

# Level of Hospital Preparedness for Internal Disasters in Tertiary Care Hospitals in Pakistan (Rawalpindi City)

Internal Disaster Preparedness Of Tertiary Care Hospitals

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## ABSTRACT

**Objective:** To determine the existing internal disaster preparedness of tertiary care hospitals at Rawalpindi and provide viable recommendations for improvement.

**Study Design:** Cross sectional survey

**Place and Duration of Study:** This study was conducted at the National University of Sciences and Technology (NUST), MCE Campus, Islamabad from May 2019 to Aug 2019.

**Materials and Methods:** The study design is a cross sectional survey using quantitative measure of Hospital Safety Index (HSI) questionnaire developed by PAN WHO. Questionnaire was administered to five tertiary care hospitals based on convenient sampling technique, with data analysis being carried out using HSI calculator.

**Results:** Out of five hospitals, Military hospital secured the highest safety index of 0.92, whereas Holy Family hospital secured lowest with 0.41. While QIH, CMH and FFH were almost equal in the safety index. The vulnerability index showed similar trends in categorization. Four hospitals were categorized as category A hospital, while remaining as category B.

**Conclusion:** There is dire need to improve the overall disaster preparedness status of hospitals. The study provides an insight on importance of hospital preparedness enabling policy makers and stakeholders to plan appropriate interventions. It is a starting point leading to awareness, discussion, concrete and sustained actions for both national and provincial policy makers.

**Key Words:** Internal Disaster, Hospital Preparedness, Tertiary care hospitals.

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## INTRODUCTION

The United Nations International Strategy for Disaster Reduction (UNISDR), characterizes disaster as: "A serious disruption of the functioning of a community or a society involving widespread human, material,

economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources"<sup>1</sup>. Disasters occurring within hospitals debilitating their capabilities are known as INTERNAL DISASTERS e.g. structural instability, fire, floods, power failures, radiation and toxic hazards etc.

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The Hyogo Framework for action calls for "making hospital safe from catastrophes by guaranteeing that every new hospital is built with a degree of flexibility and resilience that fortifies its ability to stay practical in disaster circumstances"<sup>2</sup>. HFA emphasizes an all-hazards approach, capacity building and community participation in disaster risk reduction programs<sup>3</sup>.

As indicated by UNDP, in Pakistan, there is no extensive, incorporated and assimilated disaster management strategy, proper systematic tactics and legitimate framework for disasters readiness at the national level. There is a requirement of capacity building and training of health care workforces who are directly involved in handling the victims of disasters<sup>4</sup>.

Hospitals and health facilities need to stay utilitarian throughout crises as they are the centers of social coherence and community well-being<sup>5</sup>. Perhaps the advantage of emergency clinic collaboration with different medical clinics and locale centers is to address

surge and capacities<sup>6</sup>. Plans and methods must guarantee the wellbeing of faculty, offices and assets with the goal that the system can work viably<sup>7</sup>. Extreme conditions affect health facility functioning and structure this way or other way<sup>8</sup>.

Since Pakistan geographical areas are more exposed to active disasters with more frequency of earthquakes and floods, hospitals are of prime importance to deal with aftermaths of disaster<sup>9</sup>. However, they too are exposed to both external and internal disasters. Therefore, hospital need to be well equipped, prepared and organized, in case of an emergency and all strategic and operational plans to be in place during occurrence of disaster<sup>10</sup>.

**MATERIALS AND METHODS**

The study design is a descriptive cross-sectional survey regarding level of preparedness and resilient hospitals. It was conducted using quantitative measure of HSI questionnaire developed by Pan American Health Organization and WHO<sup>11</sup>. The study population included Medical superintendents, commandants and administrators of hospitals. The study site included following five hospitals at Rawalpindi: Quaid e Azam International Hospital, Holy Family Hospital, Combined Military Hospital, Pak Emirates Military Hospital and Fauji Foundation Hospital. The duration of the study was one year and it included only tertiary care hospitals while primary and secondary hospitals were excluded. Convenient sampling was used for data collection. Hospital safety index, developed by PAHO & WHO was used for data collection without any modification. Completed questionnaires data were entered and analyzed using online HSI calculator, which processed data as per designated weightage of each component and subsequent classification. Generation of graphical representation was carried out in MS Excel by using data from HSI calculator.

