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Operational Teams' Preparation in Environmental Health Rapid Response: Tabriz University of Medical Sciences in Response to the Earthquake Scenario (Designing an Exercise)

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ABSTRACT

Introduction: Natural disasters are usually a series of unpredictable incidents, which do not originate from humans. With regard to the occurrence of unexpected factors such as earthquakes, floods, and fires, individual and social preparations must be increased in the crisis management.

Methods: The aim of this cross-sectional study was to evaluate the preparation of operational teams to provide an effective response to earthquakes. The statistical population included the experts of environmental health and disaster risk reduction management in the healthcare centers of Tabriz University of Medical Sciences. The participants were categorized into 20 operational teams. The necessary equipment of the participating teams was evaluated by checklists.

Results: The results showed that 76.2 percent of the teams had the required equipment to control the drinking water and dispose the wastewater. Furthermore, 58 percent had the required equipment for disasters' conditions and 78.1 percent had the equipment to spray and disinfect in the emergency situations. In addition, about 90 percent of the vehicles used in training were appropriate for emergencies, 95 percent of teams observed the standards to setup tents, deployed the equipment, and had the needed proficiency skills. Moreover, 81.3 percent of the operational team authorities had sufficient skills to work with technical equipment.

Conclusion: The presence of teams in the response phase in the East Azerbaijan earthquake in 2011 and the acquisition of field experiences led to their technical coherence, made them familiar with facilities, and equipped the operational teams. We suggest the authorities to conduct executive training according to the designed twice a year based on the response plan of the deputy of health department two times a year.

Keywords: Exercise, training, Preparation, Earthquake, Azerbaijan

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Introduction

The United Nations Office of disaster risk reduction defined disasters as the functional breakdown of a community that results in widespread human, economic, or environmental damages. Adaptation to disasters is usually beyond the ability of the community or society by the existing resources (1).

Natural and manmade disasters have always been associated with human life throughout the time and had many adverse effects on the environment and humanity, including loss of life, financial, psychological, and environmental damages (2). Iran is one of the most disaster prone countries in the world. In addition, with only one percent of the world population, more than six percent of the natural disasters occur in Iran (3). According to the 2009 global assessment report on disaster risk reduction, the disaster risk indicator in Iran is at the eighth level out of 10 (4).

Iran is ranked fourth in Asia and sixth in the world with regard to the natural disasters (3, 5). Due to its location on the Himalayan Alpine belt, Iran is among the 10 earthquake prone countries (6). After occurrence of natural disasters especially earthquake, affected regions are potentially predisposed with the spread of various infectious diseases. The literature showed that the prevalence of post disaster infectious diseases were high and the most important factors that influenced the prevalence of infectious diseases included the lack of safe water, disruption of environmental recovery services (ERS), population displacement, and impairment in the provision of health services (7).

Considering that Iran is a disaster-prone country with high frequency of disasters, we need to provide an appropriate and effective response immediately after the disaster to reduce the human and material casualties. Therefore, the rapid response teams and standard operating procedures for these teams are necessary for the country. Due to the fact that the tasks and the structure of rapid response teams in most countries are flexible and changeable according to the type of disaster, formation of these teams with a standard structure and special description of their tasks should be clear and predefined by the local governments of each country(8).

The disaster management cycle includes four phases of impacts' mitigation, preparedness, response, and recovery. In the preparation phase, one of the important functions is to promote the preparation and build capacity for the disaster-type trainings. In other words, the practices are designed to improve the development and validation of organizational competencies and capabilities for performing one or more functions in disasters (9). In fact, trainings are measures with the purpose of education, practice, ability promotion, fundamental competence to prevent and mitigate the impacts, vulnerability reduction, participants' response, and recovery in a safe environment (9). In a common division among different types of training resources, two categories are defined based on discussion and operation. The trainings based on operation are further divided into functional and full-scale trainings (9, 10).

An important strategic goal in National Health Security Strategy in 2012 is to develop the evaluation methods for reporting and estimating the progress in security and health area (10). However, the scarcity and abruptness of disasters are obstacles in determining the effectiveness of a health response system. In this regard, simulated events such as training are considered in evaluation of the capabilities and preparations in disaster situations and lead to better program designs (11,12).

Every year, different countries organize different training programs for preparation of the related participants and staffs. In the United States in 2008, 38 trainings were conducted in more than 218 cities, by participation of a total of 5892 staff members (13).

One of the important ways to create, strengthen, and maintain the preparation of the staffs is to conduct a training program in which the participants experience similar situations after a disaster based on the hypothetical scenario (14). Individuals practice trainings, emergency planning, and team works to identify deficiencies provide

logical and correct responses at the time of disasters (15).

