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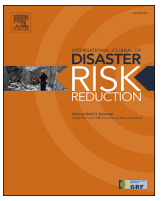

Challenges of disaster risk communication from the perspectives of experts and affected people: A conventional content analysis

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ABSTRACT

Effective risk communication is essential for disaster risk management. It is necessary to understand the present contextual factors to select appropriate strategies to enhance risk communication. Therefore, this study aimed to explore the factors that create challenges for risk communication in Iran. Using a qualitative methodology, this research included 25 managers, rescuers, and event survivors with prior experience responding to disasters. Data were collected via semi-structured interviews and analyzed using conventional content analysis. Data analysis resulted in the identification of four categories and eleven subcategories related to the factors that facilitated the formation of challenging risk communication. These categories include distrust (distrust in public warnings, public distrust in relief organizations), ineffective information dissemination (ineffective informing authority, irresponsible dissemination of information, negligence in information transparency), insufficient educational communication (limited training capacity, universal education restriction, extensive educational infrastructure), and uncertain warning messages (uncertain content of warning messages, alert channels diversity, delayed warning messages). Multiple contextual elements thus contribute to ineffectual risk communication, the most significant of which is diminished public confidence in relief organizations. Identifying these factors provides a basis for relief organizations to anticipate and plan long-term strategies to improve communication between relief organizations and the public, thereby increasing the preparedness of individuals for disaster response.

1. Introduction

Risk communication is the social process of exchanging information and guidance between individuals and relief organizations in the society about any type of risk (individual, social, political, environmental) and how to respond to disasters [1]. The goal of risk communication in disasters is to prevent and reduce damages, prepare the population, and disseminate timely information during disasters [2,3]. In the times of disasters and emergencies, risk communication is essential for informing and empowering the public to protect themselves [3].

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People need to have access to risk information more than ever terms of high frequency and variety of hazards and increasing vulnerabilities [4,5] In pre-disaster phase, many risk communication activities are aimed at changing people's behavior or attitudes [6,7]. Efficient communication takes place when information is exchanged in a preferred way. Efficient communication also guarantees that the message remains intact and unaltered throughout the communication process. Finally, it helps people make informed decisions and behave in such a way that they are protected from the risks and damages caused by the occurrence of hazards [8]. For the effectiveness of the best communication it is recommended to form two-way communication between people and emergency management or response groups so that experts can exchange information about risk [9]. This requires trust between two parties. Numerous studies showed that the transmission of information by relief organizations in the pre-disaster phase can increase public knowledge, and awareness and change people's attitudes and behaviors, as well as promote public trust in risk management by the organizations so that people can respond appropriately and in a timely manner in times of disaster and post-disaster [10–12]. During emergencies and disasters, information from aid organizations and disaster management should be adequate, precise, and unambiguous since inaccurate information may raise doubts and concern. However, the information from credible and reliable sources can reduce individuals' exposure to illusions, rumors, and false information [13]. Therefore, relief organizations need to provide accurate, credible, and timely information about disasters so that people can receive the necessary guidance to cope with disasters [2]. But, people may face challenges in communicating with emergency management or response groups, and therefore cannot take appropriate measures to protect themselves or others [14]. Therefore, relief organizations use various strategies to prepare the public for disasters. For instance, Kievik and his colleagues' research notes that some organizations attempt to safeguard people by communicating with them on a regular basis [15], despite the fact that other studies have shown that this tactic is ineffective [16,17]. Some use diverse information channels and methods such as guides, informational brochures, media campaigns, websites, social networks [18,19], and instructional videos [20] to communicate with citizens. Moreover, some studies reported using school-centered approaches [21–23] for public education. So, in some countries, disaster risk reduction programs are part of their curriculum [24]. However, there are many challenges in establishing communication with the public. Zaksek and Arvai found that local messengers can often enlighten people more effectively than specialists due to their extensive knowledge and expertise in the field, as well as the fact that people have greater faith in those they know from their own community [25].

Iran is one of the developing countries that is exposed to all kinds of disasters including earthquakes, floods and epidemics etc. [26]. It was one of the countries that was hit hard by the pandemic, and many aspects of life were affected by the prevalence of infections and the large number of the patients in need of treatment. By February 2022, it had passed several Covid-19 pandemic waves. One of the lessons from Corona in Iran was the importance of communication between relief organizations and the healthcare system and transparency in sharing health information with the public to win their trust and cooperation. A lack of communication increased the likelihood that the public would not cooperate or participate [27]. Various studies in Iran demonstrate a lack of communication and cooperation amongst risk management groups [28], as well as people's skepticism of relief organizations [29–31].This distrust can be in terms of various factors, such as poor risk communication of relief organizations [32].

