



Lessons from Flood Disaster Management of Khuzestan Province, Iran, Based on the Experiences of Policymakers: A Qualitative Study

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Abstract

Background: Floods are among the most destructive crises in various countries, including Iran, and are considered a national issue. To reduce flood damages, the flood management process must be regularly reviewed and its problems be identified.

Objectives: Therefore, the present study aimed to focus on flood management in April 2019 in Khuzestan province, Iran, to investigate the flood disaster management in Iran based on the experiences of policymakers, identify problems, improve the process of flood disaster management, and reduce damage in the future.

Methods: This study was designed based on qualitative content analysis. Data was collected using one-on-one, semi-structured interviews with open-ended questions. According to the targeted sampling method, six policymakers related to the Khuzestan flood disaster management in April 2019 were selected as interviewees. Interviews continued until data saturation.

Results: After data analysis, three main themes were identified, namely 1) actions before the flood disaster, such as provision of infrastructure and public awareness, 2) actions during the flood disaster, such as flood disaster level assessment and coordination of actions, and 3) actions after the flood disaster, such as damage assessment. It should be mentioned that each theme included sub-themes and categories.

Conclusion: Increased effectiveness of disaster management requires integration and centralization of disaster management and coordination between organizations involved in the disaster at all stages of disaster management, including before, during, and after the disaster. It is also necessary to pay attention to research and successful models and implement preparedness programs along with disaster drills to prevent disaster damage. Engagement of the participation of people should be considered as well.

Keywords: Disaster intervention, Floods, Policy making

1. Background

A disaster is a hazardous event in which there is a threat and great damage to the core values or functions of life in the social system. Crises occur either naturally or by humans suddenly and cause damage to society. Natural disasters such as floods, earthquakes, hurricanes, and man-made disasters such as wildfires and wars, are crises that threaten human lives and result in significant financial and human losses. Hence, they need a serious and coordinated response to eliminate the harm and normalize the situation (1-4). Floods are natural disasters that cause the most damage in the world including Iran and affect many people. The risk of floods is inevitable, but it can be reduced with the necessary measures. Flood management is known as an effective method to reduce damages and catastrophic consequences (5-7).

2. Objectives

Therefore, many studies have been conducted in the field of flood disaster management in Iran and

around the world. The main topics of these studies include strategic plans; management rearrangement; review of challenges, experiences, and problems in this field in different countries (7-10). The feature of this study is to examine flood disaster management and its problems from the perspective of policymakers who had sufficient knowledge about the study subject. Flood is one of the most destructive crises in Iran and is therefore a national issue. So, the present study was conducted focusing on flood management in April 2019 in Khuzestan province based on the experiences of policymakers. The purpose of this study is to identify problems and provide solutions to improve flood management in Iran and reduce damage in the future.

3. Methods

3.1. Study design

This study is designed based on the qualitative content analysis method, which is a suitable

method for problems whose nature should be discovered and explained by describing experiences. In this way, by using experiences, more nobility, insight, and awareness can be found about the desired event. Qualitative research is the description of social realities from the perspective of individuals, which is mostly used in social sciences and is suitable for complex processes such as decision-making and the like.

3.2. Sampling and data collection

In qualitative studies, the interviewees are people who have first-hand and sufficient knowledge about the dimensions of the subject under study. Therefore, in this study, policymakers and officials in flood management were selected. Policymakers are people who in the country, determine the general and detailed policies and policies of a particular system or event.

According to the targeted sampling method and to reach the saturation stage, officials and policymakers related to flood disaster management in April 2019 were selected as interviewees. The interviews with the interviewees continued until the saturation stage. Finally, interviewees included six policymakers involved in the April 2019 flood disaster in Khuzestan, Iran who had sufficient knowledge about the study subject including, Head of the Relief and Rescue Organization (Iranian Red Crescent Society), the Head of Iran's National Medical Emergency Organization, Advisor to the Governor of Tehran, Chief of National Disaster Management Organization of Iran, Deputy Director General of disaster management of Khuzestan government, Director of the Control and Coordination Center of the Rescue

Organization (Iranian Red Crescent Society).

In the results section, the numbers in parentheses at the end of each quote were used to separate the interviewees' answers. For this purpose, the interviewees were randomly numbered from A to F, regardless of the order mentioned above.

