

Non-structural & Functional Vulnerability of Rehabilitation Centers of Tehran Welfare Organization in Disaster



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ABSTRACT

Background: The safety of rehabilitation centers is of great importance to ensure the well-being of patients. The present study aimed to determine non-structural and functional vulnerability of state rehabilitation centers of Tehran City welfare organization in disasters using national standard instruments in 2014.

Materials and Methods: This study has a descriptive and cross-sectional design. A total of 17 rehabilitation centers affiliated with Tehran welfare organization are investigated. The vulnerability of centers was measured using 2 checklists of non-structural and functional vulnerability of the World Health Organization. The reliabilities of the non-structural and functional vulnerability instruments were 0.79 and 0.91, respectively, using the Cronbach α . The data were collected through observation and interview with authorities of centers and their staffs. The data analysis was performed through descriptive statistics and 1-sample t-test using SPSS 16.

Results: Among 17 rehabilitation centers, the mean functional safety of 11 centers (64.7%) was high and showed low vulnerability and safety of 6 centers (35.3%) was average and showed average vulnerability. With regard to non-structural safety level, 9 centers (53% of centers) had high safety level and showed low vulnerability. Eight centers (47% of centers) had average safety level and showed average vulnerability. The results of 1-sample t test showed that at the significance level of 0.05, there was no significant difference between functional and non-structural safety of centers.

Conclusion: The functional and non-structural safety of state rehabilitation centers of Tehran welfare organization was above average and vulnerability of centers to disaster was average, too. We suggest that the required planning be performed to improve non-structural and functional safety quality of centers and reduce their vulnerability.

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1. Introduction

Disasters are events associated with extensive damages to human life, economy, and environment. These disasters are divided into natural and man-made disasters [1]. Iran is among the 10 disaster-stricken countries in the world and about 90% of its population are exposed to natural disasters such as earthquake, flood, storm, and other unexpected events. Iran population comprised 1% of the world population but more than 6% of losses are caused by natural disasters around the world and Iran is in the 4th rank in Asia and 6th in the world in this regard [2].

Natural events, such as earthquake depending upon its severity can have devastating effects on health centers due to the incorrect informing, staff confusion, shortage of equipment, or defects in equipment, utilities, and non-structural components. These factors increase casualties and mortalities of patients due to different diseases [3]. Hospitals are the first sites fulfilling the basic needs of the injured after any event. Therefore, structural, non-structural, and functional improvement based on safety analysis of these health centers are of great importance and any damage to structural, non-structural, and functional facilities of these centers could reduce efficiency of these centers [4]. According to the study of Zaboli et al. in a military hospital, admission wards of hospitals were vulnerable to disasters [5]. In another study by Lari et al. in hospitals affiliated to social security organization of Tehran, the results indicated that hospitals had no safety in case of disasters and lost their normal performance [6].

Besides health centers of Ministry of Health, one of the organizations with important role in presenting services to the injured in disaster is rehabilitation center of welfare organization. Iran welfare organization with 1000 rehabilitation centers for the elderly, psychiatric patients, and homeless children, covering about 50000 people, is one of the communities with high risk taking assessment in any event or accident [7]. According to a study by Musavi et al. rehabilitation centers were not prepared to unexpected events as one of the service providers in disasters [8]. Thus, improvement of non-structural and functional elements, as well as the risk analysis of these important health centers should be on priority [9]. Vulnerability is also changing over time and it is necessary to update vulnerability of health centers. The results of vulnerability study of each organization or health center (hospital or rehabilitation centers) cannot be generalized to other centers [10].

One study has been performed regarding the vulnerability of hospital centers in disasters in Iran, but no study has been performed on vulnerability of rehabilitation centers in disasters. The purpose of this study was to evaluate the functional and non-structural vulnerability of rehabilitation centers of Tehran welfare organization to evaluate their safety in disasters and identify their weaknesses and present suitable solutions to reduce their vulnerability. By assessment of safety, we can determine vulnerability. The higher the safety, the lower the vulnerability and vice versa.

2. Materials and Methods

In this cross-sectional and descriptive study all 17 state rehabilitation centers of Tehran welfare organization were investigated in 2014. To evaluate vulnerability of non-structural components and functional vulnerability, 2 checklists of non-structural and functional vulnerability were used based on hospital risk assessment measure of WHO disaster customized by Aradalan et al. [11] for Iran. The checklist of safety assessment of non-structural components consists of 5 fields: 1) vital systems (23 questions), 2) heating systems and air ventilation in important regions of the center (7 questions), 3) administrative equipment (3 questions), 4) rehabilitation equipment (3 questions), and 5) architectural components (18 questions).

