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Identifying the Components of Prehospital Emergency Preparedness in Radiological and Nuclear Incidents: A Protocol Study

Somayeh Yadollahifar [1], Mohsen Aminizadeh [2], Khadijeh Nasiriani [3], Abas Ali Dehghani Tafti [1], Reyhaneh Sefidkar [4], Samaneh Mirzaei [1*]

1. Department of Health in Disaster and Emergencies, School of Public Health, Shahid Sadoughi University of Medical Sciences and Health Services, Yazd, Iran
2. Department of Medical Emergencies, Sirjan School of Medical Sciences, Sirjan, Iran
3. Spiritual Health Research Center, Research Center for Nursing and Midwifery Care, Non-communicable Diseases Research Institute, hahid Sadoughi University of Medical Sciences and Health Services, Yazd, Iran
4. Center for Healthcare Data Modeling, Department of Biostatistics and Epidemiology, School of Public Health, Shahid Sadoughi University of Medical Sciences and Health Services, Yazd, Iran

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Corresponding Author:
Samaneh Mirzaee
s.mirzaei@ssu.ac.ir

ABSTRACT

Background: Prehospital emergency preparedness in radiological and nuclear incidents is significant to the health system's first responders. This study aims to conduct a scoping literature review to identify and explain the components affecting prehospital emergency preparedness in radiological and nuclear incidents.

Methods: This study is a scoping review protocol. A search will be conducted in PubMed, Scopus, Web of Science, ProQuest, and Google Scholar databases using main keywords, including nuclear, radiation, radiological, and Prehospital Emergency Care, preparedness, and relevant MeSH terms defined in the PubMed database from 1970 to 2024. Articles related to prehospital emergency preparedness and nuclear and radiation incidents are the inclusion criteria for the study. The documents used will include a variety of original, systematic, and scoping review articles. The basis for defining search strategies will be the guide for each database. Database management, removing duplicate and irrelevant articles, and extracting appropriate articles will be done using EndNote software version X7. Two team members will perform all screening and selection steps based on the inclusion and exclusion Criteria. The PRISMA 2020 flowchart will be used to show the article selection process.

Results: The results of this study will identify the effective components for prehospital emergency preparedness in radiological and nuclear incidents, categorized into subcategories and codes.

Conclusion: Knowing the effective components of prehospital emergency preparedness will improve the response. In this way, various groups, including decision-makers, researchers, and executive areas, including the Ministry of Health and Medical Education and the Non-Active Defense Organization, can take a more effective step in managing the risk of emergencies and disasters.

Keywords: Emergency medical service, radiological, radiation, radioactive hazard release, nuclear reactor, disaster planning

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Introduction

chemical, biological, radiological, nuclear, and explosive (CBRNe) incidents, like all disasters, usually occur without prior notice and, in addition to injuring a large number of people, causing significant loss of life and damage, can also pose challenges to the provision of health services (1-3). Among the possible incidents of CBRNe are radiological and nuclear (RN) incidents; although they may be low in probability, they can have severe consequences (4). A radiological emergency occurs when radioactive materials or radiation are released into the environment. This release can lead to hazardous conditions in which people and the environment can be contaminated with radioactive materials or exposed to high doses of radiation (5). From 1944 to 1999, there were 405 civilian radiation accidents worldwide, resulting in 3,000 injuries and 120 deaths (6). According to the statistics presented in GTD, in the period 1970-2020, there were 91 terrorist incidents against facilities, scientists, transportation, and other targets related to the nuclear industry. These incidents occurred in 25 countries and nine regions, with the majority (46.1%) occurring in Western Europe. Most of these attacks occurred at other sites related to the nuclear industry, i.e., outside a nuclear power plant (7).

