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Respond quickly and effectively! Components of the military health surveillance system in natural disasters: A qualitative study

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Abstract:

BACKGROUND: The systematic collection, analysis, and interpretation of health data by health surveillance systems provide timely and comprehensive surveillance of public health, identification health priorities, and, consequently, a quick and timely response to reduce damage during natural disasters. Since military forces appear as first responders at the scene of accidents, the present study aimed to identify the components of the military health care system during natural disasters.

MATERIALS AND METHOD: Qualitative data collected through semi-structured interviews were analyzed via the conventional content analysis approach to identify the components of the military health care system in natural disasters. The participants consisted of 13 experts who were experienced in providing health services in the military and the civilian health care system during natural disasters in January 2022 to June 2022.

RESULT: The identified components were classified into four main categories, namely, pre-requisite components (comprehensive health care, defined position, and providing information), driving components (system efficiency, effective communication), operational components (contingent performance, effective response), and promotional components (purposeful support, pre-disaster preparation).

CONCLUSION: In conclusion, the military health surveillance system is a cooperative service for the national health system in which data is essential for making decisions on health and treatment measures during disasters. This study—by identifying four categories of the important components in the design, implementation, and development of the military health surveillance system—provides a comprehensive view of an appropriate and evidence-based military surveillance system in disasters.

Keywords:

Military health services, natural disasters, public health surveillance

Introduction

A public health surveillance system can be comprehensively defined as the systematic and continuous collection, analysis, and interpretation of health data that are necessary for planning, implementing, and evaluating public health performance in society and for the timely

dissemination of data to policymakers of the health system.^[1]

In the event of accidents and disasters, an active public health surveillance system can provide accurate, timely, and usable data for planners, emergency responders, and decision-makers.^[2] Early detection helps in allocating appropriate resources and

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preventive measures to prevent further illnesses, send timely and accurate messages to the community, and also minimize its impact on the hospital/medical system and the community.^[3]

The Emergency Events Database (EM-DAT) recorded 432 catastrophic events related to natural hazards worldwide just in 2021 that had resulted in 10,492 deaths, affected 101.8 million people, and caused approximately \$252.1 billion of economic damage.^[4] Pre-disaster preparedness of health care organizations for rapid assessment of the determinants of disease, injury, and mortality associated with disasters among the affected population help decision-making processes related to response and recovery.^[5-7]

The role of the armed forces in disaster management and response operations during natural disasters is well known globally.^[8,9] Professional training, purposeful supervision and support, morale and the ability to provide services in difficult and unfavorable conditions increased the participation of the armed forces in helping civilian populations during various natural disasters.^[10,11] Despite the important role of the health surveillance system in responding to disasters,^[12] there are only a few studies on the implementation of military health services during said disasters. Hence, the present study aimed to explore the components of the military surveillance system in natural disasters.

Materials and Methods

Study design and setting

The present qualitative study aimed to identify the components of the military health surveillance system in natural disasters. The required data were extracted from interviews using the conventional content analysis method.^[13]

Study participants and sampling

In this work, like other qualitative studies, data saturation determined the sample size.^[14] To select the samples, purposeful sampling technique was used with maximum diversity strategy.^[15] Sampling was done among armed force who had practical experience or specialized knowledge in providing emergency health and medical services during disasters. Interviews were conducted with experts working in the Ministry of Health and Medical Education, hospitals and universities of medical sciences, and military-related health organizations, and who had experience of providing health services. At last, based on the principle of saturation of all and new concepts desired by the researchers,^[16] 13 participants were selected [Table 1].