Despite the measures taken by relief organizations to increase communication between these organizations and the people, the nature of this phenomenon and related factors among stakeholders was not studied, and therefore there is little information in this field in Iran. In addition, the identification of these factors can yield valuable insights that can inform the development of guidelines aimed at fostering stakeholder communication and establishing disaster and accident preparedness. So, this study aimed to examine the experiences of rescuers, relevant executives and people affected by the accident by focusing on the factors that led to inefficient communication.

2. Methods

2.1. Study design

Given the importance of communication between people and relief organizations pre-disaster, during-disaster, and post-disaster and the lack of descriptive data on the contextual factors of disaster communication in Iran, a qualitative content analysis design was chosen to explore the experiences of executive managers, operational forces, and affected peoples regarding the background factors of disaster communication. Content analysis is a method that can be used with qualitative or quantitative data in an inductive or deductive manner [33]. In this study, the contextual factors of communication hazards were examined.

2.2. Study setting and participants

This qualitative study was conducted in Iran, which is one of the most disaster-prone countries in the world [34]. The purposeful sampling method was used to collect data. To select the participants, the first interview was carried out with one of the experienced disaster managers and the subsequent participants were selected purposefully. The study population included all managers in the field of disaster management at the Ministry of Health, the Red Crescent Society, the Crisis Management Organization, as well as medical emergency experts and Red Crescent rescuers. Moreover, individuals who had been affected by the various disasters were included in the study. A total of 25 participants with extensive experience in disaster communication were selected. The participants consisted of 9 disaster managers from the Ministry of Health, the Red Crescent Society, and the Crisis Management Organization, 7 operational emergency experts from pre-hospital and Red Crescent services, and 9 affected individuals. Peoples with relevant experience were purposefully selected for their participation, and their specialized knowledge was used to capture unique experiences [35].

2.3. Data collection

The data collection took place from July 2020 to March 2021. One of the researchers (A.F.) conducted in-depth and semi-structured interviews with all the participants. Before each interview, the researcher explained the interview process and obtained written informed consent from the participant. The researcher also arranged the time and place of the interview with the participant. The researcher interviewed 12 participants face-to-face in private rooms at their organizations and 13 participants over the phone. The total number of interviews was 29, including 25 initial interviews and 4 follow-up interviews. The follow-up interviews were done with 4 participants to verify and clarify the information from the initial interviews. The researcher recorded all the interviews with the oral consent of the participants. The initial interviews lasted for an average of 45 min (ranging from 20 to 90 min), and the follow-up interviews lasted for an average of 15 min (ranging from 10 to 25 min). We started the interview process by asking all participants a general question to establish rapport and elicit their experiences with disasters: "Based on your experience with disasters, how have relief organizations communicated with people in the case of disaster?" Then we asked them about the challenges they faced in forming this relationship and the reasons for it. We also asked follow-up questions to probe deeper into the concepts, such as "Can you explain more?" or "Can you give us some examples?" The interviews lasted for about four months until we reached data saturation.

2.4. Data analysis

This is a qualitative study that utilized conventional content analysis proposed by Granheim and Lundman [36] to explore the disaster risk communication factors from the perspectives of disaster managers, operational personnel, and affected peoples. We analyzed the interviews as we collected them, starting from the first ones. We listened to the interview recordings several times and transcribed them in Microsoft Office Word™. Then, we identified semantic units that captured important aspects of the participants' experiences and coded them. We grouped the codes into subcategories and categories based on their similarities and differences. We repeated this inductive process until we had fully developed subcategories and categories. Researchers continued discussion until agreement was reached in terms of subcategories and categories. For further explanation, an example of an analytical process from open codes to final categories is provided in Table 1. We used MAXQDA 10 software for data analysis.

2.4.1. Trustworthiness

We used criteria such as Credibility, Confirmability, Consistency or Dependability, and Transferability to enhance the rigor and credibility of our study [36]. We establish credibility by collecting and analyzing sufficient data, long-term interaction with partici-

Table 1
Example of analysis from open codes to main category.