The data collection tool was a one-on-one interview in a semi-structured way and open-ended questions. Based on the purpose of the study, a questionnaire was designed, which was modified and approved for interview by an expert. (Appendix 1). This questionnaire includes 11 questions based on the objectives of the project and answers to the research questions of the project about organizational tasks, how to implement organizational tasks, how to coordinate, problems and bottlenecks and solutions, assess the current situation from the perspective of interviewees (Figure 1).

Interviews were conducted by appointment at the interviewees' workplaces from September 2019 to September 2020. Five face-to-face interviews were conducted, and in one case, the respondent answered the questions in writing. Questions and answers continued until data saturation. The data was recorded in the form of notes and audio recordings. Then, audio files were implemented and converted into text. By careful examination, words and sentences related to the purpose of the study were extracted. Then the process of compression and classification of meanings was performed. To analyze the data, coding and content analysis method were used. The steps for extracting the results are shown in Figure 1.

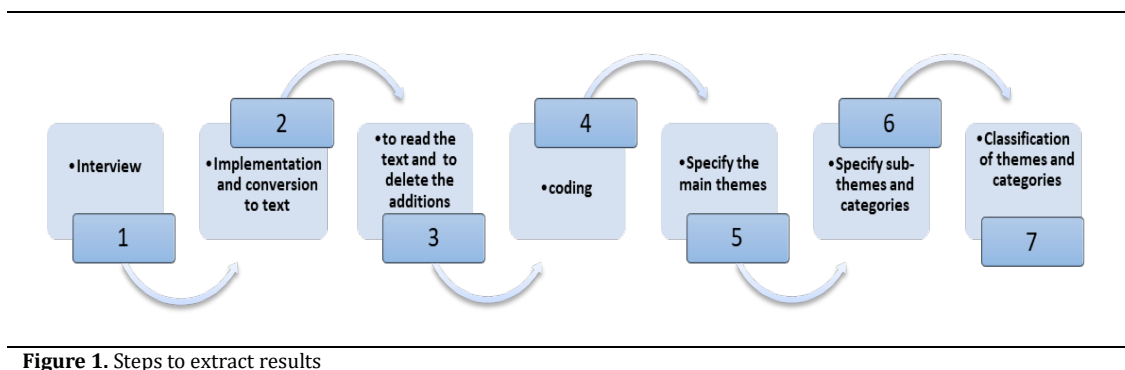


Figure 1. Steps to extract results

4. Results

Three main themes have emerged from the data analysis: 1. Actions before the flood disaster, 2. Actions during the flood disaster, 3. Actions after the flood disaster each included sub-themes and categories (Table 1).

The extracted themes provided an overview of the flood disaster management process in Iran (Figure 2).

4.1. Actions before the flood disaster

The participants considered "actions before flood disaster" as the first and fundamental step in disaster flood management. This theme was the result of eight sub-themes:

4.1.1. Importance of actions before disaster

The participants mentioned this sub-theme: "Prevention of damages is the basis of all our programs. Our management must be based on

Table 1. Themes and sub-themes and concepts extracted from interviews

Theme	Sub-theme	Concepts
Actions before flood disaster	Importance of actions before disaster	-
	Existence of logistics and infrastructure	Trained manpower, Procurement of resources
	Existence of legislation and regulations	Comprehensive laws, up-to-date laws, mandatory laws
	The importance of research and study	The necessity of research and study, centralized studies
	Public Awareness	Training content, training priority
	Importance of data collection	Information sources, type of information
	Pre-disaster coordination	Symposiums
Actions during the flood disaster	Advance warning of the flood disaster	Alarm system, accuracy of alarm system
	Immediate action upon notification of flood disaster	Informing, act quickly, make an initial assessment
	Flood disaster level assessment	Determining the level of the flood disaster
	Coordination of actions	Coordination of actions during the flood disaster, Integrating centralized disaster management, Coordination headquarters, and working groups, the need to integrate management
Actions after the flood disaster	Damage assessment	Assessing and determining damages
	Reconstruction and rehabilitation	Distributing tasks in reconstruction and rehabilitation between organizations

