Evaluation of Disaster Preparedness Levels of Flood-Affected Hospitals: Turkey

Abstract

This study aimed to evaluate the disaster preparedness levels of a hospital and its personnel who were exposed to flood disasters in the Eastern Black Sea region of Turkey. The study was designed qualitatively. Since it was aimed to obtain in-depth information, the phenomenology design was used in the study. The data were collected from 15 people through face-to-face interviews with a semi-structured interview form. The data were computerized to the MAXQDA 22 software and codes, categories, and themes were created. In the study, three themes were created: "Infrastructure Management and Sustainability of Critical Facilities, Preparedness, and Health Service Delivery". It was determined that infrastructure problems arose due to flooding on the lower floor and the hospital's garden as a result of the flood disaster. It was observed that medical equipment was prepared before the flood disaster and equity resources were protected after the disaster. It is considered that the preparatory efforts carried out before the flood disaster, the organized training and exercise programs, and the establishment of early warning systems contribute to the continuity of healthcare services in the event of a possible flood disaster and aid in the return of individuals/institutions to normal life after the disaster.

Keywords: Disaster·Disaster Management·Health Care in Disasters·Flood Disaster·Critical Facilities in Disasters

Introduction

Disasters can be described as situations that exceed the coping capacity of society, cause disruption of daily activities, and cause loss of life and property (Choksi et al., 2018). In recent years, the number of both human-made and natural disasters, including earthquakes, floods, epidemic diseases, terrorist attacks, storms, and forest fires has increased (Anshuka et al., 2021; CRED, 2022; Usta, 2023). It is known that floods are one of the most significant disasters among all these disasters. Floods are among the disasters that cause deaths, injuries, displacement, economic damage, and property losses in many countries (Yousefi et al., 2020). Floods cause destructive effects on infrastructure, economies, and healthcare systems in the areas where they occur (Paterson et al., 2018).

In Turkey, where the study was conducted, the number of flood disasters is increasing day by day, and these disasters not only result in material damage but also lead to loss of life (Bayraktar et al., 2021). As a result of the landslides and flood disasters that occurred in the cities of Karabük, Sinop, Bartın, and Kastamonu between August 10-11, 2021, in Turkey, 82 people lost their lives, many citizens went missing, and significant material damage occurred. Especially in the Bozkurt district of Kastamonu province, the flood caused loss of life and property (AFAD, 2021b). On August 24, 2015, eight people lost their lives, three people were missing, and serious material damage was caused in the flood disaster that occurred in and around the Hopa district of Artvin province (Torpuş & Bostan, 2022). As of the evening hours of July 21, 2021, floods occurred in the Arhavi district of Artvin province as a result of excessive rainfall. Due to the overflow of the Arhavi creek, roads were damaged, routine life was interrupted, and disaster victims were injured (AFAD, 2021a).

Health facilities are the first places where the injured seek help after disasters. Therefore, health facilities are considered among the major stakeholders in terms of disaster management and play a significant role in combating the devastating consequences of disasters (Yazdani et al., 2021). Disasters can negatively impact the service capacity of healthcare systems, leading to a decrease in the quality of healthcare services (Ziegler et al., 2021).

Therefore, it is important to answer questions about whether healthcare facilities have been damaged by these disasters, whether the health service delivery has been affected as a result of disasters, and whether there has been any change in the number of people receiving services from healthcare facilities after disasters. Because hospitals play a significant role in the creation of disaster-resistant cities (Yazdani, Mojtahedi, Loosemore, & Sanderson, 2022; Yazdani, Mojtahedi, Loosemore, Sanderson, et al., 2022). Hospitals need to remain functional in disasters to provide health service delivery (Aghapour et al., 2019). Some studies focus on the conditions, role, weaknesses, evacuation processes, and preparedness activities of healthcare facilities during disasters (Bongiovanni et al., 2017; Childers & Taaffe, 2010; Farley et al., 2017; Haghani, 2020; Haverkort et al., 2016; Lovreglio et al., 2019; Olanrewaju et al., 2019; Sandra et al., 2017; Sorensen & Mileti, 1987; Van Minh et al., 2014), it has been determined that there is a lack of qualitative studies examining the vulnerability and resilience of hospitals exposed to floods. Addressing the research gap in this field can help reduce the vulnerability of hospitals during flood disasters.

