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Review Article

A Comparative Study of the Elderly Needs and Coping Capacities in Disasters and Emergencies: Implications for Healthcare Systems

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Abstract

Introduction: The elderly has special needs in disasters, and their lives and health status are affected by disasters. Two countries, Iran and Germany, were selected to study and analyze the different aspects of the elderly's needs and capabilities in disasters. This study aims to identify and compare the needs and capacities of the elderly in disasters in Iran and Germany and suggest implications for healthcare systems.

Method: The present research is a comparative study using a scoping review. Relevant keywords were searched on the Web of Sciences, PubMed, and Scopus. Two researchers selected the final references using title and abstract screening based on the inclusion and exclusion criteria.

Results: A total of 18 references were selected for the final analysis. Earthquakes and heat waves were the most common disasters in the studies of Iran and Germany. The elderly status in disasters was explained in terms of vulnerability/needs, capacities/capabilities, assessment/measurement, and the interventional approach.

Conclusion: Comparing the elderly conditions in disasters in Iran and Germany can result in useful implications for policy-making and management. Hazard risk analysis and assessment, special training for nursing home staff, and improving the elderly's disaster risk perception are highly suggested.

Keywords: Elderly; needs and capacities, disasters, Iran, Germany.

Introduction

Age is considered a vulnerability factor in disasters. Children and the elderly are categorized as the most vulnerable groups in disasters and emergencies [1]. The world's elderly population is increasing, and it is estimated that older adults will account for 22 percent of the global population by 2050 [2,3]. On the other hand, disasters occur more frequently worldwide. Thus, the simultaneous growth of elderly populations and disaster occurrence can result in significant challenges.

The elderly has special needs in disasters, and their lives and health are affected by the negative consequences of disasters. For instance, after the Japan earthquake and tsunami in 2011, the elderly was recognized as the most vulnerable group who needed care and help [4,5]. Reduced coping capacities for climate change and disaster effects, as well as socio-economic restrictions and insufficient physical and cognitive abilities, are the aging factors that can cause the vulnerability of the elderly to disasters [2].

Older people encounter serious health problems during disasters and need healthcare services. For instance, musculoskeletal pain was associated with the new physical disability among the elderly who survived the Great East Japan Earthquake [6]. However, considering the vulnerability and needs of the elderly has not been a priority of disaster management systems [7,8].

In Iran, the number of older population is increasing [9]. For instance, the elderly population of Iran had risen from 7.22% in 2006 to 8.20% in 2011 [10]. On the other hand, Iran is a hazard-prone country frequently affected by disasters [11]. For example, a flood disaster devastated 21 provinces in Iran in 2019. Similarly, Germany has been affected by heat waves and disasters, especially floods. For instance, in 2021, Germany was destroyed by floods that killed 180 people and negatively affected about 40000 inhabitants [12,13]. Germany is among the top five countries in terms of the number of the elderly population in the world [14].

Population aging is a global issue in both developed and developing countries. This issue remains under-researched, especially in developing countries [15]. On the other hand, disasters increasingly occur around the world and negatively affect the elderly living in the destructed regions. Thus, older people suffer from the destructive effects of disasters in both developed and developing countries. Merging and comparing the experiences and lessons learned by developing and developing settings can lead to comprehensive plans and policies for improving older people's resilience in future disasters. Accordingly, Iran and Germany were selected to study and analyze the different aspects of the elderly's vulnerabilities and capabilities in disasters that occurred in both countries. Thus, this study aims to identify and compare the needs, challenges, and capacities of the elderly during disasters in Iran and Germany and to suggest practical implications for the healthcare systems.

Methods

Setting

The present research is a comparative study using a scoping review. The scoping review was applied since this study aimed to clarify the elderly needs and capacities in disasters in developed and developing settings and provide suggestions for future actions and research. Arksey and O'Malley's O'Malley methodological framework was used for the scoping review. According to this framework, any scoping review is conducted following a 5-stages process: identifying the research question, identifying relevant studies, study selection, charting the data, and collating, summarizing, and reporting the results [16]. In the current review, the research question was "What are the elderly needs and coping capacities in disasters and emergencies in Iran and Germany?"