Data collection tools and technique

In this study, face-to-face semi-structured interviews were conducted to collect data from the experiences

Table 1: Demographic characteristics of the participants in the study on indicators and components of the military health care system in natural disasters

Participants	Sex	Frequency	Percentage
Sex	Male	8	62
	Female	5	38
Age (years)	25–35	3	23
	36–45	4	31
	46–55	6	46
	10–20	5	38
	21–30	8	62
History of providing service in natural disasters	Earthquake	10	83
	Flood	4	33
	Epidemic	7	54
Interview Levels	Operational expert	3	23
	Operations manager	4	31
	Senior manager	2	15
	Academic expert	4	31

of beneficiaries regarding the performance of the health care system during natural disasters. The interviews first started with general questions about the participant’s experience of participating in natural disasters relief and the challenges of the health care system in response to these disasters. Then, it gradually moved to more specialized questions on management strategies and solutions to improve the performance of the health care system in the service delivery systems of the army and armed forces, the appropriate structure of the health care system for the army and military forces, and the important components in the design of the health care system for the army and armed forces [Table 2]. Interviews were conducted for six months from January 26, 2022 to June 28, 2022, and they lasted for 11 to 69 minutes, with an average duration of 30 minutes.

Data analysis

Data analysis was done by qualitative content analysis method using Granheim and Lundman’s approach.^[17] All the interviews were recorded with a digital recorder and immediately typed. For a general understanding of the content of the text, the entire text of the interview was heard and then read many times, and key phrases related to the research question, meaning units, and primary codes were extracted using the open coding method. Then the similarities and differences of the codes were found by MN and AZ, and similar primary codes were classified into more comprehensive classes. In this way, subcategories and main categories were formed.^[17] In this study, data analysis was done at the same time as data collection, and participants’ views on the less-discussed classes were investigated by repeating supplementary interviews or in interviews with subsequent people. The data collection process continued until saturation

Table 2: Interview questions on military health surveillance system in natural disasters

Question title
Do you have experience of providing health care services in natural disasters?
During which natural disasters did you participate as a health care provider?
Based on your experiences, what challenges related to the health surveillance system did you experience?
Based on your experiences, what solutions do you suggest for these challenges?
Based on your experiences, if you want to develop a health surveillance system in the military, what components and indicators would you consider?
In your opinion, which components and indicators are important to design and implement a military health surveillance system during natural disasters?
In your point of view, if there is something important about the subject that I did not ask, I would be grateful if you could explain it.

regarding each of the concepts of the subcategories was reached.

Trustworthiness

Trustworthiness was ascertained through credibility, transferability, dependability, and confirmability in the process of conducting this study.^[18] In the data collection and analysis stage, credibility of the study was evaluated through member check, peer check, and expert check. This study's author is a researcher in the field of health in disasters and has worked in the field of treatment and health services of the army for 13 years; for this reason, she had a good interaction with the service centers of the army. Prolonged engagement with the research environment, data collection, and analysis for six months is another method of increasing credibility. The purpose of transferability is to describe the study method in detail so that the reader can search for similar evidence in his setting. Triangulation of the data collection was provided by using interviews, observations, and group discussions. The qualified participants were contacted by the main researchers who had experience in the field of health in disasters and emergencies, and then the participants who had practical experience of participating in natural disasters as evaluators or providers of health services were selected for the interview.

Ethical consideration

This research is a part of a doctoral thesis and has been approved by the Medical Ethics Committee of the AJA University of Medical Sciences with the code of IR.AJAUMS.REC.1400.284.^[19] The participants participated in this study voluntarily and with the knowledge that their information will be used confidentially and anonymously in the research. In each interview, this information and the purpose of the study were presented orally to the participants, and the written

consent form for participating in the research project was signed by the participant.

Result

Four main categories of the components of the health surveillance system in natural disasters were identified. They included pre-requisite components (with three subcategories of comprehensive health care, defined position, and providing information), driving components (with two subcategories of system efficiency and effective communication), operational components (with two subcategories of contingent performance and effective response), and promotional components (with two subcategories of purposeful support and pre-disaster preparation) [Table 3].