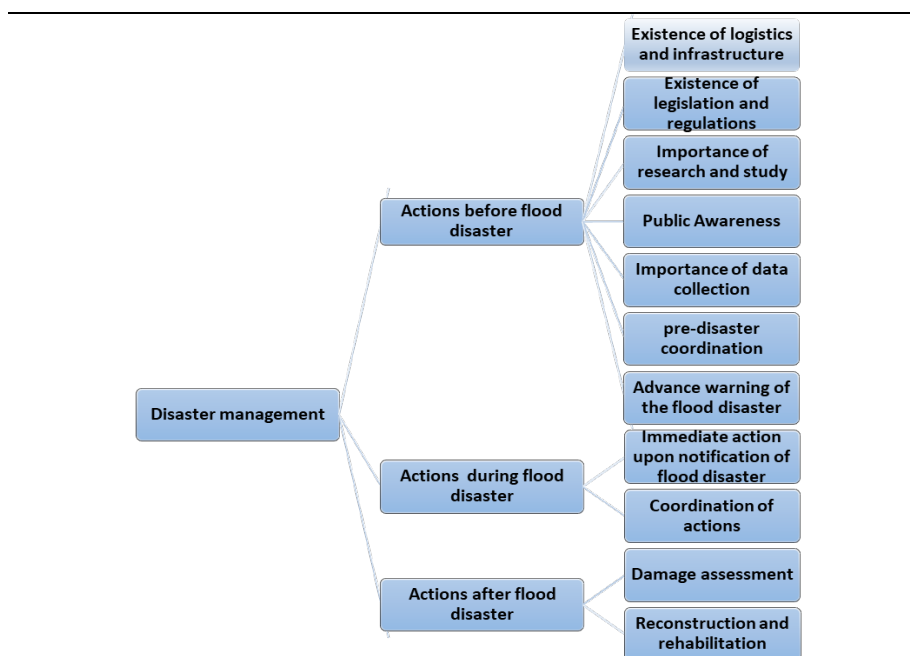


Figure 2. The view obtained from flood disaster management in this study

calculating the risk before a disaster occurs."(A) "The management of each province should prepare its province by estimating the consequences of disasters for a comprehensive response, with the existing facilities of the region and independent of human and financial resources and auxiliary items of other provinces or even international aid."(B) Respondents also pointed out problems related to the topic of prevention: "In our country, prevention is not as important as it should be. We respond very well to crises after a disaster, but we always have problems with prevention."(C) This respondent cited an example: "In the summer of 2018, the international organizations warned that we will have torrential rains in late 2018 and April 2019, so we identified the floodgates problems which we were hit and fixed them. Of course, our preventive measures are not

commensurate with the catastrophe. Because preventive measures are not given as much importance as should be." (C)

4.1.2 Existence of logistics and infrastructure

This sub-theme had two categories, including trained manpower and procurement of resources.

4.1.2.1. Trained manpower

One of the participants explained this: "At the first stage, we set up quick reaction teams in the provinces. It means each person is trained to become a ranger. Any operational manpower is trained in a specialized field and up to two specialized fields. But the members of the quick response team are trained in all four specialized fields and must experience life in difficult conditions."(D)

4.1.2.2. Procurement of resources

According to the interviewees, logistics and the provision of required resources are other necessary actions before the flood disaster: "If our preparedness in the logistics sector had not happened before the flood, a disaster would have happened in the country." (D) "Our logistics, in times of non-disaster, are prepared in terms of both auxiliary depots and vehicles to be able to use them in times of disaster. The deputy knows how much manpower and equipment are needed in times of disaster. It directs them to do their job." (E) Another respondent pointed to experiences gained from this disaster: "One of the lessons we learned was to complete what our equipment lacks, or if our weaknesses were related to regulations, to amend regulations or guidelines." (D)

4.1.2. Existence of legislation and regulations

The participants acknowledged that various rules, standards, and regulations have been developed in the field of flood disaster management before. They said: "In the disaster management structure, we have the Supreme Council for Disaster Management, which high-level representatives of the judiciary, the parliament, and the executive attend this council." (D) "Existing law has great capacity. This law includes the duties of the executive organs, the judiciary, the parliament, and the non-governmental sector." (A) "The development of standards has made it possible for everyone to know their duty and is by international standards." (D)

But one of the respondents mentioned the lack of supervision over the implementation of the law as a problem: "Monitoring must be right until the right thing is done. Some constructions along the catchment area were not stopped.... No family would be stressed if the law was implemented and the buildings in the river area were not built." (A)

4.1.3. The importance of research and study

Research and study were emphasized in the interviews: "In my opinion, it is very important to focus on studies and update and model successful countries in this field. That is, it must be studied in advance and agreed upon on what to do in times of disaster. Not to decide whether or not to do so in times of disaster. The studies in all fields of disaster management should be done in a centralized study center and not in such a way that each organization does its study." (C)

4.1.4. Public Awareness

Public awareness was emphasized by the interviewees too much: "Certainly, if we can inform and educate the people well, they will change their ways. Unfortunately, we do not inform enough, so people have not changed their views yet." (D)