Therefore, this study is considered significant in terms of qualitatively addressing the disaster preparedness, post-disaster response, and recovery process of hospitals experiencing flood disasters in Turkey. The results of this study can serve as a guide for hospitals and emphasize the role of the health sector in disaster management. In addition, the results of the study can be used as a reference for hospitals in similar disasters in other countries. In this regard, this study aimed to evaluate the disaster preparedness levels of a hospital and its personnel who were exposed to flood disasters in the Eastern Black Sea region of Turkey. For this purpose, answers to the following questions were sought.

- How has the health service delivery of hospitals exposed to flood disasters been affected?
- How have the preparatory activities conducted before the flood disaster affected post-disaster efforts?
- What are the factors that influence the vulnerability and sustainability of hospitals to flood disasters?

Material and Method

Research Pattern

This study was designed qualitatively. Since it was aimed to obtain in-depth information, the phenomenology design was used in the study (Boyd, 2001; Guba & Lincoln, 2005).

Universe and the Sample of The Study

The population and sample of the study consisted of the employees of a hospital exposed to flood disasters in the Eastern Black Sea region of Turkey. The study included individuals who were 18 years or older, working as hospital personnel, actively involved in tasks during the flood disaster, and willing to participate in the study.

Data Collection Tool

The study data were collected using a semi-structured interview form prepared by the researchers in light of the literature and approved by the expert. The prepared form consists of two parts: socio-demographic questions and questions related to the research content. In the first part, the socio-demographic section, there are 12 questions, including the place, date, and method of the interview, gender, marital status, age, education status, professional title, position in the institution, working time in the institution, total work experience and previous disaster

experience. In the second part, there are nine main questions and six probe questions to evaluate the experiences of hospital employees who were exposed to flood disasters. The main questions in the interview form are as follows:

- Can you please tell us about the preparations your hospital made for such events before the flood disaster you experienced?
- Can you tell us how you provided health services during the flood disaster you experienced?
- Have you experienced any disruptions in emergency services? What has been done?
- Can you tell us about the evacuation process of the patients hospitalized in the ward?
- Can you tell us about the evacuation process of intensive care patients?
- Were there any problems with the hospital infrastructure during the flood disaster? Can you explain?
- Were there any problems in terms of the supply of medical equipment during the flood disaster? Can you explain?
- What preparations were made for a potential next disaster in the aftermath of the flood disaster?
- Probe Question 1: In terms of preparation plans?
- Probe Question 2: In terms of tools/equipments?
- Probe Question 3: In terms of educational activities?
- Probe Question 4: In terms of infrastructure?
- Probe Question 5: In terms of the evacuation process?
- Probe Question 6: In terms of staff supply?
- Can you evaluate the functionality of the hospital disaster plan regarding the flood disaster? Can you assess the positive and negative aspects?

Data Collection

The data of the study were collected between April and May 2023. The participants were reached by snowball technique and the participants were determined by the purposeful sampling method. A total of 15 people were included in the study. When similar responses were received from the participants, it was accepted that data saturation was reached and the data collection process was terminated (Saunders et al., 2018). In qualitative research, it is important to find people who will provide detailed information about the subject to be examined in determining the sample size (Creswell & Poth, 2016). The literature shows that generally qualitative studies were carried out with 10-15 people (Johnson & Christiansen, 2014). The data were collected by face-to-face interview technique. In accordance with the policy of the institution, the interviews could not be recorded with a voice recorder. However, to prevent data loss and bias, both participants and researchers transcribed the interviews at the same time during the interviews. Later, the transcriptions obtained were re-submitted to the participant evaluation, and approval was obtained. It was observed that the majority of the participants were university graduates and females. It was determined that the youngest participant was 36 years old and the oldest participant was 61 years old (Table 1).

Table 1 Participant characteristics

Participants Code	Gender	Age	Title	Educational status	Work Experience (Years)
P1	Female	47	Nurse	Undergraduate	28
P2	Female	48	Nurse	Undergraduate	25
P3	Female	39	Data preparation and control operator	Undergraduate	16
P4	Male	47	Data preparation and control operator	High school	20
P5	Female	37	Secretary	Associate Degree	8
P6	Female	49	Midwife	Graduate	30
P7	Male	38	Secretary	Associate Degree	13
P8	Male	42	Security Supervisor	High school	24
P9	Female	44	Nurse	Associate Degree	25
P10	Male	48	Data preparation and control operator	Undergraduate	19
P11	Male	40	Data preparation and control operator	High school	22
P12	Female	52	Nurse	Undergraduate	30
P13	Male	47	Chief	High school	26
P14	Male	36	Security	High school	13
P15	Male	61	Civil servant	High school	33

Data Analysis

The data collected were edited and transcribed with the participation of all the researchers.