Pre-requisite components

Comprehensive health care perspective

Most participants believed that a comprehensive health perspective—from two aspects of comprehensive health perspective and comprehensive hygiene perspective—plays an important role in developing a health surveillance system for natural disasters. The surveillance system for communicable diseases during natural disasters is a well-known system. However, according to the practical knowledge of the participants, no dynamic and efficient surveillance system is available for people with chronic and special diseases. Identification, supply of medicine and equipment, and follow-up of these patients during disasters have been among the most important challenges experienced by the participants. During natural disasters, after physical damage, the affected people experience mental, psychological, social, and spiritual complications such as posttraumatic syndrome (PTSD), hopelessness in life, and self-harm, although less attention has been paid to the mental and social health component in the design of the health care system. Therefore, according to the experience of the participants, beneficiaries must apply a comprehensive perspective in developing the health surveillance system for natural disasters.

In the opinion of Participant 08 (P08), “[H]ealth shall be considered as a whole with all dimensions, for example, physical, mental, etc., Infectious diseases, such as diarrheal and respiratory diseases, etc., are known to all people, but non-communicable diseases are neglected in disasters although they are a challenge to the health system. During disasters, people with chronic or non-communicable diseases may not have good nutrition or have difficulty accessing medicine, can't come for a visit on time or even the stress may cause a series of their symptoms such as high blood pressure to worsen. There may be also people with kidney disease or diabetes among the affected people.”

Table 3: Content analysis-components of military health surveillance system in natural disasters

Main categories	Subcategories	Subcategories of subcategories	Examples of codes		
Pre-requisite components	Comprehensive health care	Comprehensive health perspective	Importance of care for specific diseases in disasters	Complications and injuries of loss and PTSD	Importance of special and chronic disease care
		Comprehensive hygiene perspective	Lack of sanitary sewage disposal system	Importance of care system for the disposal of corpses	Considering care system to control insects, vermin, and vectors
	Defined position	Defined level of service for military organizations	Importance of services of military organizations in natural disasters	Defined access to military health services in disasters	Identifying the position of the military in providing health services
		Defined role of the military in natural disasters	The importance of defining the role of the military in disasters	The importance of cooperation in natural disasters	Importance of military activities in natural disasters
Driving components	Providing information	Data collection at the moment and timely reporting	Importance of electronic registration	Incompleteness of registration (bookkeeping)	Importance of creating a record and having a health record
		Information security	Importance of information authenticity	Importance of the accuracy of the information collected	Defining information access levels in militaries
	System efficiency	Specialized training staff	Necessity of having crisis managers	Manpower trained for the crisis	Necessity of crisis management training for medical staff to protect themselves in crisis situations
			Disease diagnosis and active identification of patients	Early detection of signs and symptoms	Identifying the symptoms of the disease
		Continuous monitoring	Importance of patient follow-up	Follow-up of people exposed to harm	Importance of monitoring the history of exposure and patients
			Timely analysis and decision-making	Importance of analyzing collected health information	Ability to perform an analysis at the time of data collection
	Effective communication	Efficient referral system	Effectiveness of a referral system in natural disasters	Importance of communication between the data recording and analysis departments	Importance of the relationship between the collection of disease information and the follow-up of disease cases
			Internal and external communication of the care system	Necessity of connecting the army health care system with the national health care system	Importance of connecting the army's surveillance system with the information of other responders in disasters
		Acceptance of the system	Necessity of the acceptance of the health care system among the medical staff	Importance of accepting the health care system by doctors when collecting and completing data	Improving communication in acceptance systems

Contd...

Table 3: Contd...

Main categories	Subcategories	Subcategories of subcategories	Examples of codes		
Operational components	Contingent performance	Duty-oriented performance	Duty-oriented performance of the army in natural disasters	Flexibility in implementation according to duty	Improving the components of the health care system based on organizations' capabilities
		Performance in accordance with the crisis	Conditions of the affected area	Importance of performance in accordance with the crisis	Place of residence of exposed people
	Effective response	Functional coherence	Necessity of unified command in natural disasters	Importance of the establishment of the deputy health care system of the armed forces	Avoiding islanded operations
		Rapid response	The need for rapid measures for outbreaks of diseases	Importance of structured rapid-response teams	Importance of staff readiness for rapid response
		Applying fair distribution of resources	Importance of allocating funds fairly among all affected areas	Importance of equitable distribution of healthcare equipment and resources	Need to distribute human resources fairly
Promotional components	Purposeful support	Purposeful monitoring	Necessity of monitoring the trend of disease outbreaks	Necessity of monitoring the performance of the health care system	Monitoring targeted disease
		Informed support	Importance of having support systems for the health care system	Importance of maintaining and updating the health care system	Importance of maintenance of surveillance system
	Pre-disaster preparation	Continuous exercise and maneuver	Maneuver of preparation of disaster care system	Importance of military exercises in natural disasters	Importance of repeating exercises periodically
		Scenario-orientedness	Mental preparation of teams by practicing crisis situations	Inconsistency of maneuver conditions with reality	Importance of reality-based scenarios
		Experience-orientedness and localization of the system	System review based on lessons learned	Studying the experience of successful countries in the care of diseases	Considering the cultural components of the region

