



Design and Validation of Prehospital Emergency Preparedness Evaluation Tool for Terrorist Attacks in Iran: A Study Protocol

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Abstract

Introduction: Accidents and disasters have affected human lives and various aspects, including casualties, and financial, psychological, and environmental damage, directly and indirectly. Prehospital emergency, one of the vital organs and agencies that respond immediately to the scene and aid the injured, plays a crucial part in such incidents and is a vital link in the chain of public safety that protects the lives and health of its users.

Methods: Each of the two stages in this mixed-method (qualitative and quantitative) study serves as an introduction to the application of the subsequent phase. The first phase was a qualitative one (Item generation) with 3 steps: a scoping review, qualitative study, and incorporation of steps 1 and 2 (synthesis research). Second, the quantitative phase (item reduction) has 4 steps: face validity, content validity, construct validity, and tool reliability.

Results: Every year, many terrorist attacks occur in different countries of the world and many people become victims of such incidents and their lives and families are affected. The analysis and review of the studies that have been conducted in this area demonstrate that different nations, particularly developed and developing nations, are taking a fresh look at these incidents and are working to improve their readiness and capabilities in a variety of areas for managing and responding to them.

Conclusion: Pre-hospital emergency preparedness to properly manage and respond to terrorist attacks requires formulating and training response programs and quantitative and qualitative improvement of existing capabilities and capacities. The gap caused by the existence of a standard and comprehensive evaluation tool for pre-hospital emergency preparedness in terrorist attacks is one of the main obstacles to accurate and scientific evaluation of this preparation. Therefore, it is necessary to design a tool to measure pre-hospital emergency preparedness in terrorist attacks.

Keywords: Prehospital emergency care, Terrorist attack, Emergency preparedness, Tool

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Introduction

Accidents and disasters are divided into two categories: natural and man-made disasters (1, 2). There are different types of accidents and disasters, and terrorist attacks are one of the types of man-made accidents (3). One of the most major and hazardous man-made events that take place every year in our planet, terrorist attacks claim many lives while terrifying society (4, 5). Preparedness for accidents and disasters is one of the four stages of the disaster management cycle (6). Different organizations should increase their level of preparedness against all kinds of accidents and disasters and be able to deal with them in the case of occurrence

and suffer the least damage (7). Cooperation and coordination between relevant organizations are very important in such incidents, and necessary planning and coordination must be done between the organizations involved (8, 9).

Prehospital emergency, one of the crucial organizations in such occurrences that rush to the scene to aid the injured, plays a crucial role in such incidents and is a vital component of the public safety network that protects the wellbeing and safety of residents (10-12). Therefore, the evolution of this organization includes advances in emergency medical care and preparation for terrorist attacks (13). This system significantly reduces disability and death caused by diseases

by providing appropriate and timely emergency services through various resources including human power, equipment, facilities, and programs, with the main goal of saving human life (14). Evaluating the performance and level of preparedness of pre-hospital emergency system managers and employees in terrorist attacks and such incidents is very important; therefore, a suitable tool should be available for this evaluation so that the level of preparedness can be measured based on that (15, 16). Unfortunately, the results of various studies indicate that there is a low level of preparedness for handling these situations, and the medical emergency is less prepared to address them (17, 18). Studies by Annelie Holgersson et al. (19) and Westman Anton et al. (20) highlighted the importance of empowering inter-organizational insights on safety culture, risk perception, and management practices, as well as understanding of the institutional logic and primary tasks of the other organizations, to achieve effective, collaborative response to terrorism-induced incidents. Valuable tools have been designed

by health professionals accidents and disasters in Iran to measure preparedness, but these tools do not measure pre-hospital emergency preparedness (15, 21).

Given that there are several terrorist attacks taking place throughout the world right now, which have resulted in numerous financial and human losses for many innocent members of society, the prehospital emergency has a crucial role to play in saving lives and maintaining people's health (22-25). Therefore, evaluating prehospital emergency preparedness and increasing the level of preparedness of this system will play a significant role in the better management of terrorist attacks (26).