Identifying relevant studies

Databases and search strategy

The databases of Web of Sciences, PubMed, Cochrane Library, Science Direct, Scopus, and related Iran and German databases were used (SID, IranMedex, Livivo). The authors applied Google Scholar to check if any relevant documents were included in the review. The relevant keywords were selected by PubMed MeSH terms, similar articles, experts' suggestions, and reference lists of related articles. The leading search terms included elderly, older people, older adults, natural disasters, floods, earthquakes, heat waves, emergencies, drought, vulnerability, and capacity—the search strategy used AND/OR between selected keywords and terms. The search terms were applied to the articles' titles, abstracts, keywords, and text. Searching the literature was performed on January 29, 2023.

Inclusion and exclusion criteria: All forms of published peer-reviewed papers (e.g., case studies/reports, original articles, commentary) that considered the elderly status in disasters in Iran and Germany were included. The exclusion criteria were artificial disasters, online news, website reports, and articles not published in English, German, and Persian. Furthermore, the papers whose abstracts were not available were removed. There was no time limitation for searching the documents.

Studies selection and charting of the data

Two researchers conducted the selection of studies. In the first stage, the authors examined the titles and abstracts of all papers, and the studies that met the inclusion criteria were chosen for the next screening stage. In the next stage, the full texts of all selected references were independently studied by two authors. References that met one of the exclusion criteria were rejected. Once the references were selected and the relevant articles were finalized, primary analysis was performed to illustrate the characteristics of the selected documents. The authors assessed all extracted studies to verify the qualification. The data extracted from each

reference were collated, summarized, and reported the different aspects of the elderly conditions in disasters in both countries.

Results

Collating, summarizing and reporting the results

Initial searches yielded 1859 references. The 901 references were related to Iran; the remaining were Germany's publications (*n* = 958). After removing duplicates (n=490), the title and abstracts of the remaining references were screened. At this stage, publications irrelevant to the research topic were excluded (n=652). The full text of the remaining references was read, and 18 references were identified for final analysis (Figure 1).

Descriptive analysis

Of all references included in this review (*n* =18), eight citations were related to elderly status in disasters in Germany, and the remaining ones were related to Iran (n=10). Iranian researchers used the qualitative research design the most (*n* =5) compared to German authors who applied quantitative research designs such as retrospective analysis and survey study. Researchers considered different types of disasters in both countries. Iranian studies considered earthquakes the most, while German authors investigated heat waves (Table 1). All references were explained based on the disaster type, management phases, primary findings, and implications (Table 2&3).

Table 1: The characteristics of the final articles

Type of study	Iran		Germany	
	N	%	N	%
Quantitative	4	40	7	87.5
Qualitative	5	50	-	-
Mixed method	1	10	1	12.5
Disaster type	**Iran**		**Germany**	
	N	%	N	%
Earthquake	10	100	-	-
Flood			2	25
Heat waves			6	75
Article type	**Iran**		**Germany**	
	N	%	N	%
Original	10	100	8	100
Disaster phase	**Iran**		**Germany**	
	N	%	N	%
Post-disaster (recovery/response)	9	90	7	87.5
Pre-disaster (mitigation/preparedness)	1	10	1	12.5

Categorization and description of studies

Elderly vulnerability/needs in disasters

Older people have special needs and vulnerabilities in disasters in both countries. Their disaster-related vulnerabilities in Iran were identified as personal and social factors. Personal factors included individual capacity, limitations, family situation, and demographic characteristics. Social factors consisted of religious beliefs, behaviors, and cultural attitudes [9]. In Iran, the elderly population experienced emotional distress, inadequate service delivery based on their unique conditions, indignity at the time of providing relief aids, and feelings of insecurity and vulnerability to theft after the Bam earthquake. The relief agencies worked regardless of the particular health conditions of older people, such as physical weaknesses and chronic diseases [17]. Furthermore, the elderly had maladaptive responses to the earthquakes in the forms of inadequate motivation for searching for relief packages, reduction of social activities, and undue dependency on the family [18].

