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Evaluating the Status of the Environmental Health Services in Kermanshah Earthquake in 2017

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ABSTRACT

Introduction: An earthquake with the magnitude of 7.3 Richter occurred near Azgel on the Iranian-Iraqi border in November 2017. Considering the health environment as an important factor in reducing the damages of earthquakes, this study aimed to assess the health status and the health services provided in Azgel area.

Methods: This was a descriptive cross-sectional study. Villages with a population of 150 or more inhabitants which were supported by 5 rural and urban health centers have been selected. The data collection tools were including the standards Sphere project, for the quantitative and qualitative comparison of facilities and the WHO checklist for evaluating the facilities. The checklist included 7 categories and 14 subcategories and 37 activities which were done by the researcher group for 7 days after 18 days from the earthquake.

Results: In the subcategories of the household, the provision and use of design and ready-made places and hand washing, in general, the evaluated activities were in full compliance. The subcategory of the temporary accommodation area of the affected areas in all the regions had 100% relative compliance; since setting up tents was non-principled and with no monitoring by the concerned organizations. In the subcategory of personal protection and provision of disposal facilities for infants, there was a lack of conformity. Five subcategories and 2 activities of all activities are shared with other related organizations and should co-ordinate with other organizations.

Conclusion: Evaluating, prioritizing the level of interventions, establishing coordination in conducting common activities, and educating are suggested for providing better and more effective future services.

Keywords: Environmental Health, Kermanshah Earthquake, Natural Disasters

Introduction

Despite the ever-increasing advances made by human societies in various fields of science, society is still unable to cope with natural disasters, including earthquakes, floods, storms, and etc. (1). One of the factors that threatens the life and health of human societies has always been natural disasters, and Iran is not immune to this issue. Iran is classified among the 10 most disastrous countries in the world, which out of 43 world-known incidents, 34 of which occurred in Iran and 90% of the population are exposed to earthquakes and floods (2, 3). Often the control of natural disasters such as the earthquake is beyond the

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capacity of local devices (4). The earthquake is one of the threats that always has been considered due to its widespread amplitude and destructive effect and the provision of the disease incidence and epidemic (5). The frequency of earthquakes occurring in Iran shows that on average, every 2 to 3 years in Iran, a great earthquake happens (6). After the East Azarbaijan earthquake in 2012 and the continuation of the same trend, at 21:48, on November 12, 2017, a large earthquake with magnitude of 7.3 richter happened near Azgal, Kermanshah province settled in the Iranian-Iraqi border in 32 kilometers of southwest of the Halabja in Iraq. The source of the earthquake was 5 km far from the city of Kermanshah, Azgale (7). According to the International Institute of Seismology and Earthquake Engineering, the earthquake center at a distance of 5 kilometers from Azgale and 25 kilometers from Kermanshah Taze abad, had a longitude of 45.9 and latitude of 34.84 and a depth of 11 kilometers.

The impact of disasters on the healthcare sector has a wide range of outcomes. To respond to these consequences, health services, especially environmental health, are at the forefront and are one of the main pillars of earthquake mitigation. Assessment and prioritization of needs are important for the provision and delivery of health services to injured and survivors of disasters and accidents (8). The purpose of this study was to assess the health status and the health services provided in the earthquake of Kermanshah province.

Materials and Methods

This was a descriptive cross-sectional study. After the earthquake, the crisis management headquarters, Red Crescent Society and other crisis management organizations had meeting, and crisis management groups, the Basic Health Care Unit, including the Department of Environmental Health were formed and sent to the affected areas. The earthquake affected areas of Kermanshah province included the cities of Salas Babajani and Sare-pol Zahab; among them, Salas Babajani has two parts, six villages, two cities and 147 villages and it is near the Iran- Iraq border. The city has an area of 1920 square kilometers with a population of 35219 people; the central part has 109 villages and Azgal has 38 villages, which 69 villages are settled in the central part and 9 villages in Azgal have the highest rate of destruction. In this study, villages with a population of 150 people or more supported by 2 urban health centers (Taze Abad and Azghel Center) and 3 rural health centers including the center of Negare, Kani Rash and Mir abad wich are shown **Table 1**, were selected.