P07, who experienced the 2018 Sarpol-e Zahab earthquake, referred to the lack of a coherent surveillance system to monitor the spread of mental and neurological disorders. He states that “during disasters, besides the physical diseases, a series of mental and social disorders, marital violence or even sexual violence may occur.”

Water and sewage system, excreta disposal, dead body disposal, and insect, vermin, and vector control systems are among the most important factors that should be considered when developing a health surveillance system. This requires a comprehensive health perspective in the design of the care system model; according to the experts in the affected regions, the pre-requisite factors are known in the health surveillance system in natural disasters.

P01 states that “during disasters, we encounter homeless people with an adverse health condition with no access to drinking water and restroom and also dead animals which are not collected and disinfected early and contaminate the environment both by their stench and by gathering vermin, as experienced in Kermanshah earthquake. Disposing human waste in the open space can cause pollution and contaminated water and food lead to fecal-oral diseases transmission. During the Kermanshah earthquake, in the field hospital the sewage was going on in the street.”

Defined position

Health system specialists participating in this study believed that the role, service level, and position of national military organizations in providing health services during natural disasters must be defined as a requirement for designing an efficient health

surveillance system for the army and similar military organizations.

According to P11, “[F]irst of all, the description of the tasks and the position of the army (Should it help 10% or 100%), should be clarified because it is mainly the task of the Ministry of Health and Medical Education and the Red Crescent Society to help people affected by disasters. Then, after the role of the army is determined, the role of the forces and indicators such as equipment and medicines shall be defined.” P11 believes that we still do not know what the role of the army is? Then, we cannot say much until it is clear.

Providing information

For the participants, collection of health and sanitation data is an important step in the efficient implementation of a health surveillance system. According to the prevailing opinion of operational experts who have provided services during natural disasters, the registration of health and medical data during disasters is not completely carried out. They suggested that the variable statistics regarding the health and treatment conditions of the disaster area, including the number of patients, prevalence of disease, and the rate of infection, are associated with the inefficient registration system during accidents and disasters. Manual recording of information, incomplete information and forgotten cases of illness, and failure to record health data due to lack of access to health records of community members were among the issues emphasized by the participants. On-the-spot recording of information prevents the forgetting of data to a great extent and provides data ready for analysis at the moment. The participants reported that the defects of the data collection and recording system and the lack of access to accurate information challenged the analysis and decision-making system in providing timely health and treatment responses. According to one of the experts, the electronic registration system provides the possibility of online dissemination of information and data management and analysis. Although electronic data recording using software and on the web was recommended by all the participants, the simultaneous manual recording as a backup method was highly emphasized.

P05, in a report on the 2019 Agh Qala flood, pointed out the lack of an active registration system to record patients history: “For example, the cases of scorpion or *Anopheles* biting not referred to the hospital.”

According to P11, “until data registration is done correctly, no solution can be provided. He/she stated to this issued that Covid-19 epidemic, only the patient admitted to the hospital or those undergone PCR tests were recorded.”

Furthermore, the participants pointed out the important role of reporting in the data collection process and

believed that in the military forces, people refrain from reporting diseases due to fear or for their own interests and that this makes the accuracy of disease information and timely action to control its occurrence and spread a serious problem.