Another interviewee said: "People are the basis

of work in various stages of disaster management and educating them can reduce financial losses and physical injury." (A) Some of the participants mentioned the content of the training: "In our training, we should say that we have to obey the law." (D)

Another participant mentioned priority learners: "We cannot educate the whole community directly. So we started the necessary training for flood preparation in schools". (D)

Another respondent pointed to the effectiveness of the training: "You look at the recent floods in Sistan and Baluchistan. We did not have any casualties or injuries. This is because we taught a series of preparations or warnings to people. So these are things that even listening to it is very effective in saving lives." (A)

4.1.5. The importance of data collection

This sub-theme includes sources of information and types of information.

4.1.5.1. Sources of information

One of the participants cited sources of information and the work of pre-disaster data collection centers: "The task of a control center is to collect information and manage information. In this way when we do not have a disaster, these centers start collecting information." (E)

4.1.5.2. Type of information

This participant also described the type of information they collect: "We collect information such as information about villages and cities, as well as, demographic information that is updated every 5 years by the country's census information. Our equipment is updated. If we create a new operations center, it will be registered in the system. We have a collection of human resources data that is updated monthly. We enter the names of the staff member in it who are on shift this month. We update some information annually and some as needed." (E)

4.1.6. Pre-disaster coordination

Intra-organizational symposiums were a topic that one of the participants in pre-disaster coordination pointed out. This respondent said: "We had two symposiums in which almost everyone involved in flood disaster management attended." (D) Some respondents noted the lack of coordination between organizations in pre-disaster measures: "The fact is that centralized disaster management has not yet formed in the country. We tried to coordinate ourselves, but it still needs more coherence." (F) Another participant answered: "There is a monopolistic view in our organizations." (A)

4.1.7. Advance warning of the flood disaster

The need for alarm systems to predict flooding

was another issue mentioned by participants: "One of the factors in our success in responding to the disaster was the announcements made by the meteorological agency." (D) "The first thing is to make a prediction. This forecast is provided to us by the meteorological organization, which informs us about the amount of rainfall in the areas." (A) Accuracy of meteorological systems was another category: "Usually the probability of rain in the forecasts and warnings is high, but the forecast is not 100% correct. For example, it is predicted that there will be rain in a large geographical area, but it is not clear exactly in which area there will be torrential rain until we evacuate people."(A)

4.2. Actions during the flood disaster

The second main theme extracted was the actions during the flood disaster, which included some categories as follows:

4.2.1. Immediate action upon notification of a flood disaster

Immediate action upon notification of a flood disaster is one of the subthemes related to actions during the flood disaster. One of the participants explained: "The main task of control centers is to receive information from all kinds of events. These centers are obliged to be informed immediately of anything that happens in the country."(E) "Operations control centers in all provinces are ready all the time. We are linked to the Institute of Geophysics. We get the information from the Meteorological Organization online. We first send staff from our nearest base to do the initial assessment. The on-duty director of the province sends the staff of the operations control center to the area. Our bases are located in large numbers throughout the country."(D)

4.2.2. Flood disaster level assessment

The participants explained how to determine the flood disaster level: "According to the argument presented by the governor, the level of disaster has become national. If not, it is a provincial or regional level and it depends on the situation."(A)

"The response to a flood disaster is proportional to its extent. At first, it can be local. If the local management could not manage the disaster, it could be a provincial one, and if the province could not, it could be a disaster at the national level."(C) Another respondent explained: "We define things based on the level we have specified. We acted on the basis that the locals acted first, and when the level of the accident came higher, we acted regionally and sent the supporting teams there to help."(F)

4.2.3. Coordination of actions

Another sub-theme derived from the interviews is the coordination of actions during the flood disaster,

where many explanations were provided by the respondents, and this seemed that it was the main concern of the interviewees in national disaster management.

