Design and psychometric evaluation of health system intervention assessment tools for children in floods

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Received: 12-04-2022
Accepted: 06-09-2022
Published: 31-08-2023

Abstract:

BACKGROUND: Flood is one of the most frequent disasters in Iran, which has highly affected the population and consequences on the health system. Children as the most vulnerable group too need to receive health services during floods. The aim of the present study was to develop a national tool for evaluating the provision of health services to children in floods.

MATERIAL AND METHODS: This study is a sequential-exploratory mixed method study that consists of two qualitative and quantitative stages. The qualitative part includes the analysis of documents and panel of experts while the quantitative part includes the design and validation of the tools.

RESULTS: In this study, organizations providing health services to children were first identified, and according to their mission the relevant items were extracted and the initial checklist was designed. Then validity and reliability of the tools were done. The content validity ratio and content validity index for the tool were 59 and 98%, respectively. Cronbach's alpha and intraclass correlation coefficient were determined as 0.7 and 0.964, respectively. The final tool was presented with 64 items.

CONCLUSIONS: The response program, the scope of interventions, service coverage, and the effectiveness of the response after the flood can help reduce the risk of disasters in children. Using the assessment tool of evaluating the health services to children can assist the stakeholder organizations to meet the standards and best quality of services. Assessing the needs of the children affected by floods, identifying the strengths and weaknesses of health services, and proposing corrective strategies according to the information extracted from this tool are other achievements of this study.

Keywords:
Assessment tools, children, flood, health services, health system

Background

Every year many people around the world lose their homes and lives due to natural disasters such as earthquakes, tidal waves as well as hurricanes.[1] In 2019, at least 396 natural disasters were reported in the Emergency Events Database, causing the killing of 11,755 people, affecting the life of 95 million individuals, and economically damaging nearly 130 billion dollars.[2] Owing to the growing global warming and climate change, the world will face an increasing number of disasters[3] and change in type of disasters.[4]

Owing to Iran's geographical location and climatic conditions, it is one of the calamity-prone countries in the continent of Asia and the world exposed to natural disasters.[3] Based on the Global Bank assessments, earthquakes, droughts, and floods are the most important disasters in Iran.[5] According to the statistics, 31 of 40 types of natural disasters have occurred in Iran, and over the past 90 years, 120,000 individuals have lost their lives due to

natural disasters.[6,7] In 2019, destructive floods in Iran affected 200 cities and 4300 villages and had 80 deaths and 1136 injured.[8]

Floods can affect the health of the community by affecting individual health, damaging the infrastructure of the health system, and disrupting the process of providing health services.[9] Owing to the aftermath of the disasters, various services are essential to respond to the needs and compensation of the affected people.[10] Natural disasters through direct and indirect impact on health care system can lead to a decrease in access coverage and quality of health services and to an increase in health costs.[11] Disasters can damage any of the components of health,[12] drug management, disease control, and prevention programs such as immunization that affected individual health, especially mothers and children.[13]

According to the standards defined in the sphere project, children are referred to the age group from birth to 18 years old.[14] This group due to lack of physical development, inability to self-care, and dependence on parents or adults to meet their basic needs are known as one of the vulnerable groups in disasters.[15,16] Epidemiological studies show that after floods, children are more exposed to infectious diseases, such as measles, cholera, colds, diarrhea, and water and foodborne illnesses than adults.[17] Delay or failure to provide timely and required services for this age group will create secondary health problems, so it is emphasized.[18]

Determining the children's health needs and measuring them has been done in the health syste m assessments that are related to the current situation. There are no measuring tools, or the actions taken are sporadic and occasional and do not follow instructions to standard guidelines. During the floods in Iran, in April 2019, which occurred simultaneously in 25 provinces of the country, more than 10 million people of the country were affected and about 500,000 were wandered; half of whom were children. About 25% of the 78 recorded deaths were children.[8] Surveys showed that there is no tool to evaluate the health services provided to children in Iran. Since the evaluation of the services provided requires the use of standard tools, the present study was conducted to design tools for the evaluation of health services to children in flood and the processes and procedures in the field of health.