Methods

This mixed-method (qualitative and quantitative) study contains two phases, each of which introduces the application of the following phase (Figure 1). This study aimed to identify and assess how well-prepared the prehospital emergency organization was for terrorist attacks both globally and in Iran.

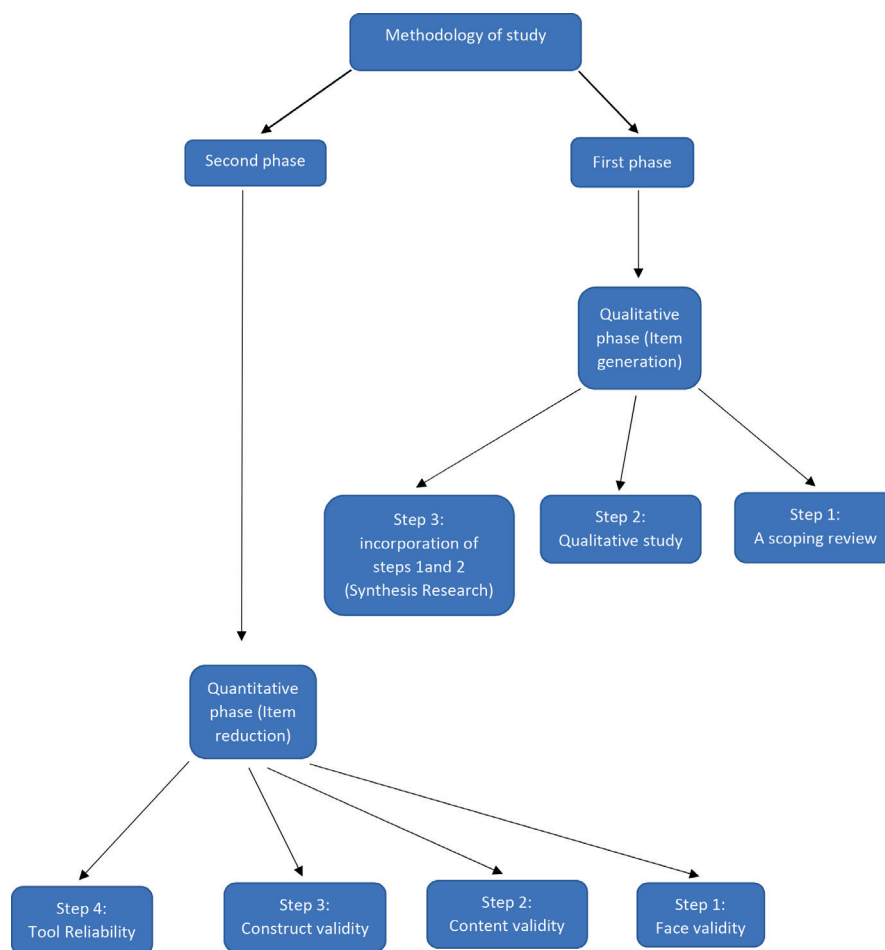


Figure 1: Methodology of the study

One Phase

One Phase (Step 1)

From January 1, 2000 to February 13, 2020, we looked for information in databases including ISI Web of Science, PubMed, Scopus, Science Direct, Ovid, Pro Quest, Wiley, and Google Scholar for the study population. Using OR and AND, we combined and wrote the keywords in the search box of databases ((Terrorist Incidents OR Terrorist Accidents OR Terrorist Attacks OR Terrorism Attacks OR Terror OR Terrorism OR Terrorists) AND (Violence OR Political OR Conflict OR Criminality OR War) AND (Prehospital Emergency OR Prehospital Emergency Care OR Prehospital Emergency Medical Services OR Emergency Health Service OR Emergency Medical Response OR First Medical Responder OR Emergency Medical Services OR Emergency Medical Care) AND (Medical Preparedness OR Emergency Preparedness OR Emergencies System Prepare OR Emergencies System Readiness), AND (Tool OR Checklist OR questionnaire OR scale)). The synonyms of the key terms were all searched for utilizing MESH techniques. Keywords were scoping review, prehospital care, emergency medical services, and terrorist incidents and assaults.