4.2.3.1. Coordination of actions during the flood disaster

The participant's explanation about the coordination of actions during the flood disaster was as follows:

"With multiple face-to-face and virtual meetings and telephone conversations, the necessary coordination was made regarding the sending of facilities and relief resources to the headquarters of Khuzestan province, as well as the coordination and cooperation of all agencies in the transportation and delivery of these items."(B)

Another participant explained: "We have a coordination council and 14 committees. In this flood, we summoned all the responsible agencies to the Ministry of Interior. During this time, their representatives from organizations were at the Ministry of Interior all of the time."(A)

4.2.3.2. Need to integrate centralized disaster management

Another issue was the need to integrate centralized disaster management which was mentioned by the participants: "Disaster management consists of the governor, all departments, military, institutions, security institutions, the Ministry of Interior, and municipalities, but one person must be the coordinator of disaster management. In response to the disaster, many officials came to the region, but the system was not integrated. The lack of serious involvement of some departments related to the disaster is one of the factors that some of our duties are not fulfilled."(C) "Sometimes there is a lack of coordination."(A) Another interviewee said: "Of course, when the disaster happens, they are coordinated but I say that disaster management organization must be a cohesive organization that makes decisions. Now, the organizations are not willing to go under someone else's coverage."(F)

These respondents suggested solutions: "It is better to form a deputy under the supervision of the president as a disaster management organization that has a general administration in all provinces to do all the coordination."(F) Another participant said: "The disaster manager in any ministry must be the deputy minister with all the authority. In any organization, the deputy chief executive officer (CEO) should be the head of disaster management and the disaster management department should be established in all organizations. At times of disaster, the head of disaster management should have the same authority as the head of the organization so that the efforts are centralized in one place."(C)

Another participant explained this inconsistency: "It was difficult to transport the road construction machinery and workshop equipment from the central regions to the southern areas."(B)

One respondent pointed out the strengths: "We encountered a very large flood that caused a lot of water to come out of the dams, but it was managed in such a way that no city was submerged, there were no casualties, and livestock losses were very low. The towns remained intact, and villages with large populations were not submerged. We directed the water, and the water went to the lagoon. Agricultural lands, which quickly went underwater, were quickly depleted." (C)

4.3. Actions after the flood disaster

The third main theme was "actions after the flood disaster" which include damage assessment, reconstruction, and rehabilitation.

4.3.1. Damage assessment

Participants said that after the flood subsides and the situation stabilizes, the situation in the flooded areas and the amount of damage will be assessed. They explained:

"When the flood is over, we assess the damage in various sectors such as housing, agriculture, and roads. We have instructions for assessing damage based on which we determine the amount of damage and notify the government. And the government approves the necessary budget."(A)

4.3.2. Reconstruction and rehabilitation

The participants explained that after the damage assessment phase, the reconstruction and rehabilitation phase begin: "After assessing the damage, the issue of reconstruction and repair and the payment of various damages are raised. There is also the issue of rehabilitation related to mental health and healthcare issues."(A) One of the participants pointed out more details about this phase after the flood in Khuzestan: "The flood was a national issue. Thus, the National Headquarters for Reconstruction and Renovation of Flooded Areas was formed. We had several sections that included houses, farmlands, and roads. The Housing Foundation and the Agricultural Jihad started working as the two main parts of this headquarters in cooperation with other departments. For example, the Department of Roads and Transportation started working on roads and the Department of Housing and Urban Development started working on houses in villages and cities."(C)

5. Discussion

The present study, focusing on flood management in April 2019 in Khuzestan province, tried to explain how to manage the flood disaster in Iran and the

existing problems. The findings of this study, which is the result of the experiences of the policymakers involved in flood disaster management, provided an overview of centralized flood disaster management in Iran.

According to the participants, the stages of flood disaster management were divided into three parts: pre-disaster, during disaster, and post-disaster. The pre-disaster stages has a fundamental role in the optimal management of the flood disaster and the prevention of financial and human losses. This is in accordance with previous studies (11-14).

Although similar studies have been conducted in the field of flood disaster management and the identification of strengths and weaknesses of measures, the results of these studies have been in areas such as the role of government, the effectiveness of planning in disaster management at various stages, the effectiveness of evaluation and monitoring, and the problems and challenges (6, 14-20), this study examined flood disaster management and its problems from the perspective of policymakers who were senior officials of organizations involved in flood management.

What was clearly achieved in this study based on the experiences of policymakers was a lack of belief in disaster prevention and a lack of seriousness in pre-disaster measures. Although measures are taken quickly as soon as a disaster occurs, we face a large amount of damage because preventive measures have not been taken before. This is consistent with previous studies that emphasized the importance of the pre-disaster phase and disaster preparedness (11, 21-23).

In particular, these deficiencies include a lack of research and study in identifying the characteristics of each geographical area, while in other countries there are these centers which provide reports and recommendations (24); the lack of use of the results of existing studies; and lack of coordination between organizations to have a coordinated disaster prevention process and actions during the disaster. Despite the extensive measures that have been taken since the onset of the flood disaster, the respondents acknowledged that the organizations were operating separately. Lack of coordination between involved organizations leads to inefficiency in actions, confusion among stakeholders, waste of resources, and ultimately dissatisfaction and distrust of the people as the main stakeholders.

