Review Article

Access this article online

Quick Response Code:

Website: www.jehp.net

DOI: 10.4103/jehp.jehp_1415_23

Disaster health literacy for diabetics: A scoping review towards a framework

Somayeh Panahi[1,2], Golrokh Atighechian[3], Maryam Heidarpour[4], Zahra Heidari[5], Hasan Ashrafi-rizi[1]

[1]Medical Library and Information Science Department, Health Information Technology Research Center, Isfahan University of Medical Sciences, Isfahan, Iran, [2]Social Determinants of Health Research Center, Isfahan University of Medical Sciences, Isfahan, Iran, [3]Health Management and Economics Research Center, Isfahan University of Medical Sciences, Isfahan, Iran, [4]Isfahan Endocrine and Metabolism Research Center, Isfahan University of Medical Sciences, Isfahan, Iran, [5]Biostatistics Department of Epidemiology and Biostatistics, School of Health Isfahan, Isfahan University of Medical Sciences, Isfahan, Iran

Address for correspondence:
Dr. Hasan Ashrafi-rizi, Medical Library and Information Science Department, Health Information Technology Research Center, Isfahan University of Medical Sciences, Isfahan, Iran.
E-mail: hassanashrafi@mng.mui.ac.ir

Received: 05-09-2023
Accepted: 23-11-2023
Published: 28-12-2024

Abstract:

Due to the increasing occurrence of natural disasters, it is essential to prioritize the improvement of health literacy during emergencies, particularly for individuals with chronic illnesses like diabetes who are especially vulnerable in the medical sector. The primary objective of this study was to identify the key themes within an emerging framework for disaster health literacy specifically tailored for diabetics. A scoping review design was selected based on the Arksey and O'Malley framework. The published articles indexed in PubMed, Embase, Scopus, and Web of Science databases were retrieved up to April 2023, applying related keywords. There restrictions were placed in the English language and the study design. Textual analysis method to identify themes in the articles. The research team conducted multiple collaborative sessions to identify the themes related to health literacy during disasters based on a comprehensive review of existing literature. Three challenges were identified during the analysis process. These challenges include the difficulties encountered by diabetic patients in the early stages of disasters, the physical side effects they experience, and the major recommendations for preparedness and initial response. Subsequently, a framework was developed based on the extracted main challenges and the established logical connections between the conceptual codes, achieved through consensus among the research team. The study emphasized the importance of integrating health literacy assessment and training initiatives throughout all stages of the disaster cycle, with a specific emphasis on individuals with diabetes. By implementing such programs, it is anticipated that the overall health literacy of diabetic patients during disasters can be enhanced.

Keywords:

Diabetes mellitus, emergency preparedness, health literacy, natural disasters, non-communicable diseases

Introduction

With the rise in natural disasters such as earthquakes and floods at the turn of the century, governmental and non-governmental relief agencies attempted to prepare people for disasters, some making it a national requirement.[1-3] Disaster preparation programs generally focus on evacuating the wounded, particularly the disabled, the sick people, and the pregnant women, and providing transportation, food, water, and shelter via trained caretakers. These programs also concentrate on preventing infectious diseases.[1,2,4,5] According to research, adverse conditions during natural disasters (lack of food and medicines) complicate preparation for high-risk groups such as patients with chronic heart disease,[6,7] lung disease,[8-10] dialysis,[11] hypertension,[12] cancer,[13,14] stroke,[15] and diabetes.[8,16-19] To that end, the UN Office for Disaster Risk Reduction and Health System Programs developed the Sendai Framework for Disaster Risk Reduction, which emphasizes the importance of developing management strategies and programs, as well as the analysis and

How to cite this article: Panahi S, Atighechian G, Heidarpour M, Heidari Z, Ashrafi-rizi H. Disaster health literacy for diabetics: A scoping review towards a framework. J Edu Health Promot 2024;13:475.

dissemination of information before, during, and after a disaster to improve the resilience of the chronically ill.[5,16,20]

Diabetes ranks sixth globally in terms of prevalence and death among chronic illnesses.[21,22] Due to complex factors such as unpredictable recovery and long treatment duration, uncontrolled diabetes often leads to complications such as heart disease, stroke, hypertension, blindness, kidney disease, diabetic coma, amputations, and psychological complications such as depression and decreased quality of life,[5] which must be accompanied by precise self-care.[23,24] Because there is no cure for diabetes and its complications must be treated and controlled over time, effective intervention strategies, particularly in the field of primary prevention, such as eliminating the disease's causes and optimizing management in terms of lowering healthcare costs and improving patient literacy, can be considered the most valuable measures.[21,25,26] According to research findings, the extent of people's awareness about disaster health complications, risks, and actions that can be taken is still in an initial stage. They require adequate literacy about the consequences and causes, as well as how to respond to them.[27]