The checklist of functional safety assessment includes 5 fields: 1) organizing crisis committee of the hospital (11 questions), 2) operating plan of responding to internal and external risks (15 questions), 3) plans of medicine operation (1 question), 4) availability of operating plan for restoring vital services (4 questions), and 5) access to drugs and equipment (2 questions). The responses to all questions of 2 checklists are scored as low (score 1), average (score 2), or high (score 3). For each field (functional or non-structural safety) and the relevant sub-groups, if the score is less than 1.3 of score, the safety level is low, between 1.3 to 2.3, safety level is average, and more than 2.3, high safety level is considered [4].

The checklists were standard and their validity was determined by Ardalan et al. (0.93%). The reliabilities of questionnaires were achieved based on 17 rehabilitation centers by Cronbach α for safety checklist as 0.79 and for non-structural safety checklist as 0.91. This showed high consistency of questions of 2 checklists. For data collection, the researcher personally referred to study centers and completed the checklist questions via interview and direct observation after explanation of study purpose to the manager or staff. The data were analyzed through descriptive statistics (frequency and percentage)

using SPSS, version 16. Normality of the obtained data was evaluated by Kolmogorov-Smirnov test and then 1-sample t-test was used to compare the mean scores of each safety level with its average value (value 3). For all study tests, $P < 0.05$ was considered as significance level.

3. Results

Except Khazane center with high safety (crisis committee), 16 other centers had low safety with regard to “organizing crisis committee of rehabilitation center” (lack of crisis committee). Regarding “operating plan of response to internal and external risks” except Narmak center with high safety, other centers had average safety level. Other functional safety indices were “probable plans” in which Malekan, Varda-

varan, and Molavi centers (17.6% of centers) had low safety, Khazane center had average safety (5.9% of centers) and other 12 centers (76.5%) had high safety. The majority of centers (76.5%) had average safety regarding “availability of operating plan of restoring vital services” and 4 other centers of Arman, Narmak, Vardavaran, and Molavi had high safety. Of 17 rehabilitation centers, 10 centers (59% of centers) had high safety in “access to drug, equipment, and required reserves under emergency conditions” and 7 centers (41% of centers) had low safety. The results of study showed that functional safety level of 11 centers (64.7%) was high and 6 centers (35.3%) had average functional safety. Khazane and Narmak with scores of 95 and 84, respectively had the highest functional safety and Ravanpoyesh and Pyam

Table 1. The functional safety level and its indices in rehabilitation centers.

Index Rehabilitation center	Organizing crisis committee of rehabilitation center		The operating plan to internal and external risks		Probable plans		Availability of operating plan of restoring vital services		Access to drug, equipment in emergency conditions		Functional safety	
	Score	Safety level	Score	Safety level	Score	Safety level	Score	Safety level	Score	Safety level	Score	Safety level
Ravanpoyesh	1	Low	26	Average	3	High	6	Average	6	High	45	Average
Malekan	1	Low	30	Average	1	Low	6	Average	6	High	74	High
Hadi and Mehdi	1	Low	27	Average	3	High	6	Average	3	Low	74	High
Mehrvaran	1	Low	19	Average	3	High	4	Average	3	Low	63	Average
Armaghan Asr	1	Low	30	Average	3	High	7	Average	3	Low	69	High
Arman	1	Low	31	Average	3	High	8	High	3	Low	82	High
Fateme Zahra	1	Low	21	Average	3	High	4	Average	4	High	70	High
Ayande	1	Low	22	Average	3	High	5	Average	6	High	64	Average
Narmak	1	Low	34	Good	3	High	12	High	6	High	84	High
Ayat	1	Low	18	Average	3	High	6	Average	6	High	74	High
Payam	1	Low	22	Average	3	High	4	Average	3	Low	57	Average
Erfan	1	Low	26	Average	3	High	4	Average	3	Low	65	Average
Hazrat Zeinab	1	Low	22	Average	3	High	6	Average	3	low	67	Average
Vardavard	1	Low	27	Average	1	Low	9	High	6	High	70	High
Ahang	1	Low	26	Average	3	High	6	Average	6	High	73	Good
Khazane	24	High	28	Average	2	Average	6	Average	4	High	95	Good
Molavi	1	Low	26	Average	1	Low	8	High	4	High	71	Good
Mean		0.21		1.59		2.59		1.57		2.21		2.25
T-value		-		-6.005		3.05		-3.37		1.20		-4.69
P-value		-		$P < 0.001$		0.008		0.004		0.25		$P < 0.001$

Table 2. The non-structural safety level and its indices in rehabilitation centers.