To anonymize participants, separate codes were assigned to each participant (P1, P2... P15). The transcribed data were reviewed by the researchers at different times. The reviewed transcriptions were computerized and coded using MAXQDA 2022 qualitative research software. From the codes, the categories and themes have been reached. During coding and categorization, expert opinions were obtained from two faculty members who conducted qualitative research in the field of disaster management. MAXQDA 2022 software was preferred for data analysis as its visual tools offer rich analytical capabilities for qualitative research, allowing for the creation of main themes and concept maps within the text. The data analysis process involved the following steps: coding the data, creating categories and themes, organizing themes and codes, and describing and interpreting the findings (Graneheim & Lundman, 2004).

The analysis of the data was carried out within the framework of the question of how to explain "the experiences, expectations, attitudes, awareness, and perceptions of hospital employees who experienced the flood disaster". The reporting of the study was conducted taking into account the criteria in the Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist (Tong et al., 2007). In addition, the World Health Organization (WHO) health systems' six building blocks framework was used to categorize the impact of flood disasters on the health system (WHO, 2010).

Validity and Reliability

To enhance the validity of the study, various methods were used, such as purposive sampling to select participants with different roles, participant control, and expert support. In the study, the design, sample, participants, data collection, and data analysis of the study were clearly stated and the transferability of the study was ensured (Roller & Lavrakas, 2015). To ensure transferability, clear and distinct explanations have been sought regarding the context, the selection and characteristics of the participants, the data collection, and analysis process, as well as the rich and powerful presentation of findings with appropriate citations (Guba & Lincoln, 2005).

Ethical Considerations

In order to carry out the study, permission was obtained from Artvin Coruh University Social Sciences and Humanities Scientific Research and Publication Ethics Board (Decision No: E-81614018-000-2200054598). In addition, written permission was obtained from the institution where the study will be conducted. Informed consent was obtained from the participants. All privacy rights, including the information of the participants, were complied with. In addition, the collected data will be kept by the researchers on two different computers for at least five years.

Findings

Within the scope of the study, three themes were created: "Infrastructure Management and Sustainability of Critical Facilities, Preparedness, and Health Service Delivery".

Theme 1: Infrastructure Management and Sustainability of Critical Facilities

It was observed that there were inundations of water into the hospital's garden, basement, or ground floor due to sewage and infrastructure problems following the flood disaster. It was stated that the problem was resolved with the timely intervention of the municipality teams. It can be stated that the inadequacy or insufficient openness of the systems carrying floodwaters has an impact on this situation. It was observed that there were problems after the flood disaster in the electricity system connected to the city line and accordingly there were power cuts. However, this problem was solved with the rapid activation of supplementary energy (generator) sources. In addition, it was determined that there are problems with the location of the hospital and transportation routes. It was stated that access roads have been damaged. Although partial issues were reported after the flood, these problems did not create a major impact on the health service delivery. Under the theme of infrastructure management and sustainability of critical facilities, four categories have been created: transportation, infrastructure, site selection, and power cut. In the study, it was observed that infrastructure problems were frequently mentioned by the participants. There is a relationship between power cut and supplementary energy sources (Fig. 1). Some of the statements of the participants regarding this theme are as follows:

"The embrasures in the hospital yard were clogged and the garden was flooded (P2)".

"... both transportation problems and infrastructure problems may occur (P3)".

There was flooding in the basement of the hospital (P9)".

"There was an electricity-water outage (P12)".

"Water came back from the loggers and the smell spread (P14)".

