

Assessment and Development of Hospital Disaster & Emergency Management
Plan for Secondary and Tertiary Healthcare Facilities



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A thesis submitted in partial fulfilment of
the requirements for the Degree of

Master of Science

In

Disaster Management

Military College of Engineering (MCE)
National University of Sciences & Technology (NUST)

Risalpur Campus, Pakistan

(2018)

This is to certify that the thesis titled

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Management Plan for Secondary and Tertiary Healthcare Facilities**



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Dedicated to

MY BELOVED PARENTS

&

MY WIFE

For their everlasting love and continuous support

ACKNOWLEDGEMENTS

I am highly grateful to Allah Almighty, the most beneficent, the most merciful, for giving me strength, courage and resources to complete this research.

Firstly, I would like to express my heart-felt gratitude to my supervisor **Dr. Neem Shahzad** and **Dr. Hamid Shahzad, Director Emergency and Assistant Professor from Lady Reading Hospital, Peshawar** for their guidance, encouragement and determination to see me complete this thesis on time. When I was stuck, both Professors helped me look at things from a different perspective. Without their constant support, this thesis would not have been successfully completed. **Mr. Idrees Khan**, Secretary Health, Government of Khyber Pakhtunkhwa has provided me support in assessment of hospitals. I am very thankful to the Honourable Secretary Health.

No words suffice the extent of my facilitations to **Assistant Professor Zarmina and Dr. Arshad Ali, committee members** for their prodigious interest and assistance out of their busy schedule in helping me. My gratitude goes to **Dr. Naeem Shahzad, PhD** for his administrative support and guidance during my study. Thank you so much Dr Naeem, for helping me out whenever I had a challenge with my studies.

ABSTRACT

In the last few decades the rate and intensity of disasters has increased. The research data shows that disasters result in death of millions of people and damage to structure and infrastructure including roads, healthcare facilities and schools. In the wake of recent major natural and man-made disasters, development and implementation of disaster and emergency management plan for major healthcare facilities at local, national and international level is need of time to increase preparedness and enhance response capabilities.

The theme of this research is to evaluate the disaster and emergency preparedness and response capacities of tertiary and secondary healthcare facilities of the developed countries and asses capabilities of selected tertiary and secondary hospitals in KPK, Pakistan. Findings of the research and best practices being followed internationally led to the development of response plan for selected healthcare facilities/hospitals. The data was collected through a questionnaire which was designed according to World Health Organization (WHO-HOPE) Hospital Emergency Response checklist. 3 tertiary care hospitals and 12 secondary care hospital/DHQ hospital of Southern Districts of KPK were selected for this purpose. The results show that hospitals are lacking in disaster and emergency response capacities. A comprehensive emergency plan consisting of nine key components developed for selected hospitals. The research finally concluded with formulation of plans, guidelines and recommendations in order to enhance the hospital emergency services in selected hospitals.

LIST OF ABBREVIATIONS

WHO	World Health Organization
NDMA	National Disaster Management Authority
ERRA	Earthquake Rehabilitation and Reconstruction Authority
MCI	Mass Casualty Incident
HOPE	Hospital Preparedness for Emergency
SPSS	Statistical Package for Social Science
DHQ	District Headquarter Hospital

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INTRODUCTION

1.1 Background

Disaster occurrence is as old as the existence of earth. The emergency is a catastrophic event that exceeds the capacity of available resources of an organization to cope with. The intensity of natural and man-made disasters is increasing day by day and it results in loss of life, structural damage, nature and property lost. The world is facing disasters on a large scale and more than 255 million of world population gets affected by natural disasters per year between 1994 and 2003. During the period from 1994 to 2003, the average death rate per year was 58,000 results because of natural disasters (Guha-Sapir, Hargitt, & Hoyois, 2004).

1.2 Natural Disasters and its Health Impacts

The scientific researches and data shows that the rise in temperature and sea level will increase the occurrence of more catastrophic natural hazards including flood, windstorm, earthquake, tsunami etc (CRED/UNISDR, 2016) . Forest fires results in increase in asthma attacks and respiratory distress , resulting in significant increase in number of patients visiting emergency department for treatment after wild fire in Florida (Control & Prevention, 1999) . In the last twenty years the disasters of severe intensity resulted in killing of millions of people as mentioned in Table 1.1

Table 1.1: Number of Deaths each disaster from year 1996 to 2015

S. NO	Disaster	Deaths
1.	Earthquake	748,621
2.	Storm	239,125
3.	Extreme Temperature	165,869
4.	Flood	150,061

5.	Drought	22,295
6.	Landslide	17,674
7.	Wildfire	1,472
8.	Volcanic Activity	722
9.	Mass Moment	357

The triggering factors which contribute in increasing vulnerability of population at risk are low income, weak or non-availability of early warning system, inappropriate risk management and absence of proper mechanism to protect the civilians. The best example is flash floods in 1996 in Spain which resulted in deaths of 86 people in community located near a channelized river (Estrela et al., 2001). The data of twenty years from 1996 to 2015 revealed that 1.35 million deaths occurred because of natural disasters and earthquake is a major contributor in it, because more than fifty percent of 1.35 million died in earthquake worldwide. The majority of these deaths happened in countries with low and middle income population. October 2005, earthquake in Pakistan resulted in loss of 73, 338 precious human lives. Previous data shows that tsunami is the most dangerous and deadliest natural disaster on the earth in terms of proportion killing of victims. Furthermore, natural disasters also damage the very important infrastructure including the nuclear plants, schools, hospitals, airports, dams and tall buildings especially in urban infrastructure. The country's income does not affect the striking of natural hazards but the consequences and impact of natural disaster is directly proportional to the level of income and development of that country or area. This statement is supported by mortality rate caused by disaster from 1996 to 2015 i.e. in twenty years as shown in Table 1.2.

Table 1.2: Number of Deaths in each Income Group for all Natural Hazards, 1996-2015

S.NO	Income Group	Deaths	Percentage
1.	High income	124,706	9.3%
2.	Upper middle income	301, 469	22.4%
3.	Lower middle income	627, 232	46.6%
4.	Lower income	292, 789	21.7%

Each disaster in the countries with low income resulted in killing of 327 people on the average in the last twenty years. The rate is five folds higher than the high income countries. It reveals that the impact of disaster is higher in poor and marginalized population. It has been observed by the scientists that there is increase in the global temperature in the last thirty years. It was found out in a study that in the European cities of Rome and Stockholm, heat wave resulted in an increase in mortality rate in age group above 50 from year 2000 to 2008 (Åström et al., 2015). Karachi heat-wave impacts in June, 2015 data shows that residents of Karachi were 17 times more at risk of dying because of extreme temperatures as compared to reference period of June, 2014(Team, 2016). Humanitarian emergencies resulting after natural disasters or civil conflicts negatively affect negatively the health status of population, livelihood loss and human loss (Wisner, Adams, & Adams, 2002). Drought is one of the more devastating natural disaster which effects human being health through nutritional deficiency and food and water borne diseases, reduction in production of livelihood and crop, increase in prices of food products and migration. When the drought combines with low income, health infrastructure at risk and poor services of sanitation, the results become devastating (Ebi & Bowen, 2016). The El Nino cycle influenced the number of effects by drought across the world (Bouma, Kovats, Goubet, Cox, & Haines, 1997).

In recent past, Pakistan has faced many challenges in provision of sufficient life saving services to the disaster victims. The Kashmir earthquake of October 8, 2005 had widespread destructive effects. The natural disaster resulted in large scale destruction of health facilities and very limited healthcare and medical facilities were available on spot. The human behavior perceives that natural disasters are “act of God” involving limited relationship of human activities. It is revealed through different researches that nature damaging human activities result in more devastating impacts of natural disasters, flood being an example (Guha-Sapir et al., 2004). Flood effected population may suffer from mental disorders (Ahern, Kovats, Wilkinson, Few, & Matthies, 2005). As a secondary disaster, vector-borne diseases result after natural disaster, for example in 2000, a heavy rainfall and cyclone hit Mozambique and consequently resulted in outbreak of malaria disease (Epstein, 2005). The natural disasters and possible health outcome are summarized in Table 1.3

Table 1.3: The Natural Disasters and Possible Health Outcomes

S.NO	Natural Disaster	Health outcomes
1.	Earthquake	Trauma, crush injuries, Head& Spinal cord injuries, fractures
2.	Floods	Drowning, infectious diseases outbreak, infrastructure damage
3.	Landslide	Crush injuries, trauma, infrastructure damage
4.	Volcanoes	Burns, fractures, inhalation injuries, stress and anxiety
5.	Tsunami	Drowning, fractures.

1.3 Techno-industrial Disasters and its Health Impacts

Technology-industrial disasters also result in devastating impacts on human beings and environment. These disasters include chemical accidents, fires, explosions, oil spills and some transportation related disasters. The impact of these disasters is directly proportional to the vulnerability of local population and inversely proportion to the preparedness and alert of local population.

The big examples at international level are Chernobyl disaster, Bhopal disaster, while Ojhari camp, Rawalpindi and baldia factory, Karachi disasters happened at national level resulting into fire, radiation emission, loss to human life and adverse environmental consequences.

Chernobyl accident resulted in complete melting down of reactor, radiations, and death of thirty one persons on the spot. The Methyl Isocyanide gas leakage in Bhopal, India resulted in killing of approximately 3,800 people and thousands of people suffered from injuries and long term health consequences (Broughton, 2005). Bhopal accident is the world's deadliest industrial incident till now.

Few major incidents also took place in our country Pakistan. In April, 1988 Ojhri camp blast in Rawalpindi resulted in loss of approximately one hundred lives (Malik, 2000). Fire emergency in baldia town factory, Karachi resulted in killing of hundreds of factory workers. Structural collapse of a factory in Sundar industrial area, Lahore led to loss of hundreds of lives and damages to the environment.

To deal with such types of emergencies on spot, at pre-hospital level and hospital level requires appropriate early warning systems and preparedness because of fire, chemicals contamination

and radiation effects are very lethal. The hospital emergency department may receive the injured which may be contaminated and left untreated. Antidotes of different chemical agents are already available to deal with poisoning cases. The search and rescue and hospital medical staff requires practicing of the personnel protective equipments (PPEs) for safety purpose and a designated area for decontamination is also required in the hospital.

1.4 Man-made Disasters and its Health Impacts

Man-made disasters ranging from bombing, shooting, hijacking, civil conflicts, wars, stampede, use of biological weapons, road traffic accidents, air crashes, rail accidents, watercraft accidents etc. According to World Health Organization (WHO) report issued in February 2018, 1.25 million people die every year because of road traffic accidents. The detail of total deaths as a result of road traffic accidents in developing countries and developed countries is mentioned in Table:1.4

Table 1.4: World Health Organization (WHO) Estimated Number of Road Traffic Deaths in Developing (SAARC countries) and Developed Countries in 2013

S.No	Country Name	Deaths	Comment
1.	Pakistan	25,781	Regression estimate
2.	Afghanistan	4,734	Regression estimate
3.	India	20,7551	Regression estimate
4	Bangladesh	21,316	Regression estimate
5.	Nepal	4,713	Regression estimate
6.	United States of America	34,064	Projected Death regression data
7.	United Kingdom	1,827	Death registration data
8.	France	3,268	Reported deaths

9.	Germany	3,540	Projected Death regression data
10.	China	261,367	Death registration data

The aviation crashes usually results in death of all passengers and crew. In recent past civil aviation air crashes in different parts of the world lead to loss of precious human lives. War and civil conflicts also leave devastating impacts on human health. The health impacts include mass casualties, long lasting psychosocial impacts, and physical disabilities. The war results in shortage of healthcare facilities and impacts human health. Approximately 191 million populations died as a result of wars and civil unrest (War and Public Health). Complex emergencies or internal or external conflicts are those situation which result in violence because of weakening of political system in country or region. The human impacts of these emergencies are ranging from mass displacement of people, large scale violence, disabilities, and loss of life to psychological disorders and decreasing the capacity to sustain livelihood. Proportion of national population of twenty most effected countries which got affected by conflicts in 2012 as given in Table 1.5.

Table 1.5: Proportion of National Population Affected by Conflict 2012

S.No	Country	Population %	S.No	Country	Population %
1.	Libya	92%	11.	Cent. African Republic	21%
2.	Somalia	89%	12.	DR.Congo	19%
3.	Syria	74%	13.	Pakistan	15%
4.	Zimbabwe	62%	14.	Nigeria	11%
5.	Iraq	56%	15.	Kenya	09%
6.	Yemen	41%	16.	Mali	08%
7.	South Sudan	39%	17.	Cote d'Ivoire	08%
8.	Sudan	36%	18.	Eriteria	04%
9.	Afghanistan	36%	19.	Republic of Congo	04%
10.	Liberia	26%	20.	Uganda	04%

The health impacts of complex emergencies are summarized in Table 1.6, where the crude mortality rate in top 10 conflicts affected countries are given.

The crude mortality rate in top 10 countries in the population effected by conflicts is given in

Table 1.6: Total Mortality among PAC in 2007-2012

S.No	Country	Rate	S.NO	Country	Rate
1.	Somalia	0.77	6.	Chad	0.42
2.	Democratic Republic of Congo	0.62	7.	Niger	0.40
3.	South Sudan	0.60	8.	Kenya	0.31
4.	Uganda	0.58	9.	Haiti	0.25
5.	Sudan	0.45	10.	Ethopia	0.19

Crude Mortality Rate/CMR (Per 10,000/per day)

The trauma which is the consequences of any man-made disaster need prompt response and treatment. Epidemics may also occur after mass movement of population and other disasters.

1.5 Regional Vulnerability

Southeast countries in Asia are densely populated and are vulnerable to the disasters. With diverse climatic and geographic conditions, each country is prone to the disaster. The countries with long coastal line like Philippines, India & Bangladesh are usually affected by typhoons, floods. Seismic activity results in earthquake, landslide, and tsunami in the Southeast Asian countries. Drought occurrence is also reported in Pakistan, Burma and Indonesia.

1.6 Disaster Management in Pakistan

Different authorities and offices were working for relief activities since long but after October, 2005 earthquake in Pakistan, which forced the Govt. and people of Pakistan to develop a proper mechanism to make the country safe and for the rehabilitation and reconstruction of the earthquake affected areas. The National Disaster Management ordinance was passed in 2007, Earthquake Rehabilitation and reconstruction Authority (ERRA) was constituted to carry on relief and rehabilitation work in earthquake affected areas of Pakistan. The NDMA act in 2010, clearly defines the policies and guidelines for disaster management mechanism in Pakistan from

local to national level. In National disaster management plan the emphasis is on strengthening the capacities of hospital's emergency department in order to provide best services to disaster victims

The emergency levels are also defined according to National Disaster management Act, 2010 as following:

1.6.1 Level-I

It is a localized emergency situation; examples are small scale fire, flood, road accident, limited disease outbreak. The emergency handling is done by district disaster management authority (DDMA) and declared by District Nazim.

1.6.2 Level-II

The emergency or disaster situation that overwhelmed the coping capacity of DDMA is of level 2 intensity. The disaster is managed at provincial level and emergency is declared by chief executive of the province (Chief Minister).

1.6.3 Level-III

If regional or provincial government is unable to manage the disaster, the level 3 or national level emergency is declared by the Prime Minister. Appeal for the international assistance may be launched.

In the past two decades the intensity of natural and man-made disaster is increasing day by day. The devastating of all types of disasters in Pakistan after 2000, deficient pre-hospital and in-hospital emergency and life saving facilities results in loss of precious human lives. Pakistan is a disaster prone region due to its geophysical location, high degree of vulnerability and climate change impacts. Hydro-metrological, biological and geophysical hazards such as cyclones, avalanches, storms, flood, drought, GLOF, earthquake, landslide and tsunami are threats to Pakistani nation. According to the report issued by prevention web report from 2005 to 2013 the disaster events in Pakistan resulted in 37,321 injuries and 10,420 deaths. Human suffering are the most dangerous impact of any disaster and the stake holders including UN agencies, Governments and INGOs are working to reduce the human sufferings by reducing the disaster

risks. The sustainable development goal no. 3 good health and well being and goal no. 11 sustainable cities and communities clearly emphasizes on making the human life safe and secure.