Index Rehabilitation center	Vital systems		Heating, cooling systems and air ventilation		Administrative equipment		Rehabilitation equipment		Architecture components		Non-structural safety	
	Score	Safety level	Score	Safety level	Score	Safety level	Score	Safety level	Score	Safety level	Score	Non-structural safety
Ravanpoyesh	21	Low	14	High	6	High	8	High	44	High	93	Average
Malekan	25	Average	19	High	3	Average	6	High	45	High	98	Average
Hadi and Mehdi	28	Average	15	High	8	High	9	High	48	High	108	High
Mehravarán	14	Low	9	Average	5	Average	6	High	42	High	76	Average
Armaghan Asr	34	Average	21	High	7	High	9	High	48	High	119	High
Arman	32	Average	21	High	5	Average	7	High	49	High	114	High
Fateme Zahra	18	Low	14	High	6	High	8	High	42	High	88	Average
Ayande	28	Average	20	High	7	Average	8	High	49	High	112	High
Narmak	60	High	21	High	9	High	9	High	54	High	153	High
Ayat	17	Low	7	Average	3	Average	3	Average	42	High	72	Average
Payam	20	Low	19	High	5	Average	9	High	47	High	100	Average
Erfan	20	Low	13	Average	7	High	9	High	48	High	97	Average
Hazrat Zeinab	22	Low	15	High	7	High	8	High	48	High	100	Average
Vardavard	50	High	18	High	9	High	7	High	49	High	133	High
Ahang	31	Average	20	High	7	High	8	High	48	High	114	High
Khazane	28	Average	19	High	8	High	9	High	51	High	115	High
Molavi	26	Average	21	High	7	High	9	High	52	High	115	High
Mean	1.39		2.10		2.14		2.59		2.63		2.34	
T-value	-4.51		-10.63		0.60		4.54		13.58		-0.35	
P-value	P<0.001		P<0.001		0.35		P<0.001		P<0.001		0.73	

centers with scores of 45 and 57, respectively had the lowest functional safety (Table 1).

Based on the results of non-structural safety of 17 rehabilitation centers (Table 2), Narmak and Vardavard centers (11.8%) had high non-structural safety level, 7 rehabilitation centers (41% of centers) had average and other centers had low non-structural safety level. With regard to non-structural safety index of "cooling, heating, and air ventilation in important regions" except 3 centers of Mehravarán, Ayat, and Payam, 14 centers (82.3%) had high non-structural safety. Safety of "administrative equipment" of 11 rehabilitation centers (64.7%) was high and 6 centers (35.3%) was average. Regarding rehabilitation equipment, except Ayat center with average safety level, other centers had high non-structural

safety. Regarding architectural safety of rehabilitation centers, all 17 rehabilitation centers had high safety level. Generally, regarding non-structural safety of rehabilitation centers, of 17 centers, 9 centers (53%) had high safety level and 8 centers (47%) had average safety level. Narmak and Vardavard with scores of 153 and 133, respectively had the highest non-structural safety levels and Ayat and Mehravarán with scores of 72 and 76, respectively had the lowest non-structural safety levels (Table 2).

Vital system index is composed of 4 sub-groups and for rehabilitation centers, 3 indices of electric systems, communication, and water reserve are used. Among 17 centers, Vardavard and Narmak (11.7% centers) with scores of 19 and 18, respectively, had the highest safety levels in elec-

Table 3. The safety level of vital systems sub-groups in rehabilitation centers.

Index Rehabilitation center	Electric system		Communication system		Water reserve system		Fuel system	
	Score	Safety level	Score	Safety level	Score	Safety level	Score	Safety level
Ravanpoyesh	7	Average	8	Average	6	Average	-	-
Malekan	6	Low	10	Average	9	Average	-	-
Hadi and Mehdi	8	Average	9	Average	11	Average	-	-
Mehrvaran	4	Low	6	Average	4	Low	-	-
Armaghan Asr	8	Average	12	High	14	High	-	-
Arman	8	Average	11	Average	13	High	-	-
Fateme Zahra	5	Low	6	Average	7	Average	-	-
Ayande	8	Average	9	Average	11	Average	-	-
Narmak	18	High	13	High	18	High	-	-
Ayat	4	Low	8	Average	5	Low	-	-
Payam	6	Low	8	Average	6	Average	-	-
Erfan	6	Low	8	Average	6	Average	-	-
Hazrat Zeinab	6	Low	9	Average	7	Average	-	-
Vardavard	19	High	14	High	14	High	-	-
Ahang	6	Low	11	Average	14	High	-	-
Khazane	8	Average	13	High	7	Average	-	-
Molavi	9	Average	11	Average	6	Average	-	-
Mean	1.77		1.63		2.12			
T-value	-5.87		-3.86		-2.73		-	
P-value	P<0.001		P=0.001		P=0.015		-	