The older people's lives changed after disasters. For instance, older people had a re-victimization after the earthquake in Iran. Poverty and deprivation, physical and mental health disorders, increased dependency as well as avoiding family and work activities were the reflections of their post-disaster life changes in Iran [19]. Social isolation, lack of social acceptance, and inadequate social support were the social vulnerabilities of the elderly after the earthquakes. The social isolation of the elderly who didn't have any earthquake experience was more than the ones with earthquake experience ($P<0.01$) [7]. In addition, the functional performance of the elderly was adversely affected during a short period after the Bam earthquake. The elderly survivors of the Bam earthquake suffered from diminished functional capacity and had considerable challenges in meeting their basic needs. For instance, the elderly with lower function experienced more challenges in access to relief aid ($p = 0.04$) [20].

In Germany, the most common disasters affecting the elderly population are heat waves. An analysis of urban and rural areas showed that older adults and women indicated an increased vulnerability to heat stress [21]. Data from the 2003 heat wave in Frankfurt showed that the excess mortality increased disproportionately with

age, with 66% in the age group 60-70 years, 100% in the age group70-80 years, 128% in 80-90 years, 128% and 146% in those older than 90 years 146%. Additionally, deceased women were significantly older (mean 81.3 ± 13.3 years) than men (mean 71.8 ± 16.3 years; p=0.005), and 22.7% were from nursing homes [22]. Similar results were shown for heat waves between 2003 and 2013. In the 2010 heat wave, mortality significantly increased by 23%, with an even 38% higher mortality in the population above 80 years [23]. Among elderlies, those living in nursing homes indicate a very high vulnerability to heat stress. Data reveal that people in nursing homes have the lowest risk of dying between 16.0 and 25.9°C. A temperature of 30.0-31.9°C, 32.0-33.9°C, and ≥34°C increased the mortality risk by 18%, 26%, and 62%, respectively. Nevertheless, the most susceptible age group to heat stress was observed among the oldest, aged ≥90 years. Nursing home residents with the lowest degree of care need are less susceptible to heat-related mortality compared to those with the medium degree of care need [24]. Despite the above-mentioned risk for the elderly at heat waves, a study showed that people aged 65-74 years and ≥74 years are those with the lowest heat risk perception [25], which can affect their vulnerability to extreme heat waves. Finally, a study analyzing the impact of floods on welfare identified that households with a head at retirement age (>65 years) indicate a higher welfare loss compared to the mean of all age groups [26]. For destructive disasters, which make restoring buildings necessary, the elderly need special assistance. It is difficult to fill in forms or collect the required documents to get support and apply for governmental funding. In addition, it is difficult for the elderly to deal with insurance companies after disasters [27].

Elderly's capacities/capabilities in disasters

Older people have unique capabilities and capacities that can be applied for effective disaster management. Adjusting to new post-disaster circumstances, religious coping, and sharing information and feelings were found to be the adaptive capacities of the elderly after the earthquakes in Iran. Religious coping as a context-based factor included having faith, trusting in God, and high acceptance of earthquake consequences and other emerging issues. Furthermore, the elderly shared their feelings and experiences with others to reduce post-disaster uncertainty. Older survivors contributed to effective post-disaster roles and activities such as caring for women and children, providing psychological support, and offering guidance and advice after the earthquakes [18].

Older people's lives may positively change after the disasters. For instance, the elderly benefitted from improved post-disaster lives through self-regulatory behaviors and individual growth in Iran [19]. Comparing positive mental health between the elderly and young earthquake survivors in Iran revealed that the elderly population had a higher level of positive mental health than the young adults. This research was conducted three years after the East Azerbaijan earthquakes in 2012. It showed that older adults benefited from higher social, emotional, and psychological well-being levels than young people [28].