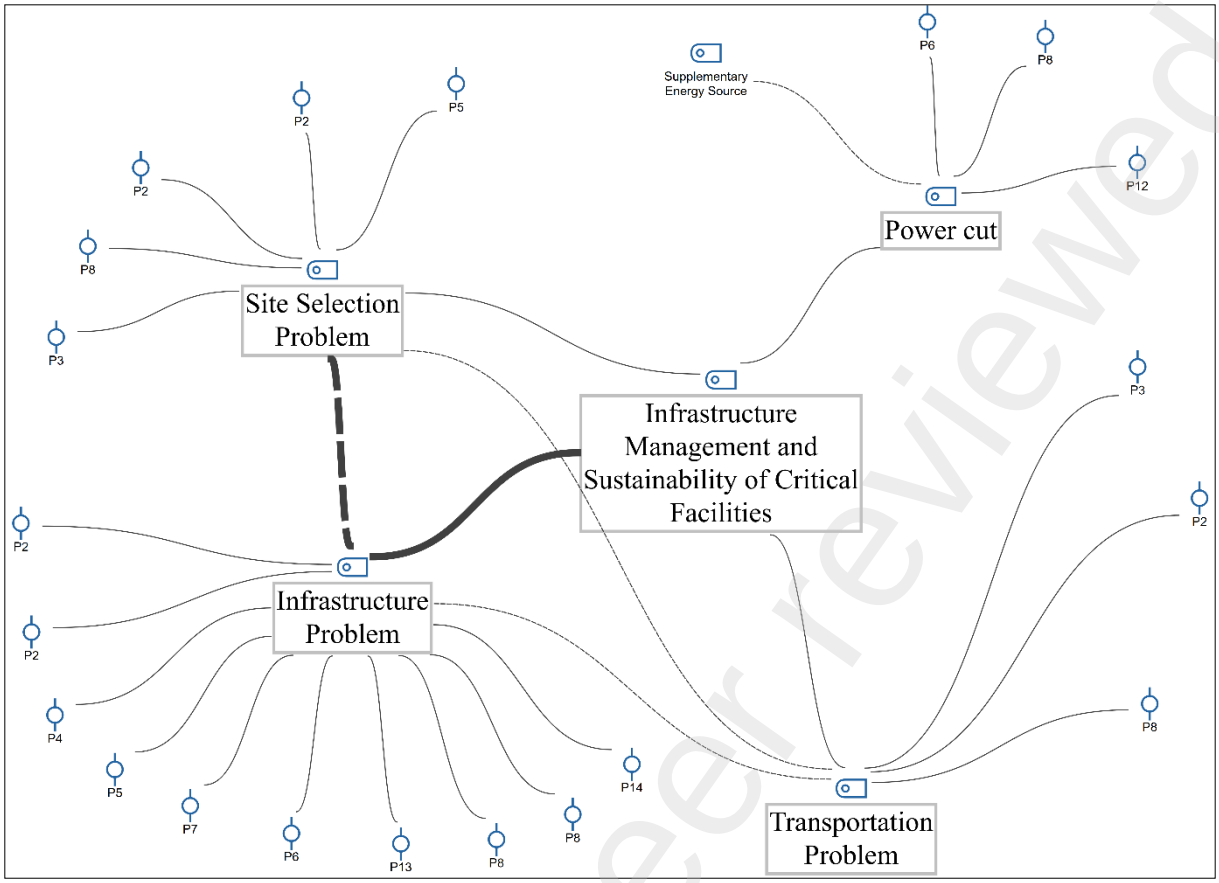

Fig. 1. Infrastructure management and sustainability of critical facilities theme and categories

Note: Line thickness reflects frequency.

Theme 2: Preparation

It was observed that significant preparation was made in terms of medical equipment before the flood disaster occurred. In this unusual situation, it can be stated that internal resources were preserved in a way that did not disrupt routine health service delivery. It was determined that the plans prepared specify how personnel should be mobilized in exceptional circumstances and that task notifications are carried out. It was observed that disaster plans are created institutionally and these plans are frequently supported by exercises. It was determined that control mechanisms are operated to evaluate the effectiveness of the plans. The frequent coding of training and exercises under this theme can be considered as evidence of this situation. Taking measures to ensure the safety of medical devices against disasters and securely archiving critical documents were considered as another noteworthy issue in the study. Taking quick action in flood prevention actions for flood disasters is considered as an indicator of how appropriate the preparation activities are. Such measures play a significant role in mitigating the effects of flood disasters. Furthermore, the active use of information and early warning messages by the institution has also been recognized as another significant aspect. It has been reported that necessary precautions were taken based on early warning messages transmitted by the General Directorate of Meteorology before the flood disaster occurred. Under the theme of preparation, three categories have been created: logistics, training-planning-control, and safety-preventive measures. It was determined that there was a relationship between personnel and equipment and between the hospital disaster plan and training and exercise practice. In addition, it can be stated that, albeit at a

weak level, there is a relationship between personnel support and flood prevention actions (Fig. 2). The statements of some participants regarding this theme are as follows:

"Under the Hospital Disaster and Emergency Plan, training is conducted twice a year, and drills are conducted once a year (P6)".