There are 145 items in questionnaire and to evaluate the hospitals it is in Likert scale of High, Average and Low. Although all items were not applicable to hospitals under study and only those areas were answered that are applicable in local condition of health facility under study. This tool developed by PAHO to assess the probability that hospitals under study are prepared for disasters internal / external and to evaluate that they will continue functioning in emergency taking in account the structural, nonstructural and functional components also the environment and social networking<sup>12</sup>.

**RESULTS**

The present study design is a cross sectional survey using quantitative measure of Hospital Safety Index (HSI). Questionnaire was administered to five tertiary care hospitals based on convenient sampling technique, with data analysis being carried out using HSI

calculators Out of five hospitals, Military hospital secured the highest safety index of 0.92, whereas Holy Family hospital secured lowest with 0.41. While the vulnerability index showed similar trends in categorization. Four hospitals were categorized as category A hospitals, while remaining as category B.

**Table No.1: Classification of Hospital Safety Index**

Safety index score	Category	What should be done?
0 – 0.35	C	Critical intercession measures are required. The medical clinic's present preparedness levels are lacking to ensure the lives of patients and emergency clinic staff during and after a calamity.
0.36 – 0.65	B	Intercession measures are required for the time being. The emergency clinic's present preparedness levels are such that patients, medical clinic staff, and its capacity to work during and after a disaster are possibly compromised.
0.66 – 1	A	Almost certainly, the health facility will work if there is occurrence of a calamity. It is suggested to proceed with measures to improve reaction limit and to complete preventive measures in the medium-and long term to improve the preparedness level.

**Table No.2: Holy Family Hospital**

Category	Unlikely to function	Likely to function	Highly likely to function	Total
Structural	61.25	35.00	3.75	100.00
Non-structural	20.35	39.42	40.23	100.00
Functional	2.64	18.16	79.20	100.00

**Input of Vertical Weight Data**

Vertical Weight	
Structural	0.5
Non-structural	0.3
Functional	0.2

Category	Unlikely to function	Likely to function	Highly likely to function	Total
Structural	30.63	17.50	1.88	50.00
Non-structural	6.11	11.83	12.07	30.00
Functional	0.53	3.63	15.84	20.00
Total	37.26	32.96	29.78	100.00

**Input of Horizontal Weight Data**

Horizontal weight		Safety factors
Unlikely to function	1	0.37
Likely to function	2	0.66
Highly likely to function	4	1.19
Overall Safety Factor		2.22

$$\text{Range} = \text{Upper horizontal factor} - \text{lower horizontal factor} = 4 - 1 = 3$$

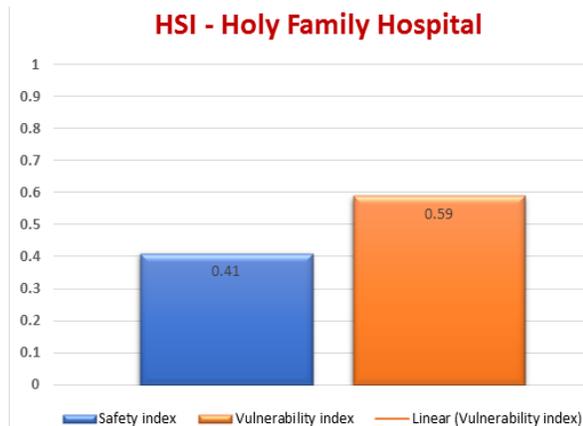
$$\text{Safety Index} = S = \frac{\text{Safety factor} - \text{Lower Range Limit}}{\text{Range}} = 0.41$$

$$\text{Unsafety Index} = \frac{\text{Upper range limit} - \text{Safety Factor}}{\text{Range}} = 0.59$$

Safety index 0.41  
 Vulnerability index 0.59  
 Health Facility Status: B

**Overall percentage of core components**

	Low %	Average %	High %
Structural Safety	61	35	4
Non-Structural Safety	20	40	40
Functional Safety	3	18	79



**Figure No.1:** HSI for HFH

**Remarks:** HFH is a 850 bedded government hospital, with hospital occupancy rate of around 80%. Based on classification system, the hospital was assigned Category B, with safety index of 41%, while vulnerability index of 59%.