To prepare the elderly for heat waves in Germany and increase their capabilities, exercise interventions might mitigate physical performance and provide resources for appropriate adaptation to heat stress [29]. In addition, the highest mortality rates during a heat wave were seen in the most densely built-up districts [21]. Nevertheless, the elderly is often retired and do not need to live in the city center and could, therefore, move to less densely built city areas.

Assessment/measurement of the elderly status in disasters

Iranian researchers explored important indexes for assessing the elderly status in disasters, including physiological indexes (e.g., specific nutrition and physiological needs of the elderly), psychological indexes (e.g., psychological supports, leisure services, welfare, sports, psychological counseling needs, psychological- physical reactions, suicide issue, preserving the elderly's dignity, age and culture of the elderly, experience and strengths of the elderly) religious and spiritual indexes (e.g. religious ceremonies), economic indexes (e.g. Prostheses requirements, accommodation and housing, and elderly job), health indexes (e.g. Therapeutic medicine and addiction) as well as security indexes [30].

In Germany, mortality is a central index to measure the impact and status of disasters on the elderly, using claims and/or death registry data. Claims data include information on age, gender, reason for death, comorbidities, and need for care. Since the main research focus in Germany is on heat waves, metrological data is used to identify relationships

between heat, the health of the elderly, and the impact of heat waves. Other indices to assess disaster's impact in Germany are socioeconomic status and physical performance.

Interventional approach

In Iran, some researchers designed educational interventions to improve disaster preparedness in older people. The necessity of securing the living place, preparing a rescue bag, and personal and family training were the educational packages developed using the public education content of relevant disaster management organizations and the literature review. Based on the findings, all scores of earthquake preparedness subscales (communication preparedness, environmental preparedness, time for responding to earthquakes, recovery from earthquakes) significantly increased in the interventional group after the educational intervention ($P<0.05$) [31].

In Germany, the perception of disasters must be increased because, in the past, Germany was not regularly affected by disasters such as heat waves. More intensified heat risk communication among the elderly in urban areas is recommended [25]. Heat Health Warning systems can be implemented, considering the weather and forecast for the next few days. Urban planning and building design can take increasing heat more into account. Creating open green spaces with trees, better city ventilation, or painting roofs and walls white are interventional measures [21]. Finally, equipping buildings, especially nursing and retirement homes, with air conditioning can be a quick and efficient measure. More effortless measures such as footbaths, washing of bedridden people with cold water, critical review of diuretics during heat waves, and subcutaneous administration of isotonic infusions might help the elderly in nursing homes [24].

