, its sensitivity and ability to adapt (adaptive capacity). Also referred to a set of specific circumstances that affect the community's ability to prevent, reduce, get ready or react to a threat (Lundy and Janes, 2009). The lack of management strategies is also an ingredient of social vulnerability and should be included in the vulnerability analysis, for example, people living in the foothills, fault lines, river banks or flood plains, etc.

Social vulnerable communities have feeble family system, lack of leadership qualities in individuals for decision making and conflict management, lack of participation in collective matters, feeble or no local organization. Additional social or communal factors such as traditions, culture, religion, economics, norms and values, accountability and political stability also plays significant role to determine social vulnerability (Cardona & Hurtado, 2000).

Considering the mentioned analytical characteristics of social vulnerability concept, the study is planned to use this concept to understand the management of land resource conflicts which are mainly caused because of floods. In addition, how local community is involved in management if these conflicts and what are the coping strategies they have used.

#### **1.4 Problem Statement**

There is a mounting consent that the population, infrastructure and environment are threatened by climate impact. Climatologists are now starting to identify and attribute changes in severe events to human pressure on the worldwide climate system (Zwiers and Zhang, 2003). Risk of further extremes such as severe rain (Groisman et al., 1999), disparaging cyclones (Emanuel, 2005) and floods (Milly et al., 2002) are also predictable to increase. Northern areas of Pakistan are prone to disasters and floods and at the top, and people of the area face varying type of vulnerabilities under the catastrophic situations. Moreover, regular and concentrated precipitation leads to riverine flooding and devastating the agricultural settings on the floodplains. The effects of climate change induced hazards and disasters are being observed in many sectors with and adverse impact on natural resources and the livelihood sources that they support. In Pakistan 40 percent (Human Development in South Asia, 2006) of the people are highly susceptible to natural disasters and frequently exposed to multiple catastrophes. This exposure to vulnerabilities also emerges risks of conflicts on the redistribution and management of natural resources, right after a hit of flood event. Therefore, the present study is designed to understand the management of land resource conflicts which are mainly caused because of floods. In addition, how local community is involved in management if these conflicts and what are the coping strategies they have used.

#### **1.5 Research Objectives**

The major objective of this research study is to explore the flood induced conflicts on the agricultural land resources on the floodplain area.

The specific objectives of the study are given below;

1. To explore how floods, affect the land resources and increase social vulnerability of the target population.
2. To analyze the communal conflicts on land resource management and the coping strategies of local community in reduction of these conflicts.

#### **1.6 Thesis Layout**

The first chapter addresses the background information related with the flood induced conflicts on the agricultural land resources. It provides the overview of this research study. Second chapter includes the literature review reflecting the contributions of different authors regarding the research study. Third chapter contains detailed research methodology which includes the information about targeted area, study sample size and technique, data collection techniques, study variables and the tools been used data analysis. Fourth chapter includes the data results obtained during this thorough research is discussed in this chapter, in the form of tables, graphs and discussions. The fifth chapter contains the conclusions of this dissertation.

## CHAPTER 2

# LITERATURE REVIEW

### 2.1. Understanding Floods

Floods are the costliest and wide reaching of all natural hazards. They are responsible for up to 50,000 deaths and adversely affect some 75 million people on average worldwide every year (Mwape, 2009). According to Nott (2006), the causes of floods can be broadly divided into physical, such as climatological forces, and human influences such as deforestation and urban development. The most common causes of floods are climate related, most notably rainfall. Prolonged rainfall events are the most common cause of flooding worldwide. These events are usually associated with several days, weeks or months of continuous rainfall. Human impacts on river catchments influence flood behavior. Land use changes in particular have a direct impact on the magnitude and behavior of floods. Deforestation results in increased run-off and often a decrease in channel capacity due to increased sedimentation rates. Nott (2006) correctly points out that a flood event is not considered to be a natural hazard unless there is a threat to human life and/or property. The most vulnerable landscapes for floods are low-lying parts of flood plains, low-lying coasts and deltas, small basins subject to flash floods. Rivers offer human populations transport links, a water source, recreational amenities, fertile plains and are an attractive place for settlements. Floods then become a major natural hazard because of the high human population densities that inhabit these lands.

Nott (2006) further stated that physical damage to property is one of the major causes for tangible loss in floods. This includes the cost of damage to goods and possessions, loss of income or services in the floods aftermath and clean-up costs. Some impacts of floods are intangible and are hard to place a monetary figure on. Intangible losses also include increased levels of physical, emotional and psychological health problems suffered by flood-affected people. Ariyabandu and Wickramasinghe (2005) observed that some groups are more vulnerable to floods than others are. Vulnerability is not just poverty, but the poor tend to be the most vulnerable due to their lack of choices. The influences of both poverty and development process on people's vulnerability to disaster are now well established. Class, ethnicity, gender, disability and age are some of the factors affecting people's vulnerability.

They further noted that because vulnerability plays such an important part in why natural hazards become human disasters, it is worth spending time to examine the characteristics of vulnerability. Conditions of vulnerability are a combination of factors that include poor living conditions, lack of power, exposure to risk and the lack of capacity to cope with shocks and adverse situations.

Primarily losses can be high in rural areas where most of the damage is sustained by crops, livestock and the agriculture infrastructure, such as irrigation system, levees, walls and fences. In other words primary losses relate mainly to the disruption of economic and social activities, especially in urban areas, immediately after a flood (Pegram, 2003).

According to Lind, et al. (2008), the loss in case of flooding has many dimensions. In addition to economic loss and loss of life and injury, there may be irreversible loss of land, of historical for cultural valuables and loss of nature or ecological valuables

Economic development of flood prone areas is a factor that increases flood risk. Population pressure and shortages of land cause encroachment into flood plains. Mushrooming informal settlements often form enlargement zones around mega cities in developed countries (Kundzewicz, et al.2002).

According to Mustafa (2002), despite Pakistan's massive investment in its water sector, it still remains vulnerable to the flood hazard. Pakistan suffered major floods in 1950, 1956, 1973, 1976, 1988 and 1992, each affecting more than 10 thousand lives. The 1992 floods cost the country more than 3 percent of its total GDP. According to the study undertaken in four villages in Central Pakistan, the people attributed their vulnerability to floods to poverty, God's will, socio-economic powerlessness and Government (Mustafa 2002).

## **2.2 Floods and Vulnerability**

The origin of the word vulnerability can be traced back to its Latin root *vulnerary* - which means "to hurt" or in a broader perspective to be subjected to any physical attack with inability to defend (Lundy and Janes-2009). More specifically, in reference to floods, vulnerability can only be defined as being prone to floods with inadequate coping skills to overcome its consequences. Initially vulnerability was defined as a threat or limiting factor for a society's ability to absorb and recover from a negative dangerous event (Gabor and Griffith 1980; Timmerman 1981; Kates 1985; Bogard 1989). Later it was approached in terms of the extent to which a society or its people are exposed to risk elements (Petak and Atkisson 1982). Some distinguished geographical vulnerability (physical conditions) on the one hand and social vulnerability (human relations) on the other (Liverman 1990).

Differences in theoretical approaches to disaster studies and development reflect on the need to review key concepts that situate floods within the vulnerability context. To assess the extent to which hazards affect people or society it is necessary to distinguish between, "risk" and "vulnerability" components of disaster analysis. Hazard in this case can be defined as an extreme geophysical event that poses a potential threat to cause a disaster (Alexander 2000). Risk, therefore, can be understood as the probability of loss as a result of interaction between a given level of risk and vulnerability (Stewart and Donovan 2008; Wisner, et al., 2004; Alexander 2000).

The vulnerability is a function of the nature, size and frequency of climate variation which a system is exposed, its sensitivity, and its adaptive capacity. Also defined as a set of specific circumstances which adversely affects the community's ability to prevent, mitigate, prepare for or respond to a threat (Lundy and James 2009). Absence of coping strategies is also part of the vulnerability and has to be considered in vulnerability analysis e.g. living in danger exposed places as close to a lake or river i.e. flood plain, the fault lines at the foot of a mountain etc.

Vulnerability of a region depends on its geographical proximity to the source and origin of disasters e.g. if an area located near the floodplains, unstable slopes etc. it makes the area more vulnerable to disasters in relation to an area that is far away from the origin of the disaster. Physical vulnerability also include difficulties with access to water resources, means of communication, hospitals, police stations, fire departments, roads, bridges and exits of a building or an area in case of disaster. Moreover, the lack of proper planning and implementation in the construction of

residential and commercial buildings that is weaker and vulnerable in floods, landslides, earthquakes and other hazards. (Cardona and Hurtado, 2000a)

### **2.3 The Drivers of Vulnerability**

To effectively manage risk, it is important to understand how vulnerability is generated, how it increases and how it builds up (Maskrey, 1989; Cardona, 1996a, 2004, Lavell, 1996, 1999a; O'Brien et al., 2004b). Vulnerability describes a set of conditions for people originating from the historical and prevailing cultural, social, environmental, political and economic contexts. In this sense, vulnerable groups are not only at risk because they are exposed to a risk, but as a result of marginality, everyday patterns of social interaction and organization, and access to resources (Watts and Bohle, 1993; Morrow, 1999; Bankoff 2004). Consequently, the effects of a flood at any particular household due to a complex set of drivers and cooperative relation. It is important to remember that people and society are not solely or mainly of the victims, but also active managers of vulnerability (Ribot, 1996; Pelling 1997, 2003). Therefore, integrated and multidimensional approaches are very important to understand the causes of vulnerability.

Some global processes are key drivers of risk and are particularly related to the creation vulnerability. There is high confidence that these include population growth, rapid and inappropriate urban development, international financial pressures, increase in socioeconomic disparities, trends and failure of governance (e.g. corruption, mismanagement), and environmental degradation (Maskrey, 1993a, b, 1994, 1998; Mansilla, 1996; Cannon, 2006). Vulnerability profiles can be constructed that takes into account the sources of environmental, social and economic marginality (Wisner, 2003). This includes an assessment of the relationship between society and specific environmental services and vulnerability components of the ecosystem (Williams et al, 2008).

There are many examples of interaction between society and environment that makes people vulnerable to extreme events and highlight the vulnerability of ecosystem services (Metzger et al., 2006). As an example, vulnerabilities due to flooding intervention and increased risk exposure is typical of the intricate and finely balanced relationships within human-environment systems (Kates, 1971) as we have been aware for several decades. Increasing human occupancy at floodplains increase exposure to flood risk. It could put not only the lives and property of human beings with risk, but can damage flood ecology and allied ecosystem services. Increased exposure of humans comes about even in the face of measures to reduce the risk. Structural response and relief measures (such as provision of fillings, channel modification, and other physical changes of floods Environment), designed ostensibly to reduce flood risk, may have reverse result. This is among other things known as Levee effect (Kates 1971), escalator effect (Parker, 1995), or the secure development paradox (Burby, 2006), where flooding intervention leads to increased flood risk and to end flooding. A misfit policy response to such exposure provides structural flood defenses, which encourages the belief that flood risk is removed. This in turn stimulates more flooding intervention and a repeat of cycle as flood protection (built to a lower design specification) is exceeded. This is typical of many maladaptive policy measures, as focus on the symptoms rather than the causes of bad environment management.

Within the environmental dimension, physical aspects refer to a site-specific context of human-environment interaction (Smithers and Smit, 1997) and to the material world (e.g. built structures).

The physical exposure of humans to hazards has been partially shaped by patterns of settlement risk vulnerable landscape for the equalization benefits they offer. Furthermore, in the context of climate change, physical exposure in many regions also increasing due to spatial extension of natural hazards such as flooding, areas affected by drought, or delta regions affected by salinization. This does not make the inhabitants of such places vulnerable because they may have the capacity to withstand the impact of extreme events; this is the basic difference between exposure and vulnerability. The physical dimension of vulnerability begins with the recognition of a link between an extreme physical or natural phenomenon and a vulnerable human group (Westgate and O'Keefe, 1976). Physical vulnerability includes aspects of geography, location and location (Wilbanks, 2003); settlement patterns; and physical structures (Shah, 1995), including infrastructure located in hazard-prone areas or with lacking in resistance or susceptibility to injury (Wilches-Chaux, 1989).

#### **2.4 Floods and Social Vulnerability**

Socially vulnerable communities have weak family structures, lack of leadership for decision making and conflict resolution, unequal participation in decision making, weak or no local organizations, and one in which people are discriminated against on ethnic, ethnic, linguistic or religious basis. Other social factors such as culture, tradition, religion, local norms and values, economic standard, and political accountability also play an important role to determine the social vulnerability of a community (Cardona and Hurtado, 2000a).

Social vulnerability to floods is greatest among the poorest in developing countries due to lack of information and resources to take the necessary measures. Within this group are children, women and older are considered to be the most vulnerable. To reduce social vulnerability, all the above factors to be addressed, but this requires knowledge and understanding of the local conditions, which can - in most cases - only be provided by local actors.

#### **2.5 Flood Induced Conflicts: Global Context**

The relationship between climate change and conflict has gained increasing attention from academics and policy makers alike in recent years (Barnett and Adger, 2007; United Nations, 2007; Burke et al., 2009; Hsiang et al., 2013), especially after the publication of the fourth assessment report of the Intergovernmental Panel on Climate Change (IPCC, 2007). French President Nicolas Sarkozy (2008) warned that "climate change is already having considerable impacts on security [...] and the Darfur crisis will be only one crisis among dozens." President Obama in his Nobel Peace Prize acceptance speech warned that climate change "will fuel more conflict for decades" (White House, 2009). Similarly, the recently released Strategic Sustainability Performance Plan by the U.S. Department of Defense (DOD, 2014) predicts that, in addition to direct effects on military infrastructure, climate change will have indirect effects on regional stability, particularly on those areas of the world already prone to conflict.

Among its wide range of impacts, climate change is expected to increase the frequency and severity of natural hazards such as floods, droughts, heat waves, storms and tropical cyclones. These hazards can become natural disasters with profound environmental, political, and social consequences (Nel and Righarts, 2008). Floods are a potentially "dangerous" consequence of climate change. Having a rapid onset compared to changes in mean conditions (such as temperature, sea-level, or annual precipitation), they allow for less time to adapt (Falk, 1971, Barnett, 2003).



Floods are already the most frequent natural disaster, accounting for 40 percent of all natural disasters reported over the last 25 years (CRED/OFDA, 2011), and the reported frequency and damages of floods show a positive trend that is expected to continue (IPCC 2007, 2012). It is estimated that by 2020, climate change will have exposed 6 million more people living in coastal areas to flooding (39% more than would otherwise be the case) (Warren et al., 2006). Although moderate floods can be beneficial in the medium to long term (Fomby et al., 2011, Cunado and Ferreira, 2014), extreme weather events can be highly disruptive. In 2010, hydrological disasters caused about US\$ 46.9 billion in economic damages worldwide (Guha-Sapir et al., 2011), were responsible for over 8,100 deaths, and displaced over 179 million people (CRED/OFDA, 2011).

Disasters are often described as a result of the combination of exposure to a hazard, preexisting conditions of vulnerability, and insufficient capacity to reduce or cope with the potential negative consequences. More generally, environmental change does not undermine human security in isolation from a broader range of social factors that include poverty, access to opportunities, social cohesion, and institutional effectiveness (Barnet and Adger, 2007). For example, countries with higher income and better institutions are less vulnerable to and better able to cope with natural hazards (Kahn, 2005; Ferreira and Ghimire, 2012; Ferreira et al., 2013). On the other hand, the incidence of natural disasters is increasing because of economic growth and growing exposure of population and infrastructures in disaster-prone areas, floodplains in particular (Raschky, 2008; IPCC, 2012).

## **2.6 Floods and Security: Theoretical Connections**

According to the environmental security view of conflict, degradation in natural environments creates scarcity that when combined with population growth, skewed resource distribution, and weak institutions can lead to violent conflict. This conflict is more likely to occur at a subnational level rather than between states, to be persistent and diffuse, and to affect poor societies that are less able to buffer themselves from environmental degradation and the social crises they cause (Homer-Dixon, 1994, 1998; Homer-Dixon and Blitt, 1998)

The literature on environmental security suggests different, complementary mechanisms through which extreme flood events might lead to social unrest. First, flood events can result in anger and frustration among groups losing material benefits that they once enjoyed (Grofman and Muller, 1973; Miller et al., 1977). Relative deprivation theories stress rapid changes in people's conditions such as those arising from rapid-onset floods. Floods can quickly destroy crops, cropland, forests, pastures, freshwater, and fish, leading to food shortages and spikes in market prices. Catastrophic flooding can knock down power lines, contaminate oil supplies, and destroy other infrastructure needed to deliver energy supplies resulting in energy scarcities. With rapid onset disasters, little time is available for adaptive changes, which increases the likelihood and intensity of violent conflict (Falk, 1971).

Because of immediate damage to capital and agriculture, extreme events can have large negative short-run macroeconomic impacts. For instance, the 2010 floods in Pakistan damaged 3.3 million Ha. of standing crops, more than 5,000 miles of primary and secondary roads, 400 bridges, 400 miles of railways, 11,000 schools, and 200 health facilities, and reduced Pakistan's GDP growth in that year by 2 percentage points (UNITR, 2010; Looney, 2012). In Thailand, floods in 2011 resulted in US\$ 45 billion damages (almost 14% of Thailand's GDP) and lowered GDP growth by one percentage point (Xinhua, 2011). Displacement, loss of lives, and damages to infrastructure, agriculture and crops can hurt overall economic productivity and result in an economic slowdown (Hendrix and Salehyan, 2012). During an

economic slowdown, the opportunity costs to engage in violence are lower, while the benefits from looting and engaging in violence may become attractive (DiPasquale and Glaeser, 1998). In addition, an economic slowdown may increase competition among ethnic groups to control local resources (Olzak, 1992; Brass, 2003). Following the 2010 floods in Pakistan, with the government troops concentrated in rescue and relief works in a few urban areas, Pakistani Taliban exploiting the 'political space' created by the floods, intensified their activities in several parts of the country (CBS News, 2010).

Within the current debate on how environmental factors may affect the risk of conflict, scarcity of important resources holds a prominent place. Acute scarcities, caused by reduced supply, increased demand or skewed distribution, are suggested as a significant current and future source of violent conflict (Homer-Dixon, 1999). The idea that climate change leads to violent conflict in general can be regarded as a continuation or revised version of the Malthusian concept of resource scarcity as a cause of environmental degradation, poverty, and an escalating struggle for resources (Homer-Dixon, 1994). Traditionally, the scarcity literature has primarily been concerned with 'overpopulation' and the associated 'overuse' of renewable natural resources (Homer-Dixon, 1999). With global warming and the subsequent climate security discourse, the putative impact of anthropogenic climate change on the security of societies and livelihoods has gained prominence.

Most natural disasters occur relatively abruptly (the main exception is drought), but the after-effects may linger on for a long time, causing or exacerbating scarcities caused by reduced supply, increased demand or skewed distribution, are suggested as a significant current and future source of conflict (Homer-Dixon, 1999).

Quarantelli & Dynes (1976) find that conflicts related to the allocation of blame or the distribution of resources rights tends to arise right after the flood. Resource rights refer to an enforceable authority to undertake particular actions with regards to resources (Ostrom, Elinor, 1999). Goldstone (2001) suggests that the political outcomes of disasters hinge on how they are handled; poorly managed floods in developing countries are argued to increase the risk of political unrest and conflict, while competent disaster management may actually increase the support for the government. Conflict relations always include the striving for control of scarce resources, or to influence behaviors of others in a desired direction. This means that in a conflict relationship there is always an attempt to attain or use power, or the actual attainment or application of power (Sheppard, 1954).

## **2.7 Coping and Adaptive Capacities**

Capacity is an important element in most conceptual framework of vulnerability and risk. It refers to the positive aspect of people's properties that can reduce the risk of a certain danger. Improving capacity is often identified as targets for policies and projects, based on the notion that a strengthening of the capacity will eventually lead to reduced risk. Capacity counts clearly also to reduce the impact of climate change (Sharma and Patwardhan, 2008).

Mastering is generally used to refer to ex post actions, whereas adaptation is normally associated with ex ante actions. This means that the coping capacity also refers to the ability to react to and reduce the negative effects of experienced hazards, while adaptive capacity refers to the ability to predict and transform the structure, function or organization to better survive hazards (Saldaña-Zorrilla, 2007). Presence of capacity indicates that the effects will be less extreme and / or recovery time is shorter, but high capacity to recover does not guarantee equal levels of ability to predict. In other

words, the capacity to handle not imply capacity to adapt (Birkmann, 2011a), although coping capacity is often considered to be part of adaptability (Levina and Tirpak, 2006).

## **2.8 Capacity to Anticipate Risk**

Capacity risk prevention and reduction can be understood as number of elements, measures and tools aimed at intervention in hazards and vulnerability in order to reduce existing or controlling future potential risks (Cardona et al., 2003a). This may vary from guarantees survival to the ability to secure future livelihoods (Batterbury 2001; Eriksen and Silva, 2009).

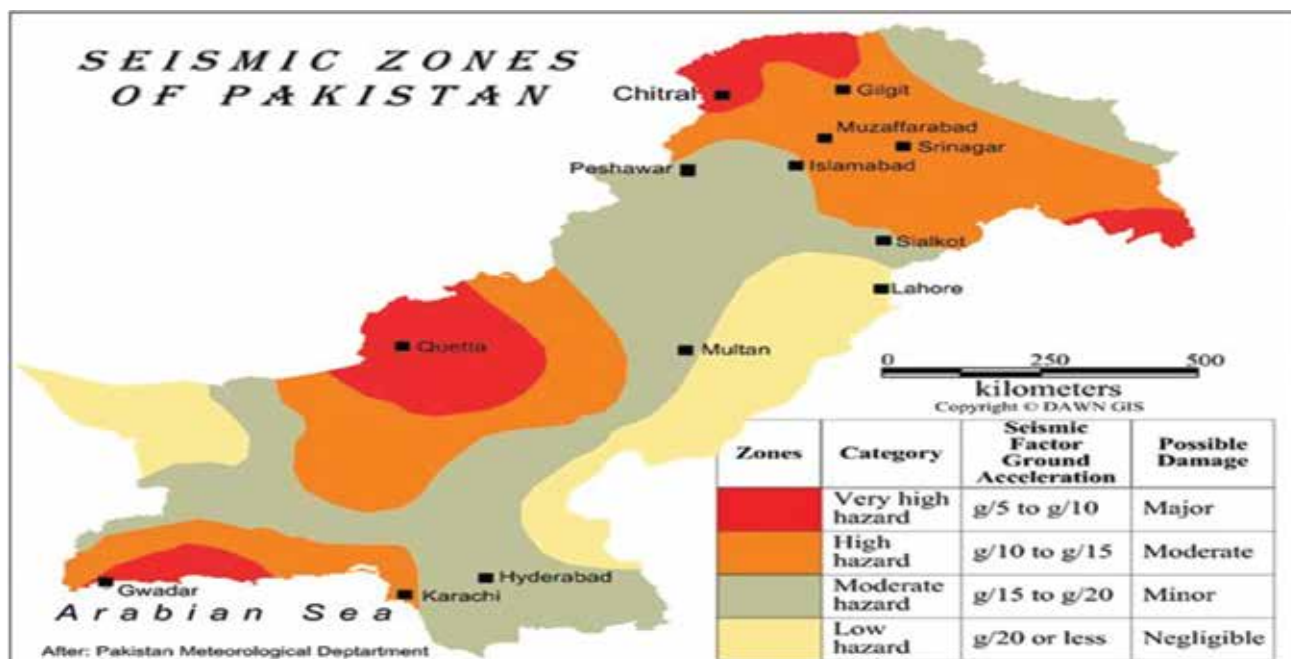
Development planning, including land use and urban planning, river basin and land management, hazard resistant building codes, and the landscape design are all activities that can reduce exposure and vulnerability to dangers and change (Cardona, 2010). The ability to carry out these effectively is a part of the capacity to reduce the risk. Other Activities include diversifying income sources; maintain social networks, and collective action to avoid a development that puts people at higher risk (Lavell, 2003).

## **2.9 Capacity to Recover and Change**

Having the ability to change is a requirement for being able to adapt Climate change. Looks customization that requires transformation means that it cannot be understood as just a set of actions that physically protect people from floods (Pelling, 2010). In conjunction with natural calamities, the possibility of change often greatest during recovery phase, when the physical infrastructure has to be rebuilt, and may be improved and behavior patterns and habits could be (Comfort et al, 1999). This is an opportunity to rethink whether crops planted which is most suited to the climate and whether it is worth rebuilding hotels near the floodplains, taking into account what other types of environmental changes can occur in the region.

## **2.10 Vulnerabilities of the People of Balakot**

Balakot was one of the worst quake-hit towns in the episode of 8 October 2005. Balakot town sits on an active fault line. The intensive geotechnical and seismic microzonation study of Balakot city and peripheral region was conducted by NESPAK and micro-seismic hazard map was prepared. The two fault systems merged here form a network of four major and twenty small fracture lines. These fractures net are very vulnerable to seismic. Therefore, the risk of earthquake in the area is very high. Based on various studies conducted in the area and looking at the future seismic activity and earthquake hazard vulnerability Balakot, the government declared Balakot site in the red zone and abandoned it for residential purposes.



**Figure 1: Seismic zones of Pakistan.**

Source: Chaudry, 2009

The river Kunhar runs through the middle of Balakot. The geomorphic analysis of river Kunhar show that it has elongated oval shape with catchment area of 2706 Sq. Km. The valley is characterized by steep slopes with a maximum altitude of 5075 m and a minimum 632 m. The elongated oval shape of the catchment area and steep slope are the indicators of flooding. River Kunhar near Balakot has relatively more active flood plain area than elsewhere in the valley. This active flood plain area is at one-meter distance and extensively used for agricultural purposes. This area is subjected to frequent flooding. The floods of 1992 and 1993 severely damaged agricultural and residential area on both sides of the river.

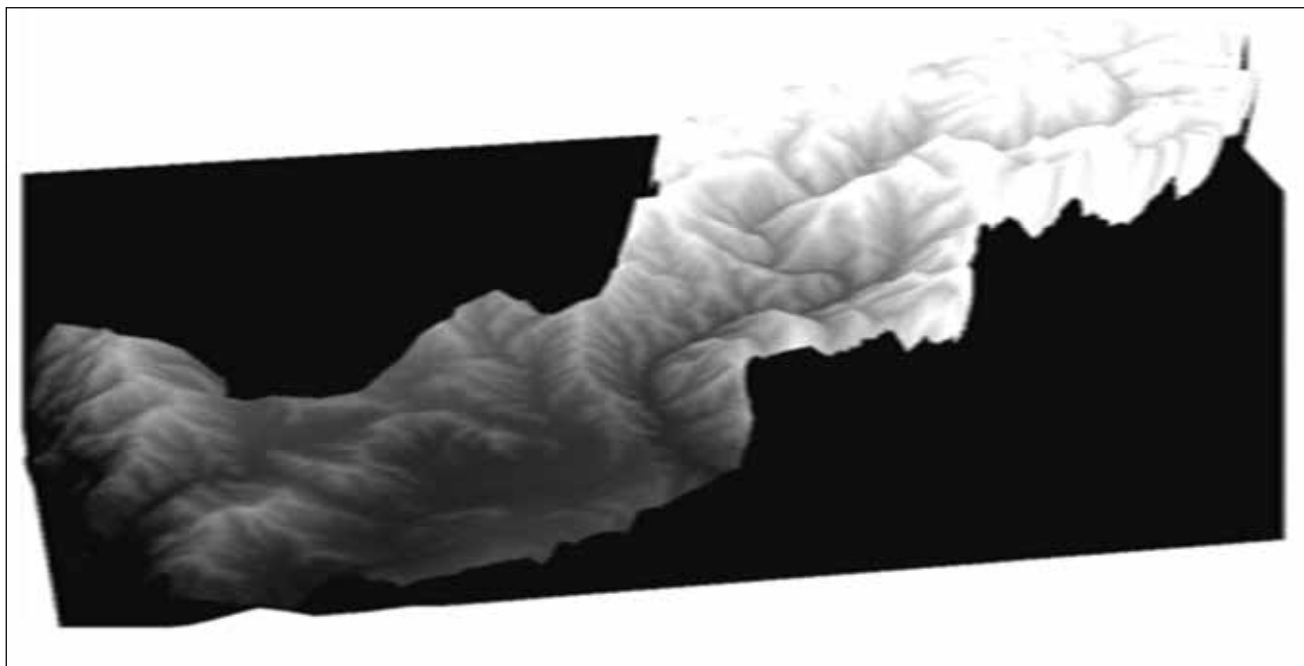


**Figure 2 : River Kunhar, Balakot (view of village Kashtara)**

Source: Study Survey 2016

Balakot lies on active fault and the surrounding region has complex geology. The eastern part especially along the fault line is highly vulnerable to landslide danger. In built up area is natural rocks or soil and drainage system less prone to

landslide hazards. Steep slopes and vertical cutting of the river, streams and roads are major factors for landslide hazards in the area, while other factors such as fault surface fractures in the northeastern part, receptive soil of gable plains in the south and moisture availability along the river and streams are other factors.



**Figure 3: Balakot digital (3d) surface model (gis-based terrain analysis of Balakot region, Mehran university research journal)**

### **2.11 Flood Vulnerability Assessments**

Vulnerability assessments carry tools and processes used to assess the extent to which a society and its natural resources to climate change that ultimately affect them. The approach recommended in much climate literature (Marshall et al. 2010) covers three main areas i.e. exposure, sensitivity and adaptability, as they collectively determine the level of sensitivity to climate change. The human dimension, which is the focus of this addendum, is collected to provide a better understanding of the social aspects of exposure, sensitivity and adaptability of the valuation community. In a social context, the following terms are defined as follows:

#### **2.11.1 Exposure**

The extent to which a society comes into contact with climatic events or specific climatic effects is called its exposure to that specific hazard. Specifically, this includes the areas of residence and resource use exposed to various climatic events and consequences. For example, the house near the shoreline has high exposure to rising sea levels. Settlement of people in the flood plain may have high exposure to flood damage.

#### **2.11.2 Sensitivity**

The extent to which a society is adversely affected by changes in climate is known as sensitivity. Sensitivity is largely determined by the relationship between individuals, households, or communities to the resources affected by climate events, and the degree of dependence on these resources. For example, if "exposed" agricultural products are the main source of food and income for a community, family or group of households, as they can have a high degree of

sensitivity. If the exposed reefs are the most important area for fishing providing income and food for a community, that community very sensitive to mass coral bleaching that results from an increase in water temperature.

### **2.11.3 Adaptive Capacity**

The potential or ability of a community to adapt to the consequences of climate change is its adaptive capability. Adaptability is complicated. It can be strongly influenced by a few key characteristics, or by a wide range of social features. For example, well-informed villages with a strong traditional leader who is able to develop good plans and make decisions that help and involve all members of society are likely to show high adaptive capacity. A household that has diversified revenue sources and supplemental livelihood options will likely have higher adaptability to the consequences of climate change than those who do not.

## CHAPTER 3

# RESEARCH METHODOLOGY

### 3.1 Research Methods and Paradigms

In this Chapter some of the key aspects of research execution will be explained in detail. These aspects or methods are not just limited to qualitative data collection and analysis, for example, participant observation and interviewing, but also include establishing research relationships with issues like selecting sites, participants, data collection and analysis. Decision about research methods depend upon specific context and issues being raised. One of the critical decision in shaping the study is designing of paradigm.

The word paradigm, according to Thomas Kuhn, refers to the assumptions that tend to be shared by researchers working in a specific field. Paradigms also include specific methodological strategies linked to these assumptions and methods. At the most abstract and general levels, examples of these paradigms are philosophical positions, such as positivism, constructivism, realism and pragmatism.

Each embodying very different ideas about reality (Patton, 2002) and providing the methods to gain knowledge from them. Specifically, paradigms relevant to the qualitative research include interpretivism, critical theory, feminism, postmodernism, and phenomenology. Established paradigm allows the study coherence and well developed approach. However, it is possible to combine aspects of different paradigms based on the compatibility among them (Schram, 2003).

The study will use the interpretivist/constructivist paradigm. This approach to research has the intention of understanding "the world of human experience" (Cohen & Manion, 1994), suggesting that "reality is socially constructed" (Mertens, 2005). The interpretivist /constructivist researcher tends to rely upon the "participants' views of the situation being studied" (Creswell, 2003) and recognizes the impact on the research of their own background and experiences.

### 3.2 Research Methodology

Research methodology is a systematic way to solve a research problem (Industrial Research Institute, 2010). Research in common words refers to a search for knowledge to get specific information on a specific topic. In fact, research is an art of scientific investigation (Kothari 1990). Redman and Mory (1923) define research as a "systematized effort to gain new knowledge." It is a way to systematically solve the research problem.

After reviewing the existing literature on vulnerabilities of people in the context of flood induced conflicts on agricultural lands on the flood plain. It has been clearly known that most of the researchers had used positivist



approach to analyze the quantitative data. For data collection in this case of study, the constructivist approach will be used to analyze the interviews and personal observations. As it is necessary to observe the individual experiences and knowledge.

### **3.3 Reliability and Validity of Research**

The principles of reliability and validity are important parts of the scientific method. When we talk about reliability we mean consistency or repeatability of results. Validity of a study means that the study is capable to measure for which it has been designed. According to Patton (2001), validity and reliability are two factors, which any qualitative researcher should be concerned about while designing a study, analyzing results and judging the quality of the study. However, the credibility in quantitative research depends upon the instrument construction while in qualitative research the researcher is the instrument (Patton, 2001). Hence validity of the research is referring towards the researcher abilities in collecting and analyzing the data. The concept of a good quality research when reliability is a concept, evaluate quality in quantitative study with a “purpose of explaining” while quality concept in qualitative study has the purpose of “generating understanding” (Stenbacka, 2001). To ensure reliability in qualitative research, examination of trustworthiness is essential (Seale, 1999).

In the present study care has been taken to ensure reliability and validity by giving a detailed account of all the processes involved in the research. Constructivism paradigm values multiple realities that people have in their minds. Therefore, to acquire valid, reliable multiple and diverse realities, multiple methods of search or gathering data are in order. Engaging multiple methods, such as, personal observation, interviews and recordings will lead to more valid, reliable and diverse construction of realities. The study has construct the reality and by engaging all such methods in collecting and analyzing the data.

### **3.4 How Biases were Removed in The Study**

It is not possible to conduct a completely unbiased research but what one can do to ensure accuracy of a study is to clearly become aware of one’s own biases. In this study, the researcher took certain measures to deal with his own biases. For instance, the respondents who were not directly been affected by the floods were contacted just for taking preliminary interviews (for improving the interview guide) but their information was not included in the actual study. Similarly, simple and clear questions were asked from the respondents rather than making them complicated to understand. If the respondents were unable to understand the questions, they were made simpler at the moment. Moreover, the questions were kept neutral to reduce question bias and question order bias was also reduced. For instance, general questions were asked before specific questions.

### **3.5 Ensure Accuracy in Research**

Two important threats to the validity of qualitative conclusions are the selection of data that is appropriate to the researcher’s existing theory or preconceptions and the selection of data that stand out the research. Such situation in the research refers towards the biasedness (Miles and Huberman, 1994). Qualitative research is concerned with the understanding of how particular researcher values and expectations influence on research conducted to eliminate biases.



Another problem in conducting the qualitative research is related with the influence or reactivity of the researcher on the setting during the data collection. Most importantly during interviews this thing is well understood in mind that not only minimize the reactivity but also to understand the situations accordingly.

### 3.6 Study Area

The study area is Balakot and is located about thirty-eight kilometers north-east of the city of Mansehra, in Khyber Pakhtunkhwa Province. It has an average elevation of 971 meters (3188 feet). It is a historical town, a famous tourist destination of the region and the gateway to Kaghan valley of the Khyber Pakhtunkhwa Province of Pakistan. The river Kunhar, originating from Lulusar lake, runs through the city and merges with Jhelum. It was one of the towns which was most damaged in the flash floods of 1992 and 1993 severely destroyed the area. Villages were badly affected and landslides cut off thousands of people from Balakot. People of Balakot are susceptible to seasonal floods, land sliding and earthquakes because Balakot is geographically situated on the fault line. The geomorphic analysis of river Kunhar show that it has elongated oval shape with catchment area of 2706 Sq. Km. The valley is characterized by steep slopes with a maximum altitude of 5075m and a minimum 632m. The elongated oval shape of the catchment area and steep slope are the indicators of flooding. River Kunhar near Balakot is relatively more active flood plain area than elsewhere in the valley. This active flood plain area is at one-meter height and extensively used for agricultural purposes. This area is subjected to frequent flooding. According to Pakistan Floods/Rains report 2012 series 4, Northern areas of Pakistan faced floods and tormenting rains during the three consecutive monsoons from 2010 to 2012 and this problem is frequent and continuous.

The respondents have been taken from the area of Balakot, namely village Kashtara. The main reason for selecting these areas was due to its location on active flood plain. A location map of village Kashtara is as attached. In figure 5 it can be clearly observed that the huge agricultural part of study area is located on the active flood plain. River Kunhar affects the area from one side and Bagaa nullah from the other.



Figure 5: River Kunhar and Bagaa nullah

### 3.7 Sampling Technique and Sample Size

Sampling may be defined as the selection of some part of an aggregate or totality on the basis of which a judgment or inference about the aggregate or totality is made (Kothari 1990). Sample should be truly representative of population characteristics without any bias so that it may result in valid and reliable conclusion (Kothari 1990). Stratified sampling technique was used in the present study. The strata were divided into four various groups depending upon their trade and living statuses. The rationale behind makeup of these strata lies in the fact that for effective assessment of social vulnerability and impacts of flood, we need to target various groups of people who are affiliated with agricultural land resources or who live near/on flood plain. Secondly, an inclusive approach is useful when we need to understand the phenomenon under study from different scenarios. Therefore, stratified sampling technique was used to build the strata. Respondents were selected and divided into four strata including equal proportion of landlords, tenants, sharecroppers and local men and women.

The sample size for the study was forty interviews were taken and divided into four strata to get detailed interviews from the areas. These interviews were taken from each of area, including both males and females based on the availability during the time of interviews.

The total sample size for the study was 40 interviews, which was further divided into 4 equal strata i.e. 10 respondents per strata.

Respondents/Strata of the Study	Number of Respondents
Landlords	10
Sharecroppers	10
Tenants	10
General Public – men and women	10

### 3.8 Unit of Analysis

A researcher Jackson pointed out that if we consider households as complete units of analysis, then the internal workings of the households are generally ignored. Therefore, for the present study, the households are not used as complete unit of analysis, so individuals from different household are considered as unit of analysis.

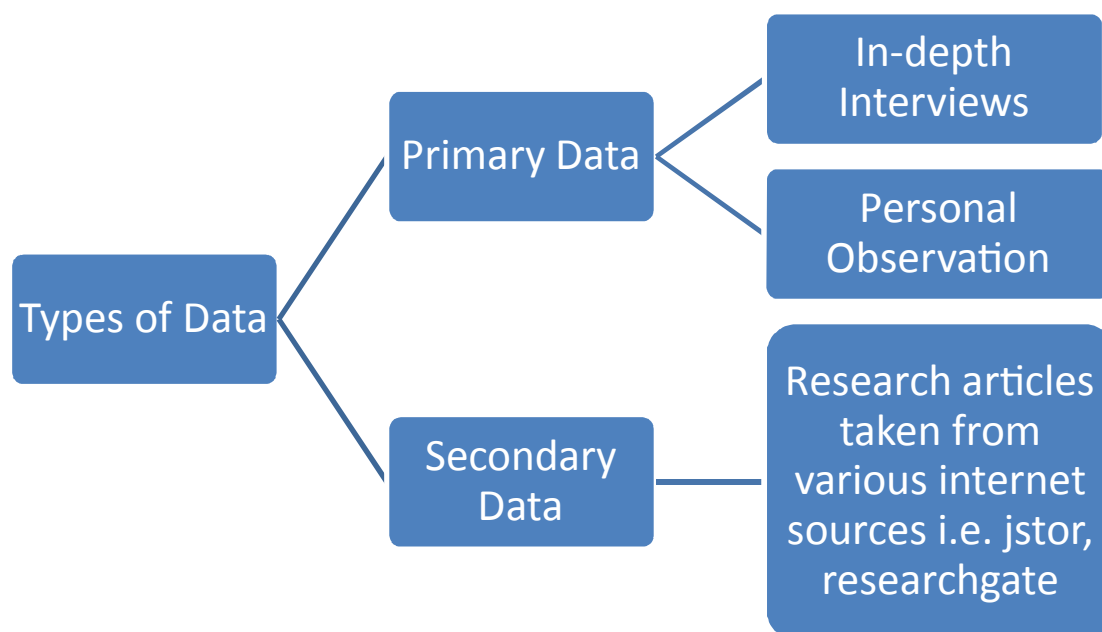
### 3.9 About Strata and Respondents of the Study

The study has considered the landlords, tenants, sharecroppers and general public including both sexes as the unit of analysis. Because, the main focus of the study was to assess flood induced conflicts on the agricultural land resources.

### 3.10 Research Instruments Used in the Study

In order to achieve the objective of the research, pragmatic research methodology has been used to analyze the data collected from both primary and secondary sources. The primary data has been collected from the respondents

through personal observations and structured interviews, while, secondary data was collected through the published research reports and articles relevant to the study.



### 3.11 Structured Interviews

The study has used structured interview method to get information from individuals. Individuals were mostly related to the agriculture. The method of collecting information through personal interviews is usually carried out in a structured way. As such we call the interviews as *structured interviews*. Such type of interviews involves the use of a set of predetermined questions and of highly standardized techniques of recording (Kothari 1990).

This method was used for several reasons. Firstly, to explore how floods affect the land resources and increase social vulnerability of the target population. Secondly, the objectives of the study were based upon analyzing the communal conflicts on land resource management and the coping strategies of local community in reduction of these conflicts and its continuous degradation.

### 3.12 About the Interview Guide

In order to get information about people and problem (2 Ps), structured interview guide was design. It was mostly containing open ended questions. The interview guide was designed in order to cover all the aspects of the study like, demography, sensitivity i.e. exposure to hazard, flood and their impact on social life, damages caused by floods, flood induced conflicts, flood control measures and adaptive capacity of the habitats of study area. However, it was finalized after taking few interviews from people who are not included in this case of study. The guide has been redesigned after pretesting it in taking five interviews. Some of the irrelevant and repeated questions were eliminated and most relevant questions were added. This exercise was done to minimize baseness and ensure validity of the study.

### 3.13 Personal Observations

Personal Observation becomes a scientific tool and the method of data collection for the researcher. When it serves as a formulated research purpose, it is systematically planned and recorded and is subjected to check and control the

validity and reliability. Under the observation method, the information is sought by way of investigator's own direct observation without asking from the respondent (Kothari 1990). Along with the interviews personal observations were also gathered through non-verbal expressions and attitudes of respondents.

### **3.14 Secondary Data**

Secondary data either is published data or unpublished data. Usually published data is available in various publications of the central, local governments, various publications of foreign governments, international bodies and their subsidiary organizations, technical and trade journals, books, magazines and newspapers, reports and publications of various associations on sociology, etc. in different fields and public records and statistics, historical documents, and other sources of published information. The sources of unpublished data are many; they may be found in diaries, letters, unpublished biographies and autobiographies and also may be available with scholars and research workers, and other public/ private individuals and organizations. The literature and secondary data linked with the present study has been collected through the reports and published articles from online websites like J-store, Academia, etc.

### **3.15 Quality of Data**

In order to ensure the quality of data the researcher has taken different measures during data collection. To build a rapport with the interviewee, the enumerator approached most of the interviewees with the help of reference persons, usually friends or relatives of the participants. This helped to build a relationship of trust with the interviewees. Secondly, the interview guide was designed in such a way that the opening questions were quite general, which also helped to build a good rapport between the researcher and the research participants. Enumerator initiated conversations with the respondents other than asking questions, to get them in confidence and to fill the gap. This exercise had worked in getting detailed information about the sensitivity of people in the context of flood induced conflicts and the role of local individuals and the representatives of government line agencies in this regard. Before taking the interviews the researcher had visited the study area just to observe the respondents' behaviors and attitudes that helped a lot while conducting the research study.

### **3.16 Respondents' Behavior During Interviews**

Many respondents were giving data in detail about the study and had sacrificed their time for the enumerator but some respondents were not taking it seriously and few were giving with over detailing. The unwanted data was not included in analysis of the data. Only the relevant data has been recorded based on personal observations about the respondent and the setting. Some of the respondents were hesitating and ignoring to provide any data about the conflicts. However, some respondents were much cooperative and candid in providing the data.

### **3.17 Data Analysis**

A qualitative content analysis research technique was used to make replicable and valid inferences by interpreting and coding textual material. By systematically evaluating texts (e.g., documents, oral communication, and graphics), qualitative data can be converted into quantitative data.

The quantitative data was analyzed through MS Excel spreadsheets and Statistical Package for the Social Science (SPSS). The descriptive statistical tools such as means, standard deviations and percentages were used to condense and summarize data and to present it in the forms of tables and diagrams.

### **3.18 Time Taken for Gathering Data**

The interview guide was prepared in the month of July, 2017 and the researcher started to gather research data from the start of August, and finally it got ended in the same month. Therefore, it took approximately 1 month in the whole data collection process.

### **3.19 Limitations of the Study**

The accessibility of data remains a serious concern, as people were generally reluctant to talk about the conflicts. Some of them were not ready to give that much time for detailed information. They got curious and did not reveal sensitive information about the role of police and land revenue department in the resolution and control of conflicts on land resources. But indirectly questions helped the enumerator to get real information. The exercise took much time in gathering data and only six to seven interviews were taken a day.

## CHAPTER 4

# RESULTS AND DISCUSSIONS

In this chapter, the empirical findings from the fieldwork have been gathered and presented underneath distinct themes exhibiting the results and discussion. The data has been reviewed and confirmed through existing literature available on the study and it has also been cross checked through personal observation by the researcher, himself. Basically this chapter is divided into six sections, focusing on demography, vulnerability, exposure, sensitivity, conflict and adaptive capability of the people of the study area.

### SECTION - I: DEMOGRAPHY

#### 4.1 Average and Standard Deviation of Demographic Traits of the Respondents (Table 1)

Respondents were having enough information about the natural calamities of their area so the age limit (class) of the respondents of the study area ranged from 25 to 66 with the Mean  $\pm$  Standard deviation of  $45.3 \pm 10.3$ . The schooling years of the respondents ranged from 0 to 16 with the Mean  $\pm$  Standard Deviation of  $7 \pm 6.4$  while, the average household size ranged from 3 to 20 with the Mean  $\pm$  Standard Deviation of  $8.4 \pm 4.5$ .

The elevation was measured by using GPS device to get appropriate idea about the steep slopes of the study area which make it more susceptible to frequent flooding. Elevation of Kashtara ranged from 824 to 901 meters with the Mean  $\pm$  Standard Deviation of  $850.6 \pm 28$ .

**Table 1: Average and standard deviation of demographic traits of the respondents**

Demographic Traits	Range	Mean $\pm$ Standard Deviation
Age	25 – 66	$45.3 \pm 10.3$
Years of Education	0 - 16	$7 \pm 6.4$
No. of household members	3 - 20	$8.4 \pm 4.5$
Elevation (meters)	824 - 901	$850.6 \pm 28$

## 4.2 Demographic Profile of the Communities

Statistics of target population in terms of number of respondents, age and education is depicted in table 2. The youngest respondent was 25 years old and the oldest was 66 years. Majority of the respondents fall under 36 to 45 years of age cadre. To get better idea about the problem prevalence, interviews were being conducted from both sexes, 67 percent male respondents were interviewed and 33 percent female respondents were interviewed.

Education is considered as an important factor as an awareness and adaptation because educated people can better understand and implement the mitigation practices regarding hazards or disasters. Majority of the respondents were having 5 years of education i.e. till primary level. It was observed that the study area was backward and people had less job opportunities in the area. Most of the respondents interviewed were affiliated with agriculture.

**Table 2: Demographic profile of the communities**

<b>Classes</b>	<b>Kashtara</b>	
<b>Age</b>	<b>Frequency</b>	<b>Percentage</b>
25 – 35	5	12.5
36 – 45	20	50
46 – 55	7	17.5
56 – 65	7	17.5
66 – 75	1	2.5
<b>Total</b>	<b>40</b>	<b>100%</b>
<b>Education</b>	<b>Frequency</b>	<b>Percentage</b>
0 – 5	18	45
06 – 10	16	40
11 – 16	6	15
<b>Total</b>	<b>40</b>	<b>100%</b>

## SECTION II– VULNERABILITY

The vulnerability is a function of the nature, size and frequency of climate variation which a system is exposed, its sensitivity, and its adaptive capacity. Also defined as a set of specific circumstances which adversely affects the community's ability to prevent, mitigate, prepare for or respond to a threat (Lundy and James 2009). More specifically, in reference to floods, vulnerability can only be defined as being prone to floods with inadequate coping skills to overcome its consequences. Initially vulnerability was defined as a threat or limiting factor for a society's ability to absorb and recover from a negative dangerous event (Gabor and Griffith 1980; Timmerman 1981; Kates 1985; Bogard

1989). Later it was approached in terms of the extent to which a society or its people are exposed to risk elements (Petak and Atkisson 1982).

### Definition of Vulnerability According to the Respondents

The respondents were asked about their perception about the concept of vulnerability, (Fig XX) 67.5 % respondents said that according to our understanding, vulnerability is moon soon rain which eventually causes floods. It was observed that most of the people were so helpless in the context of flood and it's after effects. The remaining respondents said that floods and earthquakes is vulnerability and we find so much difficulty to cope up with them and their after affects. It was observed that this perception of respondents was directly linked to their physical vulnerability as on average 38% people of the study area were having average of 20 kanals agricultural land and property on the active flood plain area which in fact made them more vulnerable to flood induced destructions and eventually the conflicts.

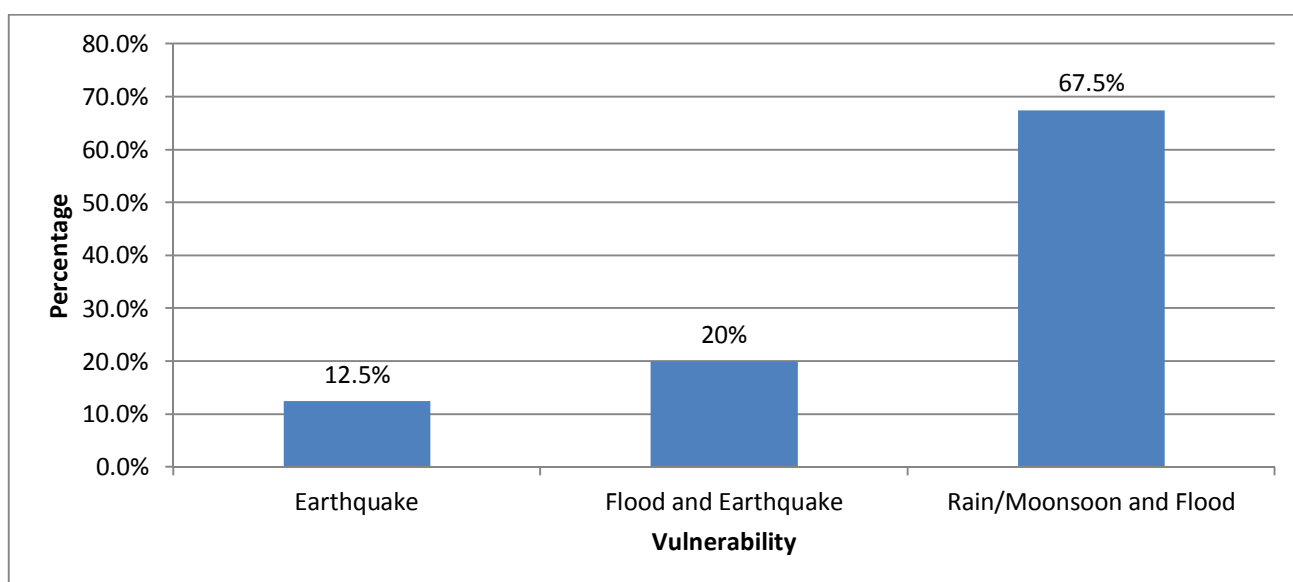


Figure 6: Vulnerability to different disasters

### 4.3 Extent of Damage Due to Floods and other Calamities

Balakot lies on active fault line and the surrounding region has complex geology. The eastern part especially along the fault line is highly vulnerable to landslide danger. In built up area is natural rocks or soil and drainage system less prone to landslide hazards. Steep slopes and vertical cutting of the river, streams and roads are major factors for landslide hazards in the area, while other factors such as fault surface fractures in the northeastern part, receptive soil of gable plains in the south and moisture availability along the river and streams are other factors.

The river Kunhar runs through the middle of Balakot. The geomorphic analysis of river Kunhar show that it has elongated oval shape with catchment area of 2706 Sq. Km. The valley is characterized by steep slopes with a maximum altitude of 5075 m and a minimum 632 m. The elongated oval shape of the catchment area and steep slope are the indicators of flooding. River Kunhar near Balakot has relatively more active flood plain area than elsewhere in the valley. This active flood plain area is at one-meter distance and extensively used for agricultural purposes. This area is



subjected to frequent flooding. The floods of 1992 and 1993 severely damaged agricultural and residential area on both sides of the river.

The region is vulnerable for many types of natural disasters. In spite of being susceptible to earthquake and landslide, the community of study area was also vulnerable to seasonal and flashfloods. Many examples of flooding in the area are still there.

A 65 years old respondent who was also a member of jirga told us that on October 8, 2005 the earthquake that hit Northern Pakistan caused widespread destructions and killing people. That devastating disaster severely injuring many more, leaving millions without shelter. The affected areas of Northern Pakistan suffered extensive structural and economic damage, with vulnerable groups in this mountainous region bearing the brunt of the disaster. The devastation was spread over thousands of square kilometers to treacherous Himalayan terrain. Hundreds of post-quake tremors and constant landslides multiplied the shock and trauma, while the onset of winter threatened the lives of the survivors. This was without question the worst natural calamity in Pakistan history; recovering from it is going to cost billions of dollars, but different communities who were badly affected did not lose hope and fought against all odds over a period of almost 10 years managed to come back to normal life.

#### **4.3.1 Damage**

The monetary value of fully or partially destroyed assets, equities and real estate is considered as damage. It is basically assumed that the assets will be repaired or replaced to the same state - in quantity and quality - before the disaster, i.e. valued at agreed replacement (as opposed to reconstruction) costs. The assessment should consider the degree of damage, i.e. whether an asset can be rehabilitated or repaired, or has been completely destroyed (R. Jovel, 2007).

##### **4.3.1.1 Damages Caused to Humans**

Damages caused to human life at households' level due to floods was 27.5 percent. Many of the households from target village were displaced from their actual location that had number of injured people with them.

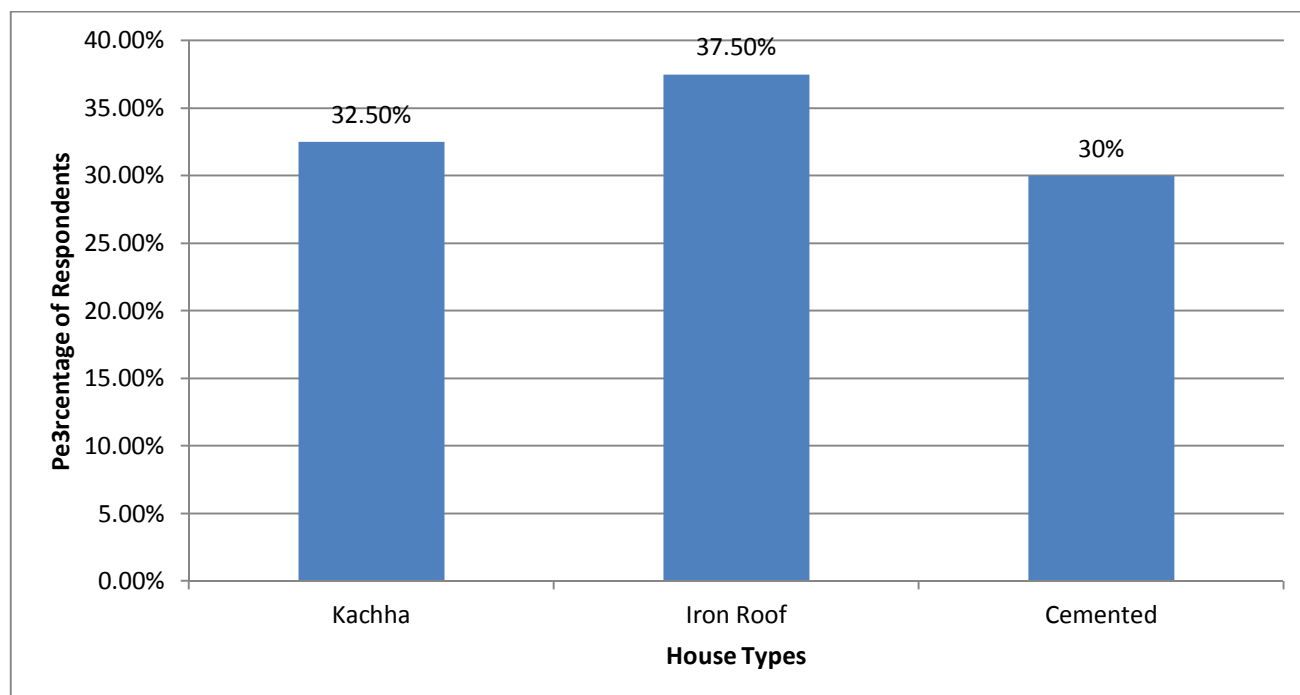
##### **4.3.1.2 Damages Caused to Residents**

The basic reasons for humongous magnitude of destruction in the study area were;

1. Poverty
2. Lack of proper building codes
3. Illiteracy/Lack of awareness
4. Absence of regulatory authorities regarding planning and development

The people of the study area were having less knowledge regarding the proper building codes. Figure 7 shows that they had mix of kachha, iron roof and cemented houses but mostly were having iron roof houses. Damage caused to houses is dependent on the way it is constructed, and this factor can increase or decrease the vulnerability to human loss. A school teacher told us that in our area most of the people do not have any knowledge about the building codes or

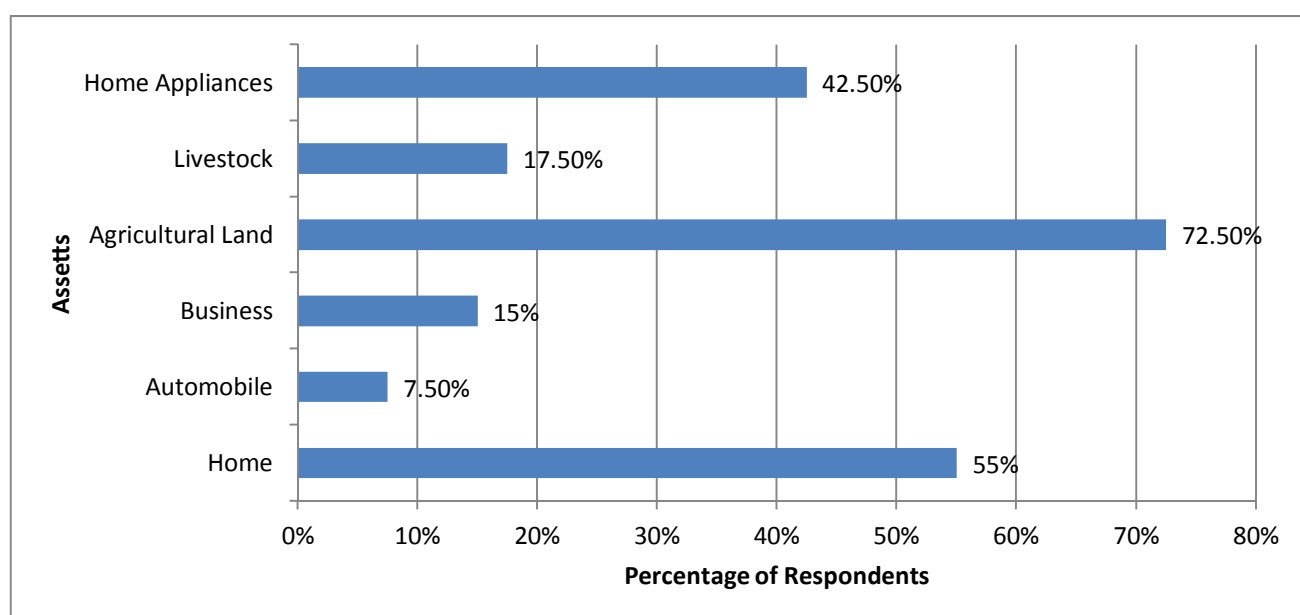
prevention technique. Because of poverty and lack of education people built their accommodations according to their economic power, moreover, no one plans for the future and sustainability.



**Figure 7: Types of house of respondents**

#### 4.3.1.4 Damages Caused to Assets

Most of the respondents were of the view that no one was safe from the damages of floods as the whole community lives on active flood plain. The Graph (Figure 8) illustrates the extent of damages to assets due to floods. In the study area significant damages to assets were reported. It was observed that Agricultural lands, houses and home appliances of respondents were affected severely by the floods. Business, livestock and automobile/motorbike got minor damages.



**Figure 8: Damages caused to assets (percentage of respondents)**

#### **4.4 Respondents who were Forced to Leave Their Houses Due to Floods**

In the disaster prone areas, disasters sometimes force the habitats of area to leave their houses which ultimately increases their susceptibility to many other kind of risks. The study shows that 80% respondents left their houses in disastrous situations to save their lives from the negative impacts of floods. These floods affected their assets badly.

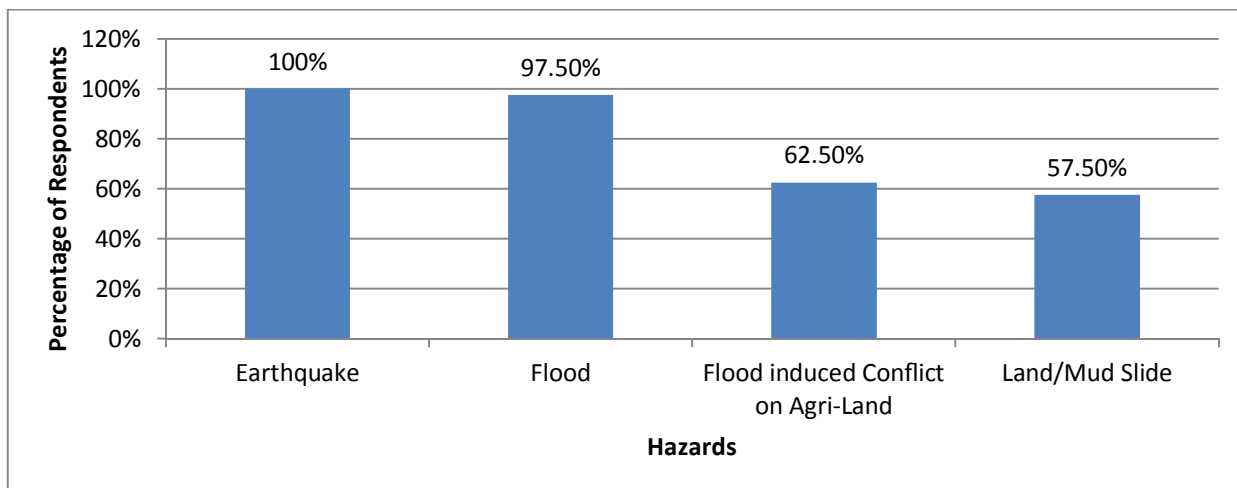
### **SECTION III – EXPOSURE**

The extent to which a society comes into contact with climatic events or specific climatic effects is called its exposure to that specific hazard. Specifically, this includes the areas of residence and resource use exposed to various climatic events and consequences. For example, the house near the shoreline has high exposure to rising sea levels. Settlement of people in the flood plain may have high exposure to flood damage.

#### **4.5 Exposure to Hazards**

Hazard in this case can be defined as an extreme geophysical event that poses a potential threat to cause a disaster (Alexander 2000). The severity of the impacts of extreme and non-extreme weather and climate events depends strongly on the level of vulnerability and exposure to these events. Trends in vulnerability and exposure are major drivers of changes in disaster risk and of impacts when risk is realized. Understanding the multi-faceted nature of vulnerability and exposure is a prerequisite for determining how weather and climate events contribute to the occurrence of disasters, and for designing and implementing effective adaptation and disaster risk management strategies.

It was observed that 100% respondents were exposed to hazards like earthquakes because Balakot is located on fault line and is considered as a red zone area. The elongated oval shape of the catchment area and steep slope are the indicators of flooding so 97.5% respondents were exposed to the seasonal and flash floods and 62.5% respondents were eventually exposed to flood induced conflicts on agricultural lands. Percentage of respondents exposed to climate related land or mud slide was 57.5%. It was found that mostly people were exposed to different types of hazards and dangers. It was observed that people of the study area were highly exposed to floods, earthquakes and land/mud slides and were also having significant exposure to flood induced conflicts on agricultural lands.