According to P01, “following a natural accident, even under normal conditions, health and treatment centers should be obliged to immediately report that, for instance, similar symptoms has been seen among people of one part of the country in order to prevent and control it before it spreads.”

Driving components

System efficiency

The participants highlighted the role of education in the adherence to the protocol and instructions of the health surveillance system efficiency in natural disasters. They emphasized that managers and various specialists needed in the disaster-affected area should have undergone specialized training to work in the crisis-affected area before being posted there.

P02 stated that “an organization may be very strong in, for example, disease detection, but because it has not yet had so much training for crises and disasters, it does not know how to do disease detection in crisis situations.” He believed that, “in Iran, there are no trained managers and training in this field and that people with academic degrees in Crisis and Disaster Management can provide such trainings.”

Based on the experiences extracted from the interviews, active surveillance and detection of signs and symptoms of disease in people who visit the hospitals and medical centers in person, field identification of patients, and screening and discovery of new cases of disease are emphasized during natural disasters. In this research, health providers in natural disasters repeatedly mentioned that the system of active surveillance during natural disasters is efficient in identifying disease symptoms and early diagnosis of disease outbreaks. Based on the participants’ practical experiences, monitoring and follow-up of patients and exposed people is one of the most important components of advancing the goals of efficiency in a health surveillance system.

According to experts, access to statistical estimates to assess existing conditions, identifying needs, and making health and treatment decisions during disasters require a system that is able to analyze data at the required time; otherwise, the data are of no practical and operational value in making decisions on health and treatment conditions. Furthermore, operational managers participating in this study considered timely decision-making as one of the most important factors of an efficient surveillance system. Therefore, information

analysis and timely decision-making are two effective components in the efficiency of the health surveillance system in natural disasters.

P08 referred to an important issue: that registration alone, although valuable, cannot be helpful if it is not analyzed.

From P09's point of view, *"the data should be able to be analyzed, using a software, both as graphs and extract raw data."*

P12 highlighted user-friendliness and fastness of the data analysis software used for the crisis.

Effective communications

Effective communication as an important component in the design and formulation of the military health care system in disasters was emphasized by all the participants. The participants considered the communication of this system from three perspectives: the internal communication of the military health care system, the communication of the military health care system with the national health care system and other organizations providing health services, and, finally, the performance of the referral system in transferring information to the decision-making levels of the health care system. From the participants' point of view, there should be effective communication between the identification, registration, follow-up, analysis, and support parts of a health care system. Effective communication includes access to correct information, information exchange, and expert advice in making decisions and providing feedback. According to the participants' statements, the details of the patient's location and the clarity of the patient's dispatch and treatment route have always faced problems in past disasters due to the failure of the communication system.

As P09 reported *"[O]ne of the problems we have in the disaster communication system is that it is not clear where the patient will be sent, the injured person's initial treatment is done and he/she is delivered to ambulance, airplane, helicopter, then it is not at all clear where to take the party. Again, in Kermanshah, there were families where, for example, each member of the family was sent to a place and they did not know about each other at all, and even, the person who sent them did not recorded anything in this regard."*

Based on the practical experience of service providers in disasters, in the health system the referral system has been able to provide intra-organizational communication of the national health care system to a large extent. Therefore, in the design of the military health surveillance system, they recommended using the successful experience of the referral system in the field of system communication.

All participants believed that in order to accurately implement and advance the goals of the health surveillance system, this system should be accepted by the beneficiaries. The implementation of the steps of the health surveillance system requires the effective communication and cooperation of operational forces present in the field. The participating doctors in this research stated that if the collection and recording of information prevents them from implementing the treatment process or slows down the speed of their treatment due to the importance of the speed of action in saving human lives in a crisis, they should refrain from recording information. Failure to implement each step will ultimately cause a malfunction of the health care system. Therefore, they believed that the design and implementation of the system through questioning and consultation with beneficiaries would lead to the formulation of an acceptable system.