Materials and Methods

Study design and setting
This study was a sequential-exploratory mixed method. The qualitative part includes the analysis of the documents and panel of experts and the quantitative part includes the design and validation of the tools.

The study began in July 2020 and lasted until the end of December 2021. The result of this study was to identify the stakeholders in the process of providing services to children in floods and also to design and validate a national tool for evaluating the health services to children in floods.

This study was conducted in Iran with an area of 1,648,195 km^2 with a total population of 83 million people.[16] According to field and epidemiological reports, flood-prone provinces that experienced this event in 2019 were included in the setting of this study, and managers and health professionals in disasters in these cities were interviewed including Golestan, Tehran, Kerman, Ilam, Lorestan, Mazandaran, and Fars.

Phase 1: Document Analysis
In the first phase, all the legal documents and descriptions of the duties of the organizations involved in providing services to children in floods such as Iran disaster management laws, regulations, guidelines, protocols, upstream documents, and national response framework, from different websites of Ministry of Health and Medical Education, The Government Information Website, The President Information database, the database of Red Crescent Organization, were extracted. The literature was reviewed to analyze the data, and thematic content analysis was used.

Phase 2: Qualitative study (panel of experts, designing primary checklist)
In this phase, for designing the checklist, the panel of experts was used.

Study participants and sampling
Purposeful sampling was selected and entered the study and participated in two sessions held at the faculty of health and safety of SBMU.

Inclusion criteria of experts:
- 5 years of academic and non-academic (volunteers) activity in the field of health in disasters and emergencies.
- Minimum attendance at a flood event.

Data collection tool and technique
Data collection tools were the research team and a recorder. Two sessions in the presence of a total of eight experts were held. During the meeting, in addition to taking notes, the voices of the participants were recorded with their consent. The participants were asked to express their opinions about the outlines and items of the tool. Their opinions were listened to several times and the necessary corrections were made. In the second session of the panel of experts, a modified checklist was presented and approved by the participants. Adequacy

of questions, comprehensiveness of questions, coverage of all actions, classification of questions based on job descriptions, according to the consensus (agreements of more than 50% of participants), and maximum opinions of experts on each item were accepted by the research team. The tool consisted of 108 items.

Phase 3: Tool psychometrics

The psychometrics of the tool included validity and reliability, where validity was measured by including the content validity ratio (CVR) and content validity index (CVI), as well as face validity. For the reliability of the tool, internal consistency (Cronbach's alpha) and stability (test–retest) were used. Test–retest results were reported through the intraclass correlation coefficient (ICC).

Content validity assessment of the tool

To evaluate the content validity, two coefficients of CVI and CVR were used. The checklist was sent to a group of ten professors, to determine the content validity. CVR was the essential criterion with the Likert scale of three options, including necessary, useful but not necessary, and not necessary. After collecting the participants' opinions, the CVR formula was used to evaluate the CVR for each index. The minimum acceptable CVR was considered 0.59 according to the number of participants. Indicators that were lower than this number were removed from the tool.[19]

To determine the thematic validity of CVI, the relevancy criterion with the Likert scale of four choices, including fully relevant, relevant, relatively relevant, and irrelevant, was used. The criterion of "simplicity" with Likert scale of four options, including quite simple, simple, relatively simple, and not simple, was also used. The questions that had the score >0.79% were accepted, between 0.7 and 0.79% were corrected, and <0.7 were eliminated.[19]

Determining the reliability of the tool

Reliability means the degree of the consistency and correlation or internal consistency of the tool and causes the reliability and retest of the tool. In the present study, ICC and Cronbach's alpha coefficient, and five-point Likert scale answers were used. Values between 0.7 and 0.9 were considered good. Cronbach's alpha and ICC score above 0.8 were considered excellent.[17]

Data analysis method

For the analysis of qualitative data extracted from the experts' panel, their opinions were listened to several times and the necessary corrections were made in agreement with the research team by using the content analyzing method. To analyze the quantitative data of the checklist and to check its validity, SPSS software version 16 was used.