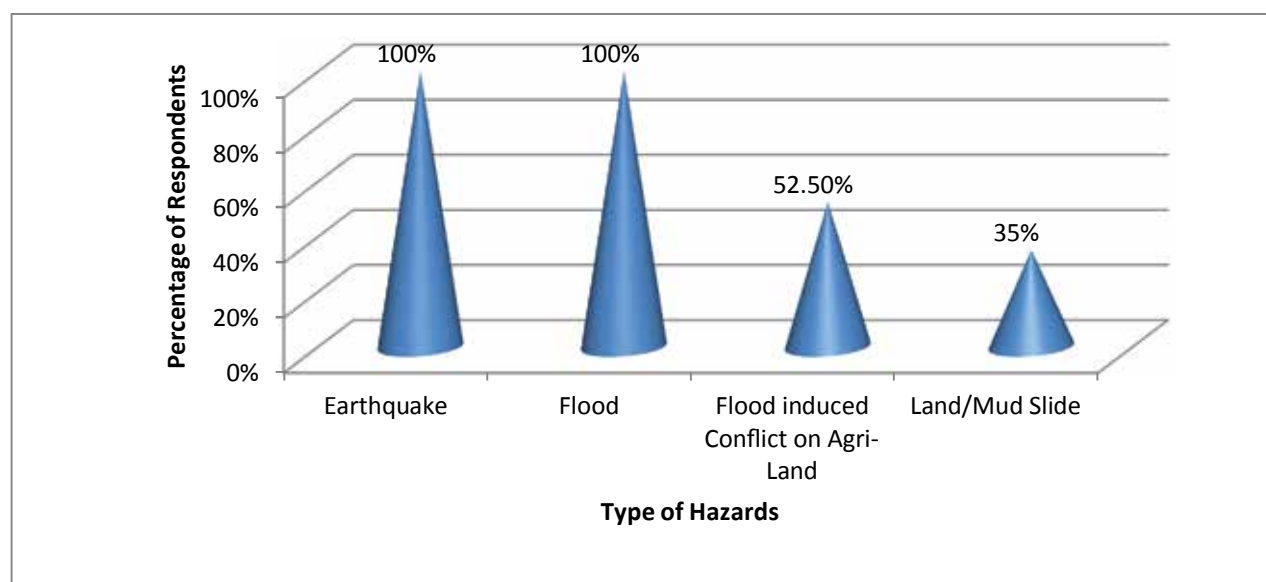


**Figure 9: Percentage of respondents who were having exposure to hazards**

#### **Hazards Experience of Households for the Past 30 Years**

Nel and Righarts, (2008) observed that climate change is expected to increase the frequency and severity of natural hazards such as floods, droughts, heat waves, storms and tropical cyclones. These hazards can become natural disasters with profound environmental, political, and social consequences.

The graph (Figure 10) delineates the percentage of respondents who had experienced above discussed hazards at their household level for the past 30 years. It was found that 100% respondents experienced the floods and earthquakes weather they were seasonal or flash floods and right after a hit of flood 52.5% respondents experienced flood induced conflicts on agricultural lands. 35% respondents also experienced Land/Mud slide.



**Figure 10: Hazards experience of households for the past 30 years (percentage)**

#### **4.5.1 Extent of Exposure to Hazards**

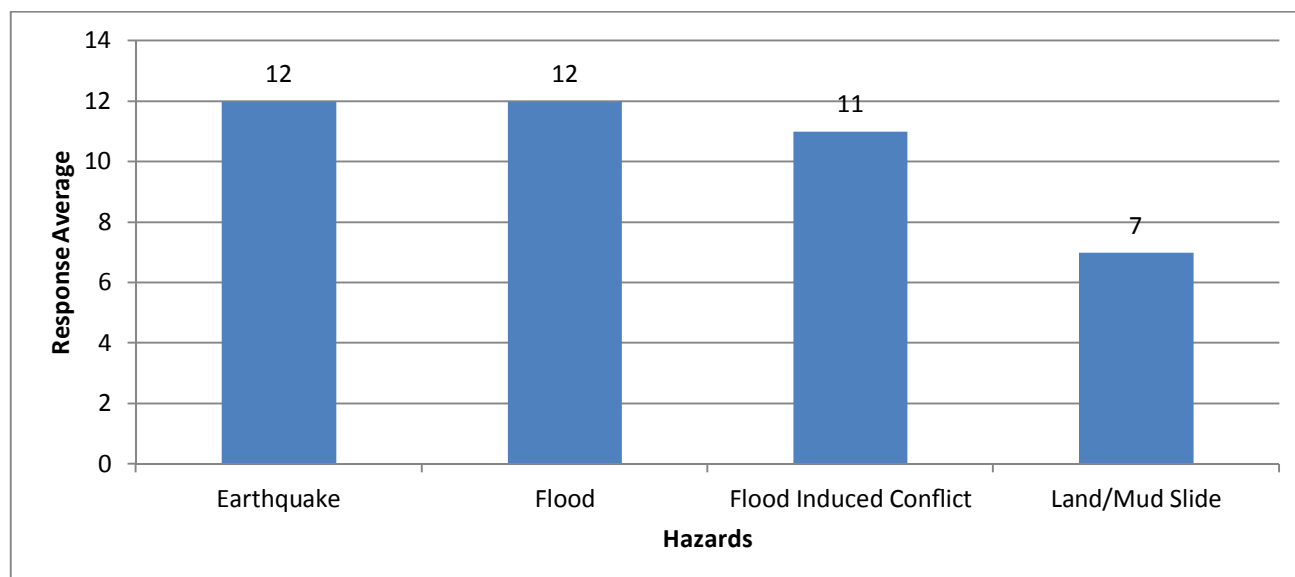
### **SECTION IV – SENSITIVITY**

The extent to which a society is adversely affected by changes in climate is known as sensitivity. Sensitivity is largely determined by the relationship between individuals, households, or communities to the resources affected by climate

events, and the degree of dependence on these resources. For example, if "exposed" agricultural products are the main source of food and income for a community, family or group of households, as they can have a high degree of sensitivity. If the exposed reefs are the most important area for fishing providing income and food for a community, that community very sensitive to mass coral bleaching that results from an increase in water temperature.

#### 4.6 Extent of Vulnerability to Natural Disasters

The graph (Figure 11) represents the extent of vulnerability of the people of study area towards natural disasters and bad events. The questions were mainly focused on the frequency of natural hazards, their severity, difficulty to cope, and their negative impact of that disaster on their households. The respondents were given a scale of 1 - 12 to rate the frequency of natural hazards, their severity, difficulty to cope, and their negative impact of that disaster on their households. It was found that the people of village Kashtara rated the scale for earthquake and flood as 12 each respectively and they ranked the scale for flood induced conflicts on the agricultural lands and properties as 11. Issues relating land or mud sliding were found less severe. It was observed that mostly people find difficulties in coping the natural disaster or bad events and they also put negative impact on the habitats of the study area.



**Figure 11: Extent of vulnerability to natural disasters**

**Note: Respondents were asked to Rank Between 1 to 12 the Frequency, Severity, Negative Impact of Disasters on their Households and Difficulty in Coping with Disasters.**

All interviews were audio taped and transcribed. Transcriptions of the interviews were analysed using the constant comparative method (Glaser, 1976, 1993; Glaser and Strauss, 1967)

Respondents were asked a few questions regarding their sensitivity to the floods focusing the questions regarding frequency of flood and its effect on agricultural land resource and the interventions of Government Line Agencies regarding the solution of this issue.

Most of the respondents were of the view that in almost every moon soon season, the flood emerges from river Kunhar from one side and Bagaa nala from the other side, which destroys our agricultural land and also sometimes our residential area. River Kunhar comes from the north of Balakot our crops are affected badly even in low scale floods. It

was found that most of the habitats living in the area were having property on the flood plain and were so susceptible to the seasonal and flash floods. In this regard Government line agency installed only one retaining wall and some spurs to prevent the properties of people but according to the respondents only one retaining wall was insufficient to cover the area. One 55 years old respondent said that the area which is susceptible to seasonal floods is almost four kilometers long and one retaining wall cannot stop the huge amount of destructive water. So the interventions of Government Line Agencies in this context were found unsatisfactory.

#### 4.7 Community's Dependence on Resources

The table 5, delineates the percentage of community's dependence on the resources and the percentage of it as household use and for income generation purpose. Study shows that in village Kashtara, 50% people use agriculture as house hold use and among them 20% also use it as income generation purposes. Livestock for house hold and income generation was used as 27% and 20% respectively.

It was observed that most of the people were dependent on forest wood for cooking and heating purposes while others were using Liquid Petroleum Gas(LPG) gas for the same purpose because there is an extreme weather condition in winters in the study area. This was also a big reason for deforestation in the area which eventually triggers weather extremes

**Table 3: Percentage of community's dependence on resources**

Resource Name	Household Use f (%)	Income Generation f (%)
Agriculture	20 (50)	8 (20)
Livestock	11 (27)	8 (20)
Farming	6 (15)	6 (15)

#### 4.8 Agriculture

The agriculture sector continues to be an essential component of Pakistan's economy. It currently contributes 21 percent to GDP. Agriculture generates productive employment opportunities for 45 percent of the country's labor force and 60 percent of the rural population depends upon this sector for its livelihood. It has a vital role in ensuring food security, generating overall economic growth, reducing poverty and the transforming towards industrialization. The present government is determined to improve the quality of life of the people and to banish hunger and malnutrition from the country by making agriculture an efficient, productive and profitable sector of the economy.

Agriculture was considered as an important factor as a food security in the study area, as illustrated in table 6, Almost 50 percent of population was producing wheat and maize as a major crop mostly for house hold use. A very few people also sale their crops to get cash income.

**Table 4 : Percentage of respondents who cultivate crops**

Crop Name	Frequency (f)	Percentage
Wheat	20	50%
Maize	20	50%

#### **SECTION –V FLOOD INDUCED CONFLICT ON AGRICULTURAL LAND RESOURCE**

Within the current debate on how environmental factors may affect the risk of conflict, scarcity of important resources holds a prominent place. Acute scarcities, caused by reduced supply, increased demand or skewed distribution, are suggested as a significant current and future source of violent conflict (Homer-Dixon, 1999). The idea that climate change leads to violent conflict in general can be regarded as a continuation or revised version of the Malthusian concept of resource scarcity as a cause of environmental degradation, poverty, and an escalating struggle for resources (Homer-Dixon, 1994). Traditionally, the scarcity literature has primarily been concerned with 'overpopulation' and the associated 'overuse' of renewable natural resources (Homer-Dixon, 1999). With global warming and the subsequent climate security discourse, the putative impact of anthropogenic climate change on the security of societies and livelihoods has gained prominence. (Homer-Dixon, Thomas (1994) Environmental scarcities and violent conflict: Evidence from cases. *International Security* 19(1): 5-40.)

Most natural disasters occur relatively abruptly (the main exception is drought), but the after-effects may linger on for a long time, causing or exacerbating scarcities caused by reduced supply, increased demand or skewed distribution, are suggested as a significant current and future source of conflict (Homer-Dixon, 1999).

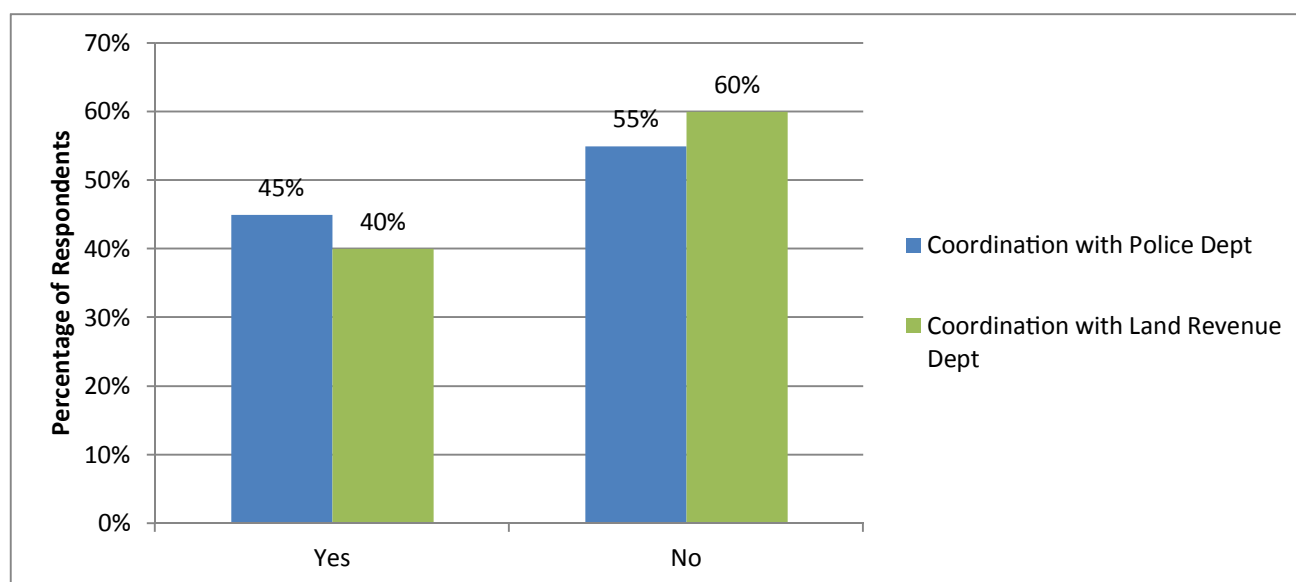
Quarantelli & Dynes (1976) find that conflicts related to the allocation of blame or the distribution of resources rights tends to arise right after the flood. Resource rights refer to an enforceable authority to undertake particular actions with regards to resources (Ostrom, Elinor, 1999).

Study shows that 65% respondents experienced flooding on their agricultural lands or properties which eventually caused loss in the shape of crops destruction or land runoff.

Respondents were asked a few questions regarding the types of conflicts which generally arose on agricultural lands after floods and how they resolve them because it's a continuous process and also the role of land revenue department in this context.

It was noted that right after the flood the conflicts in area were generally emerged on the agricultural lands. According to the respondents the flood enters the agricultural lands and disturbs its boundary settings and this triggers emergence of conflicts among the land owners and also among the tenants or sharecroppers. The poor land owners are the most vulnerable in these conflicts. It's the prime responsibility of land revenue department to take action in this context and work actively but due to their negligence, community manage the disputes on agriculture lands by the help of their local Jirga members and the community elders by mutual consensus. They also help out people in the redistribution of Agricultural- land whose bounders are disturbed by the flood. Some people also had coordination with

the police and land revenue department but because of the delays and lengthy processes people prefer to address their problem by themselves but if some big issue comes across, people contact them and get their services. The graph (figure 12) shows that approximately 42.5% people were having coordination with the Police and land revenue department in the context of flood induced conflicts on agricultural land resources. Some elderly people suggested that land revenue department should pay attention on these kinds of conflicts which are basically due to floods.



**Figure 12: Coordination**

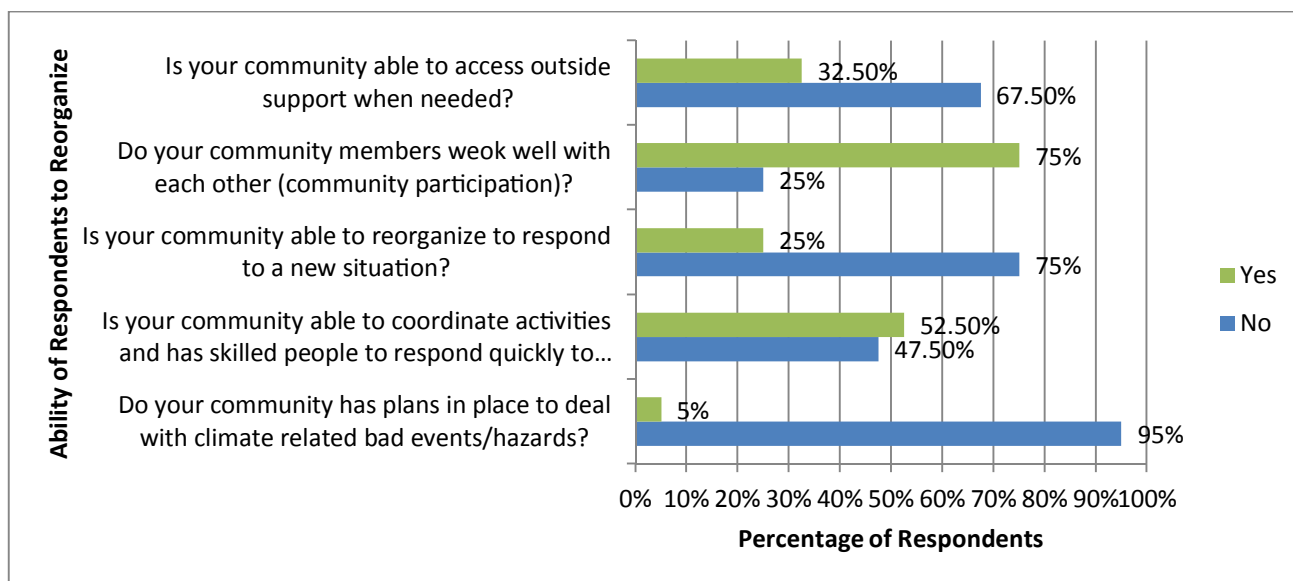
## SECTION – VI ADAPTIVE CAPACITY

Respondents were asked about their interventions for minimizing the impact of frequent flooding in the area, and also about the hindrances in their way. Most of the people were of the view that they were unable to minimize the impact of flooding on them and others because of ignorance, illiteracy and lack of appropriate resources but some said that they planted trees on the flood plain but the problem they faced again and again was that in every moon soon season flood took the plants away. Some people also said that they used sand bags to prevent their lands and property from flooding. A 50 years old respondent who was a teacher by profession said that he wrote many applications to the political representatives in order to get some kind of help from them regarding flooding matters but no one responded positively. It was observed that most of the people also were not having necessary information and training to minimize the effects of flooding incidents on themselves and other in the community. People demanded training sessions and workshops on the flood coping mechanisms and also provision of more spurs and retaining walls for the area. Some people suggested that mass media and TV should be used for alarming people for the expected flooding in the area.

### 4.9 Ability of Community to Reorganize

The graph (Figure 13) depicts the adaptive capacities of respondents with respect to their capabilities and capacities of community. Study shows that, mostly people agreed on the ability of community's participation to work with each other and their ability to coordinate activities and having skilled people to respond quickly to the impacts of natural events and the institutions or communities that support them when they need to reorganize to cope with new situations or problems. Study found that most of people disagreed on the availability of reorganize to respond to a new situation and having any plans in place to deal with climate related hazards or events.



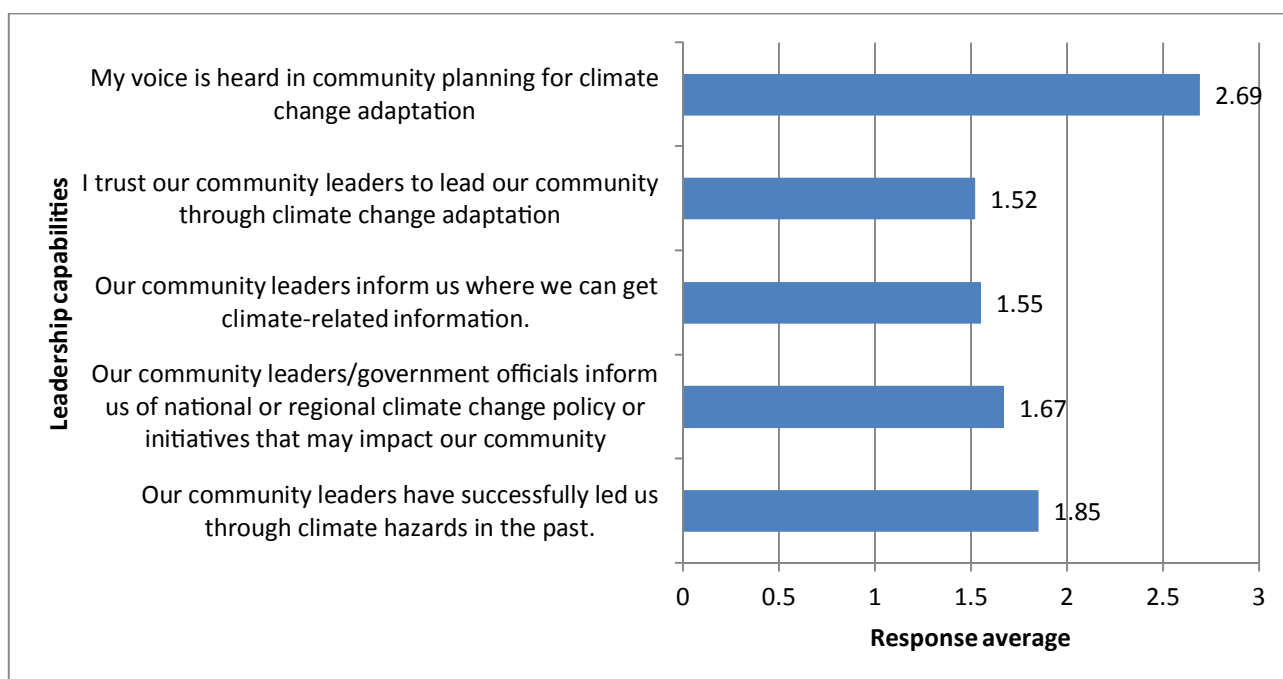


**Figure 13: Ability of community to reorganize**

#### **4.10 Leadership Capabilities in Reducing Community Vulnerability**

Leadership in an area really affects the habitats of that area and has vital role in increasing and decreasing the adoptive capability of respective community. The following graph (figure 14) represents the leadership status of the study area. It was observed that, respondents were having neutral perception on the importance of the voice of individuals in the community planning for climate change adaptation because climate change is the factor which ultimately results in the cause of disasters. Mostly respondents disagreed on the leadership that led them through climate hazards in the past and were of the view that their community leaders and officials didn't informed them about the national and regional climate policies or initiatives and also didn't informed us where we can get climate related information. The results shown that mostly respondents were not having any trust on their community leaders those can lead their community through climate change adaptation.

Generally speaking, the leadership in the study area was not found satisfactory and the people were of the view that the leaders only visit their area in elections, after their nomination they do not even bother to listen our voices.



**Figure 14: Leadership capability (response average using Likert scale (1 - 5) )**

#### **4.11 Role of Nongovernmental Organizations**

Although NGOs have recently emerged into the development limelight but they are not a recent phenomenon. They were the earliest form of human organizations. Long before the governments, people organized themselves into group for mutual protection and self-help.

NGOs play a critical role in all areas of development. People and policy makers are agreeing on one thing that NGOs play a vital role in development. Role of NGOs vary over the years as the policy of government changes. NGOs are almost dependent on policies of government. Socio economic development is a shared responsibility of both i.e. government and nongovernmental organizations. Role of NGOs are complementary but vary according to policies of government. If we closely pursue the voluminous literature on NGOs many roles can be found according to the expectations of people.

Previously many Government Line Agencies and Non-governmental organizations worked in response and rehabilitation works right after the disasters like earthquake 2005, landslides, flood 1990 etc in the study area. United Nations, Sungi, Sarhad Rural Support Program (SRSP), RDP and Army are amongst the top of list and these organizations facilitated most of the people. But currently the scenario is very different. The Government Line Agencies and the NGOs are not working efficiently. People are facing many financial issues regarding eradication of unsafe conditions especially in flood context.

## CHAPTER 5

### CONCLUSION

The results of study and common observations give certain noticeable conclusions as under:

The study shows that although maximum respondents practice safety measures according to their own understanding but poor coordination between government line agencies, less training and education and not following the building codes reduce their adaptive capacity and make them susceptible to floods. A proper awareness raising and capacity building sessions would help in raising people awareness to adopt mitigation techniques in case of natural disaster. The disaster management authorities should plan a proper system to cope with the seasonal floods and flash floods. Mitigation infrastructure be planned and constructed to avoid huge loss and land sliding from flash floods.

The study revealed that there is no scientifically sound awareness program to highlight the importance of emergency response management and risks for the site of Balakot. There is an essential need of scientifically sound awareness programs that must highlight the importance of emergency response management and risks of the site of Balakot. The awareness activities should be followed by emergency response management. The community preparedness activities like plan preparation, training and drills will increase their capacities for disasters. It will also make them aware that they are living in hazardous site. Avoidance to participate in resettlement also shows a lack of confidence among various sections of affected communities. Local leadership and the government line agencies should work efficiently so the communities could get benefits.

It was observed that the residential and built up system was entirely disappeared along the river banks and the low elevation while the land cover was also vanished due to the human induced activities by deforestation in the area, also a large amount of people were unaware about the coping strategies and were of the view that disasters are natural and they cannot do anything to better cope them. There is a dire need of retaining walls and spurs in the area. Because of unawareness and poverty people were not having enough information about the mitigation practices and their point of view was that it needs a lot of economic resources. Affordable financial schemes by local institutes and governments will encourage people for resettlement. Some banks can be pursued by the governments to step forward and play a role in the scheme.

People of village Kashtara were found most vulnerable to flood as they were settled on the flood plain. There was no preplanned system or plan to cope with flash floods. It is recommended to plant more trees i.e. Afforestation and reforestation to decrease soil erosion. This will be the most suitable mitigation method to avoid frequent floods. Capacity building of the community by using different techniques like skill development training, awareness raising trainings should be the first priority of the administration to make people aware of self-preparedness.

A wide gap was observed between communities and government line departments i.e. Police, Land revenue department. This also resulted in trust deficit among population towards government departments. Channel to improve coordination between communities and the local administration should be established so the people can get proper facilitation.

Capacity of communities to response immediately towards natural disasters was very low. Confidence building measures need to be taken to ensure maximum participation in resettlement from all sections of the affected communities. These measures will be based on changes in the present approaches. All stakeholders need proper attention particularly the elite class which has strong influence on the whole community perception and attitude.

NGOs and INGOs played an important role in assisting the local administration and state in relief efforts. A well planned and sound linkage between the communities and government line agencies and organizations should be established, so the gap between them can be bridged. A sound and well-coordinated mechanism should exist at federal and provincial government's level to involve NGOs and INGOs in natural disaster management immediately.

Study revealed that the conflicts and disputes on land resources right after a hit of flood, were mostly resolved by the people themselves. There was a system of jirga which was responsible for the conflict resolution. Police and Land revenue department should work efficiently in the area to minimize the incidents of conflicts on land resources.





# **ASSESSING THE SOCIAL VULNERABILITY AND ADAPTIVE CAPACITY OF NATURAL DISASTER PRONE COMMUNITIES**

**IN TEHSIL BALAKOT, DISTRICT MANSEHRA**

**By**

**Muhammad Shoaib Rafiq**

## ABSTRACT

The study was mainly emphasized on to explore the social vulnerabilities i.e. exposure, sensitivity and adaptive capacity of people of study area and also their capacity to mitigate the risks of natural disasters i.e. earthquakes, land/mud sliding, and floods in two villages of Tehsil Balakot i.e. Kashtara and Gulmera using stratified random sampling technique. A total of 100 respondents were selected which were divided into two strata, the respondents in both the areas were selected using proportionate random sampling technique. The results showed that 80% people of village Kashtara were exposed to seasonal floods because it is situated on flood plain and is on low elevation whereas 90% people of village Gulmera were exposed to land/mud slides because the terrain is hilly with steep slopes. Livelihoods of 20% people from both the villages were totally damaged due to previous natural disasters and a majority of people were displaced for months. Around 75% and 80% to 90% respondents found difficulties to cope with floods and earthquakes, respectively from both the villages. Although maximum respondents in both villages practice safety measures according to their own understanding but poor coordination between government line agencies, less identification of safe sites, comparatively less training and education and not following the building codes reduce their adaptive capacity and make them susceptible to disasters. Population, in general, had obstinate opinion that disasters are naturally occurring events and therefore mitigation is beyond their capacity. There is an essential need of scientifically sound awareness programs that must highlight the importance of emergency response management and risks of the site of Balakot.



## CHAPTER 1

# INTRODUCTION

### 1.1 Overview

Over the past few decades, the world has witnessed an increasing number of natural disasters that have caused social, economic and human losses worldwide. (Pelling-2003) notes that the rate of human disasters triggered by natural disasters has been doubling every decade since the 1960s. World statistics reflect an increase in the pattern of disasters from natural events such as earthquakes, floods and cyclones, to disasters caused by human factors as oil spills, transportation accidents, infrastructure collapses and massive population displacement due to conflict (Le Arthur-2007). The impact of such disasters on populations and the material losses are not at all equal. Over 95% of all disaster-related deaths occur in developing countries. Losses due to natural disasters are twenty times greater in developing countries than in industrialized countries. This differential impact shows that disasters should not be regarded as isolated incidents at all: they are most likely related to the physical, social, political and economic environment in which they occur (IFRC & RCS-2001). Specifically, the chance of a disaster occurs and the impact of a disaster depends upon the exposure to hazards and vulnerability of populations to different hazards.

### 1.2 The Concept of Vulnerability

The origin of the word vulnerability can be traced back to its Latin root *vulnerary* - which means "to hurt" or in a broader perspective to be subjected to any physical attack with inability to defend (Lundy and Janes-2009). More specifically, in reference to natural disasters, vulnerability can only be defined as being prone to natural disasters with inadequate coping skills to overcome its consequences. Although the notion of vulnerability as a passive response to natural disasters was introduced in disaster studies in 1970 it gained prominence in the 1980s when the conventional divine causal disasters was constantly challenged (Bankoff et al 2004; Birkman 2006). Initially vulnerability was defined as a threat or limiting factor for a society's ability to absorb and recover from a negative dangerous event (Gabor and Griffith 1980; 10 Timmerman 1981; Kates 1985; Bogard 1989). Later it was approached in terms of the extent to which a society or its people are exposed to risk elements (Petak and Atkisson 1982). Some distinguished geographical vulnerability (physical conditions) on the one hand and social vulnerability (human relations) on the other (Liverman 1990).

Differences in theoretical approaches to disaster studies and development reflect on the need to review key concepts that situate Natural Disaster within the vulnerability context. To assess the extent to which hazards affect people or society it is necessary to distinguish between, "risk" and "vulnerability" components of disaster analysis. Hazard in this case can be defined as an extreme geophysical event that poses a potential threat to cause a disaster (Alexander 2000).

Risk, therefore, can be understood as the probability of loss as a result of interaction between a given level of risk and vulnerability (Stewart and Donovan 2008; Wisner, et al., 2004; Alexander 2000).

### **1.3 Coping Strategies and Adaptive Capacities against Natural Disasters**

Improving capacity is often identified as targets for policies and projects, based on the notion that a strengthening of the capacity will eventually lead to reduced risk. Capacity counts clearly also to reduce the impact of climate change (Sharma and Patwardhan, 2008). Mastering is generally used to refer to ex post actions, whereas adaptation is normally associated with ex ante actions. This means that the coping capacity also refers to the ability to react to and reduce the negative effects of experienced hazards, while adaptive capacity refers to the ability to predict and transform the structure, function or organization to better survive hazards (Saldaña-Zorrilla, 2007). Presence of capacity indicates that the effects will be less extreme and / or recovery time is shorter, but high capacity to recover does not guarantee equal levels of ability to predict. In other words, the capacity to handle not imply the capacity to adapt (Birkmann, 2011a), although coping capacity is often considered to be part of adaptability (Levina and Tirpak, 2006)

### **1.4 Reducing Vulnerabilities through Improved Adaptive Capacity**

Most risk studies before the 1990s focused primarily on hazards, while the newer reversal of this paradigm has placed equal focus on vulnerable side of the equation. Underline that the risk can be reduced through vulnerability is recognition of the power of social, political, environmental and economic factors driving risk. Although these factors run the risk on the one hand, however, they can be the source of the capacity to reduce the susceptibility (Carreno et al, 2007 a Gaillard, 2010). The relationship between capacity and vulnerability is described differently between different schools of thought, stemming from various applications in the areas of development, disaster risk management and climate change adaptation. On the whole, the literature describes the relationship between the vulnerability and capacity in two ways, which are not mutually exclusive i.e.

- 1) Vulnerability is partly the result of lack of capacity.
- 2) Vulnerability is the opposite of capacity, allowing increased capacity means reducing vulnerability, and high vulnerability means low capacity.

### **1.5 Risk Reduction Strategies at Community Level to Reduce Vulnerability**

The vulnerability of a society to a natural hazard is, the degree of loss to a given element of risk or set of such elements (Granger et al., 1999). While resilience is the opposite of vulnerability, it is more than just the opposite, because a different set of factors in a community strengthen it against natural disasters and contribute to its recovery. Kieffer (1984) and Paitone and Bishop (1996) described community empowerment strategies based on community participation, enhance perceived control, facilitating community identification of problems, and develop strategies to resolve or contain problems in ways that correspond with the needs, systems and values specific community. To maintain empowerment, a consensus approach to decision making is recommended.

Recognizing the need to reduce vulnerability for effective disaster management errors by a top-down approach becomes apparent. This approach was unsuccessful in addressing the needs of vulnerable communities. As a result, many feel it is important to adopt a new strategy, which directly involves vulnerable people in the planning and

implementation of mitigation measures. This bottom up approach also called community based disaster management approach has gained wide acceptance because considered society are the best judges of their own vulnerability and can make the best decisions about their health.

The aim of CBDM approach is to reduce vulnerabilities and strengthen people's ability to cope with hazards, the primary strategy to reduce vulnerability by increasing the community's capacities, their resources and coping strategies. This strategy also leads to an overall improvement of the quality of life for the vast majority of the poor and the natural environment. A thorough assessment of a community's exposure to risks and an analysis of their specific vulnerabilities and capacities are the basis for activities, projects and programs that can reduce disaster risk. The local community is involved in the whole process, their felt and real needs, as well as inherent resources considered. In the community, are given priority attention to the conditions of the most vulnerable and their mobilization in disaster risk reduction. Therefore, there is a greater probability that problems will be treated with appropriate measures (ADPC 2000).

### **1.6 Problem Statement**

Pakistan is a developing country and many of the areas of Pakistan are disaster prone and are also considered as red zones. Northern areas of Pakistan are prone to disasters like Earthquake, Land sliding, Floods etc, and people of the area face varying types of vulnerabilities under different disaster situations. And as such the vulnerabilities may be reduced by adapting different strategies against varying hazards. Less understanding and awareness of the local communities as well as little knowledge about the strategies to use existing resources for risk reduction make the residents of area more vulnerable to disasters. Therefore, the present study is designed to understand the social vulnerabilities of communities to natural disasters like earthquake, flood, landslide and their adaptive capacities to reduce such vulnerabilities.

### **1.7 Research Objectives**

The objectives of the study fall under '2' Ps i.e. People and Problem

The main objective of the study is to explore the social vulnerabilities i.e. exposure, sensitivity and adaptive capacity of people of study area and also their capacity to mitigate the risks of natural disaster i.e. earthquakes, land/mud sliding, and floods. The specific objectives of the study are given below;

1. To assess the social vulnerability of communities of study area towards natural disasters.
2. To analyze the effects of the adaptive capacity of communities in reducing social vulnerabilities towards natural disasters.

### **1.8 Purpose of the Study**

Over the past decades, Pakistan has witnessed a steady increase in the number of disasters. Many factors including growing population, an increased number of people living in hazard-prone areas, environmental degradation, global warming, and unsustainable development patterns have contributed to this trend. This often leads to higher levels of vulnerability, as well as rapid and unplanned urbanization, amongst others. Globally, risk reduction initiatives have failed to keep pace with the increase in exposure to natural hazards and higher levels of vulnerability.

In Pakistan, like other developing countries, there is less focus on the issues which ultimately are responsible for disasters, therefore, re-focusing on the human activities to minimize the risks of disaster needs careful consideration. Keeping in view the importance of the issue, a dissertation is designed which besides identifying social vulnerabilities of local communities towards the major disasters i.e. earthquakes, floods and land/mud slides, of the study area of Balakot, but also will analyze the extent of understanding and realization of the local communities towards disaster risk reduction strategies. The study will also relate the efforts of local communities and administration in reducing vulnerabilities through disaster risk reduction strategies adapted at local level.

### **1.9 Major Contribution of this Dissertation**

There is sufficient literature available dealing with issues of disasters in Pakistan, either they are natural or anthropogenic but there isn't any sufficient work done on the assessment of vulnerabilities of the communities living in disaster prone areas. The focus of the present study is to access the social vulnerabilities of the people of areas towards natural disasters. To add more beauty, the study will also focus on the coping strategies at local level.

### **1.10 Thesis layout**

#### **Chapter 2**

This chapter includes the literature review reflecting the contributions of different authors regarding the research study.

#### **Chapter 3**

This chapter contains detailed research methodology which includes the information about targeted area, study sample size and technique, data collection techniques, study variables and the tools been used data analysis.

#### **Chapter 4**

The data results obtained during this thorough research are discussed in this chapter, in the form of tables, graphs and discussions.

#### **Chapter 5**

Contain the conclusions and recommendations of this dissertation.

## CHAPTER 2

# LITERATURE REVIEW

### 2.1 Concept of Disasters

On average, 232 million people are affected by various types of disasters each year (CRED, 2012). Catastrophe losses continue to rise with grave consequences for life, livelihood and dignity of people as well as for hard-won development gains. In recent years, disaster risks have been on the rise due to factors such as population growth, unplanned urbanization, environmental degradation, conflict and competition for scarce resources, climate change, disease epidemics, poverty and pressure from development within high-risk zones. But these disaster risks can be significantly reduced through strategies and measures that seek to reduce vulnerability and exposure to hazards within broader efforts to address poverty and inequality and through risk-informed humanitarian responses to disasters and other crises.

### 2.2 Vulnerability

The extent to which a system is susceptible to or unable to cope with the adverse effects of climate change, including climate variability and extremes. The vulnerability is a function of the nature, size and frequency of climate variation which a system is exposed, its sensitivity, and its adaptive capacity. Also defined as a set of specific circumstances which adversely affects the community's ability to prevent, mitigate, prepare for or respond to a threat (Lundy and James 2009). Absence of coping strategies is also part of the vulnerability and has to be considered in vulnerability analysis e.g. live in danger exposed places as close to a lake or river, the fault lines at the foot of a mountain etc. Types of vulnerability are as follows;

#### 2.2.1 Physical Vulnerability

The physical vulnerability of a region also depends on its geographical proximity to the source and origin of disasters e.g. if an area located near the coast lines, dividing lines, unstable slopes etc. it makes the area more vulnerable to disasters in relation to an area that is far away from the origin of the disaster. Physical vulnerability include difficulties with access to water resources, means of communication, hospitals, police stations, fire departments, roads, bridges and exits of a building or / an area in case disasters. Moreover, the lack of proper planning and implementation in the construction of residential and commercial buildings that is weaker and vulnerable in earthquakes, floods, landslides and other hazards. (Cardona and Hurtado, 2000a)

### **2.2.2 Economic Vulnerability**

Economic vulnerability of a community can be assessed by determining how diverse their sources of income are, easy access and control over the means of production (e.g. farmland, livestock, irrigation, capital etc.), coverage of economic fall back mechanisms and availability of natural resources in the area (Cardona and Hurtado, 2000a).

### **2.2.3 Social Vulnerability**

Socially vulnerable communities have weak family structures, lack of leadership for decision making and conflict resolution, unequal participation in decision making, weak or no local organizations, and one in which people are discriminated against on ethnic, linguistic or religious basis. Other social factors such as culture, tradition, religion, local norms and values, economic standard, and political accountability also play an important role to determine the social vulnerability of a community (Cardona and Hurtado, 2000a).

Social vulnerability to natural phenomena is greatest among the poorest in developing countries due to lack of information and resources to take the necessary measures. Within this group are children, women and older are considered to be the most vulnerable. To reduce social vulnerability, all the above factors to be addressed, but this requires knowledge and understanding of the local conditions, which can - in most cases - only be provided by local actors.

### **2.2.4 Attitudinal Vulnerability**

A society that has a negative attitude to change and lacking initiative in life resultantly becomes more and more dependent on external support. They cannot act independently. Their sources of livelihood have not variety, lacks entrepreneurship and do not have the concept of collectivism. This brings about disunity and individualism in society. Thus, the victims of conflicts, hopelessness and pessimism which reduces their ability to cope with a disaster.

## **2.3 The Drivers of Vulnerability**

To effectively manage risk, it is important to understand how vulnerability is generated, how it increases and how it builds up (Maskrey, 1989; Cardona, 1996a, 2004 2011 Lavell, 1996 1999a; O'Brien et al., 2004b). Vulnerability describes a set of conditions for people originating from the historical and prevailing cultural, social, environmental, political and economic contexts. In this sense, vulnerable groups are not only at risk because they are exposed to a risk, but as a result of marginality, everyday patterns of social interaction and organization, and access to resources (Watts and Bohle, 1993; Morrow, 1999; Bankoff 2004). Consequently, the effects of a disaster at any particular household due to a complex set of drivers and cooperative relation. It is important to remember that people and society are not solely or mainly of the victims, but also active managers of vulnerability (Ribot, 1996; Pelling 1997, 2003). Therefore, integrated and multidimensional approaches are very important to understand the causes of vulnerability.

Some global processes are key drivers of risk and are particularly related to the creation vulnerability. There is high confidence that these include population growth, rapid and inappropriate urban development, international financial pressures, increase in socioeconomic disparities, trends and failure of governance (e.g. corruption, mismanagement), and environmental degradation (Maskrey, 1993a, b, 1994, 1998; Mansilla, 1996; Cannon, 2006). Vulnerability profiles can be constructed that takes into account the sources of environmental, social and economic marginality (Wisner,

2003). This includes an assessment of the relationship between society and specific environmental services and vulnerability components of the ecosystem (Williams et al, 2008). In the climate-related impact assessments, integration of underlying "reasons vulnerability "and adaptability are needed rather than focusing on technical aspects only (O'Brien et al, 2004b).

Because of different conceptual frameworks and definitions, as well as disciplinary views, approaches to solve the causes of vulnerability also differ. Mitchell et al. (2010) examine the similarities and differences between climate change adaptation and disaster risk management communities, and identify key areas of difference and convergence. The two communities tend to perceive nature and timescale of threat is different: consequences due to climate change and return periods of extreme events often use the language of uncertainty; but considerable knowledge and safety have been expressed about event properties and exposure to extreme historical environmental conditions.

Four approaches to understanding vulnerability and its causes can be separated, rooted in political economy, Social Ecology, vulnerability and disaster risk and adaptation to climate change:

1) The pressure and release (PAR) model (Wisner et al, 2004) is common for social science vulnerability research and emphasizes the social factors and underlying causes of exposure more than the danger that generate unsafe conditions. This approach linking vulnerability to unsafe conditions in a continuum that connects local vulnerability to major national and global changes in the political economy of resources and political power.

2) The social ecology perspective emphasizes the need to focus on coupled human-environment systems (Hewitt and Burton 1971). This perspective emphasizes the opportunity for communities to transform nature and also the consequences of changes in the environment for social and economic systems. It claims that exposure and susceptibility to a system can only be adequately understood if these link processes and interactions are addressed.

3) Holistic perspectives on vulnerability aim to go beyond technical modeling to embrace a broader and comprehensive explanation of vulnerability. These approaches differentiate exposure, sensitivity and community preparedness which causes or factors of vulnerability (Cardona and Hurtado, 2000a). A core element of these approaches is the feedback loop that underlines the vulnerability is dynamic and is the main driver and determinant of current or future risk.

4) In connection with climate change, have different vulnerability definitions and concepts are developed and discussed. One of the most prominent definitions is the one reflected in the IPCC Fourth Assessment Report describing vulnerability (Füssel and Klein (2006), Füssel (2007) This approach is different from the understanding of vulnerability in disaster risk management perspective, as the rate and magnitude of climate change is considered. The concept of vulnerability here includes external environmental factors of shock or stress. Therefore, in this view, the scale and frequency of potential risk events to be considered in vulnerability to climate change. This view is also different in its focus on long-term trends and stresses instead of the current shock forecasts, which are not explicitly excluded, but rather rarely considered within disaster risk management approaches.

The lack of a comprehensive conceptual framework that enables a joint multidisciplinary risk assessment hinders the effectiveness of disaster risk management and adaptation to climate change (Cardona, 2004). Options foresee prevention and adaptation exist precisely because the risk is a latent condition, which announces potential future adverse effects (Lavell, 1996 1999a). Understand disaster risk management as a social process allows for a shift in focus

from responding to the disaster event towards an understanding of disaster risk (Cardona and Barbat, 2000). This requires knowledge of how human interactions with the natural environment lead to the creation of new dangers, and how people, property, infrastructure, goods and the environment are exposed to potentially harmful incidents. Moreover, it requires an understanding of the vulnerability of people and their livelihoods, including the allocation and distribution of social and economic resources that can work for or against the achievement of resistance, flexibility and security (ICSULAC, 2010a, b). Overall, there is high confidence that even if hazard events are usually regarded as the cause of the disaster risk, vulnerability and exposure are their main determining factors. Furthermore, unlike his father, vulnerability and exposure often be influenced by policy and practice, including in the short to medium term. Therefore, disaster risk management and adaptation strategies must solve essentially the same risk factors (Vogel and O'Brien, 2004)

Despite various frameworks designed to define and assess vulnerability, it is interesting to note that at least some common causal factors of vulnerability have been identified, both in disaster risk management and climate change adaptation communities (Gallopín 2006; ICSU-LAC 2010a, b):

- *Sensitivity / fragility (in disaster risk management) or sensitivity (in adaptation)*: physical predisposition of people, infrastructure and the environment to be affected by a dangerous phenomenon because of lack of resistance and predisposition to society and ecosystems to suffer damage as a consequence of intrinsic and contextual conditions that make it likely that such systems when affected will collapse or experience major damage and injuries due to the influence of a hazard event.
- *Lack of elasticity (in disaster risk management) or lack of coping and adaptive capacity (in adaptation)*: restrictions on access to and mobilization of resources in people and their institutions, and the inability to anticipate, adapt and respond in absorbing the socio- ecological and economic consequences.

There is high confidence that at the extreme end of the spectrum, the intensity of extreme climate and weather events - low-probability, high-intensity - and exposure for them tend to be more pervasive in explaining disaster losses than vulnerability itself. But as the events get less extreme - more likely, lower intensity - vulnerability exposed elements play an increasingly important role in explaining the level of impact. Vulnerability is a major cause of the increasing adverse effects of non-extreme events, i.e. small recurring disasters that many times are not visible at national or sub-national level (Marulanda et al, 2008b) Overall, the promotion of resilient and adaptive society requires a paradigm shift away from a primary focus on natural disasters and extreme weather to the identification, evaluation and ranking of vulnerability (Maskrey, 1993a). Therefore, understanding the vulnerability is a prerequisite for understanding risk and the development of risk mitigation and adaptation strategies for extreme events in the light of climate change (ICSU-LAC, 2010 a, b)

## **2.4 Coping and Adaptive Capacities**

Capacity is an important element in most conceptual framework of vulnerability and risk. It refers to the positive aspect of people's properties that can reduce the risk of a certain danger. Improving capacity is often identified as targets for policies and projects, based on the notion that a strengthening of the capacity will eventually lead to reduced risk. Capacity counts clearly also to reduce the impact of climate change (Sharma and Patwardhan, 2008).



Mastering is generally used to refer to ex post actions, whereas adaptation is normally associated with ex ante actions. This means that the coping capacity also refers to the ability to react to and reduce the negative effects of experienced hazards, while adaptive capacity refers to the ability to predict and transform the structure, function or organization to better survive hazards (Saldaña-Zorrilla, 2007). Presence of capacity indicates that the effects will be less extreme and / or recovery time is shorter, but high capacity to recover does not guarantee equal levels of ability to predict. In other words, the capacity to handle not imply capacity to adapt (Birkmann, 2011a), although coping capacity is often considered to be part of adaptability (Levina and Tirpak, 2006).

#### **2.4.1 Capacity and Vulnerability**

Most risk studies before the 1990s focused primarily on hazards, while the newer reversal of this paradigm has placed equal focus on vulnerable side of the equation. Underlines that the risk can be reduced through vulnerability are recognition of the power of social, political, environmental and economic factors driving risk. Although these factors run the risk on the one hand, however, they can be the source of the capacity to reduce the (Carreno et al, 2007a).

Many approaches for assessing the vulnerability rely on an assessment of capacity as a basis for understanding how vulnerable people are to a specific hazard. The relationship between capacity and vulnerability is described differently between different schools of thought, stemming from various applications in the areas of development, disaster risk management and climate change adaptation. Gaillard (2010) points out that the concept of capacity "played a central role in the progressive growth of the vulnerability paradigm within the scientific world." In all, describes literature relationship between vulnerability and capacity in two ways, which are not mutually exclusive (Moss et al, 2001);

- 1) Vulnerability is partly the result of lack of capacity.
- 2) Vulnerability is the opposite of capacity, allowing increased capacity means reducing vulnerability, and high vulnerability means low capacity.

The relationship between capacity and vulnerability is interpreted differently in the climate change community of practice and disaster risk management communities of practice. Throughout the 1980s was vulnerability a central focus of much work on disasters, in some circles overriding role dangers in driving risk. Some have noted that the emphasis on vulnerability tend to ignore capacity, focus too much on the negative aspects of vulnerability (Davis et al., 2004). Recognizing the role of capacity to reduce risk also indicates recognition that people are not 'helpless victims' (Bohle, 2001; Gaillard, 2010).

In many climate-related studies, capacity basically was subsumed under vulnerability. The first books and guidelines for adaptation emphasized impacts and vulnerability as the necessary steps to determine the customization options (Kate, 1985). Climate change vulnerability was often placed in direct opposition to capacity. Vulnerability measured was regarded as the rest after that capacity had been taken into account.

However, Davis et al. (2004) note that capacity and vulnerability are not necessarily opposites, because communities are extremely vulnerable can actually display with increased capacity in certain aspects. This reflects the many elements of risk reduction and additional capacity needs across them. Alwang et al. (2001) also emphasize that

vulnerability is dynamic and determined by a number of factors, and thus high capacity in the ability to respond to an extreme event does not accurately reflect low vulnerability.

#### **2.4.2 Capacity to Anticipate Risk**

Having the capacity to reduce the risks posed by hazards and changes implies that people's ability to steer is not absorbed, so they are not left considerably worse. Reducing risk means that people have to devote significant resources to deal with a danger that it happens, but instead have the capacity to anticipate this type of event. This is the type capacity that is required to adapt to climate change, and involves deliberate, planned action to reduce risk. Capacity to reduce the risk also depends on ex post actions, which involves making choices after an event that reduces the impact of future events.

Capacity risk prevention and reduction can be understood as number of elements, measures and tools aimed at intervention in hazards and vulnerability in order to reduce existing or controlling future potential risks (Cardona et al., 2003a). This may vary from guarantees survival to the ability to secure future livelihoods (Batterbury 2001; Eriksen and Silva, 2009).

Development planning, including land use and urban planning, river basin and land management, hazard resistant building codes, and the landscape design are all activities that can reduce exposure and vulnerability to dangers and change (Cardona, 2010). The ability to carry out these effectively is a part of the capacity to reduce the risk. Other Activities include diversifying income sources; maintain social networks, and collective action to avoid a development that puts people at higher risk (Lavell, 2003).

Until early 1990, disaster preparedness and humanitarian response dominated disaster practice, and focus on capacity was limited to understand the inherent response capacity. Thus, emphasizing the ability to reduce the risk was not a priority. But in the face of growing evidence

As significant increases in disaster losses and the inevitable increase in financial and human resources dedicated to disaster response and recovery, there is a growing recognition of the need to promote capacity for prevention and risk reduction over time (Lavell, 2003). Nevertheless, various actors, stakeholders and interests affect the ability to predict a disaster. Measures to reduce exposure and vulnerability of a group of people can come at the expense of increasing it for another, such as when flood risk is shifted from upstream communities to downstream communities through large-scale upstream dike construction (Birkmann, 2011a). Consequently, this is not sufficient to assess the effect of adaptation or capacities to reduce the risk by focusing on the goals of a group only. The evaluation of the success of adaptation strategies depends on spatial and temporal scale was used (Adger et al., 2005).

#### **2.4.3 Capacity to Respond**

Capacity to respond is relevant both ex post and ex ante, since it includes everything necessary to react once an extreme the event takes place. Response Capacity is mostly used to refer to capability institutions to react after a natural hazard, especially post during preparedness. But effective response requires considerable ex ante planning and investments in disaster preparedness and early warning (not only in terms of economic costs, but especially in terms of raising awareness and capacity building; IFRC,2009). Moreover, it also response phases for gradual changes in

ecosystems or temperature regimes caused by climate change. Replying spans everything from peoples own initial reactions to danger by its impact on measures to try to reduce secondary damage. It is worth noting that in the climate change literature, anticipatory measures are often referred to as the response, which is different from the way this term used in conjunction with disaster, where it only involves actions taken once there has been an impact.

Capacity to respond is not sufficient to reduce risk. Humanitarian aid and relief measures have been discussed in connection with their role in reinforcing or strengthening existing vulnerabilities (Anderson and Woodrow, 1991). This makes not only have significance for the ability to react, but also for other aspects of capacity. Wisner (2001a) shows how poorly constructed shelters, where people were placed temporarily in El Salvador after Hurricane Mitch in 1998, turned into "permanent" residence when on-governmental organization support (NGO) ran out. Date strong earthquake hit in January and February 2001, the shelters collapsed, leaving people homeless again. This example illustrates hazards associated with emergency measures that focus only on answer, rather than the capacity to reduce risk and change. Response Capacity is also to differential (Chatterjee, 2010). Mostly effective ex ante risk management strategies will often contain combination of risk reduction and increased capacity to respond to effects (including smarter response by better preparedness and early warning and risk transfer such as insurance).

#### **2.4.4 Capacity to Recover and Change**

Having the ability to change is a requirement for being able to adapt Climate change. Looks customization that requires transformation means that it cannot be understood as just a set of actions that physically protect people from natural disasters (Pelling, 2010). In conjunction with natural disasters, the possibility of change often greatest during recovery phase, when the physical infrastructure has to be rebuilt, and may be improved and behavior patterns and habits could be (Comfort et al, 1999). This is an opportunity to rethink whether crops planted which is most suited to the climate and whether it is worth rebuilding hotels near the coast, taking into account what other types of environmental changes can occur in the region.

Capacity to recycle not only depends on the extent of a physical effect, but also on the extent to which the community has been affected, including the ability to resume livelihood activities (Hutton and Haque, 2003). This capacity is driven by a number of factors, including mental and physical ability to recover, economic and environmental viability, and political will. Because reconstruction processes often do not take people's livelihood into consideration, rather than focusing on their safety, new settlements are often located where people do not want to be, as brings change - but not necessarily change leading to sustainable development. Countless examples show how people who have been resettled returning back to its original location, move into dilapidated house or set up new homes, although more solid housing is available elsewhere, simply because the new location does not allow them easy access to their fields to markets or roads, or to the sea (South and Southeast Asia after the 2004 tsunami).

Restore to return to conditions before a natural hazard occurs Not only means that risk can be the same or larger, but also makes not the question of the earlier conditions were desirable. Actual, recovery processes are often out of sync with the evolving process of development. The recovery and reconstruction phase after a disaster provides an opportunity to rethink past relationships and addressing underlying causes of risk, who want to avoid reconstructing vulnerable (IDB, 2007), but often the process is too rushed to enable effective reflection, discussion and consensus building (Christoplos, 2006). Sliding recovery towards transformation and change requires taking new approach instead

of a return to "normalcy." More examples have shown that the capacity to restore severely limited by poverty (Hutton and Haque, 2003), where people are driven further downward spiral of poverty, never returned to their previous conditions but undesirable.

The different capacities to respond and survive danger and events changes have also been discussed in connection with the term resistance. While originally the concept of resilience strongly linked an environmental perspective on ecosystems and their ability to maintain vital functions even in times of difficult conditions and crises (Holling, 1973), the term has undergone major changes and has been improved and applied also within social-ecological systems and catastrophe risks (Abel et al, 2006). Folke (2006) distinguishes between three different resilience concepts comprising a technical perspective elasticity focusing on recovery and stamina problems, while ecological and social resilience focus on endurance and robustness, and finally, the integrated social ecological resilience perspective deals with adaptability, transformability, learning, and innovation (Folke, 2006). In disaster risk reduction concepts resilience building and lack of elasticity achieved a high recognition. These terms are related to capacity community or society to manage the impact of a hazard event or emergencies and the ability to learn and create robustness through these experiences. New papers but also criticize unconsidered use or simply transferring the concept of resilience in the wider context of adaptation (Cannon and Müller-Mahn, 2010). Additionally, lack of flexibility has also been used as an umbrella to investigate missing in capacities as communities include, for managing with hazard events. Describes lack of elasticity, and Cardona-Barbat (2000) identify various capacities that are often lacking in communities suffering heavily during disasters, such as those lacking with regard to the ability to anticipate, to manage and adapt changing environmental conditions and natural disasters.

Other work has claimed a different view of the resistance, because the occurrence of a disaster, shows that there are gaps in the development process (UNDP, 2004). Lessons learned from studying the effects of the 2004 tsunami (Thomalla and Larsen, 2010) are informative for climate-related hazards. They suggest that:

- Social vulnerability to multiple hazards, especially rare extreme arrangements tend to be poorly understood.
- There is an increasing focus away from vulnerability the resilience building; however, elasticity poorly understood and much to be done to move from theory to practice.
- One of the main issues in the sub-national risk mitigation is anticipated to better define the roles and responsibilities of government and NGO actors and to improve coordination between them. Without mechanisms for joint goal setting, coordination, monitoring and evaluation, there is much duplication, competition and tension between actors.
- Risk reduction is only meaningful and prioritized by local authorities if it is perceived to be relevant in the context of other, more pressing day-to-day issues, such as poverty eradication, livelihood improvement, management of natural resources, and community development.

## **2.5 Dimensions and Trends of Vulnerability and Exposure**

Vulnerability is: multidimensional and differential - that is, it varies across physical space and amongst and within social groups; scale-dependent with regard to space and unit analysis as an individual, household, region, or system; and dynamic- Characteristics and driving forces for change vulnerability over time (Vogel and O'Brien, 2004). As

vulnerability and exposure are not fixed, understanding trends in vulnerability and exposure is therefore an important part of the discussion.

There is high confidence that multiple hazards, changes in exposure and in some cases vulnerability are the main drivers behind observed trends in disaster loss, rather than a change in danger character, and will continue to be key drivers of changes in risk patterns over coming decades (Pielke Jr. and Landsea, 1998). In addition, there is high confidence that climate change will affect disaster risk, not only through changes in the frequency, intensity and duration of some events, but also through indirect effects on vulnerability and exposure. In most cases it will make that not isolated, but as one of many possible sources of stress, example through effects on the number of people in poverty or suffering from food and water insecurity, changing disease patterns and general health levels, and where people live. In some cases, these changes are positive, but in many cases they will be negative, especially for many groups and areas that are already among the most vulnerable.

Although developments in some of the determinants of risk and vulnerability apparent (such as accelerated urbanization), the extent these are changing the level of risk and vulnerability in a number of geographical and time scales are not always clear. While there is high confidence that these connections are, current knowledge often does not allow us to provide specific quantifications of regional or global importance.

Multidimensional nature of vulnerability and exposure does something organizing frameworks random, overlapping, and disputed a degree. The following text is organized under three very broad headings: environmental, social and economic dimensions. Each of these has a number of subcategories, which map out the key elements of interest.

### **2.5.1 Environmental Dimensions**

Environmental dimensions include:

- Potentially vulnerable natural systems (e.g. low-lying islands, coastal zones, mountainous areas, arid areas, and Small Island Developing countries (Dow, 1992)
- Impact on systems (e.g. flooding of coastal cities and agricultural lands or forced migration)
- The mechanisms that lead to consequences (e.g. dissolution of Specialize sheets) (Fussler and Klein, 2006)
- Responses or adaptations to environmental conditions (UNEP/UNISDR, 2008).

There are important linkages between development, environment management, reducing disaster and climate change (van Aalst and Burton, 2002), also including social and legal aspects Property (Adger, 2000). For the purposes of vulnerability in the context of climate change, it is important to recognize that environment and people that form the socio-ecological system (Gallopin et al., 2001) behaves non-linear way, and strongly coupled, complex, and evolving (Folke et al., 2002).

There are many examples of interaction between society and environment that makes people vulnerable to extreme events (Bohle et al., 1994) and highlight the vulnerability of ecosystem services (Metzger et al., 2006). As an example, vulnerabilities due to flooding intervention and increased risk exposure is typical of the intricate and finely balanced relationships within human-environment systems (Kates, 1971) as we have been aware for several decades. Increasing

human occupancy at floodplains increase exposure to flood risk. It could put not only the lives and property of human beings with risk, but can damage flood ecology and allied ecosystem services. Increased exposure of humans comes about even in the face of measures to reduce the risk. Structural response and relief measures (such as provision of fillings, channel modification, and other physical changes of floods Environment), designed ostensibly to reduce flood risk, may have reverse result. This is among other things known as Levee effect (Kates 1971, escalator effect (Parker, 1995), or the secure development paradox (Burby, 2006), where flooding intervention leads to increased flood risk and to end flooding. A misfit policy response to such exposure provides structural flood defenses, which encourages the belief that flood risk is removed. This in turn stimulates more flooding intervention and a repeat of cycle as flood protection (built to a lower design specification) is exceeded. This is typical of many maladaptive policy measures, as focus on the symptoms rather than the causes of bad environment management.

Environmental dimension of vulnerability also deals with the role regulating ecosystem services and ecosystem functions, which directly affect human well-being, particularly for those social groups heavily dependent on these services and functions because of their livelihood profiles. Particularly in developing countries and countries in transition, poorer communities often totally dependent on ecosystem services and features to meet their livelihood needs. The importance of these ecosystem services and ecosystem functions for society context of environmental vulnerability and disaster risks have been recognized by the 2009 and 2011 Global Assessment Reports on Disaster Risk Reduction (UNISDR, 2011) and of Millennium Ecosystem Assessment (MEA, 2005). The degradation of ecosystem services and functions can contribute to a worsening of both natural hazard context and vulnerability of people. The erosion of ecosystem services and functions may contribute to the decline coping and adaptive capacity in terms of reduced options livelihood and income generating activities because of degradation of natural resources. In addition, a deterioration of environmental services and features can also increase the costs of using these services, for example in terms of increased time and travel needed to access drinking water in rural communities affected by drought or salinization. Moreover, the environmental problem also means that in case of a dangerous event occurs, society may lose access to only available water resource or face a major reduction in productivity of the soil, which then increases the risk of crop failure. To example, Renaud (2006) stressed that salinization of wells after 2004 tsunami had a very negative consequence for these communities who had no alternative access to fresh water resources.

#### **2.5.1.1 Physical Dimensions**

Within the environmental dimension, physical aspects refer to a site-specific context of human-environment interaction (Smithers and Smit, 1997) and to the material world (e.g. built structures).

The physical exposure of humans to hazards has been partially shaped by patterns of settlement risk vulnerable landscape for the equalization benefits they offer (UNISDR, 2004). Furthermore, in the context of climate change, physical exposure in many regions also increasing due to spatial extension of natural hazards such as flooding, areas affected by drought, or delta regions affected by salinization. This does not make the inhabitants of such places vulnerable because they may have the capacity to withstand the impact of extreme events; this is the basic difference between exposure and vulnerability. The physical dimension of vulnerability begins with the recognition of a link between an extreme physical or natural phenomenon and a vulnerable human group (Westgate and O'Keefe, 1976). Physical vulnerability includes aspects of geography, location and location (Wilbanks, 2003); settlement patterns; and

physical structures (Shah, 1995; UNISDR, 2004), including infrastructure located in hazard-prone areas or with lacking in resistance or susceptibility to injury (Wilches-Chaux, 1989). Moreover, Cutter's (1996) 'dangers of place' model of vulnerability refers explicitly to the time dimension, which, recognizing the dynamic nature of place vulnerability, argues for a more nuanced approach.

#### **2.5.1.2 Geography, Location, Place**

There is a significant difference in exposure and vulnerability between developing and developed countries. While a similar (average) number people in low and high human development countries may be exposed to hazards every year (respectively 11 and 15%), average numbers killing are very different (53 and 1%, respectively) (Peduzzi, 2006).

Developing countries are recognized as facing greater consequences and having the most vulnerable populations, the greatest number, which are least able to easily adapt to changes in including temperature, water resources, agricultural production, health and biodiversity (Beg et al, 2002). Small Island developing countries, some of which also Least Developed Land is recognized as highly vulnerable to external shocks extreme including climate (UN / DESA 2010). While efforts in adaptation have been completed, progress has been limited, focusing on public awareness, research and policy rather than implementation (UN / DESA, 2010).

Developed countries are also vulnerable and geographically different levels of vulnerability, which is masked by a dominant, focus the direct impacts on biophysical systems and broad economic sectors. But indirectly and synergies, differential vulnerabilities and assumptions about the relative ease of customization within seemingly robust developed countries may lead to unforeseen vulnerabilities (O'Brien et al., 2006). Thus development in itself is not a guarantee of invulnerability. Development can undermine ecosystem resilience on the one hand, but create wealth that can improve society's resilience overall if fair (Barnett, 2001).

Hazard exposure is combined with historical vulnerability (measured by mortality and economic loss) to identify geographic regions who are at risk from a variety of geophysical hazards. While flood risk widespread across a number of areas, drought and especially cyclone the risk demonstrate different spatial patterns with the latter closely related the climatologically pattern of cyclone tracks and landfall (Dilley et al. 2005).

### **2.5.2 Social Dimensions**

The social dimension is multifaceted and cutting. It focuses primarily on aspects of social organization and collective aspects rather than individuals. However, some reviews also use 'individual descriptor to clarify questions about the scale and units for analysis (Adger and Kelly, 1999). Weighting of the individuals also useful when considering psychological trauma and after disasters, including information about family breakdown and loss. The social dimension includes demographics, migration, and displacement, social groups, education, health and wellness, culture, institutions, and management aspects.