Efforts to build and measure disaster health literacy, particularly among the chronically sick, can be an excellent beginning point for reducing possible hazards. Health literacy's influence and involvement in complications, as opposed to health literacy's usefulness in recognizing health risks and repercussions, are yet unknown. For years, experts in finance, taxes, insurance, networking, digital, information, media, environmental, and other fields have discussed the concept of public literacy.[28] Studies in the field of disaster health literacy are still in their early stages of development, and the development of literacy against such disasters is not as advanced as health literacy. So far, the components of health literacy have been employed as a foundation for its development.[20,28]

To address health literacy, several factors are evaluated: 1) the abilities of individuals to recognize and use healthcare information to make well-informed healthcare decisions, 2) the setting (e.g., hospitals, clinics, the home) in which the demands are made where individuals may seek or receive health care and information, and 3) the content used to exchange health information.[29] Regarding health literacy, these three factors also need to be clearly identified and addressed when responding to the disaster literacy needs of diverse populations.[30] In addition, these factors must be included to define health literacy in disaster health literacy as a person's capacity to use, interpret, and comprehend essential health information and services that improve one's quality of life in the aftermath of a disaster.[30,31]

Disaster preparation research and training materials for the chronically sick, particularly diabetics, provide a little contribution, and there are still numerous gaps to be filled. In light of these issues, and in anticipation of future natural disasters such as earthquakes and floods, initiatives to increase disaster literacy among the general public, particularly among people with diabetes, are a critical public health priority. There are only programs for educating healthcare providers in disasters, as previously stated, but there is no mention of self-care for persons with diabetes in disasters. To solve this issue, the first step is to build a literacy health framework to improve persons with diabetes empowerment in disasters so as that avoid human losses and financial expenses.[32] As a result, this study's primary goal was to identify the primary themes of an emerging disaster health literacy framework for diabetics based on scoping reviews.

Materials and Methods

The study utilized a scoping review to independently explore broad areas, identify gaps in existing evidence, clarify fundamental concepts, and provide information on the different types of evidence that contribute to and guide practices in a specific subject area. The scoping review was based on the Arksey and O'Malley framework and consists of five steps,[33,34] which are described in detail below:

Research question

What are the main dimensions and components of developing a framework to promote diabetic health literacy during disasters?

Identifying studies in the following databases

The main aim of this stage was to gather as many relevant studies from diverse databases, with the goal of providing a comprehensive response to the main research question. The published articles indexed in PubMed, Embase, Scopus, and Web of Science databases were retrieved up to April 2023, applying related keywords. There restrictions were placed in the English language and the study design. The search strategy was formulated as outlined below: *("Disaster Health Literacy" OR "Disaster Prevention Literacy" OR "Disaster Risk Reduction "OR "Understanding disaster risk") AND ("Chronic Disease" OR "Non-Communicable" OR Diabete*) AND questionnaire OR framework).*

Study selection: The authors carefully selected the study inclusion and exclusion criteria to enhance the sensitivity of the review. The criteria were designed to ensure that a

comprehensive range of relevant studies were included while minimizing the inclusion of studies that were less pertinent to the research question. The present study was approved by the Research Ethics Committee of Isfahan University of Medical Sciences on December 4, 2021 (IR.MUI.NUREMA.REC.1400.184).

Inclusion criteria

- Study Population: Patients with diabetes who have been affected by natural disasters.
- Exposure: Studies that examine the impact of natural disasters (e.g., earthquakes, hurricanes, floods) on individuals with diabetes.
- Outcome Measures: Studies that investigate the effects of natural disasters on diabetes management, glycemic control, health outcomes, and complications specific to diabetes.
- Study Design: Observational studies (e.g., cohort studies, case-control studies) and intervention studies (e.g., pre-post-intervention studies) that assess the impact of natural disasters on patients with diabetes.
- Publication Language: Studies published in English.
- Publication Status: Both published and unpublished studies (e.g., gray literature and conference abstracts) will be considered.

Exclusion criteria

- Study Population: Studies focusing on populations without diabetes or populations not affected by natural disasters.
- Exposure: Studies that investigate the impact of other non-natural disaster-related factors (e.g., man-made disasters, socioeconomic factors) on individuals with diabetes.
- Outcome Measures: Studies that do not report specifically on the impact of natural disasters on patients with diabetes or focus solely on general health outcomes unrelated to diabetes.
- Study Design: Reviews, editorials, commentaries, case reports, and studies with inadequate study design or methodology.
- Publication Language: Studies published in languages other than English.
- Publication Status: Studies without access to the full text (e.g., abstract-only publications, unpublished data without available information).