tric system. Eight rehabilitation centers (47%) had average level and the rest had low electric safety level. Regarding the communication system, 4 centers (23.5%) were at high level and other centers at low level. Two centers of Vardavard and Narmak had the highest score and Fateme Zahra and Mehrvaran were in low condition. Regarding the water reservation system, 4 centers (23.5%) had high safety levels and Narmak center with the highest score and Mehrvaran and Ayat with scores of 4 and 5, respectively were in the lowest safety levels of water reservation and other centers were at average level (Table 3).

4. Discussion

In this descriptive study, 17 state rehabilitation centers in Tehran were investigated to evaluate their non-structural and functional vulnerability. The results showed that functional safety level of rehabilitation centers of

Tehran ranged from high (64.7%) to average (35.3%). Except Khazane center, none of the centers had plans for organizing crisis committee and this was one of the most important issues in the centers.

Among functional safety indices (except “crisis committee organization” with low safety), with regard to 2 indices of “probable plans” and “access to drug, equipment, and reserves under emergency condition”, the centers had the best functional safety. With regard to “availability of operating plan of restoring vital services” and “operating plan of response to internal and external risks”, the centers had the lowest safety level. In a similar study done by Mosavi et al. in Zanjan Province, no action was observed regarding crisis management in any studied welfare center, and there was a weak coordination regarding service providing in disaster [8].

Kaji, & Louiz et al. reported that in Los Angeles hospitals, preparedness to disaster was low due to problems in planning and correct training. These findings are in line with our study [12]. In the study of Seyedin, evaluating the safety of 6 hospitals in Tehran, most of the studied hospitals had high safety level [13].

The results of our study showed high safety of rehabilitation centers of Tehran. This result is related to some factors as in charged experienced managers, access to facilities, supervision of authorities, people expectations, considering the disaster-stricken condition of Tehran, and other issues. Generally, more than half of rehabilitation centers in Tehran (53%) had high non-structural safety. In another study done by Sabzghabayi et al. in 5 hospitals of Tehran city, non-structural safety of hospitals was average [14]. According to the findings of other studies, average safety level for a health center means the lack of fulfillment and presenting services to the injured [15].

Regarding the investigation of the indices of non-structural safety of rehabilitation centers in this study, non-structural safety of “vital systems” is lower than average but other indices like “cooling, heating systems, and air ventilation”, “administrative equipment”, and also safety level of “architectural components” and “rehabilitation equipment” were high. In the study of Seyedin, the safety level of hospitals architecture was average [13]. In a study in a children hospital in Oskuye, the evaluation of glasses showed that they were the most dangerous element in a hospital building and its application as big windows or dominant material in most partitions can be dangerous. The results of Oskuye study were not consistent with our study results [16].

In another study performed in 14 hospitals in Northridge of California, electricity disconnection was the main cause of patients discharge in 14 hospitals. This study result was inconsistent with our study results, too [17]. New structure of buildings of rehabilitation centers is the cause of high score of this index. Among the centers, Narmak and Vardavard had the highest non-structural safety level and Ayat and Mehravaran had the lowest level. The comparison of the standard mean of scores of electric, communication, and water reserve systems showed that safety condition of water reservation system of centers was relatively high and in better condition compared to 2 other systems.

In Seyedin study, 6 hospitals had higher safety of water reservation compared to that of electric and communication resources and this is consistent with the findings of our study [13]. This outcome is due to higher signifi-

cance of water safety reserves in crisis and disaster than that of other resources.

Considering some features as number of staffs, their education, managerial experience and their presence in field of disasters, holding educational courses and other features of rehabilitation centers could have considerable effect on improving safety of rehabilitation centers. The only study evaluating the safety level of rehabilitation centers is the study of Mousavi in which the indices were not analyzed separately [8]. The present study is restricted to the rehabilitation centers of Tehran welfare organization and does not show an image of vulnerability centers of the central province.