#### **2.5.2.1 Demographics**

Certain population groups may be more vulnerable than others to climate variability and extremes. For example, the very young and old are more vulnerable to heat extremes than other population groups (Gosling et al., 2009). A rapidly aging population community to land scale carries implications for health, social isolation, economic growth, family



composition, and mobility, which are all social factors of vulnerability. However, as discussed further below (Social Groups section), static checklists vulnerable groups do not reflect the diversity or dynamics of people's changing conditions.

### **2.5.2.2 Migration and Movement**

Trends in migration, as a component of the changing population dynamics, have the potential to rise because of changes in extreme climate incident frequency. UN Office for the Coordination of Humanitarian Affairs and the Internal Displacement Monitoring Centre has estimated that around 20 million people were displaced or evacuated in 2008 because of the rapid onset climate-related disasters (OCHA / IDMC, 2009). Furthermore, during the past 30 years, twice as many people have been hit by drought (slow onset events not included in the previous point) which after storms (1.6 billion compared to approximately 718 million) (IOM, 2009). However, because of the multi-causal nature of migration, the relationship between climatic variations and changes in migration is disputed (Black, 2001) are rules environment and climate refugees (Castles 2002). Despite an increase in the number Hydro meteorological disasters between 1990 and 2009, the international organization on Migration reports no significant impact on international migration flows because displacement temporary and often limited within a range, and displaced individuals do not have the financial resources to migrate (IOM, 2009).

Although there is also a lack of clear evidence of a systematic trend in extreme weather events and migration, there are clear instances of the impact of extreme hydro meteorological activities displacement. Such as floods in Mozambique displaced 200,000 people in 2001, 163,000 people in 2007 and 102,000 in 2008 (IOM, 2009); in Niger, major internal movements of people is due pervasive changes related to drought and desertification trends (Afifi, 2011); in the Mekong River Delta region, appears changing flood patterns to be associated with traits movements (IOM, 2009); and Hurricane Katrina, as social vulnerability, race and class played an important role in the outward and return migration (Elliott and Pais, 2006), resulted in displacement of over 1 million people. In addition to displacement effect, there is evidence of increased susceptibility to extreme events among immigrant groups because of an inability to understand the extreme event-related information because of language problems, prioritizing to find work and housing, and mistrust of authorities (Enarson and Morrow, 2000).

Migration can be both a condition and response to vulnerability especially political vulnerability created through conflict, which can run people from their homeland. Increasingly regards economic and environmentally displaced, but can also refer to those who do not cross international borders but become IDPs as a result of extreme events in both developed and developing countries (Myers et al., 2008).

Although data on climate change-forced displacement is incomplete, It is clear that many outcomes of climate processes will be seen and felt that disasters of the affected populations (Oliver-Smith, 2009). For people affected by disasters, subsequent displacement and settlement often constitutes another disaster in their lives. As part of depletion risk and Reconstruction approach, Cernea (1996) describes the eight basic risks that people are subjected by displacement: landlessness, joblessness, homelessness, marginalization, food insecurity, increased morbidity, loss of access to common property resources and social disarticulation. When people are forced from their known environments, they are separated from the material and cultural resource base as they have been dependent for life individuals and as a society (Altman and Low, 1992). Submission loss usually associated with displacement and



resettlement are loss of access to common properties and resources. Displaced are often distant from their sources of livelihood, whether land, say (water, forest, etc.), or urban markets and clientele (Koenig, 2009). Disasters and displacement can break identification with an environment that might once have been one of principle functions of cultural identity (Oliver-Smith, 2006). Displacement for all groups can be troublesome, but for indigenous people, it may result in especially serious consequences. Environment and ties to the land are considered to be important elements in the survival of indigenous communities and distinctive cultural identities (Colchester, 2000). Shift and resettlement process has been consistently shown to disrupt and destroy these networks of social relations that the poor depend for access to resources, particularly in periods of stress (Scudder, 2005).

Migration is an old coping mechanism in response to environmental (and others) change, and not necessarily lead to negative results, either for the migrants themselves or to receive communities (Barnett and Webber, 2009). Climate variations will cause some movement of stressed people, but there is low confidence in the ability to assign direct causality to climatic effects or the number of people affected.

### **2.5.2.3 Education**

The education dimension spans vulnerability of educational building structures; issues related to access to education; and also sharing and access to prevention and climate adaptation information and knowledge (Wisner, 2006b). Priority 3 of the Hyogo Framework for action 2005-2015 recommends the use of knowledge, innovation and education to build a culture of safety and resilience on all levels (UNISDR, 2007a). A well-informed and motivated population can lead to prevention, but it requires the collection and dissemination of knowledge and information on hazards, vulnerabilities, and capacities. But it is not the information itself that determines action, but how people interpret it in the context of their experiences, perceptions and expectations. Perceptions of risk and hazards are culturally and socially constructed, and social groups construct different meanings for potentially dangerous situations (McIvor and Paton, 2007). In addition, to knowledge and information, explicit environmental education programs among children and adults can have benefits for public understanding of risk, vulnerability and exposure to extreme events (Kobori, 2009), because they promote resilience building in socio-ecological systems through its role in the management of biodiversity and ecosystem services, provides the ability to integrate different forms of knowledge and participatory processes in resource management (Krasny and Tidball, 2009), and help to promote action on sustainable development (Breiting Strasse and Wikenberg, 2010).

Many lives have been lost through the inability of education infrastructure to withstand extreme events. Where flooding is a recurrent phenomenon schools may be exposed or vulnerable to flooding. For example, a survey of primary schools' flood vulnerability in Nyando River catchment of western Kenya showed that 40% were vulnerable, 48% was marginally vulnerable, and 12% were not vulnerable; vulnerable status was attributed to a lack of funds, poor building standards, local topography, soils and inadequate drainage (Ochola et al., 2010). Improving educational infrastructure security can have multiple benefits.

Access to information related to early warning, response strategies, coping and adaptation mechanisms, science and technology, and human, social and economic capital is essential for reducing vulnerability and increase elasticity. A number of factors can influence or control access to information, including economic status, race (Spence et al., 2007), trust (Longstaff and Yang, 2008), and belonging to a social network (Peguero, 2006). However, the mode of information

transfer or exchange must be considered because there is new evidence of growing digital inequality (Rideout, 2003) which may affect the development invulnerability that an increasing amount of information about extreme event preparedness and response are often made available via the internet. Evidence has existed for some time that people who have experienced natural disasters (and thus may have information and knowledge directly through the experience) is, in general, better prepared than those who have not (Kates, 1971). But this not necessarily translates to protective behavior because of what has been called prison experience (Kates, 1962), where people response behavior is determined by previous experience, and are not based on an objective assessment of current risks. In the uncertain context of extreme climate-related, this could mean people are not appropriately educated about the risks.

## **2.6 Disaster Risk**

Disaster risk is the potential loss, expressed in terms of life, health status, livelihoods, assets and services, to a particular community or society due to the impact of a natural hazard. Disaster Risk can be further described as a function of the characteristics and frequency of hazards experienced in a specified location, the nature of the elements at risk, their inherent degree of vulnerability or resilience, and the existing capacity to respond to a threat. Risk is reduced by reduced exposure to hazards, lessened susceptibility of people and property, wise management of land and property, and better preparedness. Climate change will generally increase disaster risk not only through increased frequency and scale of extreme weather events and sea level rise. As water becomes scarcer, agriculture is concerned, ecosystems are degraded and society will be more vulnerable to hazards. It is important to remember that other forms of environmental degradation, related to climate change may also exacerbate or modify existing threats. Climate adaptation is defined as adjustment in natural or human systems to actual or expected climatic stimuli or their effects, in order to moderate harm or exploit beneficial opportunities.

## **2.7 Interventions**

Prevention was placed on the global agenda through the Hyogo Framework for Action, which was launched at the World Conference on Disaster Reduction held in Kobe, Hyogo, Japan. The Hyogo Framework, adopted by 168 governments, is a global framework for prevention efforts during the next decade. Its goal is to substantially reduce disaster losses by 2015, to save not only lives but also the social, economic and environmental values of communities and countries.

The five priorities of the Hyogo Framework for Action 2005-2015

- 1). Ensure that prevention is a national and local priority with a strong institutional basis for implementation.
- 2). Identify, assess and monitor disaster risks and enhance early warning.
- 3). Use knowledge, innovation and education to build a culture of safety and resilience at all levels.
- 4). Reduce the underlying risk factors.
- 5). Strengthen disaster preparedness for effective response at all levels.

## **2.8 Pakistan Scenario**

Pakistan is a low-income country where much of the population is below the poverty line, suffering from food shortages, unfavorable social indicators systems and insecurity. Women in particular suffer majorly because of poverty, lack of education / awareness and low access to health care. Low literacy rates, poor health and high maternal mortality are common problems. Pakistani women lack the power and freedom to make decisions because of social pressure and cultural obstacles. Despite bearing the brunt of multiple responsibilities, they are not the decision-makers; and usually deprived of financial resources and lack control over their own assets or income of the household.

A framework introduced called Poverty Reduction Strategy Paper (PRSP), the government's long-term commitment to poverty reduction through sustained growth in agriculture and rural economic activity will lead to broad economic growth. With special emphasis on vulnerable group key to human development and economic stability is dependent on access to education, health, clean drinking water and rural infrastructure. The ultimate strategy is to mobilize and uplift women.

Pakistan is a disaster-prone country. The very different terrain and climatic conditions make it vulnerable to various forms of disasters. The mountain areas in the north are at risk of earthquakes, floods, blizzards, landslides and avalanches. Coastal areas face the risk of floods and cyclones. Deltas and mid-river systems also face the risk of flooding, while arid and semi-arid areas of southern Punjab, Sindh and Baluchistan are prone to drought.

Pakistan is also located in a seismic active zone because of its proximity to the Indo-Australian and Eurasian plates. Northern Areas and parts of Baluchistan are Seismic risk, where that flooding is a common phenomenon in the provinces of Punjab and Sindh. Aftermaths always sport indelible mark in the form of human deaths, property loss and environmental degradation and, above all, painful memories. It is apparent from the disaster profile of Pakistan that it is a disaster-prone country in South Asia with large loss of property, flora and fauna that occur each year. Pakistan continues to suffer from a host of natural and man-made hazards that threaten to affect the lives and livelihoods of its citizens. Frequent occurrence of flood causes severe disaster in Pakistan, followed by tropical cyclones, strong earthquakes and landslides in the country. Add to these natural events numerous man-made hazards; poor construction, which could lead to the collapse of buildings and infrastructure, fires, conflicts and military operations, oil spills, etc.

Pakistan has also been wrecked by violence for the past 20 years. In 2009 more than three million people in Pakistan were forced to leave their homes in the country's northwestern areas as a result of political uncertainty. More than 2 million people have voluntarily returned to their areas of origin since July 2009 while forced eviction still exist in Khyber Pakhtunkhwa province since 2010. Risk factors that increase vulnerability and contribute to the severity of disasters in Pakistan are: (i) Poor infrastructure and limited enforcement of existing building regulations; (ii) Lack of timely warning systems; (iii) Limited awareness and education on disasters and response; (iv) Limited manpower and coordination between various state disaster agencies; and (v) A large number of impoverished communities susceptible to disaster.

## **2.9 Vulnerabilities of the People of Balakot**

Following are some details about the vulnerabilities of people of Balakot to different natural disasters;

### 2.9.1 Vulnerability to Earthquake

Balakot was one of the worst quake-hit towns in the episode of 8 October 2005. Balakot town sits on an active fault line. The intensive geotechnical and seismic micro zonation study of Balakot city and peripheral region was conducted by NESPAK and micro-seismic hazard map was prepared. The two fault systems merged here form a network of four major and twenty small fracture lines. These fractures net are very vulnerable to seismic. Therefore, the risk of earthquake in the area is very high. Based on various studies conducted in the area and looking at the future seismic activity and earthquake hazard vulnerability Balakot, the government declared Balakot site in the red zone and abandoned it for residential purposes.

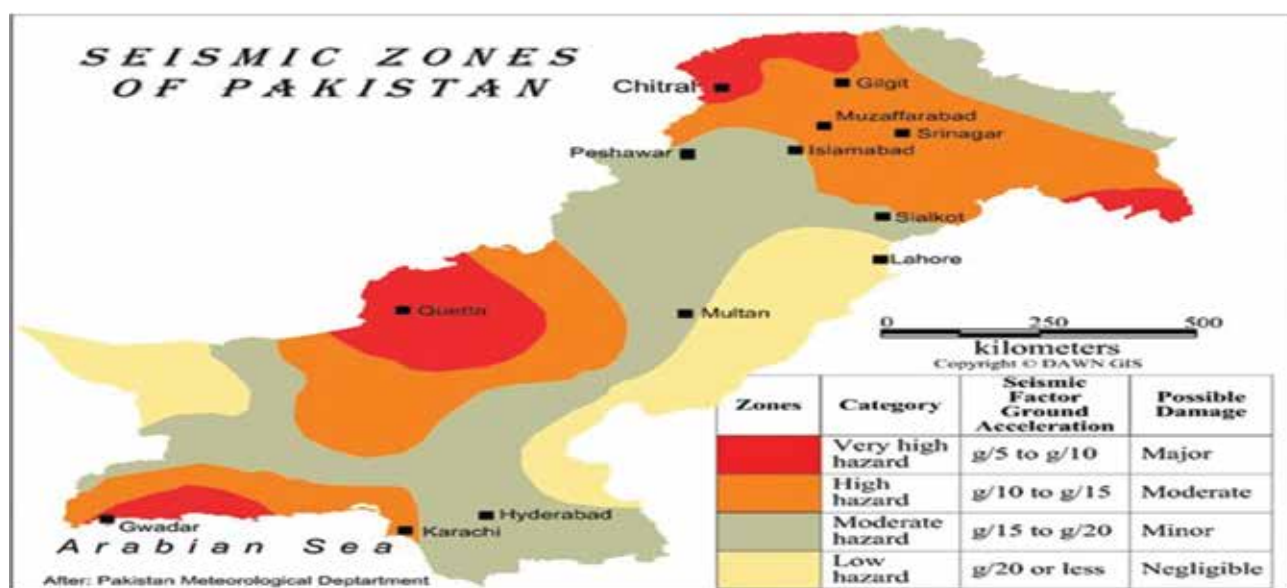


Figure 1: Seismic zones of Pakistan

Source: Chaudry, 2009

### 2.9.2 Vulnerability to Flash Floods

The river Kunhar runs through the middle of Balakot. The geomorphic analysis of river Kunhar show that it has elongated oval shape with catchment area of 2706 Sq. Km. The valley is characterized by steep slopes with a maximum altitude of 5075 m and a minimum 632 m. The elongated oval shape of the catchment area and steep slope are the indicators of flooding. River Kunhar near Balakot have relatively more active flood plain area than elsewhere in the valley. This active flood plain area is at one-meter height and extensively used for agricultural purposes. This area is subjected to mild flooding. Similarly, bridge, number of stores and homes are just five meters height from the riverbed. Here the banks of the river in the area from 80 to 150 meters. The flash floods of 1992 and 1993 severely damaged shrine, bazaar area and residential area on both sides of the river.

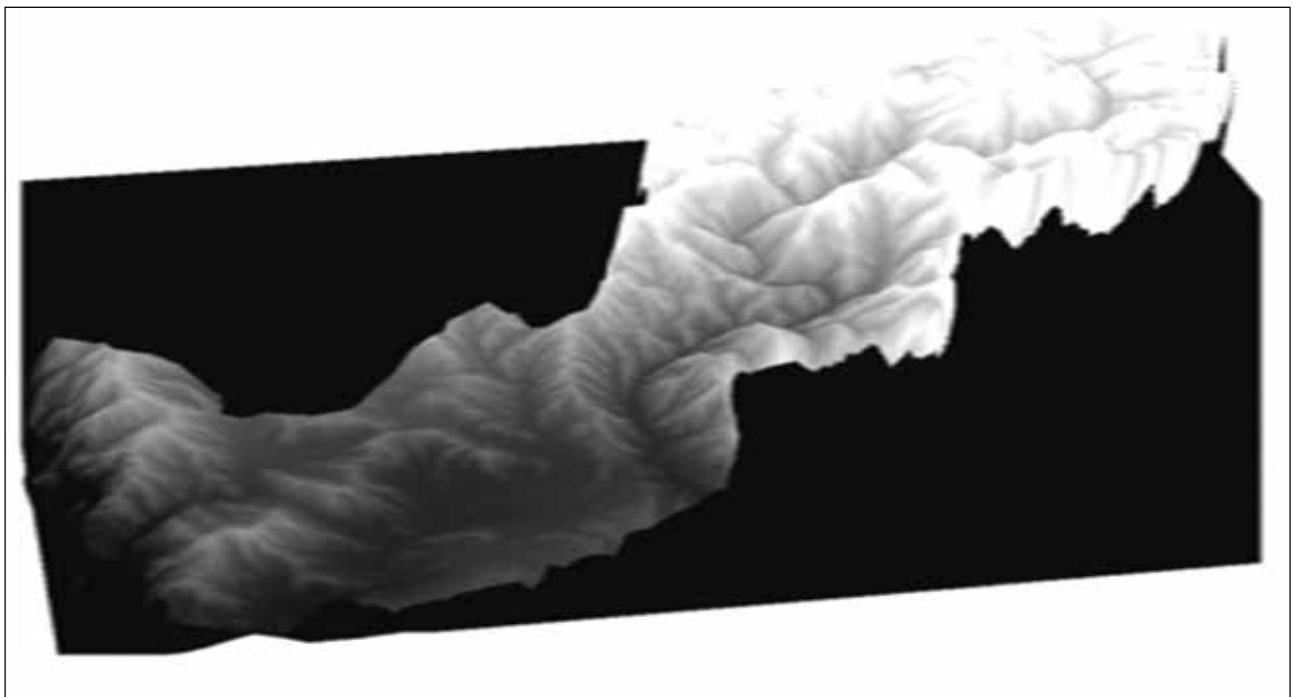


**Figure 2 : River Kunhar, Balakot (view of village Kashtara)**

**Source: Study survey 2016**

### **2.9.3 Vulnerability to Landslides**

The Earthquake - 2005 caused large number of avalanches in the region. Most of these landslides were associated with the wrong line rapture. Balakot lies on active fault and the surrounding region has complex geology. The eastern part especially along the fault line is highly vulnerable to landslide danger. In built up area is natural rocks or soil and drainage system less prone to landslide hazards. Steep slopes and vertical cutting of the river, streams and roads are major factors for landslide hazards in the area, while other factors such as fault surface fractures in the northeastern part, receptive soil of gable plains in the south and moisture availability along the river and streams are other factors.



**Figure 3: Balakot digital (3d) surface model (gis-based terrain analysis of Balakot region, Mehran university research journal)**

## **2.10 Vulnerability Assessments**

Vulnerability assessments carry tools and processes used to assess the extent to which a society and its natural resources to climate change that ultimately affect them. The approach recommended in much climate literature (Marshall et al. 2010) covers three main areas i.e. exposure, sensitivity and adaptability, as they collectively determine the level of sensitivity to climate change. The human dimension, which is the focus of this addendum, is collected to provide a better understanding of the social aspects of exposure, sensitivity and adaptability of the valuation community. In a social context, the following terms are defined as follows:

### **2.10.1 Exposure**

The extent to which a society comes into contact with climatic events or specific climatic effects is called its exposure to that specific hazard. Specifically, this includes the areas of residence and resource use exposed to various climatic events and consequences. For example, the house near the shoreline has high exposure to rising sea levels. Settlement of people in the flood plain may have high exposure to flood damage.

### **2.10.2 Sensitivity**

The extent to which a society is adversely affected by changes in climate is known as sensitivity. Sensitivity is largely determined by the relationship between individuals, households, or communities to the resources affected by climate events, and the degree of dependence on these resources. For example, if "exposed" agricultural products are the main source of food and income for a community, family or group of households, as they can have a high degree of sensitivity. If the exposed reefs are the most important area for fishing providing income and food for a community, that community very sensitive to mass coral bleaching that results from an increase in water temperature.

### **2.10.3 Adaptive Capacity**

The potential or ability of a community to adapt to the consequences of climate change is its adaptive capability. Adaptability is complicated. It can be strongly influenced by a few key characteristics, or by a wide range of social features. For example, well-informed villages with a strong traditional leader who is able to develop good plans and make decisions that help and involve all members of society are likely to show high adaptive capacity. A household that has diversified revenue sources and supplemental livelihood options will likely have higher adaptability to the consequences of climate change than those who do not.

## **2.11 The Social Dimensions of Climate Change – Differentiated Impacts**

The effects of climate change will be laid over existing vulnerabilities in both rural and urban poor and excluded, as vulnerability to seasonal variations, poor health and to market fluctuations. Poor communities are not homogeneous, however, and it is important to understand the differentiated social impacts of climate change on the basis of gender, age, disability, ethnicity, geographic location, livelihood, and migrant status (Tanner and Mitchell, 2008). Some specific examples include:

### **2.11.1 Gender**

Men and women have different roles in water use and management, leading to different needs and priorities. Climate change will increase the time it takes to fetch water in rural areas, a task mainly done by women and girls, due to travel greater distances to find water. In urban areas, water collection also a problem that women and girls can spend hours searching for intermittent water supplies (Brody et al., 2008).

### **2.11.2 Older**

The elderly are likely to be particularly vulnerable especially where social protection is absent or limited. They are at high risk from climate change related effects such as heat stress and malnutrition and in rural areas can meet the low access to health care, as they are often unable to travel long distances to the nearest health facility center (Brody et al. 2008).

### **2.11.3 Children**

Children are at highest risk to health from inadequate water supply during drought, and also predicted changes in vector-borne diseases. They are also at highest risk of malnutrition, with long-term implications for overall development. Children can also be at risk for early entry into the work and utilization to cover lost revenue from agriculture (Bartlett, 2008).

## **2.12 Community Based Disaster Risk Management**

CBDRM in Pakistan has helped increase people's strength through community-based organizations that developed contingency plans for dealing with disasters, developing relationships with external state and non-state actors involved in emergency preparedness and response activities and implement micro mitigation work within communities. Agencies have also become better organized coordinate their DRR work and implement DRR related advocacy through the establishment of a DRR Forum. However, coordination between NGOs at the local level remains low. It is not too little exchange of information, resources etc. on the lower level and very limited attempts have been made to develop broader perspectives on the vulnerability status communities within districts. Furthermore, DRR work mainly being done by agencies as part of preparedness efforts. CBDRM mainly focuses on response and avoidance and ignoring DRR prevention and mitigation dimensions.



## CHAPTER 3

### RESEARCH METHODOLOGY

This chapter presents the methodology adopted to provide the basic grounds for discussion and analysis and facilitate in reaching out the objectives of research study. The survey was designed so as to help the researcher understand the factors that contribute to increase the vulnerability of local communities of disaster prone area towards hazards and disasters. It was also intended to help paint a picture on the coping strategies practiced at local level to reduce vulnerability to hazards or disasters. The chapter will highlight the design and methods applied in studying the research objectives and questions.

#### 3.1 Profile of Balakot

The study area is Balakot and is located about thirty-eight kilometers north-east of the city of Mansehra, in Khyber Pakhtunkhwa Province. It has an average elevation of 971 metres (3188 feet). It is a historical town, a famous tourist destination of the region and the gateway to Kaghan valley of the Khyber Pakhtunkhwa Province of Pakistan. The river Kunhar, originating from Lulusar lake, runs through the city and merges with Jhelum River just Balakot, is a town in Mansehra District in the Khyber Pakhtunkhwa Province of Pakistan.

Tehsil Balakot is occupied mainly by members of the Awan, Gujjar, Syed, Qureshi, Mughal, & Swati tribe and is on the banks of the River Kunhar before it enters the Kashmir Valley. The livelihood source of most of the people is agriculture, and people sow rabbi and kharif crops as per the season. Few people are dependent on businesses i.e. General stores, Food items, grocery stores, Bakeries, Fodder shops etc in the main Balakot city. Economic condition of most of the people is not so good, a few number of families are influential and economically strong. . Also the literacy rate and awareness level is low.

It was one of the towns which was most damaged in the 2005 Kashmir earthquake on 8 October 2005 and an estimated 80% of the buildings there were destroyed. Villages were badly affected and landslides cut off thousands of people from Balakot. People of Balakot are susceptible to seasonal floods, land sliding and earthquakes because Balakot is geographically situated on the fault line.





Figure 4: 2005 Earthquake epicentres

Source: BBC

### 3.2 Target Population

Target population was two villages of U/C Talhatta, Tehsil Balakot i.e. Kashtara and Gulmera. Population of village Kashtara and Gulmera is 350 and 150 households respectively. People of village Kashtara are vulnerable to seasonal and flash floods and people of village Gulmera are susceptible to landslides. Both villages were significantly damaged in Earthquake 2005. In these villages mostly people rely on agriculture and small businesses in the Balakot city.

### 3.3 Sample Size and Sampling Technique

A total of 100 respondents were selected which were divided into two strata, the respondents in both the areas were selected using proportionate random sampling technique.

### 3.4 Data Collection

The study was carried out using both primary and secondary data sources using different methods including structured questionnaire, articles, documents, reports etc

**3.4.1 Primary Data** – A questionnaire was designed regarding the research study for the collection of data from field. The questionnaire included mostly the close ended questions regarding the types of disasters and awareness level of the community to how better cope them and remedies regarding disaster risk reduction (DRR). Some open ended questions were also included, regarding the perceptions of people.

**3.4.2 Secondary Data** – It included the geographical information of the area, its locality, livelihood patterns etc and was collected from journals, articles, document, reports, thesis, and websites.

### **3.5 Study Variables**

- Demographic variables - age, sex, occupation, education, elevation
- Disasters (Earthquake, Landslide and Floods), damages, levels, seasonality, timeframe
- Vulnerability – Social only
- Livelihood
- Education - Awareness, Capacities, Local knowledge
- DRR variables - building codes, mitigation practices.

### **3.6 Data Analysis:**

The data collected through questionnaires was analyzed through MS Excel spreadsheets and Statistical Package for the Social Science (SPSS). The descriptive statistical tools such as means, standard deviations and percentages were used to condense and summarize data and to present it in the forms of tables and diagrams.

## CHAPTER 4

# RESULTS AND DISCUSSIONS

This chapter contains results and discussions of the research study; basically this chapter is divided into five sections, focusing on demography, vulnerability, exposure, sensitivity, and adaptive capability of the people of the study area.

### SECTION - I: DEMOGAPHY

#### 4.1 Average and standard deviation of demographic traits of the respondents (Table 1)

##### 4.1.1 Age

The age limits (class) of the respondents of Kashtara and Gulmera ranged from 17 to 68 with the Mean  $\pm$  Standard deviation of  $46 \pm 11$  and 19 to 70 with Mean  $\pm$  Standard Deviation of  $45.3 \pm 11.9$  respectively.

##### 4.1.2 Education

The schooling years of the respondents of Kashtara and Gulmera ranged from 0 to 16 with the Mean  $\pm$  Standard Deviation of  $6.4 \pm 5.3$  and 0 to 12 with Mean  $\pm$  Standard Deviation of  $7.17 \pm 4.59$  respectively.

##### 4.1.3 Household Size

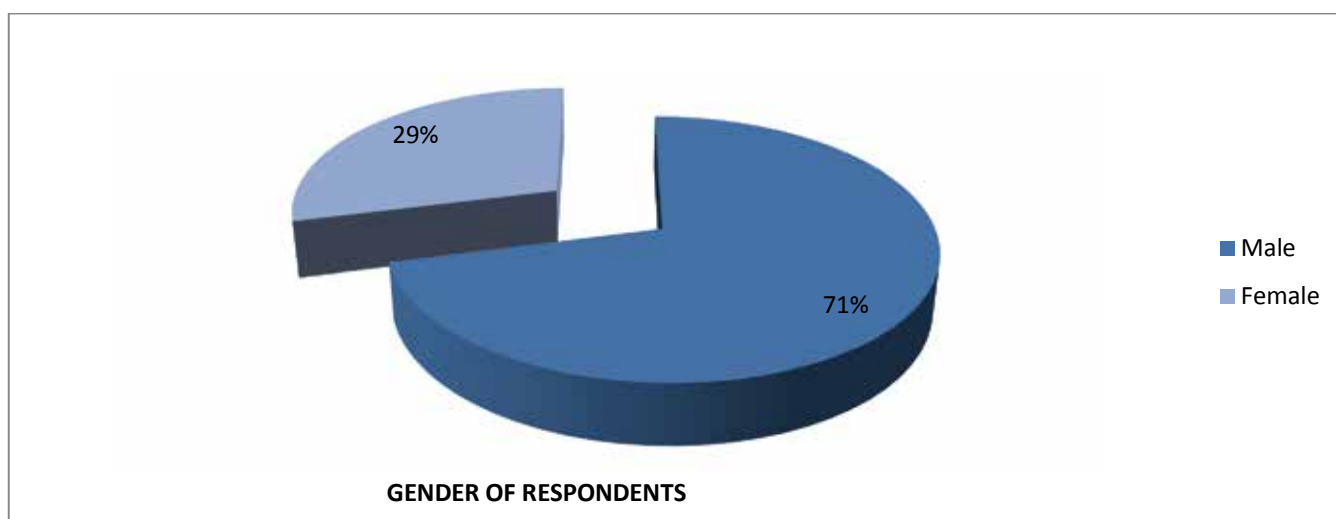
The average household size of the people of Kashtara and Gulmera ranged from 2 to 10 for both the villages with the Mean  $\pm$  Standard Deviation of  $4.7 \pm 1.705$  and  $4.43 \pm 1.69$  respectively

##### 4.1.4 Elevation

Elevation of Kashtara and Gulmera ranged from 821 to 914 meters with the Mean  $\pm$  Standard Deviation of  $859 \pm 31$  and 1161 to 1208 meters with Mean  $\pm$  Standard Deviation of  $1183.533 \pm 13.95494$  respectively.

**Table 1: Average and standard deviation of demographic traits of the respondents**

Demographic Traits	Kashtara		Gulmera	
	Range	Mean $\pm$ Standard Deviation	Range	Mean $\pm$ Standard Deviation
Age	17 – 68	$46 \pm 11$	19 - 70	$45.3 \pm 11.9$
Years of Education	0 - 16	$6.4 \pm 5.3$	0 - 12	$7.17 \pm 4.59$
No. of household members	2 - 10	$4.7 \pm 1.705$	2 - 10	$4.433 \pm 1.69$
Elevation (meters)	821 - 914	$859 \pm 31$	1161 - 1208	$1183.53 \pm 13.95$



**Figure 5: Gender of respondents**

#### **4.2 Demographic Profile of the Communities**

Statistics of target population in terms of number of respondents, age and occupation distribution is depicted in table 2 and 3. The youngest respondent was 15 years old and the oldest was 70 years. Majority of the respondents fall under 30 to 59 years of age cadre.

Education is also an important factor as an awareness and adaptation because educated people can better understand and implement the mitigation practices regarding hazards or disasters. Majority of the respondents of Kashtara and Gulmers were having 10 years of education. Both the targeted villages were backward and people had less job opportunities in the area. Most of the respondents living there were Government employees, shopkeepers (self-employed), skilled labors and other salaried employees.

**Table 2: Demographic profile of the communities**

Classes	Kashtara		Gulmera	
Age	Frequency	Percentage	Frequency	Percentage
15 – 29	4	6	3	10
30 – 44	27	38.5	12	40
45 – 59	26	37	11	37
60 - 74	13	18.5	4	13
<b>Total</b>	<b>70</b>	<b>100%</b>	<b>30</b>	<b>100%</b>
Education	Frequency	Percentage	Frequency	Percentage
0 – 5	31	44	9	30
06 – 10	25	36	18	60
11 – 16	14	20	3	10
<b>Total</b>	<b>70</b>	<b>100%</b>	<b>30</b>	<b>100%</b>

**Table 3: Occupation distribution of target population**

Occupation	Kashtara	Percentage	Gulmera	Percentage
Small Holder Farmer	3	4.3	2	2.9
Livestock Producer	4	5.7	0	0
Unskilled agricultural labor	2	2.9	0	0
Wage labor	5	7.1	4	5.7
Shopkeeper (Self Employed)	11	15.7	5	7.1
Business Traders	2	2.9	0	0
Skilled Labor	11	15.7	8	11.4
Government Employee	18	25.7	8	11.4
Other Salaried employee	8	11.4	2	2.9
Home Base Work	3	4.3	0	0
Miscellaneous	3	4.3	1	1.4
<b>Total</b>	<b>70</b>	<b>100%</b>	<b>30</b>	<b>100%</b>

## SECTION II– VULNERABILITY

### 4.3 Extent of Damage Due to Earthquake, Landslide and Flood

On October 8, 2005 the earthquake that hit Northern Pakistan caused widespread destruction killing over 73,000 people. Severely injuring many more and leaving millions without shelter. The affected areas of Northern Pakistan suffered extensive structural and economic damage, with vulnerable groups in this mountainous region bearing the brunt of the disaster. The devastation was spread over 30,000 square kilometers to treacherous Himalayan terrain. Hundreds of post-quake tremors and constant landslides multiplied the shock and trauma, while the onset of winter threatened the lives of the survivors. This was without question the worst natural calamity in Pakistan history; recovering from it is going to cost billions of dollars, but different communities who were badly affected did not lose hope and fought against all odds over a period of almost 10 years managed to come back to normal life.

The Balakot region is vulnerable for many types of natural disasters and flood is also one of them in spite of being susceptible to earthquake and landslide, the community of study area is also vulnerable to seasonal floods and lightening. Many examples of flooding in the area are still there.

#### 4.3.1 Damage

The monetary value of fully or partially destroyed assets, equities and real estate is considered as damage. It is basically assumed that the assets will be repaired or replaced to the same state - in quantity and quality - before the disaster, i.e. valued at agreed replacement (as opposed to reconstruction) costs. The assessment should consider the degree of damage, i.e. whether an asset can be rehabilitated or repaired, or has been completely destroyed (R. Jovel, 2007).

#### 4.3.1.1 Damages Caused to Humans

As delineated in Figure 6, Damages caused to human life at household level in both the villages Kashtara and Gulmera due to disasters is 31% and 63% respectively. Many of the households from target villages were displaced from their actual location that had number of injured people with them.

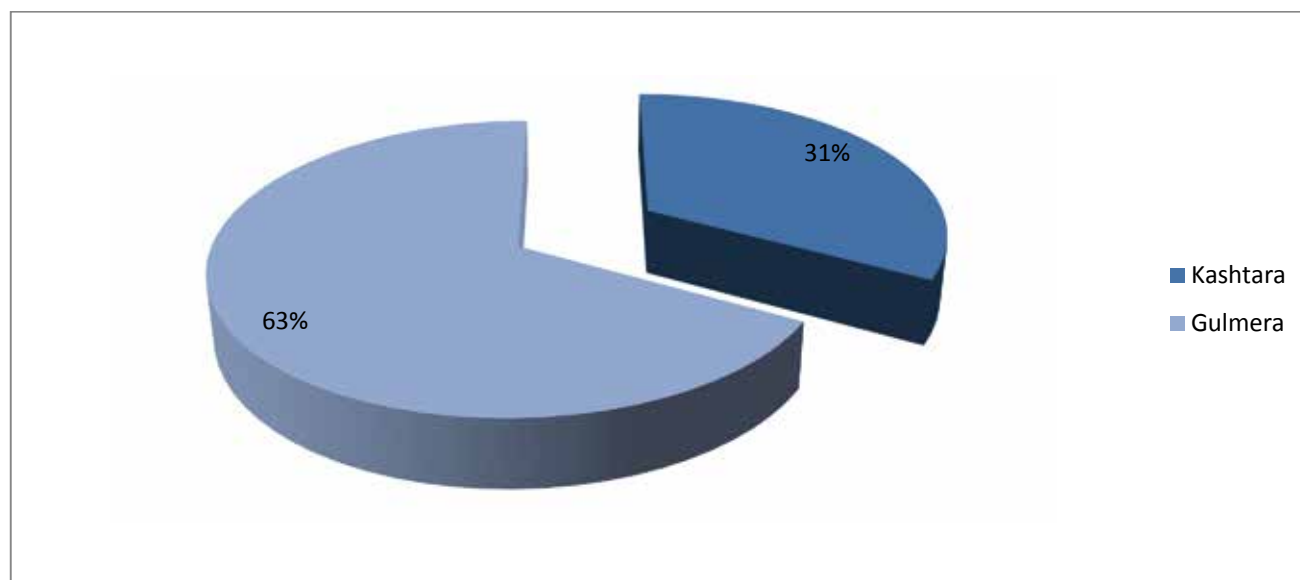


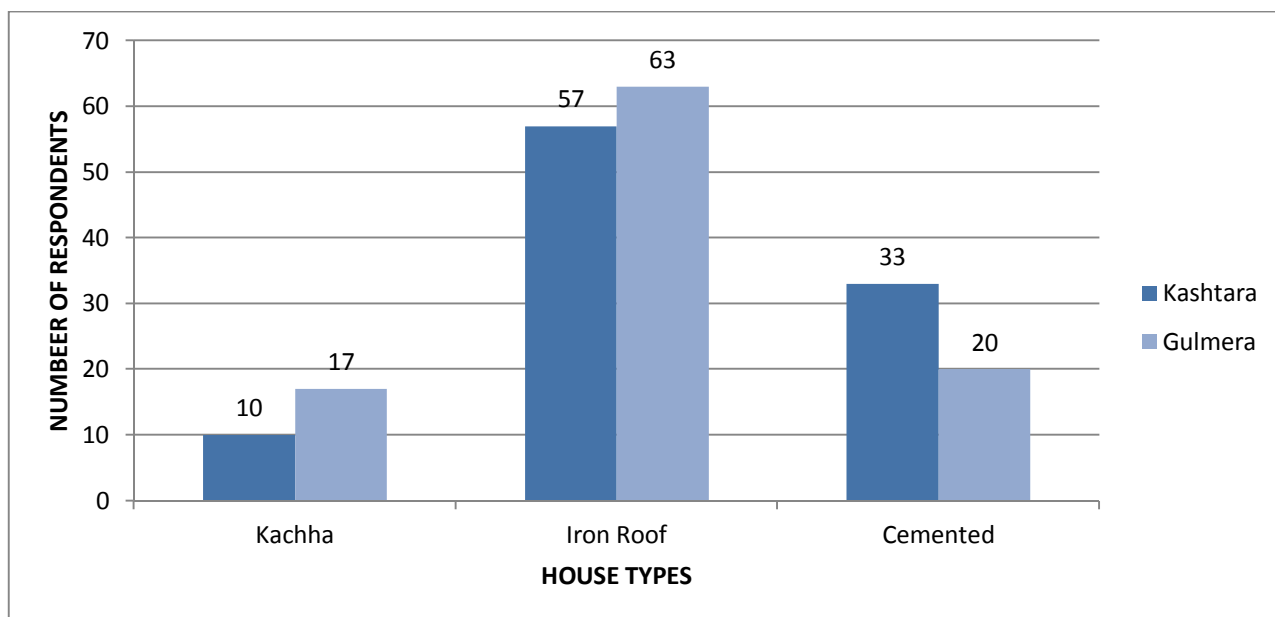
Figure 6: Damages caused to humans

#### 4.3.1.2 Damages Caused to Residents

The basic reasons for humongous magnitude of destruction in the union council Talhatta were;

1. Poverty
2. Lack of proper building codes
3. Illiteracy/Lack of awareness
4. Absence of regulatory authorities regarding planning and development

The people of the study area were having less knowledge regarding the proper building codes. In both the villages (Figure 7) they had mix of kachha, iron roof and cemented houses but mostly were having iron roof houses. Damage caused to houses is dependent on the way it is constructed this can increase or decrease the vulnerability to human loss.

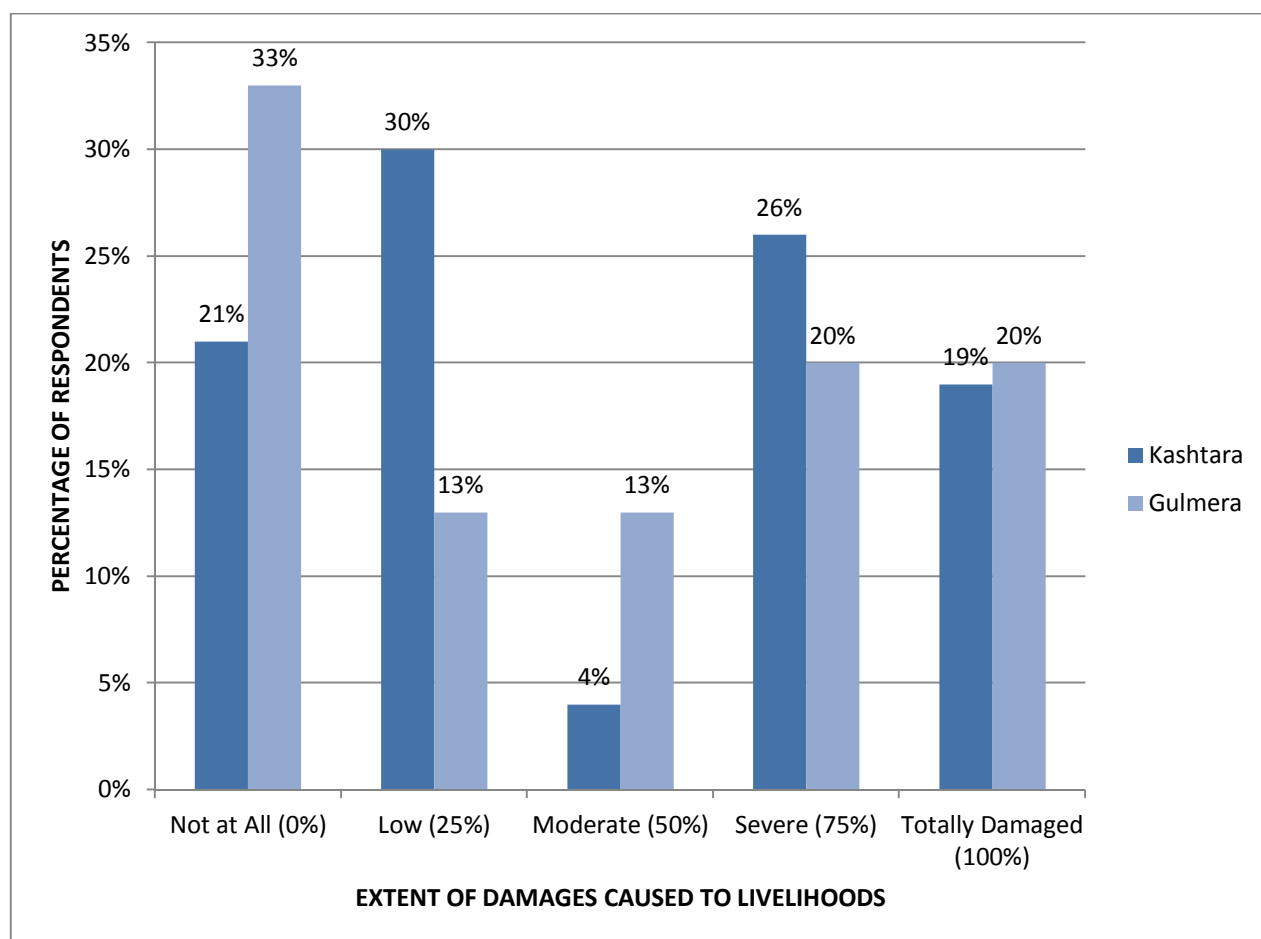


**Figure 7: Status of house types (percentage)**

#### **4.3.1.3 Damages Caused to Livelihoods**

A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stress and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base (Chambers & Conway, 1991). The term livelihood is well recognized as humans inherently develop and implement strategies to ensure their survival. The hidden complexity behind the term comes to light when governments, civil society, and external organizations attempt to assist people whose means of making a living is threatened, damaged, or destroyed.

The graph (Figure 8) depicts the percentage of people from each village that faced damages to their livelihood sources due to disasters. It was observed that in village Kashtara, livelihoods of 19% respondents were totally damaged (i.e. 100%) due to disasters, whereas 26% respondents face severe damages (i.e. 75%). 4% respondents got moderate damages (i.e. 50%) and 30% respondents got low damages (i.e. 25%) and luckily 21% respondents didn't get any damage. On the other hand, in village Gulmera, livelihoods of 20% respondents were totally damaged whereas same percentage of respondents face severe damage (i.e. 75%). 13% respondents get moderate damages (i.e. 50%) and 13% respondents got low damages (i.e. 25%). Luckily 20% respondents didn't face any damage.



**Figure 8: Damages caused to livelihoods**

#### **4.3.1.4 Damages Caused to Assets**

The Graph (Figure 9) illustrates the extent of damages to assets in context of disasters. In both the villages significant damages to assets were reported. It was observed that in village Kashtara, houses and home appliances of respondents were affected severely by the disasters. Business, livestock, automobile/motorbike and agriculture got minor damages. On the other hand, in village Gulmera, the destruction to houses and the home appliances was found same as Kashtara. Agriculture was also being affected moderately and livestock, business and automobile/motorbike got minor damages.



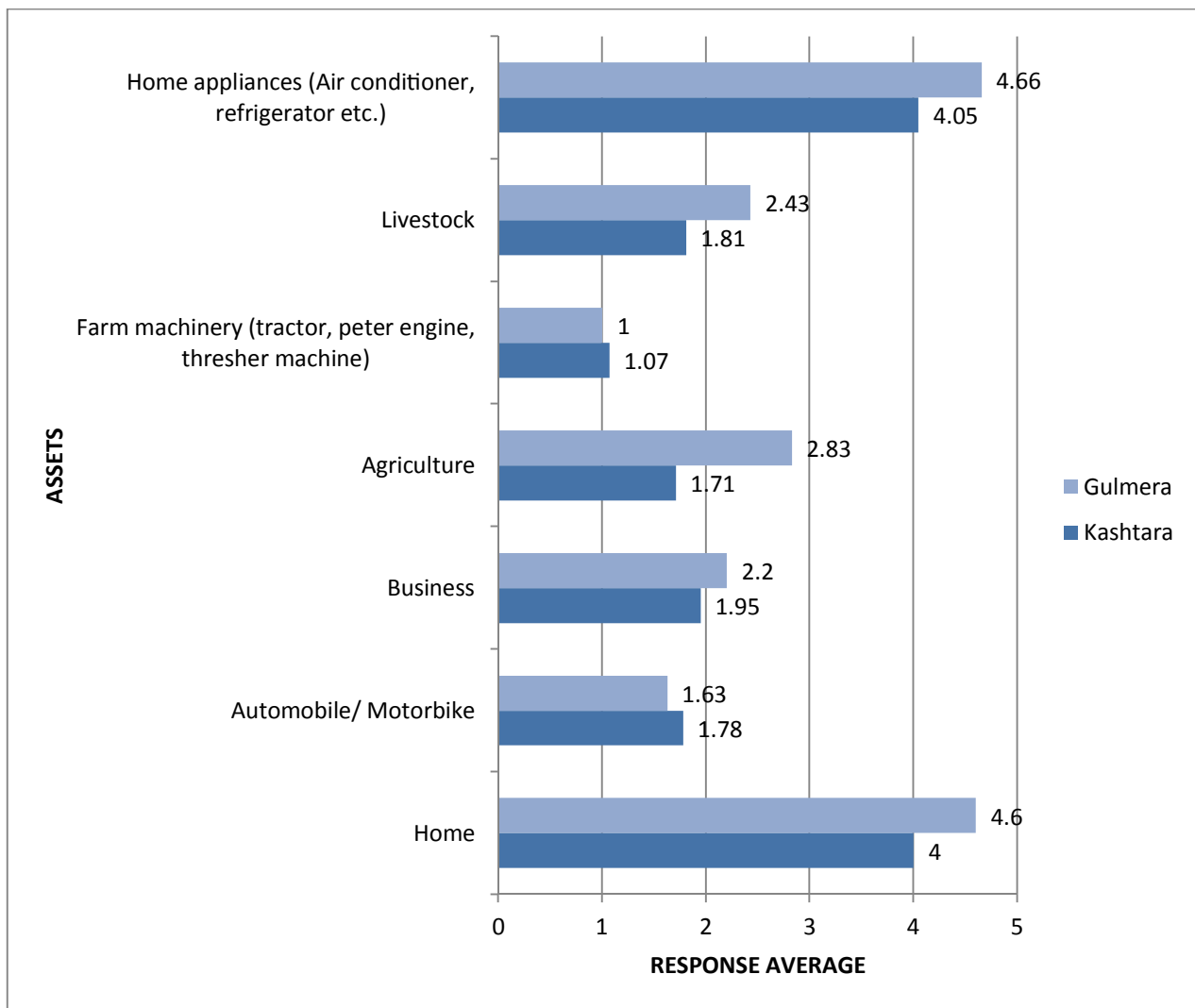


Figure 9: Damages caused to assets (response average using Likert scale)

#### 4.4 Respondents Who Were Forced to Leave Their Houses Due to Disasters

In the disaster prone areas, disasters sometimes force the habitats of area to leave their houses which ultimately increases their susceptibility to much kind of risks. The pie chart (Figure 10) represents the percentage of respondents from both villages that were forced to leave their houses due to disasters, so the study shows that 91% respondents from village Kashtara and 67% respondents from village Gulmera who left their houses in disastrous situations to save their lives from the negative impacts of disasters.

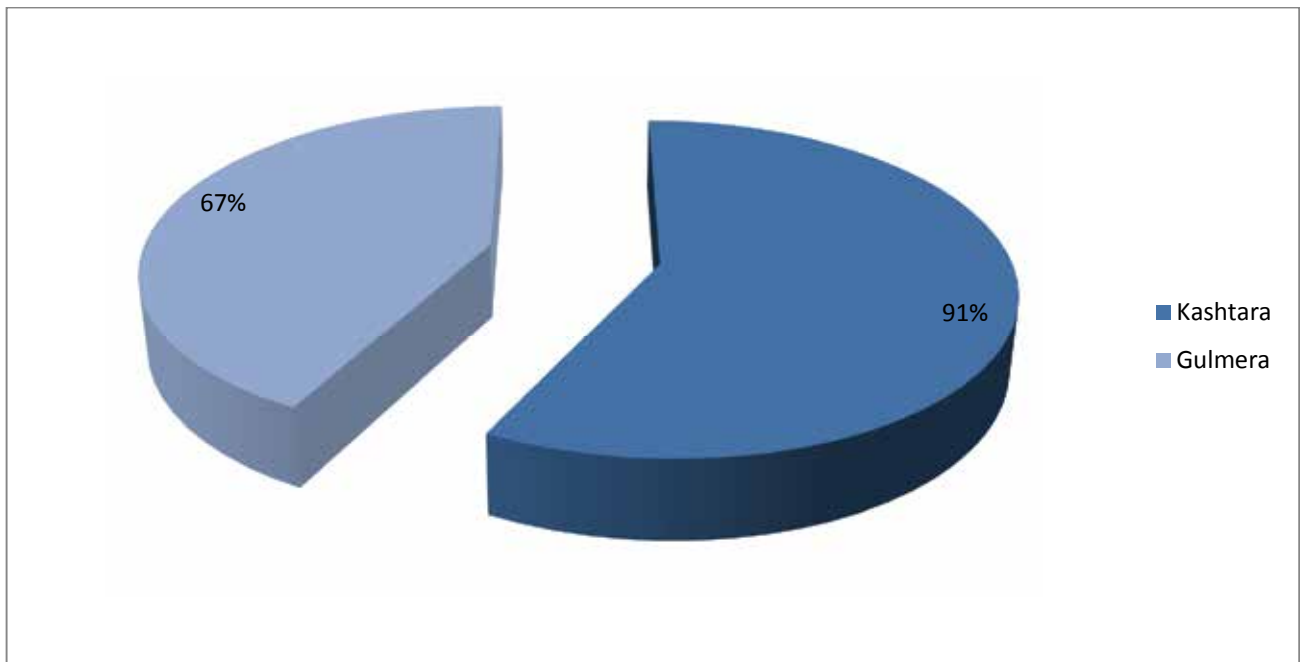


Figure 10: Percentage of respondents from both villages who were forced to leave their houses due to disasters

#### 4.4.1 Stay at Displacement Site

The figure 11 delineates the stay of respondents at displacement site in the disastrous situations. It was observed that in village Kashtara the stay of respondents at displacement site ranged from 7 days to 365 days (i.e. 1 year) and on average mostly respondents stayed at displacement sites for 180 days. In the case of village Gulmera, the stay ranged from 30 days to 180 days and on average most of the respondents stayed at displacement sites for 120 days. Respondents were of the view that they stayed in camps and tents, where the weather extreme was also a survival challenge for them and their families.

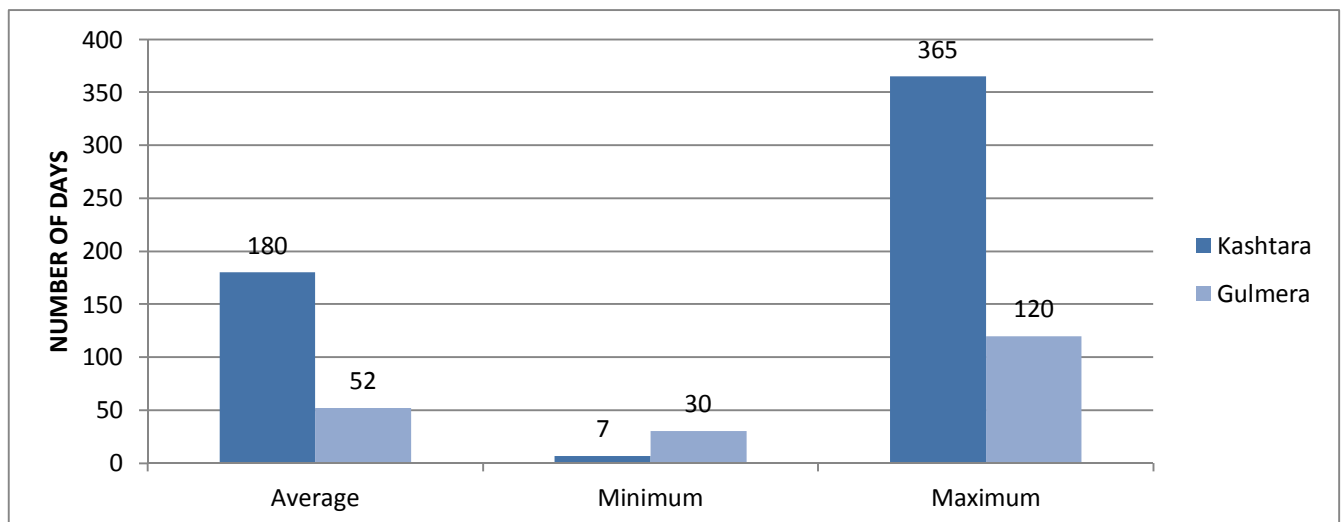


Figure 11: Stay at displacement site

## SECTION III – EXPOSURE

### 4.5 Exposure to Hazards

The severity of the impacts of extreme and non-extreme weather and climate events depends strongly on the level of vulnerability and exposure to these events. Trends in vulnerability and exposure are major drivers of changes in disaster risk and of impacts when risk is realized. Understanding the multi-faceted nature of vulnerability and exposure is a prerequisite for determining how weather and climate events contribute to the occurrence of disasters, and for designing and implementing effective adaptation and disaster risk management strategies.

The table 4, depicts the percentage of respondents of both villages who were exposed to hazards. It was observed that 100% respondents from both the villages were exposed to earthquakes. In Kashtara 68% respondents were exposed to the seasonal and flash floods and the percentage in village Gulmera was 97%. Percentage of respondents exposed to lightening in village Kashtara and village Gulmera was 59% and 87% respectively.

All the respondents of village Gulmera said that they were exposed to landslide and when we asked them about the conflicts 46% respondents from village Kashtara and 10% from village Gulmera agreed. It was found that mostly people from both the villages were exposed to different types of hazards and dangers.

**Table 4: Percentage of respondents who were having exposure to hazards**

	Kashtara		Gulmera	
Hazards	Frequency	Percentage	Frequency	Percentage
Earthquake	70	100%	30	100
Floods	68	97%	29	97%
Conflict	32	46%	3	10%
Lightening	41	59%	26	87%
Climate related land or mud slide	7	10%	30	100%

#### 4.5.1 Extent of Exposure to Hazards

The graph (Figure 12) illustrates the extent of exposure to hazards of the population of both villages. It was observed that people of village Kashtara were highly exposed to floods and earthquakes and were having slight exposure to lightening. On the other hand, people of village Gulmera were highly exposed to landslides/mudslides and earthquakes and were having moderate exposure to floods and lightening.

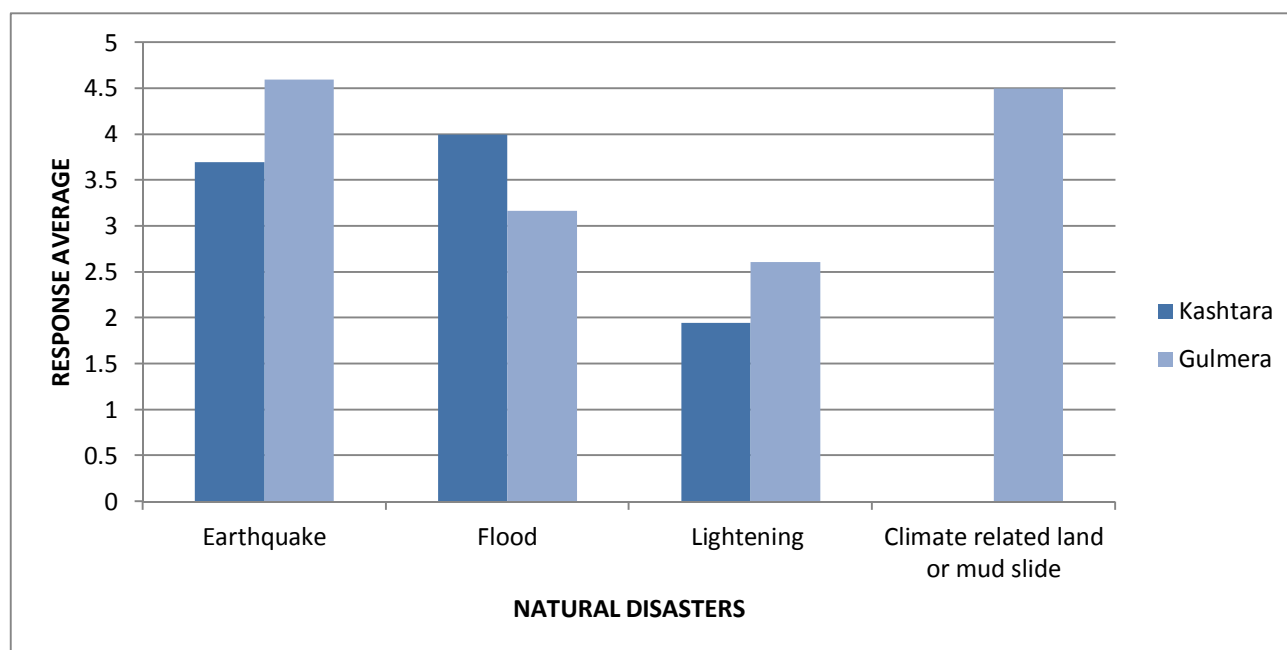


Figure 12: Extent of exposure to hazards (response average using Likert scale)

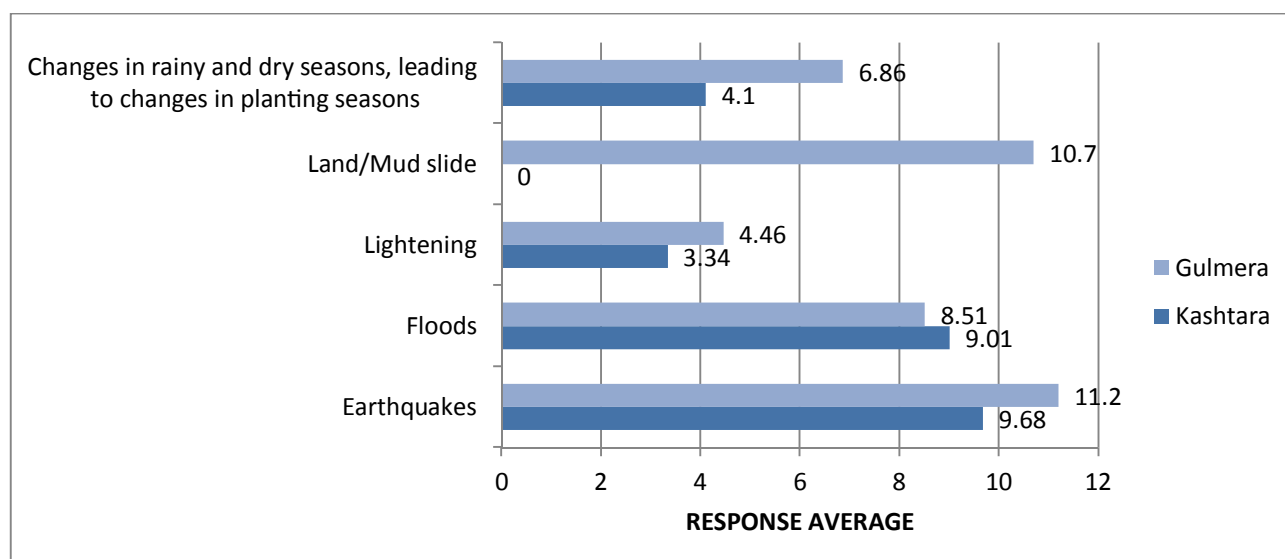
#### SECTION IV - SENSITIVITY

#### 4.6 Extent of Vulnerability to Natural Disasters

The graph (Figure 13) represents the extent of vulnerability of the people of study area towards natural disasters. The questions were mainly focused on the frequency of natural hazards, their severity, difficulty to cope, and their negative impact of that disaster on their households. The respondents were given a scale of 1 - 12 to rate the frequency of natural hazards, their severity, difficulty to cope, and their negative impact of that disaster on their households. It was found that the people of village Kashtara rated the scale for earthquake and flood as 9.68 and 9.01 respectively and they ranked the scale for lightening and changes in rainy and dry seasons leading to changes in planting season as 3.34 and 4.1 respectively.

The respondents of village Gulmera rated the scale of earthquake and flood as 11.2 and 8.5 respectively and rated lightening and changes in rainy and dry seasons leading to changes in planting season as 4.46 and 6.86 respectively. People were found highly vulnerable to the land/mud sliding. They rated the scale as 10.7 out of 12. Most of the people of village faced human losses due to landslide.

It was observed that mostly people find difficulties in coping the natural disaster and they also put negative impact on the habitats of the study area.



**Figure 13: Extent of vulnerability to natural disasters**

**Note: Respondents were asked to Rank Between 1 to 12 the Frequency, Severity, Negative Impact of Disasters on their Households and Difficulty in Coping with Disasters.**

#### **4.7 Community's Dependence on Resources**

The table 5, delineates the percentage of community's dependence on the resources and the percentage of it as household use and for income generation purpose. Study shows that in village Kashtara, 50% people use agriculture as house hold use and among them 44% also use it as income generation purposes. 76% people were dependent on forest wood for cooking and heating purposes while others were using Liquid Petroleum Gas(LPG) gas for the same purpose because there is an extreme weather condition in winters in the study area. Livestock for house hold and income generation was used as 27% and 11% respectively and 14% people also were cultivating vegetables as kitchen gardening. 6% people were using business like grocery stores as household use and 20% use for income generation purpose.

On the other hand, study shows that 53% people of village Gulmera use agriculture as household use and 13% use same resource an income generation purpose. 100% people were dependent on forest wood for cooking and heating purposes and wee depleting the forests. Livestock for house hold and income generation was used as 30% and 7% respectively. 37% people were cultivating vegetables at household level for their food requirements. 10% people were using business like grocery stores as household use and 40% use for income generation purpose.

**Table 5: Percentage of community's dependence on resources**

	<b>Kashtara</b>		<b>Gulmera</b>	
<b>Resource Name</b>	Household Use f (%)	Income Generation f (%)	Household Use f (%)	Income Generation f (%)
Agriculture	35 (50)	8 (11.42)	16 (53)	4 (13)
Business	4 (5.7)	14 (20)	3 (10)	12 (40)
Livestock	19 (27)	8 (11)	9 (30)	2 (7)
Wood (Forest)	53 (76)	0	30 (100)	0
Farming	10 (14)	1 (10.42)	11 (37)	0

#### 4.8 Agriculture

The agriculture sector continues to be an essential component of Pakistan's economy. It currently contributes 21 percent to GDP. Agriculture generates productive employment opportunities for 45 percent of the country's labor force and 60 percent of the rural population depends upon this sector for its livelihood. It has a vital role in ensuring food security, generating overall economic growth, reducing poverty and the transforming towards industrialization. The present government is determined to improve the quality of life of the people and to banish hunger and malnutrition from the country by making agriculture an efficient, productive and profitable sector of the economy.