"The institution was informed before the flood disaster (P8)".

"Device security in flooded areas has been ensured. Document and equipment security was ensured according to the instructions on what to do in the event of a flood (P8)".

".....because the meteorology had warned (P10)".

"Additional doctors and nurses were provided. At least 10-15 doctors, 30 nurses, and the whole team were on duty until the morning (P10)".

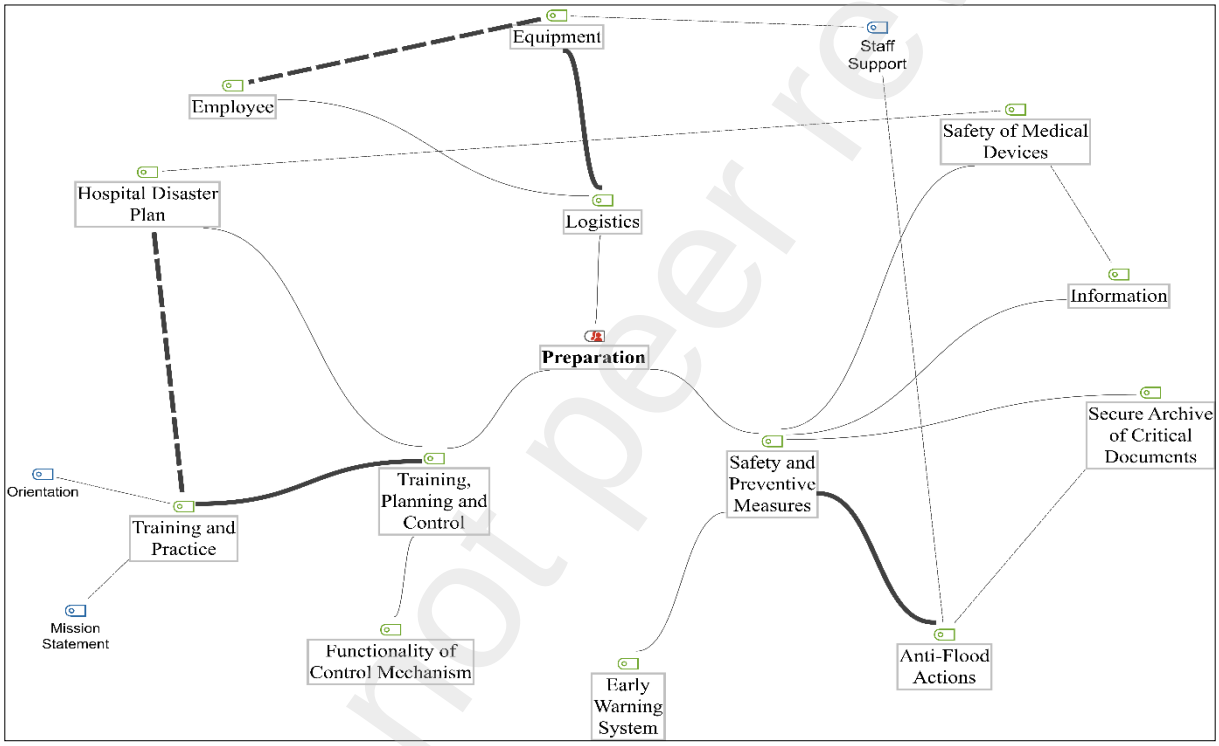

Fig. 2. Preparation theme and categories

Note: Line thickness reflects frequency.

Theme 3: Health Service Delivery

It can be considered that the factors that will affect the health service delivery after the flood disaster are minimized as a result of timely measures taken and quick action. It was observed that regular data records were made during the flood disaster. Therefore, it can be stated that this situation is a significant factor for damage assessment and the continuity of health service delivery. It was observed that the preparation of medical equipment and successful organization were other factors that ensured the continuity of the service provided. It was observed that patient transfers from the damaged health unit to different hospitals were carried out successfully after the flood disaster. It was determined that specially equipped ambulances according to the conditions of the patients are dispatched to the region. It is considered that the distribution of duties among personnel according to the pre-disaster planning and the rapid response of personnel contribute significantly to health service delivery. Under the theme of health

service delivery, three sub-categories have been created: equipment management, capacity and data management, and personnel management and successful evacuation. In the category of personnel management and successful evacuation management, it was observed that codes such as task notification, successful evacuation process, orientation, and personnel taking action were coded more frequently than others. In addition, it was determined that there was a relationship between the successful evacuation process and orientation and ambulance support. Likewise, a relationship was found between orientation and training exercise, and between power cut and supplementary energy source (Fig. 3). The statements of some participants regarding this theme are as follows:

"... I quickly made the data entries. Doctors also made the interventions easier according to these data (P10)".

