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Assessment of Health System Functions in Earthquake-stricken Regions in Kermanshah, Iran

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Abstract

Background: The occurrence of an earthquake in Kermanshah province in 2017 leads to death and injury of its inhabitants. Assessment of the health system functions can lead to the provision of the necessary healthcare services for the affected population post-disasters. The present study is aimed to assess the health system functions after the Kermanshah earthquake.
Objectives: Assessment of health system functions in the reproductive, pediatric, and environmental health dimensions in the affected regions of Kermanshah were the research objectives.
Methods: This mixed methods study was conducted in the two phases of developing a tool and assessment of the main health system functions. Content validity and reliability were measured by CVR and CVI, and Cronbach's alpha, respectively. Assessment of health system functions was conducted by the participation of 100 affected households.
Results: Firstly, the primary tool was designed using 31 primary items extracted from literature review and a qualitative study. CVR and CVI of the tool were 100%, and Cronbach's alpha was 0.97. The coverage of the reproductive, environmental, and children's health services ranged from 90 to 100% since the first day to one year after the earthquake and between 30 and 60% from one year to two years post-earthquake.
Conclusions: The assessment of health system performance can provide the necessary data for effective decision making and promoting health system functions. Further research is needed to assess the functions of the health system after other natural disasters rather than earthquakes.

Keywords: Iran, Assessment, Disaster, Health System, Earthquake

1. Background

Although health is an essential human right and a fundamental factor for community development, well-being and health of disaster-affected people have been insufficiently considered, more specifically in low-income countries (1). On the other hand, disasters interrupt health system functions, and thus the vital health needs of affected people are addressed inadequately (2-4). Health system assessment can lead to effective interventions for meeting the health needs of the affected people, reducing duplicative services, and accelerating the recovery of disrupted health structures (5).

The literature reported the lack of monitoring and assessment of health system functions during and after disasters, more specifically reproductive, environmental, and children's health (6, 7). For example, the study of men's and women's health in flood- and earthquake-stricken regions of Iran showed the inappropriate status of water, sanitation, and nutrition of people living in temporary settlements (8). Children's malnutrition and mental disorder issues after floods and earthquakes were reported as well (9, 10). In addition, several studies highlighted the need for the assessment of pediatric, environmental, and reproductive healthcare services in disaster-affected regions in Iran (11-13).

A number of studies reported the health needs of children affected by disasters. For example, the Haiti earthquake (2010) affected about 1 million children and young people and exacerbated preconceived concerns about the health and protection needs of children (14). The long-term effects of disasters on children's mental health were

reported as one of the most important public health concerns (15, 16). Regarding the key role of parents in children's mental health (17), a study of 489 children found that maternal PTSD increased children's depression and anxiety (18).

Although women have different public health needs and issues, they suffer from limited access to health facilities and resources after disasters (19-21). While reproductive health (RH) has been reported as one of the important needs of women post-disasters (22), evidence reports inadequate reproductive health services (23-25) due to degraded health facilities, insufficient human resources, exposure to sexual violence, and poverty (26). Neglecting post-disaster RH services can lead to maternal and neonatal death, stillbirth, unintended pregnancy, unsafe abortion, STDs, and menstrual problems (25, 27-31). For example, reproductive health indicators of women affected by the twin earthquakes of East Azerbaijan showed a decrease in live birth rate and coverage of contraceptive methods and an increased in stillbirth rate (32).

Evidence shows that environmental risk factors account for more than 25% of diseases post-disasters (33). For instance, the waste generated by the Indian Ocean tsunami (2004) was 5 to 15 times higher than conventional waste (34). Furthermore, the spread of infectious diseases at the time of disasters requires environmental health services to reduce mortality and morbidity (35). Basic environmental health activities such as water supply, wastewater and effluent management, and food safety are necessary to prevent outbreaks and facilitate the recovery process (36).

Assessment data can help public health systems with identifying their weaknesses and strengths at the times of disaster (37). Moreover, it can facilitate the provision of the most needed services based on limited resources after disasters (38). Primary data sources such as household surveys can provide details for health system assessment (39).

The health system is considered as one of the most important sections to provide various health needs of affected people, including reproductive, pediatric, and environmental health (40). A number of studies have emphasized that the assessment of health system functions is required after disasters (41). On the other hand, assessing all functions of health systems in one research project is not possible. Thus, the present study is aimed to assess the health system functions in the three aspects of reproductive, pediatric, and environmental health after the Kermanshah earthquake.