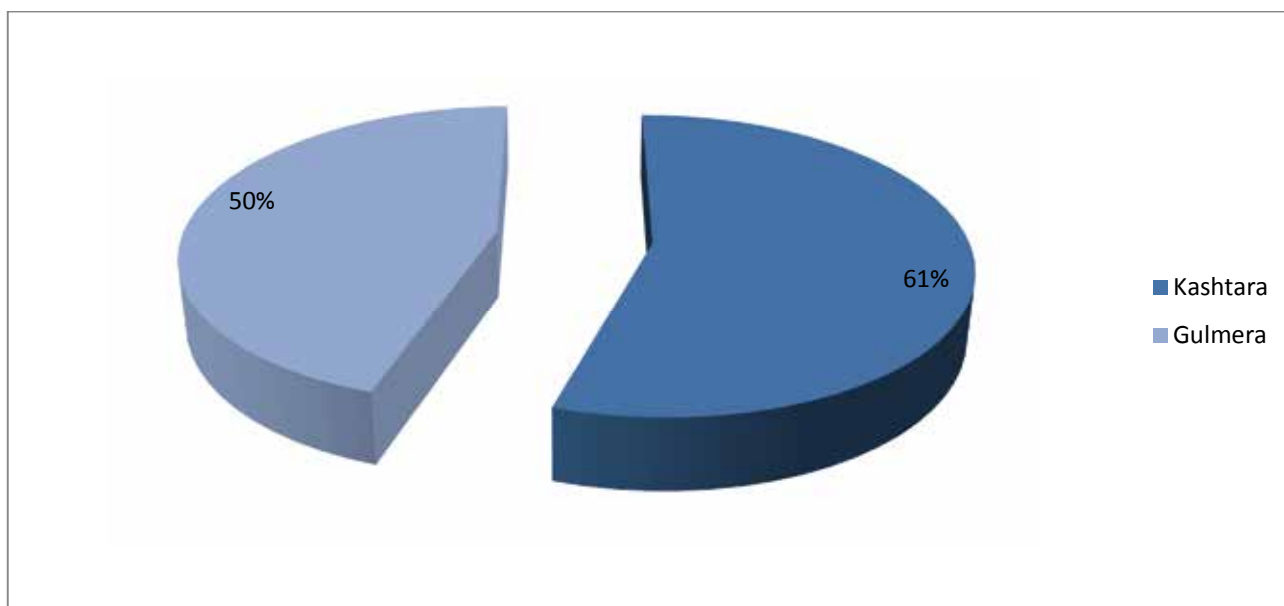
Agriculture was considered as an important factor as a food security in the study area, as illustrated in table 6, Almost 50 percent of population of both villages were producing wheat and maize as a major crop mostly for house hold use. A very few people also sale their crops to get cash income.

**Table 6 : Percentage of respondents who cultivate crops**

<b>Crop Name</b>	<b>Kashtara (f)</b>	<b>Percentage</b>	<b>Gulmera (f)</b>	<b>Percentage</b>
Wheat	35	50%	17	56.6%
Maize	35	50%	17	56.6%

#### 4.9 Percentage of Respondents from Both who take Loans to Cover their Expenses

The pie chart (Figure 14) depicts the percentage of respondents from both the villages who take loans to cover their expenses. It was observed that in village Kashtara and Gulmera, 61% and 50% respondents took loans to cover their domestic expenses respectively. They took loans from family, friends, community elders and shopkeepers. A large amount of people in the study area take loans to run the cart of life.

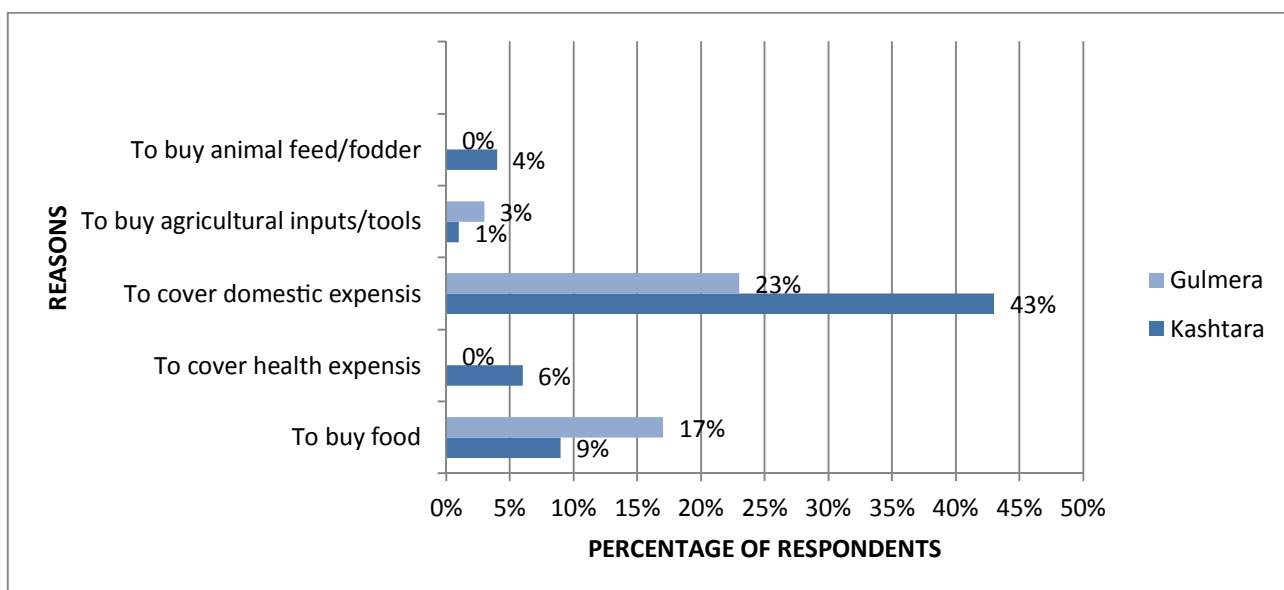


**Figure 14: Percentage of respondents from both who took loans**

#### 4.9.1 Reasons for Taking Loans

The following graph (Figure 15) further elaborates the reasons, on the bases of which respondents took loans. The study shows that in village Kashtara, 43% respondents took loans to cover domestic expenses, to buy food 9% respondents took loans, 6% respondents took loans to cover health expenses and 4% took loans to buy animal feed/fodder and miscellaneous reasons. On the other hand, in village Gulmera, 73% people were of the view that they took loans for miscellaneous reasons, and to cover domestic expenses 23% respondents took loans. 17% respondents took loans to buy food and a very few percentage of respondents took loans to buy agricultural inputs/tools.

Generally speaking, it was observed that mostly respondents were the regular receivers of loans, and were so much dependent on them. They were of the view that without taking loans they were unable to cover their domestic expenses.



**Figure 15: Reasons for taking loans**

## **SECTION V – ADAPTIVE CAPACITY**

Adaptation is broadly defined as a set of actions to reduce the impacts of climate change that are happening now and increase resilience to future impacts.

### **4.10 Disaster Hazard Control Measures**

As mentioned above that people of Balakot are vulnerable to different disasters. Following are the details of the percentage of people who practiced the mitigation practices in context of earthquake, floods and landslides and also their efficiency as per the knowledge of people of the study area who practiced them;

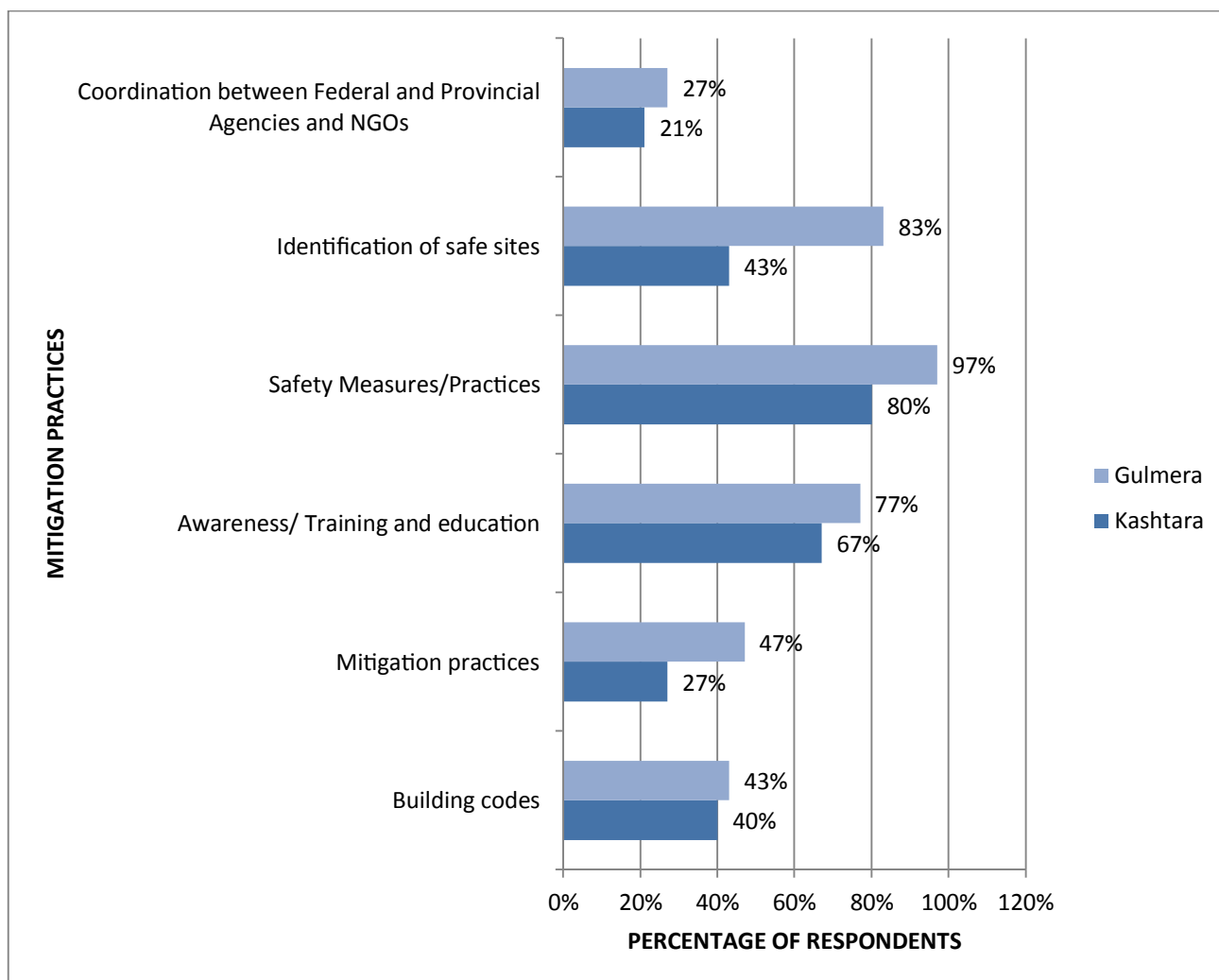
#### **4.10.1 Mitigation Practices in Context of Earthquakes**

After the major disaster of earthquake and landslide many of the Government line agencies and nongovernmental organizations facilitated the people by building their capacities and giving them training/education sessions. People started realizing the importance of following the mitigation practices and very few of them also practiced them. The graph (Figure 16) illustrates the percentage of people from each village who follow mitigation practices to reduce their vulnerability in context of earthquakes. Study found that in village Kashtara 80% people practiced safety measures and practices i.e. moving under the table/corner etc. Many Organizations worked on the capacity building of communities and 67% people got awareness training and education from different organizations. 43% respondents said that they have identified a safe site for disasters. Building codes were followed by 40% which means the remaining 60% are at risk and are susceptible to earthquakes. Only 27 % people practiced mitigation practices and it was observed that their coordination with federal and provincial agencies was weak.

The study shows that in village Gulmera, it was observed that 97% people practiced safety measures and practices i.e. moving under the table/corner etc. 83% respondents said that they have identified a safe site for disasters. 77% people got awareness training and education on how to respond disastrous situations. 47% people practiced mitigation practices and 43% people practiced building codes. Coordination with federal and provincial agencies was weak and only 27% people agreed on it.

It was observed that very few people of both villages practiced mitigation practices to reduce the risks of disasters due to poverty and lack of sufficient resources. Many of the people were still not aware of how to better cope up with disasters.

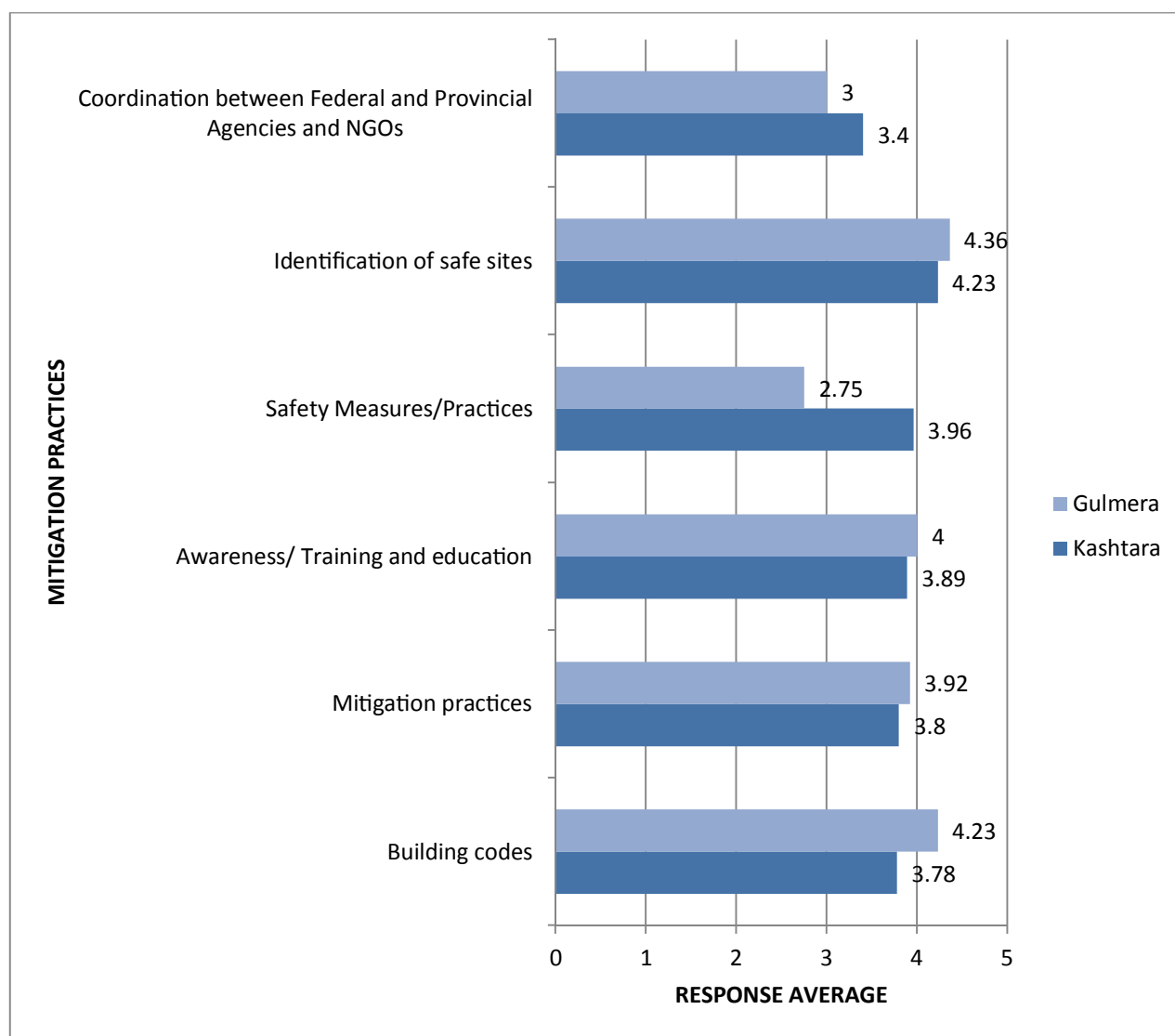




**Figure 16: Percentage of respondents who practiced mitigation practices in context of earthquakes**

#### 4.10.2 Efficiency of Practicing Mitigation Practices

As mentioned above the percentage of people who practice proper mitigation practices is low if we compare them to their area which is prone to disasters. The graph (Figure 17) depicts the usefulness of following mitigation practices as per the knowledge of respondents who have practiced them. In village Kashtara, study shows that following proper building codes, mitigation practices, awareness raising trainings and education, safety measures and practices, identification of safe site, was found effective but respondents were not sure about the coordination between federal and provincial agencies. On the other hand, the respondents of village Gulmera were of the view that practicing proper building codes, mitigation practices, awareness raising trainings and education, identification of safe site, is effective but respondents were not sure about the safety measures and practices and coordination between federal and provincial agencies.



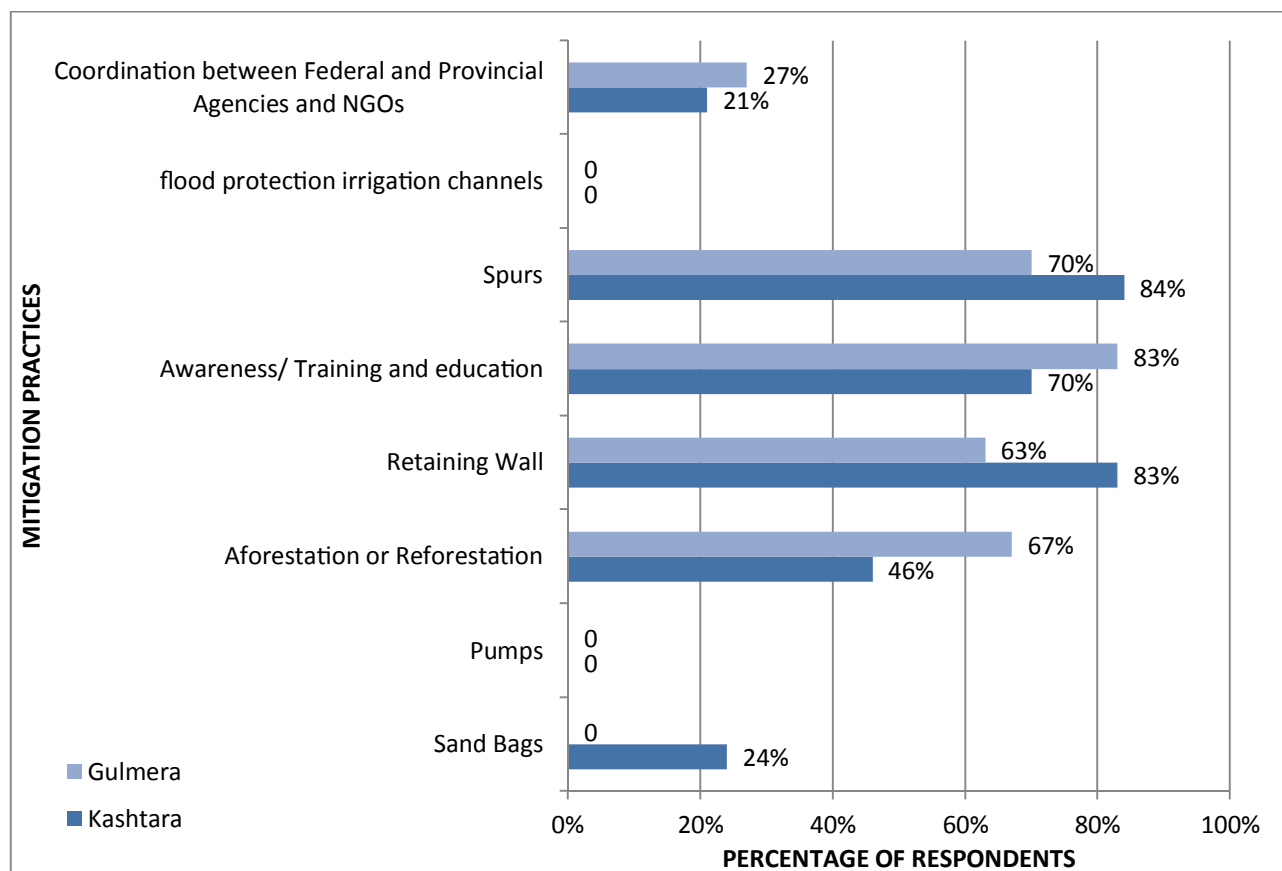
**Figure 17: Efficiency of practicing mitigation practices (response average using Likert scale)**

#### 4.10.3 Mitigation Practices in Context of Floods

The graph (Figure 18) delineates the percentage of people from both villages who follow mitigation practices to reduce their vulnerability in context of floods either they are seasonal or flash floods. Study found that in village Kashtara, approximately 83.5% people practiced retaining walls and spurs, which were mostly provided by the government line agencies and nongovernmental organizations. 70% respondents got awareness training and education on how to respond disastrous situations. 46% people practiced afforestation and reforestation. It was observed that only 24% respondents practiced sand bags which were found useless in the opinion of most of the respondents. The coordination with federal and provincial agencies was weak and only 21% people agreed on it.

In village Gulmera, it was observed that 83% people got training and education sessions from different organizations regarding how to respond in disasters. 70% respondents said that spurs were provided to their areas from different governmental and nongovernmental organizations. Because the study area was highly susceptible to land/mud sliding 67% people practiced afforestation and reforestation to reduce the risks of land sliding. 63% people got assistance from

governmental and nongovernmental organizations regarding the retaining walls. The coordination with federal and provincial agencies was also found weak.



**Figure 18: Percentage of respondents who practiced mitigation practices in context of floods**

#### 4.10.4 Efficiency of Practicing Mitigation Practices in Context of Floods

As mentioned above the percentage of people who practice proper mitigation practices is low if we compare them to their area which is prone to many kind of disasters. The graph (Figure 19) represents the usefulness of following mitigation practices as per the knowledge of respondents who have practiced them. In village Kashtara, study shows that practicing Afforestation/reforestation, retaining walls and awareness trainings and education is effective. Mostly respondents were not sure about the coordination with federal and provincial agencies. Respondents were not sure about the safety measures and practices and coordination between federal and provincial agencies. It was also observed that sandbags and spurs were rated less effective by the respondents.

On the other hand, study shows that the respondents of village Gulmera find practicing Aforestation/reforestation, retaining wall and awareness trainings and education effective in reducing their vulnerability. Mostly respondents were not sure about the coordination with federal and provincial agencies spurs were also found less effective in their area.

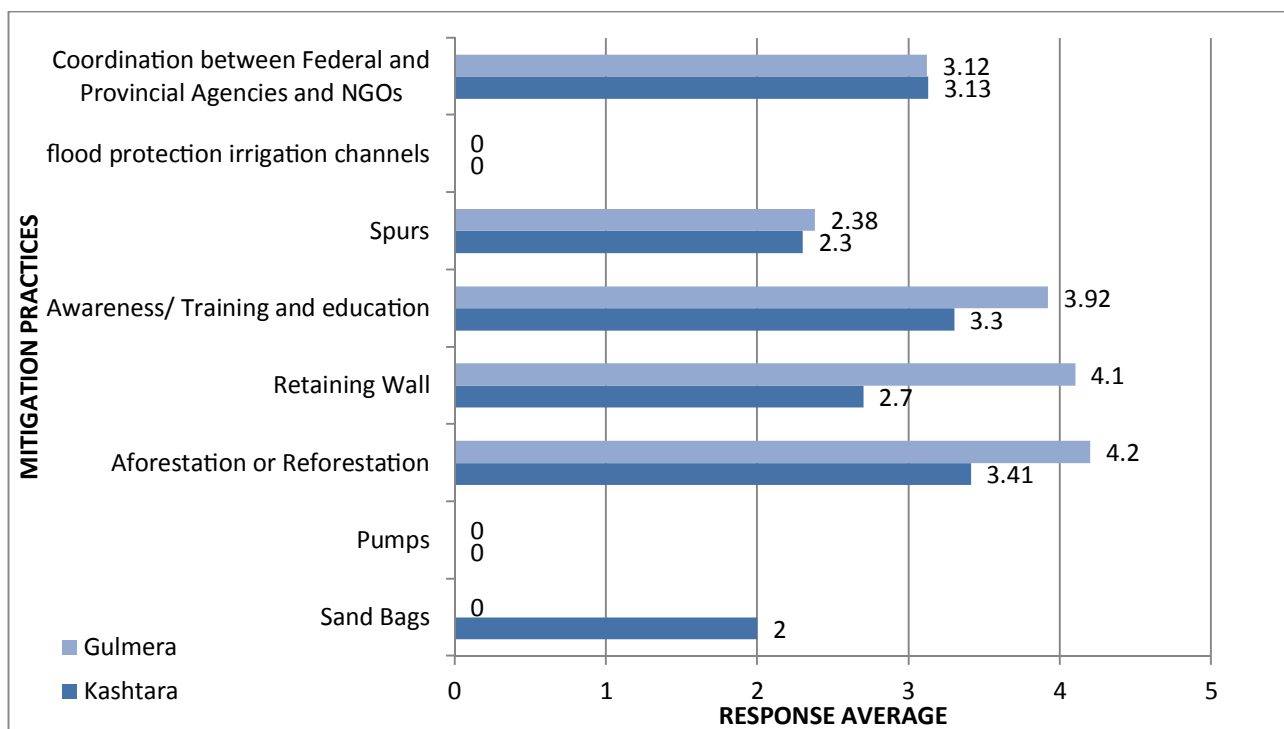
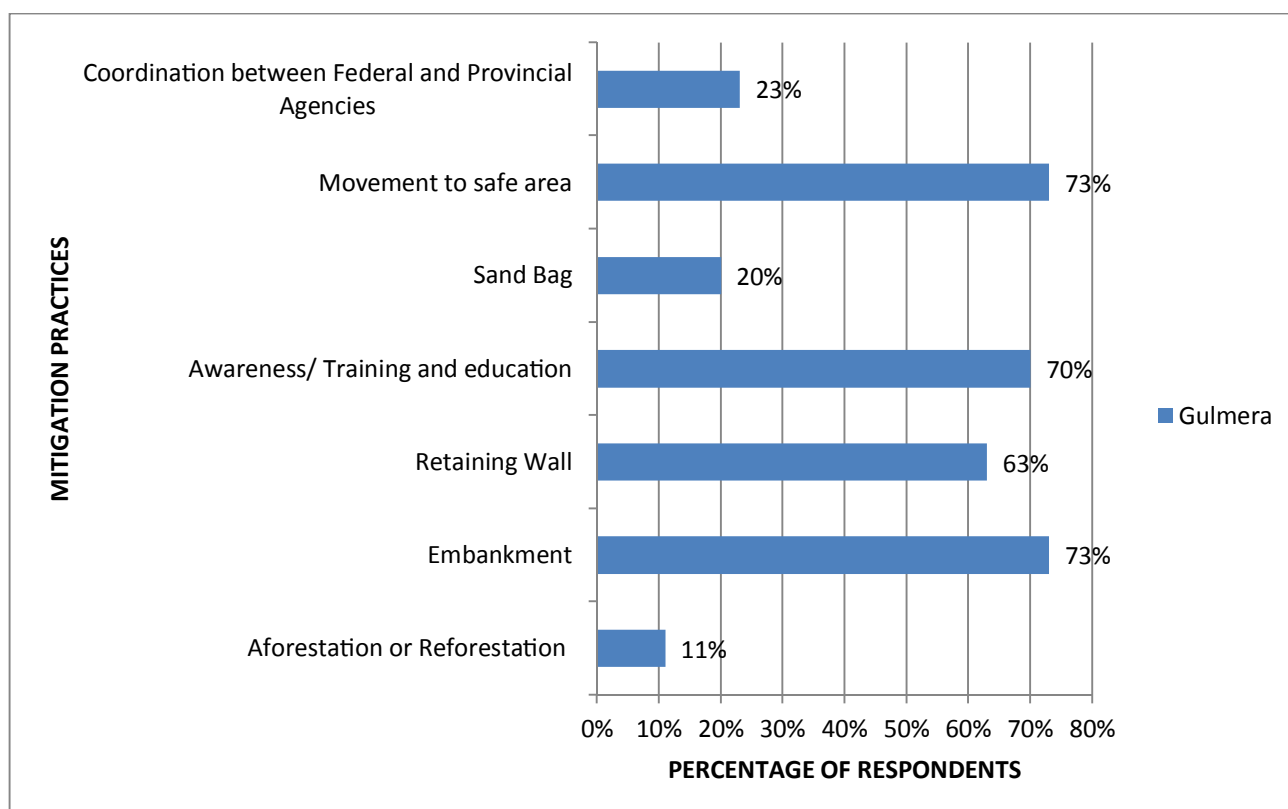


Figure 19: Efficiency of practicing mitigation practices in context of floods (response average using likert scale)

#### 4.10.5 Mitigation Practices in Context of Land/Mud Sliding

Land/mud sliding is a major issue in the study area i.e. village Gulmera. Many people lost their family members and also the sources of their livelihoods were fully destroyed in landslides. Mostly people were settled in landslide area which disrupted their wellbeing.

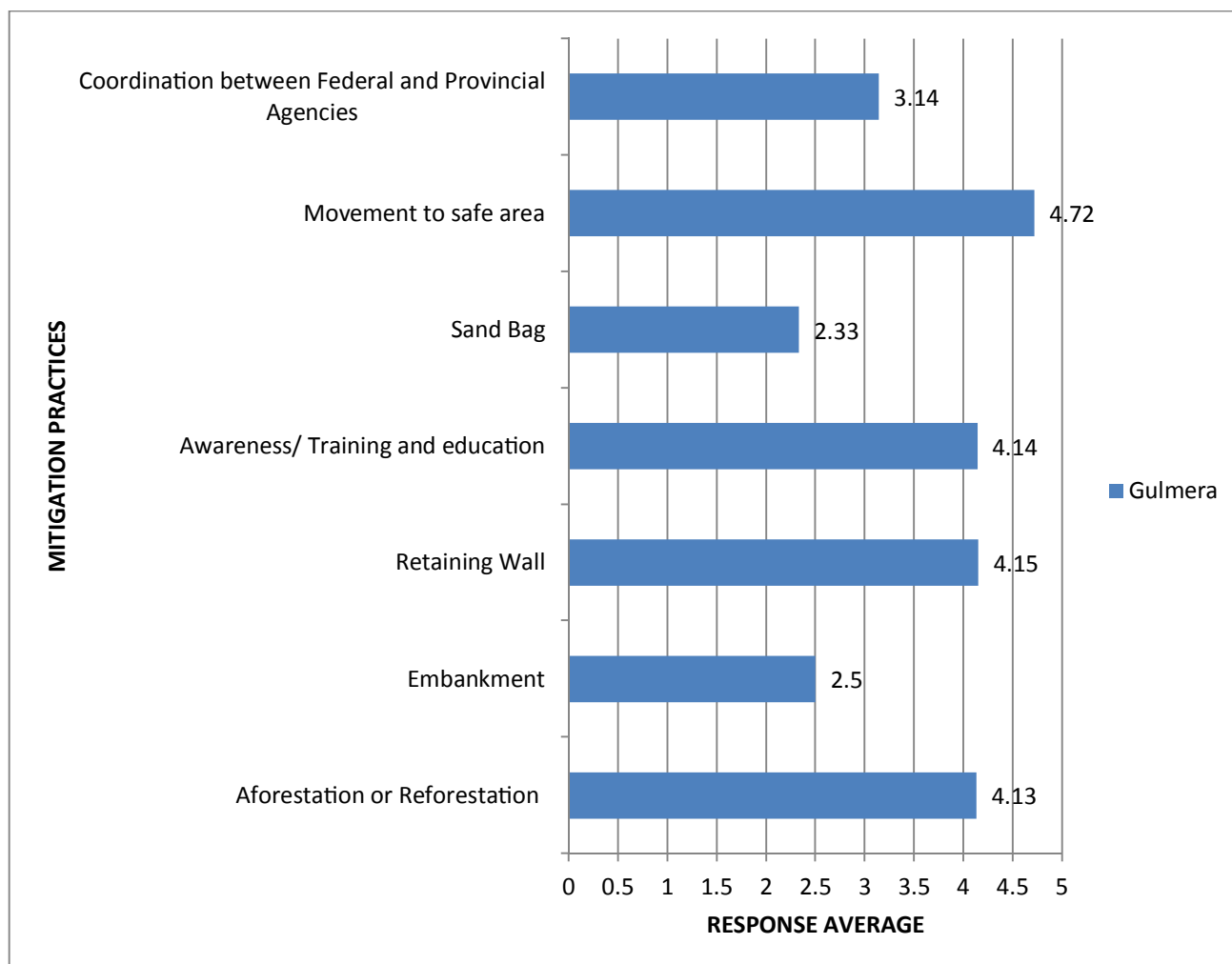
The graph (Figure 20) depicts the percentage of people from village Gulmera who follow mitigation practices to reduce their vulnerability in context of land/mud sliding either they are seasonal or caused by earthquakes. Study found that in village Gulmera, approximately 70% people got training from different organizations regarding the mitigation practices to get maximum protection from disasters. 73% respondents practiced embankments and found them useless so they moved to the safe areas. 63% respondents were provided retaining walls from government line agencies and nongovernmental agencies. Coordination with federal and provincial agencies was found weak and only 23% respondents agreed. 20 percent respondents also practiced sandbags at their household level and 11% planted new trees at the landslide area.



**Figure 20: Percentage of respondents who practiced mitigation practices in context of land/mud sliding**

#### **4.10.6 Efficiency of Practicing Mitigation Practices in Context of Land/Mud Sliding**

As mentioned above the percentage of people who practice proper mitigation practices is low if we compare them to their area which is prone to many kind of disasters. The graph (Figure 21) illustrates the usefulness of following mitigation practices as per the knowledge of respondents who have practiced them. In village Gulmera, study shows that people who moved to safe areas found the practice very effective. Further it was observed that retaining walls, awareness trainings/education and plantation of trees was found effective in reducing their vulnerability. Mostly people were not sure about the system of coordination with federal and provincial agencies. Sand bags and embankments were experienced less effective by the habitats of study area.



**Figure 21: Efficiency of practicing mitigation practices in context of land/mud sliding (response average using Likert scale)**

#### **4.11 Necessities in Case of Disaster**

Disaster can strike any time. We should be ready and prepared for it to prevent our self and our family from loss of any kind. In the study area mostly people were aware that they are living in a disaster prone area and their area is on fault line. The graph (Figure 22) delineates the percentage of respondents from both the villages who responded to the different necessities that should be available in case of disastrous situations. It was observed that in village Kashtara 39% people said that they have access to primary health care center in their area, in case of emergency they used to visit Christian hospital, Kashtara and Basic Health Unit, Talhatta. Approximately average 23.5% people were having tents and vehicles which they can use in case of disaster. 42% respondents were having first aid kits in their households which were provided by nongovernmental organizations after the earthquake 2005. A very less amount of people i.e. 33% in the study area were having backup of water but 80% percent people were having backup for food and blankets and 90% were having clothes which they can use in the emergency situations. 59% people were having sanitation and personal hygiene items. 64% respondents were having cell phones with the help of which they can communicate but mostly said that in the disastrous situations there is a huge problem of electricity failure in the area.

On the other hand, there was no health care center in Gulmera. 35% people were having tents and sanitation and personal hygiene items which is very low. 55% respondents were having emergency first aid kits in their houses which

were been provided by different organizations after the major disasters in the area. A very few percentage of respondents were having backup for drinking water, vehicles and electricity but 93% people were having backup of food and 100% were having clothes which they can use in emergency situations. 74% people were having blankets and 52% responded to the availability of telephone for communication.

Generally speaking, there was a very low amount of people who were having these necessities discussed above to efficiently respond to natural disasters, this issue also enhanced their vulnerabilities in many contexts.

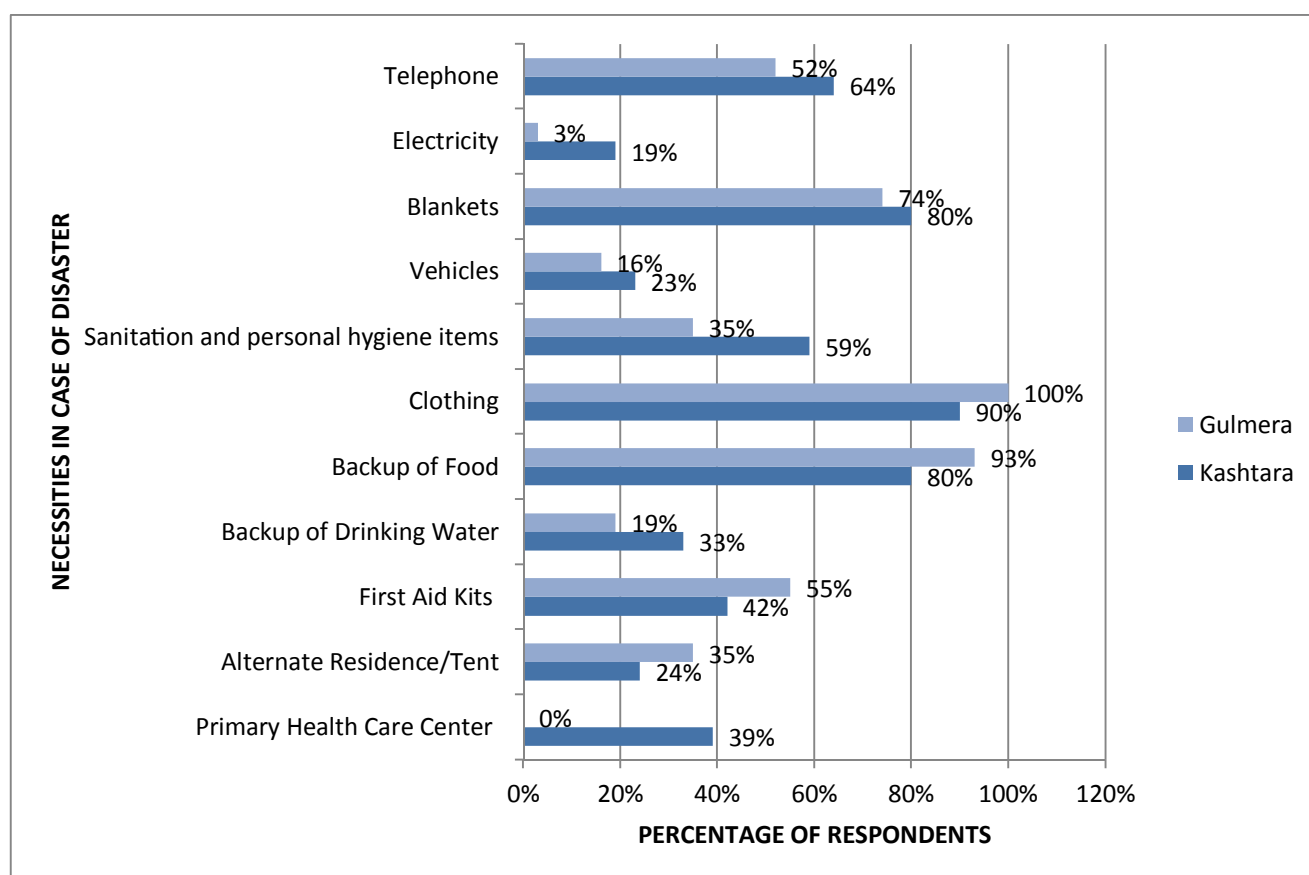


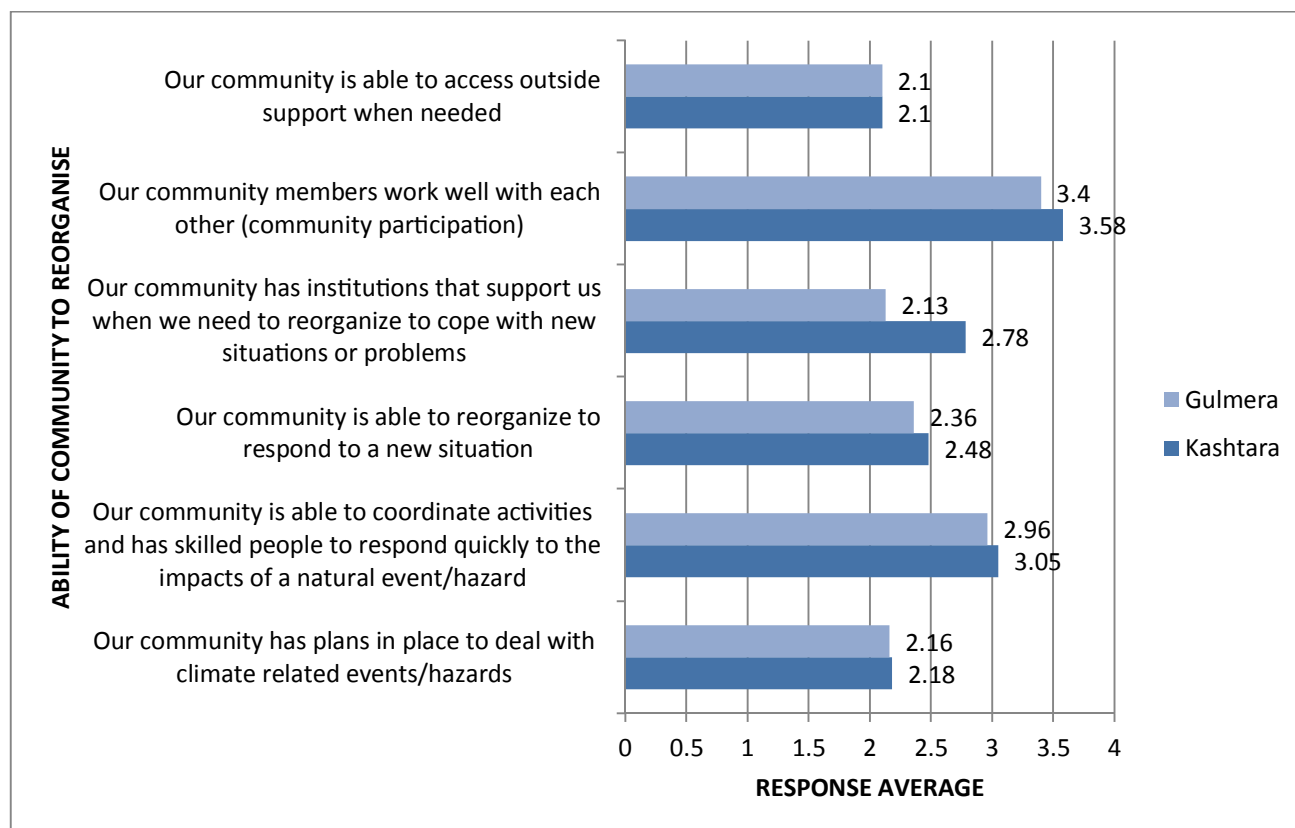
Figure 22: Percentage respondents having necessities in case of disaster

#### 4.12 Ability of Community to Reorganize in Disaster Situation

The graph (Figure 23) depicts the adaptive capacities of respondents of both the villages with respect to the capabilities and capacities of community itself. It was observed that in village Kashtara; mostly people were having neutral perception on the community's participation to work with each other and their ability to coordinate activities and having skilled people to respond quickly to the impacts of natural events and the institutions that support them when they need to reorganize to cope with new situations or problems. Study found that most of people disagreed on the availability of reorganize to respond to a new situation and wont having any plans in place to deal with climate related hazards or events. They also disagreed on the community's ability to access outside support when needed.

On the other hand, in village Gulmera, mostly people were having neutral perception on the community's participation to work with each other and their ability to coordinate activities and having skilled people to respond quickly to the impacts of natural events. Most of respondents disagreed on the community's ability to reorganize to respond to a new

situation and they do not have any plans in place to deal with climate related events or hazards and they were unable to access outside support when in need.



**Figure 23: Ability of community to reorganize (response average using Likert scale)**

#### 4.13 Leadership Capabilities in Reducing Community Vulnerability

Leadership in an area really affects the habitats of that area and has vital role in increasing and decreasing the adoptive capability of respective community. The following graph (Figure 24) represents the leadership status of the study area. It was observed that in village Kashtara, respondents were having neutral perception on the importance of the voice of individuals in the community planning for climate change adaptation because climate change is the factor which ultimately results in the cause of disasters. Mostly respondents disagreed on the leadership that led them through climate hazards in the past and were of the view that their community leaders and officials didn't informed them about the national and regional climate policies or initiatives and also didn't informed us where we can get climate related information. The results shown that mostly respondents were not having any trust on their community leaders those can lead their community through climate change adaptation.

On the other hand same is the case of village Gulmera, all respondents disagreed to all the questions been asked regarding leadership of their area i.e. capability, information, capacity, sincerity, implementation, and governance of their leaders.

Generally speaking, the leadership in the study area was not found satisfactory and the people were of the view that the leaders only visit their area in elections, after their nomination they do not even bother to listen our voices.



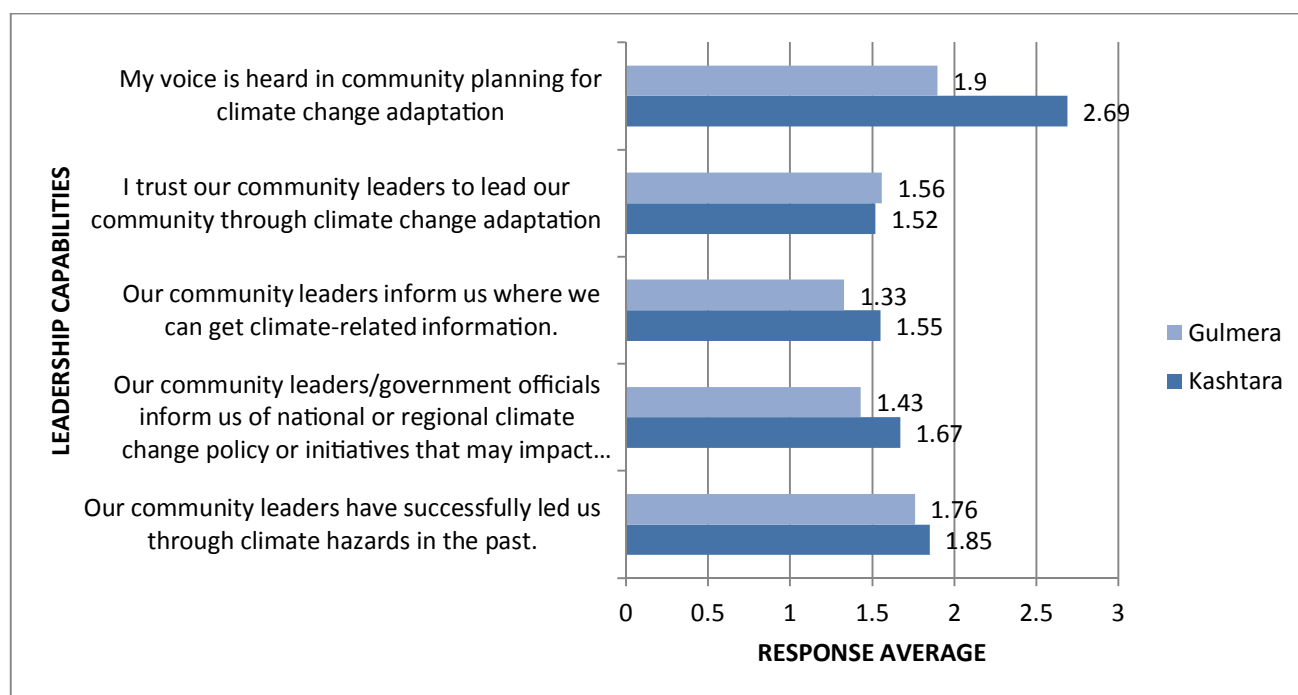


Figure 24: Leadership capability (response average using Likert scale)

#### 4.14 Health Status

Health is defined as a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity. That means that we can't judge a person's health on one dimension only. In good health always means that a person is mentally, physically sound and has a good social wellbeing. The following pie chart (Figure 25) presents the percentage of different age groups of habitats of the study who were having medical conditions. It was observed that in village Kashtara, 9% children of 1 day to 5years of age were having acute respiratory infections including cough, common cold, flu. 23% children of 5 to 17 years of age were having the same disease including diarrhea and heart problem. Above 18 years of age, 49% people were having Acute Respiratory infections including cough, flu, common cold, skin disease, eye infections, and malaria/dengue and heart problem.

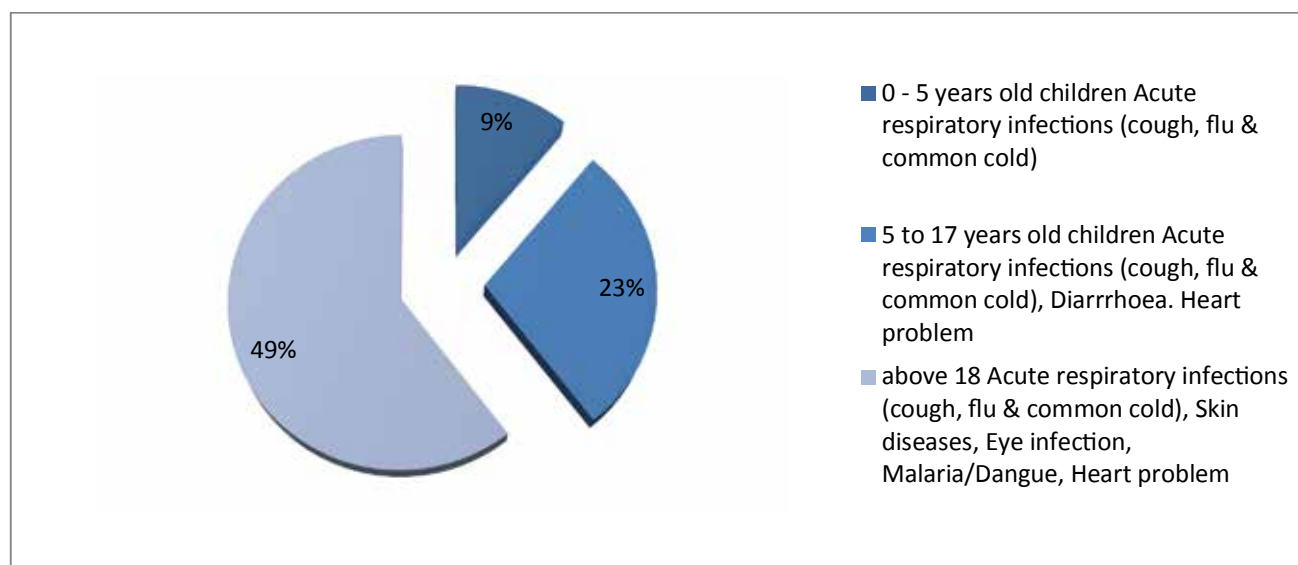
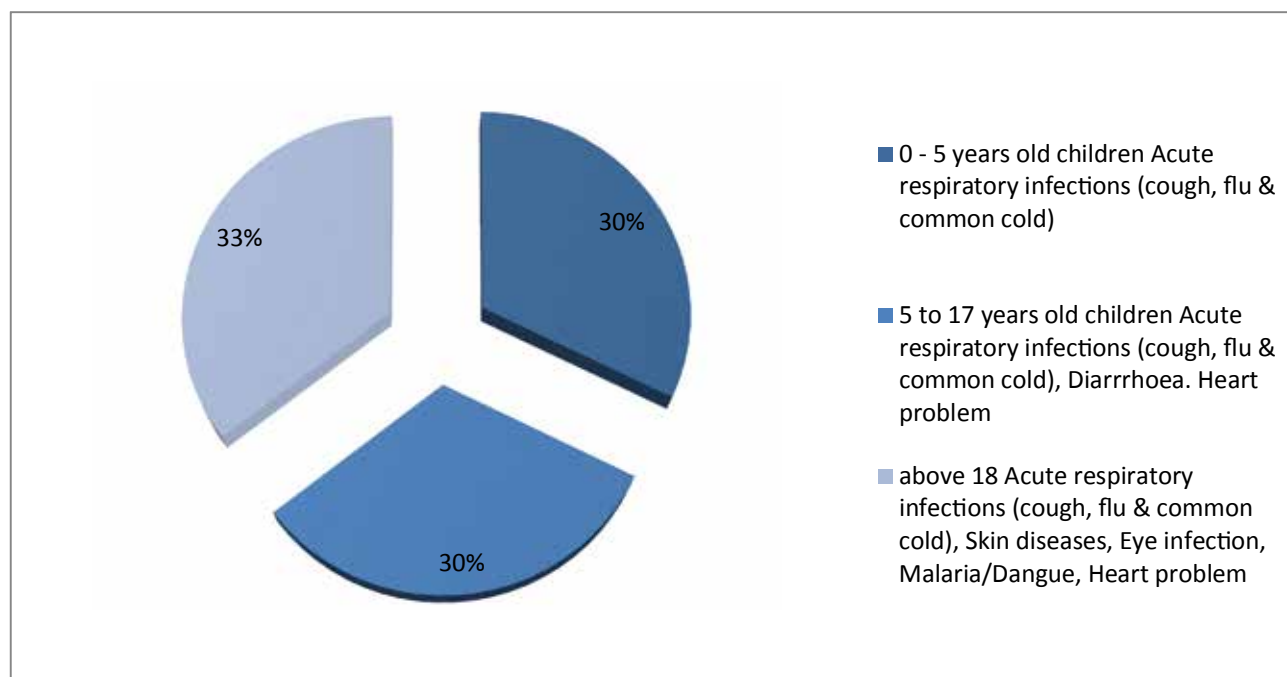


Figure 25: Health status in village Kashtara

On the other hand, study shows (Figure 26) that in village Gulmera, 30% children from 1 day to 5 years of age were having acute respiratory infections including cough, flu & common cold. Same was the percentage of children from 5 to 17 years of age and the medical conditions were acute respiratory infections including cough, flu & common cold, diarrhea, heart problem. 49% People who were above 18 years of age were having acute respiratory infections including cough, flu & common cold, Skin disease, eye infection, malaria/dengue and heart problem.



**Figure 26: Health status in village Gulmera**

#### **4.14.1 Constraints to Access to Health Facilities**

The graph (Figure 27) delineates the percentage of respondents who were facing issues relating their accessibility to the health centers. It was observed that in village Kashtara, 36% respondents said that there was limited transport facility in the area. 10% respondents were of the view that there were security reasons and social and cultural restraints. On average 6.5% people said that they face road blockage problem and the condition of road is also not good. 4% respondents were having financial reasons.

In the case of village Gulmera, 67% respondents said that they were having a serious concern of bad condition of road which was almost 3 kilometers, also 30% respondents said that they face transport problem and 10% were having financial reasons.

Generally speaking, all the above constraints also enhance the susceptibility of respondents of the study area to reach the health facilities timely in emergency or disastrous situation. Mostly respondents from both the communities said that it takes 30 to 40 minutes to reach health center if the road is clear.

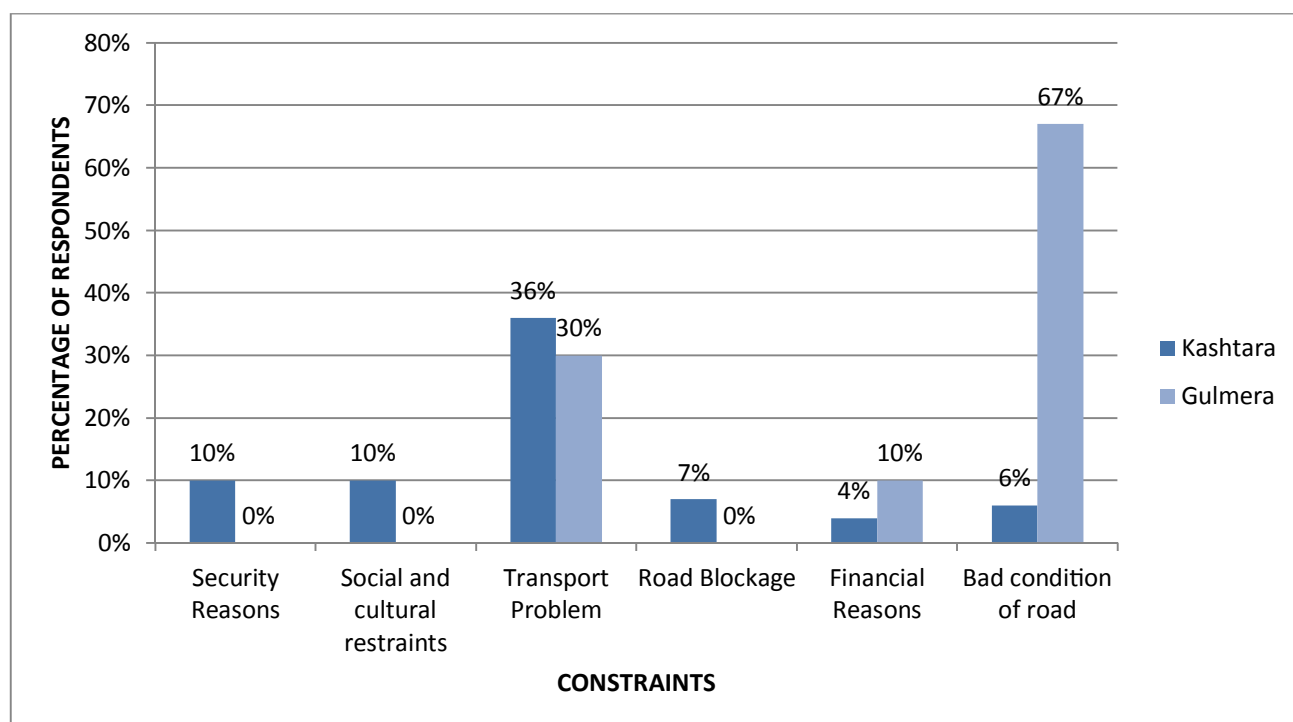


Figure 27: Constraints to access to health facilities

#### 4.14.2 Health Facilities

It was observed that mostly people of both the communities (Figure 28) avail the services of government civil hospital to get health treatments, because of their services, availability of competent doctors, medical testing labs and advance machine technology. Only 27% people from village Kashtara visited Health centers including Basic Health Units but were of the view that mostly doctor is not available. A few percentages of people from both the communities were consulting private clinics, dispensary, MCH centre and BHUs.

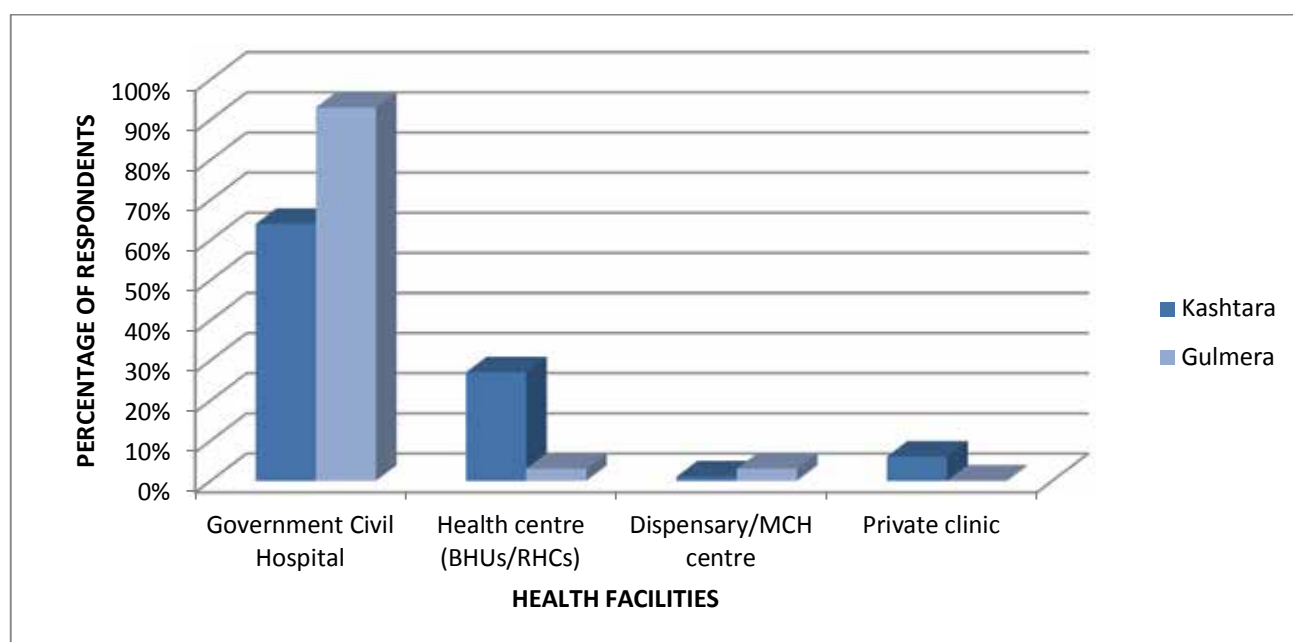


Figure 28: Availability of health facilities

#### **4.15 Role of Nongovernmental Organizations**

Although NGOs have recently emerged into the development limelight but they are not a recent phenomenon. They were the earliest form of human organizations. Long before the governments, people organized themselves into group for mutual protection and self-help.

NGOs play a critical role in all areas of development. People and policy makers are agreeing on one thing that NGOs play a vital role in development. Role of NGOs vary over the years as the policy of government changes. NGOs are almost dependent on policies of government. Socio economic development is a shared responsibility of both i.e. government and nongovernmental organizations. Role of NGOs are complementary but vary according to policies of government. If we closely pursue the voluminous literature on NGOs many roles can be found according to the expectations of people.

In the study area many Government Line Agencies and Non-governmental organizations worked in response and rehabilitation works right after the disasters like earthquake 2005, landslides, flood 1990 etc. United Nations, Sungi, Sarhad Rural Support Program (SRSP), RDP and Army are amongst the top of list and these organizations facilitated most of the people. These organizations worked in the study area on response and rehabilitation and provided the habitats shelters, iron sheets, health facilities, camps, blankets, clothes, food items, small livelihood sources, retaining walls, spurs etc

It was the ability of NGOs who implemented the response and rehabilitation projects quickly right after the disasters

## CHAPTER 5

# CONCLUSION AND RECOMMENDATIONS

### Conclusions:

The results of study and common observations give certain noticeable conclusions as under:

- Although maximum respondents in both villages practice safety measures according to their own understanding but poor coordination between government line agencies, less identification of safe sites, comparatively less training and education and not following the building codes reduce their adaptive capacity and make them susceptible to disasters.
- There is no scientifically sound awareness program to highlight the importance of emergency response management and risks for the site of Balakot.
- Avoidance to participate in resettlement shows a lack of confidence among various sections of affected communities.
- It was observed that the residential and built up system was entirely disappeared along the river banks and the low elevation while the land cover was also vanished due to the human induced activities by deforestation in the area.
- A large amount of people were unaware about the coping strategies and were of the view that disasters are natural and we cannot do anything to better cope them.
- Because of unawareness and poverty people were not having enough information about the mitigation practices and their point of view was that it needs a lot of economic resources to buy land in safe place and to build an earthquake resilient house there.
- Mostly people in village Gulmera moved from the landslide area to the safe sites, because in earthquake 2005, they have lost lives of many of their family members.
- People of village Kashtara were found most vulnerable to flood as they were settled on the flood plain. There was no preplanned system or plan to cope with flash floods.
- A wide gap was observed between communities and government line departments. This also resulted in trust deficit among population towards government departments.
- Capacity of communities to response immediately towards natural disasters was very low.

- NGOs and INGOs played an important role in assisting the local administration and state in relief efforts.
- There wasn't any efficient health system by the government in the area and population had to face lot of health issues even in normal days. The situation is expected to grow worse in case of natural any calamity.

#### **Recommendations:**

Basing on above conclusions viable recommendations are listed for adaptation with a view to increase adaptive capacity and susceptibility of population and departments:

- There is an essential need of scientifically sound awareness programs that must highlight the importance of emergency response management and risks of the site of Balakot. The awareness activities should be followed by emergency response management. The community preparedness activities like plan preparation, training and drills will increase their capacities for disasters. It will also make them aware that they are living in hazardous site.
- Confidence building measures need to be taken to ensure maximum participation in resettlement from all sections of the affected communities. These measures will be based on changes in the present approaches. All stakeholders need proper attention particularly the elite class which has strong influence on the whole community perception and attitude.
- It is recommended to plant more trees i.e. Aforestation and reforestation to decrease soil erosion. This will be the most suitable mitigation method to avoid land sliding in case of earthquake.
- A proper awareness raising and capacity building sessions would help in raising people awareness to adopt mitigation techniques in case of natural disaster.
- Affordable financial schemes by local institutes and governments will encourage people for resettlement. Some banks can be pursued by the governments to step forward and play a role in the scheme.
- The disaster management authorities should plan a proper system to cope with the seasonal floods and flash floods. Mitigation infrastructure be planned and constructed to avoid huge loss and land sliding from flash floods.
- A well planned and sound linkage between the communities and government line agencies and organizations should be established, so the gap between them can be bridged.
- Channel to improve coordination between communities and the local administration should be established so the people can get proper facilitation.
- Capacity building of the community by using different techniques like skill development training, awareness raising trainings should be the first priority of the administration to make people aware of self-preparedness.
- A sound and well-coordinated mechanism should exist at federal and provincial government's level to involve NGOs and INGOs in natural disaster management immediately.

- Local leadership and the government line agencies should work efficiently so the communities could get benefits.
- In the health sector, proper accountability should be ensured by the state to ensure availability of well-organized health care system which the capacity to adopt disaster management efforts.

### CORRELATIONS

#### Earthquake and its control measures (Kashtara)

Variables			Building codes	Mitigation practices	Awareness/Training	Safety Measures	Identification of safe sites	Coordination b/w organizations
Spearman's rho	Earthquake	Correlation Coefficient	.	.	.	.	.	.
		Sig. (2-tailed)	.	.	.	.	.	.
		N	70	70	70	70	70	70
	Building codes	Correlation Coefficient	1.000	.516**	-.112	-.175	-.236*	.284*
		Sig. (2-tailed)	.	.000	.357	.147	.049	.017
		N	70	70	70	70	70	70
	Mitigation practices	Correlation Coefficient	.516**	1.000	-.029	-.158	-.164	-.022
		Sig. (2-tailed)	.000	.	.813	.191	.174	.856
		N	70	70	70	70	70	70
	Awareness/Training	Correlation Coefficient	-.112	-.029	1.000	.563**	.237*	.217
		Sig. (2-tailed)	.357	.813	.	.000	.048	.071
		N	70	70	70	70	70	70
	Safety Measures	Correlation Coefficient	-.175	-.158	.563**	1.000	.433**	.087
		Sig. (2-tailed)	.147	.191	.000	.	.000	.474
		N	70	70	70	70	70	70
	Identification of safe sites	Correlation Coefficient	-.236*	-.164	.237*	.433**	1.000	-.030
		Sig. (2-tailed)	.049	.174	.048	.000	.	.804
		N	70	70	70	70	70	70
	Coordination b/w organizations	Correlation Coefficient	.284*	-.022	.217	.087	-.030	1.000
		Sig. (2-tailed)	.017	.856	.071	.474	.804	.
		N	70	70	70	70	70	70

\*\*. Correlation is significant at the 0.01 level (2-tailed).