Open codes	Primary concepts	Sub–categories	Categories
Lack of Integrated Information areas	Restrictions on informing	Ineffective informing authority	Ineffective information dissemination
Interfering with non-technical issues in informing			
News policy in the informing			
Multiple messengers	Parallel work in the informing		
Involvement of all organizations in the informing			
Not mastering the details of the incident	Unimportant informing		
Delay in giving informing			
No single spokesperson	Lack of informing authority		
Lack of information officer			
Emotional atmosphere in the information			
Different interpretations of the incident			
Providing various statistics of a particular incident			
Dissemination of unscientific information	Dissemination of undocumented information	Irresponsible dissemination of information	
Dissemination of contradictory information			
Dissemination of information by unrelated persons			
Scattered informing	Minimal notification		
Less indicative of the severity of the accident			
Lack of information about the place of residence after the incident			
Failure to notify safe places after the accident			
Exaggerating the functioning of organizations	Organizational interests in informing		
Competition of organizations for information			
The self-expression of organizations			
News reflections from organizations			
Lack of transparency in how people communicate with organizations in accidents	Lack of transparency	Negligence in information transparency	
Not clarifying the lack of facilities for the people.			
Increasing public trust in organizations with transparent information			
Not clarifying the actions of organizations to the people.			
Ignoring the rumors	Not clarifying the rumors		
Not explaining the rumors			

pants and comparing their statements, checking findings with experts (external check) and participants (member check), and a complete immersion with the data. We discussed and reviewed the interview results (codes, core concepts, subcategories, and categories) with interviewees and other experts, which led to more insights. We confirmed the data (confirmability) by checking with participants if they accurately reflected their experiences and were free from our bias. We documented and reported the entire research process in detail to ensure reliability. We confirmed the transferability of the findings by consulting with two experienced operational personnel who were not involved in the study in several sessions.

3. Results

25 people with a mean age of 46 years (29–58) were interviewed. Table 2 shows other characteristics of the participants. We explored the underlying factors that challenge communication between disaster response organizations and the public. Based on participants' experiences, we identified four main themes: distrust, ambiguity in effective communication, inadequate educational communications, and inconsistency in warning messages. Table 3 shows the main themes, categories, and subcategories related to the underlying factors that challenge communication in disasters.

3.1. Distrust

Communication between emergency response organizations and the public requires trust in these organizations. Participants' experiences revealed that one of the main factors that hindered effective communication was people's distrust in emergency response organizations. This theme also includes two subthemes: distrust in public warnings and distrust of organizations.

3.1.1. Public distrust in relief organizations

Organizations have tried to gain trust and participation from the public in disaster response, but there is still a big gap between the people and the relief organizations.

Participants' experiences revealed that this mistrust was due to the organizations delayed decision-making in response to disasters, informational weaknesses of the organizations, their poor performance, and lack of coordination among them. Participants' experiences also showed that organizations were not ready enough to make critical decisions quickly in response to disasters, which made people distrust in urgent situations:

> "In the messages they provided at first, they said only the western side of the city was at risk. They didn't mention evacuating homes in the messages. For example, they advised taking elderly people to a safe place until the night before the flood when

Table 2
Characteristics of participants.

	NO (N = 25)	%
Sex		
Male	7	28
Female	18	72
Age		
28-38	6	24
39-50	14	56
Over 50	5	20
Types of participants		
Disaster Manager		
Ministry of Health	4	16
Crisis Management Organization	3	12
Red Crescent	2	8
Relief worker		
Pre-hospital emergency technician	3	12
Red Crescent Relief Worker	4	16
Affected people	9	36
Education		
High school graduates	3	12
Bachelor's degree	13	52
Master's degree	6	24
General physician	1	4
PhD	2	8

Table 3
Main final categories and sub-categories.

categories	sub-categories
Distrust	public distrust in relief organizations, distrust in public warnings
Ineffective information dissemination	ineffective informing authority, irresponsible dissemination of information, negligence in information transparency
Insufficient educational communication	universal education restriction, extensive educational infrastructure, uncertain content of warning messages
Uncertain warning messages	alert channels diversity, delayed warning messages

the phone lines were cut. It was with the loudspeakers of the emergency vehicles that people were told to evacuate their homes, and the water entered the city at 8 a.m. the next morning. (Interviewee 22-P)"