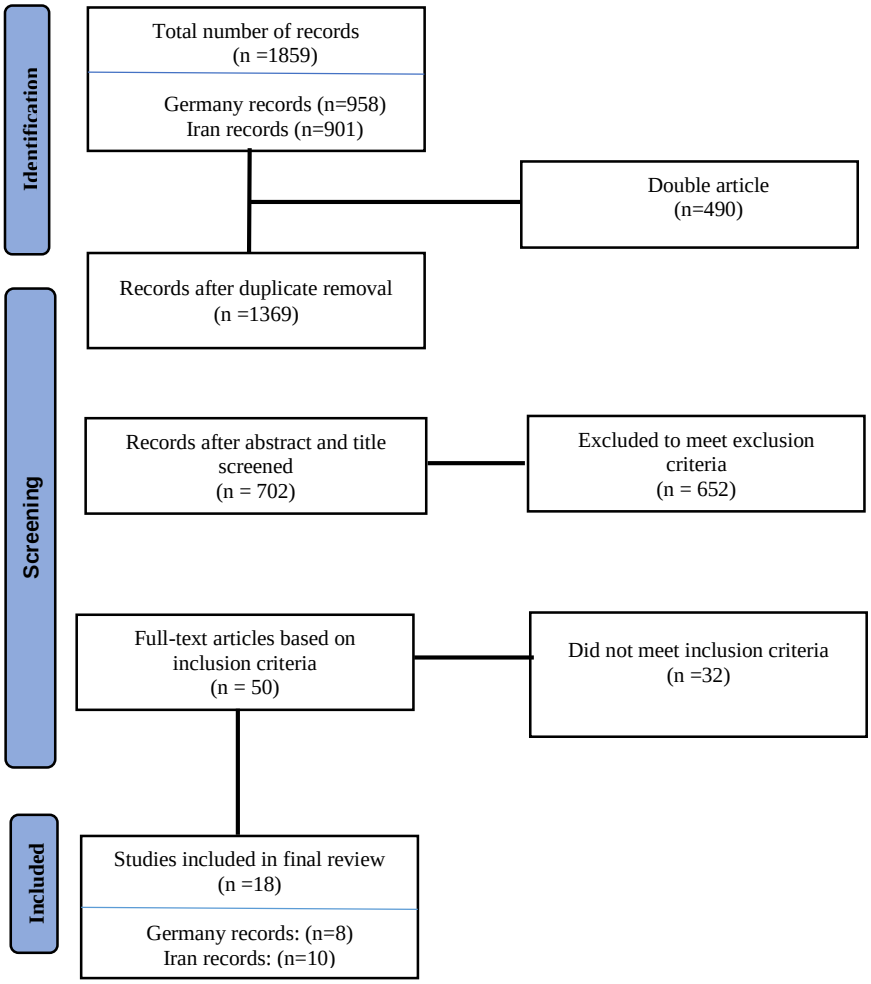

Figure 1: Articles screening and selections flowchart

Table 2: Germany references description

Germany references					
Author	**Title**	**Disaster type**	**Disaster management phase**	**Main findings**	**Main implications**
Klenk et al. (2010)	Heat-related mortality in residents of nursing homes	Heat wave	Response and recovery	Elderlies living in nursing homes are highly vulnerable to heat stress. Residents with the lowest degree of care need were less susceptible to heat-related mortality than those categorized within the medium degree of care need such as the elderly. High susceptibility to extreme weather conditions was observed among the oldest old (≥90 years)	Air conditioning suggested to be highly effective in preventing heat wave mortality, provision of cold footbaths, washing of bedridden people with cold water, review of diuretics and administration of isotonic infusions
Lindemann et al. (2017)	Effect of Indoor Temperature on Physical Performance in Older Adults during Days with Normal Temperature and Heat Waves	Heat wave	Response (During heat wave)	Elderly with higher physical performance indicate lower decrease in physical performance and show a more appropriate adaptation to heat stress	Exercise of elderly can result in better physical fitness which may alleviate impediments of physical capacity and provide resources for their adequate adaptation during heat stress
Beckmann & Hiete (2020)	Predictors Associated with Health-Related Heat Risk Perception of Urban Citizens in Germany	Heat wave	Response (During heat wave)	The lowest heat risk perception was identified in the group being aged 65–74 years followed by those older than 74 years. There is a substantial lack of experience of urban citizens in Germany how to deal with heat waves, which causes a higher vulnerability	In Germany is a need for heat adaptation measures and for more awareness on the risk of heat waves and heat stress in vulnerable populations. This also includes a more intensified heat risk communications in urban areas.
Reanos (2021)	Floods, flood policies and changes in welfare and inequality: Evidence from Germany	Flood	Response and recovery (post-flood)	Welfare losses is larger for families with children and for households with a head at retirement age compared to the mean.	Higher welfare loss expected in households with elderly and thus countermeasures need to be prepared.
Gabriel & Endlicher (2011)	Urban and rural mortality rates during heat waves in Berlin and Brandenburg, Germany	Heat wave	Response (Mortality during heat wave)	Mostly elderly people and especially women showed an increased vulnerability to heat stress. Highest mortality was seen in most densely built-up city districts.	Outdoor measures against heat stress in urban areas are needed. These measures may include creation of open green spaces, facilitation of better ventilation in cities, the reduction of thermal pollution
Kammerbauer & Wamsler (2017)	Social inequality and marginalization in Post- Disaster Recovery: Challenging the Consensus?	Flood	Response and recovery	Elderly need special assistance for restoring of their buildings after destructive disasters. It is difficult for elderlies to collect and fill in the required documents.	Provision of special assistance teams to support elderlies after an destructive disaster to fill in documents and to deal with authorities and insurances.
Heudorf & Meyer (2005)	Heat Waves and Health – Analysis of the Mortality in Frankfurt, Germany, During the Heat Wave in August 2003	Heat Wave	Response (During heat wave)	Excess mortality increases disproportionately with age during heat wave: • 66% among those aged 60 to 70 years • 100% among those aged 70 to 80 years • 128% among those aged 80 to 90 years, and • 146% among those aged 90 years and older Deceased women were older than men and 22.7% of deceased were from nursing homes.	An increase in mortality among the elderly must be expected during periods of extreme heat. Therefore, preventive measures have to be developed and communicated to the elderly and residents as well as care givers in nursing homes
Heudorf & Schade (2014)	Heat waves and mortality in Frankfurt am Main, Germany, 2003–2013 What effect do heat-health action plans and the heat warning system have?	Heat wave	Response (During heat wave)	Excess mortality by age groups: • 12% (not significant) increase in people <60 years old, • 64% in those aged 60–79 years and • 113% in persons over 80 years old. In addition, the heat wave in 2010, indicated a significant increase (23%) in total mortality, which was mainly deriving from a 38% increase in mortality of people >80 years old.	An increased fluid and electrolyte supply, appropriate clothing, cooling of rooms and, providing souterrain rooms for those persons in long-term care facilities whose rooms could not be cooled down is needed to prevent them to get harmed by heat stress.