\*. Correlation is significant at the 0.05 level (2-tailed).

# Earthquake and its control measures (Gulmera).

Variables			Building codes	Mitigation practices	Awareness/Training	Safety Measures	Identification of safe sites	Coordination b/w organizations
Spearman's rho	Earthquake	Correlation Coefficient	.	.	.	.	.	.
		Sig. (2-tailed)	.	.	.	.	.	.
		N	30	30	30	30	30	30
	Building codes	Correlation Coefficient	1.000	.800**	.164	-.212	-.150	.385*
		Sig. (2-tailed)	.	.000	.385	.260	.428	.035
		N	30	30	30	30	30	30
	Mitigation practices	Correlation Coefficient	.800**	1.000	.358	-.199	-.120	.342
		Sig. (2-tailed)	.000	.	.052	.293	.529	.064
		N	30	30	30	30	30	30
	Awareness/Training	Correlation Coefficient	.164	.358	1.000	.337	.176	.154
		Sig. (2-tailed)	.385	.052	.	.069	.352	.415
		N	30	30	30	30	30	30
	Safety Measures	Correlation Coefficient	-.212	-.199	.337	1.000	.415*	-.308
		Sig. (2-tailed)	.260	.293	.069	.	.023	.098
		N	30	30	30	30	30	30
	Identification of safe sites	Correlation Coefficient	-.150	-.120	.176	.415*	1.000	-.135
		Sig. (2-tailed)	.428	.529	.352	.023	.	.477
		N	30	30	30	30	30	30
	Coordination b/w organizations	Correlation Coefficient	.385*	.342	.154	-.308	-.135	1.000
		Sig. (2-tailed)	.035	.064	.415	.098	.477	.
		N	30	30	30	30	30	30

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).



### Flood and its control measures (Kashtara)

Variables			Sand bags	Pumps	Aforestation/Reforestation	Retaining Wall	Awareness/training	Spurs	Flood protection irrigation channel	Coordination b/w organizations
Spearman's rho	Flood	Correlation Coefficient	.097	.	-.015	.150	.075	.397**	.	-.119
		Sig. (2-tailed)	.424	.	.904	.217	.538	.001	.	.325
		N	70	0	70	70	70	70	0	70
	Sand bags	Correlation Coefficient	1.000	.	-.319**	-.008	-.065	.245*	.	-.296*
		Sig. (2-tailed)	.	.	.007	.950	.590	.041	.	.013
		N	70	0	70	70	70	70	0	70
	Pumps	Correlation Coefficient	.	.	.	.	.	.	.	.
		Sig. (2-tailed)	.	.	.	.	.	.	.	.
		N	0	0	0	0	0	0	0	0
	Aforestation/Reforestation	Correlation Coefficient	-.319**	.	1.000	.417**	.413**	.002	.	.359**
		Sig. (2-tailed)	.007	.	.	.000	.000	.985	.	.002
		N	70	0	70	70	70	70	0	70
	Retaining Wall	Correlation Coefficient	-.008	.	.417**	1.000	.529**	.220	.	.145
		Sig. (2-tailed)	.950	.	.000	.	.000	.067	.	.231
		N	70	0	70	70	70	70	0	70
	Awareness/training	Correlation Coefficient	-.065	.	.413**	.529**	1.000	.231	.	.190
		Sig. (2-tailed)	.590	.	.000	.000	.	.054	.	.115
		N	70	0	70	70	70	70	0	70
	Spurs	Correlation Coefficient	.245*	.	.002	.220	.231	1.000	.	-.253*
		Sig. (2-tailed)	.041	.	.985	.067	.054	.	.	.035
		N	70	0	70	70	70	70	0	70
	Flood protection irrigation channel	Correlation Coefficient	.	.	.	.	.	.	.	.
		Sig. (2-tailed)	.	.	.	.	.	.	.	.
		N	0	0	0	0	0	0	0	0
	Coordination b/w organizations	Correlation Coefficient	-.296*	.	.359**	.145	.190	-.253*	.	1.000
		Sig. (2-tailed)	.013	.	.002	.231	.115	.035	.	.
		N	70	0	70	70	70	70	0	70

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).

# Flood and its control measures (Gulmera)

Variables			Sand bags	Pumps	Aforestation/Reforestation	Retaining Wall	Awareness/training	Spurs	Flood protection irrigation channel	Coordination b/w organizations
Spearman's rho	Flood	Correlation Coefficient	.	.	-.131	-.141	-.083		.	-.308
		Sig. (2-tailed)	.	.	.489	.456	.663		.	.098
		N	30	30	30	30	30	30	30	30
	Sand bags	Correlation Coefficient	.	.	.	.	.		.	.
		Sig. (2-tailed)	.	.	.	.	.		.	.
		N	30	30	30	30	30	30	30	30
	Pumps	Correlation Coefficient	.	.	.	.	.	.	.	.
		Sig. (2-tailed)	.	.	.	.	.	.	.	.
		N	30	30	30	30	30	30	30	30
	Aforestation/Reforestation	Correlation Coefficient	.	.	1.000	.489**	.253	.463**	.	.267
		Sig. (2-tailed)	.	.	.	.006	.177	.010	.	.155
		N	30	30	30	30	30	30	30	30
	Retaining Wall	Correlation Coefficient	.	.	.489**	1.000	.402*	.558**	.	.302
		Sig. (2-tailed)	.	.	.006	.	.028	.001	.	.104
		N	30	30	30	30	30	30	30	30
	Awareness/training	Correlation Coefficient	.	.	.253	.402*	1.000	.098	.	.067
		Sig. (2-tailed)	.	.	.177	.028	.	.608	.	.723
		N	30	30	30	30	30	30	30	30
	Spurs	Correlation Coefficient	.	.	.463**	.558**	.098	1.000	.	.395*
		Sig. (2-tailed)	.	.	.010	.001	.608	.	.	.031
		N	30	30	30	30	30	30	30	30
	Flood protection irrigation channel	Correlation Coefficient	.	.	.	.	.	.	.	.
		Sig. (2-tailed)	.	.	.	.	.	.	.	.
		N	30	30	30	30	30	30	30	30
	Coordination b/w organizations	Correlation Coefficient	.	.	.267	.302	.067	.395*	.	1.000
		Sig. (2-tailed)	.	.	.155	.104	.723	.031	.	.
		N	30	30	30	30	30	30	30	30

\*\*. Correlation is significant at the 0.01 level (2-tailed).

\*. Correlation is significant at the 0.05 level (2-tailed).

# Landslide and its control measures (Gulmera).

Variables			Aforestation/Reforestation	Embankment	Retaining wall	Awareness/training	Sand bags	Movement to safe area	Coordination b/w organizations
Spearman's rho	Landslide	Correlation Coefficient	.	.	.	.	.	.	.
		Sig. (2-tailed)	.	.	.	.	.	.	.
		N	30	30	30	30	30	30	30
	Aforestation/Reforestation	Correlation Coefficient	1.000	.202	.398*	.327	-.315	.024	.333
		Sig. (2-tailed)	.	.284	.029	.078	.090	.901	.072
		N	30	30	30	30	30	30	30
	Embankment	Correlation Coefficient	.202	1.000	.167	-.230	-.075	-.364*	.193
		Sig. (2-tailed)	.284	.	.378	.221	.692	.048	.306
		N	30	30	30	30	30	30	30
	Retaining wall	Correlation Coefficient	.398*	.167	1.000	.257	-.138	.010	.146
		Sig. (2-tailed)	.029	.378	.	.171	.466	.956	.441
		N	30	30	30	30	30	30	30
	Awareness/training	Correlation Coefficient	.327	-.230	.257	1.000	-.036	.099	.230
		Sig. (2-tailed)	.078	.221	.171	.	.849	.604	.221
		N	30	30	30	30	30	30	30
	Sand bags	Correlation Coefficient	-.315	-.075	-.138	-.036	1.000	-.264	.264
		Sig. (2-tailed)	.090	.692	.466	.849	.	.159	.159
		N	30	30	30	30	30	30	30
	Movement to safe area	Correlation Coefficient	.024	-.364*	.010	.099	-.264	1.000	-.318
		Sig. (2-tailed)	.901	.048	.956	.604	.159	.	.087
		N	30	30	30	30	30	30	30
	Coordination b/w organizations	Correlation Coefficient	.333	.193	.146	.230	.264	-.318	1.000
		Sig. (2-tailed)	.072	.306	.441	.221	.159	.087	.
		N	30	30	30	30	30	30	30

\*. Correlation is significant at the 0.05 level (2-tailed).



**MAGNITUDE OF ROAD TRAFFIC  
ACCIDENTS IN URBAN AREAS  
OF DISTRICT ABBOTTABAD**

**By**

**Alina Naveed**

## **ABSTRACT**

The aim of this study is to measure the magnitude of the road accidents and to identify and evaluate the causes and preventive measures of road traffic accidents in urban areas of District Abbottabad. About 50 respondents were selected using cross-sectional technique. The primary data was collected through structured questionnaire and interviews. The results show that the magnitudes of road traffic accidents in district Abbottabad are lower as compared to other Districts of Hazara Division. The reason of the occurrence of road traffic accidents are that people's behavior that they do not wear seatbelts/helmets and do not follow traffic rules and road signs .It was concluded that male ratio of road traffic accidents are higher as compared to female. The study also shows that the male accidents were more harmful and dangerous that is why the rate of injuries is higher in male than females. It was recommended that in order to reduce accidents seatbelts must be applied, rules and regulations must be followed, education and training regarding motor traffic accidents should be given to the drivers and youth.

## CHAPTER 1

# INTRODUCTION

### 1.1 Background of the Study

Motor traffic accidents which are generally unintentional and preventable are a common risk every day to life that can happen to almost every individual, anywhere. The problem of motor traffic accident is gradually becoming a threat to public health and national development in many unindustrialized countries. Motor traffic accidents contribute to poverty by causing deaths, injuries, disabilities, grief, and loss of productivity and material damages.

The British Medical Journal of 11th May 2002 indicated that more people die on the road traffic accident than from malaria universally; and that traffic accident cause about 1.2 million deaths and injury 10 to 15 million people a year in the world. Many people do not know that motor traffic accidents are preventable. (Krug, 2002). Road traffic accidents are the most frequent causes of injury-related deaths universally (Astrom, et.al.2006).

According to the World Report on Road Traffic Wound Prevention (Peden et al., 2004) traffic accidents account for about 3000 daily fatalities universally. Statistical projections show that during the period between 2000 and 2020, fatalities related with motor traffic accidents will decrease with about 30% in high income countries. The reverse pattern is expected in developing countries, where traffic accidents are expected to increase at a fast rate in the years to come.

World Health Organization (WHO) strategy of 2001 reports that currently motor traffic injuries are the leading cause of deaths and injuries, the 10th leading cause of all deaths and 9th leading contributor to the problem of disease universally based on disability adjusted life years. The numbers of deaths resulting from road traffic accidents have been projected to reach 8.4 million In general the importance of injury as a public health issue is not well known in many developing countries (Lie et al 1991). Road traffic accidents are a major universal problem. In developing countries the trend has reached an alarming state, but very little attention is paid to the problem (Odero et al 1997). International reports reveal the problem of accidents being equally serious. According to research carried out by Pierce and Maunder (1998), under the support of Road Research Laboratory in UK, they found out that, road accidents universally are estimated overall 20,000,000 victims for a time period which 70% of the accidents occurred in developing countries. The number of road accidents per registered vehicles was 10% to 20% higher in developing countries than in the developed world. The more general reasons advanced by these researchers for an increase of road accidents in developing countries were as follows, 1. Rapid development process in these countries, 2. Advance growth rates of traffic and 3. Poor road infrastructure, 4. Careless driving, 5. Non-adherence to the traffic regulations by the driver and the traffic officers (due to corruption), 6. The majority of people in developing countries were

dependent on public transport for their day-to-day movement. In developing countries the public transport system such as vans has a much higher accident risk than in developed countries.

## **1.2 The Global Burden of RTAs**

Road traffic mishaps (RTAs) are a universal public health problem. Currently ranked ninth, RTAs are expected to be the fifth leading cause of death in 2030. Every year, more than one million people die globally because of RTAs, more than 2500 deaths every day. 90 % of RTA related fatalities occur in developing countries (WHO 2004). The huge number of injury and death due to road traffic accident tells the story of global crisis of road safety. Road accidents are the second leading cause of death for people between the ages of 5 and 29 and third leading cause for people between 30 and 44. With the number of automobiles rapidly rising in developing countries, this epidemic is quickly getting worse in low and middle-income countries and is on its way to becoming the third leading cause of death and disabilities by the year 2020 (WHO 2000).

The loss in road traffic accidents is immense in economy and health related issues. Families having accident victims shatters with death and the victims seriously injured often need medical facilities for the rest of their life and ultimately become a burden to their family. Road traffic injuries are burdening health care systems in countries around the world. Developing countries suffer from a significant percentage of preventable deaths and injuries from road traffic accidents.

The calamity of motor traffic accidents is that they mostly involve the young, perhaps the young and adventurous. Male aged 17 to 30 are especially involved; fatal accidents in this group symbolize not only tragic family losses but also a serious economic loss to the community, for their education and training have been wasted. In highly motorized countries, motor traffic accidents are the mutual cause of death in this group. The total of potentially active and productive years of life lost through such accidents is vast. Harris (1955) estimated that in Canada, among those children who reach their first birthday and who would normally survive to the present life expectancy of 70 years. The loss from motor traffic accidents each year is more than 105000 years of normal life expectancy. The estimated man-years lost in the United States in 1955 by persons aged 20-29 from automobile accidents, compared with certain other causes.

## **1.3 RTAs in Developing Countries**

In developing countries, including Tanzania, the situation is different to developed countries, road traffic accidents are increasing with time and mortality due to road crashes is also on the rise (Asogwa 1992). When taking the population figures into account, developing countries in Sub-Saharan Africa have the highest frequency of various accidents worldwide (Peden et al, 2004). Although an implication of this is that the risk environments in countries need further practical attention, few studies have investigated how people in those societies identify risk. This situation calls for developing countries to put more effort toward control and prevention of road traffic accidents and their conclusion. This can be achieved through a multidisciplinary approach and research. Such consideration should be undertaken, because traffic accidents have negative impacts on social and economic improvements in developing countries. In this problem there are many agents: (1) The laws which are interested in legal enforcement (2) The insurance companies and vehicle holders in the financial cost of car crashes (3) The road accident victim and their relatives in those of lives or



disability and related cost of medical care (4) the health care system and medical recruits who are responsible for the emergency treatment and life savings of accident victims (Asogwa 1992).

#### **1.4 Road Accidents in Pakistan**

We have always doubted about the statistics of deaths occurring through accidents as we don't have good roads and even worse safety measures taken to secure our roads and the people that drive on them. The response time for an accident on the highway would be just severe. Instead, according to the (World Health Organization), the global average of deaths in road accidents is 18 per 100,000 people so we are doing just fine at 17.4 per 100,000 people.

We estimate that the only reason why Pakistan is below the global average is because our speeds. Easily, average motorway and highway speed would be 80-90 km/h. And average speed within the cities would be below 60 km/h. The fatalities mostly occurred due to quality and safety equipment in cars including, the obvious disrespect of wearing seat belts and how dangerous are our roads. But thinking that speed only kills would be incorrect, Europe, household and the fastest Autobahn has the lowest fatality rate of just 10.4 per 100,000 people.

Other countries have: Bangladesh 11.4, China 20.5, India 18.9, Saudi Arabia 24.8, UAE 12.7, USA 11.4, United Kingdom 3.4, Afghanistan 19.8, and Iran 34.1.

So beside with quality of cars, motorway and highway should be planned with safety in mind and the response time to an accident of emergency vehicles should be reduced, also, properly trained paramedical staff should be hired as well, because in India, 138,258 people died of road accidents in 2012 to overtake China as the biggest contributor to road deaths. While China worked to bring the rate of fatalities down in accidents on the road.

#### **1.5 Statement of the Problem**

The road accidents in this country seem to be in primacy. These accidents have been categorized by the National Road Safety Commission as fatal, severe and minor.

This classification is based on the amount of damage to human lives and properties. The root causes of road accidents and its effects on human lives and properties have been associated with human faults.

The purpose of this thesis is to find out the magnitude of road accidents in District Abbottabad, to identify the causes, and to evaluate the preventive measures to minimize the road traffic accidents

#### **1.6 Research Objectives:**

The objectives of my research are:

1. To measure the magnitude of road traffic accidents (RTAs)
2. To identify the causes of road traffic accidents
3. To evaluate the preventive measures to minimize accidents

### **1.7 Purpose of Study**

This study is essential for setting needs for the curative action of wounds. The purpose of this study would to measure the causes of road accidents, number of injuries and disabilities from road accidents and to determine the preventable factors leading to road accidents.

### **1.8 Study Area**

The study area of the research is as follows:

1. Ayub teaching hospital (Ayub medical complex), Abbottabad.
2. Benazir District Headquarters, Abbottabad.

### **1.9 Structure of the Thesis**

The chapter one gives the background of the study, problem statement and states the main objective of the study; it also highlights ways of investigating issues in relation to the study.

The chapter two evaluates some of the theories and theoretical model based on the system theory as a base of knowledge of this study. The chapter three includes research methodology, target population, sample size and sampling techniques, data collection, variables, and data analysis. The chapter four contains results and finding. Finally paper ends with Chapter 5 containing conclusions and recommendation of my research.

## CHAPTER 2

# LITERATURE REVIEW

This aspect of the study analyses the various literatures related to the topic under consideration in order to reveal critical facts and findings which have already been identified by previous researchers and numerous studies in and around the causes, effects and economic implications of road accidents with particular reference to causes of deaths of road accident casualties.

### 2.1 State of Road Accident

Motor traffic accident in this country has become one of the growing concerns in recent times. This is as a result of the incredible effect of road accidents on human lives, properties and the environment.

Heidi (2006) stated that 1.2 million people in the world lose their lives through road accidents every year. This number has increase to 1.3 million people who lose their lives globally every year and between 20 and 50 million people sustain various forms of injuries annually as a result of road accident. The most affected of these consequences of road accidents is the people in the age group of 15 and 29. Car crashes cost the world an amount of US\$518 billion annually. It is estimated that if nothing is done globally to decrease the extensive nature of road accidents and most especially the causes of deaths of casualties before they are sent to hospitals then by the year 2020, 1.9 million people will be killed by road accidents in the world, (World Health Organization, 2011).

A research conducted by Salim and Salimah (2005) also specified that motor traffic accident was the ninth major cause of death in low-middle income countries and predicted that road accident was going to be the third major cause of deaths in these countries by 2020 if the trend of vehicular accident was to be permitted to continue.

### 2.2 A Model for Road Traffic Accident

Road traffic accidents bear strong elements of man-environment adjustments and maladjustment a familiar approach in geography (Muhlrads et al 2005). Based on the logic of a improved human ecological model of a disease the approach can be transferred to studies of road traffic accident. A model for road traffic accident as encouraged by the ecological model of a disease was developed by Jorgensen and Abane (1999) who made a empirical adjustment of this basic model to suit road traffic accident analysis. The model is categorized by three main components:

1. The vehicle (corresponding to the vector in disease ecology) which defines automobiles into its composition, age, technical conditions and safety equipment like seat belts in a car.
2. The environment, containing the road system and the broader physical and built up environment. The physical environment splits further into different characteristics such as; Daytime and climate (weather conditions and road

conditions), Spatial conditions (arrangements and Macro structures), Settlement configuration (Urban or rural / sparse or populated area), situation of areas of residence and working areas, Principle of traffic separation, structure and road constructions qualities.

3. The actions of the population; including its characteristics such as age and gender ratio as well as attitudes and general traffic behavior. And it goes more into driving behavior, driving knowledge, driving style, risk compensation and risk driving (influence of alcohol and drugs).

The fatality rate over the years has been used to compare road accident prevalence in enormous number of countries. Fatality rate is well-defined as the number of deaths which occurred through road accidents with respect to some measure of the use of road system. However, Fatality rate has been defined by several authors to suit the needs of their researches.

Ghee et al (1997) stated that fatality rate is defined as the number of injury accidents occurring per annum per million vehicle kilometer moved. Ghee et al (1997) defined the fatality rate for road accidents in a given country to be dignified in respect of the number of persons killed through road accidents per 10,000 licensed vehicles in a country.

As population increases and the number of licensed vehicles in developing countries are increasing rapidly, Rajesh (2006) proposed that fatality rate is defined as number of road accident deaths per 100,000 licensed vehicles.

Jacobs and Cuttings (1986) studied into the previous accident models developed by earlier researchers to develop upon them. A study was conducted to find the effects of speed limits on road accidents by Fieldwick (1987) who identified that speed parameters have substantial impact on road safety and severity in both rural and urban roads.

### **2.3 Causes of Road Traffic Accident**

Many researchers have arisen with the causes, effects and recommendations to road accidents in Ghana and elsewhere. For instance, Ayeboo (2009), identified that the many accidents on our road networks have been related to various causes which include over speeding, drink driving, wrong over taking, poor road network and the off-street vehicles which ply on our roads.

Furthermore, the National Road Safety Commission (NRSC) has acknowledged over twenty causes of road accidents in Ghana which include excessive speeding, lack of proper judgment of drivers, insufficient experience, negligence, wrong overtaking, carelessness, intoxication, over loading, brake failure, dazzling and defective light, boredom, unwillingness to alight from motion objects (vehicles, motor cycles, human being and wild animals), skid and road surface defect, level crossing and obstacle. Other factors are Unspecified enforcement of road laws and traffic regulations, use of mobile phones when driving, failure to buckle the seat belt and corruption, (National Road Safety Commission, 2007).

Elsewhere, the causes of road accidents have also been linked to one or combination of the following four factors, equipment failure, road infrastructure, motorists' behavior and poor road maintenance. However, studies have shown that over 95% of all road crashes are caused by the behavior of the driver and the combination of one or more of the other three factors, (Driving guidelines, and no date).

According to the country report on Road Safety in Cambodia, road accident is caused by human factors (road users), road defects and vehicle flaws. It was found in the report that road accident in Cambodia was increased by 50% in five years while the fatality rate was doubled. To help reduce the rate of road accident it was recommended that Road accidents Safety Committee was set up, accident data system was established, accident valuation policy and driver training measures were to be put in place, Ung Chun (2007).

#### **2.4 Causes of Casualty's in Road Accident**

The cause of death of casualties has been associated with many factors such as minor collision, failure of drivers and vehicle inhabitants to put on seat belt and riders failing to put on helmet, Afukaar et al (2009).

Studies have revealed that sleep related accidents tend to be more severe and as such most people are killed. This situation is as a result of the driver's incapability to prevent and stop certain actions such as applying the brakes before collision and steering onto the main road if the vehicle veers off the road. The research acknowledged that in order to reduce the risk of drowsy driving and its related crashes, drivers are advised to have sufficient sleep, motorists' are to avoid drinking especially when feeling sleepy and reduce driving between midnight and 6 :00 am, Strohl et al (1998).

Homes and Reyner (1995) proposed that due to the inactive nature of the sleeping driver to control the vehicle prior to the accident, sleep related accidents have high risk of death as compared with the other forms of motor accidents. Moreover, in a research conducted in the North Carolina, sleep related accident was found to be the most severe accidents amongst all other types of road accidents, Allan et al (1995).

Also, Zomer (1990) recognized that the number of casualties in sleep related road accidents is 50% higher than all accidents. It had three times fatalities and doubles the extremely injured as compared with non-sleeping related road accidents. The sleep related accidents are usually more severe and kills a lot of people because there is no control on the part of those involved in the accident, mostly, the driver. In this vain, there are certain circumstances which might have been avoided to reduce the number of casualties but due to the driver's incapability to control the vehicle the people suffer the consequences.

Broughton (2007) identified that when two vehicles collide, the driver and inhabitants of the older vehicle are usually at more risk of being killed than those in the newer vehicle. In that study, it was expected that the mean risk of death of drivers of vehicles which were registered in 2000 to 2003 was less than half of the risk for the drivers of vehicles which were registered in 1998 to 1999, Broughton (2007). This phenomenon may be due to weaker nature of the various parts of the older vehicles and probably the improvement and transformation in the manufacturing of newer vehicles. However, casualty rate increases in collision with more up-to-date cars on non-built-up roads where speeds are higher as compared with that of older cars.

The size of a vehicle has also been found to contribute to the death of road users in traffic crashes. From the conclusions of Broughton (2007) of road accidents data from 2001 to 2005, it was revealed that the driver casualty rate increases with the magnitude of the other vehicle in collision. The problem now is, for the past 30 years, the weight and size of vehicles have been improved by 30% yet the number of casualties' deaths have not reduced in accordance with that. The fact still remains that people end up depend on so much on the strength of their vehicles and take

unnecessary risk especially the youth, Broughton (2007). Studies have shown that young drivers and young travelers die more in road traffic crashes than their older counterparts, Broughton (2005).

In a research conducted in Britain and Wales to evaluate the death pattern of various age groups and their sexes within the period of 2000 to 2002, it was found out that 40% of males and 30% of females' drivers who died in road accidents were in the age group of 16 and 19 years. This number had risen to 44% for males and 38% for females by the end of 2005, (Department of Transport, 2006).

However, it is fascinating to note that this pattern changes with age, as the road users develop then the number of females who die through accidents become more than that of males. From 1994 to 2004, there were 13% deaths for men above 30 years and 30% for females in that same age group, (Department of Transport, 2006b). These sudden changes may be due to the fact that women tend to accumulate more weakness than men as they grow. Further, women are known to travel more often than men at old age to visit their children and other relatives.

Also, Kumar et al (2008) found out in their research in South Delhi that with all the individuals who were killed in road accidents, 88.2% of them were males. This result actually confirmed the studies by earlier researchers as Salgado and Colombaje (1998), Shadev (1994), and Henriksson (2001), all of whom proposed and proved that more males are killed in road accidents than females.

Drink-driving is another factor which was identified by Clarke et al (2007) as a contributor to death of casualties in motor accidents. The reason for this could be link to the incapability of the drunk driver to control the car as a result of sleeping, Zomer et al (1990).

Aside the drunk drivers, passengers and other road users who are drunk may even not be aware of what could be going on around them before, during and after the accident in order to take caution to avoid severe injuries and deaths in condition where they could have done so. In addition to this, when passengers are drunk, then it becomes tremendously difficult for drivers to take their advice even if they are right. The conclusion is that drivers do their own things and end up causing accidents will kill people.

## CHAPTER 3

# RESEARCH METHODOLOGY

The study was designed to conduct in-depth understanding of magnitude, causes and preventive measures of road traffic accidents in urban areas of District Abbottabad. The cross-sectional study was conducted, the study covered both qualitative and quantitative aspects. The study area of my research was Ayub medical complex and Benazir District Headquarters.

### 3.1 Target Population

The target population of the research is victims of road accidents in an Ayub medical complex Abbottabad and Benazir district headquarters, Abbottabad.

### 3.2 Sample Size and Sampling Technique

The cross-sectional sampling study was used and about 50 respondents were selected which includes 35 respondents of accident victims, 9 respondents of hospitals and 6 respondents were of traffic officers.

### 3.3 Data Collection

The primary data was collected through structured questionnaire and interviews. There were four sections in the questionnaire:

1. Demographic profile
2. Accident victims
3. Hospital information
4. Traffic officers' information

### 3.4 Variables

1. Age
2. Sex
3. Physical conditions of road
4. Literacy
5. Mode of transport
6. Poor access to health facility

### 3.5 Data Analysis

The data was analyzed through MS Excel spread sheet and were represented in the form of tables, charts and conclusion.

## CHAPTER 4

# RESULTS AND DISCUSSION

### 4.1 Demographic Information of Accident Victims

This section comprises of the information of individual background.

#### 4.1.1 Road Traffic Accidents in Relation to Age

Age is commonly assessing using five-year intervals for group (15-19,20-24, etc.). Some studies use larger intervals like 18-24,25-34, etc.

In our study the age mentioned was below18, 18-24, 25-34, 35-44 and above 45. In this study the male and female comparison is being done which shows that male age 18-24 tends to become accident victim than female but the percentage shows that female at this age becomes more victim of accident than males because women have tough time negotiating cross-roads-junctions and slip roads. On average, men drive 60 per cent of the time, and women 40 per cent. The results indicate that in certain crash scenarios, male-to-male crashes tend to be under-represented and female-to female crashes tend to be over-represented. At age 25-34 the accident victims are male as compared to female, It is reported that male at that time do not drive properly this may be due to emotional trauma, family reassurance, grief etc. At age 35-44 very few accidents occurred in both groups.

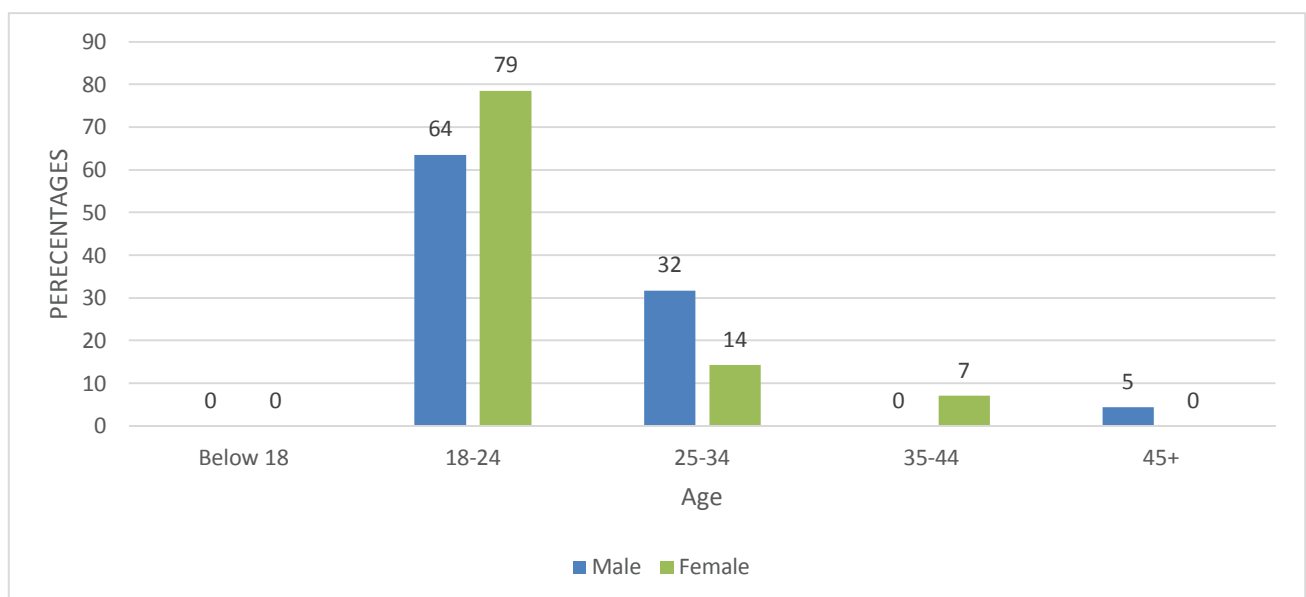


Figure 1: Road accidents in relation to age



#### 4.1.2 Road Accidents in Relation to Sex

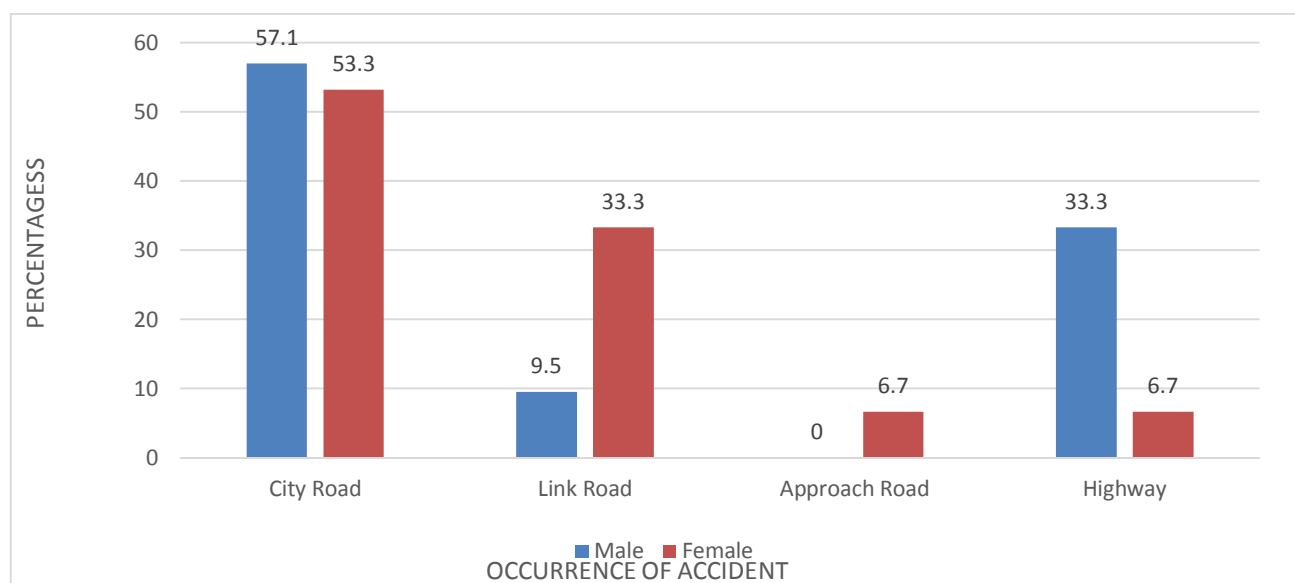
The results show that male calamity rates are significantly higher. Accident differences are significant only in normal driving conditions. Drivers over age 50 had the lowest accident rates. Car crashes rate differences were caused by lack of attention and impatience among male drivers. Proper means of communication should alert concerned populations to these findings.

**Table 1: Road Accidents in relation to sex**

Sex	No.	Total
Male	21	58
Female	15	41.7

#### 4.1.3 Occurrence of Accident

The accidents tend to occur more on City Road comprise of male 57% and female 53% in District Abbottabad. Then comes link road which comprise of male accidents 9.5% and female 33% ,female accidents are higher on link road .Then comes approach road which comprise of male 0% accidents and female 6.7%.At highway ,the percentage of male accidents are higher (33%) as compared to female (6.7%).



**Figure 2: Occurrence of accident**

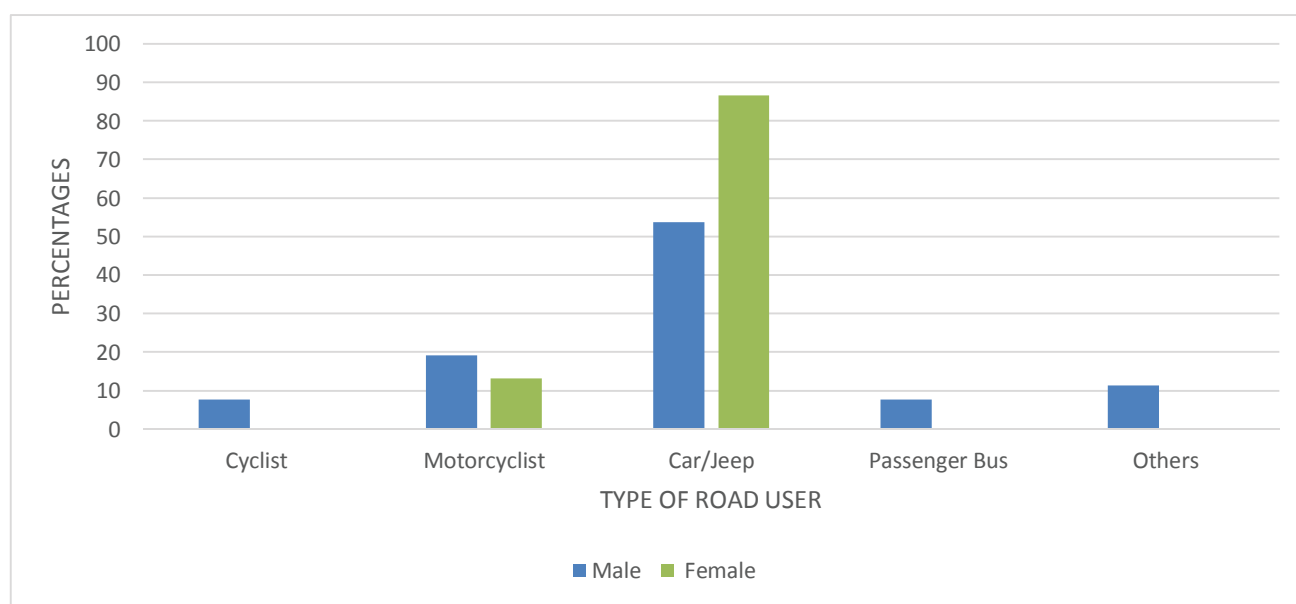
#### 4.1.4 Type of Road Users

All varieties of road user are at risk of being injured or killed in a motor traffic accident, there are distinguished differences in fatality rates between different road user groups. In particular, the “vulnerable” road users such as pedestrians and two-wheeler users are at greater risk than vehicle tenants and usually bear the greatest burden of

injury. This is especially District Abbottabad the risk is high, because of the greater variety and intensity of traffic mingling and the lack of separation from other road users. The data shows that more accidents occurred in urban areas of Abbottabad as compared to rural areas.

The type of automobile involved in motor traffic accident cannot be ruled out as a contributory factor to the number of people who are killed in that accident. The types of vehicle involved in the road accident are shown in table 4.

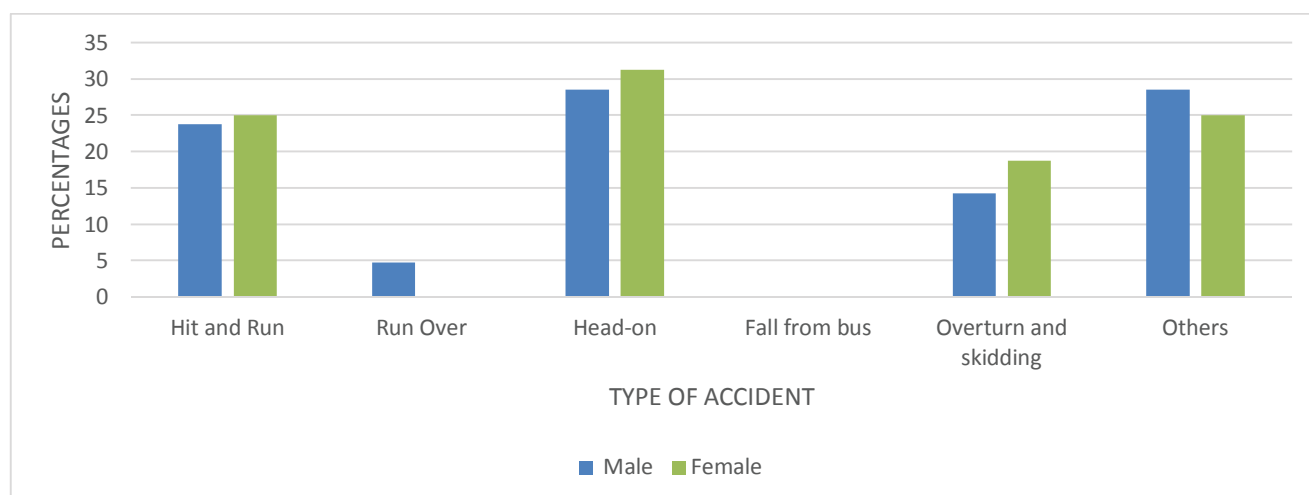
In our study the road user (car/jeep) tend to have more accidents(male 53.8% and female 86.7%).The female have higher percentage and then motorcyclist with percentage of male 19% and female 13%.The lowest percentage occurs in cyclist, passenger bus and others.



**Figure 3: Distribution of type of road users**

#### 4.1.5 Type of Accident

In our study different types of accidents are discussed in which Hit and Run is at high level which comprise of female 25%, male 23.8% and others (hit on a wall etc.) comprise of 28.6% male and 25% female. The lowest rate is accident is fall from bus and run over shown in (Figure-4).



**Figure 4: Type of road accident**

#### 4.1.6 Occupation

Pakistan has one of the world's worst records in traffic security. Pakistan recorded 14.4 fatalities per 10,000 recorded vehicles. In comparison, Japan verified a fatality rate of 1.7 per 10,000 vehicles and Canada reports a fatality rate of 1.67 per 10,000 vehicles, while rates of motor accidents in Japan and Canada are much higher than in Pakistan.

The accidents occurred mostly between age 18-35 and among them mostly are students which are recorded as 81% male and 100% female, 3% Businessman and 1% civil servant. The reasons the road accidents are higher among students are due to over speeding, drifting, rash driving, narcotics, racing, carelessness, cell phones and wrong overtaking.

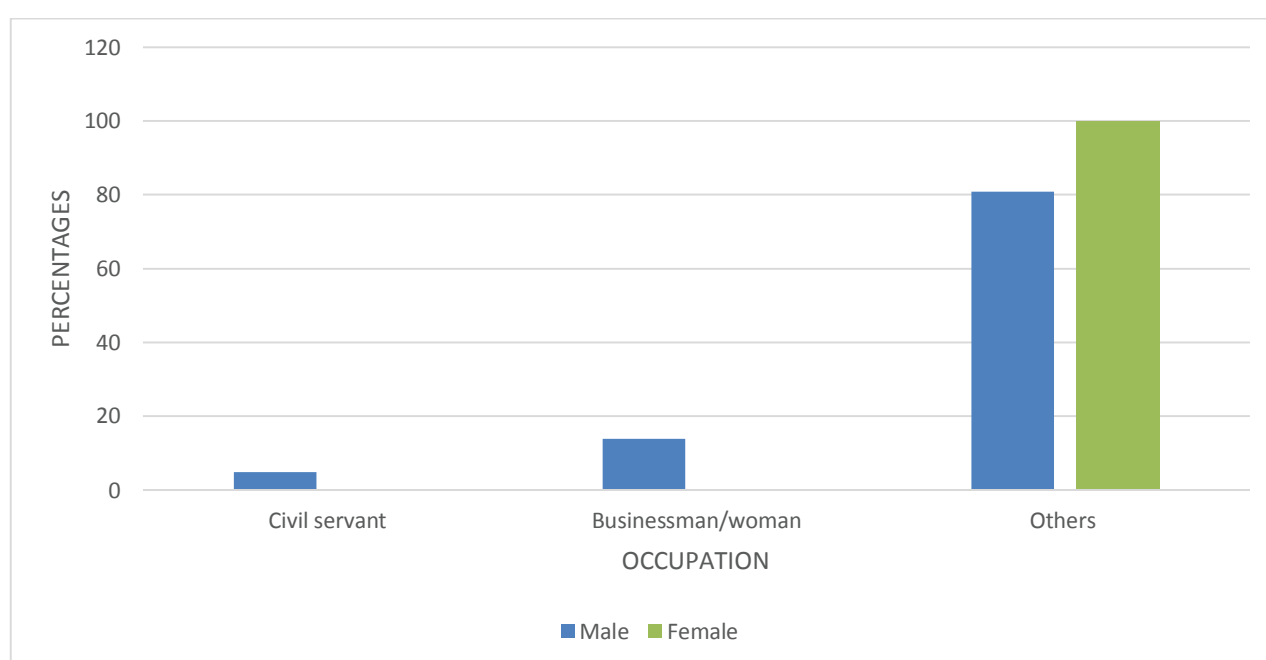


Figure 5 Percentage of male and female occupation of victims

#### 4.2 Magnitude of Road Traffic Accidents in District Abbottabad

Road traffic calamities have become a huge global public health and development problem killing nearly 1.2 million people per annum and wounding or disabling between 20–50 million people worldwide; thus making the loss of 518 billion US \$ globally. The report written by WHO in 2013 showed that more than 1.24 million individuals die every year as a result of road traffic injuries, making it “the eighth leading cause of death globally, and the leading cause of death for young people aged 15–29”. Based on current trends, it is projected to be the fifth leading cause of death globally by 2030.

In Abbottabad it was recorded that about 60-75% accidents occurs annually due to people’s behavior, road infrastructure and mismanagement. The magnitude of road accidents is lower in Abbottabad as compared to other District (Haripur).

#### 4.2.1 Comparison of Road Accidents to Other District

Figure 6 shows that there is low magnitude of road accidents in District Abbottabad as compared to other District (Haripur).

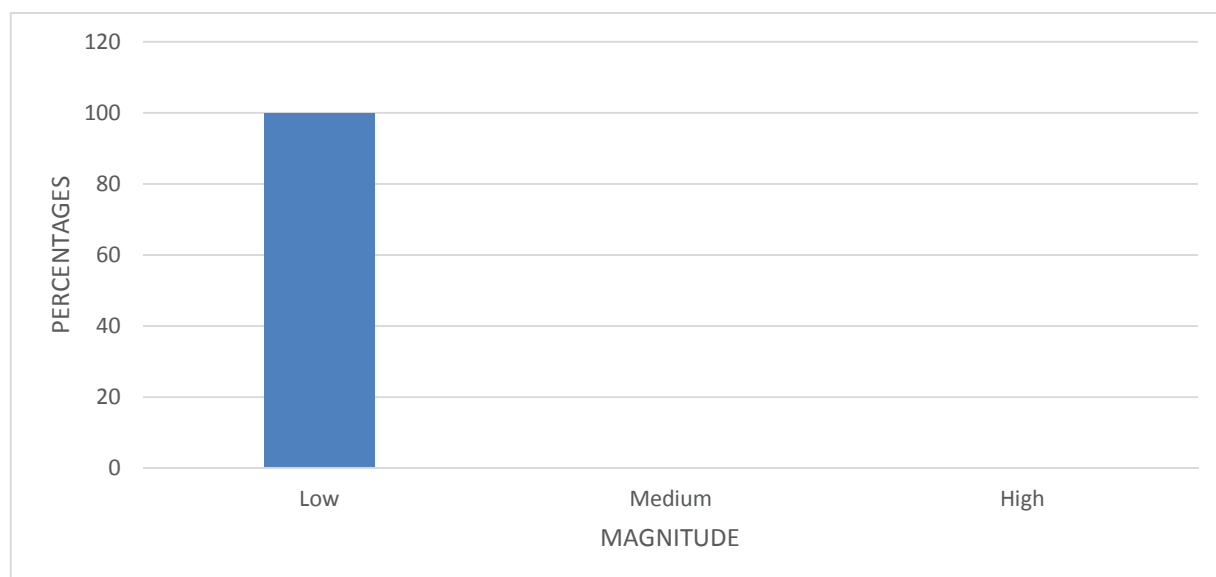


Figure 6: Comparison of road accidents of district Abbottabad to other district

#### 4.2.2 Source of Getting Information of Accidents by Traffic Officers in Abbottabad

In our study, it was recorded that the traffic officers get the information through police personals, local police stations and road users.

#### 4.2.3 Transport Injured People at the Site of Accident in Hospital

According to the police identification of causes, road accidents were responsible on road users in 90 per cent of the cases, on the road condition and the environment in 6 per cent and on vehicle defects in 4 per cent. Carefulness is needed when understanding these results as police in general have not been trained as engineers and therefore they may underestimate the impact of engineering related causes.

The study shows in the table below that 25% traffic officers send victims to hospitals via ambulance, police vehicle, and by requesting others.

Table 2: Transport injured people at the site of accident in hospital

Transportation	No.	%
By ambulance	6	25
By police vehicle	6	25
By requesting other motorcyclist	6	25
Accident victims higher vehicles themselves	0	0
Other	6	25

#### 4.2.4 Dead Bodies of Victims

The study demonstrates that the dead bodies of persons who die at the spot by an accident are sent to hospitals.

#### 4.2.5 Problems in Receiving Patients in AMC and DHQ

Accidents may be interpreted as resulting from the total forces involved in the competition between man and his environment (Gordon, 1949), and the epidemiology method thus offers a scientific approach to the prevention of road traffic accidents. There are diverse categories of problems in receiving motor accident victims. In the light of my research, it was observed that in AMC and DHQ 36% problem is of non-availability of blood, 29% is fatal injuries, 21% is of non-availability of doctors and others as shown in Figure 7.

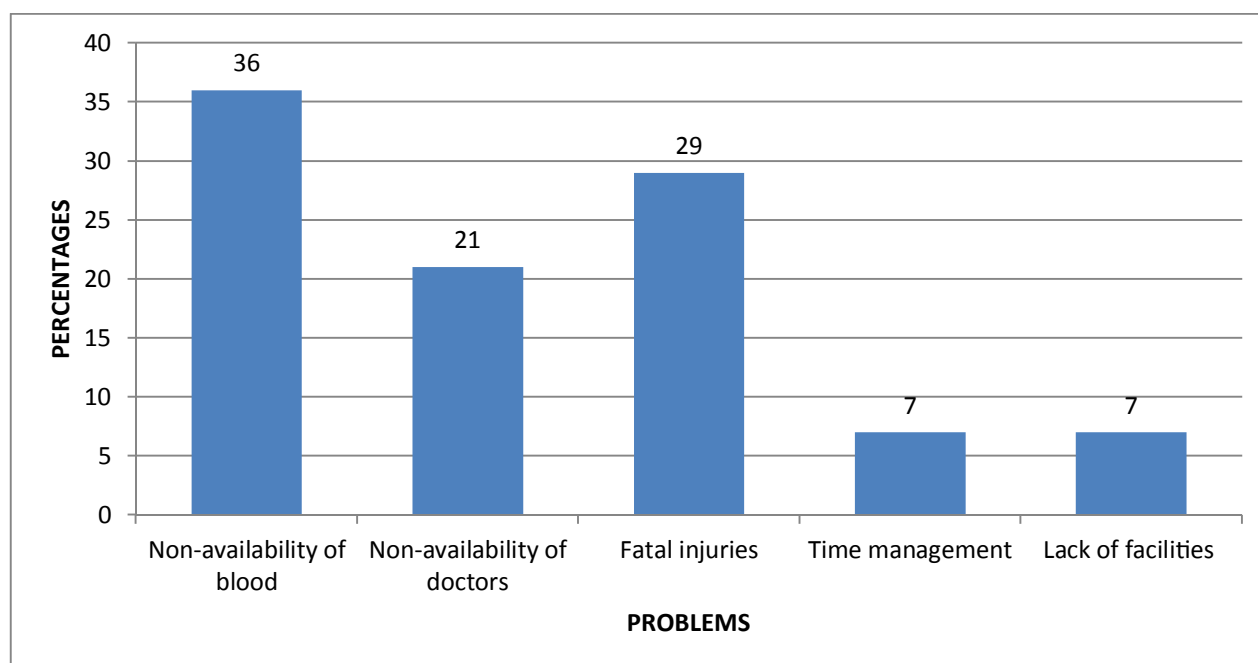
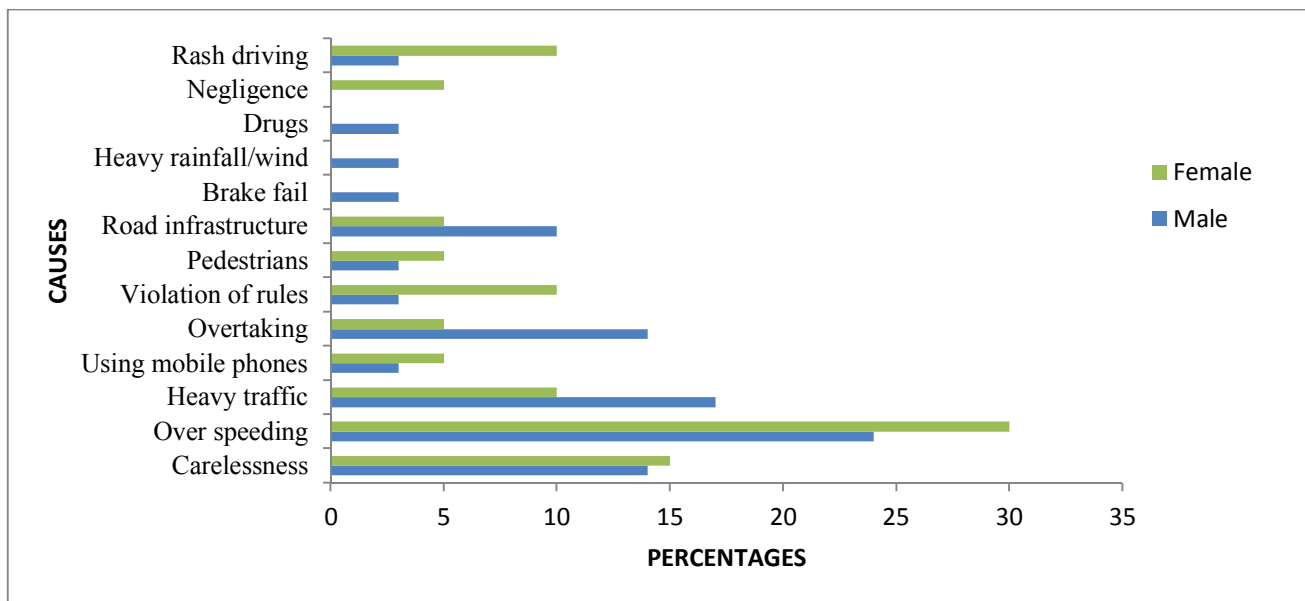


Figure 7: Problems in receiving patients in Ayub Medical Complex and DHQ

#### 4.3 Causes of Road Traffic Accidents in District Abbottabad

Causes of road accidents are carelessness, negligence, over speeding, using mobile phone, overtaking, violation of rules and pedestrians. Road infrastructure, weather conditions (heavy rainfall/wind, brake failure, off-street vehicles and drugs).

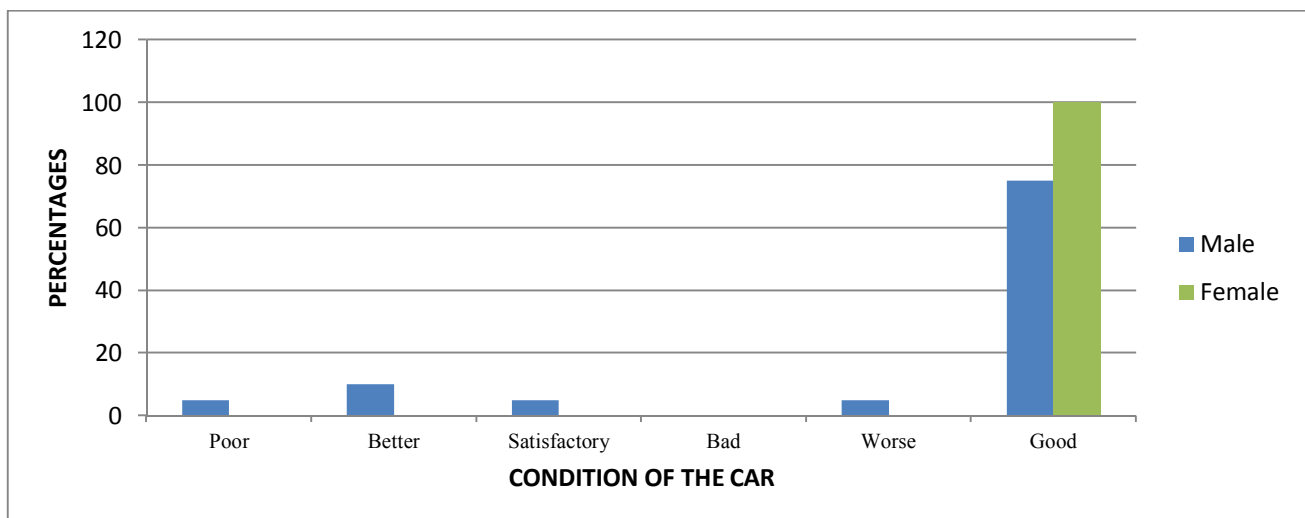
In our research study, it is recorded that the cause of motor traffic accidents are carelessness male 14% and female 15%. The higher percentage is of carelessness among male and female, over speeding (male 24% and female 30%), Heavy traffic (male 17% and female 10%), overtaking (14% male and 5% female) and other factors that are shown in Figure 8.



**Figure 8: Causes of road accidents in district Abbottabad**

#### 4.3.1 Condition of the Car Just Before the Accident

In our study, it was observed that 75 % male have good condition car and 100 % female also have good condition car. 5% male had worse /poor car conditions as shown in (Figure 9).



**Figure 9: Condition of the car**

#### 4.3.2 Condition of the Day at the Time of Accident

In our study it is shown that 76% male and 75 % female indicated that the weather was dry, and 14%male and 6%female indicated rainy weather .The weather is also the factor of road accidents

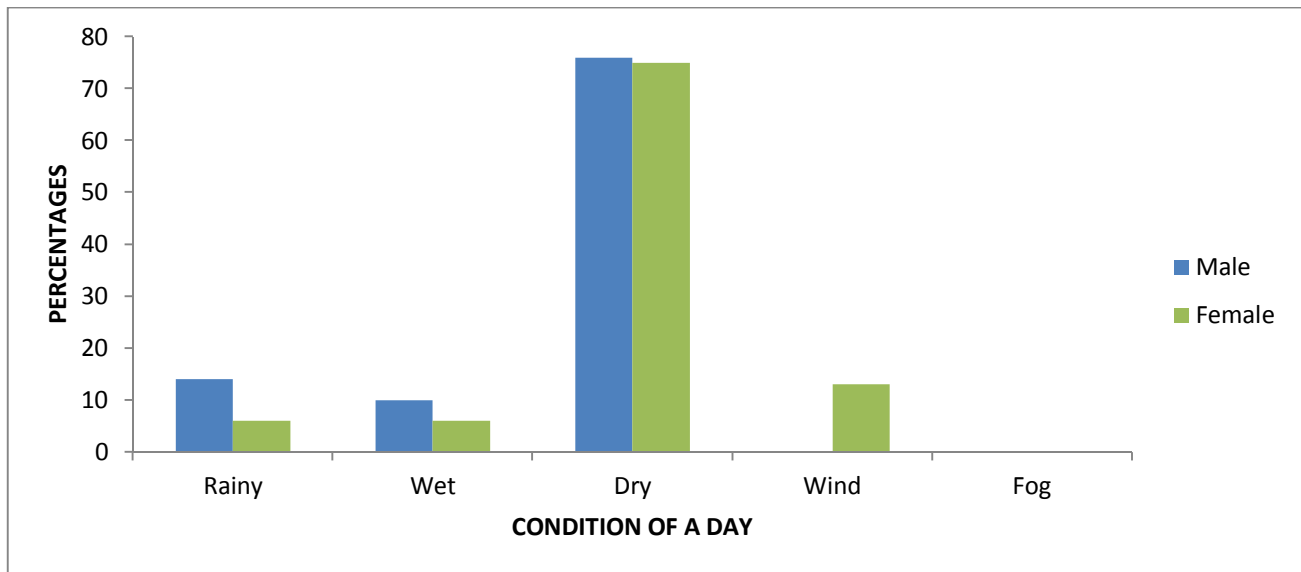


Figure 10: Condition of the day

#### 4.3.3 Speed of the Car

Bagaria (2007) observed that a mixture of factors such as the presence of a speed breaker and non-functioning street light led to a bunch of motorcycle accidents.

Study of RTA fatalities from Patna showed that the majority of RTAs (73%, n=241) took place on straight roads, 1% at T junctions, 10% at Y junctions and 8% each at four-way Juncutres and traffic roundabouts (Singh and Misra, 2001). A study of 13777 motorized. Two wheeler accidents from Hyderabad showed that 81% of accidents involving motorized Two wheelers were from rural areas and 'major groups of two wheeler accidents involved. Rural and roadside accidents among males and urban and highway' accidents among females (Umar and Jena,)

In our study, the accident occurred due to over-speeding by male and female as recorded in the Figure 11; 81% male and 60 %female drivers drive fast.10% male and 20 % female speed is recorded at 100km/h due to which unnecessary accidents are occurring.

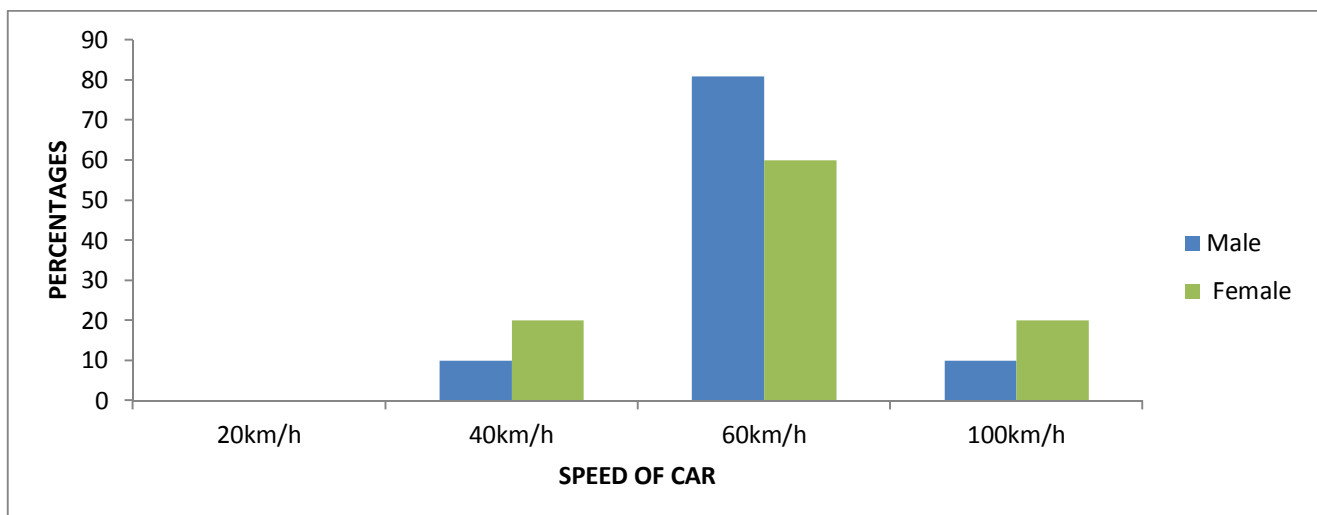


Figure 11: Speed of the car

#### 4.3.4 Number of Passengers Applied Seatbelt

Sharma et al (2007) observed that 9% of school students between 14 and 19 years of age never used a seat belt while riding in the front seat of a car; 10% used it only rarely and 52% used it sometimes.

In our research study 95% male and 63% female didn't applied seatbelt as shown in (Table 3) which is causes person to be injured at the time of accident.

**Table 3: Number of passengers applied seatbelt**

Applied Seatbelt	%Male	% Female
Yes	5	38
No	95	62

#### 4.3.5 Violation of Road Signs

Road calamities appear at a very high rate, with an estimated road traffic death rate 38.1 per 10000 populations (WHO, 2013). Only Bangkok alone, there are 2433 reported accidents in 2014 (Thai RSC , 2015. Thailand will need to give importance to accidents in order to prevent and reduce risk of accidents from happenings in the future. Accidents partly come from violations of traffic law especially where no traffic officer present (Leelavijarn *et al.*, 2014).

With traffic capacities increasing since the 1930s, many countries have adopted pictorial signs or otherwise simplified and standardized their signs to overcome language barriers, and develop traffic safety. Such pictorial signs use symbols (often silhouettes) in place of words and are usually based on global protocols. Such signs were first developed in Europe, and have been adopted by most countries to varying degree.

In our study Table 4 shows that 67% individual violated a road sign which is another cause of road traffic accident.

**Table 4: Violation of road sign**

Violation of road sign	No.	%
Yes	12	33
No	24	67



#### 4.3.6 Condition of The Road at the Time of Accident

Roundabouts are a popular alternative to intersections. Numerous studies have indicated that roundabouts are associated with lower RTA numbers and less severe injuries compared to T- or X-intersections (e.g. De Brabander, Nuyts, & Vereeck, 2005; Guichet, 1997; Retting, Persaud, Garder, & Lord, 2001).

In our research study it was recorded that 15 % male and 35 % female said that there was traffic at the time of accident. 35 % female and 13 % male said that the road was bumpy. 13 % male and 5 % female said that the road was slippery and wet due to which the accident occurred. Fewer percentages of individuals show that it was bare road and the individuals were overspending and drifting on the bare road that is why they got injured due to calamity.