Table 1: Demographic and Health Centers Data of Salas Babajani

Health Centers	**Total supported population** (person)	**Total No of supported household** (household)	**No. of areas with more than 150 population** (district)	**No. of supported population areas** (area)
Taze abad	7047	1603	9	44
Azgal	2240	564	2	23
Mir abad	4732	1150	9	30
Negare	5009	1272	10	31
Kani rash	1546	360	3	24

The data collection tool used in this study were including the Sphere project checklist (sphere project 2011) for quantitative comparison and the adequacy of the health facilities provided for damage assessment and the WHO checklist (world health origination 2002) for environmental health assessment and evaluation of the facility. The checklist has 7 indicators related to environmental health in the emergency situations, including water safety, human waste disposal, conductor control, sewage disposal, temporary accommodation, personal health and food safety. Each of the indicators was also subdivided into more subcategories and in total 14 related subcategories were reviewed. In this study, the term "full compliance", "relative compliance" and "non-compliance" was used to assess the status and services of the environmental health area with related activities in emergency situations (9, 10).

Full compliance: was All activities were carried out in accordance with the checklist for the regulatory and environmental indicators and health services.

Relative compliance: One or more activities were not performed in accordance with the checklist in reviewing the regulatory and environmental health indicators.

Non-compliance: None of the activities were checked in accordance with the checklist in the review of the regulatory and environmental health indicators.

To collect data and complete the information through objective observation, field surveys, interviews with health experts, health experts from the Emergency Health Care Crescent Population (BHCU) and health authorities in the ecological zone of the earthquake area were used. Other necessary earthquake information was provided from the geophysical website of the University of Tehran (11). This study was carried out 18 days after the earthquake and in a consecutive week from 30 November, 2017 to 7 December, 2017.

Results

In this earthquake, the number of victims reached to 620, and 9,388 were wounded, and about 70 thousand became homeless. In the city of Salas Babajani 23 people were killed and 85 villages were destroyed from 50 to 95%. Nine villages did not have the public water network, and water for 30 villages was supplied by tankers.

The results of comparing the villages covered by each of the five health centers separately from the services provided by environmental health in the affected areas under study are based on a checklist. The health centers of Taze abad, Asgel, Mir abad, Negare and Kani rash are in areas of 9, 2, 9, 10 and 3 with more than 150 people population, respectively. Regarding the evaluated activities and services provided by the environmental health center with urban and rural water and sewage in the field of water safety in the subcategory of the health care centers source, Taze abad, Asgel and Negare had full compliance, 44.4%, 50% and 40%, respectively, and Mir abad Health Centers and Kani rash had relative compliance of 44.4% and 33.3%, respectively (**Tables 2 and 3**).

The non- compliance was generally due to the non-implementation of conservation around the water supply in the visited areas, which the environmental health unit has a supervisory role. In the area of water supply in the subcategory of the household, all of them were in full compliance except the Kani Rash Health Center, which had 66.6% complete compliance and 33.3% relative compliance, and the relative compliance was due to the lack of covered containers, as well as in the subdivision of water use; the relative compliance was due to the lack of facilities for boiling water for food and drink preparation. Regarding chlorination, it was due to the residual chlorine measurements, source chlorine distribution and education.

Table 2: Status and Environmental Health Assessment Matrix in comparison with the World Health Organization checklist for villages over 150 people supported by the Towns Health Center of Taze abad and Azgal

Visited regions				Indicators														
				Water safety			disposal		Waste disposal		Conductor control		Individual health		Shelter	Food safety	
	Health center	village	population	tanker	Household level	Water use	Using sanitary facilities	Disposal facilities for infants and children	Solid waste	Liquid waste	Protection against diseases	Individual protection against disease	Water for washing and bathing✸	Hand washing	Temporary accommodation	Facing with contaminated food	Preparing and cooking healthy food
County of Salas Babajani	Taze abad	Palan olia	267	▲	●	▲	●	■	●	▲	▲	■	●	●	▲	●	■
		Alidost diyok	197	●	●	▲	●	■	▲	■	●	■	▲	●	▲	●	■
		Ghol rash	264	▲	●	▲	●	■	●	■	●	■	▲	●	▲	●	▲
		Cham lam osman	204	▲	●	●	●	■	▲	▲	▲	■	▲	●	▲	●	■
		Cham zeresh; olya	1512	●	●	▲	●	■	●	▲	●	■	▲	●	▲	●	■
		Cham zereshk	244	▲	●	●	●	■	▲	■	▲	■	●	●	▲	●	■
		Ghelghe	800	●	●	▲	●	■	▲	■	●	■	▲	●	▲	●	▲
		Zyarat namar khan	885	▲	●	▲	●	■	●	■	▲	■	▲	●	▲	●	■
		Taze abad amin	258	▲	●	▲	●	■	▲	■	▲	■	▲	●	▲	●	●
	Azgal	Azgal	1296	●	●	▲	●	■	●	▲	▲	■	●	●	▲	▲	▲
		Dare zhale	151	▲	●	▲	●	■	▲	■	●	■	▲	●	▲	▲	■