The texts underwent an independent review process conducted by the first and corresponding authors (S.P and H.A). They assessed the articles for eligibility and reached a mutual agreement on their inclusion or exclusion based on the predefined criteria. Any discrepancies or disagreements that arose during the review process were resolved through discussion and consensus among all the authors involved. The resolution of these discrepancies is depicted in Figure 1, which provides a visual representation of the number of articles screened, included, and excluded at each stage of the review process.

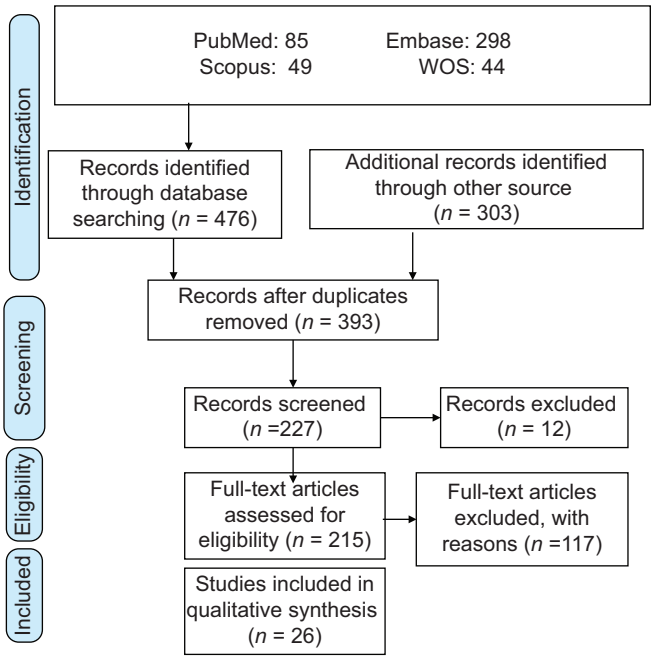

Figure 1: Identification of included studies for the scoping review

Charting the data

During this step, the bibliographic data was organized in a tabular format to facilitate data collection. The table included fields like author's name, publication year, place of publication, study aims, research methodology, key findings, and results. Researchers thoroughly reviewed the compiled data, emphasizing health-related concepts relevant to disasters and their impact on diabetes patients. This process enabled the identification and extraction of key outcomes associated with the convergence of disasters, health, and diabetes.

Summarized, synthesized, and report

The research team applied Ryan and Bernard's Textual Analysis method to identify themes in the articles. They employed techniques such as analyzing word patterns, including repeated words and synonyms, identifying implicit and explicit keywords, and closely examining the text for comparisons, similarities, differences, missing information, and underlying assumptions.[35] Finally, the research team evaluated the various types of studies published in the field of the impact of disasters on diabetics for analysis. A detailed description of all the included articles is provided in the Results section, Table 1. Through multiple collaborative sessions and drawing on theoretical foundations, the team selected the themes of health literacy during disasters with a specific focus on diabetes, aiming to present a comprehensive