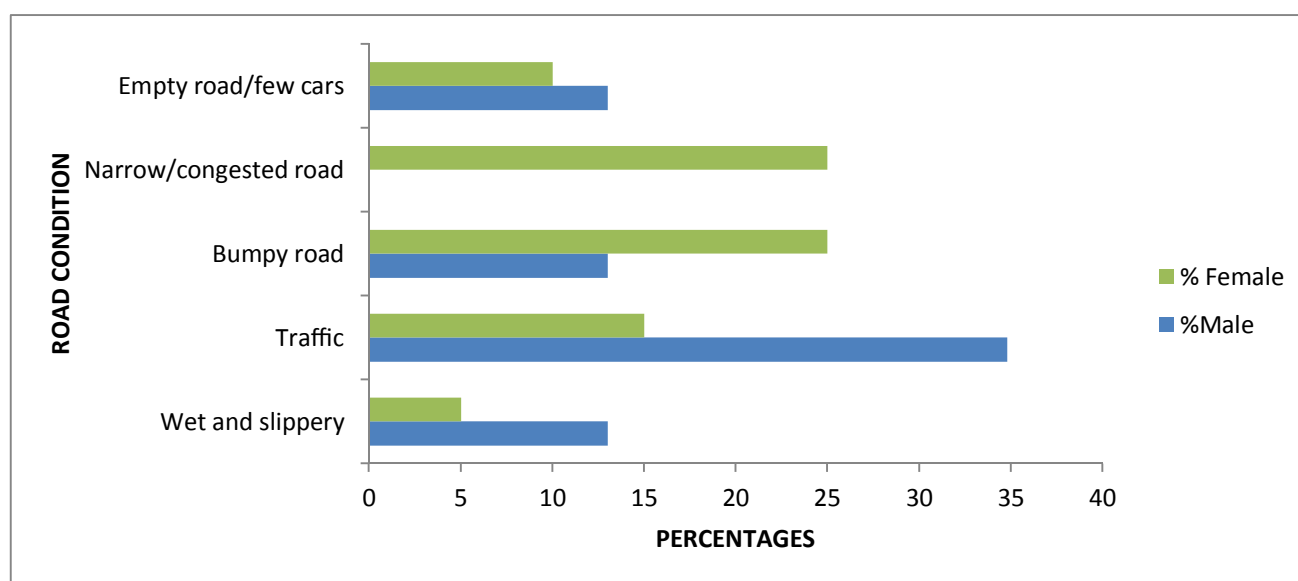


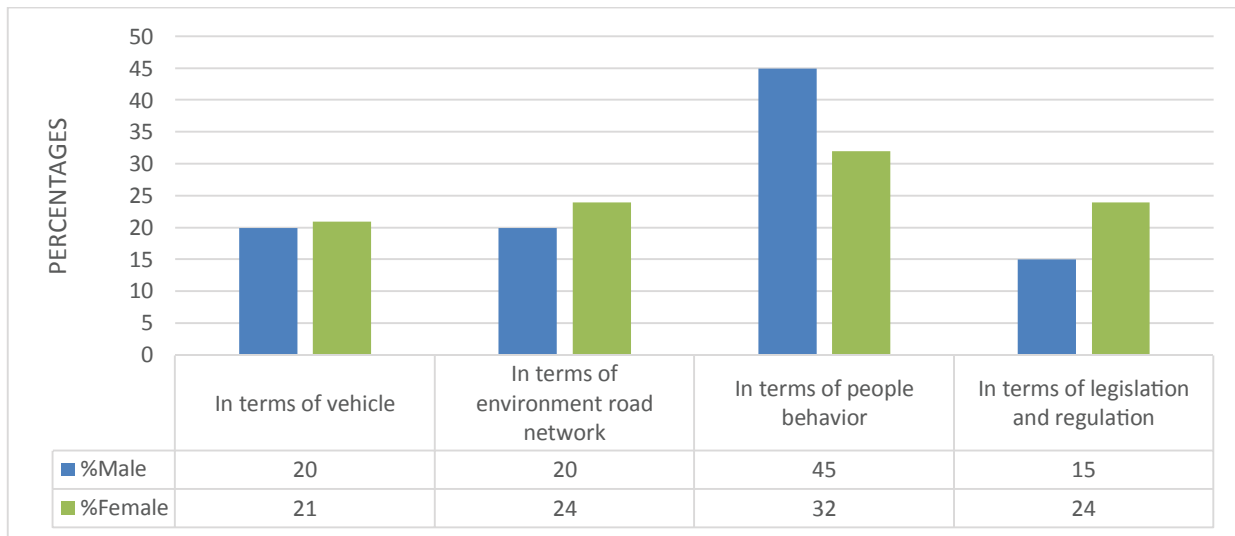
Figure 12: Condition of road at the time of accident

#### 4.3.7 Factors of the Occurrence of Road Accidents

Research indicates, however, that drivers increase their speed when road width increases and that drivers move their lateral position closer to the lane edge (Lewis-Evans & Charlton, 2006). Lane markings (lines) are crucial to guide the driver and assist him or her in maintaining lateral position. Driver behavior depends on the design of the markings (e.g. lane width, color).

There is evidence that the effect of road markings on driver behavior is unconscious and that road markings are more effective in affecting driver behavior than road signs. However, road markings should never be introduced without road signs or vice versa.

In our study it was recorded that the higher percentage of male (45 %) and female (32%) said that people's behavior facilitates the occurrence of road traffic accidents in Abbottabad. In terms of vehicles there is lower percentage of male 20 % and female 21 %.



**Figure 13: Factors of occurrence of road traffic accidents**

#### 4.3.8 Time Period of Accident

The total vehicle-kilometers (vehicle-miles) moved in the urban area were not known, calamity rates for urban roads could not be calculated. A number of 24-hour traffic volume counts were obtained, and the percentage of accidents and dimensions during the various light conditions were compared. For both daytime and night, the percentages of accidents and dimensions were very similar. There were distinctive differences in accidents during dawn and dusk. The percentages of accidents at dawn were abnormally low compared to other times during the day. The accident mostly happened during day time as compared to night because of heavy traffic, violation of rules .over speeding and overtake.

#### 4.3.9 Number of Vehicles Involved in an Accident

The risk of intersection collisions varies on rural and urban roads, with around 50% of urban crashes and 30% of rural crashes happening at junctions. In urban areas the probability of an intersection collision occurring is high as they typically have a higher density of junctions. On rural roads while the likelihood of a collision may be lower (because of fewer intersections) the consequence of the accident is often significantly worse because of the increased speeds involved.

In my research study, it was concluded that the collision occurred mostly between two cars .The percentage of collision of two cars are recorded as 58% male and 73 % female as compared to other number of cars in Figure 14.

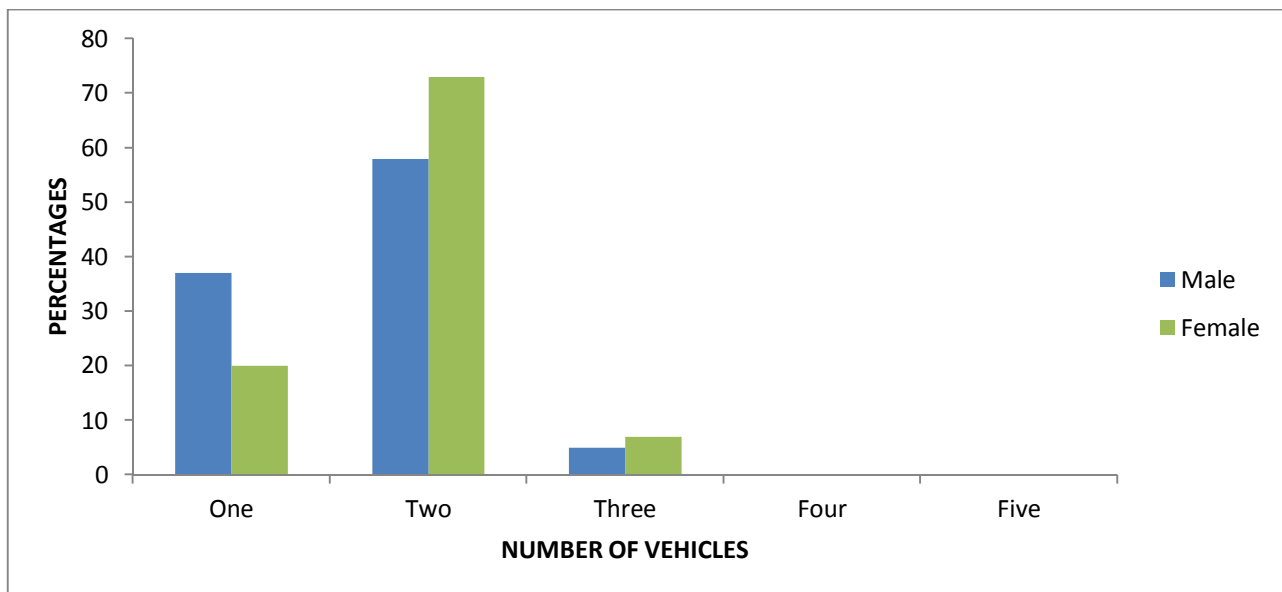


Figure 14: Number of vehicles involved in road traffic accidents

#### 4.3.10 Type of Vehicles Involved Used by the Victim

The number of bikers killed or seriously bruised in Great Britain increased in both 2013 and 2014. There were 5558 serious accidents involving motorcyclists in 2014. 339 motorcyclists were killed in reported road accidents (an increase of 2.4% on 2013) and 5289 were seriously injured (an increase of 8.7% on 2013, and the highest level since 2009).

The research study illustrates that types of vehicles used by victim to carry day-to-day movement in District Abbottabad are saloon cars with a percentage of male 81% and female 100% the female percentage is higher as compared to male because male also uses other vehicle like motorbike, bicycles, trucks etc.

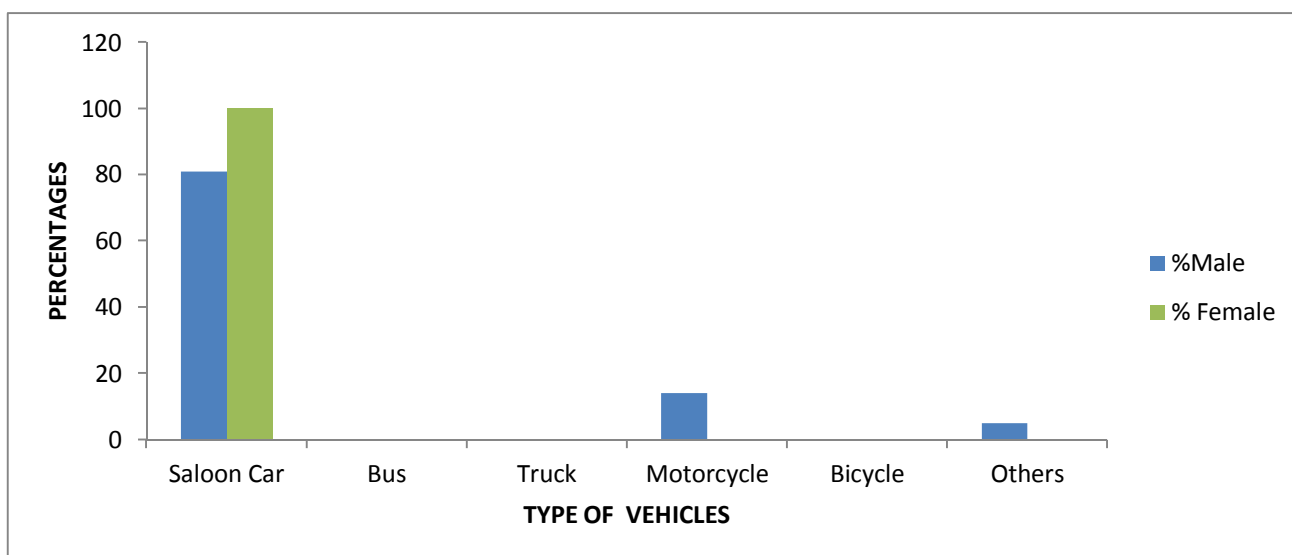


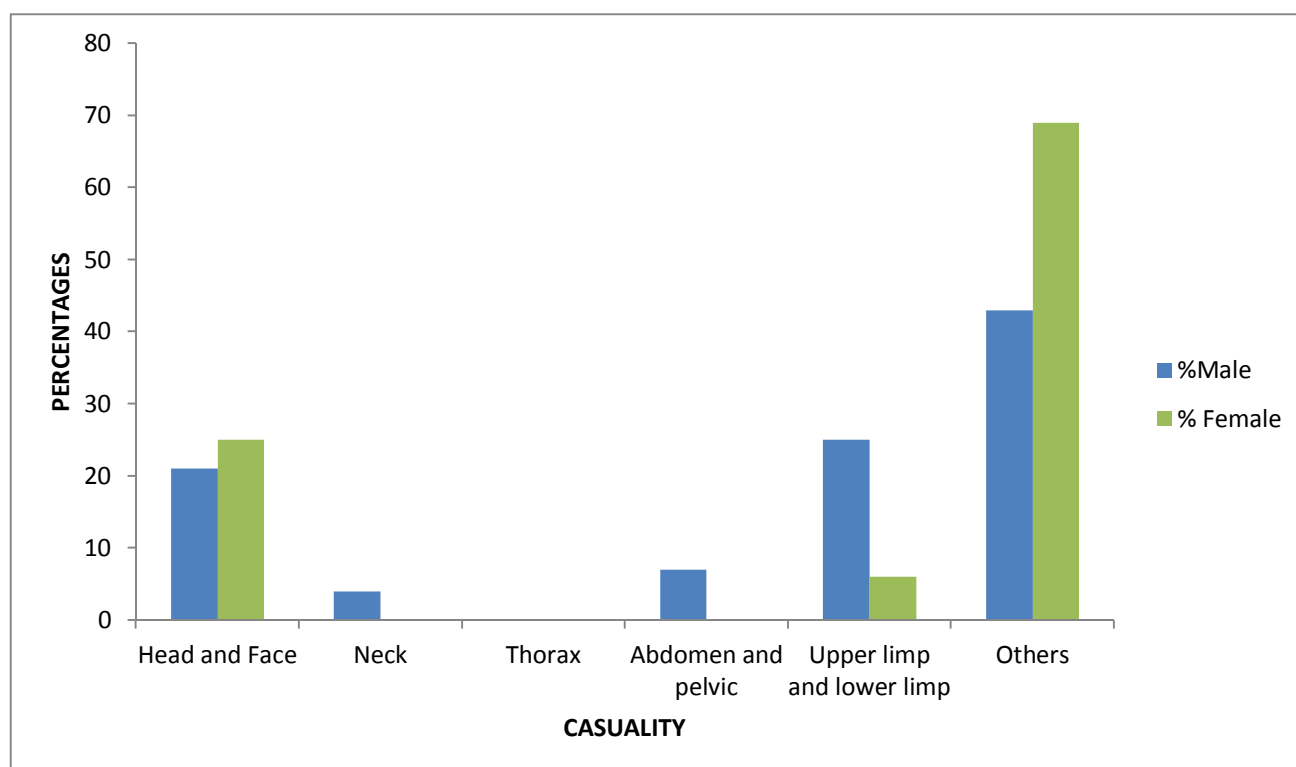
Figure 15: Types of vehicles involved used by the victim

#### 4.3.11 Causality at the Time of Accident

There were 1106 car drivers who were killed in road traffic crashes in 2005 at Britain and Wales and a study into this data by Clarke et al (2007) showed that 40% of those who died worn no seat belts and most of them were people

between the age 17 and 29 years. It was further identified that the desire for buckling the seat belt increases as one grows beyond 30 years. One of the commonest thing identified by researchers as the cause of death in road traffic crashes is anoxia-loss of oxygen supply –which cause a blockage in the air ways of the casualties and if immediate aid is not to the casualty, he/she dies after a short while due to inadequate supply of oxygen (British Red Cross, 1997).

In my research ,it is recorded that injuries that occurred from motor traffic accidents among males and females are Head and face (male 21% and female 25 %) ,Upper limb and lower limb (male 25% and female 6 %) and most higher percentage is of Others which include broken bones, ligament damage ,ACL torn, bone bruise, abrasions, disability etc.



**Figure 16: Causality at the time of accident**

#### **4.3.12 Fatal Injuries at the Time of Accident**

It is related to an injury which almost causes a death but not certainly does. Motor traffic injuries are one of the most common reasons of trauma reporting to the emergency departments of tertiary hospitals that need specialty or super-specialty care. Research from different Indian sites revealed that 23 to 40 percent of trauma cases seen at the emergency departments of tertiary hospitals were due to RTAs (Muralidhar and Roy, 2004; Sharma; Verma and Tewari, 2004; Goel et al, 2004). Between 14% and 50% of unusual deaths from unspecified urban areas and 13% of unusual deaths from rural areas (Cardona et al, 2008) were recognized to RTA. Almost two thirds (61%) of fatal head injuries (Pathak et al, 2008) and half of the fatal chest injuries (50%) (Pathak et al, 2006) were due to of RTA.

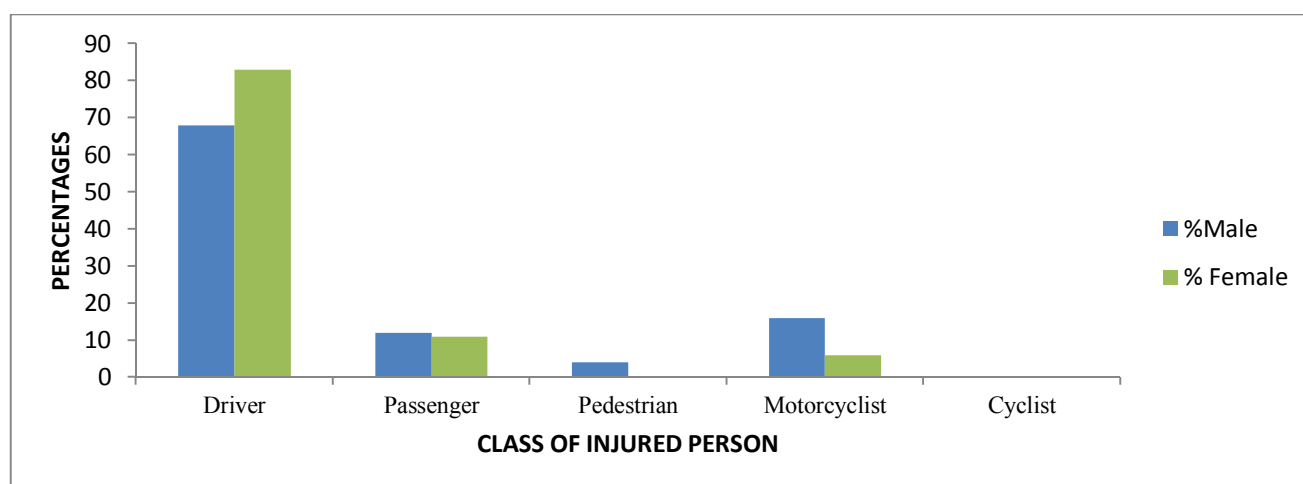
**Table 5: Fatal injuries at the time of accident**

Fatal injuries	Male	Female
Head	27	80
Cervical spine	18	20
Chest	18	0
Abdomen	0	0
Pelvic	9	0
Lower limb & Upper limb	27	0

In my research the Table 5 shows the percentage of fatal injuries of road accidents. In which Head injury (male 27%, female 80%) and cervical injuries (male 18% and 20%) recorded are higher in males and females due to carelessness, negligence and other factors.

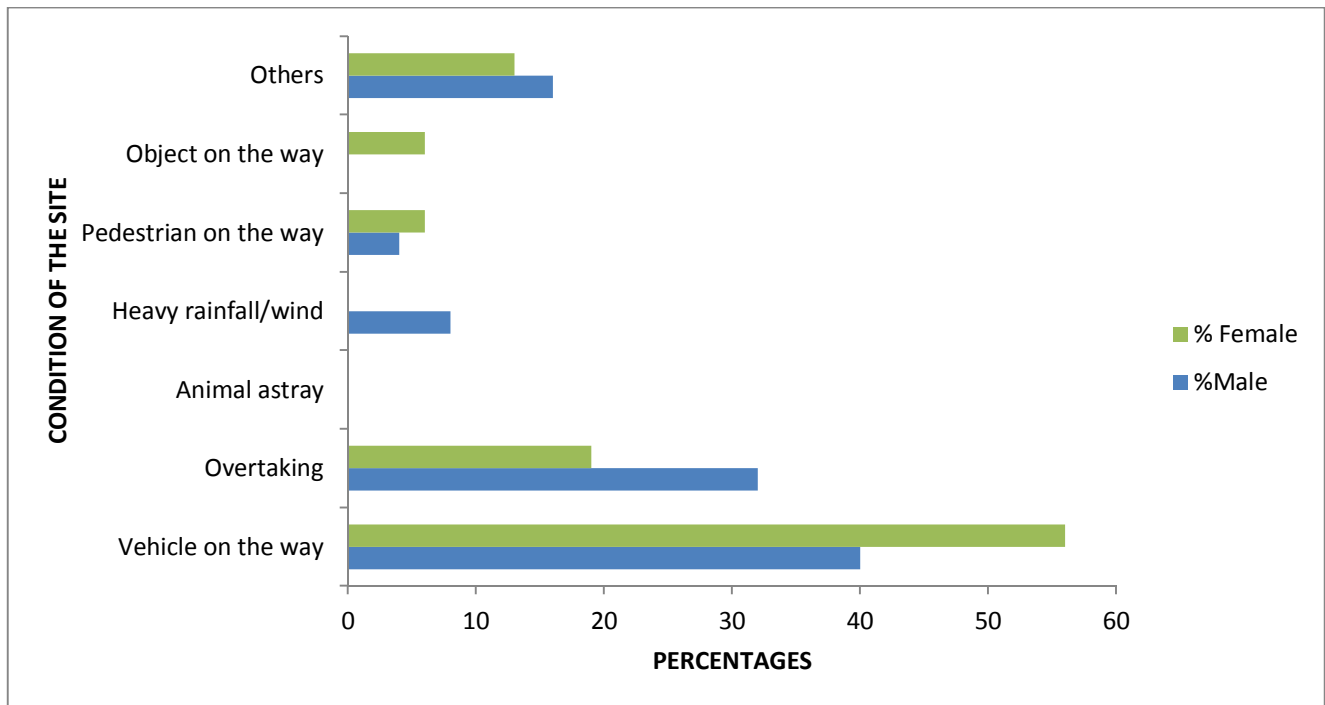
#### 4.3.13 Class of the Injured Person

If the road accident was a two car accident, one of the drivers is certainly going to be responsible. It is almost impossible to have a two car accident without at least one of the drivers being considered negligent in some way. The drivers get more injured as compared to other class (Passenger, Pedestrian, Motorcyclist, and Cyclist as shown in Figure 17.

**Figure 17: Class of injured person**

#### 4.3.14 Condition at the Site Just Before Accident

It was recorded that accidents occurred mostly due to vehicle on the way and overtaking (Figure 18). Overtaking is a kind of vigorous driving behavior which is quite commonly involved in by drivers and yet also rated as one of the most hazardous man oeuvres to perform (Harris, 1988).



**Figure 18: Condition of the site just before accident**

#### **4.4 Preventive Measures to Reduce Road Accidents in District Abbottabad**

Evidence shows that motor traffic accidents (RTAs) affect a large proportion of morbidities and mortalities in developed as well as developing countries. However, Road Traffic accidents continued to be ignored as an important public health issue till recently, because accidents and injuries were observed upon as random or accidental events that were an inevitable part of road transport. Current years have brought about a change in perception and a new understanding has emerged in terms of looking at road injuries as avoidable events that can be prevented or controlled through intervention (World Health Organization, 2004).

##### **4.4.1 Safety Measures to Reduce Road Traffic Accidents in District Abbottabad**

Road calamities appear at a very high rate, with an estimated road traffic death rate 38.1 per 10000 populations (WHO, 2013). Only Bangkok alone, there are 2433 reported accidents in 2014 (ThaiRSC, 2015). Thailand will need to give importance to accidents in order to prevent and reduce risk of accidents from happenings in the future. Accidents partly come from violations of traffic law especially where no traffic officer present (Leelavijarn *et al.*, 2014).

In our study .48% people said to reduce overspeeding and rash driving.15% said to follow road signs ,traffic rules ,10% said to avoid overtaking and 13% said to wear seatbelt in order to reduce the rate of accidents in District Abbottabad.

**Table 6: Safety measures to reduce road traffic accidents in district Abbottabad**

Safety measures	No.	%
Reduce over speeding /avoid rash driving	29	48
Avoid overtaking	6	10
Avoid cell phones	4	7
Follow road signs/traffic rules	9	15
Wear seatbelt/helmet	8	13
Approved license	1	2
Training of local drivers	2	3

#### 4.4.2 Problems in Implementing Traffic Safety Measures in Abbottabad

Issues are mostly politicized and personal benefits are involved and sometime cause hurdles in implementation.

#### 4.4.3 Rules and Regulations to Reduce Road Traffic Accidents

Respondents give importance to law implementation as a serious factor to road safety. This corresponds to the well-known fact of weak law enforcement of Abbottabad police officers to control traffics and accidents. This causes many drivers fail to follow the traffic laws. If severer traffic laws are enforced, then there will be fewer injuries and deaths.

Below in the Table7, it has been concluded that if there is enforcement of rules and regulations then the chance of occurrence of road accidents will be lower.

**Table 7: Rules and regulations to reduce road traffic accidents**

Rules and regulations	No.	%
Yes	6	100
No	0	0

## CHAPTER 5

# CONCLUSION AND RECOMMENDATIONS

On the basis of the finding of the study, the following conclusions were drawn and recommendations were formulated.

### 5.1 Conclusion

Accident rates were observed for each sex. Rates are expressed in number of annual accidents per 1,000 drivers of the same sex. Male-to-female percentages were also calculated. Accident ratios show significantly higher male rates; on average, more than three times higher (3.42 times). Statistical testing between the two sexes indicates substantial difference at the 5% level.

Analyses of the data reported in this study discovered a definite trend of significantly higher accident rates for male drivers compared with female drivers. Related trend was obtained after accident rate adjustment to account for distance traveled by each sex and for public transport accidents. Accident rate examines by region showed similar results. Rates, in general, were higher in the low-income region compared with the high-income region. In more complicated driving conditions, such as adverse weather or road surface. Male and female accident rates were compared in four different weather conditions: clear, foggy, rainy, and windy. Four road surface cases were considered: dry, wet, foggy, and windy/rainy. Visibility situations were characterized under two lighting conditions: daytime lighting, and dark conditions.

Results specify that the trend of higher male accident rates is observed in all normal conditions; that is, in clear, dry, daytime, and adequate night lighting conditions. In enormously difficult driving conditions (rainy and wet) female accident rates drop to zero. This could be an indication of extremely careful driving by females or that females may not choose to drive at all in adverse conditions. In foggy weather both sexes have lower rate of accidents. In dry weather condition the female and male accident rate differences are small. An overall conclusion that can be drawn from this analysis is the emphasis of higher male accident rates reflecting a lesser degree of carefulness in males driving under normal conditions. In the present study, drivers were characterized into five age groups as shown in Figure I. Accident rates and ratios were arranged for the two sexes for all age categories. The results approve higher male accident rates at age 25-34 due to family pressure and other traumas. Higher ratio of female accidents were observed with the age of 18-24. Lowest ratio was observed between both sexes with the age of below 18, 35-44 and above 45. The causes of road accidents were drawn that these are violation of stop sign, using inappropriate lane, violating yield sign, disregarding mandatory signs, and wrong overtaking. Reduced attention and driver impatience are believed to be the major contributors to the commitment of these liabilities. Furthermore, female drivers did not take risks to commit the serious law-breaking mistakes. The study also revealed that males' accidents were more harmful and dangerous with regard to their consequences. It was recognized that the accidents occurred more because of local Suzuki /taxi driver. It



was observed that 95% individuals do not wear seatbelt/helmet that is why the rate of injuries (Head and Face, Upper limb and lower limb and others) and fatality (Head, cervical spine chest and others) is higher between male and female. Furthermore, it was observed that 67 percent individuals don't follow road signs and their behavior is not appropriate they do violate Rules /traffic signals due to which the rate of accidents is higher.

It was perceived that in order to improve medical services in AMC and DHQ the individuals recommended first aid facility, availability of blood reservoir, availability of trained staff ,hygiene emergency wards ,latest equipment which must be sterilized, ambulance service, admit patients without filling forms.

It was perceived in order to reduce accidents seatbelts must be applied, speed should be in your control, do not overtake from wrong side, rules and road signs must be followed and implemented.

Road traffic accidents in Abbottabad have not received the attention warranted, considering the magnitude of the problem. There is the need to view motor traffic accidents as an issue that needs vital attention aimed at reducing the health, social and economic impacts.

## **5.2 Recommendations**

1. Education on motor accidents should be intensified specially among the youth.
2. The drivers should have approved license and they should avoid driving off street model vehicles
3. Drivers of vehicles such as cars and buses should be given special training to be able to avoid unnecessary accidents.
4. The accident data base of the country should be continued to include more variable so that researcher could really determine the actual factors contributing the casualties' death in road accidents.
5. Finally, institutions that implement road traffic regulations should do well to apply the law.



**ANALYSIS OF MATERNAL MORTALITY IN  
TERTIARY CARE HOSPITALS: TO DETERMINE  
CAUSES AND PREVENTABLE FACTORS  
IN DISTRICT ABBOTTABAD**

**By**

**Aroosa Tahir**

## ABSTRACT

Pregnancy, although being considered a physiological state, carries risk of serious maternal morbidity and at times death. This is due to various complications that may occur during pregnancy, labor or thereafter. Maternal death has serious implications on the family, the society and the nation. Maternal Mortality Ratio (MMR) is a very sensitive index that reflects the quality of reproductive care provided to the pregnant women. The objective of this study is to determine causes and identify preventable factors leading to maternal mortality in tertiary care hospitals of Abbottabad. This study was carried out in Gynaecology unit of Ayub Teaching Hospital Abbottabad over a period of two years (2012-2014) and Gynaecology unit of Benazir Women Hospital (Women & Children) Gammi Adda Abbottabad. Secondary Data was collected through Retrospective analysis from Gynecology registers for the period from 1st January, 2012 to 31st December, 2014. A self-structured Performa was used for data collection. The data collected through hospitals records were analyzed through MS Excel spread sheet and results were presented in the form of tables, charts, graphs and conclusions.

All pregnant women are at risk of obstetrical complications and most of these occur during labor and delivery that lead to maternal death. In our study maternal mortality is serious issue. Safe motherhood as a priority for action cannot be identified without properly assessing maternal mortality

## CHAPTER 1

# INTRODUCTION

### 1.1 Maternal Mortality at A Glance

Maternal health is a transversal issue that has not only affected the social and economic development of a country, but also on the rights to the highest attainable standard of health of an individual. Pregnancy and childbirth are natural processes in a woman's life. Motherhood should be a time of anticipation and joy for a woman, her family and her community, but they are by no means risk-free. For some women in certain parts of the world especially in developing countries the reality of motherhood is often grim. For these women is motherhood often marred by unforeseen complications or even a loss. Some women loss fetus even before they are born, or shortly after birth; while any loss both their live and that of the baby.

"A deep, dark continuous stream of mortality. How long is this sacrifice to go on" William Farr, the first registry in general in England and Wales, asked this question of maternal mortality in England in 1838; 165 years now this question has still not been answered. While risk of dying during pregnancy, childbirth or shortly after birth are now very rare in industrialized countries, in large parts of Africa, Asia and Latin America maternal mortality is still an everyday occurrence.

Progress towards the Millennium Development Goals (MDG) 5a -reducing maternal mortality by 75% between 1990 and 2015 is slow in many parts of the world. The total number of maternal deaths in 2010 is estimated, according to the latest release from WHO and partners, at 287,000 deaths, a decrease of 47% from 1990 levels. Similarly, the Institute of Health Metrics and Evaluation (Ihme) estimated the global number of maternal deaths to be 273,465 in 2011.

Earlier figures from the same departments had proposed a higher total number in 2008 (358 000) [5] and 342,900 by WHO and partners and Ihme, respectively. 25% reduction in the total number of maternal deaths within two years may reflect better data availability and statistical methods, but also the accelerating progress in maternal health in some parts of the world. Total annual reduction in maternal mortality was estimated at 3.1% and 1.9% between 1990 and 2010 and in 1990 and 2011 respectively in the two publications. The estimates in both publications, the annual rate of reduction in maternal mortality lower than 5.5% annual reduction required to achieve MDG 5.

Both WHO and Ihme publications, reports that the highest maternal mortality ratio (MM ratios) are in sub-Saharan Africa and South Asia. For the year 2010, it was reported regional MM ratios of 500 and 220 per 100,000 live births for sub-Saharan Africa and South Asia, respectively, according to WHO estimates. Many countries, especially in sub-Saharan Africa, are not likely to reach MDG5 although major efforts are made. However, some regions of the world such as North Africa and East Asia has made steady progress, reducing some MM-percentages over 60% in the period between 1990 and 2010, in line with MDG.

The WHO estimated in the past that 80% of maternal mortality is due to direct causes and 20% is due to indirect causes. Newer estimates propose that a larger proportion is due to indirect causes

The program of action of the International Conference on Population and Development formulated two overall goals in relation to women's health and safe motherhood; namely: - 1- "To promote women's health and safe motherhood" to achieve a rapid and substantial reduction in maternal morbidity and mortality and reduce the differences observed between developing and developed countries and within countries. On the basis of a commitment to women's health and well-being, to reduce greatly the number of deaths and morbidity from unsafe abortion. "To improve the health and nutrition status of women, especially pregnant and lactating women".

## **1.2 The Scale of Maternal Mortality in Pakistan**

Pakistan is the seventh most populous country in the world with an estimated population of 172.8 million with fertility rate of 4.1 births per cent and contraceptive use at 30 percent. Total expenditure on health in Pakistan is 2.6 to 2.7% of GDP (percentage of GDP) in 2006- 2009 .Total expenses is the sum of public and private health expenditures that gives both curative and preventive health care. According to Pakistan Demographic and Health Survey (PDHS) 2006-2007 National Maternal Mortality Ratio 276. Nevertheless, there is considerable variation between provinces - Punjab 227, Khyber Pakhtun Khwa 275, Sindh 314, and Baluchistan 785. The difference between Rural and Urban areas is also very pronounced, MMR is almost twice as high in rural areas (319) than in urban (175).

Trends in maternal mortality 1900-2013, an article published by WHO, estimates MMR for Pakistan for the year 2013 as 170 with a degree of uncertainty between 93 to 3,201, while the Global Burden of Disease estimates the MMR for Pakistan on 400.with uncertainty between 233- 560 .the variations in MMR values can be attributed to variations in study design, methodology selected, data collection and location (rural / urban). Actual measurement MMR is problematic because approaches available are complex and require intensive resources.

PDHS showed that maternal deaths account for 20% of all deaths in women of childbearing age. Post-Partum Hemorrhage (PPH) was the leading direct cause of maternal deaths responsible for 27.2% of deaths. Infect, Bleeding, both ante partum and postpartum, caused deaths in nearly a third (32.7%) of women.

In a study of mothers who were brought dead to the Jinnah Graduate Medical Centre, Karachi nearly 50% of deaths were due to PPH. Preeclampsia / eclampsia accounted for 10.4% of maternal deaths while abortions were found to be responsible for 5.6 percent of deaths. Abortion death was however considered to be underreported because of the stigma associated with abortions. Among the indirect causes of maternal deaths, liver failure due to hepatitis was the most common. One of the disturbing facts of PDHS report the number of deaths were classified as iatrogenic ie due to improper management and negligence in hospital settings. This included erroneous transfusions and general anesthesia complications.

In addition to medical reasons, socio-economic, psychological and cultural factors affecting maternal health. These include poverty, lack of education, poor nutrition and lack of family planning, domestic violence, gender discrimination, and access to quality care especially during birth. A thorough analysis of deaths of women of reproductive age 2006-07 highlighted anyone other than medical reasons, including some of those mentioned above. These included poverty,

neglect by an unsupportive family, domestic violence, sexism, superstition and ignorance. The psychological, social and cultural factors affecting women's lives and wellbeing and creates a barrier in seeking appropriate and timely care.

### **1.3 Causes of Maternal Mortality**

There are both direct and indirect causes of maternal mortality. Direct causes are hemorrhage, sepsis, eclampsia, obstructed labor and complications of abortion. Direct causes include related complications during pregnancy, childbirth or the postpartum period.

Indirect causes include HIV, anemia, cardiovascular diseases, tuberculosis and malaria. Indirect causes are the complications that arise from pre-existing conditions or from conditions arising in pregnancy which are not related to direct obstetric causes but may be aggravated by the physiological effects of pregnancy. In Africa and Asia, most of the deaths are due to hemorrhage (> 30%). In Latin America and the Caribbean, one in four maternal deaths due to hypertensive disorders (25.7%), and in developed countries like the European countries, North America, Australia, Japan and New Zealand, of maternal deaths is mainly due to other direct causes such as complications of anesthesia and 5 cesareans. Abortion-related deaths are high in some parts of Eastern Europe and the Caribbean regions that can exceed more than 30%. In India, most maternal deaths are imputed to direct obstetric causes and there is less indirect deaths. Other undefined complications venous complications in pregnancy, obstetric trauma are also the main causes comprises about a quarter of the total number of maternal deaths.

### **1.4 Maternal Mortality in Abbottabad**

Many studies have been conducted on this issue in NWFP earlier, most of them in the years 1998-2012, but studies done in Abbottabad was till 2009. Data on maternal deaths was available through the programs after 2009. In Abbottabad, Maternal mortality ratio was 12, 7/1000 live births (26/2040). More-over trend analysis has been reported only once in KPK on the causes of maternal mortality, shows data until 2009 only. This paved the way for this study, which aims to have newer data, trend analysis of causes and to exclude the greatest threats to women in our society during childbearing period and true picture of this city.

### **1.5 Statement of the Problem**

Maternal mortality remains prevalent in Pakistan and other developing countries thus concerns have been raised about many developing countries including Pakistan meeting the millennium Development Goal 5 i.e. improve maternal health, by 2015. Pakistan has implemented Maternal Healthcare programs which enable all pregnant women to have free access to maternity care services before, during and after childbirth from all public hospitals in the country. These programs enable the country to achieve it Millennium Development Goal 5 on maternal health as it will enable pregnant women access maternity healthcare services from skilled healthcare providers without paying fees at the point of service utilization.

However official statistics from the Ministry of Health, Pakistan indicates that the country still records high maternal mortality figures even after the Free Maternal Healthcare programs implemented in the year 2010.

## **1.6 Research Objectives**

1. To analyze causes (Both direct and indirect causes) of maternal deaths.
2. To identify preventable factors leading to maternal mortality in tertiary care hospitals.

## **1.7 Purpose of study**

The purpose of this study was to identify the pattern of maternal deaths in previous years from 2012 to 2014, their associated risk factors and to suggest the improvement in the approaches to prevent maternal morbidity and mortality in this regard at our tertiary care setup.

## **1.8 Study Area**

The Study area of the research is as follows:

1. Ayub Teaching Hospital, (Ayub Medical Complex) Abbottabad:
2. Benazir Women Hospital (Women & Children) Gammi Adda Abbottabad

## **1.9 Thesis Layout**

The paper begins with an introduction and then literature review of analysis of maternal mortality. In chapter 1 the maternal mortality in general is discussed. Chapter 2 elaborates dimension of problem globally and at national level. This is followed by Chapter 3; includes description of the research methods that is used to analyze the maternal mortality. In Chapter 4 results are presented based on variables. Finally, paper ends with Chapter 5 containing conclusions and recommendation



## CHAPTER 2

# LITERATURE REVIEW

### Definitions:

#### 2.1 Maternal Mortality

Maternal mortality is defined as a death of a woman while pregnant or within 42 days after termination of pregnancy, irrespective of the duration and site of the pregnancy, for any reason related to or aggravated by pregnancy or its management but not from accidental or incidental causes.

**2.2 Direct Maternal Deaths** is defined as deaths due to birth complications of the pregnant state (pregnancy and childbirth), from interventions, omissions, incorrect treatment or from a chain of events resulting from any of the above.

**2.3 Indirect Maternal Deaths** is defined as deaths resulting from previous existing disease or disease that developed during pregnancy and which was not due to direct obstetric causes but which was aggravated by physiologic effects of pregnancy.

**2.4 Late Maternal Deaths** between 42 days and one year after abortion, miscarriage or delivery caused by direct or indirect causes.

#### 2.5 Maternal Mortality Ratio (per 100,000 live births)

According to WHO maternal mortality ratio is the number of maternal deaths during a given time period per 100,000 live births during the same time period. This expresses the risk of death associated with each pregnancy

#### 2.6 Maternal Mortality Rate

Maternal mortality is the number of maternal deaths in a given period per 100,000 women of childbearing age during the same time period. This expresses the frequency of women at risk through fertility [

#### 2.7 Global Nature and Dimensions of the Problem

Maternal mortality is a major problem in developing countries, which were often forgotten and sometimes neglected topic during the 1970s and early 1980s (Abu Zahr, 2000).

In 1987 the safe motherhood initiative to work with developing countries (Africa, Asia and Latin America) are experimenting various techniques, direct and indirect, to provide an estimate of the magnitude of maternal mortality in some countries. According to WHO (1987), is an accurate estimation of maternal death is the first step towards reducing maternal morbidity and mortality. A smaller but significant literature have examined maternal deaths as

avoidable cause of death among young women in developing countries. They have focused on the disparity observed in health indicators between developed and developing countries as well as the medical, social and cultural reasons (Hog Berg, 1985; Royston and Armstrong, 1989; Campbell and Graham, 1991).

Hog berg (1985) discussed early death as invisible tragedy linked neglected reproductive health, lack of welfare care and unskilled professional help during childbearing period. Sheen and Williamson (1999) supports the high fertility rates as a major factor in maternal mortality process while Royston and Armstrong (1989) is regarded as a cumulative low status of women is directly related to maternal mortality. All of them recognize the need to identify the extent of maternal mortality by detecting the degree of under-reporting and knowledge of the actual dimension of the problem requires urgent intervention at international, national and local levels.

According to WHO (1995) out of a million women die each year due to pregnancy and child birth, more than half of these women are African (53% in 1995), while the rest are Asian (42%) and to a lesser extent Latin American (4 %), less than 1% of maternal deaths occur in Europe or North America.

At the global level, revised 1990 estimates of maternal mortality issued in 1996 indicate that about 585,000 women die each year from pregnancy-related causes, 99 per cent of them in developing countries. The gap in maternal mortality ratios of developed and developing countries is large: in 1990, it ranged from an average of 480 per 100 000 live births in the less developed countries to about 27 per 100 000 live births in the developed regions (world population monitoring, 1998). Maternal mortality is an event that occurs on the population of reproductive and also productive ages. In most developing countries, between one-third of all deaths of women of childbearing age can be attributed to pregnancy related causes (Royston and Armstrong, 1989; Shen and Williamson 1999), pre-mature deaths are responsible for breaking structure countless families because of the role that women play in their families and communities.

Maternal mortality in China fell by 17.1% from 63.9 per 100 000 live births in 1996 to 53.0 in 2000, in a rural area fell to 22.2% from 86.4 per 100 000 live births to 67.2, and in urban area only 1.0% from 29.2 per 100 000 live births to 28.9, the leading causes of maternal mortality in China is bleeding, preeclampsia / eclampsia and amniotic fluid maternal mortality due to bleeding in the national level and rural level has fallen by 33.8%, 34.9% respectively.

And studies in countries (Maine, D. et al, 1987) as diverse as Bangladesh, Egypt, Jamaica, Papua New Guinea and the United States have shown that less than half of the maternal deaths that occur actually reported. Demographic Yearbook, (1998) show that in 1995, estimates of maternal mortality ratio was 870 per 100,000 live births in Africa; 390 per 100,000 live births in Asia and 190 per 100,000 live births in Latin America and the Caribbean. In the USA and Europe it is lower than 10 per 100 000 live births and Canada there are about 3.6 per 100 000 live births.

While one out of every 200 pregnant women die as a result of maternal problems in developing countries, in places like Canada, this risk is a maternal death to 13000 among pregnant women. Senegal is one of the countries which are totally lacking vital registration and cause of death statistics, have sought sister methodology to assess maternal mortality levels. The questions related to the sisters were asked under a demographic and health survey conducted in 1992-1993, with a sample of 6310 women aged 15-49. The survey declared total 17,282 sisters, among them 3736 were deceased. Most of them had died in early childhood, often long before the survey. Only 167 deaths of women aged 15-

49 had happened during the past six years. Among these were no more than 70 or 42% died of maternal deaths. This shows that even in countries with high mortality, maternal death is a relatively rare occurrence, which require large samples to measure incidence.

On the basis of this study, maternal mortality ratio in Senegal estimated at 566 deaths per 100,000 live births between 1986 and 1992. (Nadiaye S., et al 1994). In Brazil during the 1970s and 1980s MMR was estimated to be 270 per 100,000 live births nationwide, with a concentration in the northeast, about 600 per 100,000 live births. Laurenti (1987) placed the number at 200 deaths per 100,000 live births for 1980.

The maternal mortality committee of Parana (1991) found maternal mortality ratio of 100 per 100,000 live births to Parana. Another estimate was conducted by Wong (1996) using the DHS-96 where maternal mortality ratio was 100 and 140 per 100,000 live births in Brazil and northeast, respectively (Valongueiro, 2001). A study conducted in 1997 - 1998 in Pernambuco Brazil based on reproductive mortality age study (RAMOS). Maternal mortality as a public health problem; maternal mortality as an underreported cause of death and maternal mortality problem of low status women were driven from this study. Among 6016 women died (10-49) years were 1152 (20%) investigated, after investigation, was 254 maternal deaths confirmed, was 155 (61%) maternal deaths declared as such on the death certificate, while 99 (39%), were recovered by the method of the study. This difference between the declared and presumable maternal deaths represent an under reporting (39%) and corresponding correction factors (1.63). The structure of maternal deaths in this study showed that (75%) were performed by direct maternal causes (Eclampsia / Hypertension (24%), Hemorrhage (22%), abortion (6%) and infection (8%). The indirect maternal causes amounted to (25%) of maternal deaths, a classic pattern for areas with high maternal mortality risk of dying of maternal mortality, estimated through life - time risk in Pernambuco during 1997-1998 was about 200, ie. one of each 200 women of childbearing years are predicted to die from maternal cause women who died of maternal case were generally young (62%) of them are under 30 years (14%) are less than 19 years and one case under 14 years. The proportion Women older than 45 years represented only (2.4%) of maternal deaths occurred during the period.

According parity (20%) of the deaths occurred during first pregnancy while (8%) occurred among women with more than 8 pregnancies (60%) of them had between 2 and 4 pregnancies (Valongueiro, 2001).

According to Tanaka et al (1991), there is a significant underestimation of maternal mortality even in developed countries, ranging from 15 to 50%. In developing countries (except Cuba, China and some Latin American countries), has the important registry a low coverage. Thus, measurement of specific cause adults and child mortality tends to be a complex and intensive structuring of the numerator and denominator to construct an indicator. This weakness of the official system of information represents the first mechanism for underreporting maternal death. The second mechanism involved with underreporting in the quality of information recorded in the death certificate.

Maternal mortality for Algeria in Bab El Oued Teaching Hospital Alger 1977-1984 was estimated to be 105 (per 100 000 live births). Maternal mortality was positively related to maternal age and parity, the most common causes of maternal deaths were ruptured uterus (31%), hemorrhage (25%), sepsis (13%), abortion and complications of surgery (9%) and other complications (12 %). Also found that high-risk group for maternal deaths were age 45+ with MMR 429 per 100,000 and age 15-49 with MMR 205 per 100,000 The other findings was that MMR was higher in winter and spring at 138 and 126 per 100 000 live births, respectively compared with 114 and 108 per 100,000 live births in summer and

autumn. Twenty of the 29 deaths from hypertensive disorders occurred during the winter. Sepsis was more common during the summer months. Of the 37 Sepsis deaths 22 occurred during the summer. (Algeria, Direction National Des Statistics 1981) Most of the information about the causes of maternal deaths come from hospitals, but study conducted in Jabalpur, Bangladesh where the 58 deaths, only three occurred in hospitals. These three were due to Toxemia, which thus amounted to 100% of hospital deaths there as it accounted for only 20% of all maternal deaths.

In 1986 study was conducted in southern India to investigate maternal mortality by combination of information from hospitals and health facility records, field surveys, and case control studies. There were 798 maternal deaths per 1,000 live births. About half of the deaths occurred in the house or on the way to hospital. Maternal deaths accounted for 36% of mortality for women under reproductive age (15- 49). The analysis shows that many of these deaths are preventable and significant differentials existed with regard to the demographic, social and behavioral factors. (Jagdish.C.B, 1993).

In Zaire, MMR for women with no education were 720 against 130 for women with education. In Jordan, 78% of women with university education using prenatal services, compared with only 24% of illiterate women. Female literacy and the average age at first marriage are the two indicators of social status for women (Abdulaziz, 1995).

Maternal mortality ratio (MMR) in Afghanistan is high (400 per 100 000 live births) compared with countries in the region, and some of the developing countries. Afghan women die due to pregnancy-related complications because they cannot get access to maternal services directly to them in their own area.

## **2.8 Dimensions of the Problem in Pakistan**

Bushra Khan, Farhat Deebe, Samina and Naseem Khattak conducted a study on maternal mortality at the Ayub Medical Complex from January 2002 to January 2012. The maternal mortality ratio was calculated as 772 per 100 000 live births. Direct maternal deaths accounted for 143 (87.7%) and indirect deaths were responsible for 20 (12.3%) deaths. Bleeding was the leading cause of maternal death and were responsible for 43.55% of maternal deaths, whereas poisoning was observed in 26.99% of maternal deaths. In 6.13% of patients rupture uterus was the cause of maternal death.

According to the study conducted by Sarawak Ara, Samaria Tahir, Adela Rehman from April 2006 to March 2010 in Faisalabad, the estimated range of maternal mortality from 190 to 1,700 deaths per 100,000 live births. Total maternal deaths during those four years were 168 in 24,667 births with MMR of 6.81 / 1000. The most common causes of maternal deaths were obstetric hemorrhage in 58 (34.5%), hypertensive disorders in 31 (18.45%), puerperal sepsis in 23 (13%) and unsafe abortion in 20 (11.9%). Other direct causes were found in 12 (7.1%) patients. A forty-eight (88.09%) patients belonged uneducated class, 110 (65.48%) from the rural area, while 95 (56.5%) had not received prenatal care.

From January 2006 until December 2010, Anisa Fawad, Humaira Naz, Ansa Islam, Seemi Zaffar, and Aziz-un-Nisa Abbasi, completed study at Ayub Medical College, Abbottabad, Pakistan. During these five years there were 200 maternal deaths of 11,997 obstetric admissions. There were 7,380 total births and 200 maternal deaths during the study period and maternal mortality were 1057/100000. The main cause of maternal death was poisoning and its complications (28.2%).

Another study by Ayub Medical conducted by Humaira Naz, Iram Sarwar, Anisa Fawad, Aziz Un Nisa from 18 April 2006 on 17 July 2006. In this study, a total of 50 cases of primary PPH were recorded during the study period. The frequency of PPH was calculated at 7.1%. The main cause of PPH was uterine agony found in 29 (58%) cases, followed by cervical, vaginal and perineal tears in 12 (24%) cases. Initially, all patients received pharmacological followed by surgery. Subtotal (haemostatic) hysterectomy was performed in 10 (20%) cases. Maternal morbidity was detected in 31 (62%) of cases; the major diseases was DIC in 3 (6%) cases, acute renal failure in 3 (6%) patients and shock in 2 (9.9%) cases and anemia occurred in 20 (90.1%) cases.

On retrospective analysis of maternal mortality in a tertiary Care Hospital of Peshawar, Pakistan, a study conducted by Farhat R Malik Arsalan AZMAT Swati, Sohail Akhter, Abdul Hadi, Shoaib Iqbal Safi, Shams ul Islam Wazir, Rameez Afridi and Mohammad Anas from January 1 2009 to 31 December 2011. In this study a total of 277 maternal deaths were recorded from the Lady Reading hospital in three years. Bleeding is still the leading cause of 27.07% (CI = 0.66, SD = 5.65) followed by poisoning 15.88% (CI = 0.60, SD = 5.13), ruptured uterus 10.83% (CI = 0, 51, SD = 4.35) and sepsis 10, 10% (CI = 0.47, SD = 4.04). Maximum maternal deaths by 33.57% reported in 26- 35 years, followed by 26.71% in the 15- 25 years, 23.10% in the 36- 45 years and 3.24% in the 45- 55 years and 6.13 % deaths reported from unknown age group as well. Post-Partum bleeding was significant with P-value (0.002).

## CHAPTER 3

# RESEARCH METHODOLOGY

This study was carried out in Gynaecology unit of Ayub Teaching Hospital Abbottabad over a period of two years (2012-2014) and Gynaecology unit of Benazir Women Hospital (Women & Children) Gammi Adda Abbottabad. This is a retrospective analysis. The catchment area of these hospitals is 2.5–3 million population of Hazara Division. The nature of admissions is mostly emergency and referred from other hospitals in critical condition. The inclusion criteria are pregnancy complications leading to death. Record of patients' age, parity, education, socio-economic status, antenatal care, level of care and distance from hospital was analysed. Patients with medical and Gynaecological causes and those beyond 42 days post-partum was excluded from study. The data was collected from maternal mortality records.

Record of first 50 women's was obtained from gynaecology unit of Ayub Teaching hospital Abbottabad and record of other 50 women's were obtained from gynaecology unit of women and children hospital Abbottabad.

Maternal mortality rate for the study period was calculating by using the formula

$$\text{MMR} = \frac{\text{Total no of maternal deaths}}{\text{Total no of live births}} \times 100000$$

### 3.1 Target Population

The target population of the research was 4025 pregnant women.

### 3.2 Sample Size and Sampling Techniques

Records of 100 pregnant women's who died because of pregnancy related problems were selected on the basis of secondary data. And random sampling was used for this study.

### 3.3 Data Collection

**Secondary Data** was collected through Retrospective analysis from Gynecology registers for the period from 1st January, 2012 to 31st December, 2014. A self-structured Performa was used for data collection.

### 3.4 Variables

1. Age
2. High parity
3. Lower socio-economic status

4. Illiteracy
5. Socio-cultural factors(Delays)
6. Poor access to health facility

### **3.5 Data Analysis**

The data collected through hospitals records were analyzed through MS Excel spread sheet and results were presented in the form of tables, charts and conclusions.

## CHAPTER 4

# RESULTS AND DISCUSSION

### 4.1 Results

A total of 4025 deliveries took place during the study period and there were 100 maternal deaths with maternal mortality rate of 24.8/1000 live births. Ages ranged from 18 to 41. Most of the maternal deaths occurred in age group of 21-30years (Table-1).

### 4.2 Age

Age is commonly assessing using five-year intervals for group (15-19, 20-24, etc.).

Some studies use larger intervals like 15-24, 25-35, and above 35 to avoid too few cases in each group. Age is known to be a natural risk factor, but age is also a socio-cultural substitute, as age influences the status of a female in the society.

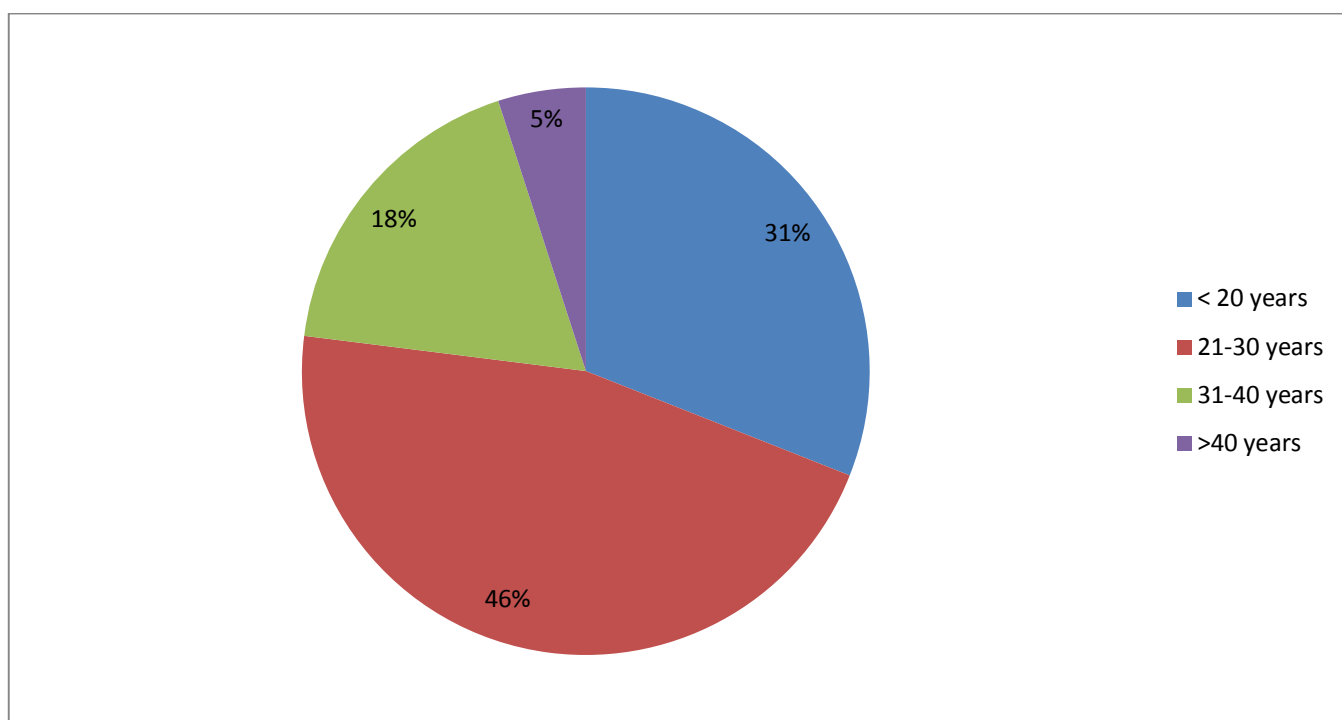
Older mothers have a higher risk of eclampsia and placenta previa. Jacobson et al calculate an increased odds ratio for rigorous eclampsia of 1.29 (95% CI 1.16 – 1.44) and for placenta previa of 4.10 (95% CI 3.55 – 4.73) in women aged 40-44 compared to women aged 20-29 after adjusting for several risk factors including parity and pre-existing maternal disease [31].

In our study it was observed that maternal mortality is high in age group of 21-30

**Table-1: Distribution of Maternal Deaths in relation to age**

Age group	No.	%
< 20 years	31	31
21-30 years	46	46
31-40 years	18	18
>40 years	5	5





**Figure 1: Percentage distribution of Maternal Deaths in relation to age**

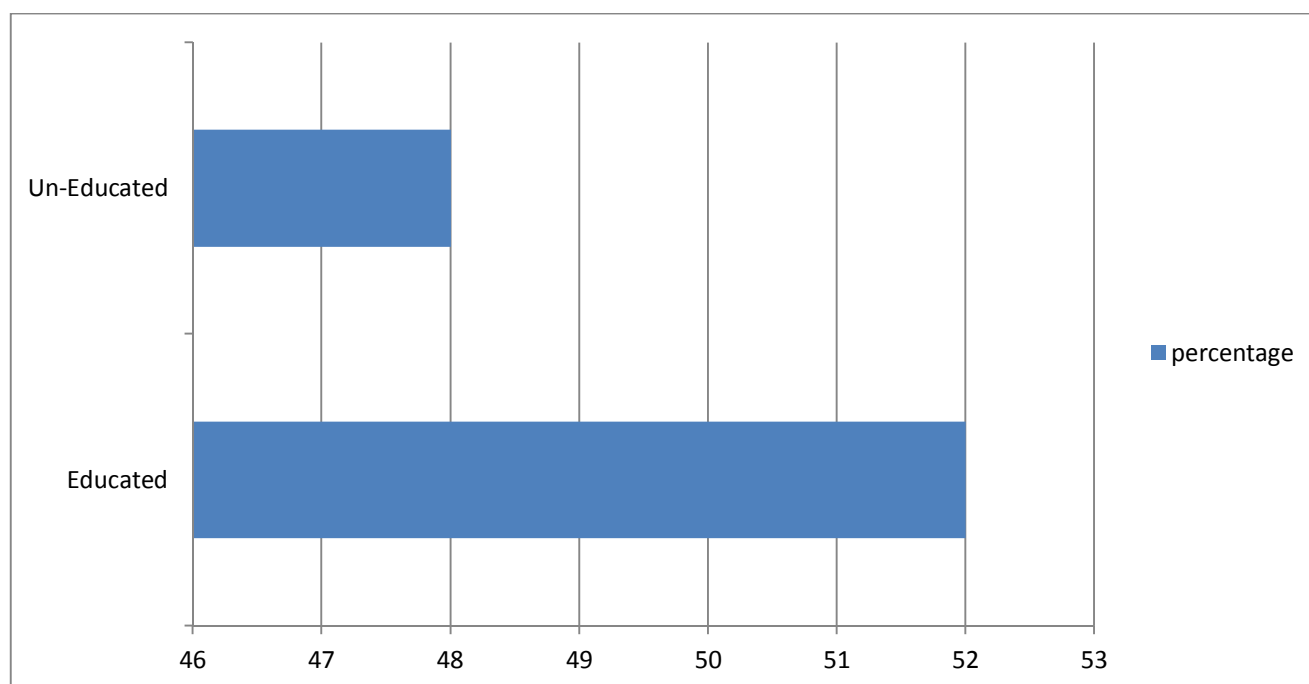
### 4.3 Education

Educational standing of women's also effects maternal mortality rate. Maternal education has mostly been assessed; few studies investigated the association between paternal education and maternal mortality .The way by which education might control maternal mortality is by means of increased utilization of health care but also better health status. Better education might also reflect family and childhood background, which might reduce the probability of harmful traditional practices such as food restriction being present in familial norms and beliefs. Higher education might also associate with higher social and economic status, factors that are often described as reducing maternal mortality. Education has consistently been documented as an important determinant of other health outcomes as well, for example infant mortality

In our study educational status of women's were analyzed in relation to maternal mortality and it was found that almost 50% of women's were uneducated (Table-2)

**Table-2: Educational status relationship with maternal mortality**

Educational Status	No.	%
Educated	52	52
Un-Educated	48	48



**Figure 2: Educational status relationship with maternal mortality**

#### 4.4 Socio-Economic Factors:

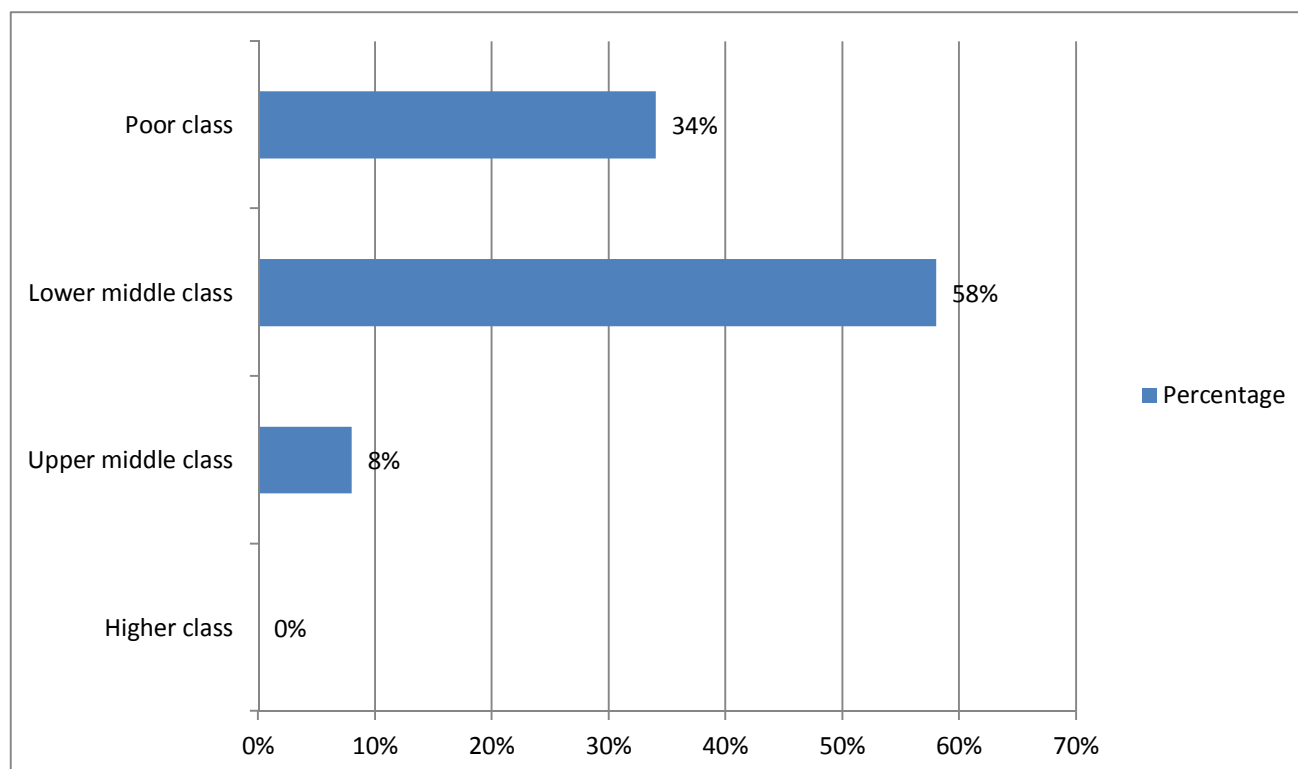
Socio economic position has been measured conventionally using income or consumption spending, or the occupations of women or their husbands. More recently, an asset-based approach to measure socioeconomic position has been used in many studies such as the DHS. The way through which economic condition might influence maternal mortality is through influencing access to maternal care and better overall health. Economic accessibility is not only influenced by the economic situation of the mother or her family, but also by the extent to which costs are actually incurred in the use of health care. Costs for health care might include direct and indirect fees at health facilities, transport costs—mostly in emergency situations—as well as opportunity costs. In most studies, economic factors showed a connection with maternal mortality. Lack of money is commonly cited as a main barrier to accessing care in qualitative studies, and main reason for maternal death.