Based on the significance of safeness in health centers in a disaster-stricken country like Iran, performing a study representing the statistical sample of welfare centers of the country and assessing functional and non-structural safety indices could show a real image of vulnerability of rehabilitation centers. The results of our study showed that functional and non-structural safety of rehabilitation centers of Tehran welfare organization was average and in case of encountering a disaster, rehabilitation centers are at risk. Although the centers condition is not critical, to improve quality of services and minimizing the risks of unexpected events, improving functional safety level and non-structural components is necessary, especially in electric, telecommunication, heating, and cooling systems and ventilation.

5. Conclusion

Based on the study results, we suggest that after conducting interventional research, the findings be examined and implemented in rehabilitation centers of the country. Also, by training expert personnel, an important step is taken toward improving the safety of rehabilitation centers. We suggest conducting studies on preparing instruments for more accurate measurements of vulnerability. In addition, obligatory rules in the field of crisis management are included in by-laws of founding rehabilitation centers.

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Conflict of Interests

The authors declared no conflict of interests.

References

- [1] Ardalan A, Rajaei MH, Masoumi Gh, Azin A, Zonoobi V, Sarvar M, et al. 2012-2025 Roadmap of I.R.Iran's Disaster Health Management. *PLOS Currents Disasters*; 2012. doi: 10.1371/4f93005fbc34
- [2] Jahanbakhsh M, Tavakoli N, Hadadpour A. [Designing disaster victims' medical record, a step toward crisis management (Persian)]. *Journal of Health Information Management*. 2011; 7(4):400-09.
- [3] Salarifar M. [The guidance of hospital planning to response disaster (Persian)]. Tehran: Ministry of Health and Medical Education; 2001.
- [4] Seyedin H, Royan J, Keshtgar M. [Disaster management planning for health organizations in a developing country (Persian)]. *Journal of Urban Planning and Development*. 2011; 137(1):77-81.
- [5] Zaboli R. [Assessment of readiness in Tehran hospitals faces unexpected disasters (Persian)]. *Military Medicine*. 2006; 8(2):103-11.
- [6] Lari A, Jahangiri K, Haji Nabi K. [Hospital Safety Index analysis in confronting disasters (Persian)]. *Quarterly Scientific Research Journal of Rescue & Relief*. 2013; 5(1):9-18.
- [7] Akbari M. [Study the effect of earthquake rescue training on knowledge and attitudes of staff rehabilitation centres under the Welfare Organization in natural disasters (earthquake) (Persian)] [MA thesis]. Tehran: University of Social Welfare and Rehabilitation Sciences; 2009.
- [8] Mousavi Q, Makarem A, Khankeh HR, Karimloo M. [Study of Zanjan rehabilitation preparedness in unexpected disasters in 2009 (Persian)]. *Journal of Rescue & Relief*. 2010; 1(4):36-42.
- [9] Zaboli R, Toufighi Sh, Seyyedeh SH, Malmoon Z, Hosseini Shokuh SM. [Organizational vulnerability and management of clinical departments against crisis (Persian)]. *Journal of Critical Care Nursing*. 2009; 2(3):99-103.
- [10] Naghavi M. [National burden of disease & injury in Islamic Republic of Iran (Persian)]. Tehran: Ministry of Health and Medical Education; 2007.
- [11] Ardalan A, Najafi A, Sabzghabaie A, Zonoobi V, Ardalan S, Khankeh HR, et al. [Development of a local model of hospital disaster risk assessment: a pilot study (Persian)]. *Hospital Journal*. 2011; 3(4):7-14.
- [12] Kaji AH, Lewis RJ. Hospital disaster preparedness in Los Angeles County. *Academic Emergency Medicine*. 2006; 13(11):1198-203.
- [13] Zaboli R, Toufighi Sh, Seyyedeh SH, Malmoon Z, Hoseini Shokuh SM. Vulnerability assessment of general hospitals of Tehran University of Medical Sciences. *Journal of Health Promotion Management*. 2014; 3(2):65-71.
- [14] Sabzghabaie A, Kondori A, Shojaee M, Hatamabadi HR, Amini A, Komrani A. [Hospital safety in hospitals affiliated with Shahid Beheshti University of Medical Sciences in 2011-2013 (Persian)]. *Pejouhandeh*. 2013; 18(2):83-87.
- [15] Waecckerle J, Burkle F. Disaster medicine: challenges for today. *Annual Emergency Medicine*. 1994; 23(4):715-18.
- [16] World Health Organization. Health facilities seismic vulnerability evaluation. Geneva: World Health Organization; 2005.
- [17] Carl H, Schultz MD, Kristi L, Koenig MD, Roger J. Implications of Hospital evaluation after the Northridge, California Earthquake. *New England Journal of Medicine*. 2003; 348:1349-355. doi: 10.1056/NEJMsa021807