An earthquake with a magnitude of six occurred in one of the cities of Tabriz called Khosrow Shah with a population of 21,000 people at 5.30 in the morning .. The severity of the earthquake was such that more than 272 villages in the region were destroyed. In the earthquake, more than 200 people were killed, more than 2000 were injured, and at least 21,000 were affected in urban and rural areas (the population was 21000). In an eight thousand-kilometers area in the East Azerbaijan province, all infrastructure including health facilities such as water supply and distribution systems, tools for collection and disposal of wastewater, toilets and bathrooms of homes, health houses, and etc. were destroyed. The level of the incident was determined by the emergency operations center (EOC) of Tabriz university of medical sciences as E3 and the operational environmental health teams were immediately established after the earthquake to go to the destroyed regions.

The incident resulted in destruction of two comprehensive centers of urban health services and eight health houses. In addition, two comprehensive health center services were undamaged in this city, which rendered services to outpatients and in-patients. Moreover, some patients with digestive problems were reported. Nearly 30 percent of the residential areas were destroyed and not habitable. Rescuers were psychologically affected by observing these scenes, but continued their duties. Water supply and gas system of Tabriz pass through this city and the earthquake damaged the water supply system at several points. Water pollution was also observed in Tabriz.

The geodetic survey conducted 200 days after the earthquake by Nouri et al. showed that the problems related to the waste management, water supply, and sanitation services were not solved appropriately and the damaged regions were faced with environmental health problems (16).

In order to maintain the coherence and improve the preparation of the environmental health teams, the health department of Tabriz University of medical sciences implemented training experiences in Yazd and Ghazvin one year after the earthquake. They conducted a training program with the presence of rapid response team of environmental health as well as health and medical networks of East Azerbaijan province in the city of Tabriz from October 28 to October 29, 2013. This training-oriented measure was conducted to evaluate the preparation of the special functions of the environmental health teams participating in the training.

Materials and Methods

This observational cross-sectional study was conducted to evaluate preparation of the operational teams of environmental health participating in a functional training in 2013 in East Azerbaijan, Iran. The statistical population included the environmental health experts and risk management specialists in the health medical network of East Azerbaijan (a total of 20 health medical networks). They were training in response to a hypothesized scenario. In each operational team, two environmental health experts and a risk management specialist participated in the training.

A total of 40 environmental health experts and 20 risk management specialists participated in the training. With regard to all of the experts and the teams studied in the training, the study was conducted on the entire population.

Members of the training assessment team were six people selected from the experts in the environmental health. Before the training, these participants attended training – justification session to achieve the necessary qualification to complete the checklists. The data collection tools included a checklist of six parts with 66 questions evaluated by the assessment team. The first five sections of this questionnaire should be answered by objective observation and the final section was required to be responded using an interview with all of the participants in the training.

This tool (checklist) was designed by a team of PhD students studying in disaster health, several months before the training and was used in a similar training in Yazd, Iran (17). First, by

referring to valid scientific resources, the relatedness of questions with the research goals was evaluated and then the necessary revisions were conducted on the questions. Subsequently, four environmental health experts experienced in the earthquake studies or similar trainings were asked to review each question to evaluate and edit the content. Finally, at the start of the fieldwork during the data collection, the questions with content and objective mistakes were edited.

The data collection tool was a checklist designed in a yes / no format; so, the Kappa coefficient was used for its reliability and stability. Two researchers, from one of the operational teams, separately evaluated the training. The coherence coefficient in their Kappa scores was calculated as 96 percent. The checklist consisted of six parts: the first part had five items (equipment and necessities to control and monitor the water and wastewater), the second part had six items (equipment and requirements to monitor and control the health of foods), the third part had seven items (equipment and requirements to spray and disinfect), the forth part had 27 items (emergency and necessary equipment of officers for the emergency conditions and situations), the fifth part had 14 items (standards of the automobiles participating in the training), the sixth part had three items (assessment of the technical skills of staffs in using equipment and requirements). The variables of this checklist were measured on a yes / no scale, and the weight of all evaluated items was similar.

Statistical analysis

The results of the completed checklists after the classification were calculated using SPSS version 18 for each item and the percentage of team preparation was calculated in comparison with each item separately.

Results

The checklists were completed for all the 20 members of the operational teams, who were present at the training location (from each health care network of the city a team was dispatched for this training). Moreover, 20 operational teams including 40 environmental health experts and 20 risk management specialists participated in the study. In evaluating the required equipment to monitor and control the water and wastewater sections in operational teams, 76.23 percent of the teams had the required equipment and necessities to control the drinking water and wastewater disposal.