Table 3: Iran references description

Iran references					
Author	**Title**	**Disaster type**	**Disaster management phase**	**Main findings**	**Main implications**
Ahmadi SH, et al, 2018	How Did Older Adults Respond to Challenges after an Earthquake? Results from a Qualitative Study in Iran	Earthquake	Recovery	The elderly's adaptive and maladaptive responses were identified	Identifying the elderly vulnerabilities and their contribution in recovery plans based on their adaptive responses were suggested by authors
Khodadadi H, et al, 2018	Indexes of Caring for Elderly in Earthquakes According to the Iranian Experience: A Qualitative Study	Earthquake	Response	The elderly's vulnerability, physiological, psychological, economic, religious, health and security indexes were explored	Implementing a comprehensive plan based on the elderly's vulnerability and capacity indexes can save their lives effective response to disasters
Ardalan A, et al. 2010	Older people's needs following major disasters : a qualitative study of Iranian elders' experiences of the Bam earthquake	Earthquake	Recovery	Concerns identified for the elderly include inappropriate service delivery, affronts to dignity, feeling insecure and emotional distress	Training relief agencies to be age-sensitive and mainstreaming the elderly's rights in the planning during response and recovery phases
Ardalan A, et al. 2011	Impact of the 26 December 2003 Bam Earthquake on Activities of Daily Living and Instrumental Activities of Daily Living of Older People	Earthquake	Recovery	Elderly survivors with lower functional capability experienced more problems in access to relief items	Considering the functional capacity of elders by disaster managers at the time of planning for medical and relief actions
Rafiey H, et al, 2016	Are older people more vulnerable to long-term impacts of disasters?	Earthquake	Recovery	Older adults scored significantly a higher level of overall positive mental health than younger age group	Higher level of positive mental health among the elderly compared with their younger counterparts in disasters show that age does not contribute to increasing vulnerability
Daddoust L, et al, 2018	The Vulnerability of the Iranian Elderly in Disasters: Qualitative Content Analysis	Earthquake	Recovery	Two categories of personal and social factors were identified as the contributing factors for the elderly's vulnerability in earthquakes	Using the rich experiences of the elderly can enhance their resilience to disasters
Ardalan A, et al, 2010	Post-disaster quality of life among older survivors five years after the Bam earthquake: Implications for recovery policy	Earthquake	Recovery	The earthquake resulted in better social relationships among the elderly who lived in the affected communities in Iran	Long-term monitoring of health and quality of life status of the elderly and focusing their mental health status were suggested by the authors
Soltani Nejad A, et al, 2017	Investigating Social Vulnerability of the Elderly in the Earthquakes of Bam, Varzaghan, and Ahar	Earthquake	Recovery	The factors of social incompatibility, social isolation, lack of social acceptance and social support were identified as social damage of earthquakes. Feelings of social support and acceptance of earthquakes affected older people were less than non-affected ones ($P<0.01$)	Planning to reduce and control the elderly deaths and injuries in disasters were suggested
Saeli E, et al, 2016	Risk reduction intervention effect on elderly people in earthquake disaster preparedness subscales communication, during earthquake as well as in post-earthquake recovery	Earthquake	Preparedness	The effectiveness of the educational intervention for the elderly was indicated. All subscales of earthquake preparedness scores significantly increased after educational intervention	Earthquake preparedness subscales can be improved by implementation of risk reduction program and educational interventions among elderlies
Khankeh HR, et al, 2020	Life Changes of the Elderly After Earthquake: A Qualitative Study in Iran	Earthquake	Recovery	re-victimization and post-accident growth were found as the changes in the elderly's lives after the earthquake	Planning for preventing the elderly challenges in disasters based on their life changes during post-disaster phase