"There was no impact on the services. We had an empty bed (P6)".

"The only disruption in the emergency room was the arrival of a large number of injured. "We were a bit lacking as a department (P7)."

"There was no shortage of supplies (P9)."

"The electricity went out. The generators have been activated (P8)".

"There was a need for a bariatric ambulance (P8)".

"When suitable dispatch locations were found and transportation conditions were met, they were referred by 112 (P9)."

"When the disaster happened, we put on the equipment and ran to the hospital (P9)".

"Everyone knows their duty. Precautions were taken according to the warnings (P10)".

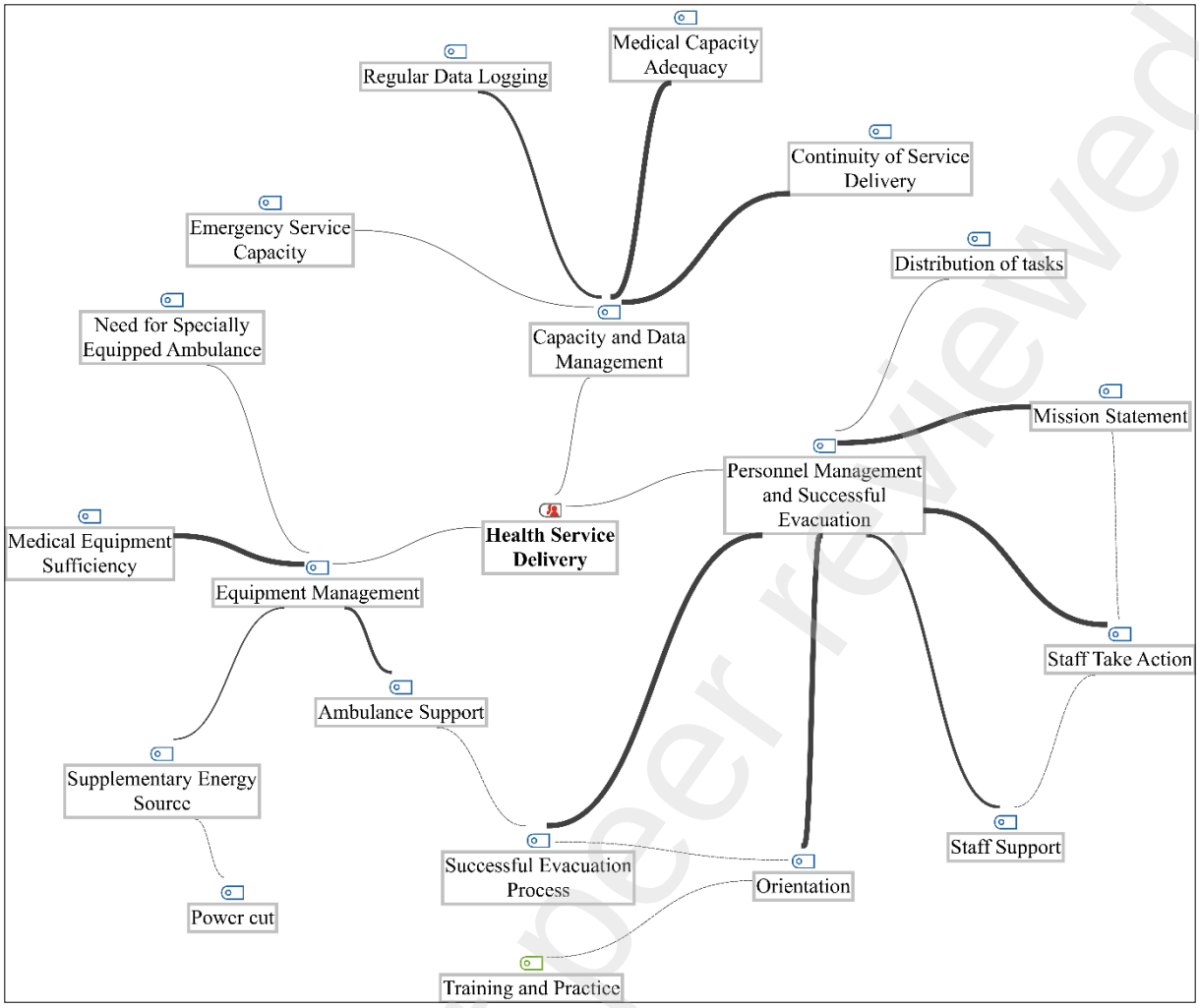

Fig. 3. Health service delivery theme and categories

Note: Line thickness reflects frequency.