Results

According to the assessments, there is no evaluating tool to assess the provision of health services to children in floods. In the stage of document analysis of the current situation, organizations involved in the health of children in flood conditions were identified. In the next step, by reviewing the documents and texts, the assigned tasks for each of these organizations were extracted. The primary tools based on the mission of the organizations that had the task of serving children and providing the minimum basic needs according to the standards of the sphere include the three organizations of the Ministry of Health (MOH), the Red Crescent, and the Welfare Organization.

Findings of the first stage
Duties of the Ministry of Health, Treatment, and Medical Education

MOH is responsible to manage the risks and crises of the health sectors in emergencies in order to reduce deaths and diseases, disabilities, and side effects, and ensuring the performance of the health sector in disasters and policymaking in relation to the reconstruction and strengthening of the health system. In Iran, the health system includes the MOH, which is primarily responsible for policymaking, planning, and controlling the relevant areas such as health, treatment, education, and research. The country's emergency services, the Food and Drug Administration, and the universities of medical sciences and health services are in the second level of regional and executive agencies and the health network is in the third level. Owing to the structure of the health system and the existence of health houses in villages and cities, there is complete and comprehensive information about the status of children, so general questions related to the target population pyramid, status of health indicators such as vaccination coverage, and growth status of children below 5 years were compiled.

Duties of the Red Crescent Society
The Red Crescent Society of the Islamic Republic of Iran is an Iranian nongovernmental organization and a member of the International Red Cross and Red Crescent Movement that in Iran and in some cases in other regions of the world accomplishes supportive and philanthropy activities. The Red Crescent, in accordance with its international duties (the International Committee of the Red Cross), must respond during the crisis such as floods, earthquakes, wars, etc., inside and outside the borders and help in rescuing and evacuating the injured and victims of these accidents.

Duties of Welfare Organization
Iran's Welfare Organization is a governmental agency under the Ministry of Welfare and Social Security

of Iran that provides services to people in need in the community. Taking care of orphans, dormitory administration, kindergarten affairs, and children with disabilities, working and street children are the duties of this organization.

Findings of the second stage

The primary checklist was evaluated in the presence of a total of eight experts [Table 1] in two sessions of experts' meetings at an interval of one month. The characteristics of the participants in the experts' meeting are described in Table 1.

The need to design an assessment tool for providing health services to children in floods was approved by experts according to the nature of the accident. During the panel, the views of the experts were obtained in the form of corrective points according to the above-mentioned organizational areas.

Psychometrics tool

In the determination of CVR and CVI and face validity of the tool, ten people participated whose demographic information is given in Table 2.

CVR formula was used to evaluate the CVR for each index, and since the number of participants was 10, a minimum CVR of 0.59 was considered. Based on this,

7 items were removed in the general question, 33 items were removed in the field of MOH, and 4 items were removed in Red Crescent Society. In the validity stage, since all items had a score above 1.5, no item was deleted, which is described in Figure 1.

Reliability of the tool

According to the performed analysis, ICC among the items was meaningful and acceptable ($r = 0.964$, $P = 0.000$) and Cronbach's alpha was 0.7; finally, this report indicates that the tool has acceptable reliability.

Discussion

Children are classified as vulnerable in disasters and emergencies. Access to basic services is a minimum of children's rights, and given that the country's responsible organizations have several programs to protect the rights and health of children, it seems necessary to have some tools to assess their health situation with regard to the types of disasters to prevent the harmful consequences which threaten the children's health. Health assessment tools are often designed for adults and their items are not applicable to children.