Table 1: Details of identified articles

Authors	Year	Method	Type of disaster	Location	Main Outcome
Allahbakhshi, K., *et al*.[37]	2022	Cross-sectional survey	Natural disasters	Iran	In light of the findings and taking into account the patients' limited preparedness, it is crucial to make decisions that will enhance their readiness to improve health outcomes during and after disasters. This can be achieved by implementing appropriate strategies and comprehensive plans across different sectors of public health.
Gautam, V, *et al*.[5]	2021	A cross-sectional study	COVID-19	India	During the lockdown phase, some participants reported migrating to rural areas, Influenza-like illness, suffering from hypertension and uncontrolled metabolic. Results recommended to preventive behavior and adherence to pharmacological management and physical activity.
Gohardehi, F., *et al*.[32]	2020	Meta-analysis review	Natural and man-made disasters	Iran	The study findings indicate a significantly higher prevalence of hypertension (HTN) and diabetes mellitus[13] among survivors of major disasters compared to the general population. These results underscore the heightened occurrence of these conditions in individuals who have experienced such catastrophic events.
Calıskan , C., *et al*.[20]	2020	Systematic review	Natural disasters	Turkey	A comprehensive definition and conceptual framework of disaster literacy were presented in an integrated model. By presenting this integrated model, a more comprehensive and nuanced approach to disaster literacy was established.
Hartmann-Boyce J. *et al*.[38]	2020	Evidence-based medicine	COVID-19	Multiple	As well as posing direct immediate risks to PWD, COVID-19 also risks contributes to worse diabetes outcomes due to disruptions caused by the pandemic, including stress and changes to routine care, diet, and physical activity.
Ghosal S, *et al*.,[39]	2020	Systematic review	COVID-19	India	The duration of lockdown is directly proportional to the worsening of glycemic control and diabetes-related complications. Such increase in diabetes-related complications will put an additional load on the overburdened healthcare system, and also increase COVID-19 infections in patients with such uncontrolled glycemia.
Aziz A. R. A. and Alsabek,[40]	2020	Retrospective study	War	Syria	The war injuries of the diabetic foot were followed up. In the absence of early detection of wounds, deformities, and PAD, DFUs likely come to the podiatrists in advanced stages. The unhealthy environment drives DFUs toward injuries, cellulitis, and infection.
Ceriello A, *et al*.,[41]	2020	Qualitative study (Author's Perspective)	COVID-19	Multiple	COVID-19 and related cardio-renal-pulmonary damage can profoundly affect the cardiovascular risk management of people with diabetes. Severe infection with SARS-CoV-2 can precipitate myocardial infarction, myocarditis, heart failure, and arrhythmias as well as an acute respiratory distress syndrome and renal failure
Satoh J., *et al*.[16]	2019	Questionnaire survey	Earthquake	Japan	This study provided a diabetes care providers' manual for disaster diabetes care to be helpful in promoting disaster preparedness and implementing disaster relief.
Quast T and Feng,[42]	2019	Quasi-experimental	Hurricane Katrina	USA	The study findings revealed that the impact of disasters on people with disabilities (PWDs) can extend far beyond the immediate aftermath of the event, persisting for years. This highlights the long-term consequences and challenges that PWDs may face in recovering and adapting to the effects of disasters.
Seifi B, *et al*,[43]	2019	Systematic review	Natural disasters	Iran	The universities' potential in providing sufficient disaster health literacy is not currently considered important enough in communities. Therefore, the proper context-bound models of development based on a community's skills and universities' potential should receive more attention
Seifi B, *et al*.,[31]	2018	Review of the literature	Natural disasters	Iran	Policymakers and health managers should be aware of the challenges of elderly women as a vulnerable group in disasters and develop plans to incorporate disaster health literacy for preparedness and prevention in educating this group.
Murakami A., *et al*.[18]	2018	Systematic review	Earthquake	Japan	NCDs pose major health issues after large-scale disasters. Establishment of strong countermeasures against interruption of treatment and surveillance systems to ascertain medical needs for NCDs are necessary to prepare for future disasters
Sadikot SH.,[44]	2017	Manual	Natural disasters	Belgium	This manual suggested that it is essential for PWDs and their families to have a disaster plan and kit which should provide for all your family's basic needs during these first hours.

Contd...

Table 1: Contd...

Authors	Year	Method	Type of disaster	Location	Main Outcome
Nomura S, *et al*.,[45]	2016	A long-term retrospective analysis	Post-nuclear disaster	Japan	Fukushima disaster was found to be associated with a small increase in long-term hyperlipidemia risk in adults. findings help identify discussion points on disaster planning, including preparedness, response and recovery measures, applicable to future disasters requiring mass evacuation.
Lee D, *et al*.,[46]	2016	Quasi-experimental	Hurricane Sandy	USA	Findings suggest that there is need to support diabetic adults during disasters by ensuring access to medications, aftercare for patients following a recent procedure, and optimizing their cardiovascular health to reduce the risk of heart attacks.
Tomio J and Sato H,[47]	2014	Review	Natural disaster	Japan	Summary of disaster preparedness recommendations for PWDs as follows: obtain self-management skills and stress management, be up-to-date with all immunizations, including tetanus, keep waterproof and insulated disaster kit ready; keep extra insulin and injection kits in multiple places, learn the carbohydrate counting approach, evacuate early
Brown LM., *et al*.[30]	2014	Review the literature	Terrorist attacks, hurricanes, and tornados	USA	Disaster literacy is defined here as an individual's ability and proposed a new model for disaster literacy focused on vulnerable adults
Tanaka K, *et al*.[48]	2013	Commentary	Earthquake	Japan	The precipitous increase in blood pressure immediately after the earthquake was due to stress-induced rapid activation of the sympathetic nervous system, which was then prolonged by physical fatigue, chronic stress, and lack of sleep owing to changes in the environment of the victims, and changes in lifestyle and dietary habits, particularly increases in salt intake from the food provided by evacuation centers and other facilities.
Fujihara K, *et al*.[49]	2012	Quasi-experimental	Earthquake	Japan	Results suggested that psychological stress during a disaster has independent effects on the worsening of glycemic control, and sleep disturbances or anxiety.
Allweiss P and Albright,[50]	2011	Review of the literature	Man-made and natural disasters	USA	The availability of medicine and supplies can be limited, particularly for those evacuated to shelters. Early planning can prevent later disaster-related exacerbations of diabetes
Fonseca V, *et al*,[51]	2009	Observational study	Hurricane Katrina	USA	This disaster had a significant effect on diabetes management and exacerbated existing disparities. Results suggested that individuals with diabetes were very seriously affected owing to the lack of medical care, appropriate food, and medications
Miller, AC and Arquilla[8]	2008	Evidence-based medicine	Earthquake	USA	Patients must be familiar with the emergency diet and renal fluid restriction plans, possible modification of dialysis schedules and methods, and rescue treatments such as the administration of kayexalate. Diabetic patients must be taught and practice the carbohydrate counting technique. diabetics should maintain an emergency medical kit.
Mori, K, *et al*.,[52]	2007	Qualitative study	Earthquake	Japan	The emergency preparedness planning and care priorities for individuals with diabetes should include attention to medication availability, stress management, support for activities of daily living, appropriate food, and availability of support devices necessary to minimize exacerbation of symptoms.
Kirizuka K, *et al*.[53]	1997	Quasi-experimental	Earthquake	Japan	Inappropriate diet demonstrated the highest partial regression coefficient to raise the mean value of the HbA1c level. It seems quite useful to supply a medical information card and a small medical bag containing essential drugs to each patient.
Kario K, *et al*.,[54]	1997	Quasi-experimental	Earthquake	Japan	Earthquake-induced stress seems to induce transient increases in BP, blood viscosity determinants, and fibrin turnover and prolong endothelial cell stimulation. The potentiation of these acute risk factors might contribute to the occurrence of cardiovascular events just after a major earthquake in elderly subjects with hypertension.