Word Trend Analysis

As can be seen in Fig 4, among the words in the transcript documents, the words "education, practice, ambulance, electricity, generator, plan, transportation, preparation, water, and evacuation" were the trending words in terms of total number of repetitions, respectively. In terms of document sections, the word education trended in the first section, the word practice trended in the third section, and the word ambulance trended in the sixth section.

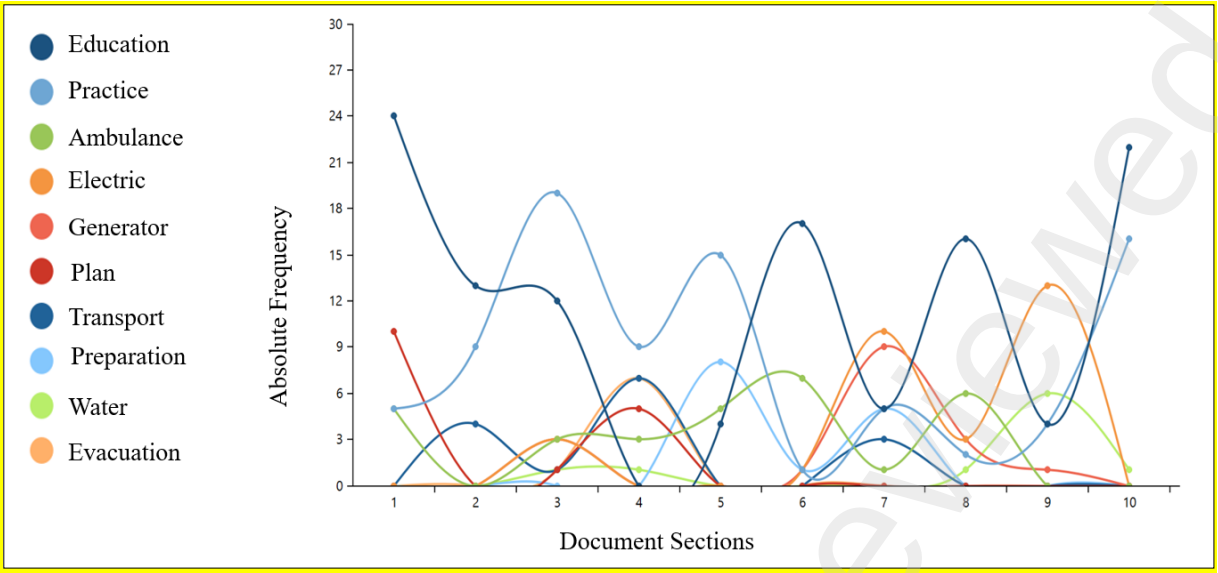

Fig 4. Transcript contents word trend

Discussion

In this study, the opinions of the personnel working in a hospital located in the Eastern Black Sea region of Turkey and exposed to the flood disaster were evaluated.

It was observed that there were floods on the lower floor of the hospital due to the flood disaster. It was determined that infrastructure problems occurred after the disaster. It was accepted that infrastructure problems and inadequate or closed systems to carry flood waters are the main sources of the problems. In unusual circumstances, pressures on the healthcare system may increase. The density of people seeking access to healthcare can increase the pressure on infrastructure and other systems, leading to problems. Therefore, it is recommended to make the necessary plans for the creation of disaster-resistant health facilities (Ortiz-Barrios et al., 2022). Building construction is as important as infrastructure preparation in the creation of disaster-resistant health facilities. Disaster-resilient healthcare facilities must have the ability to continue operating during natural disasters or other emergencies (Albanese et al., 2008). Preparing the infrastructures of critical facilities against disasters will contribute to the successful continuation of the service provision of the relevant facilities in case of a possible disaster. In this regard, it can be stated that the literature data supported our study data.