Full compliance ● Relative compliance ▲ Non-compliance ■ environmental health has supervisor role ✸

Table 3: Status and Environmental Health Assessment Matrix in comparison with the WHO checklist for villages over 150 people supported by the rural health center of Nghar-Mir abad-Kani-Rash

Visited regions				Indicators														
				Water safety			disposal		Waste disposal		Conductor control		Individual health		shelter	Food safety		
	Health center	village	population	Tanker	Household level	Water use	Using sanitary	Disposal facilities for infants and children ✸	Solid waste	Liquid waste ✸	Protection against diseases	Individual protection against disease	Water for washing and bathing ✸	Hand washing	Temporary accomodation ✸	Facing with contaminated food	Preparing and cooking healthy food
County of Salas babajani	Mir abad	Zamkan	452	▲	●	▲	●	■	●	■	●	■	▲	●	▲	▲	●
		Nime kare	311	▲	●	▲	●	■	▲	▲	▲	■	▲	●	▲	▲	●
		Ghap gholi sofla	163	■	●	▲	●	■	▲	■	▲	■	▲	●	▲	▲	▲
		Hashmare	323	▲	●	▲	●	■	▲	▲	●	■	▲	●	▲	▲	▲
		Mir abad	961	▲	●	▲	●	■	▲	■	●	■	▲	●	▲	▲	▲
		Tape khargoshan	202	▲	●	▲	●	■	▲	■	●	■	●	●	▲	▲	▲
		Holol	452	■	●	▲	●	■	▲	■	●	■	●	●	▲	▲	■
		Tepan	286	■	●	▲	●	■	▲	▲	●	■	▲	●	▲	▲	■
		Nizha sofla	210	■	●	▲	●	■	●	■	▲	■	▲	●	▲	▲	■
	Kani rash	Kani rash	245	■	▲	●	●	■	●	▲	▲	■	●	●	▲	▲	▲
		Posht kar	199	▲	●	▲	●	■	▲	■	●	■	●	●	▲	▲	■
		Nime lare	175	■	●	▲	●	■	▲	■	●	■	▲	●	▲	▲	▲
	Negare	Meydan namak	288	●	●	▲	●	■	●	▲	●	■	●	●	▲	●	■
		homajga	307	●	●	▲	●	■	●	■	▲	■	●	●	▲	●	■
		Seyed nab porab	218	▲	●	▲	●	■	▲	▲	●	■	▲	●	■	●	■
		Beshi nav khas	155	▲	●	▲	●	■	▲	■	▲	■	▲	●	■	●	●
		Kelash nahang	218	▲	●	●	●	■	▲	■	▲	■	▲	●	■	●	▲
		Ghalicha	492	●	●	▲	●	■	▲	▲	●	■	▲	●	■	●	▲
		Sheikh sela	1456	●	●	▲	●	■	●	■	●	▲	●	●	■	●	▲
		Rajabi	290	■	●	▲	●	■	▲	▲	●	■	▲	●	■	●	■
		Bani nar	202	▲	●	▲	●	■	▲	▲	▲	■	▲	●	▲	●	■
		Negare	346	▲	●	▲	●	■	●	■	▲	■	●	●	▲	●	▲

Full compliance ● Relative compliance ▲ Non-compliance ■ environmental health has supervisor role ✸

In the field of human waste disposal, the subcategory of access and using facilities were fully adapted in the affected areas, and the existing facilities either repaired or refurbished were used; and in urban areas, in addition to upgrading or repairing existing facilities, mobile sanitary facilities were utilized. Regarding the provision of stool disposal facilities for infants and young children, no action was taken in any of the areas. The environmental health unit has the role of monitoring, in this area (12).