According to the answers, during the floods of April 2019 in Khuzestan province, five provinces were introduced as supporter provinces by the Ministry of Interior to manage the flood disaster in Khuzestan province. These provinces were Tehran, Isfahan, Khorasan Razavi, Kerman, and Alborz. They helped six cities in Khuzestan, including Dashte Azadegan, Hamidiyeh, Shadegan, Karun, Shushtar, and Shush for flood disaster management,

respectively and "supporter province" refers to a province that is obliged by the relevant legal authorities before the disaster occurs, at the national level to which the province involved in the disaster does not have the potential to manage, while the supporter province, in coordination with the province involved in the disaster, is sent to the region and provides services by pre-determined tasks and as long as necessary. (B) It is clear if there was no coordination between the authorities involved in disaster management in the affected province and supporter provinces in the fields of logistics and starting work of operational teams of supporter provinces, as a result, despite extensive measures, the satisfaction that is expected will not be achieved. Hence, an integrated disaster management department that all organizations follow in all disaster management processes is essential. For this reason, in countries such as Turkey, Japan and India, crisis management organizations are under the supervision of the highest executive authority (25, 26).

Mutual trust between people and officials is another issue that should be given special attention in the disaster management process. The importance of people's participation in dealing with floods and its risks has been emphasized in other studies (27-30).

Disaster management is a process in which the

lack of any part of this process causes it to disintegrate and lose efficiency.

In summary, according to the experiences of the interviewed policymakers (Table 2), the most important things that are needed to improve disaster management include promoting coordination between organizations by the Disaster Management Law, the existence of an integrated disaster management department that all organizations follow in all of disaster management process, the existence of a research center to focus studies on the disaster and operational implementation of the results, and sufficient public awareness, which leads to more trust and seriousness of warnings and reduction of human and financial losses.

It was very difficult to get an appointment with the interviewees due to their situation, which was a limitation of our study finally, the interviewees included six policymakers, and a lot of time, from September 2019 to September 2020, was spent on interviews. Also, we selected parts of the interviews for a study that the interviewees permitted us to use, and we removed the parts that we did not have permission to use. Also, one of the disadvantages of semi-structured interviews with stakeholders and policymakers is that they overvalue their administrations and magnify the achievements of their organization.

Table 2. Problems of flood disaster management extracted from interviews and suggestions

Problems of flood disaster management extracted from interviews	Suggestions
There is not enough coordination between the organizations involved in the flood disaster management in all of the disaster management processes (before the flood disaster- during the flood disaster- after the flood disaster) which leads to inefficiency in actions, confusion among stakeholders, waste of resources, and ultimately dissatisfaction and distrust of the people as the main stakeholders.	-Promoting coordination between organizations through the Disaster Management Law - Establishing an integrated disaster management department that all organizations follow in all of the disaster management processes
There is no centralized study center to focus studies on the disaster.	Establishing a centralized research center that focuses on studies and updating the knowledge and model successful countries in this field.
There is no disaster drill and preparedness maneuver	Implementation of preparedness programs along with disaster drills that lead to training and increasing the speed and quality of operations during disasters.
Awareness programs are not sufficient.	Training, awareness, and sufficient public information lead to more trust and seriousness of warnings and reduction of human and financial losses.

6. Conclusion

In conclusion, for increasing the efficiency and effectiveness of the country's disaster management, it is suggested to consider integrating and centralizing disaster management and coordination between organizations involved in the disaster at all stages of disaster management, including before, during, and after the disaster. It is also necessary to pay attention to the research and apply the results of this research. Successful models, flood management drills, preventive measures, updating of facilities and equipment, and attracting the participation of the people are other things that need to be considered for successful flood management.

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Footnotes

Conflicts of Interest: The authors announce that there is no conflict of interest in our research.

Ethical approval: The Ethics Committee of Sina Trauma and Surgery Research Center, Tehran University of Medical Sciences, approved the study,

and the reference number is 98-01-38-370.

Author contribution: V.RM conceived of the presented idea and supervise the project. R.HA contributed to data collection. R.HA analyzed the data and wrote the manuscript. M.SH and Z.GH provided critical feedback. S.H.GH and M.A. contributed to data collection. All authors discussed the results and contributed to finalizing the manuscript.

Supplementary Materials: Supplementary file 1 contains "Appendix 1: Questionnaire"

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