2. Objectives

Assessment of health system functions in the reproductive, pediatric, and environmental health dimensions in the affected regions of Kermanshah were the research objectives.

3. Methods

3.1. Settings

The occurrence of a 7.3-magnitude earthquake in Kermanshah province in 2017 caused the deaths and injuries of about 8000 inhabitants living in Kermanshah province (42).

3.2. Design

The present mixed methods study was conducted in the two phases of developing an assessment tool and assessing the health system functions.

3.3. Primary Phase: Design and Validation of the Assessment Tool

Both narrative review and qualitative study were conducted to design the assessment tool. Databases such as PubMed, Web of Science, Scopus, and WHO Library were searched for identifying the factors of health system functions. The inclusion criteria for the studies selections were articles, guidelines, and tools of post-earthquake health system functions assessment. Once the study selection process was completed, data analyses were performed to extract the main items of the primary tool. A qualitative study using deductive content analysis was conducted to minimize the missing items from the literature review. Participants were seven experts of health management and disaster medicine selected by the purposive sampling method. The number of participants was determined according to the saturation principle. Data were collected using unstructured, in-depth, interviews and transcribed verbatim in Farsi. A categorization matrix was developed, and interview data were coded according to the categories of reproductive, environmental, and pediatric health (43). Two indicators of content validity ratio (CVR) of Lawshe (44) and content validity index (CVI) of Basel and Waltz (45) were used to evaluate content validity. To determine the CVR, the tool was given to 10 experts in disaster health management. The experts evaluated each item based on a three-point Likert scale (i.e., necessary, useful but not necessary, and unnecessary). To evaluate CVI, experts were asked to evaluate the relevance, simplicity, and clarity of the tool separately based on a 4-point Likert scale. Cronbach's alpha was applied for the tool's internal consistency with the participation of 15 earthquake-affected people who were randomly selected. Accordingly, an index above 0.7 indicates well internal consistency (45).

3.4. Second Phase: Assessment of the Health System Functions

The health system performance was assessed in the earthquake-stricken regions in Kermanshah Province using the designed tool. The size of household sample was calculated based on Cochran's formula:

$$n = \frac{Nz^2pq}{Nd^2 + z^2pq}$$

Accordingly, the total number of households damaged in the earthquake-stricken region of Kermanshah was estimated 300 ones (N) (46). Furthermore, the confidence level was 95%, which means z = 1.96 based on alpha level (5%). The estimated proportion of an attribute in the population (p) was 0.5. Considering (q), which is calculated as (1 - p), the estimated variance was (p) (q). Finally, the acceptable margin of error for proportion (d) was estimated as 8%. Accordingly, a sample of 100 household stricken by the earthquake were considered suitable for the survey. The randomized sampling method was used to select the households. A list of affected households was obtained from the health centers, and 100 households living in that area were selected by lottery.

4. Results

4.1. Phase 1: Assessment Tool Development

A number of five functions in each aspect of reproductive, pediatric, and environmental health was extracted from the literature review and qualitative study. The functions included public education and training, providing health services, availability of services, payment per services, and evaluation (Table 1). At this phase, the primary tool was designed using 31 primary items, including 11 items for reproductive health, 9 items for pediatric health, and 11 items for environmental health.

Based on the findings of content validity, CVR and CVI of the tool were 100%. That is, the validity of the tool was confirmed by the disaster health experts and scholars. Regarding reliability, Cronbach's alpha was 0.97, which revealed that there is an acceptable correlation between the items and the whole tool.

The final tool consisted of two sections of demographic information and the main body in the three categories of reproductive, pediatric, and environmental health. The questions are answered by "yes", "no", and "do not know" options, as well as a column for more descriptions.

The results showed that about 39% of the earthquake-affected households received training on reproductive health, 55% on pediatric health, and 63% on environmental health (Tables 2 and 3).

The assessment of health system functions revealed that the coverage of almost all reproductive, environmental, and pediatric health services was between 90 and 100% one year after the earthquake. However, the level of providing health services was decreased to the range of 30 to 60% between one and two years after the earthquake.

5. Discussion

Functions of the health system were assessed in the aspects of reproductive, pediatric, and environmental health through a community-based survey in earthquake-affected regions of Kermanshah province. The assessment data showed that the frequency of providing health services decreased from a one-year to a two-year interval time after the earthquake. The assessment of reproductive, pediatric, and environmental health aspects of health system functions at the same time can make our research specific and comprehensive.