Discussion

This review identifies the different aspects of the elderly's needs and capabilities in disasters in Iran and Germany. While earthquakes were the most common disaster in Iran's studies, heat waves were the primary disaster in Germany's references. The elderly status in disasters was explained in terms of vulnerability/needs, capacities/capabilities, assessment/measurement, and the interventional approach.

In 2050, the elderly will comprise more than 20% of Iran's population and more than 30% of the German population [19,32]. Floods in different regions in Iran killed about 86 people and injured 3285 inhabitants, and the latest flood in Germany killed 180 people [12]. In addition, heat waves indicate a particular risk for the elderly in Germany.

In Iran, important challenges of the elderly in disasters included poverty, health disorders, increased dependency, social activity reduction, insufficient social support, and a sense of insecurity, as well as affronting the elderly dignity. While natural disasters are increasingly occurring in Iran, considering the elderly's vulnerabilities can be a vital issue for future planning and policy-making—the elderly benefit from some capabilities that can be used to improve their status during disasters. In Iran, religious coping, offering guidance and advice, supportive roles and activities, as well as positive mental health were the main capabilities of the elderly during disasters.

On the other hand, German authors conducted studies focused on the physical health of the elderly in heat waves. In Germany, it is already known that heat and heat waves are a risk for the elderly, which is also shown based on the publications included in this review. Elderlies indicate a high risk for heat stress due to a reduced thermoregulatory capacity, resulting in reduced performance and more heat-related adverse events. Another issue in terms of heat stress is pre-conditions. For instance, more than 17% of females and 20% of males above 65 years have diabetes, and more than 18.9% ≥80 years old indicate coronary heart disease in Germany. During heat waves, cardiovascular disease can exacerbate, leading to hospitalization or death. In Germany, the prevalence of kidney diseases is higher than 12% in those aged 70-79 years. Therefore, a potential measure against heat-related adverse events can be the improvement of the public health status of the elderly.

Conclusion

Comparing the elderly conditions in disasters in Iran as a developing country and Germany as a developed country can have valuable implications for policy-making and management. The researchers of each country highlighted the important suggestions for improving the quality of life of the elderly in terms of disasters. The authors of this review suggested the following implications based on the lessons learned in each country.