Moreover, due to infrastructure weaknesses, we cannot use each other's information in responding to disasters and lack updated information. This situation causes delays in providing help and dissatisfaction among the people, as one participant said:

"I personally heard a meteorological expert say that we predicted this volume of water, but we thought it would rain over a few days and in a scattered way. This announcement of scattered rainfall made people unaware of this potential flood threat. (Interviewee 22- W)"

Successful disaster management requires cooperation and coordination among relief organizations, with the ultimate goal of reducing damage and losses caused by disasters. Improving the process of hazard communication also requires coordination and collaboration among organizations, but according to the participants, one of the main challenges that hindered effective communication among different organizations involved in disasters was the lack of coordination:

"Before, the Red Crescent rescuers didn't know beforehand that health centers have structures to identify community groups. They realized this after ten days of the flood. It all comes back to the fact that the coordination meetings before the floods had all yielded nothing. (Interviewee 8- M)"

Participants' observations and experiences showed that despite the efforts of to meet people's needs in response to disasters, some non-expert actions and decisions undermined people's trust and exposed them to many problems:

"We were in tents for about 15 days, and then they gave us prefabricated houses, and we are still living in those houses. Many officials came and promised us that they would build our houses within the next 6 months, but after a year, except for a few families, their houses are half-finished, and it is likely that we will spend this winter in the prefab houses too. (Interviewee 11-P)"

"Unfortunately, they didn't set up any camps for those who had evacuated their homes during the flood, but when the relevant officials spoke to the media, they presented everything as normal. In reality, we saw something different. (Interviewee 22- P)"

3.1.2. Distrust in public warnings

Early warning systems have been implemented in many parts of the world, but not all individuals at risk respond to the first warnings. One of the reasons for this problem is the public's lack of trust in public warnings. Participants' experiences indicated that many people did not have much confidence in these warnings:

"The night before the flood in Lorestan,[1] relief organizations were going around the streets, waking people up with sirens and loudspeakers to evacuate their homes at least in the last minutes. But some people were still in their homes at 7 a.m., and by 9 a.m., the flood had completely flooded the city. This indicates that some individuals did not take it seriously enough. (Interviewee 21- W)

Some of the participants expressed their sensitivity to the public warnings and their involvement in disaster response, saying:

"People have a high level of trust in specialized and health messages, but some individuals may ignore educational messages. During the earthquake, the situation was similar, and the majority of individuals were interested in our educational material. (Interviewee 24 - M)"

Some of the participants also said that the relief organizations themselves did not heed the issued warnings, which caused people's mistrust:

"In Poldokhtar,[2] Lorestan province, we had four departments along the riverbank, and unfortunately, none of them had evacuate. Even the emergency services had a base on the riverbank. We were only able to evacuate essential items during the final hours and were unable to move other belongings, even though the evacuation warning was issued two days earlier. (Interviewee 15 - W)"

3.2. Ineffective information dissemination

An effective communication system is vital for responsiveness and public awareness in disasters. Clear, responsive, and timely information dissemination by mass media helps people get appropriate information, while limited communication causes worry and disappointment among the public. Participants' experiences revealed that relief organizations and mass media provided a lot of information, but it had various problems, such as ineffective informing authority, irresponsible informing, and lack of information transparency, which prevented effective informing.

3.2.1. Ineffective informing authority

Ineffective informing authority means the participation of several relief organizations involved in disasters in informing the public when it occurs and the absence of a spokesperson of unit and coordinator of relief organizations in informing the public. Moreover,

[1] In 2019, a flood occurred in Lorestan province, Iran.

[2] A city in Lorestan province, Iran.

limitations in informing cause delays in information reaching the people and disrupt the communication between and the public. Participants' experiences showed that there was no unified organization for informing the public during disasters, and several organizations were involved in this process simultaneously:

> "In the Lorestan flood, besides us, other also provided the information they had within their jurisdiction to the media and the public. Sometimes the university's public relations department separately released information in the field of health and treatment, in addition to emergencies, the health deputy and to some extent the Red Crescent also provided information. (Interviewee 13 - M)"

Participants' experiences also revealed that there were limitations in unified and integrated informing with the public:

> "In the Azerbaijan earthquake,[3] each relief organization informed for itself because there was no designated spokesperson. Since the incident commander was not defined, each organization reported to its superior, and it was the superior who had to summarize these reports in the provincial governor's meeting with other organizations. (Interviewee 3 - M)"