The assessment of health system functions was conducted in the earthquake-affected regions during intermediate and long-term recovery. The quality and continuity of health services provided for affected people need to be assessed during the long-term recovery process, and rapid assessment at the response phase may not be enough (47). The assessment of health system functions can provide the data for prioritizing actions and effective post-earthquake recovery planning and management (48).

An assessment tool was developed in the present research through which health system functions were assessed. Accordingly, the findings of a literature review showed that about 55% of disaster assessment studies were conducted using a structured questionnaire, and the remaining used registries. The health needs were assessed by questionnaires, while the health status of disaster-affected people was assessed by existing registries (49). On the other hand, the validity and reliability features of our tool can confirm its accuracy to assess health system functions during the post-earthquake stage. However, a number of disaster assessment studies have been conducted without a valid and reliable tool to shorten the assessment time and facilitate the process of data collection (50-52).

Similar to our findings, the study of reproductive health assessment of gulf-coast women after disasters suggested a closer understanding of reproductive health needs post-disasters through conducting a community-based assessment in Southeast Louisiana (23). Furthermore, the study of reproductive and sexual health needs after the Nepal earthquake (2015) suggested the establishment of a monitoring and assessment mechanism for reproductive health services provided for affected communities (53). The assessment study of Hurricane Mitch's re-

Table 1. Items of Assessing Health System Functions Extracted from Literature Review and a Qualitative Study

No.	Functions	Selected Sub-functions
1	Public education and training	What fields have been people educated or trained; When have education and training provided?
2	Providing health service	What services have been provided; When have services been provided?
3	Availability of service	Have services been available and accessible?
4	Payment per service	Have you paid for receiving required services?
5	Monitoring and evaluation	Has the health system monitored and evaluated its service delivery after disasters?

Table 2. Demographic Information of the Households

Variables	No. (%)
Number of household members	427 (100)
Deaths	
Male	21 (45.6)
Female	25 (54.4)
Injured	
Male	62 (54.8)
Female	51 (45.2)
Household residency	
Urban	67 (67)
Rural	33 (33)
Damage to home	92 (92)
Injury/ damage to work	68 (68)

Table 3. Status of Health System Functions Since One Year After the Earthquake

Function	Frequency (%)
Reproductive health training	39
Reproductive health services	41
Children health training	55
Children health care and services	45
Environmental health training	63
Environmental health services	60

ported that women suffer from violence, especially sexual violence, and lack of access to family planning and adequate access to health and education about reproductive health issues is required based on assessment data (54).

The assessments of reproductive and pediatric health functions need to be considered due to the importance of providing health services for vulnerable groups such as pregnant and lactating women and children after disasters (55). Based on our findings, children's health, as a specific vulnerable group, needs to be assessed in disaster-affected communities. However, the literature has highlighted the assessment of children's mental health issues after disasters rather than their physical health (56-59) Children experiencing disasters are vulnerable to mental health trauma, particularly in developing countries (16). Thus, providing mental health services for children may be the most important step in the assessment of health system functions after disasters.

Our findings indicated that environmental health of disaster-affected regions such as water, waste, and food needs to be assessed for necessary interventions. Accordingly, a review of the public health needs assessment after major earthquakes reported that water health, food security, environmental health, and vaccinations were the items which were frequently evaluated after disasters (60). Furthermore, the prevalence of infectious diseases after disasters needs environmental health measures to decrease mortality and morbidity issues (35). The implementation of environmental health measures can facilitate the return of communities and health systems to normal life (36).

The limitation of the current study was difficulty in data collection and sampling in an community with poverty and poor health.

5.1. Conclusions

The assessment of health system functions at the long-term recovery phase can help with providing public health services for affected people. Our data revealed that such an assessment can lead to conducting necessary actions for preventing serious public health problems after earthquakes. On the other hand, the assessment data can improve post-disaster health management actions and decision making. Further research is needed to assess the other dimensions of health functions and other natural disasters.

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Footnotes

Authors' Contribution: SS designed the study. SS, HS, and AD collected and analyzed the data. SS, HS, NR, and AHB drafted the manuscript. All the authors read and approved the final manuscript, and each author believes that the manuscript represents honest work.

Conflict of Interests: None declared.

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Informed Consent: Based on the approved consent form, all the participants were informed of the confidentiality of their name and other private information in the relevant reports. In addition, the names of data collection regions cannot be published.

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