In the present study, the existing gap in the evaluation of health services to children in floods was completed by designing tools and taking into account various

Table 1: Characteristics of the participants in the panel of the experts

Level of experience	Job	Work experience (years)	Gender	Age
National/International	Academy member	20	Female	52
National	Emergency Expert	12	Female	38
National	Nurse	14	Male	38
National	Nurse and Academy member	16	Male	40
National	Academy member of Red Crescent Society	23	Female	50
National/International	Mid-level manager of Ministry of Health	12	Female	35
National	Responsible of HSE	5	Male	30
National	Academy member	12	Male	36

Table 2: Demographic features of participants in designing a national tool for evaluating the provision of health services to children in floods in Iran

| Gender	Age	Academic degree	Field	Job	Work experience (years)	Activity in disasters and emergencies in the level of		
						Provincial	National	International
Female	39	Ph.D. of Health in Emergencies and Disasters	M.Sc. of Nursing Intensive Care Unit	Expert of vice chancellery for treatment	14	*		
Male	36	Ph.D. student	Health in emergencies and disasters	Nurse	14	*		
Female	38	Ph.D. student	Health in emergencies and disasters	Academy lecturer	19	*	*	
Male	43	Ph.D. student	Health in emergencies and disasters	Academy Member	12	*	*	
Female	30	Ph.D. student	Health in emergencies and disasters	Student	3	*	*	
Female	34	M.Sc.	Nursing	Nurse	10	*	*	
Male	38	Ph.D. student	Health in disasters	Nurse	14	*	*	*
Female	38	Ph.D.	Nursing	Nurse	8	*	*	*
Male	42	M.Sc.	Nursing	Expert of Red Crescent	20	*	*	*
Female	40	Ph.D.	Health in disasters	Academy member	14	*	*	
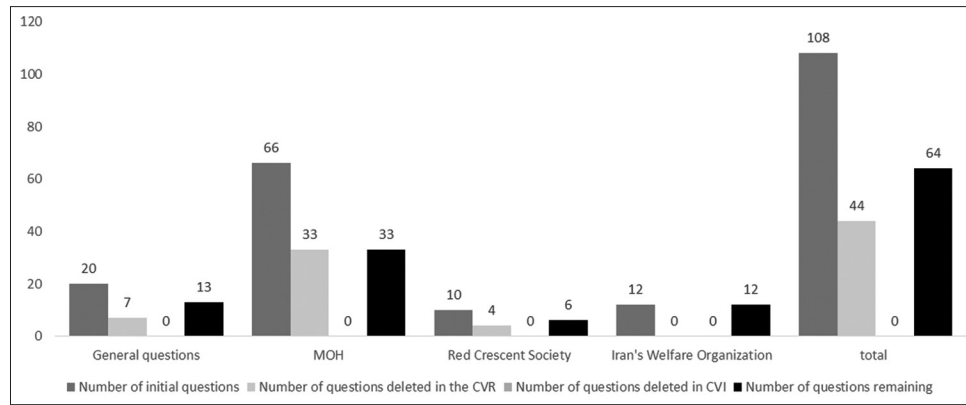
Figure 1: Face validity of the tool

aspects of services including pre-hospital emergency, treatment, health, Red Crescent, and Welfare Organization. Most studies in the field of children's health in floods have addressed one-dimensional issues and there has been no comprehensive view of all children's needs.

This study showed that the evaluation of health services to children, given their significant population in the community, must be considered in accidents and disasters to reduce secondary complications such as infectious diseases. The study by Mort *et al.*[20] also showed that not paying attention to the position of children and young people in assessing the effects of floods and prevention and response services weakens effective and legal policymaking. Elimination of attention to the needs and evaluation of children's services leads to a reduction in the effectiveness and monitoring of services in floods.

The conducted studies, in parallel to the present study, emphasized on the assessment of the provision of health services to the children affected by floods, so policymakers and managers in the field of health should consider the necessary measures to provide regular services[21] to children in the event of disasters. The designed tool showed that the availability of pre-hospital emergency services and hospital services such as the number of hospital beds, physicians, nurses, and specialists to provide general and specialized services were considered, and the percentage of coverage and type of services provided according to the special needs of children in flood conditions are in the list of assessed items.