1.7 Role of Hospital in Disasters

The healthcare setups or hospitals play a vital role in the healthcare of injured people by providing essential life saving services to the disaster victims. If the disaster is of large intensity, it will definitely affect the healthcare system. Any type of disaster may result in overwhelming of the hospital capacities, increase in services demands and healthcare delivery system. An unprepared hospital may lose its working if there is disaster, it may lose its working capacity in both condition, such as External emergencies i.e., outside of hospital incidents and Internal emergencies i.e, hospital incidents. According to American college of emergency physicians definition “Medical disaster is a situation risen after natural or man-made disaster overwhelm the coping capacity of a given area or community to meet the healthcare demand.”

Hospital Emergency department (ED) is a unit of hospital. It is responsible to deal with critical patients and serve as receiving point of injured disaster victims. The standard emergency department (ED) is well equipped, having maximum specialties, have trained medics and non-medic staff and uninterrupted supplies. Emergency department should always expect to receive huge number of disaster victims if the hospital is located near to the disaster affected area. The patient triaging help the early treatment to the disaster victim reported in serious condition to the emergency department.

In the developed countries the response of hospitals to emergencies in disaster situation is well organized and disciplined. The developing countries hospitals in most of the cases partially or completely fail because of administrative issues including early access, lack of human resources, lack of utilities and equipment availability and functioning. The mismanagement could affect the patient’s safety, hospital staff, attendants and environment. It will also adversely affect the hospital capacity to provide appropriate healthcare facilities to the disaster victims. Furthermore, damage to the hospital infrastructure also negatively affects the treatment of disaster victims.

After 2000, the intensity of disasters is increasing in Pakistan and role of hospital is being recognized by the political leadership and officials. Some major hospitals of our country have the experience to receive the natural and man-made disaster victims. Tertiary care hospitals of the

country including Lady reading hospital Peshawar, Jinnah Postgraduate medical centre Karachi, Bolan medical complex Quetta, Combined Military hospital at Rawalpindi, Peshawar and Quetta, General hospital Lahore and many secondary care hospitals at district level have been treating thousands of disaster victims in last one decade. In order to provide minimum required emergency treatment services to the disaster victims, the policy makers, NDMA and hospital administration show keen interest in development of hospital disaster management plan and capacity building of hospital staff. Not only to strengthen the emergency department services and save to disaster victims life but also to make the hospital safe.

1.8 Research Objectives:

1. To evaluate existing disaster and emergency management plan of developed countries.
2. To assess the existing disaster and emergency preparedness and response capacities of selected secondary and tertiary healthcare facilities.
3. Design an integrated disaster and emergency management plan for secondary and tertiary healthcare facilities.

1.9 Research Questions:

1. What emergency and disaster management mechanism exists in developed country healthcare facilities?
2. What level of emergency and disaster management capacities exist in the selected healthcare facilities? A checklist or questionnaire is developed containing following components:
 - I. Command and control
 - II. Communication
 - III. Safety and security
 - IV. Triage
 - V. Surge capacity
 - VI. Continuity of essential services
 - VII. Human resources
 - VIII. Logistic and supply management
 - IX. Post disaster recovery
3. Is there any emergency / disaster management plan exist in selected healthcare facilities?

1.10 Problem Statement

The natural and man-made disaster always results in human sufferings. Effected population is in urgent need of healthcare. Healthcare facilities are also vulnerable to the disasters. Hospitals are receiving huge number of disaster victims and patients are in urgent need of treatment. Keeping in view the situation of Pakistan, the multiple factors including structure and infrastructure, lack of preparedness and mitigation measures and legislation in healthcare sector, hospitals are always results in weak response to the disaster victims. The prompt and timely provision of treatment to the disaster victims is the need of time and many lives can be saved. The hospitals are not well prepared for disaster and emergency response. The results will give the recommendation to be more prepared for emergencies.

1.11 Scope of the Study

The research study has been carried out by assessing emergency and disaster preparedness of fifteen hospitals. It includes twelve secondary care and three tertiary care hospitals. World health organization recommends nine key components for prompt hospital emergency response. Many of these hospitals have responded to the natural and man-made disasters in last one decade. The study also prepared a comprehensive emergency and disaster management plan for selected hospitals including a tertiary care hospital Lady Reading Hospital-Medical Teaching Institute, Peshawar and a secondary care hospital District Headquarter Hospital-Kohat.

1.12 Significance of the Study

The research provides information about the level of hospital preparedness for emergencies and disasters. The literature on this study is rarely available in context of Pakistan.

In the past, such type of comprehensive study has not been carried out to assess the emergency and disaster preparedness of the healthcare facilities in Pakistan. The study will not only, to find the gaps but will also develop the comprehensive emergency plan for selected hospitals. Strengthening of emergency department services will results in saving of precious lives. Also an android application will be developed for emergency department of lady reading hospital Peshawar, which will strengthen the emergency preparedness response and disaster victims' information.

1.13 Organization of the Study

- The Chapter-II includes literature review, work done previously on the same topic and in same context by different countries and researchers.
- The Chapter-III covers the Methodology, elaborates the procedures that how data was collected for this research and what mechanism was adopted for analysis.
- The Chapter-IV presented the analysis and interpretation of the surveyed data. The chapter also described the comprehensive emergency and disaster management plans for two hospitals.
- The Chapter-V is last but not the least, comprises of conclusion and recommendations.

LITERATURE REVIEW

Hospital plays a vital role in healthcare delivery and life saving during and after disaster. Effective hospital planning will result in good preparatory measures, which will enhance the hospital capacities to treat the disaster victims (Yi, George, Paul, & Lin, 2010).

2.1 Hospital Emergency and Disaster Management Preparedness in Developed Countries:

Hospitals are needed to be prepared because of heavy demand of healthcare after any disaster occurrence. The developed countries spend huge budget on health care of citizens. In the United States of America it has been observed that after the large scale emergencies and disasters, a comprehensive and well managed medical emergency response was observed. In United States the health care during emergencies is considered as a vital component of emergency response at community level. It results in increase in hospital funding and issuance of latest hospital emergency preparedness guidelines in US (Barbera, Yeatts, & Macintyre, 2009). After the terrorist attack of September 2001, the US government showed keen interest in assessment of hospital preparedness for emergencies and all types of disasters. A study of 500 hospitals was conducted in United States to assess the availability of hospital emergency response plans against different types of disasters. The results are as shown in Table 2.1

Table 2.1: Hospitals in US with emergency plan against each Disaster Type

S.No	Disaster Type	Hospitals with plan
1.	Natural Disasters	97.3 %
2.	Chemical Disasters	85.5%
3.	Biological Disasters	84.8%
4.	Nuclear & Radiological Disasters	77.2 %

5.	Explosives	76.9 %
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The study also revealed that the maximum preparatory drills were conducted for natural disasters as compared to biological, chemical, explosive disasters and epidemics outbreaks. Another study found presence of trained hospital key personnel on hospital incident command system (HICS) was found in 75 % of the US hospitals (Niska & Burt, 2005). US hospitals are also vulnerable to different hazards and when disaster happens, it may result in hospital evacuation. There were approximately two hundred and seventy five hospital evacuations cases reported from 1971 to 1999. Following are the disasters which resulted in hospital evacuation mentioned in Table 2.2

Table 2.2: Disasters and Evacuation

S.No	Disaster	Percentage
1.	Internal fire	23 %
2.	Internal Hazard material event	18 %
3.	Hurricane	14 %
4.	Human Threat	13 %
5.	Earthquake	9 %
6.	Flood	6 %
7.	External fire	6%
8.	Utility failure	5 %
9.	External Hazmat	4 %

The results showed that half of total hospital evacuation occurred after the disaster originated within the hospital premises or from human intruders (Sternberg, Lee, & Huard, 2004). To assess the hospital disaster preparedness, a study was conducted in Osaka, Japan in 1994. The results showed that 93 % of the hospitals did not have surge capacity, if all beds were occupied after a

disaster event. Only 8 % had sufficient quantity of drugs and 6 % had different medical supplies, which were stockpiled for disasters events. Power generators were available in many hospitals, but only 57 % hospitals could supply electricity up to six hours because of fuel shortage. Out of 265 hospitals surveyed, no hospital was found fulfilling the adequate criteria defined for disaster preparedness. Study also recommended the development of hospital emergency plan for disasters in Japan (Kai, Ukai, Ohta, & Pretto, 1994).

Human resources including clinical and non-clinical staff of hospitals play an important role during emergency and disaster situations. Health care workers are also vulnerable and if not prepared for emergency response during or after the disaster, the consequences could be devastating. A study was conducted in Canada to assess the disaster preparedness in nurses. The results of this study showed that most of the nurses felt that they were not fully prepared to respond to the chemical, radiological, biological and nuclear disasters. Approximately 40% of the nurses had no idea about their hospital emergency plan in case of disaster and disease outbreak (O'Sullivan et al., 2008). London is a densely populated city and a gateway to many European cities. London is vulnerable to terrorist attacks as evident by bombing on a London underground (the tube) and a bus, which resulted in more than fifty deaths (Yi et al., 2010). Most of the hospitals were prepared for receiving of unsure number of casualties with different injuries (Redhead, Ward, & Batrick, 2005). Paris in August, 2003, the sudden rise in temperature resulted in increased emergency department workload and exceed death rate. A special action was initiated by creating "plan chaleur extrême" (extreme heat plan). According to the plan the sufficient increase in quantity of nurses in emergency and medical wards, increase in hospital beds/surge capacity, and decrease in hospital stay for already admitted patients. Despite of special actions, 475 deaths occurred among 1900 excess hospital admissions (Dhainaut, Claessens, Ginsburg, & Riou, 2003). The Australian hospitals received huge number of casualties after Bali bomb blasts in October 2002 and October 2005. Approximately 202 people were killed and 196 were injured as result of bomb blasts on 12 October 2002. Another bomb blast on 1 October 2005 results in killing of 23 and injury of 108 people. Research shows that Australian hospitals were not well prepared for mass casualty incidents. The study recommended the revision and implementation of major incident plan, training and development of hospital staff according to plan, stockpiling of medicines and equipments and enhancement of communication system (Rosenfeld et al., 2005).

2.2 Key Components WHO-Hospital Preparedness for Emergency Response

According to the hospital emergency response checklist issued by World Health Organization (WHO), the nine key components and their importance in making the hospitals well-prepared for emergency response are crucial for saving the lives of victims. The components are discussed as under:

- I. Command and control.
- II. Communication
- III. Safety and security
- IV. Triage
- V. Surge capacity
- VI. Continuity of essential services
- VII. Human resources
- VIII. Logistics and supply management
- IX. Post disaster recovery

2.2.1 2.2.1 Command and Control

Command and control system is necessary for sufficient performance during emergency response to the disasters. Many casualties happen as a result of disasters because of mismanagement of resources and inappropriate utilization of human resources. The hospital incident command group working under hospital incident command system (ICS) is the main command and control authority during hospital emergency response. The Incident command system was established in 1970 after the wildfires in California (Bailin, Beninati, & Bohanan, 2003). In hospital setup ICS was 1st time used in 1991 as hospital emergency incident command system (HEICS) for disaster response. The typical incident command system is consists of command, operations, planning, logistics and finance/admin as shown in figure 2.1.

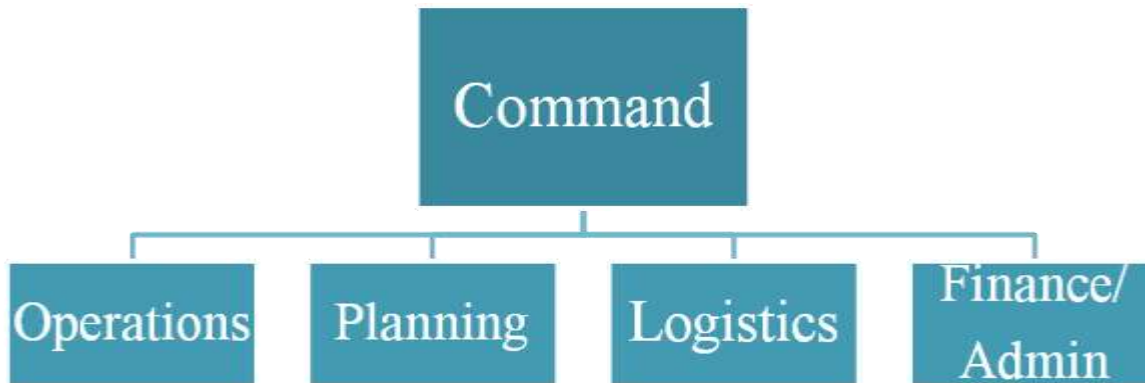


Figure 2.1: Hospital Emergency Incident Command System

The latest hospital incident command system is in practice from 2006 in many countries including US, Turkey, Taiwan for disaster response (Wang & Chang, 2006) . HICS is a standardized protocol, which is applied when hospital is responding to the disasters. According to WHO guidelines the hospital incident command group (ICG) is mandatory for the development and practice of hospital emergency response plan. HICS only exists for purposeful command, control and coordination mechanism for effective hospital's response to disaster event (J. L. Arnold, Paturas, & Rodoplu, 2005). A designated command and control centre equipped by appropriate communication system is required to implement the hospital emergency plan during and after the disaster event. Incident commander is the person who is completely responsible for all decisions for emergency response. A survey was conducted in Turkey to assess the hospital command and control system and results showed that almost all respondents were in favor of HEICS for effective hospital disaster response and planning (J. Arnold, O'Brien, Walsh, Ersoy, & Rodoplu, 2001).

2.2.2 Communication

Appropriate, accurate and timely communication in disasters plays a key role in preparedness and response to the victims of disaster .The communication and information management is a big challenge for appropriate disaster response (Auf der Heide, 1989). Effective response to the disaster requires situation analysis of each moment and correct information for available resources and needs assessment that can change suddenly (Auf der Heide, 1989). According to WHO guidelines,the communication with all the stakeholders including public, health facilities,

educational institutions, and others are necessary to manage a disaster. Communication systems must be in an appropriate way which clearly covers the objectives, message, audience, channel, and action plan. According to WHO-Hospital preparedness for emergency response (HOPE) checklist, the designated area is earmarked outside emergency department for information dissemination and press conference. Furthermore, all the information must be approved by incident commander or Incident command group and flow of information from ward or section to hospital administration must be according to pre-defined mechanism. In emergency situation, while hospitals are ready to receive large number of casualties the application of information technology including internet, computer, and smart devices have the capacity to bring more betterment in hospital emergency services (Chan, Killeen, Griswold, & Lenert, 2004). A study which was conducted in 2009 to assess challenges to effective crisis management and the result showed that there are three main challenges to the coordination, which are faced by pre-hospital services and hospital emergency department. These challenges are ineffective technology, lack of common ground and inappropriate information flow (Reddy et al., 2009). Patient identification, tracking, monitoring and medical care in the hospital is dependent on paper tags around the wrist or neck, which serve as patient identification and for documentation. However, the paper tags have some limitations including space, weather, details etc (Plischke, Wolf, Lison, & Pretschner, 1999). Triage tagging communicates the patient's condition to the receiving hospital or department. After terrorist attack on world trade centre and pentagon in September 2001, most of the victims, even those transported through EMS, arrived at emergency department without triage tagging and field information (Bradt, 2003). Recent development in triage tagging introduces the bar-coding and mobile wireless data acquisition to identify and track disaster victims. These latest technologies are known as triage tracker. Triage tracker assigns a unique and specific identifier to each disaster victim linking it with triage status (Plischke et al., 1999). During many Mass casualty incident(MCI)events, the logistics problems arises as a result of disasters not due to shortage of medical resources, rather from inappropriate distribution of resources (Der Heide, 1996).

Journalists and public health professionals are important stakeholder in information sharing and communication regarding natural and man-made disasters. The research findings suggest that due to absence of sufficient expertise and training in science and medicines the journalists are not well-prepared to give proper coverage to the disaster events (Lowrey et al., 2007).