The present study was carried out to assess the level of preparedness of internal disaster in tertiary care hospitals of Rawalpindi district. In this study, QIH is a 400 bedded private hospital, with hospital occupancy rate of around 80%. Based on classification system, the hospital was assigned Category A, with safety index of

83%, while vulnerability index of 17%. Similarly, CMH is a 1021 bedded military hospital, with hospital occupancy rate of around 86%. Based on classification system, the hospital was assigned Category A, with safety index of 82%, while vulnerability index of 18%. FFH is an 811 bedded semi-government hospital owned by Fauji Foundation, with hospital occupancy rate of around 80%. Based on classification system, the hospital was assigned Category A, with safety index of 84%, while vulnerability index of 16%.

**Table No.3 : Pak Emirates Military Hospital**

Category	Unlikely to function	Likely to function	Highly likely to function	Total
Structural	11.25	7.50	81.25	100.00
Non-structural	0.00	0.00	100.00	100.00
Functional	0.00	0.00	100.00	100.00

**Input of Vertical Weight Data**

Vertical Weight	
Structural	0.5
Non-structural	0.3
Functional	0.2

Category	Unlikely to function	Likely to function	Highly likely to function	Total
Structural	5.63	3.75	40.63	50.00
Non-structural	0.00	0.00	30.00	30.00
Functional	0.00	0.00	20.00	20.00
Total	5.63	3.75	90.63	100.00

**Input of Horizontal Weight Data**

Horizontal weight		Safety factors
Unlikely to function	1	0.06
Likely to function	2	0.08
Highly likely to function	4	3.63
Overall Safety Factor		3.76

$$\text{Range} = \text{Upper horizontal factor} - \text{lower horizontal factor} = 4 - 1 = 3$$

$$\text{Safety Index} = S = \frac{\text{Safety factor} - \text{Lower Range Limit}}{\text{Range}} = 0.92$$

$$\text{Unsafety Index} = \frac{\text{Upper range limit} - \text{Safety Factor}}{\text{Range}} = 0.08$$

Safety index 0.92  
 Vulnerability index 0.08  
 Health Facility Status: A

Overall percentage of core components

	Low	Average	High
	%	%	%
Structural Safety	11	8	81
Non-Structural Safety	0	0	100
Functional Safety	0	0	100

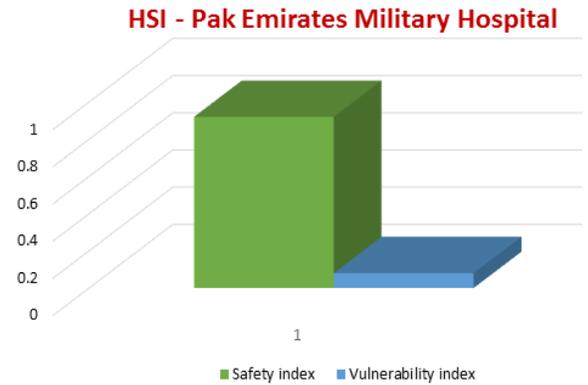


Figure No.2: HSI for PEMH

Remarks: Pak Emirates MH is a 1000 bedded military hospital, with hospital occupancy rate of around 90-95%. Based on classification system, the hospital was assigned Category A, with safety index of 92%, while vulnerability index of 8%. This can large be attributed to the fact that PEMH has undergone tremendous infrastructural over hauling with start of the art architectural designs, in line with the required objectives of safe hospitals.