The study by Chi *et al.*[22] showed that the death of mothers and children increases during disasters, especially floods. and this study only has discussed some dimensions like the nonavailability of health services, a decrease in food and nutritional materials, and damage to health infrastructures that lead to an increase in deaths. Meanwhile, one of the strengths of the present study is the emphasis on the role of stakeholders in providing hospital and pre-hospital services to children in floods as well as providing comprehensive services.

In a study by Peyravi *et al.*[23] on the challenges of health services in the floods of 2019 in Iran, rapid assessment of malnutrition, determination, and distribution of food packages, supplementation for children, and distribution of vitamins A and D have been identified as problems of the Red Crescent. However, in this study, all aspects of the Red Crescent Organization's responsibilities regarding the distribution of food packages and supplements and the availability of health and medical services, and the provision of rescue services have been considered important measures in the field of children's health.

According to a study by McLean *et al.* in 2018 on the effects of floods on children's mental health, the incidence of anxiety and stress in children in natural disasters, especially floods, increases, and psychosocial interventions should be provided at the earliest opportunity.[24] In this study, components such as assessing the mental health status of children, providing group and individual counseling services, and the number of play therapy sessions in the field of health services were mentioned due to the importance of interventions to be considered by policymakers and managers in addition to providing vital services, to pay more attention to children's psychological issues.

One of the strengths of this tool in comparison with all the studies conducted is that the present tool can be used by all stakeholders in providing health services to children in floods and all aspects of children's health physically and mentally have been considered and also this tool has promoted all previous studies with a holistic view and adequate assessment of the subject.

Questionnaire of assessment of the presentation of health services to children at flood had an appropriate validity and reliability and has the ability to be used by other researchers and also all organizations that are involved in rapid response to floods. Moreover, based on the evaluation, statistical tests and the panel of experts is a comprehensive and complete tool that can assess all various aspects of children's health.

Conclusion

According to the international health definitions, a child is a person under 18 years old and must take special actions to ensure that all children are safe in harmful conditions and they will receive all basic services equally because the children make up a large scale of vulnerable population in disasters. They are more vulnerable in crisis and emergency situations. Therefore, it is necessary to plan the accessibility of providing adequate services, especially during disasters, due to disruption and deconstruction of the structures, and an evidence-based response should be provided. Assessment tools of health services can also provide an agile plan for rapid response in addition to monitoring the delivery of appropriate services. Finally, it is suggested that this tool be completed and evaluated by the involved person who has received the necessary training in this field.

The lack of a centralized organization, in contrast to the existence of multiple organizations in providing health services and completing the checklist by them, made the process time-consuming and had different complementary patterns.

Ethics approval and consent to participate
This study was approved by the Ethics Committee of Shahid Beheshti University of Medical Sciences (ethical code: IR.SBMU.RETECH.REC. 1399,420).

Acknowledgment
We would like to thank all people who helped us in conducting this study.

Declaration of patient consent
The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Conflicts of interest
There are no conflicts of interest.