2.23 Safety and Security

Hospital safety and security is an essential part of any emergency response after the disaster event. Safe hospitals are health facilities whose services remain accessible and functioning, at maximum capacity and within the same infrastructure, during and immediately following disasters, emergencies or crises (Sam A. Geroy & Pesigan, 2011). The presence of a well resourced and trained hospital security team is very important to make the hospital safe and secure. Need assessment of hospital security requirements and fulfilling the needs is a first step in making the hospital safer. UNISDR states that there is only 4 % difference in cost of making the safe healthcare facility. A campaign launched by UNISR to make the hospital safer consisting of following objectives:

- i. Life protection of patients and hospital staff by making the healthcare facility more resilient.
- ii. Make sure that healthcare services remains functional after disaster, because these are more needed services.
- iii. Enhance the risk reduction capacities of hospital staff and institutions, including the emergency management capabilities.

In September 2009, the Katmandu declaration on protecting the health facilities from disasters was signed by health ministers from 11 Member States of WHO in South-East Asia. Both structural and non structural components play a key role in making the hospital safer. Fire safety, exits/evacuation, emergency assembly points and training on use of different types of extinguishers are necessary to deal with fire emergency. Safety measures must be taken for existing hospitals which are vulnerable to the seismic activities and for planned hospitals, the building codes must apply. The complexity, occupancy, critical supplies, infrastructure, heavy objects, hazardous material and external dependence are the factors which make the hospital building more vulnerable to the seismic activity (Organization, 2006). According to WHO guidelines, the crowd control in emergency department is necessary and defining of minimum threshold for integration of local law-enforcement agencies and army in hospital security operations is required.

2.2.4 Triage

It is a process in which patients are sorted into priority groups according to patient's need and available resources. During Mass casualty incidents, the appropriate and timely triaging of disaster victims results in disabilities prevention and saving human lives. The disaster results in overwhelming of available resources and triage is the process of maximum utilization of limited available resources. The triage was first practiced by Dominique Jean Larrey, the chief-surgeon of Napoleon's army. Now a days, multiple triage systems are in practice all over the world. According to World Health Organization guidelines 'Emergency Triage Assessment and Treatment (ETAT)', the triage of patient is based on severity of illness or injury signs. These signs are ABCD, which give the status of airway, breathing, circulation/consciousness and deformity. In some other countries including Canada, Kingdom of Saudi Arabia and Australia, START method is being used by medical professionals. The physiological parameters in START take only 60 seconds to assess the victim. START is based on respiratory rate per minute, commands obeying, capillary refill time and or radial pulse. Four color coding are applied according to the physical parameters or conditions as shown in table below. Priorities are also described against each color code and mentioned in Table 2.3

Table 2.3: Triage Tags Color and Physical Parameters

S.NO	Color	Priority	Conditions/Physical Parameters
1	Red	Priority I	Resp. rate > 30 breaths/min Absent radial pulse, Not obey the commands
2	Yellow	Priority II	Nonambulatory patients who do not meet red or black criteria
3	Green	Priority III	Able to walk to designated safe area for further assessment
4	Black	Priority IV	No breathing despite one effort to open the airway

After MCI the application of START triage begins with the transport of ambulatory patients to a safe location and declared as minor tagged with green ribbon. Airway opening is performed in patients with no spontaneous respiration and tagged with black ribbon and declared as deceased in case of failure to restore the respiration. Patients with respiration rate higher than 30 breathes/minutes, capillary refill time more than two seconds or not able to obey simple commands will be tagged with red ribbon and declared as immediate. The remaining patients are tagged delay and with yellow color ribbon.

The disaster triage is different from other two type of triaging because of low availability of resources. According to WHO-HOPE the triage officer must be appointed to supervise all the triage process, areas for different triage processes and waiting must be allocated.

2.2.5 Surge Capacity

In recent past the pandemics, epidemics, natural and man-made disasters resulted in large number of casualties around the globe. Surge capacity is the process to accommodate large number of disaster victims (Hick et al., 2004). To reduce to loss of life and to maintain control during the disasters, successful implementation of lifeboat ethics is required. After a disaster, the hospitals functions as a life boat. Life boat ethics is phenomena applied when a ship is sinking and maximum passengers are adjusted in each life boat. So life boat ethics in hospital is the steps to treat the maximum patients with limited resource availability. According to recommendations of joint commission on accreditation of health care organizations, the hospital must have the ability to “surge in place” with stand alone operating capacity for up to 3 days (Kelen et al., 2009). During the life boat situation, most of the hospitals are providing services with no increase in capacity and resources including staff, supplies and hospital beds (Kraus, Levy, Kelen, & preparedness, 2007). Different measures are recommended to maximize the medical surge capacity. These measures include cancellation of elective surgeries, utilization of free hospital area by conversion to patient-care area, addition of more beds and discharging of already admitted patients through reverse triage process. The hospitals may face the different deficiencies during the routine and emergency situations; this highlights the importance of surge capacity through discharge of admitted patients, redistribution of biomedical and other equipments, shifting of the hospitalized patients to nearby health facilities (Kelen et al., 2006). The patients of MCI can be discharged after they get admitted in the hospital. In a study which

was conducted to assess hospital bed surge capacity after the event of mass casualty incident (MCI), the results showed that large proportion of admitted patients can be discharged from the hospital within 24 to 72 hours (Davis et al., 2005).

2.2.6 Continuity of essential services

According to WHO hospital preparedness checklist the continuation of essential hospital services that exists in normal circumstance should continue after and during the disaster event. These services are medical and surgical essential service including maternal and new born child healthcare, emergency services, and urgent surgeries. Hospitals are also at a risk of structural damage after the natural or man-made disaster. According to the study conducted by Arnold and Durkin, the San Fernando valley earthquake in Feb, 1971 resulted in catastrophic structural damage to four hospitals in the valley leading to evacuation of patients and closure (C. Arnold & Durkin, 1983). Disasters like earthquake may also result in nonstructural damages like water leakage from pipes, tanks and sprinkles (Ukai, 1997). The checklist further emphasizes on development of safe evacuation plan that ensures the continuity of intensive care services in case of disaster event. The standard evacuation plan is as shown in figure 2.2, according to WHO recommended hospital evacuation decision guide issued by agency for healthcare research and quality.

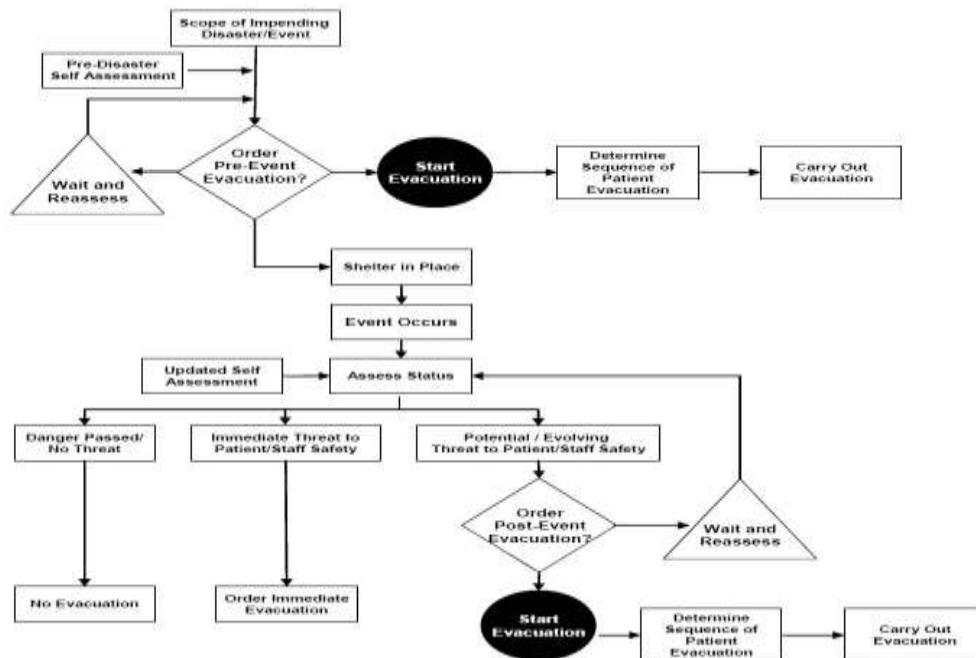


Figure 2.2: Hospital Evacuation Decision Guide

As discussed above, the evacuation results in transferring of patients to other suitable and safe hospital. The hospital authorities should properly coordinate and remain in touch with nearby healthcare facilities and private clinics to ensure provision of essential care services in the event of disaster. The backup availability of essential life line services including oxygen, power supply, water etc. is also very important. Cross-sectional survey was conducted in Shandong Province, China, in which fifty tertiary-care hospitals were assessed. The results showed that only 61 % tertiary care hospitals had the alternate energy availability in emergency event and other facilities including power, oxygen, water and telecommunications (Zhong et al., 2014). The collection and disposal of different waste including hospital waste, hazardous and human waste required a mechanism. The United Nations Basel convention declares the healthcare waste as the most dangerous waste after the nuclear waste. World health organization recommends a contingency plan for waste disposal in the checklist as well.

2.2.7 Human Resources

The availability of skillful and sufficient human resources is necessary to provide required healthcare facilities and operations continuity when disaster hits a community. The first step toward emergency preparedness is the identification of who needs to know and how to do what. As previously mentioned in command and control section, the incident command system (ICS) requires human resources for command, operations, logistics, finance and administration. Sufficient clinical staff to treat the disaster victims is a requirement for appropriate disaster response. For example, after fire emergency the burns patients are shifted to nearby hospital. Skilful human resources headed by burn specialist along with respiratory therapist, an anesthetist and nursing staff will be required to treat the burn patients. A team consisting of psychologists must be present for psychological support of burn victims and their families (Ahuja & Bhattacharya, 2004). Australian nurses play a vital role in emergency preparedness and response, from development of disaster plan to treatment of casualties and evaluation of disaster response(O'Brien, 1997) . World health organization hospital emergency response checklist clearly mentions the development of staff contact, leave policy and monitoring the staff absenteeism. The checklist also Year focuses on recruitment and training of more human resources and volunteers from universities, colleges and schools. The checklist also emphasizes on teams for psychosocial support of hospital staff and for domestic support measures. Education

and training of the hospital staff on emergency preparedness and response after a specific time period will enhance the staff capacity.

2.2.8 Logistics and supply chain management

The word of logistics was used in military for acquisition, maintenance and dispatching of material, services and personnel. Now this word is commonly used in civilian practice as well. According to WHO guidelines in humanitarian supply management and logistics in the health sector, the emergencies and disaster results in increase in logistics demand. The healthcare sector gets severely affected as a result of disaster event. The development of comprehensive logistic plan for emergency response requires knowledge and skills. Emergency Preparedness and Disaster Relief Program of Pan American Health Organization (PAHO) highlighted the importance of logistics and supply chain management in emergencies. PAHO emphasized on logistics planning and preparedness by declaring the logistics as important part of organization and national emergency response plan. Supply chain is the process of delivering the right supplies, in appropriate condition and the quantities requested, in the right places and at the time they are needed. Emergency supplies are those supplies which are used by organization for the provision of relief to effected population. It includes different goods, material and equipments. Supply can be of two types, first one is requested by the organization for relief purposes like hospitals while second one is donated from country or world for the effected population but which do not necessarily meet the need (Preparedness, Program, Emergency, & Action, 2001). World health organization hospital emergency response checklist recommends the development of updated inventory list of equipments supply and medicines. The usage estimation of different medicines and supplies during disasters are also recommended by WHO. Availability of physical space within the hospital for stockpiling is also required.

2.2.9 Post disaster recovery

When a disaster strikes, the community including hospital gets affected. The response phase begins with search, rescue and relief activities. As explained in previous sections, the hospitals are also at risk. As recommended in WHO emergency response checklist, the availability of disaster recovery officer is necessary to oversee the recovery activities in the hospital. If building of the hospital is affected from disaster, the structural repair will be also needed. Post action inventory assessment will be done by the concerned staff that is well aware of all available

resources followed by post action report and debriefing for the concerned stake holders and hospital staff.

RESEARCH METHODOLOGY

This section provides the sequence of research methods and elements that were used in study. It provides information on the hospitals studied, population and research design that was selected for the objectives of study. The chapter also presented the procedure and instrument that was used for data collection process. Furthermore, the section also defined the statistical methods that were used to analyze the data. The statistical techniques used in the study were Simple Bar Chart and chi-square test of association.

3.1 Research Design

The present study was exploratory and development in nature as it attempts to assess and develop hospital disaster and emergency plan for secondary and tertiary healthcare facilities. Thus, according to the aim of this study, the research paradigm that followed was quantitative in nature as this study includes percentages and charts of different counts. Thus, the data obtained for this study would be treated as a quantitative.

3.2 Population of the study

The study was conducted in Khyber Pakhtunkhwa. Selected secondary and tertiary health care facilities in Khyber Pakhtunkhwa were taken as population of the study.

3.3 Sampling Design and Sample Size

If all secondary and tertiary health care facilities being interviewed, we could measure all indicators with complete accuracy and could provide perfect picture and information. However, dealing or collecting information from all hospitals or health care facilities would be expensive and time consuming. It is therefore necessary to interview or select a sample of these health care facilities to obtain estimates of the actual indicators about the target population i.e. all health care facilities in Khyber Pakhtunkhwa.

The samples were drawn using Convenient Sampling method. Convenience sampling (also known as Accidental Sampling) is a type of non-probability or nonrandom sampling where

members of the target population that meet certain practical criteria, such as easy accessibility, geographical proximity, availability at a given time, or the willingness to participate are included for the purpose of the study, as explained by Ilker Etikan, Sulaiman Abubakar Musa, in their published study “Comparison of Convenience Sampling and Purposive Sampling”. The sample size, in this case, refers to the number of hospitals or health care facilities to be included in the study. A Convenient Sample of 15 health care facilities both secondary care and tertiary health care were selected for the currents study in order to achieve the study goal.

3.4 Instrument

The Questionnaire is based on WHO hospital emergency response nine key components as explained in the previous chapters. The key components have been evaluated using the options of Inappropriate, Moderate and Appropriate as verified in another study being conducted by Leila Najafi, Hosein Hatmi, to assess the hamedan hospitals (Iran) Disaster Preparedness in 2010 (Leila et al, 2017). Total fifteen hospitals are assessed including three tertiary care and twelve secondary care hospitals

3.5 Data and its Collection

The data for this study were taken from selected health care facilities using well structured Questionnaires (**Annexure-I**). A checklist or questionnaire was developed containing information based on components. These components were command and control, communication, safety and security, Patient triage, surge capacity, continuity of essential services, Human resources, Logistic and supply management, Post disaster recovery and management plan. The some questionnaires were distributed among the sampled health care facilities personally and some of them were interviewed telephonically.

3.6 Research Variables

Table 3.1 Data based on the following research variables were obtained from selected health care facilities.

S.No	Variables	Levels of Variable
1	Type of Hospitals	Secondary Care
		Tertiary Care
2	Command and Control Group for Disaster in Hospitals	Inappropriate
		Moderate
		Appropriate
3	Media and Information Facilities for Disaster Response in Hospitals	Inappropriate
		Moderate
		Appropriate
4	Safety and Licensed Security Team for Disaster in Hospitals	Inappropriate
		Moderate
		Appropriate
5	Hospitals Triage	Inappropriate
		Moderate
		Appropriate
6	Contingency site for Triage and Receipt of Mass Casualties in Hospitals	Inappropriate
		Moderate
		Appropriate
7	Surge Capacity in Hospitals	Inappropriate
		Moderate
		Appropriate
8	Ambulance/Transport for Disaster Victims in Hospitals	Inappropriate
		Moderate
		Appropriate
9	Essential Services for Disaster victims in Hospitals	Inappropriate
		Moderate

S.No	Variables	Levels of Variable
		Appropriate
10	Additional Human Resources for Disaster in Hospitals	Inappropriate
		Moderate
		Appropriate
11	Emergency and Life Saving Training Facilities for Staff in Hospitals	Inappropriate
		Moderate
		Appropriate
12	Logistics and Supply Chain	Inappropriate
		Moderate
		Appropriate
13	Post-Disaster Assessment and Recovery in Hospitals	Inappropriate
		Moderate
		Appropriate
14	Disaster/Emergency Management Plan in Hospitals	Inappropriate
		Moderate
		Appropriate

3.7 Statistical Methods

To run the analysis on above stated information or data, simple bar chart and chi-square test of association were employed which are considered as appropriate statistical methods to achieve desired goals of this study. A brief discussion on simple bar chart and chi-square test of association is given as following.