The following studies were chosen because they fit the requirements and criteria for the study: studies that have been published in English, and Prehospital Emergency Medical Services (EMSs) performance during a terrorist attack has been their subject, those that looked at using violence, threats, or force to further political goals, and studies published as reviews or original research. The exclusion criteria were the studies whose complete text was unavailable, and those that discussed additional ways that people assisted during terrorist attacks, such as studies that considered incidents like breaking into a government computer or cyberattacks on the government websites, anti-terrorist medical care provided by military personnel, post-attack medical care provided by the fire service, police, or boy scouts, or responses taking place in field hospitals. Other emergency response topics covered in studies included Internet security, sanitation, and transportation studies that were cited in editorials, case reports, series of case reports, expert consensus reports, published national guidelines, and letter to the editor. The data were gathered and analyzed after choosing

the desired research, and all procedures were checked and carried out by the PRISMA 2020 checklist principles (27). First, two writers (SM and MA) independently conducted a preliminary search and then independently reviewed submitted abstracts and titles to determine their eligibility. When the reviewers thought the abstract or title could be helpful, full copies of the article were retrieved and both reviewers assessed their eligibility. If there were disagreements between reviewers, the causes were determined, and a final choice was based on the third reviewer (HRS). Finally, Data Extraction Form was used to collect data of the remaining paper and documents (16).

One Phase (Step 2): Qualitative Study

The purpose of this step was to interview with the experts and prehospital emergency personnel who had the experience of attending terrorist attacks, to know the challenges, problems and weaknesses, and strengths of prehospital emergencies in managing these incidents and the level of preparedness of prehospital emergency teams. 34 prehospital emergency staff members and managers who had firsthand knowledge of the preparedness of the prehospital emergency system for a terrorist attack as well as at least one experience with terrorist attacks made up the study group. Using a strategy of purposeful sampling with the greatest possible diversity, participants were selected. Semi-structured interviews were used for sampling up until the point at which the researchers decided that more interviews wouldn't yield any new information due to data saturation. Nine prehospital managers, 23 prehospital emergency employees, and two specialists from the dispatch ward of the prehospital emergency center were among the expert participants.

Interview eligibility requirements: All emergency medical professionals involved in terrorist attacks, specialists with something to add, including heads of emergency medical facilities, assistants in the technical and operational departments of emergency medical facilities, experts in the emergency operations center, and skilled operational staff from all around the nation. Finally, these people agreed to take part in the research and interviews. People who lacked expressiveness and showed a lack of interest in participating in the interview were excluded from

consideration. The Kerman University of Medical Sciences' Ethics Committee approved the current study with the code of IR.KMU.REC.1400.005. Data were gathered using a research fiche and an interview guideline form. The interviewees responded to questions like "Have you ever participated in the health system's disaster preparedness exercises?" and "What terrorist attack have you been a part of so far, and what part did you play?" as well as "What issues and difficulties did you encounter when handling a terrorist incident?", and "What were the incident's advantages and disadvantages?". Colaizzi's method was used to assess the data gathered during this phase utilizing a phenomenology methodological approach. Using the MAXQDA 16 Software trial version, we managed the coding process. To ensure the reliability of the data, we used the Lincoln and Guba recommendations (28).

One Phase (Step 3): Synthesis Research

This stage involved combining all the elements and traits that had been acquired in the previous two steps, eliminating duplicates, and merging related ones. In addition to the qualitative study and scoping review, new categories and subcategories were developed. The pool of things was built upon the new categories and subcategories, so they were assessed with higher sensitivity. The major preparedness evaluation, which was transformed into items, is expanded in the final table, which includes the theme, category, subcategory, and codes. The study team looked at the questions and changed or removed some of them. Finally, a preliminary structure with 160 questions for the prehospital emergency medical services preparation evaluation tool was developed. The validity of the initial questionnaire was then established, assessing the psychometric characteristics of the tool for face, content, construct, and dependability. A 3-point Likert scale was used to evaluate the responses for each item (29).