Operational components

Contingent performance

From the point of view of the participants, the health surveillance system in natural disasters should have executive and operational flexibility based on the conditions of the crisis area, the conditions of the endemic diseases of the area, the environmental conditions of the area, and the type of crisis. Based on the experience of the participants, the diseases related to the type of crisis is diverse, and this diversity should be taken into account when developing a health surveillance system for natural disasters in order to act quickly when facing the complications and problems that arise from the crisis. Furthermore, they believed that the armed forces were obliged to respond to natural disasters.

P05 declared that *"among natural disasters, floods and earthquakes both increase the prevalence of vector-borne diseases, but floods may lead to water-borne and gastrointestinal diseases, too. However, in volcanoes lung diseases mostly caused by smoke and dust and fires, also, many of the diseases are endemic issues of the region and are unpredictable; for instance, an earthquake may become a hot spot of a disease like HIV."*

Effective response

According to operational managers, responding to natural disasters requires quick action, and functional coherence is effective for effective disaster response. For quick reaction and timely response, the relief and treatment structures should be identified before the crisis. Based on the interviewees' experiences, the requirement for strong performance of the health surveillance system in natural disasters is to avoid arbitrary work, perform a teamwork based on the capabilities of the organizations, fairly distribute resources, and implement protocols and guidelines of the health surveillance system in a coherent and integrated manner.

P02 refers to the lack of a teamwork-based system as a problem in disasters. *“The Ministry of Health, other forces, and military forces work as islanded operation. The tasks such as evacuating the wounded, cleaning, the treatment, the equipment part, each should be assigned to one organization.”*

Promotional components Purposeful support

Participants believed that when designing a natural disaster health surveillance system for the military, purposeful monitoring and awareness of the support system should be considered as an integral part of this system.

According to P10, *“We must have the regional health system data of the field including what are the existed diseases in the region or are likely to exist now and our system does not know about them? so we can be more Purposeful and fulfill out tasks with better support. For example, where there are more children, where more adults. What food should be taken for children? What equipment should be taken.?!”*

For P13, a system with no purposeful monitoring is like a system lacking executive follow-up.

Pre-disaster preparation

A component emphasized by all the participants for developing a health surveillance system in disasters is the pre-disaster preparation of the health care system in all aspects including the mental and operational preparation of human resources and the preparation of equipment and facilities. They suggested training and maneuvers for this preparation. They considered the scenario-oriented nature of the maneuvers and exercises as a factor that improved the readiness of the health care system teams. The central scenario will increase the mental preparation of the teams providing health services during the crisis and will bring the training and maneuver space closer to reality. Another factor that improves the health care system’s readiness for effective response during crisis situations is the repetition of exercises.

P09 said, *“[A] series of maneuvers are carried out at the hospital and non-hospital levels, but in my opinion, they are far from the realities. For example, usually everyone already knows that a certain day a maneuver must be held and thus, he is mentally prepared for the conditions. but the reality is that during the Sarpol-e Zahab earthquake in Kermanshah and the Varzaghan earthquake that I visited, one person is summoned and bring his family with him to the hospital yard. It seems that the training we give about disasters and the maneuvers we hold are not very consistent with reality.”*

Some participants stated that to develop a health surveillance system for the military in natural disasters,

research, experiences of similar regions during disasters, and lessons learned should be used.

According to executive and operational participants, the degree of cooperation of the affected community with aid workers and service providers who speak their own language were of great importance in past crises. Considering the indigenous, cultural, and linguistic components of the people in the crisis-stricken region in the successful implementation of the health care system has been a challenging issue in past experiences.

P13 declared that *“when collecting data from people and about their diseases or complications and symptoms, one should think about language diversity and data collection strategies in this situation.”*

Discussion

The most comprehensive definition of health was provided by the World Health Organization (WHO) as physical, mental, and social health.^[20] Although in the past, the health care system focused on infectious disease care system, recently, it has expanded to other health areas such as environmental, occupational, mental, and chronic diseases to achieve an integrated health care system.^[21,22] The COVID-19 pandemic and the significant increase in mental disorders such as stress, fear, and worry among communities have shown that the care system for mental diseases is as important as the care system for infectious diseases.^[23,24] Therefore, a comprehensive view of health should be considered as an essential component of the health care system.