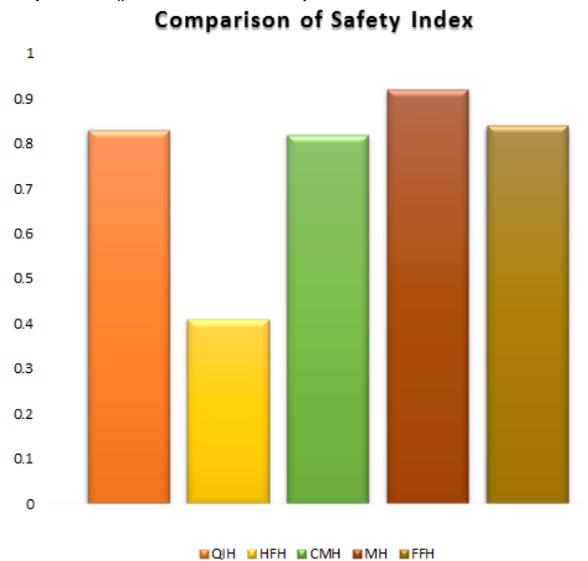


Figure No.3: Comparison of HSI of all hospitals

Remarks: Based on comparison of Safety Index of hospitals, four out of five were placed in category A. Pak Emirates Military Hospital topped the safety index with 92%, while QIH, CMH and FFH were almost equal in the safety index. However, major exception was of HFH whose safety index was merely 41%, thus making it more prone to disasters and rendering dysfunctional as well.

Table No.4: Summary of Hospital Safety Index of Hospitals

Hospital	Type	No. of beds	Hospital Occupancy Rate	HSI category	Safety Index	Vulnerability Index
QIH	Private	400	80%	A	0.83	0.17
HFH**	Public	850	100%	B	0.41	0.59
CMH	Military	1021	85%	A	0.82	0.18
PEMH**	Military	1000	90 – 95%	A	0.92	0.08
FFH	Semi-gover.	811	80%	A	0.84	0.16

\*\* Scored highest

\*\* Scored lowest

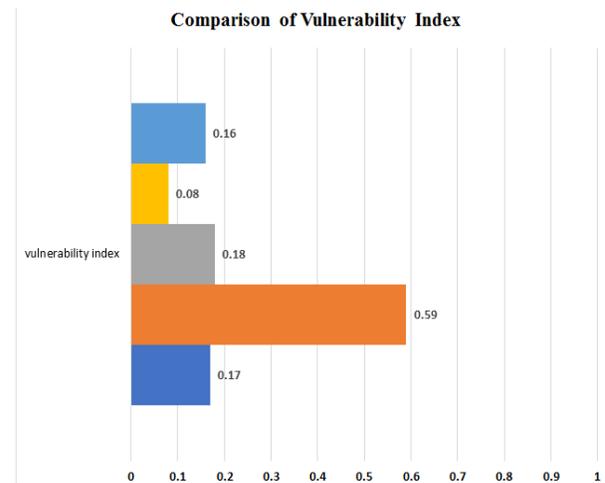


Figure No.4: Comparison of Vulnerability index of all hospitals

Remarks: Based on comparison of vulnerability index of hospitals, four out of five were placed in category A. Pak Emirates Military Hospital topped the vulnerability index with 8%, while QIH, CMH and FFH were almost equal in the vulnerability index. However, major exception was of HFH whose vulnerability index was whopping 59%, thus making it more prone to disasters and rendering dysfunctional as well.

DISCUSSION

Generally, the emphasis is made on general impact of disaster in terms of damages to infrastructure such as roads, buildings and house etc., hospitals though integral part of societal infrastructure are often neglected. They are in fact the primary source of treatment during disaster, thus must be incorporated in overall plan so as to continue with recovery and rehabilitation phases<sup>13</sup>. There is little written information available about disasters occurrence within hospitals and subsequent consequences. Hospitals play

a vital role, thus a prerequisite checklist of factors has to be followed while selecting location of any health facility, as well as design layout, building structure, and operational capabilities<sup>14</sup>.