Many still did not understand the importance of timely and transparent informing and considered it merely ceremonial:

> "In the Lorestan flood, in our alerts, we only mentioned that people should leave their homes but did not specify where it is safe and where they can go. As a member of the relief organizations myself, I was not aware of this information, and later I found out that people had mostly gone to their relatives' homes in the highest parts of the city that were not affected by the flood, and the governorate had also designated schools and halls in the upper part of the city for this purpose. (Interviewee 21 - M)"

The lack of a unified source for informing the public about the fundamental challenges that people faced during disasters was a significant issue repeatedly mentioned in their experiences:

> "Regarding the discussion of information and public education, there were discrepancies in the statistics and figures provided by different emergency units. On the first day, in the Azerbaijan earthquake Sepah (Iran's Revolutionary Guard) would report a death toll, police would report another, and we would report yet another, even though the deceased person had already been announced as hospitalized. (Interviewee 3 -W)"

3.2.2. Irresponsible dissemination of information

This concept means the dissemination of information without adequate documentation and the interference of the interests of organizations in the informing process. Based on the experiences of the participants, some relief organizations tend to compete with other relief organizations in the matter of informing by exaggerating their performance in incidents. Participants' experiences in the incident showed that some tried to highlight their own organization's name or interfere in areas where they had no responsibility for information dissemination:

> "All officials, both at the expert level and higher, are interested in statistics and figures. Some relief organizations managers would call me as the public relations officer to gather information that was not even related to their field of work. They only wanted to promote their organization by publicizing that information. (Interviewee 1 - M)"

This eagerness for information dissemination sometimes led to the publication of information without considering its source or credibility, causing confusion among the people:

> "I remember that after the flood, several deaths were announced in the media without mentioning the source. Unfortunately, it was done by one of these same relief organizations, and it was later refuted. (Interviewee 1 - M)"

Participants' experiences indicated that the lack of infrastructure and initial information dissemination on the first day, as well as the lack of a centralized authority for informing, led to various organizations acting arbitrarily:

> "As an emergency responder, I was unaware of the details of the incident for several days. Later, the Ministry of Communications deployed a hot air balloon, and communication was established. However, it seemed to me that the media acted completely arbitrarily when they were finally able to disseminate information, and there were also numerous rumors circulating on social media." (Interviewee 15 - W)

3.2.3. Negligence in information transparency

Information transparency is the right of citizens to access community incident information which includes the adequacy, accuracy and timeliness of this information. An effective and efficient response to disasters requires the rapid dissemination of situational information to improve awareness, save lives, and facilitate rapid recovery from damages. Ambiguity in this information confuses people and hinders their participation in response processes. Some participants said that a lot of information was being published in the media, including many rumors, without proper transparency by the organizations involve:

> "There were many rumors circulating on social media. For instance, it was claimed that they had opened the floodgates of one of the dams in Lorestan and couldn't close them, causing water to enter the city. They also said that if they didn't open the dam, it would break, and several cities would be flooded. They were forced to open the dam, resulting in only one city being

[3] This earthquake happened in Miyane, East Azarbaijan province, Iran in 2019 with a magnitude of 5.9.

submerged. These rumors spread through word of mouth, but no one provided any explanations regarding these rumors. (Interviewee 20 - P)"

3.3. Insufficient educational communications

One of the goals of is to provide knowledge, skills, and motivation to individuals and groups for taking actions to reduce their vulnerability to disasters. Educated individuals can better protect themselves and others (37). But relief organizations have many challenges to establish educational communication with people and social groups. Participants in this study mentioned limited educational capacity, universal education restriction, and extensive educational infrastructure as the main issues.

3.3.1. Limited educational capacity

Participants' experiences showed that often include a series of educational programs in their annual plans without understanding the educational needs of the people:

"For example, I live in Tabriz, and I don't know where my family should seek shelter if something happens. We haven't been taught anything in advance. There is no defined plan to follow if an incident occurs in any urban area and there is a need for temporary accommodation. The information we should provide in advance, such as the location for sheltering in each area, is not available. We don't even teach it to our children. (Interviewee 3 - M)"

The training provided by relief organizations is fragmented and limited, and not accessible to everyone:

"We have heard some things here and there ourselves and from television, but we have never seen any training provided to our village. In the health center, my wife was told a few things, like not sleeping under a chandelier or securing the wall hangings, and to keep some food supplies at home. But we didn't take it too seriously and never thought that earthquakes would occur here. (Interviewee 11 -P)"

"Before the floods in Golestan[4] happened, we hadn't received any kind of training to protect ourselves from flood hazards or any other disasters. Only once, several years ago, there was a class about earthquakes, but I have forgotten it over the years. Of course, I have seen some things on TV about earthquakes, but I don't remember much. However, no class has been organized for us regarding floods. (Interviewee 10 - P)"

Some participants also expressed that relief organizations, although to a limited extent, utilized the capacities of well-known individuals to prepare the public for disasters:

"In the Azerbaijan earthquake, one of the trusted officials attended the rural areas and managed to create a general sense of calmness in the region. They explained many hopeful points to the people. (Interviewee 18 - W)"

3.3.2. Universal education restriction

Participants' experiences revealed that relief organizations envisioned educational programs for the public, but these programs were not continuous and organized, and they did not include all sections of the population. Some general education was provided to people usually before disasters occur. One of the participants stated:

"Before the Lorestan flood, the disaster preparedness trainings were scattered and sporadic. However, in the Lorestan flood, what we taught was to make sure that elderly individuals carry important documents with them and to stay away from high-risk areas before any incident. We also warned through virtual spaces and health centers, especially rural ones, that we might not have any access to you after the flood due to weather conditions and blocked roads. We advised pregnant and high-risk mothers to stay in the city and in the homes of relatives and acquaintances. Fortunately, this was very effective. (Interviewee 22 - W)"

Some universal education programs were provided after disasters to prevent further harm to the people. They were meant to enable people to protect themselves and their loved ones. One participant mentioned: "We had certain groups that went to tents and identified target groups and vulnerable populations. They taught how to prevent contagious diseases, maintain a healthy diet, and more. Some of the education, which was mostly general information, was given through loudspeakers, and then we started environmental campaigns and installed educational banners in villages (Interviewee 16 - P)."

3.3.3. Extensive educational infrastructure

Considering the widespread occurrence of disasters and the necessity of preparedness among people, it is necessary to use all educational platforms to increase people's knowledge and awareness in responding to disasters. Participants' experiences showed that there were various educational areas for educating the public. These areas ranged from individual-focused education to community-focused education, and should make extensive use of these educational areas through comprehensive planning.

"We have rural relief services in villages, and we have designated places or containers where we have equipped them with basic rescue and relief equipment, including shovels and axes. Additionally, we provide self-help trainings in these villages so that people can start rescue and relief efforts on their own before the arrival of emergency forces (Interviewee 20 - M)."

[4] The Golestan flood occurred in the north of Iran in 2019.

Sometimes these trainings took place at the family level:

> "In the Azerbaijan earthquake, due to its scattered nature, public participation was not very noticeable. For example, we would use the knowledge of primary health-care workers (Behvarz),[5] his spouse, their relatives, or educated and reputable local individuals. In face-to-face trainings, if someone refused to engage in hygiene practices, we would ask their close relatives or family members to convince them so that they wouldn't face further problems, which often yielded positive results. (Interviewee 16 - W)"

Moreover, these trainings were conducted extensively at schools and in the community:

> "We want to teach students what actions to take before a disaster occurs in order to minimize our losses. For instance, we teach students non-structural preventive measures such as securing bookshelves and wardrobes to walls. We encourage students to take these teachings home and share them with their parents. (Interviewee 20 -W)"

3.4. Uncertain of warning messages

Relief organizations are obligated to send a series of warning messages to individuals to help them make the right decisions, as per their mandate for example, the Red Crescent sends a message to people to avoid near rivers when floods are predicted. If people are alerted about disasters, they can take preventive and protective measures to safeguard their lives, property, and assets. Participants stated that the uncertain content of warning messages, alert channel diversity, and delayed warning messages have caused a challenge in communication due to people's trust and response to warning messages.