Defining the position and role of the army and military organizations is also of great importance in the national health surveillance system. Since the adoption of the Oslo Directive—the first document that clarified the role of the military for international assistance in natural disasters—the coordination of military forces with civilian forces in response to natural disasters has improved.^[25,26] The military may respond differently to major natural disasters due to the strategic culture of the countries.^[11] For example, the electronic surveillance system for early notification of community-based epidemics (ESSENCE) is a secure web-based tool used by the US Department of Defense during disasters and crises. It allows health care practitioners to monitor important indicators of public health to detect and track disease outbreaks, consequences of severe weather, and warn against the threats to public health of society.^[27] Moreover, the Indian Armed Forces, one of the most professional and modern armed forces in India, are always operationally ready to quickly move to any disaster-affected area. It is the core of the country’s rapid response to major disasters and plays an important role

in rescue and relief operations.^[10] Based on this study context, the military health surveillance system should cooperate with other health systems in disasters under the supervision and command of the national health care system.

The continuous collection of health and hygiene data from two perspectives as a monitoring tool and a tool for making decisions about health measures is one of the main components of any health care system.^[28,29] The most effective health care systems are systems that collect health data around specific goals in a standardized way, analyze the data repeatedly, and disseminate the results to the decision-making levels.^[28] Based on the findings of this research, to achieve regulatory goals, collecting the minimum required data should be emphasized because a lot of complex and scattered data negatively affect the quality of collected data and challenge statistical analysis and decision-making.

Specialized training before a crisis improves the effectiveness of health and treatment teams. Pre-disaster training should include a proper understanding of the impact of specific disasters on infrastructure and the environment and the vulnerability of the population to specific disasters, and include the assessment and management of victims in damaged environments and limited resources in disasters.^[30]

Based on the findings of this research, active disease prevention is of particular importance during natural disasters. During the COVID-19 pandemic in China, active monitoring and active disease detection along with isolation and quarantine measures significantly reduced the amplitude of the epidemic peak.^[31] In the event of natural disasters such as floods and earthquakes, destruction of health care infrastructure and disruptions in the provision of public health services increase concerns around the spread of infectious diseases, occurrence of injuries and damages, mental health disorders, and the exacerbation of previous chronic diseases. In the event of Hurricane Katrina, the Ministry of Health of the involved states in USA asked the CDC to implement its surveillance activities and active disease detection.^[32-34] In the event of disasters, where the normal monitoring and care activities of patients are interrupted due to the destruction of health and treatment infrastructure of the community, temporary shelters, and mobile medical care centers, active care systems are necessary to strengthen passive health care systems.^[35] Active surveillance system and cooperation with the emergency departments of the state helped the Louisiana public health authorities to identify the high number of injured individuals and the diseases caused by Hurricane Andrew.^[35] The active patient surveillance system and disease monitoring after Hurricane Floyd in North Carolina led to the

identification of suicide attempts, animal bites, basic medical needs, dermatitis, arthropod bites, and asthma, all of which had significantly increased compared to the previous year.^[36]

In the early days of disasters, it is a challenging issue to collect health data, analyze it, and publish it to make decisions about health and treatment measures because in addition to the speed of data collection, it is necessary to ensure the reliability of the collected data for correct and timely decision-making.^[37,38] The findings of this study highlighted the importance of the health surveillance system in collecting health data and interpreting and disseminating it for decision-making in the event of disasters.

In military organizations, intra-organizational communication is often centralized,^[39] but all the organizations that provide disaster services require multi-functional communication to respond to disasters. However, the level and manner of extra-organizational communication should be determined.^[40] In the current study, the referral system was considered as one of the many factors of military health surveillance system in disasters, without which the system could not be monitored. A study on the performance of the emergency medical communication system in response to natural disasters in Indonesia also confirmed the role of a referral system in increasing its communication with other health resources in the community, integrating their resources into the health care system, and, as a result, providing wider service coverage to the affected community.^[41]