In addition, 58.09 percent of the participants had the equipment needed to control and monitor the health of foods in disaster situation, but none of the operational teams had the humidity meter. Additionally, health operational teams had 78.18 percent of the required tools to conduct spraying and disinfecting in emergencies. **Tables 1 and 2** show the completeness of requirements carried by the environmental health team staffs in emergencies.

Table 1: Equipment preparedness of the operational teams of rapid response in environmental health

Row	Type of equipment	Required equipment	Percentage
1	Control and monitor water and wastewater	Drinking water sampling bag (with its relevant sampling equipment, such as sterile bottles, dry alcohol, alcohol cotton, pence, matches, Spirit lamp, stationery, glue , and sample labels)	85
		Colorimeter kit, PH meter (and references with valid date)	95
		Drinking water purification tablet (in different volumes)	20
		Construction of sanitary toilets	10
		Required stationery equipment for recording events and reports	88
2	Control and monitor the food health	Food sampling bag	90
		Tools such as pliers, clipper, hammer, knife, special clips, dry alcohol, ice bag and sample labels (at least one from each group of items)	82.2
		Two special sterile containers	80
		At least one cold box	35
		At least one intrusive thermometer or laser and an iodine meter kit	25
		Nylon bag in different sizes	68
3	The required tools in order to spray and disinfect operation	Motor sprayer	75
		Manual sprayer	95
		Fogger	50
		Disposal clothing for spraying	65
		Equipment such as masonry boots and gloves, glasses, spray mask	82
		Insecticide and pesticide	80
		At least one type of disinfectant (Lime, Per chlorine, Quarine , and Hal amide)	74

Table 2: Equipment and requirements needed by the environmental health team staffs

Required equipment	Percentage of completeness	Required equipment	Percentage of completeness	Required equipment	Percentage of completeness
Tent	95	Radio (with battery)	70	Multifunctional opener	55
Blanket	95	Rope	85	Matches and lighter	95
Sleeping bag	80	Thick white nylon	75	Finger bowl	65
Back bag	55	Warm gloves	55	Mobile wire	65
Flash light	90	Mat and foam	80	Helmet	45
A 10 or 20 liter container	58	Washing powder, soap, damp tissue	46	Dust respiratory mask	43
Map of the country's cities	25	Meter (fabric) and whistle	55	A picnic gas, a petroleum lamp, a kettle	100
Dry ration	88	Calculator	90	Electrical heater	35
GPS Compass Navigator	51	National uniform	90	Flask or Coleman beverage	100

The evaluation of vehicles used by the authorities showed that 90 percent of the automobiles applied in the training were appropriate for emergency situations. **Table 3** shows the preparation level of the technical equipment of used vehicles.

Table 3: The rate of equipment preparation for vehicles used in the training

Row	Type of equipment	The rate of preparation	Row	Type of equipment	The rate of preparation
1	Spinner light and special logo	68	8	Wrench set	95
2	The amount of sufficient petrol to commuter in the training	95	9	Pick	65
3	Undamaged spare	90	10	At least five meters of rope	60
4	Snow chains	60	11	10 meters thick plastic	90
5	Completely undamaged lighting system	95	12	sledge	60
6	Safety belt	95	13	Wire rope	60
7	shovel	90	14	hammer	25

The assessment team completed the final part of the checklist by interviewing the participants to evaluate the preparation, the skill to setup tent, and application of technical equipment required in emergencies. The results showed that 95 percent of these teams had the required skills to setup tents punctually, deploy equipment, and conduct tasks and programs. Furthermore, 81.3 percent of the operational teams had the sufficient proficiency to work with technical equipment such as fogger, motor spraying, and manual sprayer. In addition, 95 percent of the authorities were familiar with use of pesticides and disinfectants.

Discussion

The results of this study showed that the rapid response teams of environmental health in Tabriz University of Medical Sciences did not have the expected preparation to observe and control the water and wastewater requirements; whereas, the results of geodetic study conducted by Nouri et al. (16) during 200 days after the East Azerbaijan's earthquake were in the same line with the findings of this study. With regard to this topic, it seems that the health of the area was neglected by the health authorities of the region and the district health system needs to be revised regarding the facilities and necessities to control and monitor water and wastewater. In addition, one of the reasons for this defect can be attributed to the fact that the main administer and the organization responsible for water and wastewater defects in the events and the disasters is the Ministry of Energy, while the Ministry of Health is considered as a cooperation unit in this regard.

The findings of this study showed that the needed equipment and facilities for nutritional observation was one of the most important functions of environmental health in emergencies in comparison with the operational teams of environmental health participating in the first national training in Yazd (17). The rapid response teams participating in the training of health department of Qazvin University of Medical Sciences in 2012 (18) were in a better situation in dealing with natural disasters. The results of Babaiee et al. a national training study in Yazd showed that tents, requirements, equipment, and supplies used by the teams were various and one-third of the teams had no protective equipment (17).