framework. To ensure the rigor of the qualitative data analysis, we adhered to some of the criteria proposed by Guba and Lincoln.[36] In order to enhance the transferability of the results, which refers to the ability to apply the findings in similar contexts, we provided a comprehensive and detailed description of the results. To ensure the dependability of the results, we outlined the data collection and analysis processes in a thorough manner, facilitating the possibility of external review. Lastly, to achieve confirmability, the researchers took

steps to minimize investigator bias by acknowledging and setting aside their predispositions and assumptions and clearly distinguishing them from the data included in the analysis.

Results

A total of 26 articles that met the eligibility criteria were included in the study, and their bibliographic characteristics are presented in Table 1.

The majority of studies listed in Table 1 aimed to identify physical and psychological challenges faced by diabetic patients during disasters, using a quasi-experimental clinical trial method, and with the majority of research coming out of Japan and the United States, respectively. Most studies have focused on the effects of earthquakes on diabetic patients, while in recent years, the impact of COVID-19 on the lifestyle of diabetic patients has also become a trend in this area. After reviewing all the selected articles, we identified several key conceptual codes and classified them into three sections, as outlined below:

1) The challenges confronted by diabetic patients in the initial days after disasters encompassed as follows:
   - Psychological: stress and anxiety
   - Behavioral: discontinuation of medication, non-adherence to treatment, changes in dietary habits, decreased physical activity
   - Nutrition and medication: interruptions in receiving routine meals, use of preserved and canned foods, malnutrition, low awareness of how to obtain healthcare items, and medication from relief centers
   - Cultural: disruptions in their indigenous dietary practices and social biases such as stigma surrounding disclosing their illness, particularly with language and regional dialects
   - Social: disruption in social functioning (due to residing in shelters), pessimism and disgust towards society
   - Communication/interaction: deficiencies in social skills such as self-confidence to communicate with rescue personnel, effective communication with healthcare providers, and lack of knowledge on how to participate in the healthcare team.
2) The physical side effects following disasters included disruptions in blood glucose levels and exacerbation of hyperglycemia, hypoglycemia, and diabetic coma; wounds, infections, diabetic foot ulcers, sleep disturbances, retinopathy (eye), neuropathy (nerve in hands and feet), nephropathy (kidney damage), cerebral infarction (CI), acute hypertension, cardiovascular disease (CVD), deep vein thrombosis (DVT), and post-traumatic stress disorder (PTSD).
3) The major recommendations for preparedness and initial response to disasters included the following: being prepared for evacuation in crisis situations, carrying a list of medications and emergency contact information, and preparing a diabetes emergency kit containing various medications and tablets.

Framework development

One of the gaps identified in the reviewed studies was the lack of a health literacy framework specifically designed for diabetic patients during disasters. While this aspect was mentioned in our previous qualitative research,[55] it is now elaborated on in a more visual and clear manner. As a result, the research team developed a pattern based on the extracted codes, which encompasses five main themes, as illustrated in Figure 2.