Two Phase

Phase 2, Step 1: Face Validity

The purpose of face validity was to find out whether the instrument in question has validity or not. At this step, to what extent the questions of the tool were similar in appearance to the subject they were prepared to measure, and the reasonableness, interestingness, and apparent suitability of the research tool were examined. The

quality of face validity was assessed by selecting 10 more knowledgeable individuals for a face-to-face semi-structured interview and analyzing the readability of the items, grammar, and writing style for ambiguity, level of difficulty, and fitness. *Method of data collection and data analysis:* At this stage, a five-part Likert scale questionnaire was considered for each of the items as follows:

- 1- It is absolutely important (score 5)
- 2- It is somewhat important (score 4)
- 3- It is moderately important (score 3)
- 4- It is slightly important (score 2)
- 5- It doesn't matter at all (score 1)

Then, ten participants were asked to check each of the items and choose one option. Impact score=Frequency (%)×Importance. It was determined that the impact score was more than 1.5 (30). Using a purposive sampling technique, we selected the participants of both qualitative and quantitative face validity (31).

Phase 2, Step 2: Content Validity

In content validity, the content of the test was examined to ensure that it is representative of the construct it claimed to measure. In this research, ten experts were asked to provide the necessary feedback after the qualitative review of the tool in terms of grammar, order of item placement, correct wording, spectrum, transparency, and simplicity of the above criteria. A quantitative method was used to determine the content validity as a supplementary method after getting qualitative feedback from the evaluator and modifying the items (item hammering).

Method of data collection and data analysis: To calculate the content validity ratio (CVR), we asked a group of relevant experts (at least ten people) to determine whether an item in a set of other items is necessary and important to operationalize a theoretical construct or not (32). In this stage, the expert people were different from those in the content validity index. The following 3-part spectrum was provided to the expert panel for consideration of each item:

- a. It is essential
- b. It is useful
- c. It is not necessary

Then, the answers were calculated based on the following formula:

$$CVR = \frac{n_E - \frac{N}{2}}{\frac{N}{2}}$$

The outcome of the computation was compared to the standards already in place based on the number of specialists. The relevant item would be considered to have an acceptable statistically significant level in this crucial instrument, and it is crucial if the number obtained was higher than the figures in the table (33).

In calculation of the content validity index (CVI), which is designed to ascertain whether the items are related or not, relevance was evaluated in the form of a 4-point Likert scale (1-not related, 2-somewhat related, 3-related, 4-completely related) for each case by ten experts. The content validity index score was calculated by the total percentage of agree points for each item that got the highest score in the 3rd and 4th ranks according to the following formula (34, 35):

$$CVI = \frac{\text{Number of raters giving a rater 3 or 4}}{\text{Total number of raters}}$$

Phase 2, Step 3: Construct Validity

Construct validity is always related to the question of what construct the instrument measures. The purpose of construct validity is to check the adequacy of the tool to measure the existing structures. In the current study, because the research tool was like a checklist, the convergent validity method was used to determine the construct validity. In this way, a tool similar to that of this study was selected (36) and sent to 30 emergency management centers across the country.

Method of data collection and data analysis: The same tool was sent to 30 emergency management centers across the country and these centers were requested to complete the tool based on the requirements and the existing guide and send it to the researcher. After a period of about one month, the initial tool designed for the present study was also sent to the same 30 emergency management centers and we again requested to use this tool based on the requirements and guidelines, complete it, and send it to the researcher. Then, the completed information of both tools was entered into the latest version of SPSS statistical analysis software; with the guidance of a statistician, statistical analysis was done, and the degree of correlation between the two tools was interpreted and reported (37).

Tool Reliability

Reliability refers to the existence of similarity

and stability in the measurement of traits or structures in a tool, and the existence of reliability in a tool indicates the accuracy or correctness of the measurement of the tool. It can be said that it is a reliable tool that accurately and correctly reflects the real scores of people (34). The purpose of reliability in this study was to check the degree of measurement accuracy. In other words, if we measure the desired feature twice with the same device or with a similar device under the same conditions, how similar, accurate, predictable, and reliable are the results (37). To gather the necessary data for this step, the instrument was originally made available to thirty emergency management centers outside of the construct validity stage.