3.4.1. Uncertain content of warning messages

Participants' experiences showed that the content of warning messages had been successful in creating enough awareness among the public to respond to disasters. However, there was a possibility that some people did not receive these messages:

> "The most important warning message in Lorestan flood was the evacuation notice, and it reached most people in a timely manner, ensuring they had the necessary information. It was not the case with flood alerts, as people were not aware of the possibility of a flood. (Interviewee 13- W)"

Participants' experiences also indicated that the content of warning messages was incomplete and did not provide all the necessary information to the public:

> "In the Lorestan, when they announced the flood warning, they only said to evacuate your homes and go to a safe place. We didn't know where the safe place was, and people were unfamiliar with all possible locations to go to. (Interviewee 9 - W)"

Moreover, the warning messages issued were mostly either fear-inducing or delivered in terrifying tones to have an impact on people's behavior through creating fear and terror. This could lead to long-term psychological problems among the population:

> "They mostly provided warnings through social media and loudspeakers. Since some people, especially the elderly, did not use social media, they also used traditional media and loudspeakers. However, the impact of the loudspeakers was stronger due to the fear and terror they generated. Considering that there is a mosque on every street here, these warnings were broadcasted through mosque loudspeakers and reached everyone. (Interviewee 8 - P)"

3.4.2. Alert channels diversity

Participants' experiences showed that both modern and traditional methods were used to convey warning messages, ensuring that most people became aware of the flood occurrence:

> "In Golestan flood, we warned through virtual platforms and healthcare centers, especially in rural areas that there was the possibility of limited access after the flood due to weather conditions and road blockages and we warned you to accommodate pregnant and high-risk mothers in the city and relatives' and acquaintances' homes and keep away from rural areas, which was very effective (Interviewee 22 - M)"

> "Since some people, especially the elderly, did not use social media, traditional media outlets and loudspeakers were used to deliver warning and educational messages (Interviewee 8 - W)"

3.4.3. Delayed warning messages

Participants' experiences revealed that warning messages were generally issued promptly. However, in critical situations such as evacuating homes after flood warnings, crucial decisions were delayed, and the public was notified late, leaving some people with insufficient time to take action. Lack of mutual trust among organizations led to delayed issuance of certain warnings:

> "We had relatives in Gonbad, and they called us and said that a flood was coming towards us. However, later the governorate announced that we had a dam, and this threat did not affect us. No attention was paid to what people were saying about the flood approaching Gonbad until it reached the nearby villages, and only then did they announce that a flood was coming. That is, the flood reached us the next day. The governorate announced very late that the flood was coming, about one to two hours before it reached Aggala, warning the people (Interviewee 9 - P)."

[5] Behvarz is a village health carer who works in a health home.

In many cases, timely general warnings were issued to the public. However, there was always a delay in providing detailed information:

> "A few days before the flood, the provincial crisis management informed all departments, including emergency services. We were prepared, and we patrolled the entire city with ambulances, informing everyone to be ready for the flood. If I want to be precise, we were informed 12 hours in advance (Interviewee 15 - M)."

4. Discussion

We conducted this study to investigate and identify the risk communication barriers between relief organizations and people. The study results showed that the main risk communication context that posed many challenges to emergency communication were: distrust (distrust in public warnings, public distrust in relief organizations), ineffective information dissemination (ineffective informing authority, irresponsible dissemination of information, negligence in information transparency), insufficient educational communication (limited training capacity, universal education restriction, extensive educational infrastructure), and uncertain warning messages (uncertain content of warning messages, alert channels diversity, delayed warning messages).

According to the findings of this study, public mistrust of relief organizations, both pre-disaster and post-disaster, was one of the main challenges in establishing communication between people and relief organizations. The formation of trust between public and relief organizations is a major challenge for governments in establishing better communication with the public, as demonstrated by various studies in Iran and other countries [32,37,38]. The development of trust between the public and relief organizations has had a significant impact on the public's perception of risks and their preparedness for disasters [39], and is essential for the formation of successful relationships [40]. Relief organizations have used various strategies to enhance trust between the public and relief organizations to improve communication [35]. But the study of Mashallahi et al. in Iran shows that after disasters, people seek help from influential figures in the community, indicating a serious lack of trust between the public and relief organizations [30]. One of the main reasons for this distrust is the lack of transparency in the performance of and failure to report actions taken from the public, simultaneous presence of multiple in response to disasters, lack of coordination among in disaster response, and weak communication between and the public. Another factor contributing to distrust was found in this study to be the poor performance and unpreparedness of relief organizations in disaster response. Despite efforts made by relief organizations to improve people's trust in relief organizations during all stages of the disaster management cycle, this problem still persists.