In this study, it was determined that managers and teams took rapid action to solve the problems that occurred during the flood disaster. It was stated that disaster managers' ability to make quick decisions specific to the situation, apart from applying standard protocols in extraordinary situations, contributes to the solution of problems. Standard protocols prepared before disasters primarily contribute to guiding individuals and ensuring that tasks are carried out systematically. However, since disasters are unexpected and complex situations, managers need to have the ability to make quick decisions (Roud, 2021). In addition, it was observed that exercises are significant in taking quick action in times of disaster. In a study, pre-disaster preparation and simulation studies were emphasized. In particular, attention is drawn to the modeling made in advance in the procurement and distribution of medical equipment and consumables (Vugrin et al., 2015). Therefore, it can be stated that the exercises and preparatory studies contribute to the continuity of health service delivery in disasters.

In this study, it was seen that plans were created to mobilize personnel in unusual situations. These plans were supported by exercises and their effectiveness was evaluated. The preparatory work carried out before the disaster

was evaluated as functional. It is emphasized that health professionals and health service users should work together to develop integrated disaster plans at local, regional, and national levels (Uekusa, 2020). Plans developed for disaster management should encompass a wide-ranging approach that includes the structural characteristics of hospital facilities and their daily operations (Hobfoll et al., 2007; Labarda et al., 2017). Therefore, all stakeholders must master the basic concepts and the same terminology (Najafi et al., 2017). To build a disaster-resilient society, infrastructure and public services, as well as hospitals' disaster planning and preparedness, must be assessed (Zhong et al., 2014). Beliefs about the planning and preparation process have been mentioned to affect motivation in the disaster preparedness process (Ajzen, 1991). Being prepared for disasters is important to be able to respond quickly and effectively (Hassan & Mahmoud, 2019). Preparation and planning activities contribute to the rapid action of individuals and institutions in the event of a possible disaster and minimize the damages.

It was observed that medical equipment was prepared before the flood disaster and equity resources were protected after the disaster. Necessary measures have been taken to ensure the safety of medical devices. To minimize the loss of life and property that can be caused by disasters, it is of great importance to use the available resources effectively and efficiently (Luo et al., 2013). To provide a fast and effective response to disasters, it is essential to keep the medical supplies, food, and hygiene materials required in emergencies ready in warehouses in advance. This contributes to the uninterrupted and effective health service delivery in disasters (Pourhosseini et al., 2015). Health systems must be prepared to use multiple strategies to ensure that patient care is not interrupted in disasters (Lamberti-Castronuovo et al., 2022). Both the data from our study and the literature data have shown that pre-disaster preparedness efforts are crucial for ensuring the continuity of healthcare service in extraordinary circumstances.

In this study, it was determined attention was paid to information and document management and that critical documents were archived securely. It is of great importance to have accurate data in disaster response (Perry, 2004). Having access to accurate sources of information is considered important for the successful continuation of the disaster management process.

In this study, it was determined that early warning messages were issued promptly, and action was taken according to the early warning messages received. In extraordinary situations, it is significant to effectively deliver warning messages created by official institutions to individuals and to take action. The use of mass media is of great importance in giving early warning messages (Pourhosseini et al., 2015; Rabiei et al., 2014). With the receipt of the early warning message, it was determined that the personnel tried to fulfill the previously determined roles and responsibilities. It is considered that the creation of early warning messages and the rapid implementation of preventive actions in accordance with the received warning messages are significant in minimizing the loss of life and property.

Limitations and Strengths

This study has several limitations. The first of these is that the study is single-center and includes evaluations related to the flood disaster. The second is that professional experience and other types of disasters will affect people's perception of preparedness. Therefore, conducting future studies in different regions, with people with different titles, and including different types of disasters can provide more objective data. Despite the limitations mentioned, it was accepted that the strength of the study was that information was obtained by conducting in-depth

interviews with people who directly experienced the flood disaster and contributed to the continuation of health service delivery.

Recommendations

It is considered that the preparatory efforts carried out before a disaster, the organized training and exercise programs, and the establishment of early warning systems contribute to the continuity of health service delivery in the event of a possible disaster and aid in the return of individuals/institutions to normal life after the disaster. After the flood disaster, the factors that may affect the health service delivery have been minimized thanks to the timely measures taken. It is considered that keeping regular data records is significant in terms of damage assessment and continuity of health service delivery. The distribution of duties of the personnel in line with the pre-disaster planning and the rapid action taken contributed significantly to the health service delivery. Therefore, the importance of the plans created before the disaster and the support of these plans with exercises has emerged.

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Evaluation of Disaster Preparedness Levels of Flood-Affected Hospitals: Turkey

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