3.7.1 Simple Bar Graph

For visualization, simple bar chart is one of the techniques used to present data so that the reader easily gets all the information. Simple Bar graph is used to presents counts and percentages of different categories of variables. Simple Bar graph consists of an axis and a vertical bar and showed frequencies of different values of a variable (Cooper and Shore, 2010).

3.7.2 Chi-Square Test of Association

The Chi-Square test of association can be used to test a significant relationship between two qualitative or categorical variables. In this test, the frequency of each category for one qualitative variable is compared across the categories of the second qualitative variable. The hypothesis in this test is that H_0 : There is no significant relationship between the two categorical variables i.e. both variables are independent while its opposite hypothesis is H_1 : There is significant relationship between the two categorical variables i.e. both variables dependent (Person, 2011). Let O_{ij} presents observed or given frequency of i th row and j th column and E_{ij} showed expected frequency of i th row and j th column. Then test statistic for this test is denoted by χ^2 and can be define by:

$$\chi^2 = \sum_{i=1}^r \sum_{j=1}^c \frac{(O_{ij} - E_{ij})^2}{E_{ij}}$$

The null hypothesis can be rejected and can be conclude that there is significant relationship between two categorical variables if the value of test statistic falls in rejection regions i.e. $\chi^2 \geq \chi_{\alpha(r-1)(c-1)}^2$. It is pertinent to mentioned that the null hypothesis can also be rejected if probability value (P-value) below 5% or significance value.

3.8 Statistical Software

The study included the results analysed using two software/packages; these were Statistical Package for Social Science (SPSS) version 20 (www.ibm.com) and Microsoft Excel 2007 (www.microsoft.com). The Statistical Package for Social Science (SPSS) version 20 was used to obtain chi square test of association; and simple bar chart done by Microsoft Excel 2007.

3.9 Flow Chart Showing Study Process

In the study, first step is explorations, problem has been identified by detail literature review and questionnaire was developed base on pervious study. Two main approaches: Both primary and secondary were used in the study. The primary data i.e. assessment of hospital disaster and emergency plan for secondary and tertiary healthcare facilities were obtained through well structured questionnaire. Furthermore, secondary data i.e. evaluation of existing

disaster and emergency management plan of developed countries were addressed through detail literature review. The data have analyzed on SPSS and Microsoft Excel 2007 and result was interpreted in form of statistical tests and graphical representation for achieving the research objectives.

The following Figure 3.1 presents the flowchart of research methodology and the proposed statistical methods used in study.

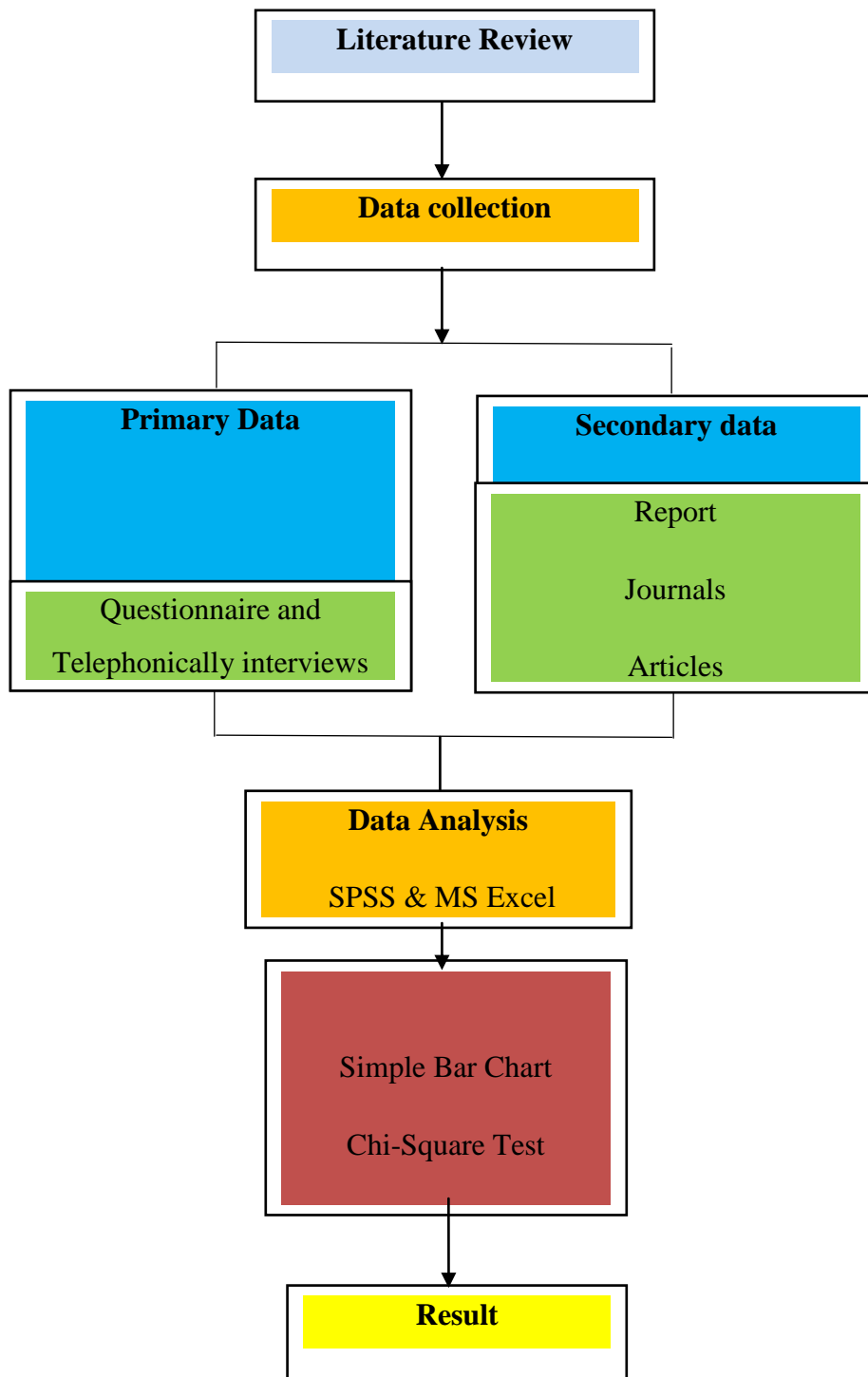


Figure 3.1: Flowchart of Research Methodology

RESULTS AND DISCUSSIONS

In this chapter, the results of the study are presented and interpreted according to the objective of the current study. The questionnaire was based on WHO Hospital Response checklist, which includes nine key components. The data was entered and analysed using Statistical Package for Social Sciences (SPSS) version 20 and Microsoft Excel 2007 for the purposes of analysis. The chapter assessed disaster and emergency preparedness level in selected fifteen secondary and tertiary care hospitals.

4.1 To Assess the Existing Disaster and Emergency Preparedness and Response Capacities of Selected Secondary and Tertiary Healthcare Facilities.

4.1.1 Type of Studied Hospitals

The following figure 4.1 presents the percentage distribution of type of hospitals studied. It was evident that the study included 80% secondary care and 20% tertiary care hospitals.

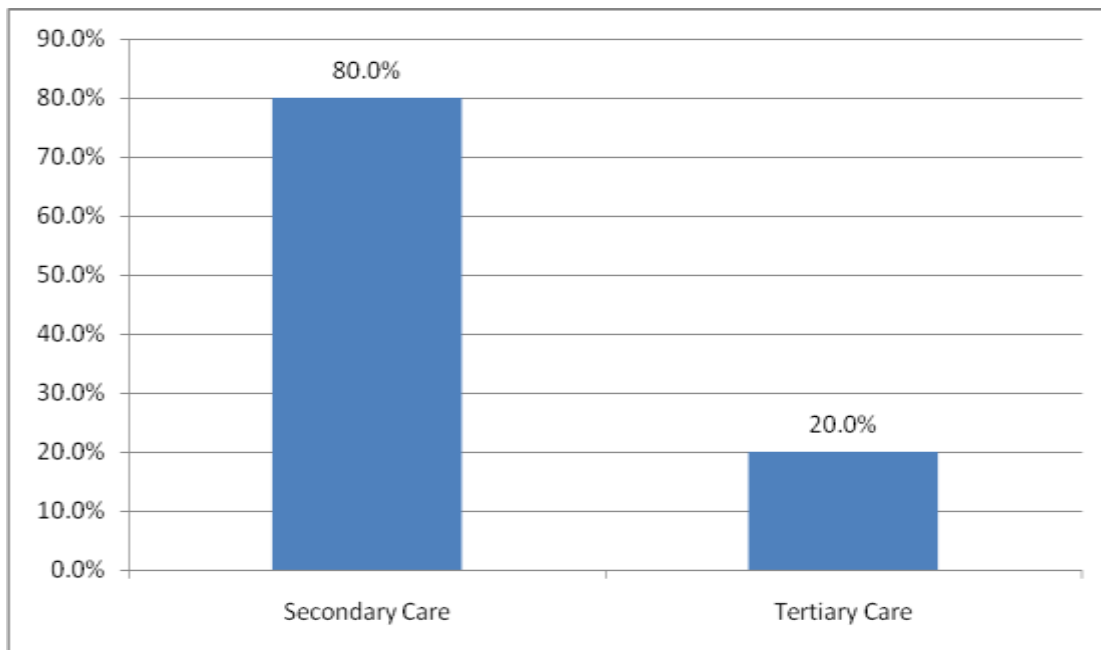


Figure 4.1: Type of Hospitals

4.1.2 Availability of Command and Control System for Disaster in Hospitals

Availability of the command and control System or incident command group in the hospital can play important role during emergency and disaster. The following figure 4.2 shows the percentage distribution of the conditions and availability of Incident command group for emergency and disaster in the hospitals. The results showed majority (66.7%) of the total studied hospitals reported that Incident command group for disaster was inappropriate. Furthermore, 26.7% of the total studied hospitals reported moderate level while only 6.7% expressed that the Incident command group for disaster in hospitals was in appropriate level.

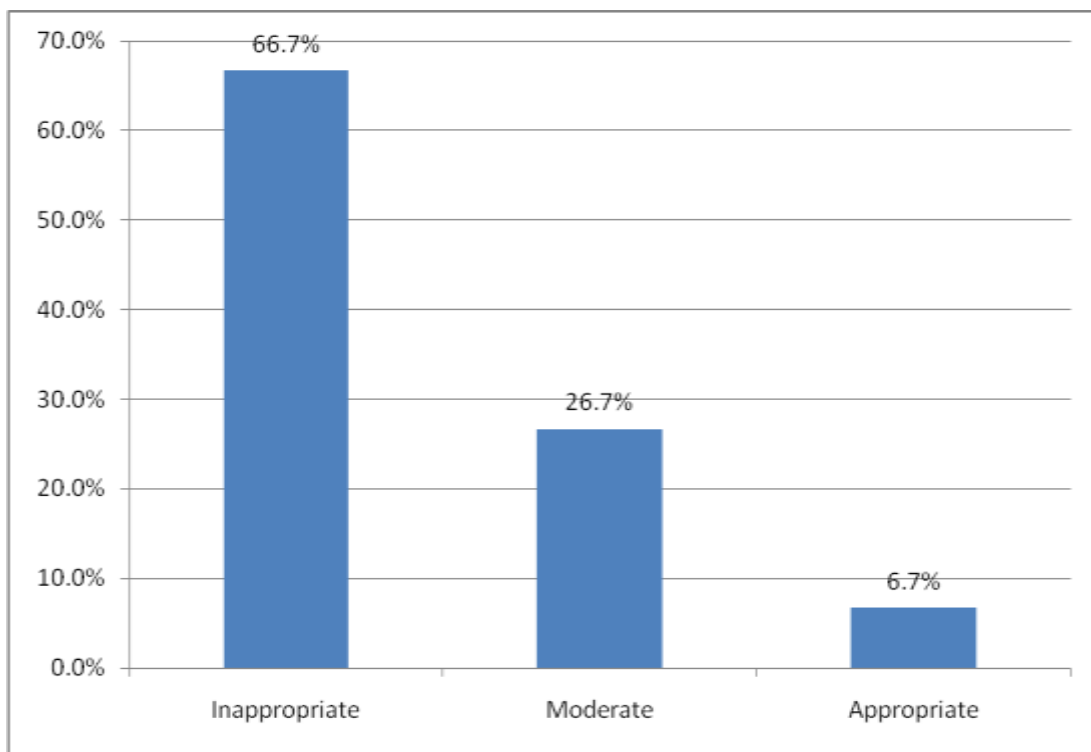


Figure 4.2: Availability of Incident Command Groups for Disaster in Hospitals

The following table 4.1 depicts the association between availability of command and control group and type of hospitals. The analysis showed maximum secondary hospitals found with inappropriate level of command and control group as compared to tertiary hospitals. It was also evident that there is exists significant association between hospital type and incident group (chi-square = 8.75 and P-value < 0.05)

Table 4.1: Association between Hospital type and Incident Group

		Incident Command Group		
		Inappropriate	Moderate	Appropriate
Hospital Type	Secondary Care	83.3%	16.7%	-
	Tertiary Care	-	66.7%	33.3%

Chi-Square = 8.75

P-Value = 0.013

4.1.3 Media and Information Facilities for Disaster Response in Hospitals

Media information sharing and other important communication is very important to respond well to disaster or emergency situation. The following figure 4.3 showed the percentage distribution of media and information facilities available for disaster response. The results revealed that the media and information facilities available for disaster in maximum hospitals (53.3%) were in inappropriate level. Similarly, about one third (33.3%) of the total studied hospitals media and information facilities were in moderate level while only 13.3% hospitals reported that they had appropriate media and information facilities available for disaster victims in hospitals.

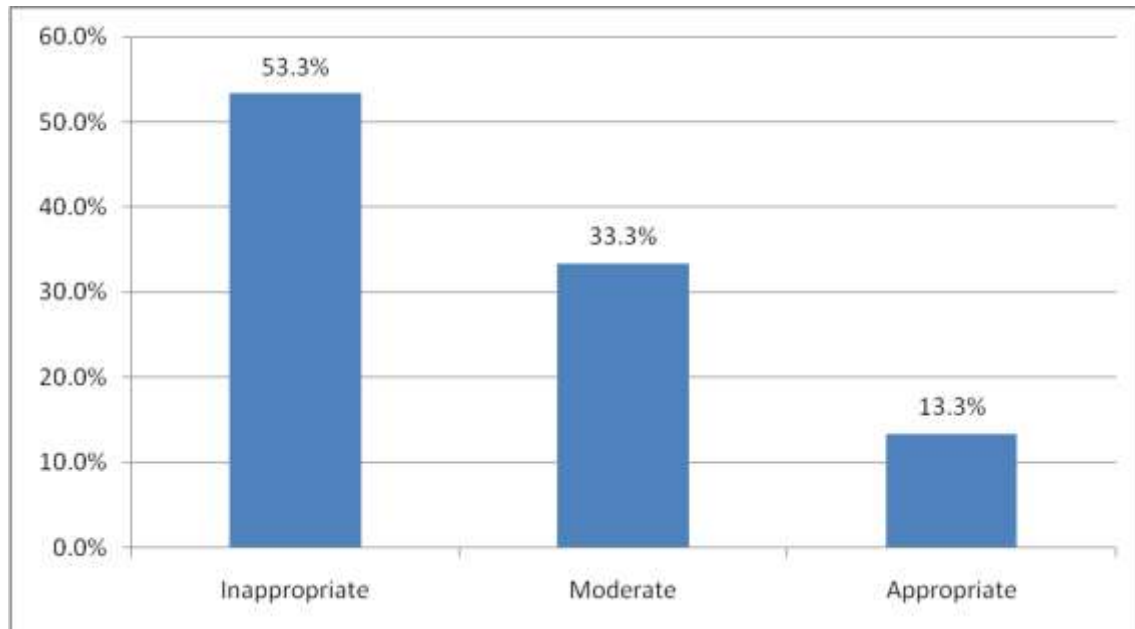


Figure 4.3: Media and Information Facilities Available for Disaster

The following table 4.2 showed association between availability of media and information facilities and type of hospitals. The analysis showed maximum secondary hospitals found with inappropriate level of media and information facilities as compared to tertiary hospitals. It was also evident that there exists significant association between hospital type and media (chi-square = 9.53 and P-value < 0.001).