Discussion

During our scoping review, it became evident that the majority of authors in the reviewed articles had considered various factors, including geographical, topographical, and climatic conditions, as well as the prevalence of diabetes in their respective countries. They also took into account the range of consequences that diabetic patients experience during disasters. One notable example is the Japanese, who developed a manual specifically for diabetic patients to guide emergency treatment staff in providing assistance after earthquakes. This exemplifies the significance of addressing the unique needs of diabetic patients and customizing interventions to their specific circumstances in disaster situations. It is evident that no region is exempt from the imminent threat of disasters. The emergence of new crises like COVID-19 highlights the need for consistent emergency plans for diabetic patients in healthcare sectors worldwide.

One of the key elements in this field is literacy in disaster risk perception, which entails making initial predictions on how to handle disasters. Hence, individuals with diabetes should possess the ability to accurately identify, analyze, and assess the risks in their lives. With the knowledge and awareness, they acquire, they can be well-prepared to face and manage disasters. For example, the concept of a "preparedness kit" consisting of essential documents such as a birth certificate, medical records, insurance information, or cash has been consistently highlighted in numerous studies. The higher the level of disaster risk perception literacy and the promotion of social participation and motivation in preventive interventions, the greater their comprehension of self-care principles and their attitudes toward them will be.[1,2,5,6,8,38,50,53]

Another suggested component is medication literacy, which aims to equip diabetic patients with essential