In addition to adverse effects on human health, radiological incidents can have widespread consequences for society and disrupt healthcare systems. For example, the Three Mile Island, Chernobyl, and Fukushima nuclear power plant accidents led to the evacuation of several hospitals in the contaminated areas (8-10). Despite experts' recognition that an RN is inevitable, the healthcare community lacks the knowledge and preparation to deal with a contaminated or exposed patient (11). Based on the findings of the study by Rebmann et al., first responders must receive radiological incident training, participate in radiological tabletop Exercises and drills, and have access to timely information and resources. Such training increases willingness to work during a radiological terrorist event and increases community resilience (12). Among the main stages of the disaster risk management cycle, preparedness is the most effective way to respond appropriately and effectively to disasters and emergencies, and its importance has been mentioned in existing national and international high-level documents (13-16). Prehospital emergency preparedness in response to such incidents, in terms of activity at the forefront of the health sector, plays a vital role in reducing casualties, maintaining governments' authority, and increasing people's trust in them in dealing with emergencies and disasters. It also reduces adverse effects and leads to more efficient and better decision-making (17-19).

This study will review studies conducted on prehospital emergency preparedness for RN incidents. Its goal is to extract relevant criteria for prehospital emergency preparedness in RN incidents and provide appropriate information for those in charge.

Methods

Type of studies: This study is a scoping review protocol. In this scoping review, based on the main question of the research, the research team will evaluate all kinds of original, systematic reviews and scoping review articles that meet the entry criteria between 01/01/1970 and 06/15/2024. No restrictions are considered regarding the language of the articles. Each database's guide will be used to define the search strategy.

Inclusion and Exclusion Criteria: Article inclusion and exclusion criteria, based on the research question ("What are the components of prehospital emergency preparedness in nuclear and radiation events?") and the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) standard and guideline (20, 21), will be used. The study will select the main keywords of prehospital, nuclear, and radiological emergencies to answer the above question. All articles related to prehospital emergency preparedness for nuclear and radiological events, without language or method restrictions, will be reviewed in this study between 1970.01.01 and 2024.06.15. Studies that have only examined the prehospital emergency

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response, the preparation or response of other rescue forces at the accident scene, and the preparation and response of other health sectors are excluded from the study.

Search methods for selecting articles: First, Scopus, Web of Science, PubMed, ProQuest, and Google Scholar will be reviewed. Keywords are selected based on mesh, experts' opinions, and keywords from past studies. The search terms and strategies in the title and abstract will be reviewed using the following method:

(Emergency Medical service* OR Prehospital) AND (Nuclear) AND (radiological)

Finally, the reference lists of the selected articles will be reviewed to determine if any articles have been overlooked.

Data collection

Article selection: First, all articles are transferred to EndNote software. Then, the following steps will be carried out:

1. Review of titles to exclude duplicate and irrelevant studies
2. Review abstracts to exclude irrelevant studies
3. Review the full text of the studies (if available) and use inclusion and exclusion criteria by two independent individuals (student and supervisor) to exclude irrelevant studies.

Also, the standard PRISMA checklist will be used to review the full text of the remaining articles. Two researchers will independently review the quality of the articles. In case of disagreement, a third researcher will review the article.

Data extraction management: The research question and several surveys with researchers will be the basis for the database search conditions. In formulating a specific search strategy (syntax) for each main database, keywords will be selected based on the number of non-repetitive indexes (NNR). According to the index, the best syntax will be selected and entered into the EndNote software. Then, two researchers will independently review titles, abstracts, and full articles. Any article that does not meet the inclusion criteria will be removed, and disagreements will be resolved through discussion with other group members. Finally, codes will be extracted from the selected articles. The process of reviewing texts and selecting articles is presented in chart number one, (Figure1).

Risk of bias assessment: Two authors will evaluate the selected articles according to the PRISMA checklist, and the final articles will be selected based on their evaluations.

Dissemination

The final articles will be analyzed and reviewed using content analysis to extract the components of prehospital emergency preparedness in RN incidents. The study's results are a basis for prehospital emergency preparedness in the incidents above. This will enable an effective response to nuclear and radiation incidents and, with planning in this area, will lead to a reduction in losses, damages, and injuries.