In a case-control study in Addis Ababa, Ethiopia, Kwast and Liff reported that mortality was higher in women where the annual family income was below 24 United States Dollar (USD) compared to over 150 USD (adjusted OR 4.6, 95% CI 0.7 – 27.9) (Table 2). Also, women who were maid compared to women who were housewives had a higher risk of dying (adjusted OR 3.2, 95% CI 1.0 – 9.8) [25]. In Mat lab, Bangladesh, a defensive effect of higher wealth was reported (crude OR 0.5, 95% CI 0.4 – 0.6) when comparing the least poor mothers to the poorest mothers). No effect was observed after change for other socio economic factors. In Burkina Faso, pregnancy-related mortality was lower in the two least poor quintiles, but the confidence intervals were overlapping

In our study Socio-economic status revealed that poverty of lower middle (58%) and poor class (34) women's are major causative factor in escalating maternal mortality (Table-3).

**Table-3: Socio-status in relation to maternal mortality**

Socio-economic status	No.	%
Higher class	0	0
Upper middle class	8	8
Lower middle class	58	58
Poor class	34	34

**Figure 3: Socio-economic status in relation to maternal mortality**

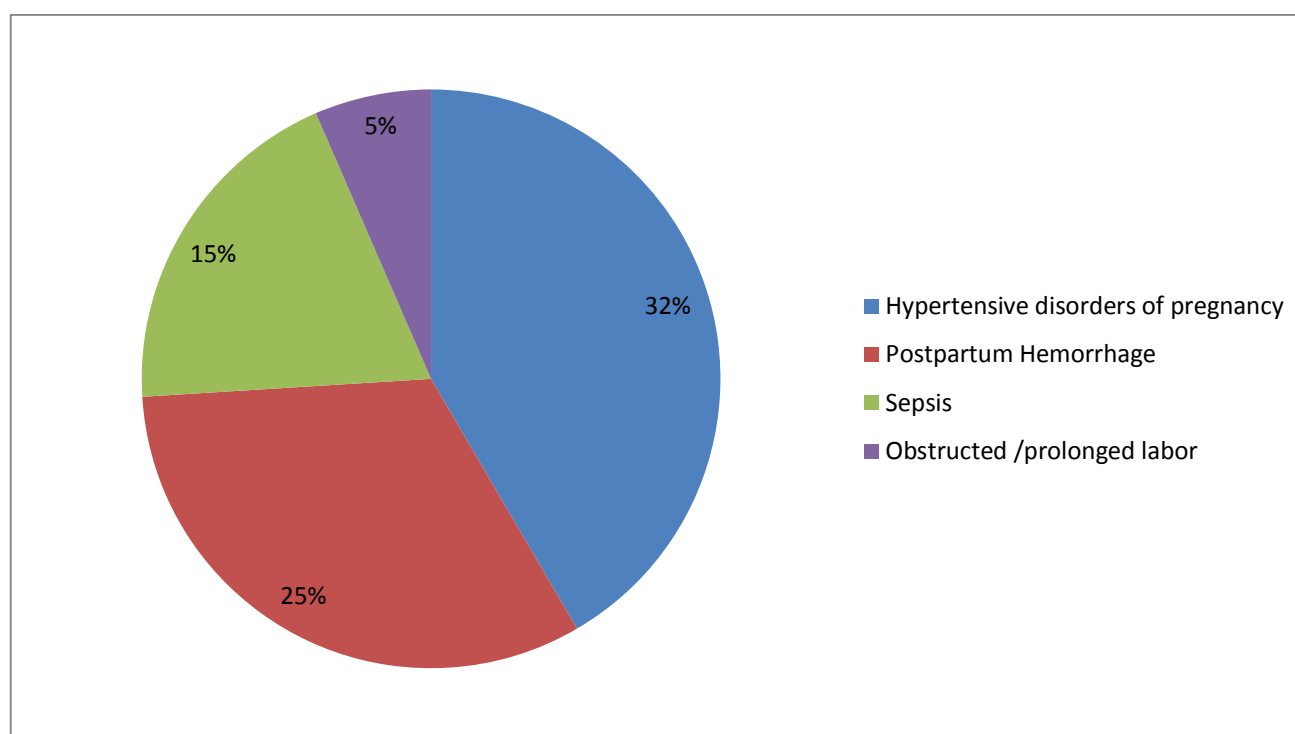
#### 4.5 Causes of Maternal Mortality

Maternal mortality results from both direct and indirect causes. Direct causes are hemorrhage, sepsis, eclampsia, obstructed labor, and complications of abortions. Direct causes include related to complications during pregnancy, labor or the post-partum period.

In our study major direct causes of maternal mortality are Hemorrhage and Hypertensive disorders of pregnancy .32% of maternal deaths occur because of Hypertensive disorders of pregnancy and 25% of maternal deaths occur because of Postpartum Hemorrhage. (Table 4)

**Table-4: Direct causes of Maternal Mortality**

Causes	No.	%
Hypertensive disorders of pregnancy	32	32
Postpartum Hemorrhage	25	25
Sepsis	15	15
Obstructed /prolonged labor	5	5
Ante Partum Hemorrhage	7	7
Others	0	0

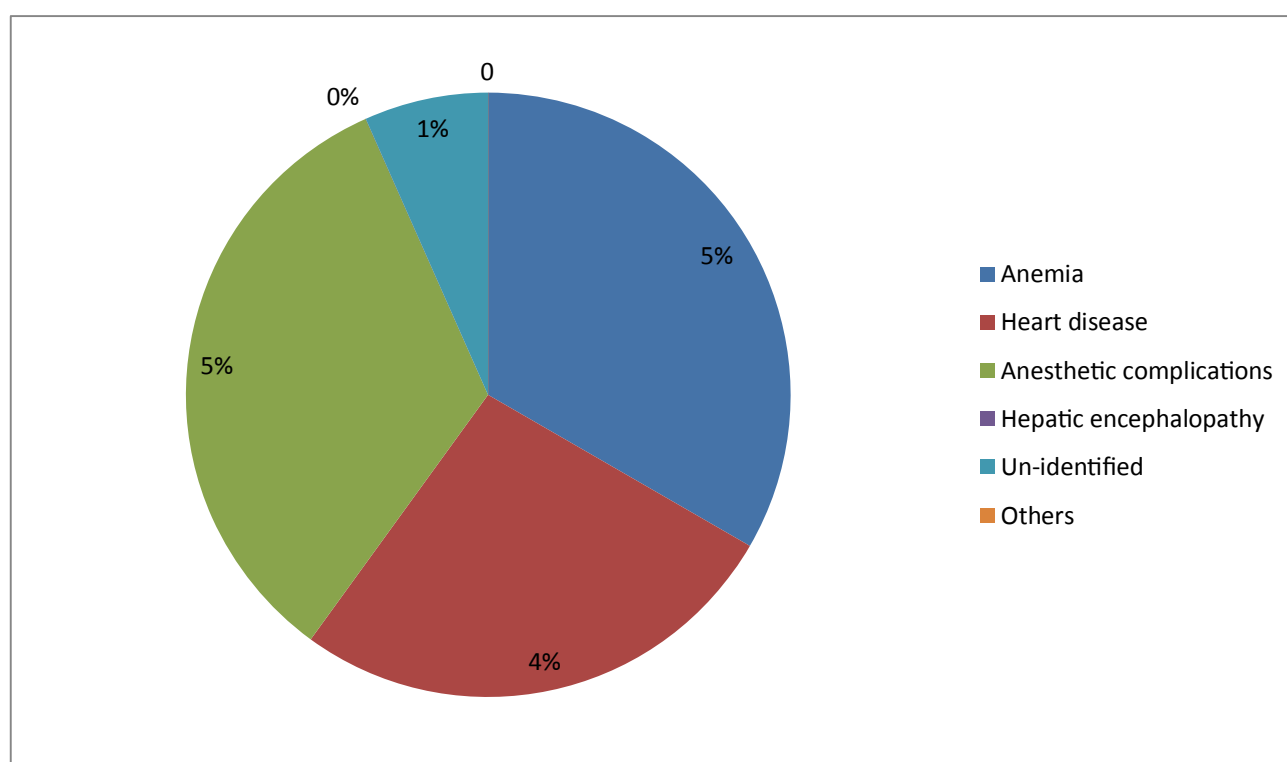
**Figure 4: Direct causes of Maternal Mortality****Indirect Causes of Maternal Mortality**

Indirect causes are those complications that occur from pre-existing conditions or from conditions arising in pregnancy which are not related to direct obstetric causes but may be aggravated by the physiological effects of pregnancy.

In our study indirect causes that result in maternal mortality are Anemia (5%), Heart disease (4%), Anesthetic complications (5%), Un-identified factors are (1%).

**Table-5: Indirect Causes of Maternal Mortality**

Causes	No.	%
Anemia	5	5
Heart disease	4	4
Anesthetic complications	5	5
Hepatic encephalopathy	0	0
Un-identified	1	1
Others	0	0

**Figure 5: Indirect causes of Maternal Mortality**

#### 4.6 Parity

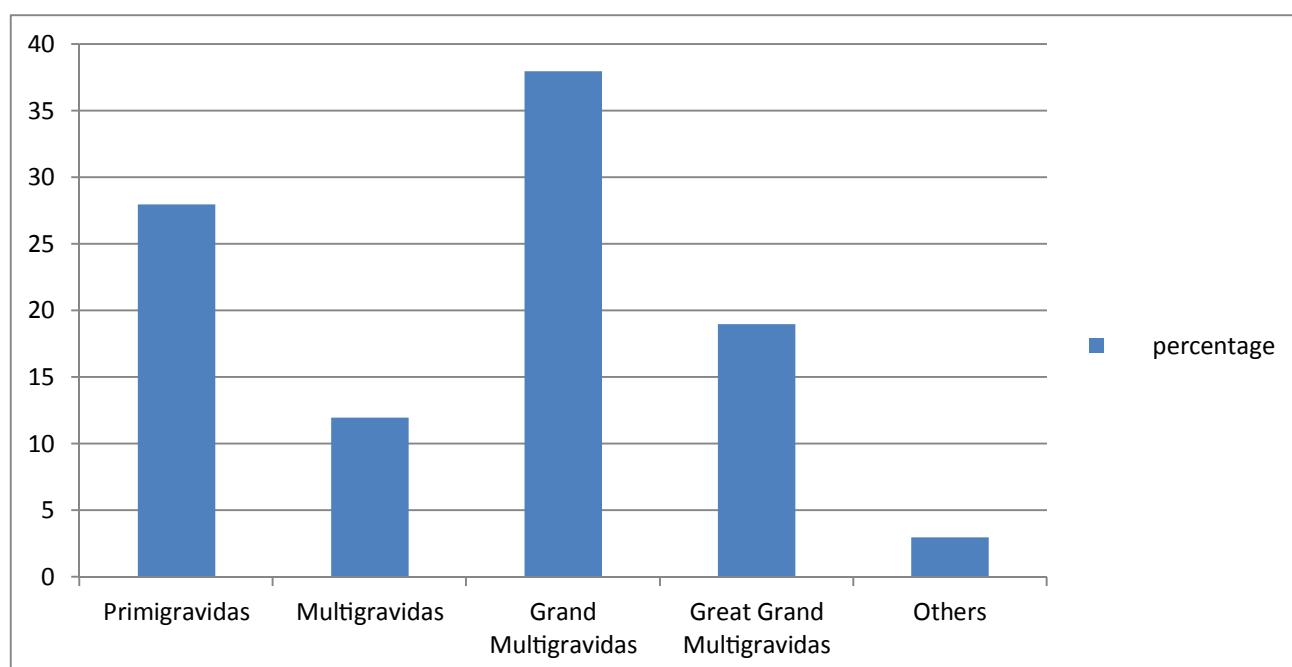
The risk of death is greater in first births and in higher order birth (above five or more pregnancies). Different categories are used for higher birth orders; sometimes gravidity is used rather than parity. Parity defines the number of earlier deliveries (stillbirths and live births) whereas gravidity counts all pregnancies whether resulting in an abortion, stillbirth or a live birth.

The biological way for how parity could affect maternal mortality might be due to the risk of obstetric complications during the first pregnancy, in particular, a higher rate of eclampsia, malaria infection, and obstructed labor. For mothers having had five or more previous births, a higher rate of postpartum hemorrhage has been reported [32, 33].

In our study highest maternal mortality was found in Grand Multi gravidas group (given birth three or more time) i.e. 38% (Table-6)

**Table-6: Distribution of Maternal Deaths according to parity**

Parity	No.	%
Primigravidas	28	28
Multigravidas	12	12
Grand Multigravidas	38	38
Great Grand Multigravidas	19	19
Others	3	3



**Figure 6: Distribution of Maternal Deaths according to parity**

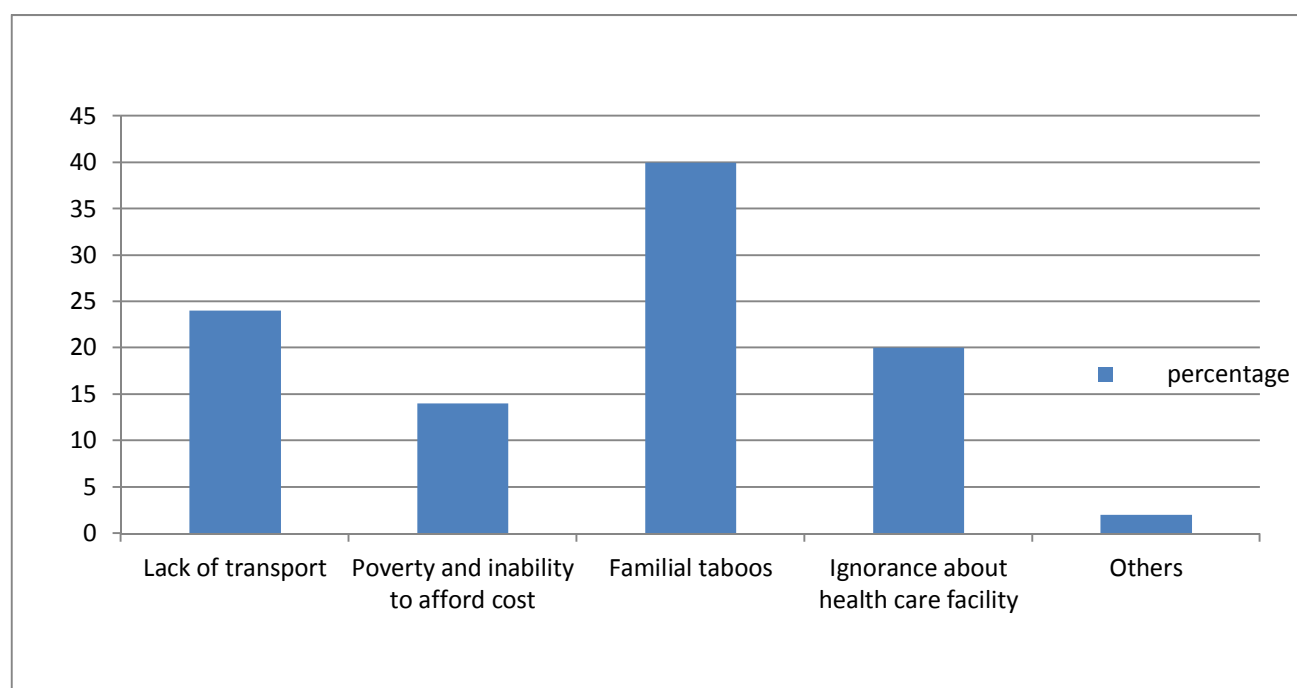
#### 4.7 Causes of Delay

There are different causes that results in delay and that results in maternal mortality like lack of transport, ignorance about health care facility, familial taboos poverty and other factors.

The major causes of delay in our study that results in maternal deaths are Familial taboos (40%) given in Table-7

**Table-7: Cause of delay in relation to maternal mortality**

Cause	No.	%
Lack of transport	24	24
Poverty and inability to afford cost	14	14
Familial taboos	40	40
Ignorance about health care facility	20	20
Others	2	2

**Figure 7: Cause of delay in relation to maternal mortality**

#### 4.8 Geographical Accessibility

Geographical accessibility might influence maternal mortality by predicting how fast and easily maternal health services can be reached for primary delivery care or in the case of obstetric complications. However, the determinant “place of living” might also be a proxy of socioeconomic status, as the urban population is often wealthier and better educated.

In Sweden in the 19th century, women living in an urban or sawmill district were at a one-and a half-times greater risk of dying from direct obstetric causes compared with women living in agricultural district (RR 1.6, 95% CI 1.3-2.0) suggesting that at that time, living in an urban area boded disadvantages for maternal health[28].

In Pakistan, women living more than 40 miles from a hospital compared to those living less than 40 miles than from a hospital had a one-and-a-half times higher risk of maternal mortality(adjusted OR 1.3, 95% CI 0.9 – 1.8) [29]. Aggarwal et al reported a sevenfold higher maternal mortality (OR 6.8, 95%CI 3.8 – 12.4) comparing women who lived more than 5 km to less than5 km from the nearest health facility in a vicariate analysis (no multivariate analysis available)using a case-control design to study mortality in slums Delhi, India [30].

In our study distance of (6-10km) and (11-15km) results in 26% of maternal deaths.

**Table-8: Distance from hospital as cause of delay in relation to maternal mortality**

Kilometers	No.	%
1-5	14	14
6-10	26	26
11-15	26	26
16-20	20	20
21-25	13	13
Others	1	1

#### 4.9 Level of Care

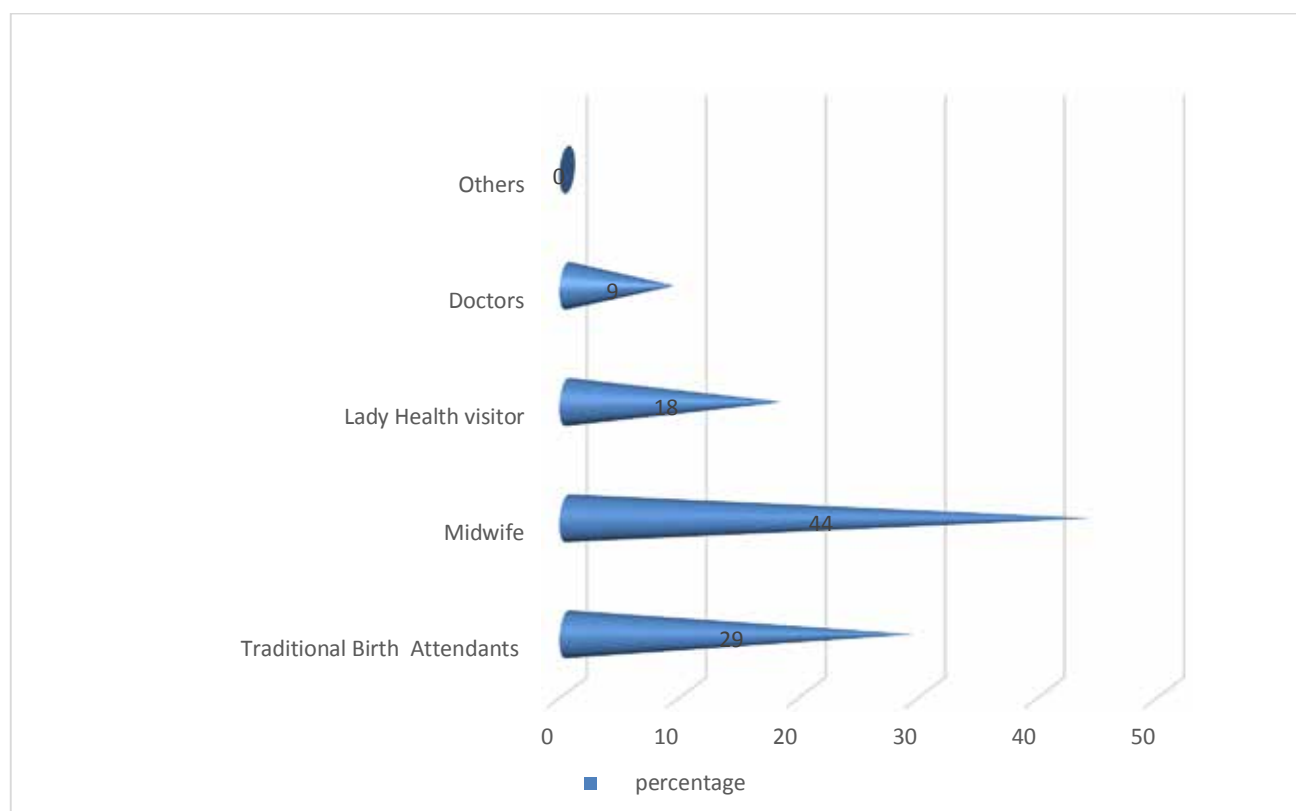
Pregnant women's have different level of care available at their nearest health care facility. In Pakistan mostly women's get health care facilities from mid wives or traditional birth attendants.

In our study mostly women's have TBA's (29%) and midwives (44%) as level of care which is present nearest to them. (Table-9).

**Table-9: Level of care available at nearest health facility to patients**

Level of Care	No.	%
Traditional Birth Attendants	29	29
Midwife	44	44
Lady Health visitor	18	18
Doctors	9	9
Others	0	0





**Figure 8: Level of care available at nearest health facility to patients**

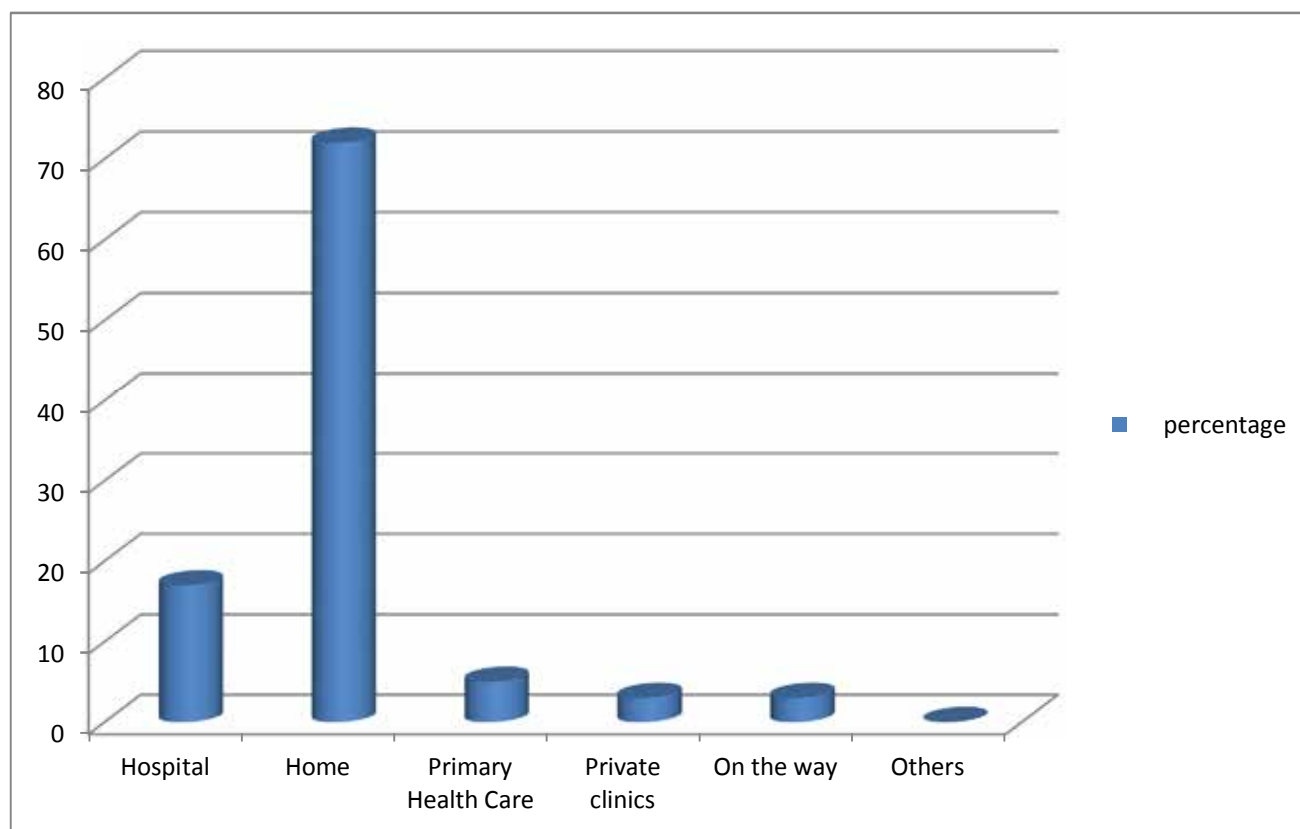
#### 4.10 Place of Delivery:

Place of delivery means place at which pregnant women delivered a child. These places includes hospitals, homes, primary health care centers, private clinics or on the way to hospitals. In developing countries like Pakistan mostly deliveries take place at homes but because of pregnancy related complications at that time, death of women's occur

In our study 72% of deliveries take place at homes.

**Table-10: Place of delivery in relation to maternal mortality**

Place	No.	%
Hospital	17	17
Home	72	72
Primary Health Care	5	5
Private clinics	3	3
On the way	3	3
Others	0	0



**Figure 9: Place of delivery in relation to maternal mortality**

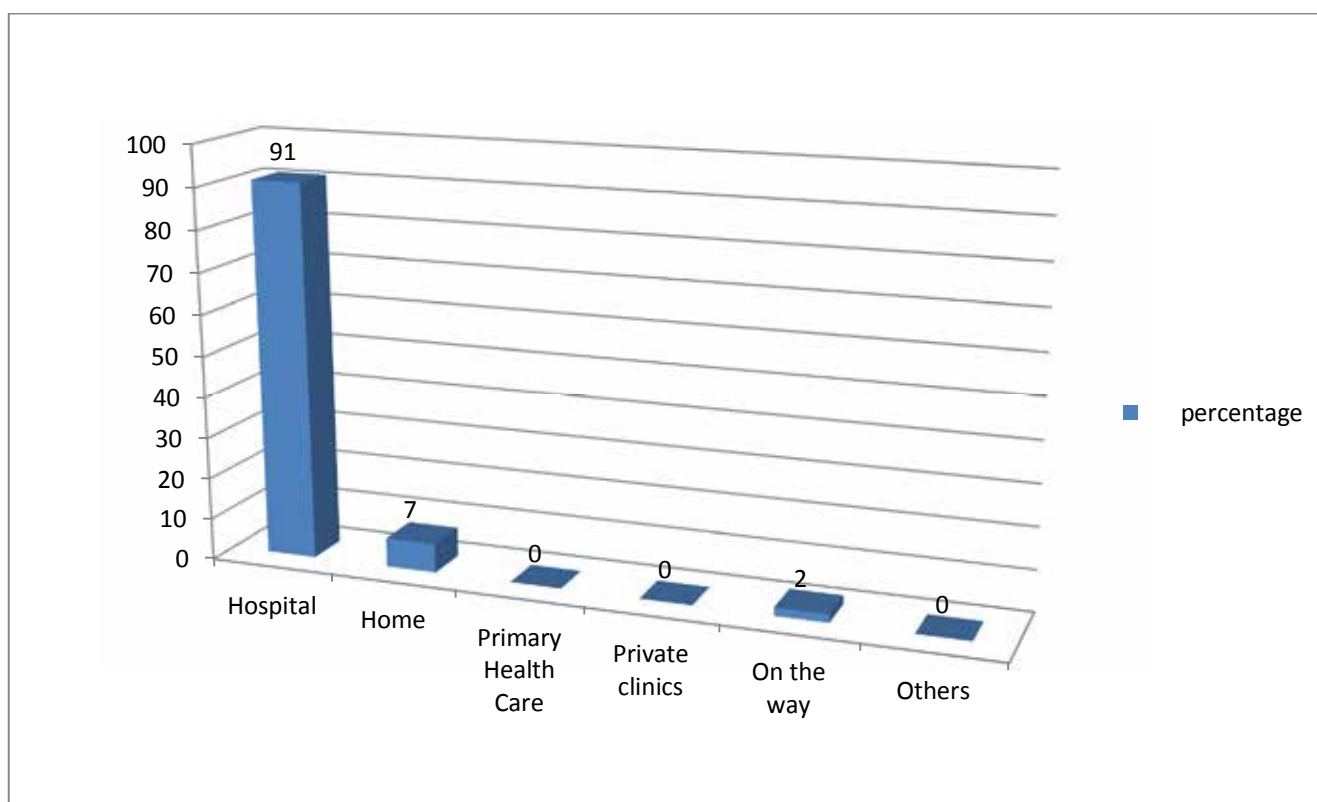
#### 4.11 Place of Death

Place of death means place at which death of women occur, during or after delivery or within 42 days of delivery.

In our study 91% of deaths of women's occur at hospital.

**Table-11: Place of death**

Place of Death	No.	%
Hospital	91	91
Home	7	7
Primary Health Care	0	0
Private clinics	0	0
On the way	2	2
Others	0	0



**Figure 10: Place of death**

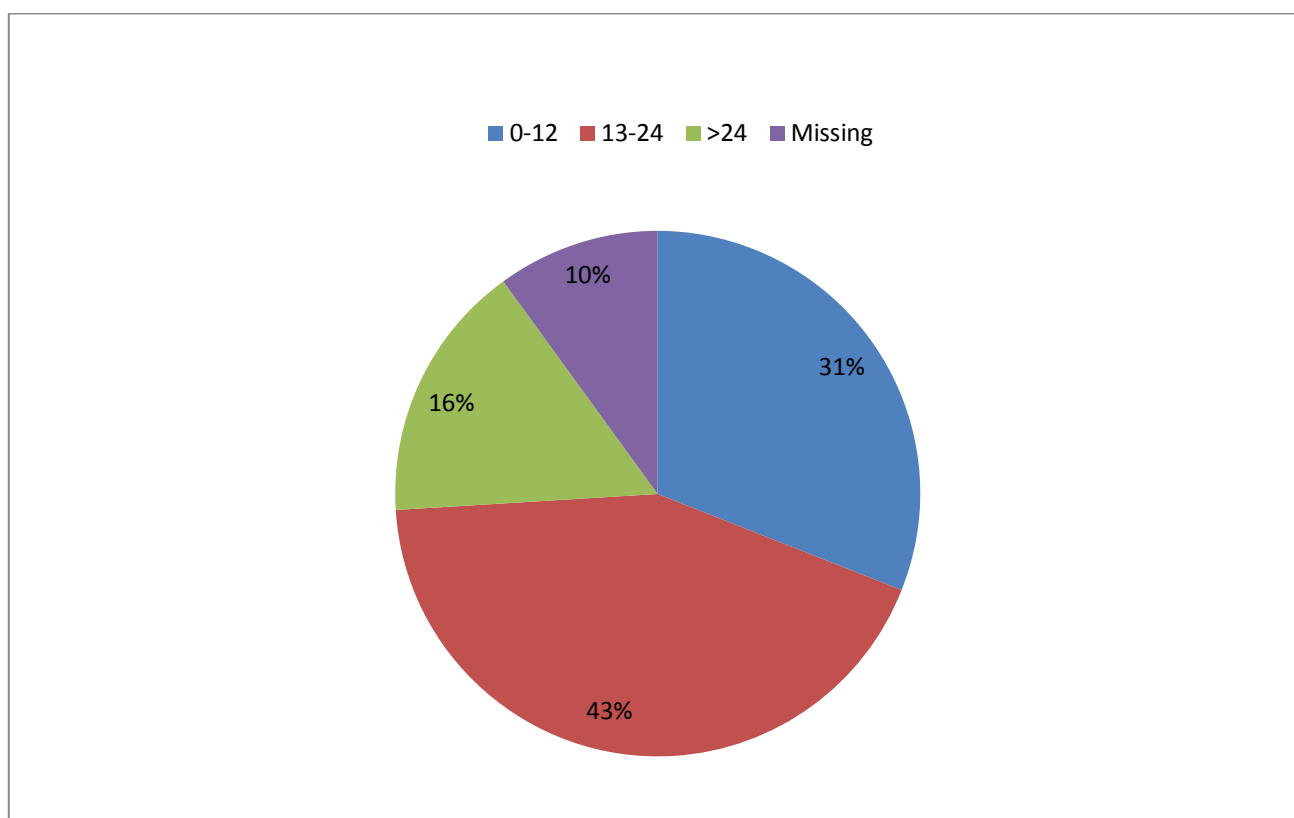
#### **4.12 Time Duration Between Delivery and Death**

Time duration between delivery and death is measured in hours that in how much time after delivery, death of women occur.

In our study it was observed that mostly deaths occur within 12-24 hours of delivery (table 12)

**Table-12: Time duration between delivery and death**

Time	No.	%
0-12	31	31
13-24	43	43
>24	16	16
Missing	10	10



**Figure 11: Time duration between delivery and death**

Hundred maternal deaths were recorded during study period. Maternal mortality ratio was 24.8 /1000 live births (100/4025). The direct causes of maternal mortality were Hypertensive disorders of pregnancy (32%), Postpartum Hemorrhage (25%), sepsis (15%). Some indirect causes include Anemia (5%), Heart diseases (4%), and Anesthetic complications (5%). Education, antenatal booking and socio-economic status were poor. The distance from hospital was between 1 and 50 KM. The level of care available at nearest health facility was estimated, 44% were attended by midwife, 29% by traditional birth attendant, 9% by doctors and 18% by health care visitors.

#### **4.13 Discussion**

The death of a woman in childbirth is a very sad event, an unnecessary and wasteful event that carries with it a huge burden of sorrow and pain. Pregnancy is not a disease and pregnancy related morbidity and mortality are avoidable. Half a million women die each year due to pregnancy related problems and 95% of them belong from developing world. The lifetime risk of a woman dying of pregnancy related causes in developing countries is 1:40 as compared to 1:3600 in developed world.

The causes of maternal mortality are several, inter-related, complex and almost always preventable. Complications of pregnancy and delivery are the leading causes of death and disability among women of childbearing age. In Pakistan each year over 5 million women become pregnant, out of these 0.7 million (15% of all pregnant women) are likely to experience some obstetrical and medical complications.

There is no organized method of data collection in Pakistan and it is very difficult to assess levels of maternal mortality. For correct assessment of maternal mortality it requires knowledge of death of pregnant women and cause of death.

The most common causes of maternal mortality are hemorrhage 21%, Hypertensive diseases 18.6%, sepsis 13, 3%, abortion 11% and others 36% (1989-90 SOGP survey).

The maternal mortality rates are high ranging from 286/100,000 in Karachi's urban settlement to 756 in rural Balochistan<sup>1</sup>. The official figures of country's maternal mortality (MM) are 340/100,000 live births but the fact is much higher than these figures. Over 89% deliveries take place at home (94% rural and 77% urban) and around 80% of deliveries are conducted by traditional birth attendants who are incapable to manage complications.

In our study the maternal mortality ratio in two tertiary care hospitals of Abbott bad (WCH and Ayub teaching hospital) is 24.8/1000 live births, which is higher than a previous local study conducted between 1994-97 in Women and Children Hospital (WCH) Abbottabad where Maternal mortality ratio was 9.46/1000 live births. The reason of this difference is that WCH receives mostly normal cases while Ayub Teaching Hospital receives serious cases with complications and also complicated cases of other hospitals as well. Regardless of this difference of maternal mortality ratio in both studies the example of maternal mortality causes did not change over the years. Still the major causes are hemorrhage, hypertensive disorders and sepsis. The reason behind this is the persistent tradition of deliveries in domiciliary settings in unsafe and unhygienic conditions by untrained or poorly trained birth attendants.

The major cause was Hypertensive disorders of pregnancy (32%) in our study and deaths due to hypertensive disorders of pregnancy are mostly preventable. Successful treatment requires abrupt, effective and resuscitative measures.

Hemorrhage is still a major cause of maternal mortality globally. The frequencies of Hemorrhage and hypertensive disorders are high in our country. Between 10-15% of maternal deaths are due to Hemorrhage while 10% deaths are associated with eclampsia. In our study Hemorrhage was responsible for (25%) maternal deaths.

Sepsis came out to be the 3rd most common cause of maternal mortality. Unsafe deliveries in unhygienic conditions lead to puerperal sepsis. Septic induced abortions make a major proportion of maternal deaths. Optimal aseptic method can clearly reduce this percentage. In our study sepsis was responsible for (15%) maternal deaths.

In our study some indirect causes are also accountable for maternal mortality. Few of them are Anemia (5%), Heart disease (4%), Anesthetic complications (5%).

In recent years though there has been major move towards establishing primary care centers. However regardless of these efforts the health care system remains dysfunctional with little direction and poor quality of services. There are 9846 primary health care services in Pakistan including 531 rural health centers, 5171 basic health units, 856 maternal and child health centers and 4635 dispensaries. Also there is active move towards increasing the role of private sector in providing health facilities.

Current figures specify that there is one doctor per 1529 persons (Economic study 2000-2001) However the distribution of these health care facilities is not uniform particularly in rural areas and majority of them are concentrated in urban areas.

Several factors keep these pregnant women away from these existing resources, such as their familial taboos, lack of education, poverty, and distance from health care facility, transport or attitude of health personnel towards delivery of health services.

The last Pakistan demographic survey indicated that 70% of births took place at home without any antenatal care. The percentage of births with no antenatal care increased with birth order of the mother and was higher for those  $\geq 35$  years of age. None of the patients in our study availed any antenatal care. The causes of lack of antenatal care are multifactorial including lowest gender ratios, illiteracy, teenage marriages, frequent pregnancies and poor access to health facilities.

One of the chief essential problems causative to high rate of maternal mortality is generally poor educational and socio-economic standing of women in Pakistan. Our literacy rate among females is one of the lowest in the world that is 28%, which keeps them unaware about their reproductive rights and health facilities. The lower life expectancy of females at birth than males (51 yr compared to 52 for males) is the result of lower status of female in our social setup plus superadded factor like malnutrition, anemia, infection, septicemia, toxemia and hemorrhage. Another contributing factor is delay in seeking help due to cultural factors like non-availability of males or hesitancy to go to hospital without attendants or their permission.

It is difficult for women to overcome these socio-cultural constraints. Currently estimated safe motherhood indicators reveal that antenatal care during pregnancy is available to 27% only, deliveries at health facilities 13% and skilled attendants at delivery in 18% cases. With this poor convenience and availability of health services the burden of closely spaced pregnancies poses a major threat to the life of women.

Our study also revealed increased frequency of maternal mortality with increasing age, high parity, lower socio-economic status, illiteracy, socio-cultural factors and poor access to health facility. It is evident that there is great need for equity in gender relations and reproductive rights. This only comes with improving literacy in females. There is a need for community education targeting men in culturally conservative areas to improve men's consciousness about females' rights over health facilities, their reproductive rights and promoting increase use of contraceptives in both sexes.

Pakistan is the seventh most populous country of the world with population of 140 million by the year 2000 and population growth rate of 2.6%. It spends less than 1% of GNP on health and education. Keeping these two major factors in mind the need for increased contraceptive measures arises so that women's misery could be solved and we should not lose more mothers during pregnancy and childbirth. By strengthening four pillars of safe motherhood including family planning, antenatal care, clean safe delivery and essential obstetrical care the increase in maternal mortality can come to a halt.

Improving the number of booked patients especially grand multi gravidas, availability of safe blood and positive approach towards lifesaving surgery can reduce maternal deaths to great extent. Selection of high-risk cases for hospital confinement, early referral and careful use of drugs to control fits can greatly improve our statistics.

## CHAPTER 5

# CONCLUSION AND RECOMMENDATIONS

### 5.1 Conclusion

Poor socio-economic conditions, un-educated status, rural residency and lack of availing benefits of already existing antenatal and health facilities are important contributors to maternal mortality. It was also noted that deficiencies such as problems with blood transfusions, availability of trained medical staff and shortages of necessities in the existing health services at primary, tehsil and district level are responsible for referral of patients in moribund condition which may further worsen the situation. It is required that refresher courses and workshops must be arranged at all level, so that we can improve quality of already existing health care system and avert maternal mortality. The timely management of direct causes of maternal death through presence of qualified personnel and adequate medicines and medical supplies and adequate healthcare facilities could salvage the situation. In areas with human resource constraints to respond to obstetric emergencies, a shift of tasks to lower cadre of staff could even further save unnecessary loss of women's lives. Existing health services should be improved and emergency obstetrical care should be available to all women's.

### 5.2 Recommendations

- For raising awareness about reproductive health, literacy rate should be improved and use of available health resources could be optimized.
- Traditional birth attendants should be trained not to cause complications, rather recognize complications and not to manage complications on their own and they should be motivated to make referrals.
- Gender discrimination should be discouraged, so that females can make important decisions regarding reproduction
- Repeated and closely spaced pregnancies should be discouraged and contraceptive prevalence needs to be increased in culturally conservative areas.
- Nutritional status of reproductive age group should be improved to discourage rise in maternal mortality.
- Socio-economic status of community needs to be improved to avoid hindrance of high cost of care and poverty
- Non-governmental organizations should expand their services in rural areas to upgrade reproductive health status





# **MEASURING THE EFFICACY OF PAKISTAN ARMY RESPONSE MECHANISM DURING EARTHQUAKE 2005**

**A CASE STUDY OF TEHSIL BALAKOT , DISTRICT MANSEHRA**

**By**

**Syed Nasir Shah**

## **ABSTRACT**

Response is the most challenging phase of disaster management. The study was aimed at understanding the response mechanism developed by the Army and measuring its efficacy from the perspective of community perception was obtained from union council Balakot. In order to get a balance and realistic input purposively those respondents were selected who were willing to provide information and were also from diverse back ground. Generally the community was found satisfied with response mechanism developed by Army. The data collected emphatically indicates the effectiveness of the same. However, certain short coming pertaining to training, equipment and coordination aspects also came into lime light. With the increasingly hostile and non-visible threat climate generated by terrorism, insurgency and localized disturbances (natural and manmade) armed forces have had to adapt and train themselves in order to carry out operation other than war. Disaster management and response is one of these activities.

## CHAPTER 1

# INTRODUCTION

Disasters and natural calamities are not a new phenomenon to mankind. Archeological sites and numerous lost civilizations are witness to such tragedies in the past. Generation after generations put in their efforts to develop infrastructures in towns and cities but it takes a moment to wipe out years of urban development when some disaster happens. In the present era of knowledge and resources have encourage man to reach the site of disaster and help out the victims of disasters instead of abandoning the areas like his forefathers. The day of 8 October, perhaps would be recorded as a nightmare a day of melancholy, sadness and sorrows in Pakistan's history. More than 73000 people lost their lives and over 120000 got injured. Nearly 5 million became homeless. The Earthquake came as a shock and perhaps found nation unprepared to meet such a challenge. The Army itself suffered badly, yet it responded courageously to face the challenges. (Role of Army in Disaster Management; HQ 5 Corps)

### 1.1 Disaster Profile of Pakistan

Geographically, Pakistan is situated in hazard-prone region. The indo-australian plat upon which Pakistan, India and Nepal lie, is continuously moving northward and sub ducting under the Eurasian plate thus triggering earthquakes in the process and forming Hamalayan mountains. Pakistan is exposed to erratic seasonal monsoons that bring rain and fertility. They also cause violent flash floods inflicting heavy damages to property and land. Floods are the most recurrent natural calamity in Pakistan, followed by earthquakes, cyclones and drought. However, drought is more damaging than floods in terms of food insecurity. Pakistan has a serious vulnerability to both natural and man-made disasters. A major flood has struck Pakistan once in every six years causing heavy losses to human lives and economy. Summer monsoons result in heavy cyclones originating from Bay of Bengal and Arabian Sea. There is a well-developed system in place based on multiple inputs of Pakistan Meteorological department (PMD), WAPDA and Indus Water Commission for floods early warning. However, there is no system in place to warn vulnerable communities from the flash flood hazard. During the period 1971-2001, fourteen cyclones approached coastal areas of Pakistan. Despite some gaps in the PMD's indigenous capacity, minimum 3-4 days of cyclone early warning with fairly accurate prediction of likely impact area can be provided. The response to this hazard has been poor and outcomes disastrous. Districts Gwadar, Lasbela, Karachi, Badin and Thatta are prone to tropical cyclones and Tsunamis. Landslides can be triggered by an earthquake, rainstorm, wind or blasting. Severe monsoon rains and or exceptional melting of Himalayan glaciers provide abundant water to cause many landslides. Bagh, Bhimber, Neelum and Muzaffarabad in Azad Jammu & Kashmir, Astore, Diamer, Gilgit & Ghanche in Northern Areas and Kaghan, Naran & Chitral in KPK are prone to slides. According to the recent seismic assessments, the region is likely to face a major earthquake in future as a critical seismic gap is widening: The districts of Pakistan most likely to be earthquake prone are: Abbottabad, Mansehra, Attock, Muzaffarabad, Chitral, Dadhar, Pishin, Dir, Pasni, Gwadar, Quetta, Gilgit, Rawalpindi, Islamabad, Swat, Kalat,

Sibi, Skardu, Khuzdar, Ziarat, Kohistan, Zhob, Loralai and Malakand. (Seismic Hazard Analysis and Zonation for Pakistan, Azad Jammu and Kashmir by Pakistan metrological department)

## **1.2 Existing Disaster Management Structure of Pakistan**

Pakistan has generally followed a reactive approach to disaster management which is apparent from October 2005 earthquake experience. Key disaster management agencies like Emergency Relief Cell working under the Federal Cabinet Division, proved woefully inadequate when confronted with a major disaster. After 2005 earthquake, a system of National and Provincial Disaster Management Commissions (NDMC/ PMDCs), and Authorities (NDMA/ PDMA) was proposed in the NDM Ordinance 2006 to facilitate implementation of disaster risk management (DRM) activities. The NDMC/ PMDCs are the policy making bodies, while the NDMA/ PDMA are the implementing and coordinating arms. National Disaster Management Commission (NDMC) is the highest policy and decision making body for DRM. The NDMC is responsible to ensure coordination and oversee the implementation through NDMA.([www.ndma.gov.pk/](http://www.ndma.gov.pk/))

## **1.3 Problem Statement**

Repaired-onset natural disasters often occur with little or no notice and call for an immediate response in order to prevent further damage or loss to life. This is particularly true in case of earthquakes. Role of army in first 48-72 hours is vital to save lives of people trapped in rubble. The effectiveness of Army's role in response phase to a great extent is determined by the speed of its deployment, relative to the civilian assets with the same capabilities. Late arrival and being slow to become operational will greatly reduce its effectiveness. An adequately equipped outfit, well familiar with area of responsibility coupled with high standard of training, readiness and thorough preparation are the areas to be addressed for facing such challenges in future.

## **1.4 Significance of Research**

Natural disasters are on the increase and projected to rise. The primary purpose of a disaster response is to save lives. Traditionally armed forces form core of a state's response to a disaster situation. Studying the effectiveness of response mechanism developed by the army in post 2005 earthquake shall provide a platform to review the existing drills and procedures involved in disaster response phase. Similarly the outcome may be of great value in terms of initiating improvement in the existing response mechanism.

## **1.5 Objective I**

To study the response mechanism developed by army during Earthquake 2005.

## **1.6 Objective II**

To determine the effectiveness of the Army's response in the study area.

## **1.7 Organization of the Study**

The study has been organized into five chapters. Chapter 1 is about introducing the subject of study, highlighting problem statement and spells out the significance of the study. Chapter 2 provides the theoretical framework by reviewing the literature. Chapter 3 describes the study area including methodology of the study. The primary and secondary data has been analyzed in chapter 4 while study has been concluded along with pertinent recommendations in chapter 5.

## CHAPTER 2

# LITERATURE REVIEW

### 2.1 Origins of Disaster Research

Although historical and literary accounts of disasters date back thousands of years, scientific analyses are more recent. Dynes (2000) contends that Rousseau provided the first social scientific insights into disaster with his observation that the impacts of the 1755 Lisbon earthquake would have been diminished if the city had been less densely populated and if people had evacuated promptly in response to the initial tremors. More than 150 years later, William James's (1983) observations in San Francisco immediately after the 1906 earthquake also anticipated important themes of later research by reporting improvisation ('the rapidity of the improvisation of order out of chaos', p. 336) and emergent organization ('within twenty four hours, rations, clothing, hospital, quarantine, disinfection, washing, police, military, quarters in camp and in houses, printed information, employment, all were provided for under the care of so many volunteer committees', p. 337). Nonetheless, the first systematic disaster research is generally acknowledged to be Samuel Prince's (1920) study of the 1917 Halifax explosion (Scanlon, 1988). This study documented the presence of convergence and emergence, as well as the absence of role abandonment. As Quarantelli (2000) noted, little additional progress was made in disaster research until the National Opinion Research Center/National Academy of Sciences studies of the 1950s, whose findings were first summarized by Fritz and Marks (1954) and Fritz (1961), received more extensive treatment in Baker and Chapman (1962) and were the subject of a systematic analysis in Barton (1969). Other classic works of the 1950s are also reviewed in the *International Journal of Mass Emergencies and Disasters*, Vol. 6, No. 3, 1988. Drabek (1986) and Tierney et al. (2001) provided later summaries of this research. Tierney et al. (2001: 234–40) and CDRSS (2006: Ch. 8) describe the institutional context of disaster research.

### 2.2 The Origins of Disaster Management

Early society viewed disasters as preordained, however, by the 20<sup>th</sup> century, the idea of providing disaster preparedness and relief was gradually forming within governments. In the case of the United State (US), a crises administration department has functioned since 1933. The National Emergency Council (NEC) was directly subordinate to the President and served as the President's personal crises and management consultants at the time. In 1939, the NEC was reconfigured into the office of Emergency Management (OEM), which is one unit within Executive Office of the President (Jan, Chung-yuang, 2004). During the Cold War in the 1950s the National Research Council carried out a series of crises management studies to address the nuclear threat and artificial disaster scenarios. National disaster research became interdisciplinary after the publication of White's Natural Hazards Research in 1973 and White and Haas' book, Assessment of Research on National Hazards in 1975. The integration and coordination of crises management in the US became more comprehensive after the establishment of the Federal Emergency Management Agency (FEMA) in 1979.

Alexander (2000) discusses the relationships among crises, risk, vulnerability and disasters. He defines a catastrophe as an extreme geophysical event that is sufficient to cause a disaster.

## **2.3 Role of Contemporary Armies in Disaster Management**

Militaries' Role in Contemporary Disaster Management System within the resources of most nations, military assets represent unique technological and logistical capabilities that can be mobilized on short notice in a self-contained, self-sufficient and highly mobile fashion, to support lifesaving relief efforts. Nearly all nations have at one time or another used their military assets and capabilities for national disaster relief. Emerging Trends of Military Operation viz Disaster Management. The latest emerging trends for use of military in disaster management are: - (Military Role in Natural Disaster Management by James Lee, 2006)

**2.3.1 Trend 1**– Disaster Management as Part of Military Operations other than War (MOOTW). Military profession is increasingly changing its focus from war fighting to a complex array of MOOTW. Disaster management is an important component of MOOTW including operations such as search, rescue, relief and rehabilitation.

**2.3.2 Trend 2**- Exclusive Military or Civil-Military Disaster Response Teams. Constitution of exclusive military or civil-military teams is emerging as another strong trend.

**2.3.3 Trend 3** – Military Acting as the Communication Hub during Disaster Management. Military often ends up as the communication hub, because of its superior Command, control and communication capability and being usually first on the disaster scene due to its inherent mobility and speed.

**2.3.4 Trend 4** – Foreign Human Assistance (FHA). FHA by military is a significant trend, the scale, speed and duration of which has already been witnessed in earthquake 2005.

**2.3.5 Trend 5** – Military Disaster Training Exercises. The latest trend is manifested in exercises like: The Northern Light, Cooperation Safeguard, Combined Protection Exercises (COMPROTEX) and Taming the Dragon - Dalmatia 2002.

## **2.4 Role of US Armed Forces**

US active Armed Forces have a role in responding to and recovering from natural disasters. At the request of State's Governor the national command authority can direct appropriate capabilities from the nation's military to the site of a disaster. The response system is built on tiered response i.e, local leaders turn to state resources and states turn to Washington. In most disasters, local resources handle things in the first hours until national resources can be requested, marshalled, and rushed to the scene. (U.S Government 'National response Plan' 2004)

## **2.5 Role of Chinese Armed Forces**

Due to its geographical location and meteorological conditions, more than 70 per cent of Chinese cities are located in hazardous areas. The Constitution and relevant laws have assigned the armed forces to act as the backbone of field actions during disaster responses. The Office for Public Emergencies is the joint headquarters of the military and the armed police for dealing with disaster emergencies and coordinating with central and local governments. In peace time, the PLA gathers information on disasters and dangers, set up a system of information exchange with local governments, draw up rescue and relief plans, conduct training and exercises, and offer and relief courses in military

command colleges. In rescue and relief operations, PLA troops receive orders from the joint military-civilian HQ. They are subordinated to civilian authorities and undertake the following tasks: - (China National Master Plan for responding to Public Emergencies ,2005)

- i. Rescuing and evacuating disaster victims and people trapped in danger.
- ii. Eliminating or controlling major dangers and disasters.
- iii. Ensuring the safety of important targets.
- iv. Participating in the emergency rescue and transportation of goods.

## **2.6 Role of Indian Armed Forces.**

India has established a multidisciplinary, multi-skilled, high-tech NDRF (National Disaster Response Force).of Eight Battalions has been set up for dealing with all types of disasters capable of insertion by air, sea and land. This is a military related response force. The battalions are to be equipped and trained for all natural disasters including four battalions in combating NBC disasters. Each battalion (approximately 1,158 strength) will provide 18 self-contained specialist search and rescue teams of 45 personnel each including engineers, technicians, electricians, dog squads and medical/paramedics. These NDRF battalions are located at nine different locations in the country based on the vulnerability profile to cut down the response time for their deployment. During the preparedness period/ disaster situation, proactive deployment of these forces will be carried out by the NDMA in consultation with state authorities.

## **2.7 Case Studies (Responses)**

### **2.7.1 Haiti Earthquake – 2010**

On January 12, 2010, a massive 7.0 magnitude earthquake centered 25 km southwest of Port-au-Prince, Haiti killed over 230,000 people, injured another 300,000, and created over one million homeless (IWG, 2010). The Haitian government (GoH), with a majority of civil leadership dead, was paralyzed. On the day of the quake, the President of Haiti declared a national emergency confirmed by the U.S. Ambassador to Haiti and both requested immediate assistance from the United States and the international community (USSOUTHCOM OPORD 01-10, 2010). “Since the first hours and days are absolutely critical to saving lives and avoiding even greater tragedy, I have directed my forces to be as forward-leaning as possible in getting the help on the ground and coordinating with our international partners as well” (Obama, 2010). The French, Italian, Dutch, Spanish and Canadian Navies sent ships that arrived within the first week (including the Italian Carrier Cavour). An Argentine military field hospital, that was part of the UN Mission in Haiti - MINUSTAH, was the only hospital left operating. Within a week, rescue and medical teams arrived from the United States, Canada, Russia, France, Chile, Peru, Jamaica, Brazil, Colombia, Cuba, Iceland, Sri Lanka, China, and Korea. From the Middle East, the government of Qatar sent a strategic transport aircraft (C-17) and the Qatari armed forces set up a hospital. The Israeli Defense Forces also established a field hospital which included specialized facilities to treat children and the elderly. Initially the relief teams were autonomous with independent logistics support. Since the functioning logistics train ended at the edge of the Port-au-Prince airport – the field hospitals and emergency response vehicles ended up clustered there as well. The combined military response to Haiti was highly impressive. ([www.sipri.org/](http://www.sipri.org/))

### **2.7.2 Floods and Cyclones in Mozambique, 2000**

In January and February 2000 prolonged heavy rains and the cyclones Connie and Eline caused catastrophic flooding in Mozambique's Gaza, Inhambane, Manica, Maputo and Sofala provinces. An estimated 2 million people were affected, 544 000 were displaced and 699 were killed. The World Bank estimated the economic damage caused by the and cyclones to be approximately 20 per cent of the country's gross national product.<sup>1</sup> Mozambique's recently created disaster management structure was quickly overwhelmed by the scale of the humanitarian crisis. A major international assistance effort included foreign military assets from 11 countries. These countries eventually allowed their assets to be under United Nations coordination to an unprecedented degree. It was the first time that the concept of a Joint Logistics Operation Centre to manage and coordinate air assets was applied in a natural disaster response. Another similar bout of flooding in the country in 2007 provides a useful comparison of the responses and some indication of how, and how far, the lessons of 2000 have been applied. ([www.sipri.org/](http://www.sipri.org/))

### **2.7.3 Indian Ocean Tsunami, Aceh Province, Indonesia, 2004.**

The tsunami that struck the coast of Aceh province in Indonesia on 26 December 2004 created an unprecedented humanitarian challenge and an equally unprecedented international response. Military assets were sent by 16 foreign governments; 14 United Nations agencies, 38 local humanitarian groups and 195 foreign or international humanitarian organizations participated in a three-month relief effort. Foreign military assets played a pivotal role in the response, particularly the emergency relief phase. ([www.sipri.org/](http://www.sipri.org/))

### **2.7.4 Japan Tsunami**

The Japanese government's response to the earthquake, tsunami and nuclear incident at Fukushima in 2011 is widely seen as exemplary. Shortly after the 2011 earthquake, almost half of Japan's 230 000 troops deployed to disaster relief and established, for the first time, joint command of ground forces, sea air. Co-ordination with 20000 US servicepersons was smooth. ([www.sipri.org/](http://www.sipri.org/))

## **2.8 Disaster and Response**

To measure a response to a disaster, the terms response and disaster must be clearly defined. As (Fritz, C.E. 1961) writes, disasters are spatial-temporal events which impact social units which then invoke responses to the event or events. Furthermore, (Kreps, G.A. 1984) goes on to write that "Responses may involve structural engineering (physical), be relevant before, during, or after the impact is felt (temporal), or result from a variety of social and organizational processes (social)". Thus responses to disasters are essentially an effort to restore the previous status quo to an affected area. Thus, response to a disaster will be defined simply as turning chaos into order.

## **2.9 Measuring the Response**

Response to a disaster must be appropriately scaled according to the size of the disaster. Because response, is considered in terms of an organized response, it will be the extent of this organization which will reflect the size of the disaster response. Currently the United States is undergoing an effort to standardize the method in which disasters are managed. It is called NIMS, National Incident Management System (Filar, Jersy2001). This system standardized an Incident Command System which classifies each individual responder into a particular sector. Within the system there



might be different sectors with the same purpose, but it is designed so that the “span of control for any one person never exceeds 5-7 people” (Boyd,Carr. 2005) The system is designed to scale appropriately to handle any disaster regardless of the size. As stated by (Boyd,Carr. 2005), “The incident command system is set up to break even the largest of incidents into manageable pieces”. Thus, by measuring the number of branches and sectors initialized under the National Incident Management System guidelines, the entire scope of the rescue effort could be represented in a standardized manner, regardless of the type of disaster. However, this implies that such a system would be used in the response efforts of the disaster. Because a disaster is defined as an event which is large enough to exceed the capabilities of a community to handle the effects, it can be assumed that some system of organization has to be implemented to handle new agencies assisting in response. The NIMS is the only nationally standardized method of emergency management, outside of military protocol, and thus should be the benchmark for measuring the extent of the response.

#### **2.10 Goals of Response**

Next the goals of the actual response must be identified. Several expert interviews as well as personal experience have led to the conclusion that emergency responders’ goals basically fall into two categories, protect life and protect property (Boyd,carr 2005) (cannon,Robert 2005). There are also several aspects to protecting life and property during the initial phases of a disaster. These categories basically are stabilization, rescue, mitigation, and safety. Stabilization involves stabilizing any obvious threats to the population or property to the greatest extent possible so as to contain them. Rescue involves searching for and identifying casualties and properly triaging them prior to transport to a hospital or other staging facility. Mitigation involves preventing further harm to a population by diminishing the malicious effects of a disaster and restoring basic services. Mitigation goes hand in hand with stabilization in some respects. For example, in a flood situation, stabilization would involve placement of sandbags to divert water away from populated areas while mitigation would involve evacuating the residents from the potentially affected area. Lastly safety involves ensuring that the responders accomplish their mission effectively by not becoming incapacitated. When a responder is injured, not only are more victims put at risk, but also that responder then becomes yet another victim that needs aid. Thus it is imperative that in any response, those who are assisting others do so safely and in a manner so as to be able to assist others throughout the duration of the incident.

## CHAPTER 3

# METHODOLOGY

### 3.1 Description of Study Area

Balakot sub division is a part of District Mansehra in Hazara Division of KPK. The town is historically famous for being the site where the decisive battle between fighters Syed Ahmed Shaheed and Shah Ismail Shaheed and the tyrannous Sikhs took place in 1830. The entire Kaghan valley is part of Balakot sub division. The valley is scenically and botanically spellbinding and popular for its verdant pastures. Sprawling Glancing the torrential and windy Kunhar river lofty snow cover mountain peaks, enchanting foamy water fall, dense dark green forests, fresh water springs and Trout and beautiful deep blue lakes perched on high altitudes, all of which make it a land of captivating beauty and create magnetic charm for Tourists specially in summer. In spite of the pressures of over increasing population and the consequent rising levels of environmental pollution, the Kaghan valley is still botanically paradise. (source: office of CMO Balakot)

### 3.2 Geographical Feature

Balakot sub division is like wedge driven up between Azad Kashmir on the East and Kohistan District in West and North respectively. Crow-flight distance from South. West to the North East in 100 KM and by road from Batrasi Forest to Babusar Top is 185 KM, within an average width of 25 KM. (source: office of CMO Balakot)

### 3.3 Administrative Sketch

**Table:1 Administrative sketch**

1.	Date of creation of Tehsil.	1 <sup>st</sup> September 1985
2.	Date of creation of Sub Division	1 <sup>st</sup> July 1993
3.	Date of creation of TMA Balakot	15 <sup>th</sup> September 2001
4.	Total Population (Census 1998)	214,630
5.	Total Area	557,803 Acres
6.	Total cultivable land	35,115 Acres
7.	Total Non-cultivable land	522,688 Acres
8.	Total irrigated land	7,079 Acres
9.	Total non-irrigated land	28,036
10.	No. of union councils	12
11.	No. of Kanungo Circles	02
12.	No. of patwar Circles	16
13.	No. of Police Stations	03
14.	No. of Police posts.	2

Source: Office of CMO Balakot

### 3.4 Population & House Holds

**Table 2: Demographics**

S.No.	Name of Union Council	Population	House Holds
1.	Kaghan	22,548	2949
2.	Mohandari	22,567	3045
3.	Kawai	13781	1952
4.	Ghanool	20,274	1928
5.	Hangrai	18,252	2458
6.	Satbani	15,949	2336
7.	Balakot	19,255	2777
8.	Garlat	18,466	2608
9.	Shohal Mazullah	13,277	1925
10.	Telhatta	13,112	1908
11.	Ghari Habibullah	19,306	2013
12.	Karnol	17,806	2700
<b>Total</b>		<b>2,14,630</b>	<b>30,357</b>

Source: Census 1998

### 3.5 Health Facilities

**Table 3: Health facilities**

1.	Tehsil headquarter Hospital	One (Balakot)
2.	Civil Hospital	Two (Kaghan & Ghari)
3.	Rural Health Centers	One ( Kawai )
4.	Basic Health Units	15
5.	Leprosy Hospital	One ( Balakot )

Source: Office of CMO Balakot

### 3.6 Main Rivers/Lakes

- i. Kunhar
- ii. Lala Zar
- iii. Dodi Patsar
- iv. Saiful-Malook
- iv. Aansoo Jheel (Lake)
- v. Lulo Sar
- vi. Babu Sar

### 3.7 Education Facilities

**Table 4: Education facilities**

l.	Boys Degree College	01
m.	Girls Degree Colleges	0
n.	Boys Higher Secondary Schools	03
o.	Girls Higher Secondary Schools	0
p.	Boys High Schools	18
q.	Girls High Schools	06
r.	Boys Middle Schools	24
s.	Girls Middle Schools	12
t.	Boys Primary Schools	235
u.	Girls Primary Schools	140
v.	Mosque / Maktab School	152

Source: Office of CMO Balakot

### 3.8 Distances (km)

i.	Mansehra to Balakot	39
ii.	Balakot to Kawai	24
iii.	Balakot to Naran	66
iv.	Naran to Tarka Jour	40
v.	Naran to Baisal	50
vi.	Naran to Babu Sar	66
vii.	Naran to Malkandi	14

**3.9 Forests** Upper Kaghan & Lower Kaghan area 52,022 Acres

**3.10 Universe of Study** UC Balakot being the worst affected was selected as universe for study.

**3.11 Study Design** Cross-sectional study design was adopted to obtain the requisite data from the respondents

**3.12 Sample Design and Size**

Purposive sampling design was adopted considering ease of access and selection of respondent who could provide requisite information willingly. Community perception on the subject was obtained using both close ended / open ended questionnaire. 70 respondents from diverse back ground were selected.

**3.13 Data Analysis**

Data has been processed/analyzed using Excel sheets and presented in the form of diagrams and tables.

**3.14 Indicators**

A set of indicators has been used to measure effectiveness of Response from the perspective of community perception. Timeliness, efficiency (saving precious lives), appropriateness of equipment, coordination and security were kept as yardstick / parameter for measuring the response mechanism.