- The German Ministry of Health has recognized the risk of heat waves and worked on developing an action plan. This plan consists of: 1. Sensitization of the population and vulnerable groups to take protective measures when heat waves occur; 2—reduction and avoidance of fatalities and mitigation of disease progression; 3. Triggering protective intervention and communication cascades through targeted information; 4—improving and disseminating scientific evidence. In addition, the importance of the elderly lives in disasters has been mentioned in some national disaster management rules and plans in Iran. However, designing and conducting specific plans for reducing the adverse effects of disasters on the elderly and preventing possible damage during context-based disasters are highly suggested for both countries. For instance, Germany's health system needs to be prepared for future floods based on the lessons learned during the destructive flood in 2021. On the other hand, Iran's health system has considerable experience in responding to frequent floods and earthquakes but is required to be prepared for dust storms and heat waves.

Regarding the elderly, earthquakes and heat waves are frequent disasters in Iran and Germany, respectively. Thus, the related lessons can be shared with the scholars of both countries through scientific and educational events as well as joint pre- and post-disaster plans and guides.

Hazard risk analysis and assessment can be conducted to identify and prioritize the most likely disasters in both countries. Such analysis and assessments should be the important basis for all future actions and measures. The health systems of both countries need to design mitigation, preparedness, response, and recovery plans based on hazard risk analysis and assessment outputs.

- People in nursing homes represent a unique population since they are vulnerable to heat stress and other disasters but often incapable of taking counteractions on their own. Therefore, nursing staff need special training on acting during disasters, identifying nursing residents at high risk of death and injuries, and providing countermeasures.

The elderly are not helpless victims in disaster fields. Their vulnerabilities and capabilities should be considered equally. Improving and applying the elderly's capacities is one important method for reducing their vulnerabilities in disasters. For instance, older survivors cared for the affected women and children and participated in post-disaster activities in the earthquake-stricken regions in Iran.

Improving the elderly's disaster risk perception is suggested for both countries. For instance, a perception of heat stress is necessary to react to heat by measures like regular hydration, increasing physical capacity, or implementing house cooling systems. Educational interventions may promote the elderly's disaster risk perception and strengthen their preparedness and response skills in both countries.

- Several mitigations and counteractions can be applied at community and organizational levels: construction of heat-resistant cities, creation of open green spaces, better city ventilation, or painting of roofs and walls white. Furthermore, specifically trained insurance or governmental employees could primarily deal with the elderly. Also, aid organizations can train their staff to help elderlies after disasters in both countries better. So, establishing trained and educated teams, including rehabilitation specialists and psychologists, to meet the health needs of the elderly during the response and recovery phases is highly suggested.

Recommendations for further research

Further research is needed to investigate the following issues in the elderly and disaster field:

- Developing a valid and reliable tool for measuring the different aspects of elderly health (e.g., mental and physical health) in disaster-prone countries.
- Joint community-based research projects focusing on the participation of the elderly in disaster risk reduction plans and actions at regional and international levels for comprehensive actions
- Designing and conducting qualitative studies to explore the elderly needs, vulnerabilities, and capacities during possible disasters in the context of Germany
- Establishing evidence-based surveillance systems for monitoring the health status of the elderly during pre- and post-disaster phases in both countries.
- Developing policy guides/briefs for improving the elderly quality of life in disasters based on the previous lessons learned and scientific works

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Conflict of Interest Disclosures

The authors declare no conflict of interest.

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Authors' Contributions

SS: Designed and supervised the study, collected, analyzed and interpreted the data and drafted the paper. LM: collected, analyzed and interpreted the data as well as reviewing the paper. All authors read and approved the final manuscript.

Ethical Statement

This project has been confirmed and approved by the Ethics Committee of Shahid Beheshti University of Medical Sciences, Tehran, Iran (Ethical code: IR.SBMU.PHNS.REC.1401.019).

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