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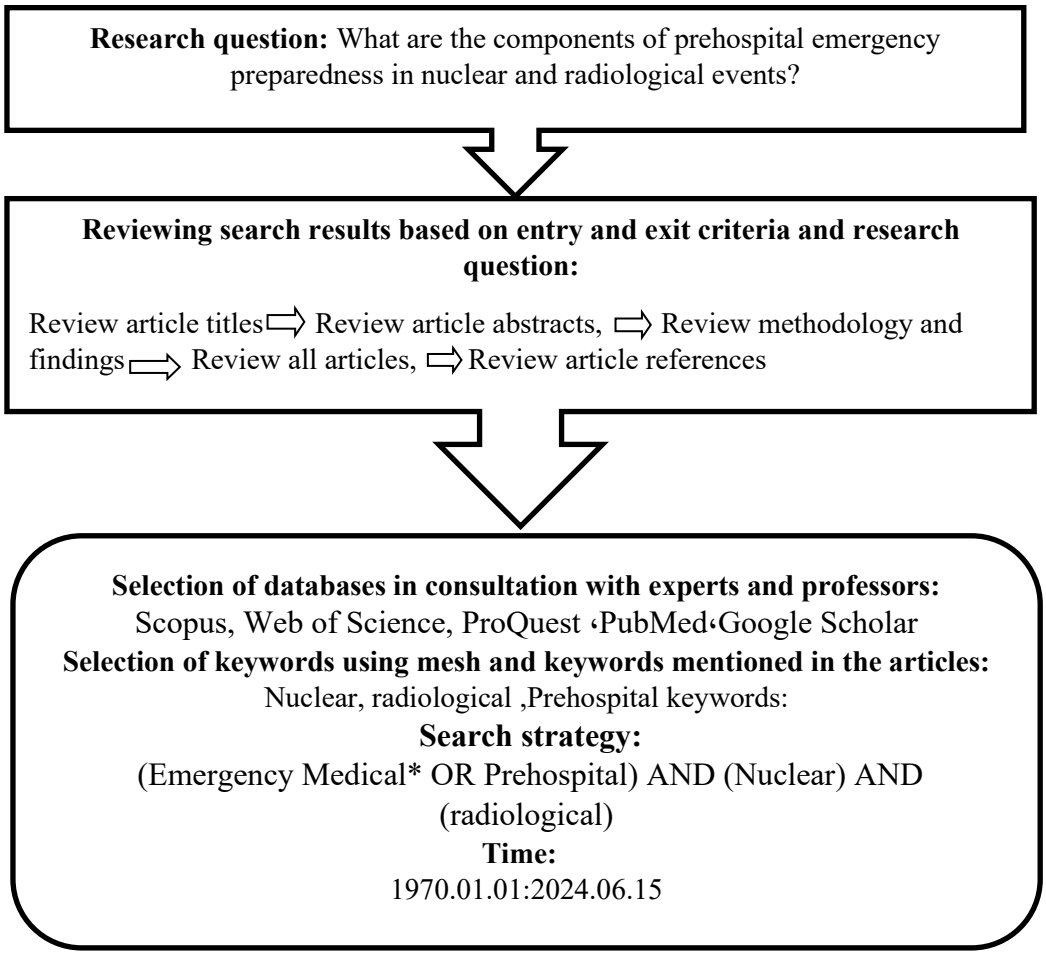

Figure 1. The process of literature review and article selection

Conclusion

A scoping literature review will present a new perspective on the dimensions of prehospital emergency preparedness in RN incidents. Multiple dimensions of preparedness and objective indicators in prehospital emergencies are defined. This will be useful for health managers and policymakers to plan this field and clarify issues such as medical aspects, equipment, human resources, and safety measures for these hazards.

Strengths

No study identified all the dimensions of prehospital emergency preparedness in RN incidents. The studies examined different aspects of preparedness separately, and the present study examined all aspects of preparedness in this field in RN incidents and provided a comprehensive perspective on this issue.

Limitations

The lack of access to the full text of some articles included in the scoping review is one of the limitations of this study, which the researcher will address by using the library resources of medical sciences universities and by direct communication with the author responsible for the article. The multi-dimensionality of the preparation field is another limitation of this study; to solve the problem, the use of different experts in the team is considered.

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Conflicts of interest

The authors declare that they do not have any competing interests.

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Ethical considerations

This university's Ethics Committee will approve the article for Human Research.

Code of ethics

This article is by the doctoral research project at Shahid Sadoughi University of Medical Sciences, Yazd, which follows the ethics code IR.SSU.SPH.REC.1403.067.

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Authors' contributions

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