Table 4.2: Association between Hospital type and Media Cell

		Media and Information Facility		
		Inappropriate	Moderate	Appropriate
Hospital Type	Secondary Care	58.3%	41.7%	-
	Tertiary Care	33.3%	-	67.7%

Chi-Square = 9.53

P-Value = 0.009

4.1.4 Safety and Licensed Security Team for Disaster in Hospitals

During or after disaster, safety and licensed security team in hospitals also play important role. The following figure 4.4 highlights the percentage distribution of safety and security team for disaster in hospitals. The analysis revealed that safety and security team in majority (60%) studied hospitals was not in satisfactory level i.e. inappropriate. About one third (33.3%) of the total studied hospitals reported that the facility of safety and security for disaster was at moderate level while only 6.7% of the total studied hospitals had appropriate i.e. good level of safety and licensed security team facility for disaster.

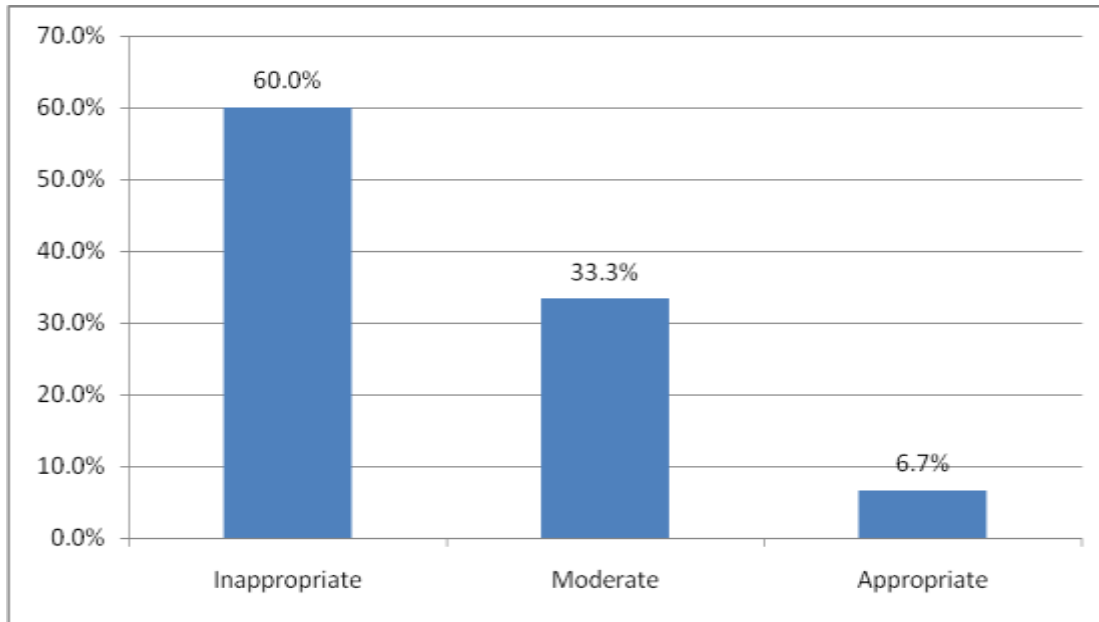


Figure 4.4: Safety and Licensed Security Team available for Disaster in Hospitals

The following table 4.3 highlighted the association between availability of safety and security and type of hospitals. The analysis showed maximum secondary hospitals found with inappropriate level of safety and security team as compared to tertiary hospitals. It was also evident that there is exists significant association between hospital type and Security (chi-square = 7.5 and P-value < 0.05).

Table 4.3: Association between Hospital type and Security Team

		Safety and Licensed Security Team		
		Inappropriate	Moderate	Appropriate
Hospital Type	Secondary Care	75%	25%	-
	Tertiary Care	-	66.7%	33.3%

Chi-Square = 7.5

P-Value = 0.024

4.1.5 Hospitals Triage

The following figure 4.5 showed the percentage distribution of patient triage protocol in emergency or casualty department in hospitals. The analysis revealed that in maximum (73.3%) hospitals, patient triage protocol in emergency department was inappropriate. Similarly, 13.3% of the total studied hospitals reported moderate level and same 13.3% of the total studied hospitals reported that the patient triage protocol in emergency was appropriate.

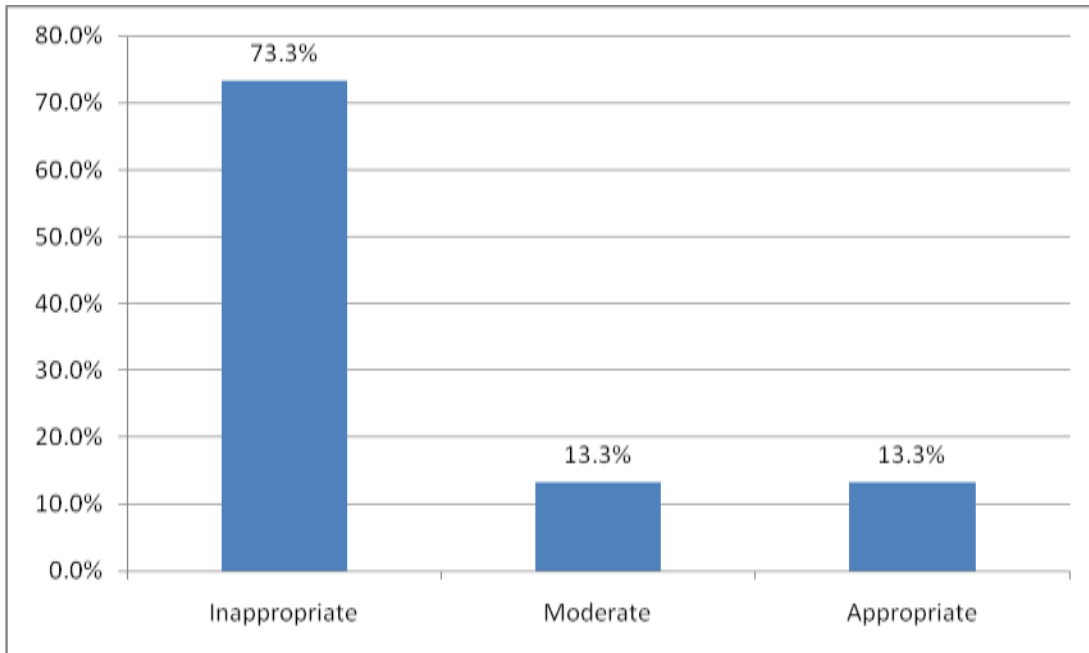


Figure 4.5: Patient Triage Protocol in Hospitals

The following figure 4.6 showed that analysis of percentage distribution of contingency site for triage and receipt of mass casualties. The analysis reported that in majority (53.3%) hospitals, contingency site for triage and receipt of mass casualties was at moderate level. The analysis also showed that in 33.3% of the total studied hospitals, contingency site for triage and receipt of mass casualties was inappropriate and in 13.3% of the total hospitals was found in appropriate level.

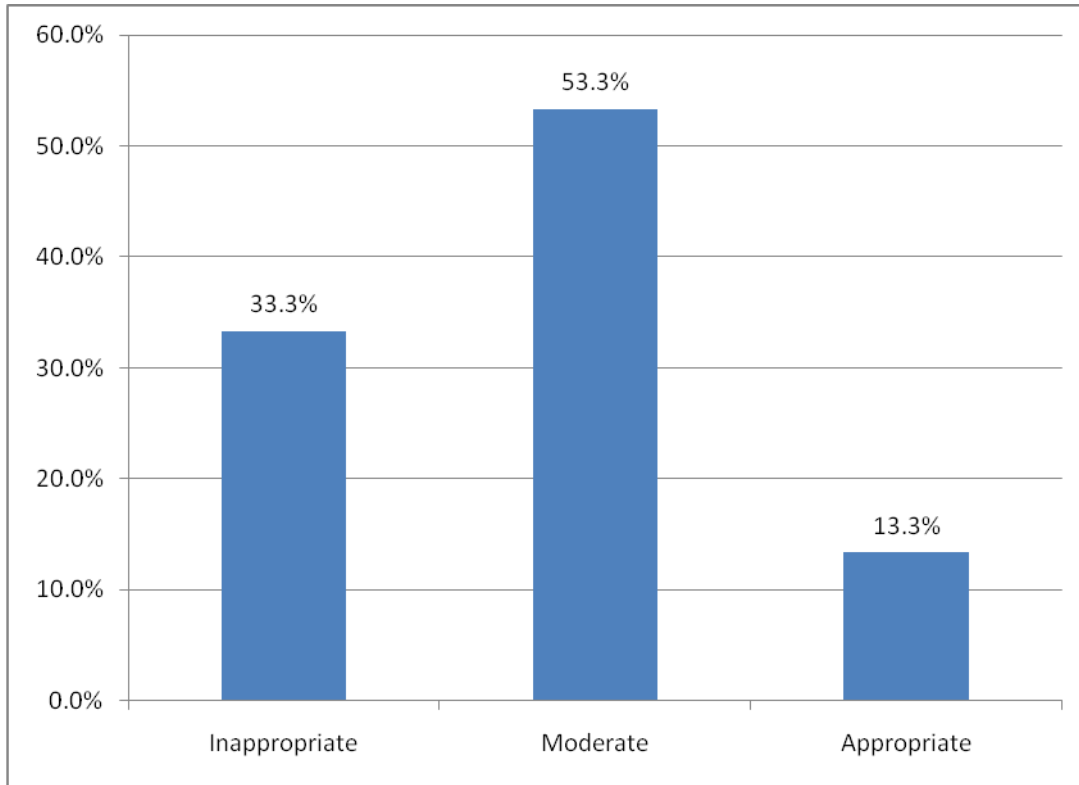


Figure 4.6: Contingency site for Triage and Receipt of Mass Casualties in Hospitals

The following table 4.4 presented the association between patient triage and type of hospitals. The analysis showed maximum secondary hospitals found with inappropriate level of patient triage protocol as compared to tertiary hospitals. It was also evident that there exists significant association between hospital type and Triage in hospitals (chi-square = 11.87 and P-value < 0.001).

Table 4.4: Association between Hospital type and Patient Triage Protocol

		Patient Triage Protocol		
		Inappropriate	Moderate	Appropriate
Hospital Type	Secondary Care	91.7%	8.3%	-
	Tertiary Care	-	13.3%	67.7%

Chi-Square = 11.87

P-Value = 0.003

4.1.6 Surge Capacity in Hospitals

In order to treat maximum disaster victims, emergency department in hospitals should have the capacity to expand is termed as surge capacity. The following figure 4.7 depicts the percentage distribution of surge capacity in emergency department for disaster victims. The analysis revealed that a moderate level surge capacity was found in maximum (73.3%) hospitals. Furthermore, the results showed that in 20% of the studied hospitals the surge capacity was inappropriate while in 6.7% of the total hospitals had appropriate surge capacity.

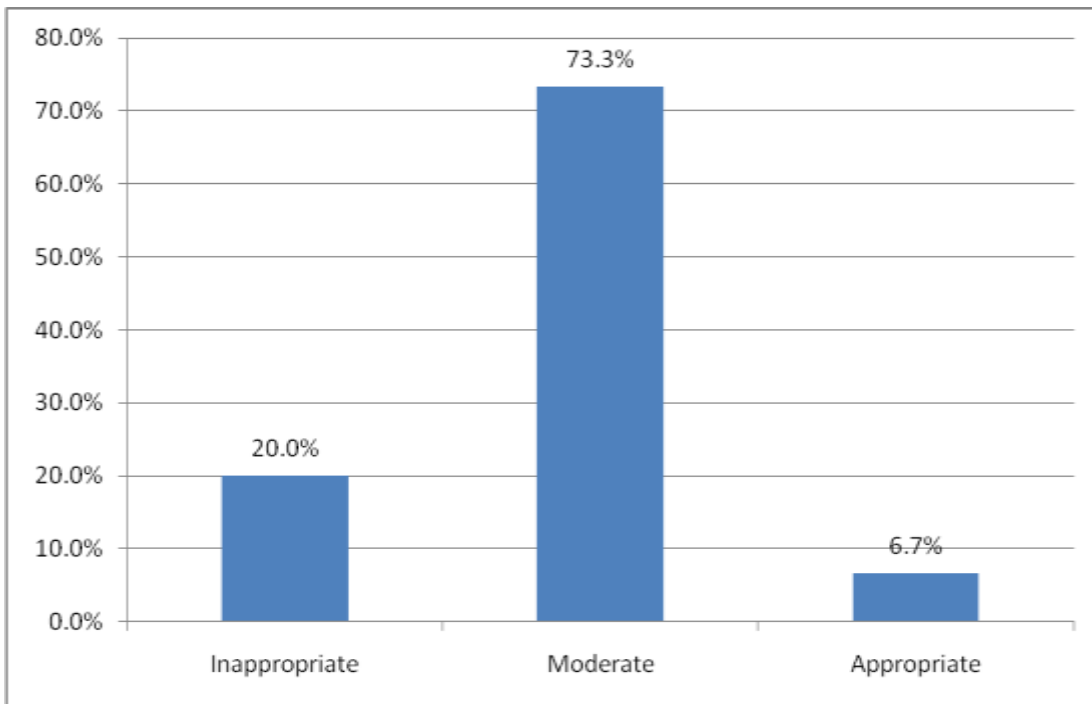


Figure 4.7: Surge Capacity in Hospitals

The following table 4.5 showed association between surge capacity and type of hospitals. The analysis showed maximum secondary hospitals found with inappropriate level of surge capacity as compared to tertiary hospitals. It was also evident that there is exists no significant association between hospital type and surge capacity (chi-square = 4.77 and P-value > 0.05).

Table 4.5: Association between Hospital type and Surge Capacity in Hospitals

		Surge Capacity in Hospitals		
		Inappropriate	Moderate	Appropriate
Hospital Type	Secondary Care	25%	75%	-
	Tertiary Care	-	67.7%	33.3%

Chi-Square = 4.77

P-Value = 0.092

4.1.7 Ambulance/Transport for Disaster Victims in Hospitals

Ambulance crew to transport the disaster victims to nearby hospitals is another important facility required for every hospital. The following figure 4.8 showed the percentage distribution of ambulance facility available for disaster victims in hospitals. It was evident that maximum (80%) of the studied hospitals, moderate level ambulance facility was available for disaster victims. Similarly, it was shown that there were 13.3% of hospitals found with appropriate and 6.7% studied hospitals found with inappropriate level ambulance facility for disaster victims.