System acceptance means the willingness of beneficiaries to implement or actively participate in the diagnosis of disease reporting.^[42] Participants in this study referred to the time-consuming nature of data recording as a reason for a system's non-acceptance and suggested to use specialized human resources for recording health data or design an electronic system with the ability to automatically record information. For example, the syndromic surveillance system is accepted by the participants because the data transfer in this system is automatic and does not require additional work by employees.^[43]

In the event of accidents and disasters, the level of interaction of military and civilian organizations in responding to disasters often depends on the type of event that is planned for and the specific performance of the service provider organization. For example, fire services and public health services in military and civilian organizations are responsible for a wide range of duties in the event of disasters, and military and civilian security forces are relatively less involved but still cooperate at the tactical level.^[39]

In disaster management, centralized response networks are more efficient due to integrated coordination and centralized communication^[39] because responding to disasters involves many dimensions and aspects of providing health services. Creating an integrated organizational network to benefit from the resources of organizations that can take appropriate and timely actions in emergency situations improves the effectiveness of said actions.^[44,45]

During a disaster, data must be collected quickly under adverse conditions. Using available data sources, standard methods of data collection, and reliable sources can improve the ability to collect information.^[2] In the event of disasters, timely decision-making is essential for effective response. Public health surveillance allows decision-makers to make evidence-based and timely decisions for more effective leadership and management.^[46,47]

Based on the findings of the present study, it is necessary to review and develop health care systems according to environmental changes, emerging diseases, and the variety of accidents and disasters in different regions with different biological conditions. Based on the WHO guidelines, the health care systems that are designed with the one health approach integrate the health of humans, animals, and the environment in order to accelerate the diagnosis and prevention of emerging infectious diseases that are common between humans and livestock.^[48,49]

Logistics and meeting the needs of the disaster scene has been likened to delivering blood to the living cells of the body. As the body stops moving without blood, no operation can achieve its goals without proper support.^[50] Therefore, the monitoring and maintenance of the health care system in disasters were identified as a component that improves the performance of the health surveillance system.

The essential elements of an effective health surveillance system include the need for the system to be adequately supported and to allow routine population-level health surveillance to be carried out continuously by an armed force and also, in peacetime and during the operation.^[9]

Based on our findings, the experience of the medical teams in preparing for disaster management has led to the identification of gaps and the feedback of less effective measures, the identification of parts of the protocols that are not effective, and the modification of the protocols.^[51-53] The important finding of our study was the importance of scenario-oriented exercises. By identifying beneficiary groups and asking purposeful questions, scenario-based exercises helped the team identify operational barriers, processes, and policies that

need to be revised, and the exercises of the team prepared for disaster response became more realistic.^[54,55] Repetition of exercises is another effective factor in pre-disaster preparedness, which was repeatedly emphasized by the participants of this study. The findings of virtual reality simulation (VRS) study show that this preparedness training method is a cost-effective and repeatable technique for practicing disaster management training, and it can cover the practice of various training scenarios that may occur.^[56] According to our study findings, the military health surveillance system can be updated and further studies can be designed to explore barriers and facilitators of the implementation of this system during natural disasters.

Limitation and recommendation

Since the occurrence of disasters affects many aspects of the society's health, this research emphasized on a comprehensive view of health in the design of the military health surveillance system.

The job consideration of military participants to sharing their experiences due to being criticized in individual job position were study limitation. Therefore, at the beginning of each interview, we assured the people about the confidentiality of their information.

Conclusion

Based on the results, the health surveillance system is a part of the country's national health system, the data of which is essential for making decisions on health and treatment measures of the society. Therefore, the military health surveillance system for natural disasters should follow the national health care system in its design and implementation. The participants in this study believed that in the design of the military health surveillance system, pre-requisite components, driving components, operational components, and promotion components should be considered. The driving components facilitate the performance and improve the efficiency of the health care system. Among the operational components, the effective response of the health surveillance system is based on timely analysis and appropriate and evidence-based decision-making. It is also necessary to follow the unified command and integrated management of the health surveillance system. Finally, the development of the health surveillance system for the army, improvement of the processes, and operational instructions of the care system are possible with the help of promotional components.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their

images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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