More important is the accessibility and reachability status of hospital during disasters<sup>15</sup>. In fact, the core importance lies in the fact, that for a hospital to remain operational during disaster, the hospital must withstand disaster, because disasters are the litmus test for determining the emergency response capabilities<sup>16</sup>. Every disaster poses new types of risks; thus, strategies and contingency plans have to be reviewed and revised regularly. Unfortunately, there are many difficulties associated with disasters and their response / lessons learnt are neither shared nor translated into effective planning for future occurrences<sup>17</sup>.

The main objective of this thesis was to systematically analyze the level of preparedness and safety of hospitals with respect to medical response to disasters. The results showed that the preparedness level of the health medical system is at best at an intermediate level with respect to response to disasters. There is growing need for a study on a wider scale on the human dimensions of DRR as well as the local operational processes involved, along with the institutionalization of DRR policies and application of risk management practices<sup>18</sup>. The study was carried out in five hospitals of Rawalpindi district, with core information given in table 4.

Out of five hospitals, two were military owned, while remaining each was private, public and semi-government in nature respectively. Pak Emirates Military hospital secured highest safety index score with 92%. This can be attributed to the fact that they have recently renovated the entire infrastructure in collaboration with United Arab Emirates. In case of any disaster, PEMH being a significantly resilient facility as depicted by HSI score, is more likely to continue its function. The intervention if any, is meant to increase response capacity and mitigation measures in long and short term for safety level improvement. On the other hand, the Holy Family Hospital, being a public sector facility established in 1948, scored the least in terms of safety index at 41%, which is alarmingly a low figure considering the overall patient catchment and services delivery at government level. The corresponding vulnerability index is 59% which is again an alarming figure. Thus, it is even more prone to disasters, and it can be rightly inferred that during disaster, hospital can suffer from internal disaster as well, thus risking the lives of patients. In addition, the spread of diseases as a result of contamination from chemicals, food and water borne diseases provides an even greater magnitude of problem in the form of secondary disaster. According to HSI the safety level for HFH is significantly low and intervention measures are needed in the short-term. The hospital's current safety levels are such that patients,

hospital staff and its ability to function during and after a disaster are potentially at risk. HFH being oldest hospital among current study sites, is situated in the heart of district. Infrastructural design poses major threat, as it is most likely become double disaster event in case of any natural disaster owing to faulty and old building design without proper disaster management plan and SOP or guidelines. Moreover, presence of residential areas and narrow accessible roads are additional hindering factors that may act as force multipliers in case of disaster, thus rendering disaster management efforts less effective. The district administration and hospital management should therefore actively look for securing alternate routes and modify disaster coping strategies by conducting mock drills to ensure readiness and preparedness of concerned staff thus optimizing the overall strategic outcome.

## CONCLUSION

The readiness of health facility and its performance is dependable on resilience of hospitals. Resilient health facility has three components Structural, Non-Structural and Functional. Hospital Safety Index (HSI) is a cost effective and reliable tool by PANHO/WHO to measure the preparedness of health facilities. This tool provides opportunity to rank the level of safety, to prioritize actions and to monitor the progress. It was concluded that there is a dire need to improve the overall disaster preparedness status of hospitals. Paradigm shift from recovery to mitigation can be achieved in Pakistan by adapting internationally recognized frameworks taking context specific priority actions for resilient health facility<sup>19</sup>. The study provides an insight on importance of hospital preparedness enabling policy makers and stakeholders to plan appropriate interventions such as the hospital safety index should be incorporated into HIMS (Hospital Information Management System) and there should be web-based tool that is periodically updated to national and regional authorities. It should be important for accreditation and licensure of hospital. There should be Ministry of Health portal for monitoring, evaluation and surveillance of Hospital Preparedness and Safety. It is a starting point leading to awareness, discussion, tangible measures and sustained actions for both national and provincial policy makers. It is recommended, however, to continue with measures to improve response capacity and to carry out preventive measures in the medium- and long-term to improve the safety level.

### Author's Contribution:

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**Conflict of Interest:** The study has no conflict of interest to declare by any author.

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