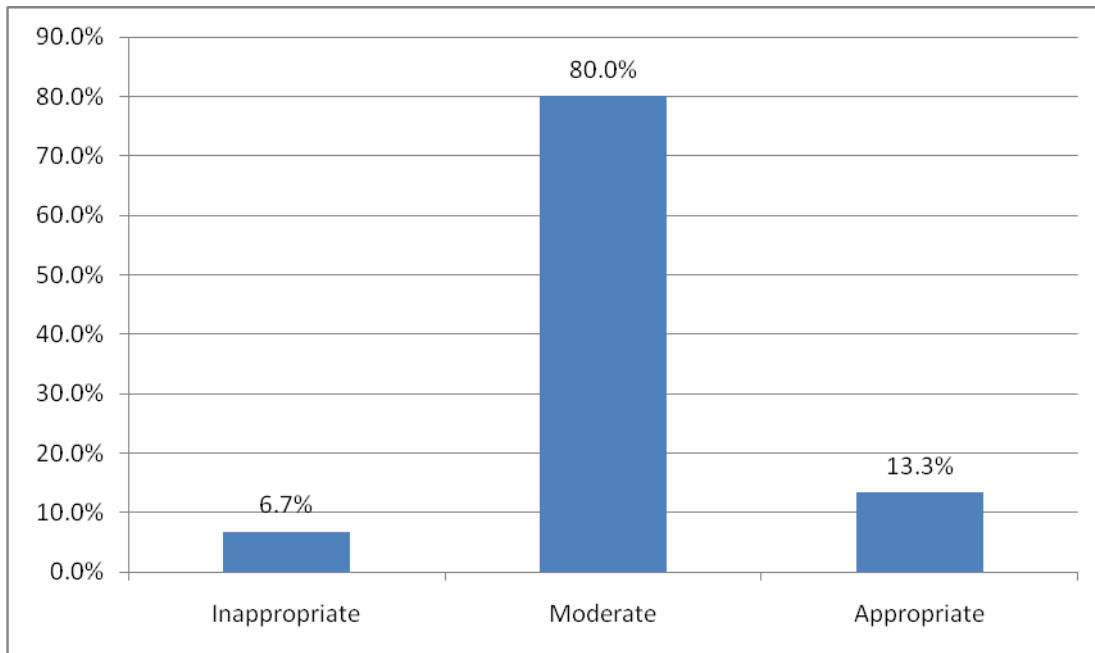


Figure 4.8: Ambulance for Disaster Victims in Hospitals

The following table 4.6 showed association between ambulance for disaster victims and type of hospitals. The analysis showed maximum tertiary hospitals found with appropriate level of ambulance for disaster victims as compared to secondary hospitals. It was also evident that there exists significant association between hospital type and availability of ambulance (chi-square = 9.27 and P-value < 0.05).

Table 4.6: Association between Hospital type and Ambulance for Disaster Victims

		Ambulance for Disaster Victims		
		Inappropriate	Moderate	Appropriate
Hospital Type	Secondary Care	8.3%	91.7%	-
	Tertiary Care	-	33.3%	67.7%

Chi-Square = 9.27

P-Value = 0.01

4.1.8 Essential Services for Disaster victims in Hospitals

The essential services include pathology, radiology, blood bank, Operation Theater, pharmacy service. Following figure 4.9 depicts the percentage distribution of essential services for disaster victims. The analysis revealed that essential services for disaster victims in majority (73.3%) hospitals were found at inappropriate level. Furthermore, it was evident that in 20% of hospitals, the essential services were at moderate level while only 6.7% of hospitals had appropriate essential services for disaster victims.

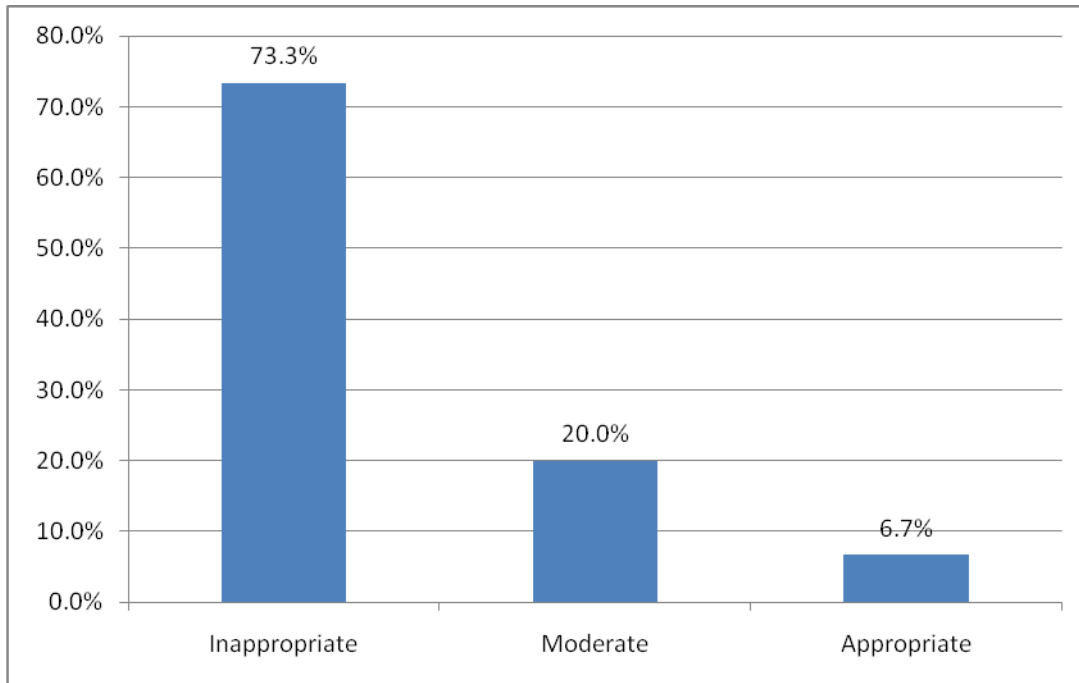


Figure 4.9: Essential Services for Disaster Victims in Hospitals

The following table 4.7 showed association between availability of essential services for disaster victims and type of hospitals. The analysis showed maximum secondary hospitals found with inappropriate level of essential disaster services as compared to tertiary hospitals. It was also evident that there is exists significant association between essential disaster services (chi-square = 10.83 and P-value < 0.001).

Table 4.7: Association between Hospital type and Essential Disaster Services

		Essential Disaster Services		
		Inappropriate	Moderate	Appropriate
Hospital Type	Secondary Care	91.7%	8.3%	-
	Tertiary Care	-	67.7%	33.3%

Chi-Square = 10.83

P-Value = 0.004

4.1.9 Additional Human Resources for Disaster in Hospitals

When emergency is declared, the availability of additional human resources may reduce the damage that has occurred i.e. could save more life. The following figure 4.10 showed at moderate level of additional human resources was found in majority (53.3%) hospitals. Furthermore, it was evident that one third (33.3%) hospitals had inappropriate and 13.3% hospitals had appropriate additional human resources for disaster.

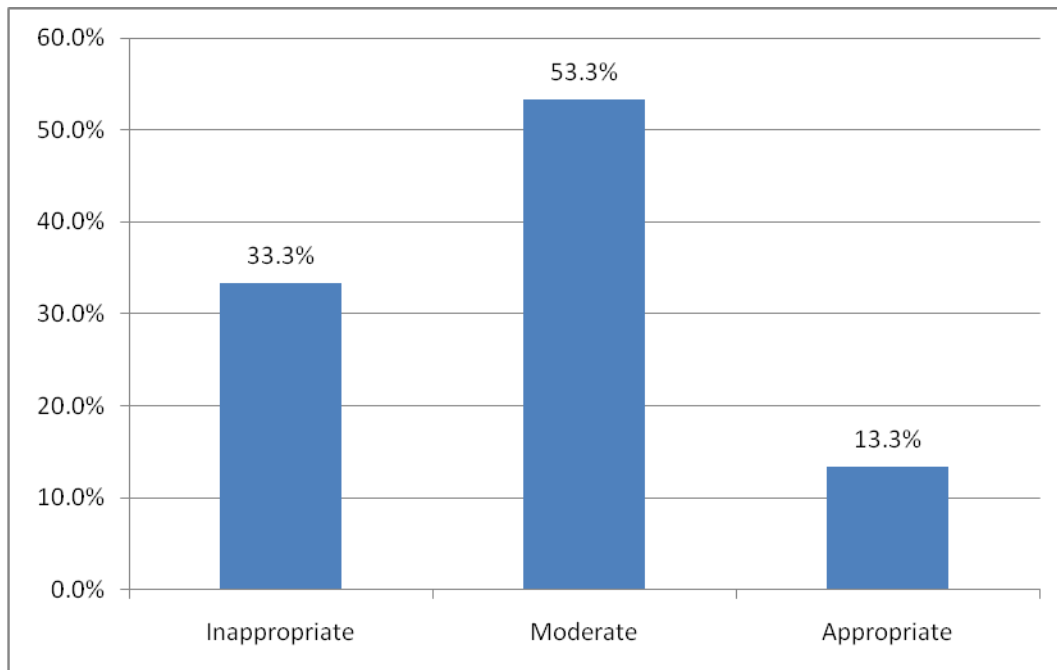


Figure 4.10: Additional Human Resources for Disaster in Hospitals

The following figure 4.11 highlighted the percent distribution showing emergency and life saving training facilities for staff in hospitals. It was evident that 80% hospitals found with inappropriate emergency and life saving training facilities for staff. Furthermore, 13.3% of the total studied hospitals had appropriate level and 6.7% hospitals had moderate level of emergency and life saving training facilities for staff.

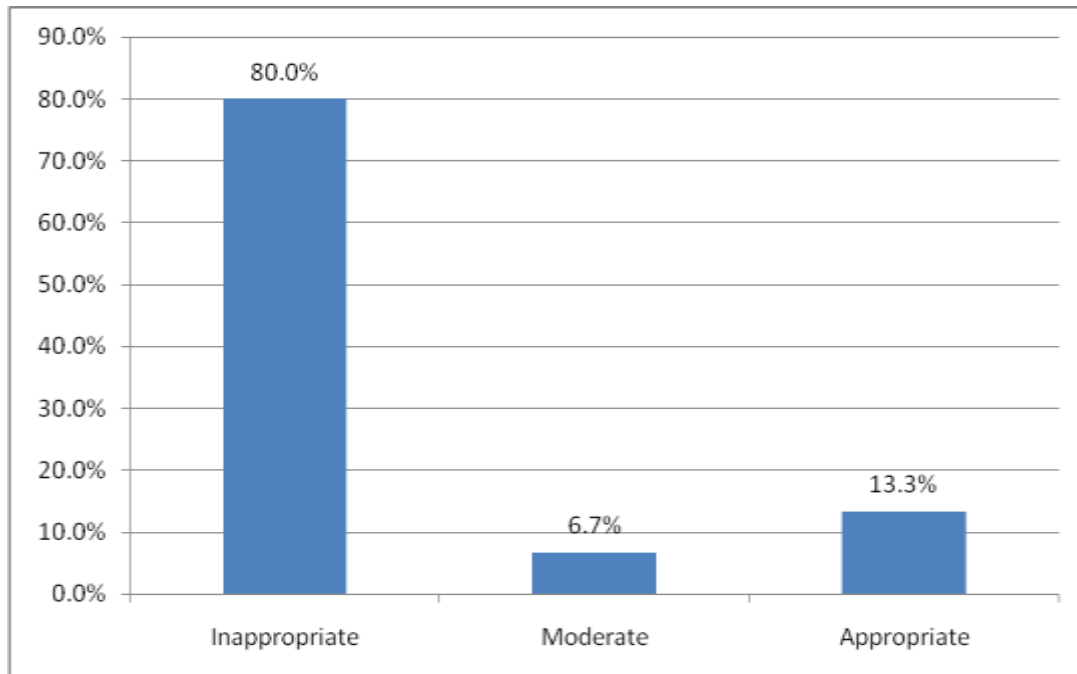


Figure 4.11: Emergency and Life Saving Training Facilities for Staff in Hospitals

The following table 4.8 showed association between availability of additional human resources for disaster and type of hospitals. The analysis showed maximum secondary hospitals found with inappropriate level of additional human resources for disaster victims as compared to tertiary hospitals. It was also evident that there is exists significant association between hospital type and human resources (chi-square = 9.53 and P-value < 0.001).

Table 4.8: Association between Hospital type and Additional Human Resources

		Additional Human Resources		
		Inappropriate	Moderate	Appropriate
Hospital Type	Secondary Care	41.7%	58.3%	-
	Tertiary Care	-	33.3%	67.7%

Chi-Square = 9.53

P-Value = 0.009

4.1.10 Logistics and Supply Chain

The availability of necessary inventory items and supplies in the emergency situations is mandatory for prompt response. The following table 4.12 highlighted the percentage distribution showing inventory list and backup plan of all necessary items in hospitals. It was evident that maximum (73.3%) hospitals found with inappropriate inventory list and backup plan of necessary items. Furthermore, 13.3% of the total studied hospitals had appropriate level and also 13.3% hospitals had moderate level of inventory list and backup plan of necessary items.

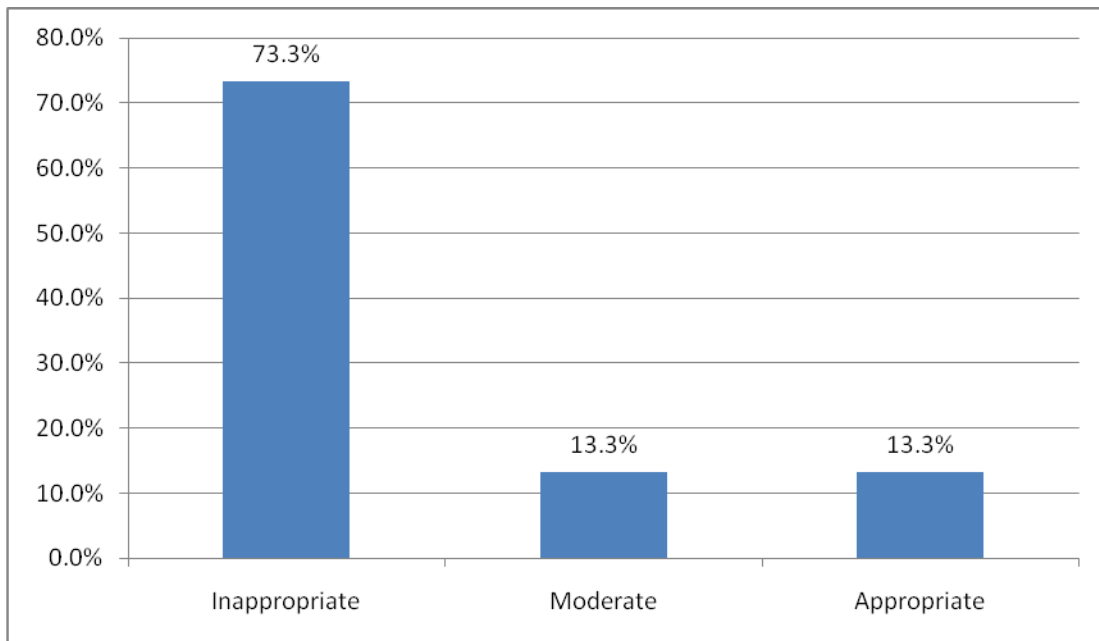


Figure 4.12: Inventory List and Backup Plan of Necessary Items in Hospitals

The following table 4.9 showed association between back up plan and type of hospitals. The analysis showed maximum secondary hospitals found with inappropriate level of backup plan of necessary items as compared to tertiary hospitals. It was also evident that there is exists significant association between hospital type and backup plan for necessary items (chi-square = 11.87 and P-value < 0.05).

Table 4.9: Association between Hospital type and Backup Plan

		Backup Plan		
		Inappropriate	Moderate	Appropriate
Hospital Type	Secondary Care	91.7%	8.3%	-
	Tertiary Care	-	33.3%	66.7%

Chi-Square = 11.87

P-Value = 0.003

4.1.11 Post-Disaster Assessment Recovery in Hospitals

The Post-Disaster need assessment and re-functioning of the hospital is required after disaster. Following figure 4.13 showed the percentage distribution of post disaster need assessment team that make the hospital functional and appropriate. It was evident that in maximum (93.3%) of the studied hospitals had moderate level of post-disaster assessment recovery. Similarly, it was shown that there were 13.3% of hospitals found with appropriate and no one of the studied hospitals found with inappropriate level of post disaster recovery.