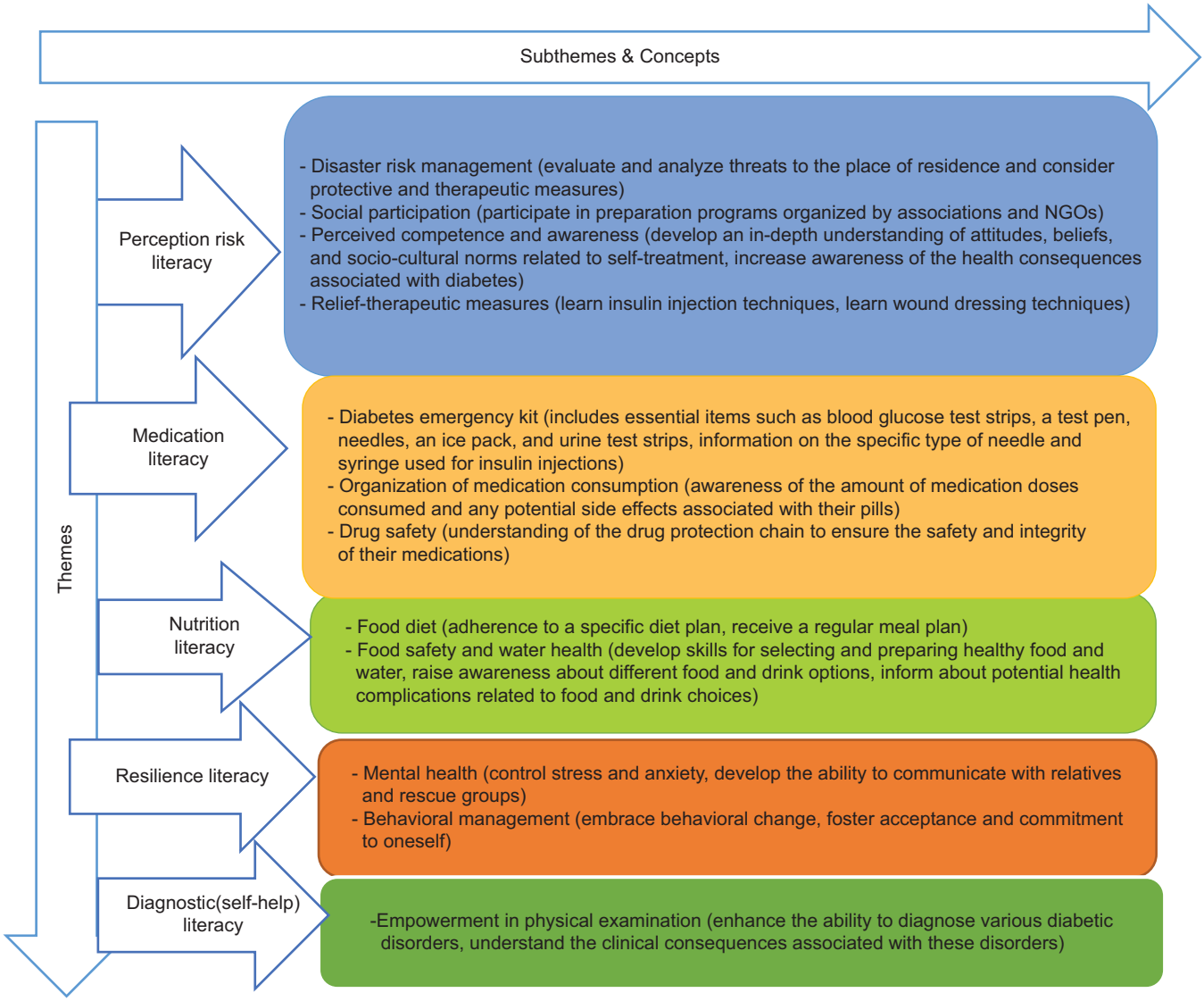

Figure 2: A preliminary framework for assessing disaster health literacy focus on PWD

knowledge on medication management. This includes understanding how to take pills, administer insulin injections, and adhere to prescribed medication regimens. Additionally, patients should be aware of potential side effects and the risks associated with non-adherence to medication and treatment, particularly in situations where access to healthcare providers is limited. It is also important for patients to have knowledge about the storage and protection of medications, as well as understanding how to use blood glucose test devices, particularly in the case of insulin-dependent individuals.[8,9,16,18,38,53,56,57]

During a disaster, when emergency conditions prevail and various food items are distributed by rescue groups, community organizations, or private entities, nutrition literacy becomes even more critical for diabetic patients. This is because effectively managing water and food intake during such situations is vital for regulating blood glucose levels and reducing the risk of potential infections and foodborne illnesses. During crisis periods, relief and rescue groups typically provide dry or canned food as well as bottled water, as these items are easier to distribute and store. If diabetic patients have received prior education on nutrition during emergencies, they can make informed choices and select healthier food options that align with their disease management needs. Moreover, once individuals with diabetes have settled in a shelter or safe location, it is essential for them to inform nutrition consultants or professionals about their dietary requirements. This communication will enable appropriate insulin regulation and ensure their specific nutritional needs are met.[1,2,8,16,38,45,53,58]

Psychological resilience is a crucial aspect for diabetic patients during times of crisis, and they should place special emphasis on cultivating this resilience within themselves. Resilience in the face of disasters is a

combination of personal attributes and interactions with the environment, and it is an ongoing process that is developed through education, learning, practice, and experience.

In practical terms, resilience literacy entails patients being able to effectively manage the primary consequences of a natural disaster. These consequences may include managing stress and anxiety, addressing sleep disturbances, maintaining medication adherence, adapting to dietary changes, finding alternative ways to exercise, and managing reduced social interactions. Additionally, resilience literacy involves being aware of the potential for PTSD that can arise from living in shelters, camps, or quarantine environments. By nurturing psychological resilience, diabetic patients can better cope with the challenges posed by disasters and enhance their ability to navigate through difficult circumstances.[20,45,46,49-51,59]

In the end, diagnostic literacy, which focuses on learning basic first aid techniques, can greatly assist diabetic patients in dealing with emergency situations. It enables them to recognize short-term adverse effects, identify signs of imminent hypoglycemia and high blood pressure, diagnose diabetic foot ulcers, and identify symptoms of urinary tract infections. Diagnostic literacy represents one of the highest levels of health literacy for diabetic patients in disaster scenarios. Initially, it may seem challenging for patients to acquire the skills to diagnose diabetes and its clinical outcomes in crisis situations. However, through active participation in rescue maneuvers and efforts to enhance physical abilities, it is possible to gradually develop this capability. Since delays in receiving assistance are possible during disasters, promoting and institutionalizing this type of literacy among diabetic patients can be highly effective and potentially life-saving (3, 8, 10, 16, 18, 38, 39, 47, 48, 50, 52, 58). While initially daunting, efforts to empower patients through physical abilities and medical first aid can enable them to diagnose diabetes, handle crises, gain confidence, and provide basic first aid. This research introduces novel dimensions to assess health literacy in disasters, specifically for diabetic patients, distinguishing it from previous disaster literacy evaluations.[3,8,10,16,18,31,39,40,48,49,51,53]

In summary, the dimensions used to assess health literacy in disasters, specifically for diabetic patients, are innovative and represent a notable strength of the current research. Despite the existence of previous criteria,[20,30,31] for evaluating literacy, the dimensions introduced to assess health literacy in disaster situations, with a specific emphasis on diabetic patients, are entirely innovative. This novelty is a notable strength of the current research.