In the training of Tabriz, 95 percent of teams had the same tent; whereas, in the training of Yazd, the participants did not use personal and travel tents and 90 percent of the officers had uniform and protective clothing. Babaei et al. in a study entitled "The Need for Designing Clothes for Health Medical Workers" mentioned that several days after the earthquake in Azerbaijan, lack of uniform for health staffs was one of the problems, which was solved within a week by designing and preparing uniforms and hats for all health staffs and this was one of the lessons learned from the earthquake in Azerbaijan (19).

This situation in Tabriz could be due to occurrence of an earthquake one year before the training, which led to the release of resources and allocation of credits. In Yazd, most teams (74 percent) used a pickup automobile that has two applications for carrying cargoes and passengers.

This automobile seems to be an appropriate automobile for emergencies, while 90 percent of the automobiles used in the training of Tabriz were appropriate for difficult geographical regions.

In the reports of rapid response teams of Qazvin University of Medical Sciences conducted in 2012 (18), the rapid response teams provided 50 percent of the required and predicted equipment for environmental health measures in average. Nouri et al. (18) reported that lack of proper tents for settlement of teams, ground positioning system (GPS) devices, and the lack of operational automobiles were the weak points of the Qazvin rapid response teams in 2012.

Moreover, these teams were more successful than Tabriz operational team in construction of sanitary toilets in the training location. This was due to the fact that during the Qazvin training, all teams that participated in the training were able to construct sanitary toilets and almost all teams were able to fulfill 80 percent of the expectations for constructing sanitary toilets. In the training of Yazd, 88 percent of the teams set up desert toilets, but in Tabriz training only two teams could set up a desert toilet.

Another important requirement for operational teams in the response phase was the availability of equipment to determine the geographical directions, operational locations, and other devices such as compass, GPS, and site map. However, in Qazvin training, none of the teams used these devices. Likewise, in Yazd training similar to Tabriz, 50 percent of the teams had the equipment. Results showed that the health teams did not have the experience of attending a real field of the earthquake.

So, it seems that these teams were indifferent to having small equipment. Although application of chlorine disinfected tablets can be a convenient and appropriate method to accelerate the function (20), in Tabriz training, only 20 percent of the teams had drinking water disinfection tablets.

One of the limitations of this study was the lack of time to collect the data as the researchers had to evaluate all 20 teams within a day.

Conclusion

Evaluation and comparison of three similar trainings in Iran (Yazd, Qazvin, and Tabriz) showed that the environmental health teams had an appropriate coherence to respond the disasters. Consequently, the teams participating in Tabriz training were more prepared than the teams in Yazd and Qazvin trainings.

It is worth mentioning that the operational teams that participated in this training attended the earthquake regions one year before the training and had valuable experiences in response to the Azerbaijan earthquake. Given that most resources will be supplied and distributed in real events, it seems that the superiority of Tabriz's equipment, facilities, as well as officers' technical cooperation and familiarity with equipment was due to their presence in Azerbaijan earthquake. This is because many of the defects and equipment of the teams were prepared at that time and all staffs worked in damaged regions for five months.

Such events can certainly affect the functional improvement of response teams. Implementation of these training and attendance of operational health teams in similar situations revealed the weak points of teams, which is an important step in improving preparation.

Considering that the functions of these teams are very various and important, we suggest the authorities to provide the training preparations for the environmental health teams based on the specific functions in the national emergence operation plan (EOP). In this regard, these functions and trainings should be designed specifically and separately: 1) Rapid assessment of environmental health conditions in emergencies, 2) Daily performance of environmental health experts in emergencies, 3) Health monitor on shelter, 4) Health monitor on drinking water and wastewater disposal, 5) Health monitor on nutrition, 6) Health monitor on spraying, sterilizing , and disinfecting, 7) Environmental health education, 8). Environmental health surveillance on chemical incidents, 9) Environmental health monitor on radiation incidents, 10) Environmental health monitor on health care centers. Trainings

should be implemented after the codification of the EOP because the trainings are a tool to evaluate the compiled program.

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Conflict of interest

The authors declare no conflict of interests regarding this study.

Authors' contribution

In this paper, Zahra Jaloo, Nima Danaee, Rozita Firooznia and Mina Abbaszadeh contributed in writing the manuscript. Mohsen Nouri, Mohammad Dashti, Somaieh Roohani Majd helped in data collection. Marzieh Rohani and Saeed Fallah edited the final draft.

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