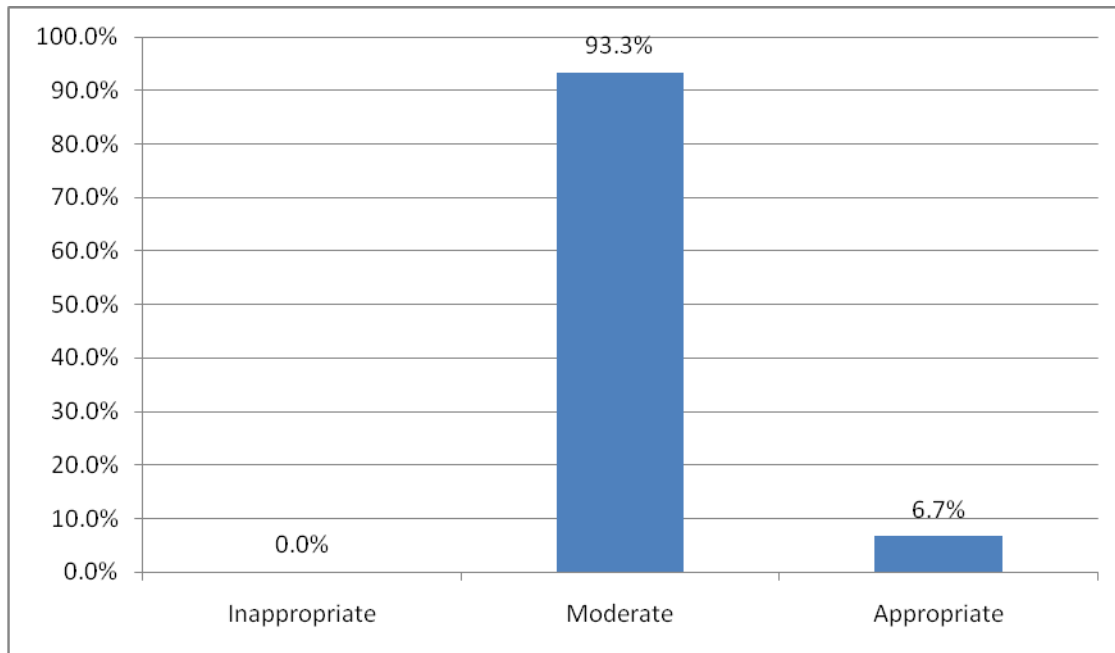


Figure 4.13: Post-Disaster Assessment Recovery in Hospitals

The following table 4.10 showed association between post disaster assessment recovery in hospitals and hospitals type. The analysis showed maximum tertiary hospitals found with appropriate level of post disaster assessment recovery as compared to secondary care hospitals. It was also evident that there is exists significant association between hospital type and post disaster assessment recovery (chi-square = 4.286 and P-value < 0.05).

Table 4.10: Association between Hospital type and Post-Disaster Recovery in Hospitals

		Post-Disaster Assessment Recovery		
		Inappropriate	Moderate	Appropriate
Hospital Type	Secondary Care	-	100%	-
	Tertiary Care	-	67.7%	33.3%

Chi-Square = 4.286

P-Value = 0.038

4.1.12 Disaster/Emergency Management Plan in Hospitals

In order to treat maximum disaster victims, emergency department in hospitals should have emergency or disaster management plan. The following figure 4.14 depicts the percentage distribution of disaster management plan exists in selected hospitals. The analysis revealed that inappropriate level i.e. no management plan was found in maximum (66.7%) hospitals. Furthermore, the results showed that in 20% of the studied hospitals the disaster management plan was inappropriate while in 13.3% of the total hospitals had expressed moderate level of disaster or emergency management plan.

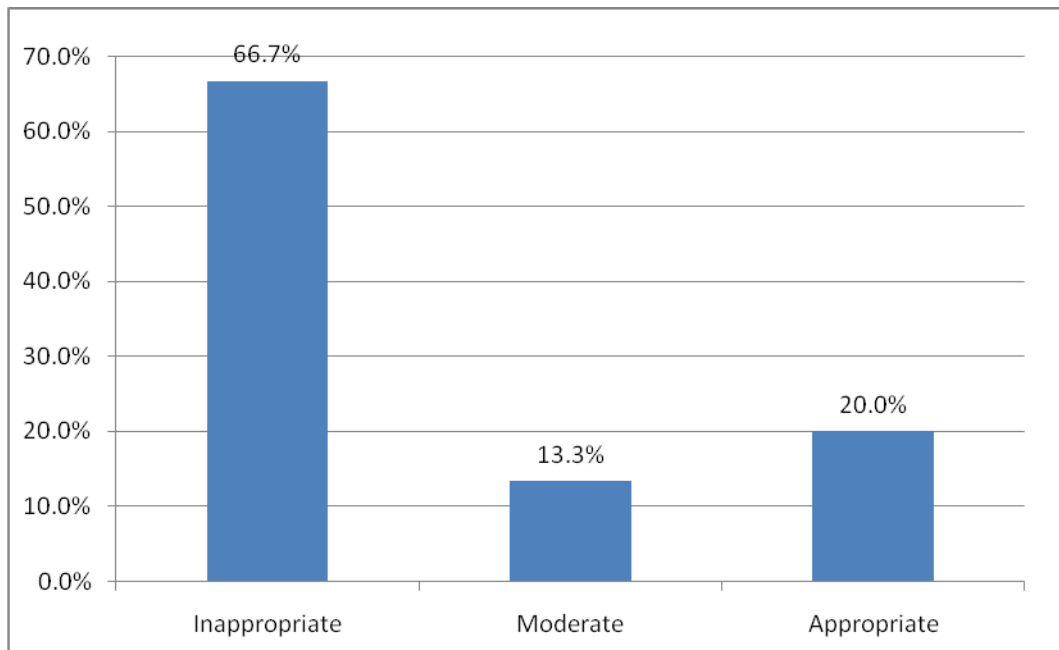


Figure 4.14: Disaster Management Plan in Hospitals

The following table 4.11 showed association between Disaster management plan and type of hospitals. The analysis showed maximum tertiary hospitals found with appropriate level of disaster management plan as compared to secondary care hospitals. It was also evident that there is exists significant association between hospital type and disaster management plan (chi-square = 15.0 and P-value < 0.01).

Table 4.11: Association between Hospital type and Disaster Management Plan in Hospitals

		Disaster Management Plan		
		Inappropriate	Moderate	Appropriate
Hospital Type	Secondary Care	83.3%	16.7%	-
	Tertiary Care	-	-	100%

Chi-Square = 15.0

P-Value = 0.001

4.1.13 Results Summary

The following table showed the results of summary statistics i.e. mean and standard deviation for the main components of the current study. The mean or average value summarized the response regarding each component while standard deviation measured the variation or fluctuation in the response regarding each component. The results revealed that the average level of command group for disaster in hospitals were inappropriate, as mean value close to 1 (mean = 1.40 and SD = 0.63). As regard to media and information, on the average, it was found at moderate level (mean = 1.60 and SD = 0.74). The analysis depicts that on the average, Security/safety team (mean = 1.47 and SD = 0.64), patient protocol (mean = 1.40 and SD = 0.74), essential services (mean = 1.33 and SD = 0.62) and logistics/supply chain were recorded inappropriate or not available for disasters in the study hospitals, as mean values were close to 1. Furthermore, it was evident that on the average, Contingency site for Triage and Receipt of Mass Casualties (mean = 1.80 and SD = 0.68), Ambulance/Transport (mean = 2.07 and SD = 0.46), Post-Disaster Assessment Recovery (mean = 2.07 and SD = 0.26) and Additional Human Resources (mean = 1.80 and SD = 0.68) were at moderate level in the study hospitals.

Table 4.12: Summary Statistics of Components of the Study

Component	Mean	Standard Dev.
Common and Control Group	1.40	0.63
Media and Information	1.60	0.74
Security and Safety Team	1.47	0.64
Patient Triage Protocol	1.40	0.74
Contingency site for Triage and Receipt of Mass Casualties	1.80	0.68
Surge Capacity in Hospitals	1.87	0.52
Ambulance/Transport for Disaster Victims in Hospitals	2.07	0.46
Essential Services for Disaster victims in Hospitals	1.33	0.62
Additional Human Resources for Disaster in Hospitals	1.80	0.68
Emergency and Life Saving Training Facilities for Staff in Hospitals	1.33	0.72
Logistics and Supply Chain	1.40	0.74
Post-Disaster Assessment Recovery in Hospitals	2.07	0.26
Disaster/Emergency Management Plan in Hospitals	1.53	0.83

1 = Inappropriate**2 = Moderate****3 = Appropriate**

4.3 Design an Integrated Disaster and Emergency Management Plan for Secondary and Tertiary Healthcare Facilities

The two hospitals were selected. One is from tertiary care which is lady reading Hospital, Medical Teaching Institution and another is secondary care which is District Headquarters hospital, Kohat.

Emergency and Disaster Management Plan for Lady Reading Hospital, Medical Teaching Institution, Peshawar

Disaster preparedness planning involves identifying organizational resources, determining roles and responsibilities, developing policies and procedures and planning activities in order to reach a level of preparedness and to response the emergency in a proper and coordinated manner. It is best to work on preparedness plans in consultation and cooperation with those who will have to implement or approve them. This preparedness plan will be molded in complete coordination with the all stake holders of the lady reading hospital, MTI.

1. Introduction of the Hospital

The LRH was established in 1927 on the directions of Her Excellency Lady Reading. She was a wife of His Excellency Lord Reading, viceroy of India from 1921 to 1926. Hospital has approximately 1850 beds including 180 beds emergency department. Hospital is recognized by College of Physician and Surgeons of Pakistan (CPSP) for post graduate trainings of doctors. LRH is a biggest and oldest hospital of Khyber Pakhtunkhwa. Approximately eight thousand patients visiting this hospital every day for treatment and checkup. It includes twenty five hundred emergency patients. Website data shows that 9,16946 patients have visited emergency department in last year i.e. 2017. LRH is treating the disaster victims since long and have managed 267 incidents of mass casualty from 2007 to 2017.

2. Aims of the Plan

- The aim of LRH-MTI emergency and disaster management plan is to produce a document which could clarify and assign the roles and responsibilities of each individual and department prior to, during and post disaster or emergency situation, within complete coordination with the all stakeholders.

- To reduce the damage to hospital and to provide maximum treatment facilities to the disaster victims when emergency is declared and plan is activated.

The plan is following

i. Hospital Incident Command Group/Disaster Team

Incident command group is consisting of all Managers of each administrative section of the hospital and it is headed by Hospital director, which is incident commander. The medical director and nursing director will be senior members. The incident commander will sit in command centre for execution of all activities according to incident command system (ICS). The manager emergency office will be command centre. The outside assistance will be called by Incident commander. The Incident command group or Disaster team (DT). The DT will perform:

- a) Report to command centre when emergency is declared.
- b) Risk assessment of the hospital.
- c) Identify elements at risk and factors contributing to the vulnerability.
- d) To make sure the supply chain and logistics, including pharmaceuticals, human resources, equipments, material and finance.
- e) Risk reduction and mitigation measures.
- f) Early warning system for evacuation and prompt response.
- g) Evacuation routes and mode of transport for patients and staff.
- h) Efficient communication with all stake holders
- i) Will assess the post disaster need assessment and will make sure the complete recovery of the hospital building and services.
- j) Training and drills of hospital staff on emergency response.

ii. Communication

After the approval from incident commander the manager media will disseminate the information of disaster victims to the relevant sections and departments. The android mobile application will also serve for information sharing and emergency alert/early warning to relevant stakeholders.

iii. Safety, security and multi hazard Profile of LRH-MTI

Deputy Superintendent of Police (DSP) of LRH is responsible for all security measures. Manager security is senior member of the security committee. When emergency is declared the crowd control and strict control on entry and exit points will be more enhanced. In case the hospital needs additional security, the incident commander will request to district administration of Peshawar for additional security forces.

The multi hazard profile of LRH is performed and it was found that following are hazards of LRH.

Possible Hazards and Emergencies	Risk Level (None, Low, Moderate, or High)	How can LRH and people working there reduce its risk?
Natural Hazards		
1. Floods	Low	Evacuation plan, building measures
2. Heavy Rains	High	Appropriate sewerage system and evacuation plan
3. Earthquakes	Moderate	Building measures and evacuation plan
4. Extreme Heat	Moderate	Proper cooling system and backup
5. Thunderstorms and Lightning	Low	Building measures and evacuation plan
6. Winter Storms and Extreme Cold	Low	Proper heating system for staff, patients and visitors.
Others (if any)		
Technological Hazards		
Hazardous Material incidents i.e. Fires etc.	Moderate	Early warning, fire extinguishers
Others (if any)		
Terrorism		
Explosions	Low	Building measures, staff training and safety
Others (if any)		

iv. Triage

The triage of mass casualties will be performed by a triage officers and most urgent (with red tag) disaster victims will be treated immediately. The stable patients (with green tag) will be referred to OPD for treatment because OPD will be also converted in emergency department. The dead victims (with black tag) will be shifted to LRH mortuary or forensic department of Khyber Medical College, Peshawar.

v. Surge Capacity/Expansion of emergency Patient capacity

The stable patients will be shifted to other wards of the hospital like eye ward, endocrinology ward and maxillofacial ward. The non essential cases may be discharged to vacate more beds. It will enhance the disaster patient accommodation capacity. In case no bed is available then the Command centre will coordinate with nearby tertiary care hospital. LRH ambulances will transport the patient to Khyber teaching hospital or Haytabad medical complex.

vi. Continuity of essential services

The continuity of essential services is necessary and ICG member will make sure the availability of required resources with contingency plan. The HoD of clinical sides will make sure the provision of essential clinical services (radiology, pathology, blood bank, neurosurgery etc) for disaster victims. Manager emergency will make sure the availability of all essential services to disaster victims.

vii. Human Resources

The sufficient HR will be required for prompt emergency response. Emergency department has trained all clinical staff in golden hour course. Golden hour course is consisting of emergency/life saving procedures. In case of emergency the incident commander will call more staff from wards and hostels to treat disaster victims. Registered volunteers from Khyber medical university will also take part in relief activities.

viii. Logistics and Supply Chain/Stockpiling

The inventory (equipments, pharmaceuticals, supplies) required for disaster victims must be ready 24/7 round the year. The concerned sections (pharmacy, biomedical, store, and works) are responsible to make sure the availability of inventory. They will submit a detailed report to hospital director. The report will consist of contingency stock for disaster victims.

ix. Post-Disaster Recovery/Damage Assessment and Evacuation

The evacuation of patients and staff will be performed in a way that maximum patients and staff are facilitated. Incident commander will order the evacuation. Patient will be transported to nearby hospitals and staff and their families to the nearby shelter in place. The Associate Hospital director will manage the evacuation. A team consisting of Manager Emergency, Deputy Director Works, Deputy Director Electrical, Deputy Director Finance, Manager Store, Manager Facilities and Biomedical Engineer will perform damage and need assessment after disaster. In case damage to the hospital the debris will be cleared by works and facilities department.





Emergency and Disaster Management Plan For
District Headquarter Hospital, Kohat

Disaster preparedness planning involves identifying organizational resources, determining roles and responsibilities, developing policies and procedures and planning activities in order to reach a level of preparedness and to respond the emergency in a proper and coordinated manner. It is best to work on preparedness plans in consultation and cooperation with those who will have to implement or approve them. This preparedness plan will be molded in complete coordination with the all stake holders of the District Headquarter Hospital, Kohat.

3. Introduction of the Hospital

The DHQ Hospital Kohat is situated in Kohat Development Authority housing society, Kohat. The new building of this hospital was started in year 2000. It is 269 beds hospital including 80 beds trauma and emergency department. The hospital is not only providing services to the people of kohat but also to districts of Karak, Hangu, Parachinar and Kurram. Hospital authorities mentioned that approximately 350 to 400 patients visit emergency department in a day. This hospital is at a distance of 45 kilometers from Provincial capital, Peshawar.

4. Aims of the Plan

- The aim of DHQ Hospital Kohat emergency and disaster management plan is to produce a document which could clarify and assign the roles and responsibilities of each individual and department prior to, during and post disaster or emergency situation, within complete coordination with the all stakeholders.
- To reduce the damage to hospital and to provide maximum treatment facilities to the disaster victims when emergency is declared and plan is activated.