In the area of waste disposal in the sub-section of solid waste, the health care centers of Taze abad, Asgel, Mir abad, Negare and Kani rash had full compliance about 44.4%, 50%, 22.3%, 40% and 33.4%, respectively. The rest had a relative compliance, and in the subcategory of liquid waste due to lack of proper sewage collection system in all regions with a high percentage of non-compliance based on the checklist. In this activity the environmental health plays a monitoring role (13).

Environmental health services in the control of conductors (insects and arthropods) under the subcategory of environmental protection were fully and completely adapted with all areas, and most of the services were upgraded; however, no protection was observed in the area of personal protection.

In the area of personal health in the water supply for washing costs such as bath and personal health and laundry facilities in the areas covered by the health care centers of Tazeabad, Asgel, Mirabad, Negare and Kani rash had a compliance of 22.2%, 50% , 22.2%, 50% and 66.6%, respectively, and the rest had a relative compliance. In the case of hand washing, in all areas, adequate detergents were provided and health education was provided by health departments and health care providers to the injured people.

In the area of temporary residence of injuries, according to the report of the city authorities, 5335 tents were distributed by unauthorized and tidy checks, and the lack of monitoring and control of relevant organizations which led to a relative compliance based on the checklist in all cases (100%).

In the field of food safety, environmental health experts in the Red Crescent Society and the Ministry of Health monitored and controlled the food departments and areas where food or dietary foods were distributed by the Red Crescent or other organizations and institutions, and if any infected food was detected, extermination was carried out.

Regarding healthy food preparation in the areas supported by the health centers, Tazeabad, Azgel, Mirabad, Nurra, and Kani Bash had no compliance of about 66.6%, 50%, 33.3%, 50% and 33.3%, respectively and 40%, 50%, 44.4%, 40% and 66.6% had the relative compliance and due to the lack of health facilities for the preparation, cooking and heating of the food, it had no compliance of assessment. Baby foods and powdered milk were also distributed in an inappropriate and non-specialized way for the infants.

In total, the staff and the executive staff in the entire affected city of salas Baba-jani were 11 serving people. The detailed results are presented in **Table 4**.

Table 4: Results of Environmental Assessment and Health Services

Indicators	Subcategory	Taze abad			Azgal			Negare			Mir abad			Kani rash		
		full	relative	non	full	relative	non	full	relative	non	full	relative	non	full	relative	non
Water safety	Tanker	44.4%	-	55.6%	50%	50%	-	40%	50%	10%	-	44.4%	55.6%	-	33.3%	66.7
	Household	100%	-	-	100%	-	-	100%	-	-	100%	-	-	66.7%	33.3%	-
	Use	22.3%	77.7%	-	-	100%	-	10%	90%	-	-	100%	-	33.4%	66.6%	-
Stool Disposal	Providing and using designed and ready places	100%	-	-	100%	-	-	100%	-	-	100%	-	-	100%	-	-
	Providing stool disposal facilities for infants and children	-	-	100%	-	-	100%	-	-	100%	-	-	100%	-	-	100%
Waste disposal	Solid waste	44.4%	55.6%	-	50%	50%	-	40%	60%	-	22.3%	77.7%	-	33.4%	66.6%	-
	Liquid waste	-	33.4%	66.6%	-	50%	50%	-	50%	50%	-	33.3%	66.7%	-	33.4%	66.6%
Conductor control	Environmental protection	44.4%	55.6%	-	50%	50%	-	50%	50%	-	66.6%	33.4%	-	66.6%	33.4%	-
	Individual protection	-	-	100%	-	-	100%	-	10%	90%	-	-	100%	-	-	100%
Individual health	Water for washing	22.3%	77.7%	-	50%	50%	-	40%	60%	-	22.3%	77.7%	-	66.7%	33.3%	-
	Hand washing	100%	-	-	100%	-	-	100%	-	-	100%	-	-	100%	-	-
Shelter	Temporary accommodation in damaged areas	-	100%	-	-	100%	-	40%	-	60%	-	100%	-	-	100%	-
Food safety	Exposure to contaminated food and its consumption	100%	-	-	-	100%	-	100%	-	-	-	100%	-	-	100%	-
	Preparing and cooking food	11.1%	22.2%	66.6%	50%	50%	-	10%	40%	50%	22.3%	44.4%	33.3%	-	66.6%	33.4%