Data collecting and analysis techniques: The reliability of the instrument was implemented using the test-retest method. The original tools created in this study were given to the same 30 emergency management centers roughly a month later. The SPSS version 22 was used to enter the data and perform a Pearson correlation test. For the t instrument reliability test, ten emergency management centers were chosen with no regard to earlier stages. Each emergency management center was evaluated separately by two assessors. The data was entered into SPSS 22 following the examination of each emergency management center by the evaluators. The reliability of the instrument was examined using Intraclass Correlation Coefficient (ICC).

Discussion

Every year, many terrorist attacks occur in different countries of the world and many people become victims of such incidents and their lives and families are affected (16). Terrorist attacks take place with different goals and intentions, and the perpetrator seeks to receive special privileges (38). The analysis and review of the studies that have been conducted in this area demonstrate that different nations, particularly developed and developing nations, are taking a fresh look at these incidents and work to improve their readiness and capabilities in a variety of areas for managing and responding to them (39). The preparation of the emergency system and ongoing planning to raise the degree of preparedness are two of the four key components that Brandrad et al. found to be necessary for the success of a prehospital emergency organization (40). It has been noted

in this study that increased preparedness and planning are essential for an effective emergency response to terrorist attacks, as well as the lack of available specialized resources, coordination and organization, regular training and learning, and empowerment of operational teams, and it must be at different levels to increase readiness.

Then, interviews were conducted with specialists and experts. After that, the initial tool preparation was done, and the resulting findings formed the categories and sub-categories of the tools. The tool compiled in this research is the result of interviews with prehospital emergency experts and using their experiences in the field of preparation and management of terrorist attacks, as well as a review of available information and evaluation tools (29). Internal consistency and convergence procedures were utilized to perform construct validity, face validity, and content validity methods employed to get validity, and the test-retest method was used in the reliability component of the questionnaire.

To manage and respond to terrorist attacks, prehospital emergency preparedness requires the development and instruction of response plans as well as the quantitative and qualitative improvement of current capabilities and competencies (41). Accordingly, it is necessary to construct and promote the preparedness-related activities that are stated in the emergency response operational plan. The hospital needs to conduct several maneuvers in this area at various operational and headquarters levels with the goal of identifying the strong points of the program and areas for improvement and strengthening the necessary capabilities (10). One of the major barriers to an accurate and scientific evaluation of this preparation is the lack of a standardized and comprehensive evaluation methodology for prehospital emergency readiness in terrorist attacks (42).

Given that our nation is situated in the Middle East, which is a volatile and accident-prone region, and that numerous terrorist assaults have recently taken place in various provinces of our beloved Iran (43), one of the major barriers to an accurate and scientific evaluation of this preparation is the absence of a comprehensive and consistent evaluation methodology for prehospital emergency readiness in terrorist attacks (42). The currently developed tool can play a significant role in raising the level of

preparedness and improving the operational capacity of these centers against terrorist attacks to remove the current obstacles and challenges and to evaluate the standard and accurate level of preparedness of emergency and medical emergency management centers in the nation.

Conclusion

Pre-hospital emergency preparedness for proper manage and response to terrorist attacks requires the formulation and training of response programs and the quantitative and qualitative improvement of the existing capabilities and capacities. Therefore, the establishment and promotion of specific preparedness functions in the operational plan of pre-hospital emergency response at different headquarters and operational levels require holding various maneuvers in this field with the aim of identifying the strong points and points that can be improved in the program and improving the relevant capabilities. The gap caused by the existence of a standard and comprehensive evaluation tool for pre-hospital emergency preparedness in terrorist attacks is one of the main obstacles to accurate and scientific evaluation of this preparation. Therefore, it is necessary to design a tool to measure the level of pre-hospital emergency preparedness in terrorist attacks.

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Authors' Contribution

SM, HRS, and HF designed the study and interpreted the data. HF and SM performed statistical analyses, collected and interpreted the data, and drafted the manuscript. HRS and HF critically revised the manuscript and provided continuous guidance throughout the study. All authors have read and approved the final manuscript.

Ethical Approval: Not Applicable

Data Availability Statement

All data generated or analyzed during this study are included in this published article. Additionally, the data are available to interested researchers from the corresponding author upon request.

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Conflict of Interest: None declared.

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