References

1. Hosseini SA, de la Fuente A, Pons O. Multicriteria decision-making method for sustainable site location of post-disaster temporary housing in urban areas. J Constr Eng Manag 2016;142:1-13.
2. CRED Crunch 58: Disaster Year in Review (2019). 2020. Available from: https://www.cred.be/publications/.
3. Kundzewicz ZW, Kanae S, Seneviratne SI, Handmer J, Nicholls N, Peduzzi P, *et al*. Flood risk and climate change: Global and regional perspectives. Hydrol Sci J 2014;59:1-28.
4. Dehghani A, Ghomian Z. Safety assessment of the largest Makeshift Hospital. Trauma Mon 2022;27:18-25.
5. Ghomian Z, Yousefian S. Natural disasters in the Middle-East and North Africa With a focus on Iran: 1900 to 2015. Health in Emergencies and Disasters Quarterly (HEDQ) 2017;2:53-62.
6. UND. Programme UND 2016. [Available from: http://www.ir.undp.org/content/iran/en/home/ourwork/Disaster_risk_management/overview.html.
7. Jahangiri K, Borgheipour H, Gendeshmin SB, Matin A, Tehrani GM. Site selection criteria for temporary sheltering in urban environment. Int J Disaster Resil Built Environ 2019;11:58-70.
8. Sarani M, Safi-Keykaleh M, Safarpour H, Honarvar MR, Kalteh E, Jahangiri K. Tractor ambulance: An initiative of emergency medical services response to the flood of Golestan, Iran in 2019. Disaster Med Public Health Prep 2021;1-3. doi: 10.1017/dmp.2021.22. Online ahead of print.
9. Du W, FitzGerald GJ, Clark M, Hou X-Y. Health impacts of floods. Prehosp Disaster Med 2010;25:265-72.
10. Yousefian S, Jahangiri K, Mehrabi Y, Sohrabizadeh S. Assessment of intraorganizational collaboration in the health sector during disasters: Exploring a valid and reliable assessment tool for disaster risk management. Int J Prev Med 2022;13:10.
11. Tarighi P, Tabibi SJ, Motevalian SA, Tofighi S, Maleki MR, Delgoshaei B, *et al*. Designing a model for trauma system management using public health approach: The case of Iran. Acta Med Iran 2012;50:9-17.
12. Sahebi A, Jahangiri K, Alibabaei A, Khorasani-Zavareh D. Factors influencing hospital emergency evacuation during fire: A systematic literature review. Int J Prev Med 2021;12:147.
13. Phalkey R, Louis V. Two hot to handle: How do we manage the simultaneous impacts of climate change and natural disasters on human health? Eur Phys J Spec Top 2016;225:443-57.
14. Morris J, Van Ommeren M, Belfer M, Saxena S, Saraceno B. Children and the sphere standard on mental and social aspects of health. Disasters 2007;31:71-90.
15. Fothergill A. Children, youth, and disaster. Oxford Research Encyclopedia of Natural Hazard Science 2017.
16. Sohrabizadeh S, Jahangiri K, Jazani RK. Reproductive health in the recent disasters of Iran: A management perspective. BMC Public Health 2018;18:389.
17. Ebrahimian A, Masoumi G, Jamshidi-Orak R, Seyedin H. Development and psychometric evaluation of the pre-hospital medical emergencies early warning scale. Indian J Crit Care Med 2017;21:205-12.
18. Krishna RN, Ronan KR, Alisic E. Children in the 2015 South Indian floods: Community members' views. Eur J Psychotraumatol 2018;9(Suppl 2):1486122.
19. DeVon HA, Block ME, Moyle-Wright P, Ernst DM, Hayden SJ, Lazzara DJ, *et al*. A psychometric toolbox for testing validity and reliability. J Nurs Scholarsh 2007;39:155-64.
20. Mort M, Walker M, Williams AL, Bingley A. From victims to actors: The role of children and young people in flood recovery and resilience. Environ Plan C: Politics Space 2018;36:423-42.

21. Kassaeian S, Gohari A, Masoumi G, Ghomian Z, Dehghani A. Post-hospital discharge strategy for COVID-19 treatment and control: Focus on Fangcang Hospitals. Disaster Med Public Health Prep 2021;1-3. doi: 10.1017/dmp.2021.83. Online ahead of print.

22. Chi PC, Urdal H, Umeora OU, Sundby J, Spiegel P, Devane D. Improving maternal, newborn and women's reproductive health in crisis settings. Cochrane Database Syst Rev 2015:1-26.

23. Peyravi M, Rahnavard F, Marzaleh MA. Overview of the strengths and challenges associated with healthcare service rendered in the first 10 days after the great flood in Northern Iran, 2019. Trauma Mon 2020;25:220-6.

24. McLean MA, Cobham VE, Simcock G, Elgbeili G, Kildea S, King S. The role of prenatal maternal stress in the development of childhood anxiety symptomatology: The QF2011 Queensland flood study. Dev Psychopathol 2018;30:995-1007.