Another finding of this study was the ineffective information dissemination (ineffective informing authority, irresponsible dissemination of information, negligence in information transparency). The results of this study showed that during disasters, several relief organizations simultaneously entered the field of information dissemination, resulting in contradictory information reaching the public over a long period of time. Yapeng's study showed that the speed and scale of information dissemination, which are key indicators for evaluating the efficiency of communication, have posed significant concerns for governments. Rapid and widespread dissemination of information helps people receive disaster-related information in a very short time, which is crucial for reducing casualties [41]. However, since information was widely distributed among different and information exchange among these organizations did not occur properly, all these organizations intervened in the communication process [42]. Given these challenges, Seyedin & Jamali suggested the creation of a website for effective communication and information dissemination to the public at the quickest possible time during response and to prevent future problems [43]. Several other studies have also highlighted the benefits of using websites for disaster management issues [44]. Furthermore, studies have shown that in Covid-19 pandemic response programs, there were numerous challenges including lack of accurate information, misinformation, abundant rumors about the spread and treatment of the coronavirus, and the availability of multiple information sources, which confirms the results of our study [45,46]. Wukich's study indicates that relief organizations have less inclination towards rumor management and information transparency [47], which is also supported by the participants' experiences in present study.

The results of this study indicated that inadequate educational communications (limited training capacity, universal education restriction, extensive educational infrastructure) led to challenging communications during disasters in Iran. Participants' experiences showed that despite the availability of extensive educational platforms like social networks, television channels, and radio, these capacities were not used effectively to educate the public. The digital era has increased access to information dissemination and faster communication with individuals. The use of these new technologies can be crucial in establishing effective communication during disasters [48]. However, studies have shown that during the COVID-19 pandemic, the utilization of these extensive capacities was limited, and there were significant barriers to mitigating the effects of the disaster. Insufficient training and weak knowledge of the people about prevention and disease control were among these barriers [49].

Another finding of this study was the uncertain warning messages (uncertain content of warning messages, alert channels diversity, and delayed warning messages), based on participants' experiences. According to studies, knowledge of risk, continuous monitoring, and response are three main elements of an early warning system (50). However, other studies have shown that if warning content is delivered in local languages, it enables people to take more appropriate actions to reduce risks [50].

Our study's findings showed that due to the diversity of alert channels, almost everyone had access to these warnings. The importance of accessing early warnings during disasters has been emphasized in disaster risk texts. Access to early warnings increases people's knowledge beyond their daily knowledge of the events they face and has an impact on urban residents' ability to respond to hazards [51]. In Adams' study, the diversity of different alert channels, including television, radio, and local groups, was mentioned [52].

4.1. Study limitations

There are a few potential limitations in our study that suggest caution in the interpretation of the findings. Due to the breadth of risk communication, the role of the media in establishing communication between people and relief organizations was less focused. Based on the findings and limitations of the study, future studies could examine the experiences and perceptions of media owners and cyberspace activists in the field of Disaster Risk Communication. Developing practical guidelines with an interdepartmental approach and examining the effectiveness of such standards and programs in promoting communication between different organizations and groups will expand knowledge in this important area of risk communication.

5. Conclusion

This study showed that distrust, ambiguity in effective communication, inadequate educational communications, and inconsistent warning messages were among the main factors that led to challenging risk communications in relief organizations. Identifying these factors provides a basis for to plan long-term strategies for enhancing communication between and the public. Building trust, transparent and timely information dissemination, and facilitating educational processes can strengthen the communication between and the public. Also, it is necessary to provide educational platforms in the field of disasters in schools, universities, virtual networks and media on an ongoing basis so that it can help people make correct and timely decisions when disasters occur.

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Ethical considerations

Ethics Committee of Shahid Sadoughi University of Medical Sciences approved the study in with IR.SSU·SPH.REC.1399.110 code. All participants were ensured confidentiality of their personal information, and they permitted recording of the conversations.

CRediT authorship contribution statement

Abazar Fathollahzadeh: Writing – review & editing, Writing – original draft, Methodology, Investigation. **Javad Babaie:** Writing – review & editing, Supervision, Methodology. **Ibrahim Salmani:** Writing – original draft, Supervision, Methodology. **Mohammad Ali Morowatisharifabad:** Writing – original draft, Supervision, Methodology, Investigation, Supervision. **Mohammad-Reza Khajehaminian:** Supervision, Methodology.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

No data was used for the research described in the article.

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