The plan is following:

x. Hospital Incident Command Group/Disaster Team

Incident command group is consisting of all Deputy Medical Superintendents and sectional heads/supervisors of each administrative section of the hospital and it is headed by Medical Superintendent, which is incident commander. The Senior most medical officer which may be a

Principal Medical Officer, nursing Superintendent and chief of Paramedics will be senior members. The incident commander will sit in command centre for execution of all activities according to incident command system (ICS). The Medical Superintendent office will be command centre. The outside assistance will be called by Incident commander. The Incident command group or Disaster team (DT). The DT will perform:

- a) Report to command centre when emergency is declared.
- b) Risk assessment of the hospital.
- c) Identify elements at risk and factors contributing to the vulnerability.
- d) To make sure the supply chain and logistics, including pharmaceuticals, human
- e) resources, equipments, material and finance.
- f) Risk reduction and mitigation measures.
- g) Early warning system for evacuation and prompt response.
- h) Evacuation routes and mode of transport for patients and staff.
- i) Efficient communication with all stake holders
- j) Will assess the post disaster need assessment and will make sure the complete recovery of the hospital building and services.
- k) Training and drills of hospital staff on emergency response.

xi. Communication

After the approval from incident commander the DMS (Admin) will disseminate the information of disaster victims to the relevant sections and departments.

xii. Safety, security and multi hazard Profile of DHQ Hospital Kohat

The DMS (Admin) will be in closed liaison with Police department and supervisor of private security company which is already providing services. In case of declaration of emergency the DMS (Admin) will request to MS or Police department for provision of security. It is also recommended that hospital own security team must be developed for sustainable security measures.

The multi hazard profile of DHQ Hospital Kohat was performed and it was found that following are hazards of DHQ Hospital Kohat.

Possible Hazards and Emergencies	Risk Level (None, Low, Moderate, or High)	How can DHQ Hospital and people working there reduce its risk?
Natural Hazards		
1. Floods	Low	Evacuation plan, building measures
2. Heavy Rains	High	Appropriate sewerage system and evacuation plan
3. Earthquakes	Moderate	Building measures and evacuation plan
4. Extreme Heat	Moderate	Proper cooling system and backup
5. Thunderstorms and Lightning	Low	Building measures and evacuation plan
6. Winter Storms and Extreme Cold	Low	Proper heating system for staff, patients and visitors.
Others (if any)		
Technological Hazards		
Hazardous Material incidents i.e. Fires etc.	Moderate	Early warning, fire extinguishers
Others (if any)		
Terrorism		
Explosions	Low	Building measures, staff training and safety
Others (if any)		

Triage

The triage of mass casualties will be performed by Casualty Medical officers/CMO and most urgent (with red tag) disaster victims will be treated immediately. The stable patients (with green tag) will be referred to General medical ward for treatment because General medical Ward will be also converted in emergency department. The dead victims (with black tag) will be shifted to

Post mortem room for further procedures. The critical patients including thoracic and vascular injured cases will be referred to Lady reading Hospital, MTI, Pesahar.

xiii. Surge Capacity/Expansion of emergency Patient capacity

The stable patients will be shifted to other wards of the hospital like ENT ward and Eye ward. The non essential cases may be discharged to vacate more beds. It will enhance the disaster patient accommodation capacity. In case no bed is available then the Command centre will coordinate with nearby hospitals. The ambulances will transport the patient to Liaqat Hospital, Kohat or Dara Adam Khel Hospital.

xiv. Continuity of essential services

The continuity of essential services is necessary and ICG member will make sure the availability of required resources with contingency plan. The HoD of clinical sides will make sure the provision of essential clinical services (radiology, pathology, blood bank, Surgery etc) for disaster victims. DMS (Admin) will make sure the availability of all essential services to disaster victims.

xv. Human Resources

The sufficient HR will be required for prompt emergency response. In case of emergency the incident commander will call more staff from wards and hostels to treat disaster victims. Registered volunteers from Kohat Institute of Medical Sciences and Kohat Institute of dental Science will be called for support. Emergency department vacant seats must be filled immediately and maximum staff must be trained in emergency/life saving procedures.

xvi. Logistics and Supply Chain/Stockpiling

The inventory (equipments, pharmaceuticals, supplies) required for disaster victims must be ready 24/7 round the year. The concerned sections (pharmacy, biomedical, store, and works) are responsible to make sure the availability of inventory. They will submit a detailed report to Medical Superintendent. The report will consist of contingency stock for disaster victims.

xvii. Post-Disaster Recovery/Damage Assessment and Evacuation

The evacuation of patients and staff will be performed in a way that maximum patients and staff are facilitated. Incident commander will order the evacuation. Patient will be transported to

nearby hospitals and staff and their families to the nearby shelter in place. The DMS (Admin) will manage the evacuation. A team consisting of DMS (Emergency), DMS (Admin), and Supervisor Electrical, Superintendent/clerk Finance, Store Keeper, and Biomedical technician will perform damage and need assessment after disaster. In case damage to the hospital the debris will be cleared by housekeeping department.

The Plan will be reviewed after every six months and changes will be made after the approval of Incident command Group.





CONCLUSION AND RECOMMENDATIONS

The current chapter presented overall summary of the study, methodology used, and results obtained after collecting primary data. In this section, conclusions were made based on researcher insights gained regarding study finding and also set of recommendations were made for Government and policy makers.

5.1 Conclusion

Disaster occurrence is as old as the existence of earth. The emergency is a catastrophic event that exceeds the capacity of available resources of an organization to cope with. The intensity of natural and man-made disasters is increasing day by day and it results in loss of life, structural damage, nature and property lost. Therefore, evaluation and assessment of existing disaster and emergency management plan and emergency preparedness in secondary and tertiary care hospitals may save maximum life after conflict or disaster.

This study was based on assessment and development hospital disaster and emergency plan for secondary and tertiary healthcare facilities. The main aim of the study was to assess the existing disaster and emergency preparedness and response capacities of selected secondary and tertiary healthcare facilities. The study also looks on to evaluate existing disaster and emergency management plan of developed countries. A total of 15 hospitals were interviewed (some were directly and some were telephonically interview) and the information was recorded using well-structured questionnaire. A checklist or questionnaire was developed containing components of command and control, communication, safety and security, Patient triage, surge capacity, continuity of essential services, Human resources, Logistic and supply management, Post disaster recovery and emergency management plan. The statistical methods employed in this study were simple bar diagram and chi-square test of association. To carrying out the desired analysis, the Statistical Package for Social Sciences (SPSS) version 20 and Microsoft Excel 2007 were used.

The analysis revealed that the study included 80% secondary care and 20% tertiary care hospitals. As regard to command and control group for disaster in hospitals, the analysis depicts

majority (66.7%) of the total studied hospitals reported that command and control group for disaster was inappropriate while only 6.7% hospitals expressed that the command and control group for disaster in hospitals was at appropriate level. To know about media and information facilities for disaster response in hospitals, the results showed that the media and information facilities available for disaster victims in maximum hospitals (53.3%) were at inappropriate level. Similarly, about one third (33.3%) of the total studied hospitals media and information facilities were at moderate level while only 13.3% hospitals reported that they had appropriate media and information facilities available for disaster victims in hospitals. Similarly, safety and security team in majority (60%) studied hospitals was not in good level i.e. inappropriate. Furthermore, only 6.7% of the total studied hospitals had appropriate i.e. good level of safety and licensed security team facility for disaster.

As regard to patient triage in emergency department of studied hospitals, in maximum (73.3%) hospitals, patient triage protocol in emergency department was inappropriate or not available. Similarly, 13.3% of the total studied hospitals reported moderate level i.e. to be good and 13.3% of the total studied hospitals reported that the patient triage protocol in emergency was appropriate i.e. available in good condition. With response to surge capacity in hospitals, analysis showed that a moderate level of surge capacity was found in maximum (73.3%) hospitals. However, in 20% of the studied hospitals the surge capacity was inappropriate or not available while in 6.7% of the total hospitals had appropriate i.e. good surge capacity. Ambulance crew to transport the disaster victims to nearby hospitals is another important facility to have for every hospital; it was evident that in maximum (80%) of the studied hospitals had moderate level ambulance facility for disaster victims. Furthermore, there were 13.3% of hospitals found with appropriate i.e. available and 6.7% studied hospitals found with inappropriate level ambulance facility for disaster victims. With regards to essential services for disaster victims in emergency department, majority (73.3%) hospitals were found in inappropriate level i.e. no essential services for disaster. Furthermore, it was also evident that in 20% of studied hospitals, the essential services was at moderate level while 6.7% of hospitals had appropriate essential services for disaster victims.

Availability of additional human resources in hospitals may reduces the damage that has to occurred i.e. could save more life. It was evident that moderate level of additional human

resources was found in majority (53.3%) hospitals. Furthermore, one third (33.3%) hospitals had inappropriate and 13.3% hospitals found with appropriate additional human resources for disaster. To know about inventory list and backup plan of all necessary items in hospitals, it was evident that maximum (73.3%) hospitals found with inappropriate level. Furthermore, 13.3% of the total studied hospitals had appropriate level and 13.3% hospitals had moderate level of inventory list and backup plan of necessary items. As regard to post-disaster assessment recovery in hospitals, maximum (93.3%) of the studied hospitals had moderate level of post-disaster assessment recovery while there were 13.3% of hospitals found with appropriate conditions. With response to emergency or disaster management plan, the analysis revealed that inappropriate level i.e. no management plan was found in maximum (66.7%) hospitals. Furthermore, in 20% of the studied hospitals, the disaster management plan was inappropriate i.e. not available while in 13.3% of the total hospitals had expressed a moderate level of disaster or emergency management plan.

The analysis showed that all tertiary care hospitals were found with almost all facilities to be need for disaster. From chi-square test of association, it was evident that main components of the study: command and control, communication, safety and security, Patient triage, continuity of essential services, Human resources, Logistic and supply management, Post disaster recovery and management plan were significantly ($P\text{-value} < 0.05$) associated with type of hospitals. It is pertinent to mentioned that all of study main components were available in majority of tertiary care as compared to secondary care health facilities.

5.2 Recommendations

In order to make the hospital more prepared for emergency and disaster response the following recommendations were made based on the findings and conclusion of study.

- a) Appropriate and comprehensive emergency and disaster management plan in line with World Health Organization (WHO) guidelines.
- b) Notify the incident command group (ICG) in each hospital.
- c) Provision of licensed security to the hospitals for disaster and emergency response.

- d) Continuity of essential services and inventory supplies in hospitals for disaster and emergency response.
- e) Hospital Staff must be train on emergency and life saving procedures for prompt emergency response.

Appendices

Annex A

Target Respondents: To be completed by Hospital Managers of Secondary and Tertiary level Hospitals.

Purpose: The information gathered through this questionnaire will be used for assessment of emergency and disaster response capacities of the hospitals. The research is conducted for the completion of Master Studies in Disaster Management.

Confidentiality: Please note that responses you provide are completely anonymous and confidential. The research outcome and report will not include reference to any individual.

Q No.1 Hospital Type?

Primary

Secondary

Command and control

Q No.2 Does hospital has the command and control or Incident group?

Inappropriate

Moderate

Appropriate

Communication

Q No.3 Does hospital has media and information facilities of disaster victims?

Inappropriate

Moderate

Appropriate

Safety and Security

Q No.4 Does the hospital has licensed Security team?

Inappropriate

Moderate

Appropriate

Triage

Q No. 5 Does the emergency/casualty department have the patient triage protocol?

Inappropriate Moderate Appropriate

Q No.6 Does hospital has contingency site for triage and receipt of mass casualties?

Inappropriate Moderate Appropriate

Surge Capacity

Q No. 7 Does the emergency department has the surge capacity, in order to treat maximum disaster victims?

Inappropriate Moderate Appropriate

Q No.8 Does the hospital has ambulance crew to transport the disaster victims to nearby health facility?

Inappropriate Moderate Appropriate

Continuity of essential services

Q No. 9 Does the hospital essential services are identified and maintained, i.e. those that need to be available at all time in any circumstances?

Inappropriate Moderate Appropriate

Human Resources

Q No. 10 Does the hospital has additional human resources, which will be required when emergency is declared?

Inappropriate Moderate Appropriate

Q No. 11 Does the hospital has emergency and life saving training facilities for staff?

Inappropriate Moderate Appropriate

Logistics and Supply Chain

Q No. 12 Does the hospital has the inventory list and backup plan of all necessary items?

Inappropriate

Moderate

Appropriate

Post-Disaster Recovery

Q No. 13 Does the hospital has post disaster need assessment team to make the hospital functional and appropriate?

Inappropriate

Moderate

Appropriate

Q No. 14 Is there any emergency / disaster management plan exist in selected your hospital?

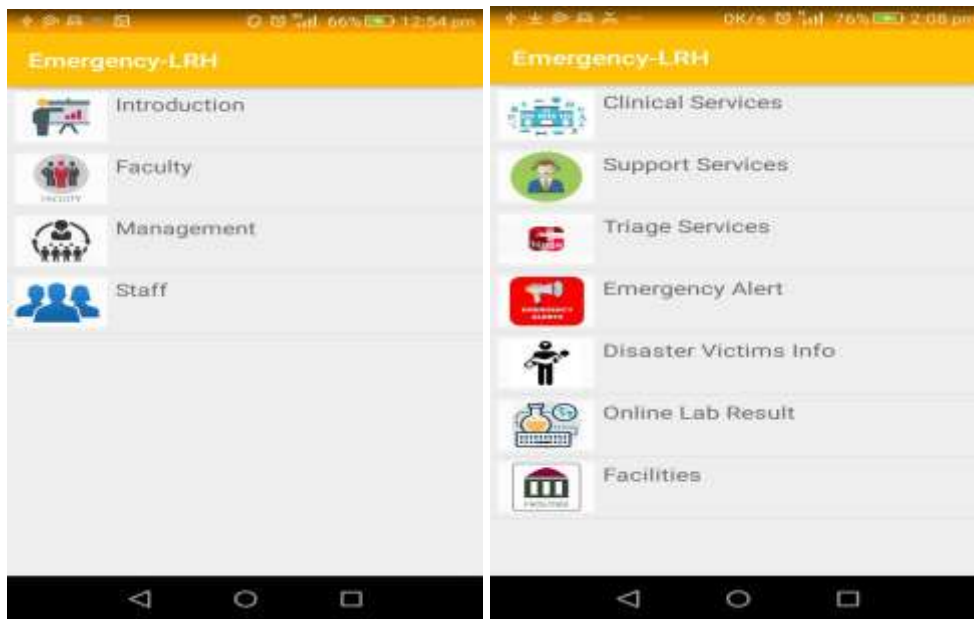
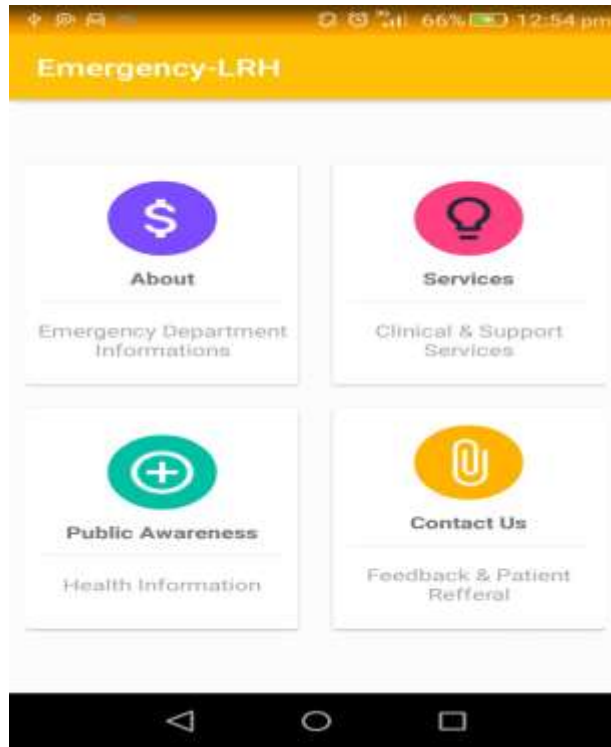
Inappropriate

Moderate

Appropriate

Annex B

The Android application for strengthening of emergency preparedness and response has been developed and loaded on Play store. Following are the snaps:



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