## CHAPTER 4

# RESULTS AND DISCUSSIONS

### 4.1 Response

Somewhere around 9 'O' clock corridors of Military Operations Directorate (MO Dte) echoed with the ringing of phone. One pick of receiver triggered what seemed to be whole chain of reactions. Formations from 1 Corps, 10 Corps, 11 Corps and 30 Corps were quick to react. Pakistan Army once again found itself at the base of "Mount Challenge". The mission assigned to the Army by VCOAS was "Bring back smile to the people of earthquake affected areas" (Operation Life line HQ 1 Corps)

### 4.2 Movement and Deployment

First to react were the deployed formations, most of these formations were victims themselves. As information/reports started pouring in from North Eastern part of KP, Army reacted and formations moved to following areas: -

<u>Ser</u>	<u>Formation</u>	<u>Date of Location</u>	<u>Location</u>
<u>Move/Arrival</u>			
i.	102 Brigade	8 October 06	Gari Habib Ullah
ii.	104 Air Brigade Defence	9 October 06	Batgram
iii.	107 Brigade	10 October 06	Balakot
iv.	Headquarters 37 Division	11 October 06	Mansehra
v.	14 Para Brigade	12 October 06	Battal
vi.	9 Armoured Brigade	12 October 06	Chattar Plain
vii.	7 Armoured Brigade	25October 06	Kala Dhaka

### 4.3 Tasks

In the absence of any national organization coordinating the effort, Pakistan Army assumed the role of "central coordinating agency". After appreciating the situation, commanders decided on following tasks:-

- Recovery, rescue and evacuation of the casualties.
- Provision of medical support to the injured.

- iii. Provision of relief goods.
- iv. Maintenance of law and order.
- v. Restoration of communication infrastructure.
- vi. Rubble removal.
- vii. Coordination of the activities of foreign NGOs.
- viii. Establishment of Tent villages.
- ix. Construction of semi-permanent shelters
- x. Assistance of civil administration.
- xii. Assessment / collection of data of dead, injured and damaged houses.

**4.4 Basic Strategy for Rescue Operation.** The strategy evolved to conduct immediate rescue operation in the assigned area of responsibility was:-

- i. Deployment of troops in every 8-10 kilometer area to make access to all affected villages and harmonize all segments of population to participate in relief work.
- ii. Relief goods to be provided in all weather conditions to all affectees through air, man pack and Animal Transport to avoid the hazards of coming weather.
- iii. Utilize local population by motivating and strengthening them.
- iv. Clear all roads and tracks as soon as possible to restore normalcy.
- v. Harmonize efforts of civil administration, NGOs and locals through necessary coordination and direction and act as hub of all activities. (Operation Life line HQ 1 Corps)

**4.4.1 National Response.** Nation responded in an unrivalled manner which cannot be described in words. However it can be assimilated by an incident that an old man kept roaming around the pile of relief items being collected at Haripur. He could be taken as a petty thief. However, after much of hesitation, he reached out to the pile, removed his shoes and walked away barefooted. He did not have more to offer. We have millions of such like examples. (Operation Life line HQ 1 Corps)

**4.5 Federal Government Response.** Government of Pakistan, blamed for slow initial reaction, as the media remained focused on **Margalla** Towers in Islamabad, played an important and critical role not only at the inner front in harnessing the rescue and relief efforts but its performance was also applauded at the external front in international community donors. (Operation Life line HQ 1 Corps)

**4.6 Provincial Government Response.** Response of KPK Provincial Government could have been a shade better, as compared to their other provincial counter parts.

**4.7 Response of International Community.** The international community responded swiftly and generously to strengthen Pakistan's response to overcome unprecedented challenge. Immediate arrival of 5 x rescue teams from various countries and latter arrival of helicopters tremendously enhanced the efficiency of rescue and rehabilitation work. On an average, 50 tons of relief goods were arriving at Chaklala Base only. The overwhelming response of world community at the donor's conference in Islamabad provided an impetus to the process of re-construction and rehabilitation work. (Operation Life line HQ 1 Corps)

#### **4.8 Army Level**

**4.8.1 Rescue and Relief.** The Army mounted its relief and rescue efforts. Engineer assets proved more than useful as compare to bare hands, shovels and hammers. More than 100,000 people had received injuries of various natures. Thousands of them needed to be removed from affected areas to main hospitals down the country. All available means were used by the troops to evacuate these injured to medical camps and hospitals at different locations. Over 17000 were evacuated through helicopters only. In addition adequate arrangements were made to counter the threat of abduction of injured specially women and children, evacuated beyond Mansehra, as most of them were not accompanied by their relatives. Burial of dead bodies was another emotional trauma. Army teams first helped the affectees to dig their loved one from rubbles of debris and then helped to arrange for their burial. In the beginning mass graves were made to bury a large no of dead bodies. (Operation Life line HQ 1 Corps)

**4.8.2 Provision of Food.** Earthquake posed major problem of food shortages. Troops who came with very limited rations immediately exhausted their rations giving away to those in need. Demand of food grew with every passing hour. All efforts were put to bring the food to the affectees. Army was assisted by locals in providing food and water to the affectees. (Operation Life line HQ 1 Corps)

**4.8.3 Engineer Operations.** In Operation Life Line the "main manoeuvre" consisted of Engineers and Aviation. The engineers were involved in: -

- i. **Opening of Roads** Engineers embarked on the challenge and put their heart and soul. Worked zealously and were able to deliver. 715 kilometers of roads and 320 kilometers of tracks were restored in KPK alone. Their achievement also includes the launching of major bridges like Hassa and Ghanul. It is important to mention that in initial survey report of a UN organization, they ruled out the possibility of opening of these roads with in a year. Despite the enormity of the task, main arteries of the area were opened for regular traffic with in the span of one month in KPK.
- ii. **Removal of Debris** Removal of debris of buildings was one task which had to be done simultaneously with rescue and relief. A comprehensive plan ascertaining the priorities for removal of debris was chalked out and executed accordingly. Everyone employed in 'Operation Life Line' has been involved in removal of debris in one way or another. Troops carried out this task with bare hands, shovels, and hammers. Engineers employed all possible resources and took on the job with steadfast approach, but the amount of debris was such that it would take years to remove it completely. A total of 23570 dumpers load of debris have been removed. It is interesting to know that if these many dumpers



stand as one convoy with a distance of 100 metres between each other, it would cover the half the circumference of the earth.

- iii. **Water Supply** Disruption / destruction of existing water supply schemes posed threat of epidemics due to contaminated water. Army Engineers immediately established water points for provision of chlorinated water. Commander 1 Corps taking personal interest arranged 5 x water treatment plants for the affectees. (Operation Life line HQ 1 Corps).

#### 4.8.4 Role of Army Aviation

- i. According to a report issued by the UN, October earthquake was "the most devastated natural disaster in the most difficult terrain". In this environment Aviation proved the only workable solution, and became an important component of this episode. Never in its history, had Army Aviation been put through such a testing time. The courage motivation and tireless effort put in by pilots and ground staff of Army Aviation would never be forgotten. An episode of an aviator epitomizes this aviation spirit and effort. On 5 November 2005 at 2200 hours, a fire broke out in tent village of Shuhal, Balakot. Two young siblings were severely burnt and needed immediate evacuation to Burn Centre at CMH Kharian\_ There was only one pilot (Major Khattak) at Abbottabad who had night vision devices, but he has had a very busy day. He volunteered to fly again, when not permitted by the GOC; he insisted and flew after getting permission from Director General Aviation. He landed at CMH Kharian after midnight. One out of these two survived.
- ii. Army Aviation was handicapped by non-availability of helipads in these areas. Establishment of suitable helipads on slopes of high mountains and narrow valleys was skilful job carried out well by troops with the help of local people.
- iii. In the biggest ever heliborne relief operation conducted, Army Aviation emerged as true professionals. They conducted operations in day and night and even during withering weathers, they flew from top of the mountains to narrow and closed valley. In the absence of any air traffic control and metrological facilities, Army Aviation ensured continuous supply of relief goods. Please note that during this operation more than 29000 sorties were flown which is higher than total number of sorties made by Army Aviation since its inception. The total aviation assets used during Operation Life Line are: -

(i)	Pakistan Army	42
(ii)	Air Force / Navy	09
(iii)	Ministry of Interior	08
(iv)	Agha Khan Foundation	04
(v)	Government of Punjab	01
(vi)	Edhi Trust	01

(vii)	United States Military	25
(viii)	UN	17
(ix)	NATO	05
(x)	Miscellaneous Sources	28
<b>Total</b>		<b>140</b>

#### **4.8.5 Logistics**

In order to ensure smooth and regulated flow and distribution of relief goods reaching the calamity stricken districts, it was considered essential to evolve a logistic system, in line with that followed in the Army. To this end, a central collection point in the form of Main Operating Base (MOB) at Mansehra, Forward Operating Bases (FOB) at brigade level and Advance Operating Bases (AOB) at the unit level were established. This strategy helped in achieving the following:-

- i. Expeditious distribution of relief goods to the most affected area / individuals in an organized manner.
- ii. Controlling pilferage of the relief items.
- iii. Proper documentation / accounting of all relief goods down to blankets and quilts received / issued to various FOBs.
- iv. Build confidence and trust of the donors and provide them a safe, reliable and professionally organized place to deliver their donations.
- v. Helped Divisional Headquarters to decide distribution priority to forward areas. (Operation Life line HQ 1 Corps).

#### **4.8.6 Forward Observation Bases (FOBs)**

In order to regulate and ensure speedy delivery of relief items to the affectees, FOBs were established at all Brigade Headquarters. On daily basis required relief items were transported from MOB to FOBs on available trucks. Proper record was maintained for all such donations. These FOBs also served as distribution points for the villages falling within the designated area of responsibility. (Operation Life line HQ 1 Corps)

#### **4.8.7 Advance Observation Bases (AOBs)**

In order to meet the biggest challenge of reaching to the affected population settled in/around inhospitable/difficult terrain and to provide them immediate support, a large number of AOBs were established. To ensure the transparency and just distribution, notables of the area were also incorporated in the distribution process. These AOBs eventually became hub of all the relief activities in the affected areas. (Operation Life line HQ 1 Corps).

#### 4.8.8 Mode of Transportation.

To win the race against time, all possible transport modes were utilized to reach the stranded people. These included: -

- i. Helicopters
- ii. Road Transport
- iii. Animal Transport
- iv. On Foot.

Despite the availability of these modes of transportation, there were thousands of places which could only be accessed by foot. It was the soldier on ground that took the lead and delivered relief items on man packed basis to those affected areas where no other mode of transport could have reached. On daily basis, affectees were provided relief items on their door step by these parties after scaling hard, difficult and inhospitable terrain, while also keeping Fast. Simultaneously these troops also used to issue chits to the needy for collection of relief items from the bases. (Operation Life line HQ 1 Corps).

#### 4.8.9 Provision of Medical Facilities

Medical persons / organizations, especially AMC played a vital role in the operation. They never wasted a single minute to start their job. They applied dressings, stitched open wounds and even operated without availability of any sophisticated equipment and operation theatre. It is considered prudent to mention about a lady doctor at Balakot. She started treating the injured immediately; when she had exhausted all her medicine and bandages she went to her destroyed house and brought her cloths to be used as bandages. To provide psychological relief, she even started injecting saline water without any medicine. All of this was happening despite the fact that she had no news of her two sons. Summary of Medical resources / patients attended so far is as under.

**Table 5: Medical skilled personnel mobilized in initial phase**

Surgeons	19
Anesthetists	13
Medical Officers	96
Paramedics	433
Nursing Officers	33

**Source: Medical Directorate GHQ Rawalpindi**

**Table 6: Patients attended, treated, deaths, amputation and spinal injuries in the country**

Patients Attended	1846744
Patients Evacuated	17150
Surgeries Performed	130588
Presently Admitted	2264
Deaths in Hospital	643
Amputations	707
Spinal Injuries	721

Source: Medical Directorate GHQ Rawalpindi

**Table 7: Details of casualties – in three major Armed Forces hospitals**

Details of Causalities	CMH Rwp	MH Rwp	CMH Atd
Causalities Received	3363	1789	2384
Discharged/Transferred/Outdoor	3219	1681	2321
No of Deaths in Hospitals	47	34	42
No of Brought in Dead	182	76	6
No of Major Operations	2442	531	1356
No of Minor Operations	3086	1941	546
No of Still Admitted	97	74	21
a. Army	18	12	0
b. Civil	79	62	21
Total unattended Patients	27	12	10
No of unattended Patients Remaining	0	0	0
Total No of Amputations	56	24	56
a. Army	12	7	1
b. Civil	44	17	55
Total No of Paraplegics	11	20	15
a. Army	2	3	0
b. Civil	9	17	15

Source: Medical Directorate GHQ Rawalpindi

**Table 8: Details of field hospitals / teams**

Medical Teams	281
Field Hospitals National	44
Field Hospitals Foreign	64

**Table 9: Air relief operations**

Type of Mission	Number
Casualty evacuation	17155
Dead bodies transported	130
Personnel transportation	43785
Relief goods transported	32799 tons
Ration and food items transported	99410 tons
Total flying	19957 Hours

Source: Medical Directorate GHQ Rawalpindi

#### 4.9 Community Perception Regarding Effectiveness of response by Army

##### 4.9.1 Diversified Sample

The sample size of this study is 70 respondents. An endeavor has been made to select a diversified sample size through purposive sampling. The respondents from all age groups, profession and education back ground were selected for getting a whole some and diversified input. Fig 1, 2, 3 reflects the same.

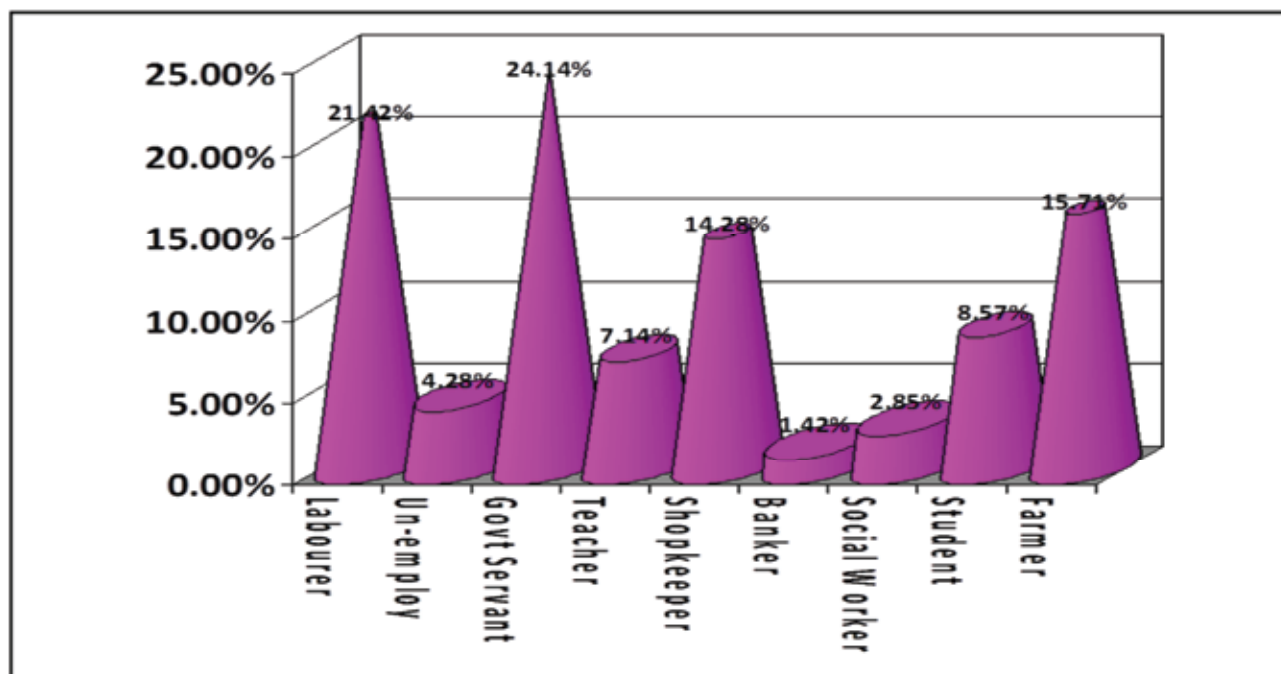
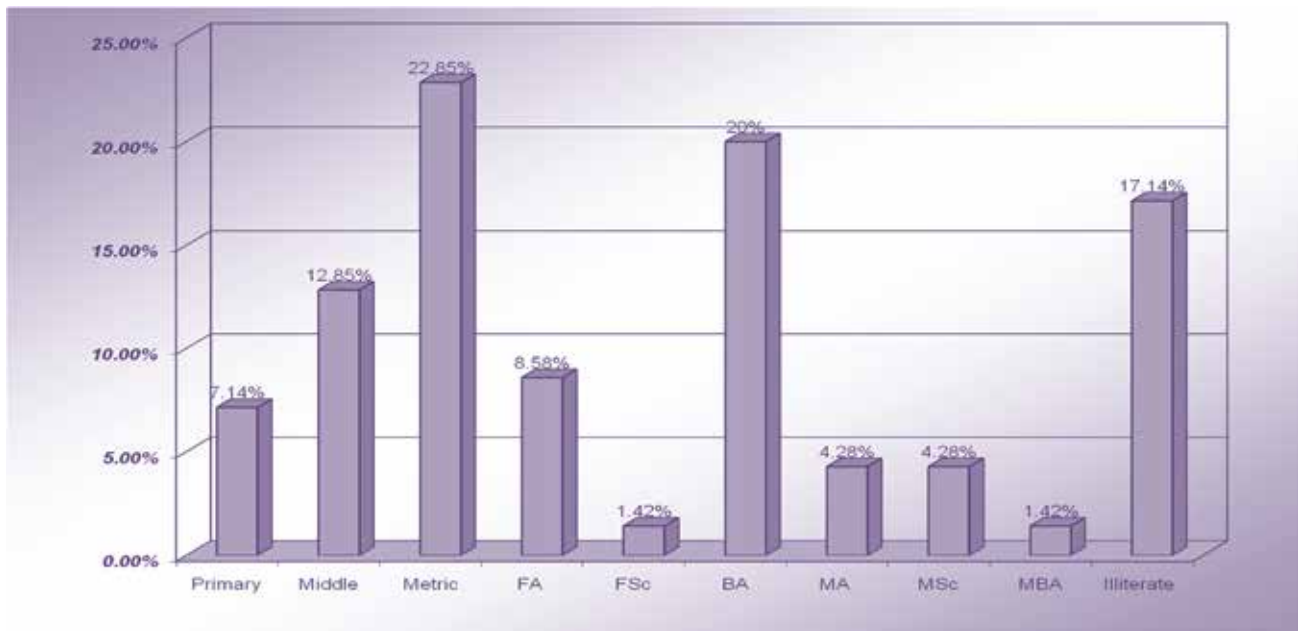
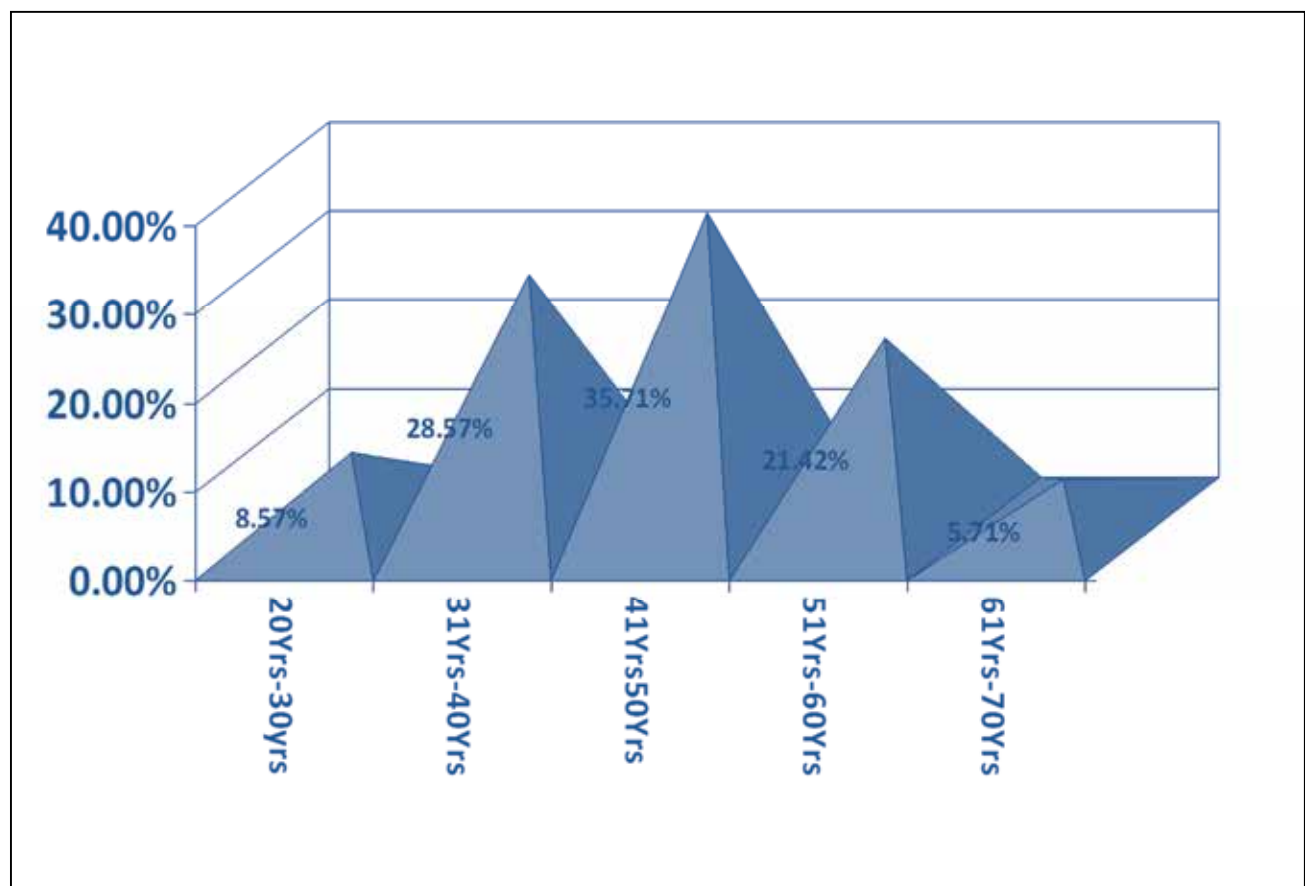


Figure 1: Profession

Source: Own survey, 2013



**Figure 2: Education**  
Source: Own survey, 2013

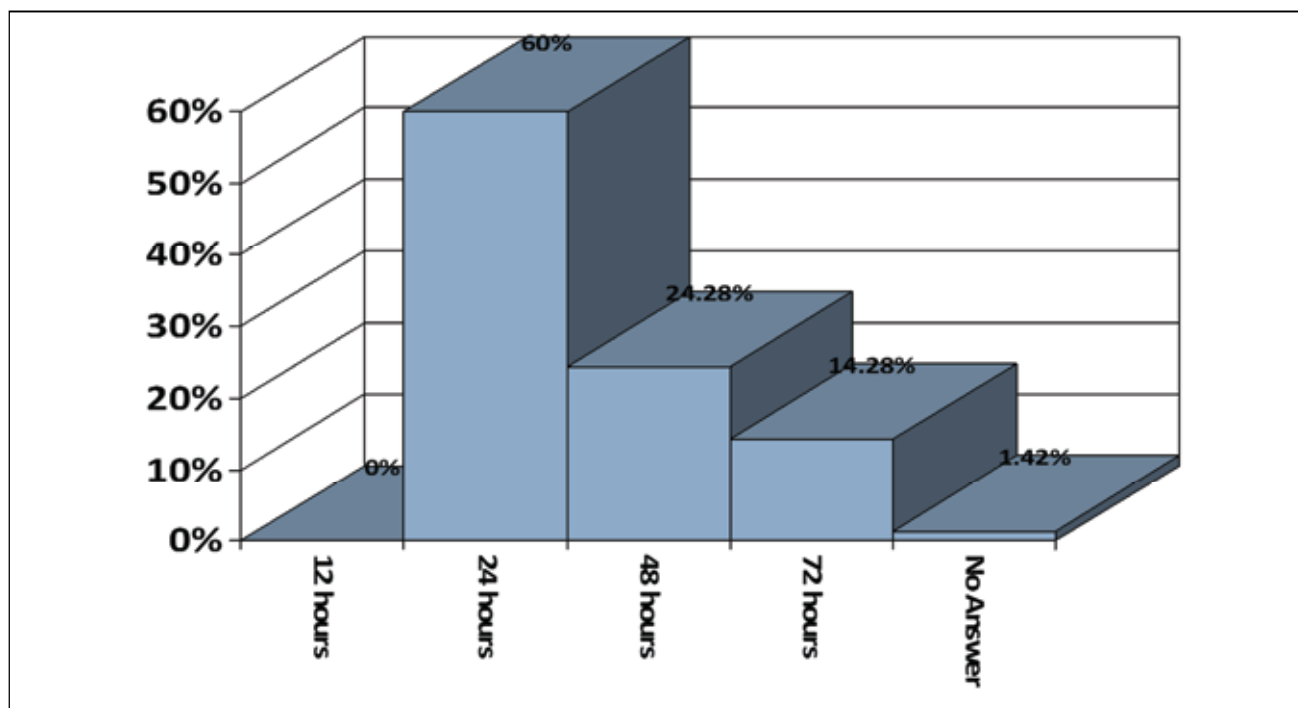


**Figure 3: Age wise %**  
Source: Own survey, 2013

#### 4.9.2 Timeliness

Rapid onset natural disasters often occur with little or no notice and call for immediate response in order to prevent further damage of life. This is particularly true in case of earthquake. First 72 hours are very critical for saving lives of

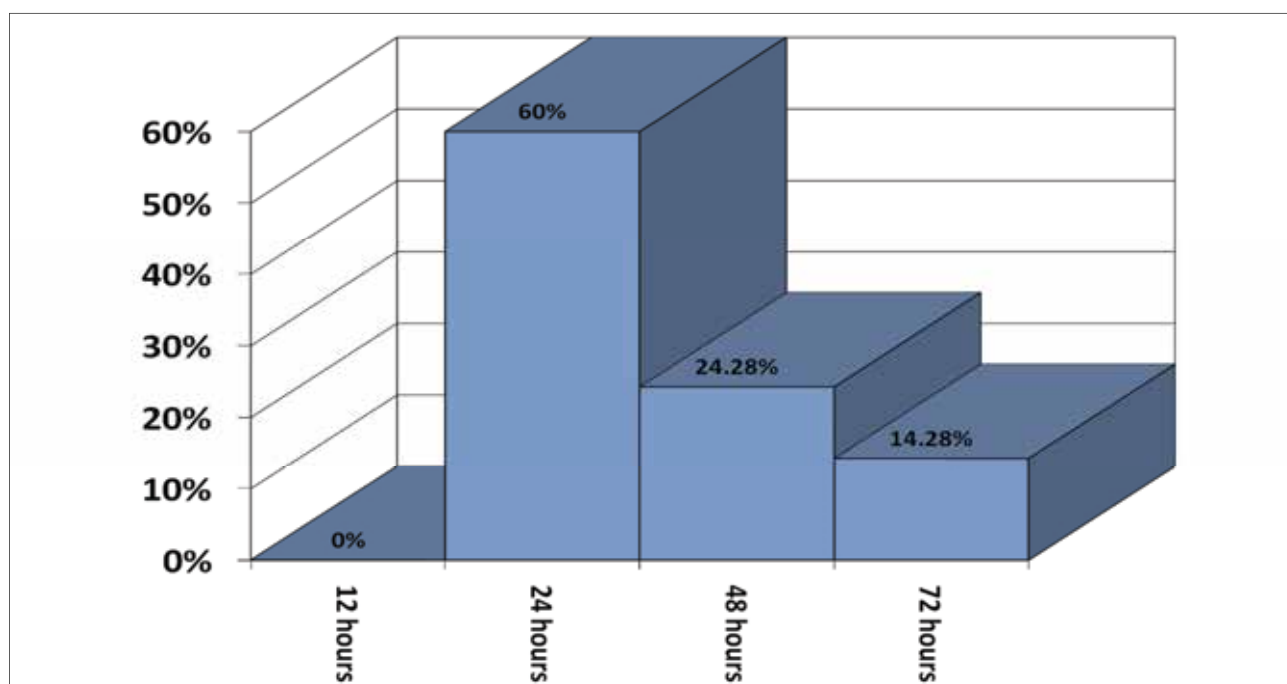
people trapped in the rubble. When asked (Fig 4) as when the army reached the affected area after the onset of disaster 60% respondents replied that army was in the affected area after 24 hours, 24% said that army took 48 hours to reach the area.



**Figure 4: Timeliness for reaching the affected area**

Source: Own survey, 2013

Similarly, for timely response the clearance of line of communication is also vital. The perception in this regard is clear from Fig 5 which indicates that 60% respondents are of the opinion that army reached the affected area in 24 hours. 24% said that army arrived after 48 hours. 14% were of the opinion that army reached within 72 hours and only 1% said that they don't know.

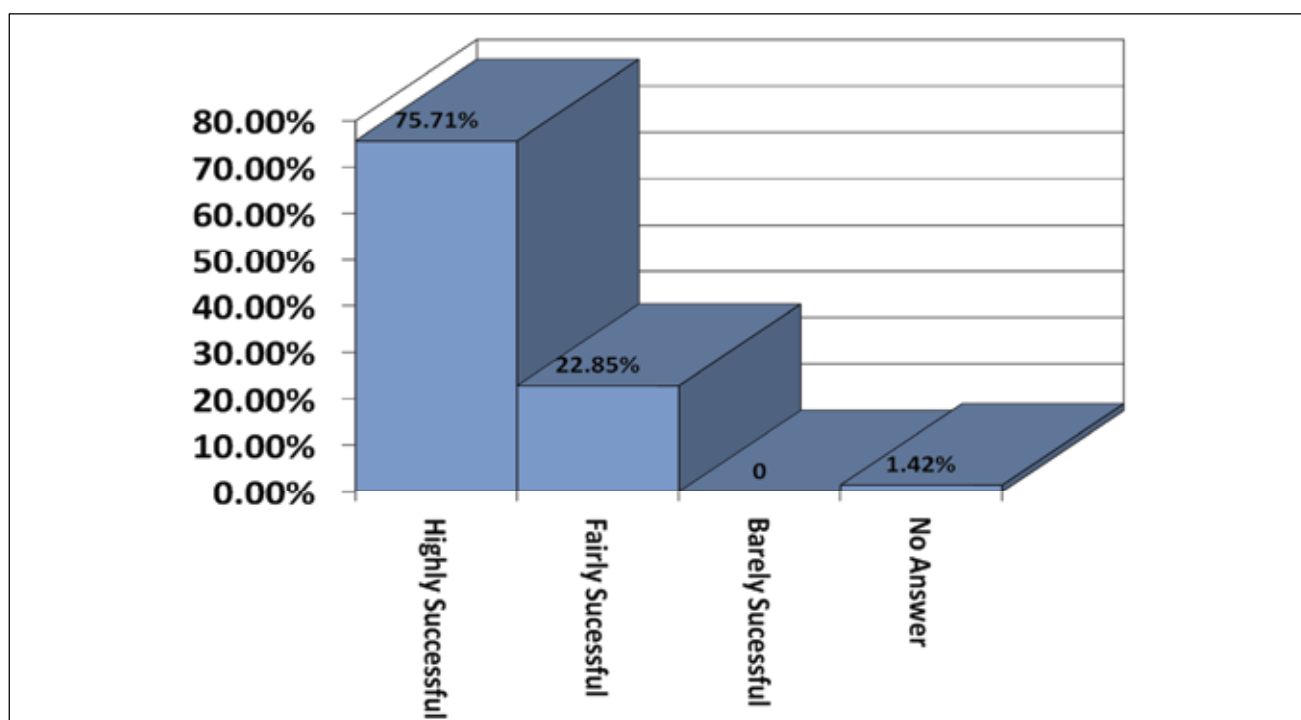


**Figure 5: Timeliness opening line of communication**

Source: Own survey, 2013

#### 4.9.3 Efficiency (Saving Precious Lives)

One of the prime task during response phase is saving precious lives. When asked Fig 6 as how the community assesses the army role in saving lives more than 75% respondents declared it as highly successful.

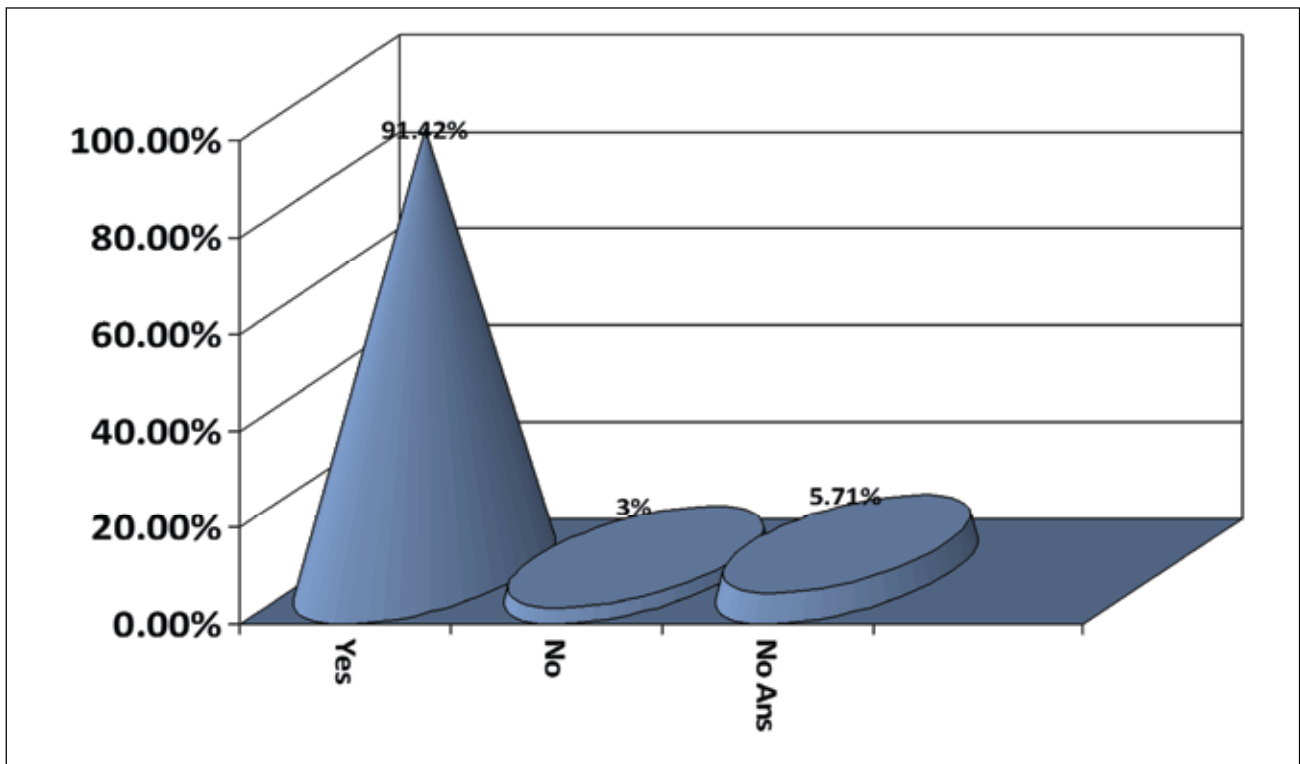


**Figure 6: Efficiency of saving lives**

**Source: Own survey, 2013**

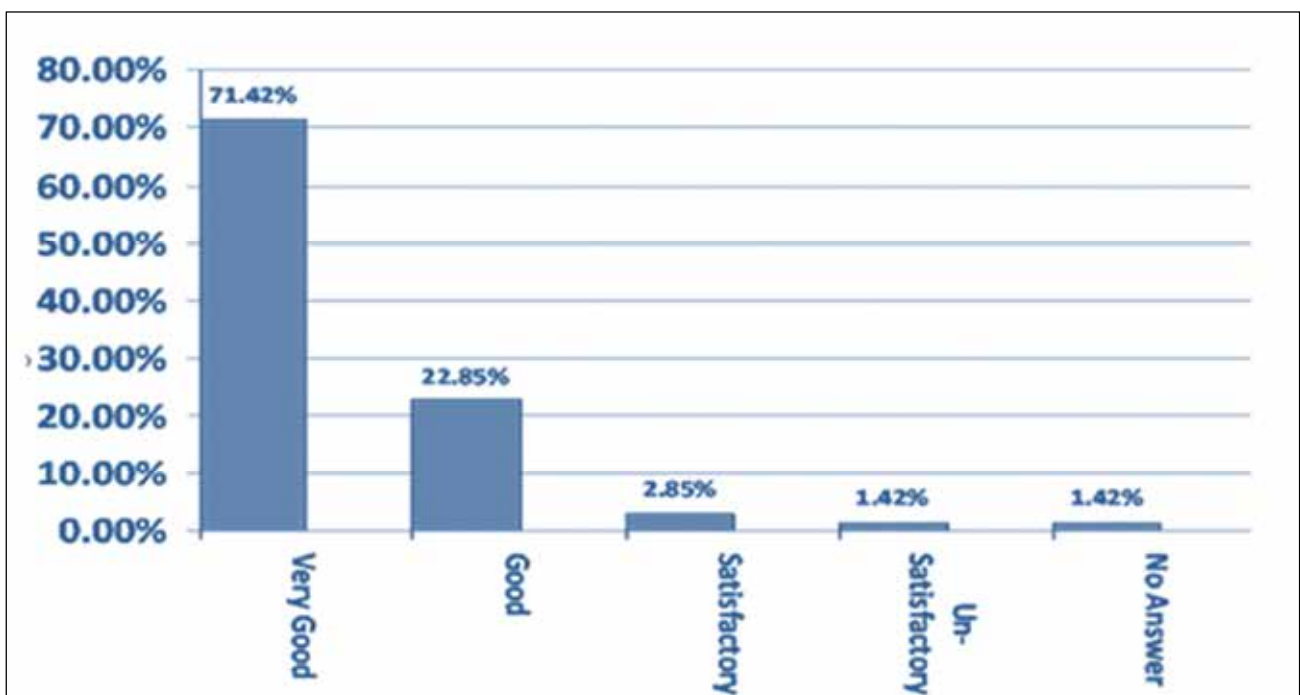
The same question was supplemented by asking as how prompt was evacuation of the injured executed 71% termed it "Very Good". Similarly, when asked as how the army efforts were successful in saving lives of children, in one of the discourse with respondents during focus group discussion the respondents narrated an incident that 70 students of a school got trapped when a building collapsed. The community informed the army and the army rushed towards the site initially a tunnel on one side was made and a dog with water bottle in mouth was sent inside after some time the dog returned with empty bottle in his mouth which indicated that some children were still alive. Subsequently the slabs with help of concrete cutters and heavy machinery were removed and only 35 out of 70 students could be saved as one side of building was completely flushed with the ground. When the respondents were asked about rescuing school going children (fig 7) 94% said the army rescued most of the children.





**Figure 7: Rescuing children**  
Source: Own survey, 2013

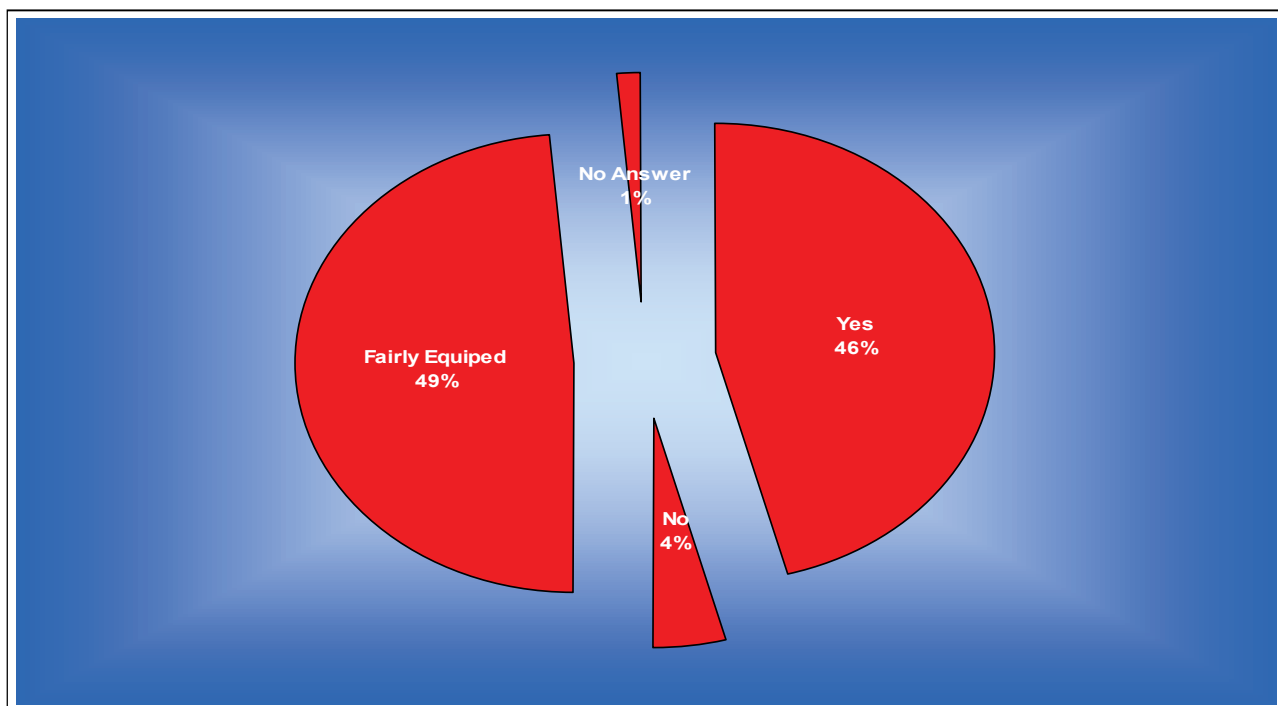
Similarly, prompt evacuation of injured did save lives of many people (fig 8) indicates that more than 70% respondents were quite satisfied with evacuation strategy executed by the Army.



**Figure 8: Prompt evacuation of injured.**  
Source: Own survey, 2013

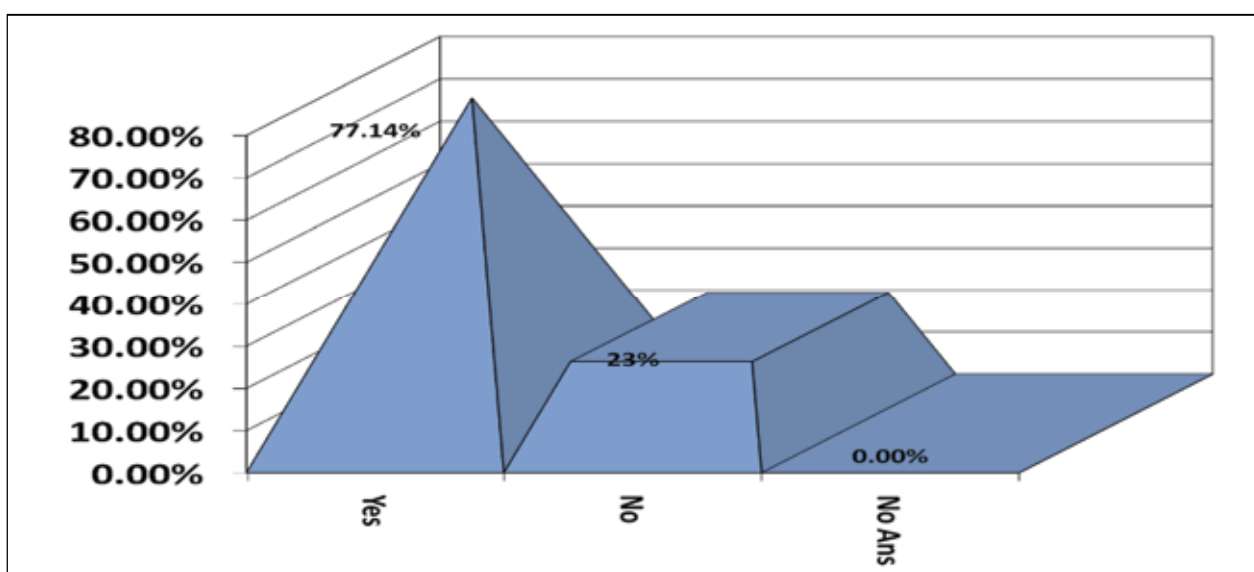
#### 4.9.4 Appropriateness of Equipment

Reaching the affected area is indicative of a prompt response but carrying along the proper tools and equipment is equally important. As only a rightly and properly equipped force can deliver the best. When the community perception in this regard was sought (Fig 9), more than 48% of respondents declared it that the army was fairly equipped where as 45% said that it was sufficiently equipped.



**Figure 9: Appropriateness of equipment**  
Source: Own survey, 2013

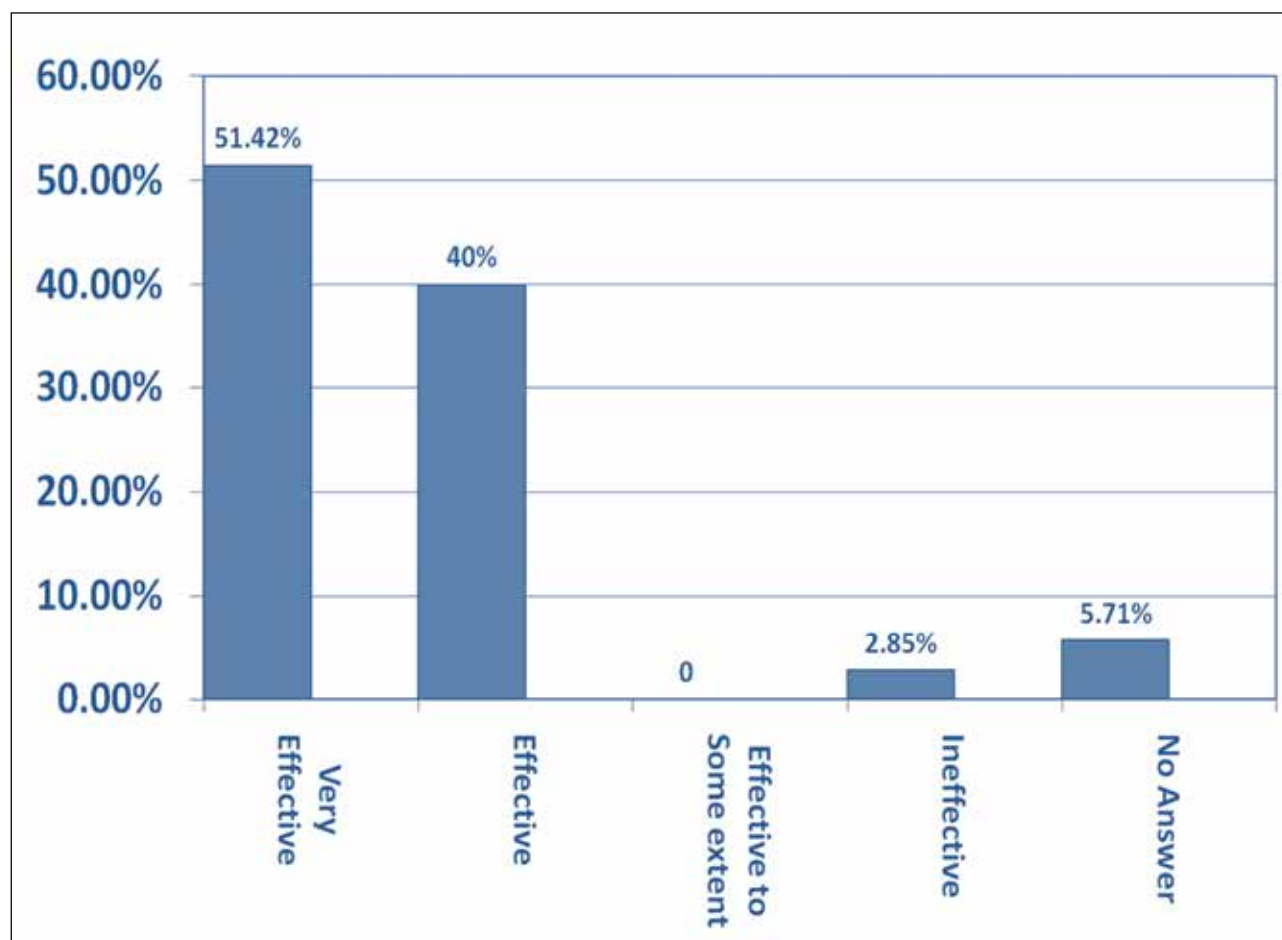
Similarly, when respondents' opinion was sought (fig 10) regarding equipment utilized during Search and Rescue 77% declared it appropriate where as 23% said that the troops were not properly equipped.



**Figure 10: Assets for search and rescue**  
Source: Own survey, 2013

#### 4.9.5 Coordination

To avoid duplication of efforts and to enhance efficiency coordination among all the actors/agencies is necessary. When the perception of respondents was sought (Fig 11) 51% respondents declared it very effective, 40 % termed it effective whereas only 2.8 percent considered it ineffective. Fig 11 clearly indicate that the whole effort of response was well coordinated.



**Figure 11: Coordination**  
Source: Own survey, 2013

#### 4.9.6 Security

For any endeavor peace of mind is vital. Secure environment increases efficiency and greatly contribute towards timely completion of tasks. The earth quake of 2005 occurred when Pakistan was fighting war against terrorism. Similarly there were a lot of foreign agencies operating and helping the affected people. Their safety was again very important when the respondents were asked (Fig 12) as how successfully the army provided security cover to the complete response mechanism. More than 85% responded in affirmative whereas only 9% respondents were not satisfied with security arrangements provided by the army. Similarly, when respondents were asked as how effectively prevented looting of relief goods 90% replied in affirmative (fig13) whereas only 9% said that it was not properly handled.

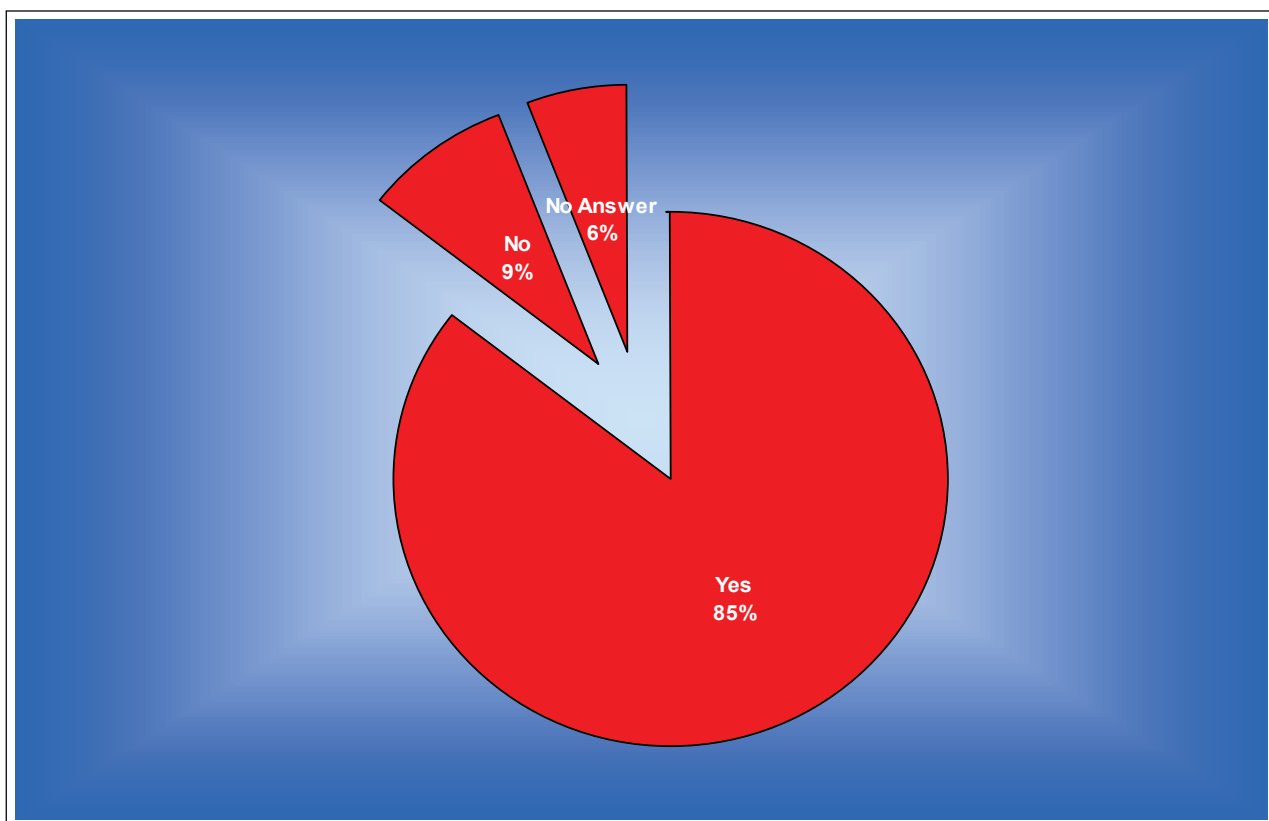


Figure 12: Security  
Source: Own survey, 2013

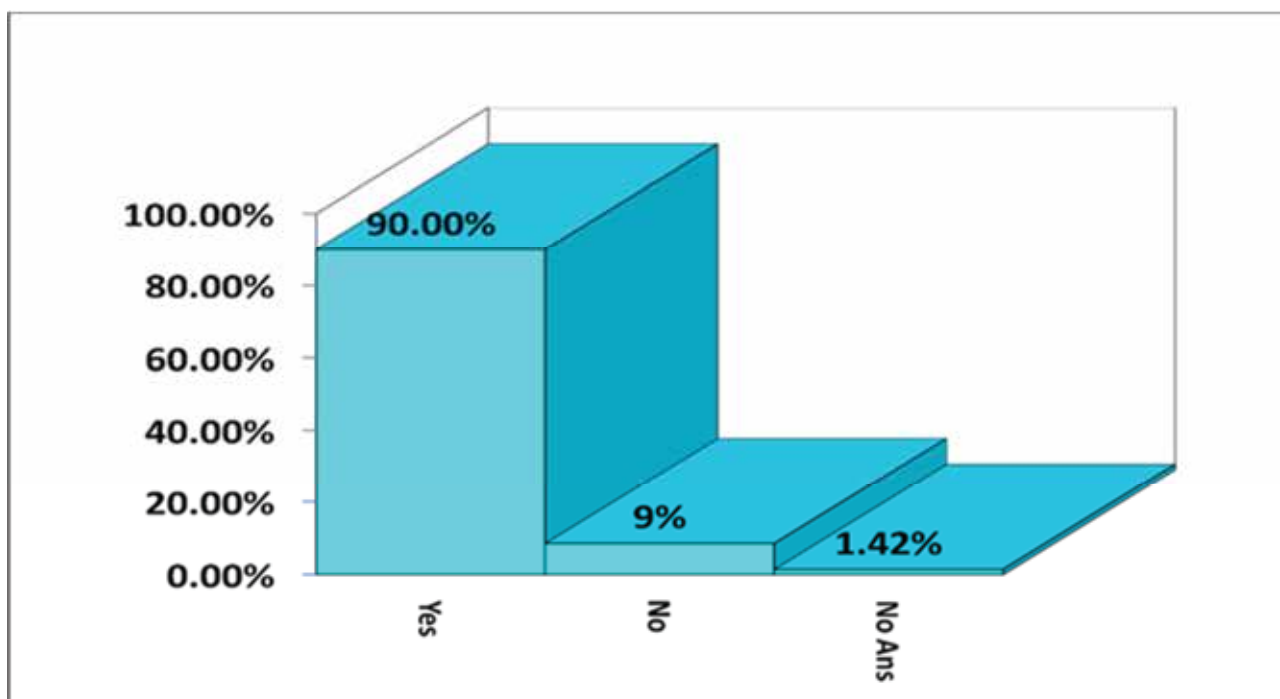


Figure 13: Preventing looting  
Source: Own survey, 2013

#### 4.9.7 Training

Adequate training and professional handling is required during search and rescue. When respondents were asked about the state of training of troops Fig 14 indicates that only 40% were satisfied where as 54.28% said the the troops were fairly trained, 2.85% of respondents were of the view that they were barely trained.

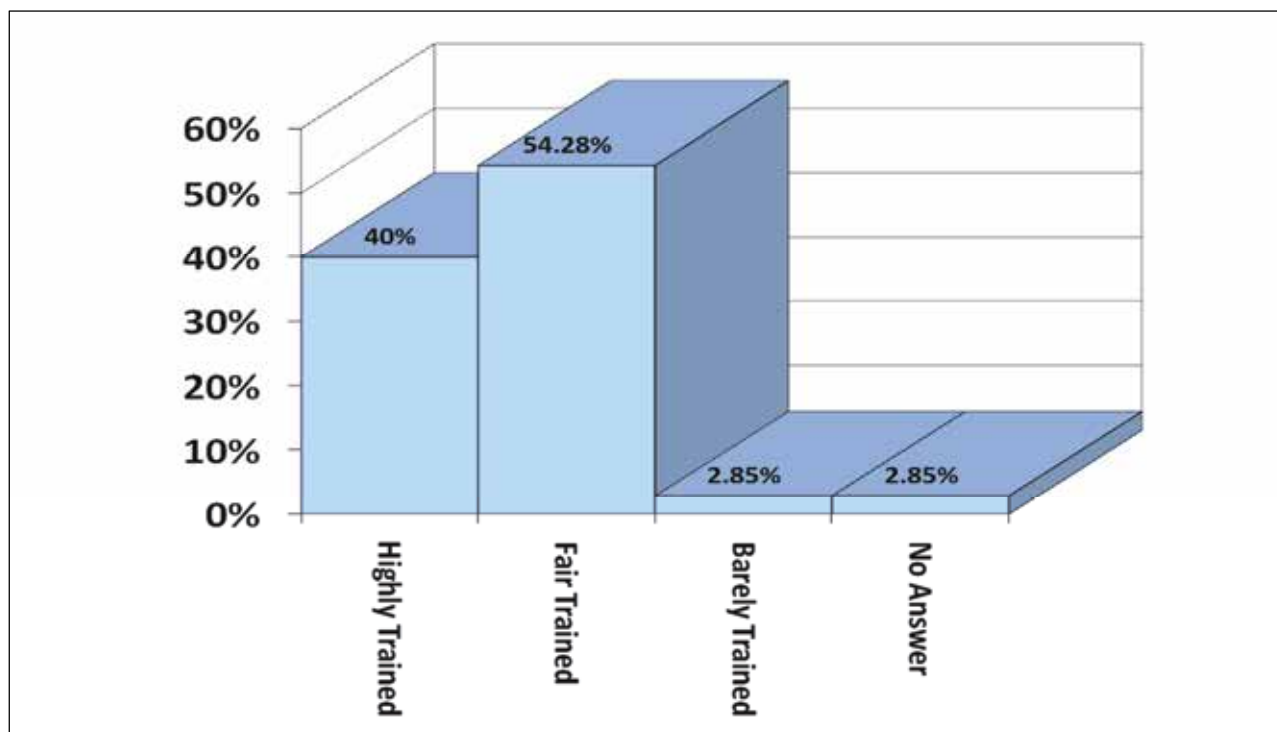


Figure 14: Training

Source: Own survey, 2013

#### 4.8.8 General Behavior

When respondents were asked about the general behavior and attitude of troops towards the affected people, 48.57% of respondents said that they were helpful, 35.71% termed them friendly and only 2.85% declared them disrespectful.

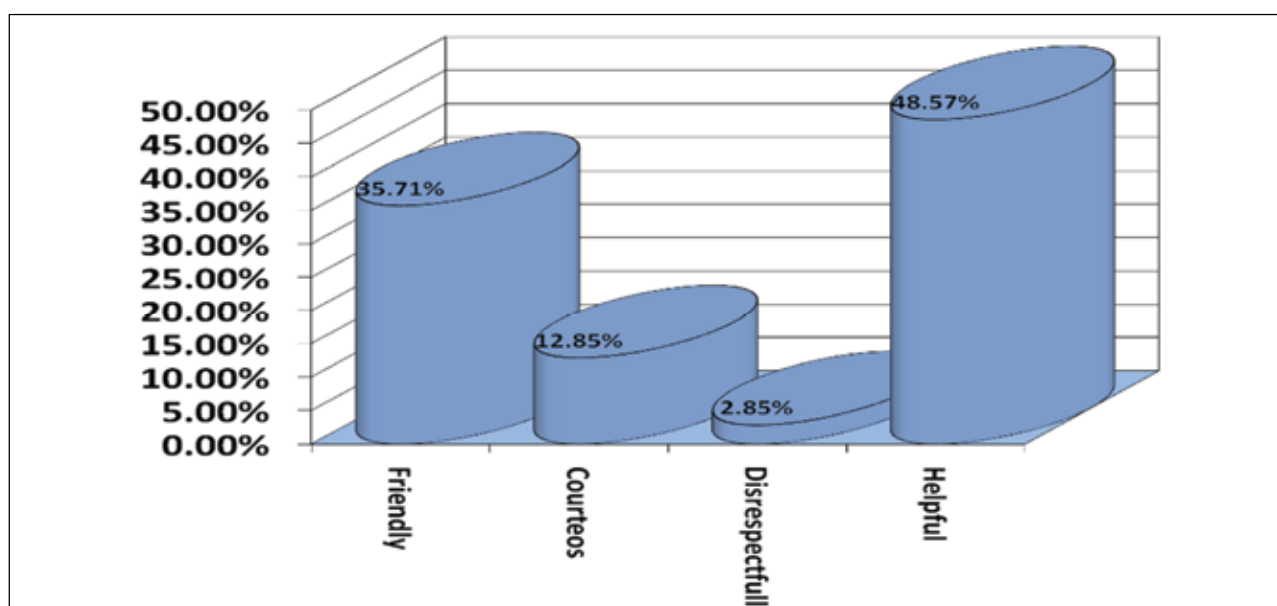


Figure 15: General behavior of troops

Source: Own survey, 2013

## CHAPTER 5

# CONCLUSIONS AND RECOMMENDATIONS

### 5.1 Conclusion

Aim of the study was to ascertain the efficacy of response mechanism developed by Army during earthquake 2005 in UC Balakot. Though a lot of material has been published and is available in the form of secondary data since the occurrence of the disaster however, to test the effectiveness of the response mechanism community perception was obtained. Timeliness, Efficiency (saving precious lives), carrying along appropriate tools and equipment ,coordinating the entire process and provision of fool proof security cover were the main aspects that were used as a yardstick for measuring the effectiveness of the response mechanism. The primary data obtained was tested and compared with secondary data.

Pakistan current disaster management focus is largely limited to post - disaster consequence management, with little attention, if any, to pre-disaster prevention, preparation and response activities. The Armed Forces play a vital role in a range of disaster and crises management activities in nations around the globe. However, total dependency on Army leaves other government functionaries ineffective. State-level disaster preparedness and mitigation measures are heavily tilted towards structural aspects and undermine non-structural elements such as the knowledge and capacities of local people, and the related livelihood protection issues.

Since all the indicators set forth to measure the effectiveness of response mechanism, get a positive response from the community hence effectiveness of response mechanism has been established to a certain extent. However, few grey areas that have been identified during analysis for which pertinent recommendations are given in succeeding paras.

### 5.2 Recommendations

To create an awareness of the complexity of disaster management and the military's tasks, it is necessary to impart training at all levels. At the Army level, there is a need to interact with foreign institutions to gain training for rescue teams' and other "specialized" disaster related training. The latter should form part of the national response capacity. Specialized equipment for flood relief, urban disaster and maritime disaster needs to be procured after having identified this equipment should be kept as station stores. Specialized equipment required in such like operations should be issued at unit level and made part of the TO&E. Following items are suggested:-

- i. Steel cutters
- ii. Sensors
- iii. Respirators
- iv. Generator sets

- v. Powerful torches and Search lights
- vi. Special sound detecting devices
- vii. Sniffing dogs (at formation level)

Local political and administrative set up must be incorporated in relief effort to make it self-sustaining. National capacity must be enhanced to combat such disaster in future.

Civilian Aviation capacity needs to be increased to address dependence on military helicopters since helicopters will be the most likely means of transport in any such disaster related scenario, where damage to infrastructure is immense. The role of Army in Response phase cannot be relegated; however, total dependency on Army leaves other government functionaries ineffective.

At the same time, timeline for employment of Army and its de-induction must be spelt out. Disaster management requires civil response through civil institutions, because the primary mission of Armed Forces is to prepare for war. Present HF and VHF sets with Brigades and Units should be replaced with latest HF and VHF sets to ensure provision of reliable and clear transmission. There should be a high degree of communication interface with LEA, CAF and civil departments. The role of army disaster management must be clearly defined. In this case role of army should have been restricted to relief and rescue operation only and thereafter, the provincial government should have taken over the responsibility. For an integrated response, the three services would require dedicated cells with a coordinating headquarters at the Joint Staff level. A Disaster Management Wing at Joint Service Headquarters to interact with NDMA at Federal level is suggested. Relief mechanism should be transparent and accountable in order to enhance public confidence.

**Asian Disaster Preparedness Centre (ADPC)** with support from Bill and Melinda Gates Foundation (BMGF) is implementing the program 'Strengthening Capacity of Government, Local Humanitarian Organizations and the Private Sector on Preparedness for Response in Asia' in 6 South and South-East Asian countries namely- Nepal, Pakistan, Sri Lanka, Cambodia, Philippines and Myanmar.

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