Discussion

The number of environmental health workers who are needed during an emergency situation depends on the nature of the community, the number of injured people, the extent of the affected area, the type of required services, the extent to which the transfer and communication networks are effective, and the adequacy of existing staff. According to the number of injured people the WHO recommends one headquarter staff and 4 to 8 executive staff members for a population of 10,000 to 50,000. Generally, the headquarter staff and executive staff in the entire affected city of Salas Babajani, who served, were consistent with the WHO recommendation (9). The present study is consistent with Akbari et al. study in the Bam earthquake in 2003 regarding the number of environmental health personnel and the number of injured people (14).

To increase the effectiveness of health services, it is necessary to employ more people, who are familiar with the culture, traditions of the injured. Chlorine measurements in damaged areas were continuously evaluated in the public water supply and water supply networks. No reports of water-borne diseases were reported among the injured people from the time of the earthquake to the time of the study. In a study by Zeinalzadeh et al. in 2017, the amount of remaining chlorine 200 days after the earthquake for the Ahar, Varzaghan and Harris villages was reported to be 75%, 27% and 26%, respectively, and water pollution rates for villages in Ahar, Varzaghan and Harris regions were reported 57%, 21% and 13%, respectively (15, 16). A study by Mahmood et al. in Pakistan earthquake in 2005 showed that using a sand filter in water treatment might reduce the microbial contamination by 97% (5, 17). In most of the studied areas, the minimum standards were provided in using refurbished toilets and movable toilets. In the study of sphere for every 20 people one toilet was provided (10).

A study by Mosaferi et al. in Azerbaijan earthquake in 2012 showed that installing sanitary toilets, sewage disposal systems in damaged areas was one of the major problems in the first week after the earthquake, which is similar to the present study (2). However, the sewage disposal system of some movable toilets was carried out without considering the minimum standards. In some areas, slack waters caused by rain, or washing has the potential to attract Carriers of the diseases. Environmental measures in the areas of earthquake have been cleaning, disinfected, sprayed and with the goal of preventing infectious diseases and diseases transmitted from surfaces and water (18).

Distribution and installation of tents in disastrous regions were carried out in all areas without monitoring of the Red Crescent Society and meeting the minimum standards of health and safety This scattered settlement made operating the distribution of health items and nutritional, non-nutritional and security items, difficult (19, 20). The results of the study by Fatemi et al. in 2013 are similar to those of the present study (8). Meanwhile, it provided conditions for profitable and inefficient management.

Similar incidents such as earthquakes occur annually in other parts of the country. Therefore, considering the cooperation and activities of the Red Crescent Society health care services team, the Ministry of Health and Water and Rural Municipalities may provide a cooperation memorandum, teaching and practical training. The World Health Organization standard checklist and the minimum standards provided in the sphere project were useful and operational. The design and temporary accommodation of damaged areas by the Red Crescent Society and the trained volunteers of the Crescent are ongoing. However, specialist environmental groups immediately intervened to the injured areas to provide services; however, the interventions have not been satisfactorily achieved. Assessing, prioritizing the level of interventions, creating inter-sectorial coordination in conducting joint activities and training were suggested in order to provide better and more effective services for the future.

Conclusions

Annual events similar to earthquakes happen in other parts of the country. Therefore, with regard to the cooperation and activities of the Red

crescent Society Health Care and treatment Team, Ministry of Health and Urban and rural water and wastewater companies will lead to a Memorandum of Cooperation, Teaching and Practical Training. The World Health Organization's standard checklist and the minimum standards provided in the Sphere project are to be used and operational. The temporary accommodation of damaged areas by the Red Crescent Society and trained volunteers in the crescent should be done. Although environmental health groups immediately intervene in affected areas to provide services after the earthquake, however, interventions have not been satisfactorily. Evaluation, prioritization of interventions level and creating inter-sectional coordination are recommended to conduct joint activities and training in order to provide better and more effective services for the future.

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Conflict of interest

There is no conflict of interest to be declared.

Authors' contribution

All authors contributed to this project and article equally. All authors read and approved the final manuscript.

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