Conclusion

The evidence highlights that disasters have a negative impact on diabetes self-care. This study emphasizes that self-care during disasters differs from what patients have learned in regular educational periods. This issue indeed presents a challenge to the conventional self-care handbooks or guidelines that have been developed for diabetic patients. However, the concept of health literacy in disasters presents a hopeful opportunity for diabetic patients. Promoting and institutionalizing this type of literacy can be highly effective in saving lives, especially considering the possibility of delayed assistance in disaster situations. We recommend the creation and distribution of valuable, relevant, and consistent content on disaster health literacy to enhance risk perception based on the proposed framework.

Limitation and recommendation

One limitation of this study is that the evidence is largely based on existing literature and may not capture real-time experiences and variations in different disaster scenarios. Additionally, the study primarily focuses on the impact of disasters on diabetes self-care and may not fully address other aspects of diabetes management during disasters.

Based on the findings of this study, it is recommended to conduct further research that includes empirical data and firsthand experiences from individuals with diabetes who have faced disasters. This would provide a more comprehensive understanding of the specific challenges and needs of diabetes self-care in various disaster situations. Furthermore, it is suggested to develop tailored educational materials and guidelines that specifically address self-care during disasters. These resources should consider the unique circumstances and limitations that individuals with diabetes may encounter in such situations. Regular updates and dissemination of this content should be ensured to keep it relevant and accessible to the target audience. Institutionalizing the concept of health literacy in disasters is essential. Efforts should be made to integrate disaster health literacy into existing healthcare systems, community programs, and emergency preparedness initiatives. This can be achieved through collaborations between healthcare providers, disaster response agencies, and educational institutions. Lastly, raising public awareness about the importance of disaster health literacy for diabetes management is crucial. Communication campaigns, workshops, and training sessions should be organized to enhance risk perception and empower individuals with diabetes to effectively navigate self-care during disasters.

Acknowledgment

The authors would like to express their gratitude to the

authorities of the Isfahan University of Medical Sciences and all the experts who participated in this study.

Authors' contributions

S.P conducted scoping review to extract and identify the themes related to health literacy in disasters. H.AR and G.A analyzed and interpreted preliminary codes in order to describe the content. H.AR established the project and the project team and read and contributed to subsequent reviews and revisions. Z.H and M.H conceptualized the research design and confirmed the accuracy of data collection, conclusions, significance, and implications of the findings. G. A and H.AR refined the research methodology and approved the final manuscript. All authors participated in the meeting and contributed to the integration and summarization of the results of phase 1. S.P wrote the first draft of this submission and coordinated the submission process.

Financial support and sponsorship

The current study was derived from a doctoral thesis and was undertaken with financial support from the Isfahan University of Medical Sciences. Additionally, it received approval from the Scientific Committee of the Isfahan University of Medical Sciences (Code: 3400685).

Conflicts of interest

There are no conflicts of interest.

References

1. Sahil, Sood SK. Scientometric analysis of natural disaster management research. Nat Hazards Rev 2021;22:04021008. doi: 10.1061/(ASCE)NH.1527-6996.0000447.
2. Nofal OM, van de Lindt JW. High-resolution flood risk approach to quantify the impact of policy change on flood losses at community-level. Int J Disaster Risk Reduct 2021;62:102429.
3. Bronfman NC, Cisternas PC, Repetto PB, Castañeda JV. Natural disaster preparedness in a multi-hazard environment: Characterizing the sociodemographic profile of those better (worse) prepared. PloS One 2019;14:e0214249. doi: 10.1371/journal.pone.0214249.
4. Pourvakhshoori S, Khankeh HR, Mohammadi F. Emergency and disaster preparedness in nurses: A concept analysis. J Holist Nurs Midwifery 2017;27:35-43.
5. Gautam V, Dileepan S, Rustagi N, Mittal A, Patel M, Shafi S, *et al*. Health literacy, preventive COVID 19 behaviour and adherence to chronic disease treatment during lockdown among patients registered at primary health facility in urban Jodhpur, Rajasthan. Diabetes Metab Syndr 2021;15:205-11.
6. Satoh M, Kikuya M, Ohkubo T, Imai Y. Acute and subacute effects of the great East Japan earthquake on home blood pressure values. Hypertension 2011;58:e193-4.
7. Nakano M, Kondo M, Wakayama Y, Kawana A, Hasebe Y, Shafee MA, *et al*. Increased incidence of tachyarrhythmias and heart failure hospitalization in patients with implanted cardiac devices after the great East Japan earthquake disaster. Circ J 2012;76:1283-5.
8. Miller AC, Arquilla B. Chronic diseases and natural hazards: Impact of disasters on diabetic, renal, and cardiac patients. Prehosp Disaster Med 2008;23:185-94.
9. Brook RD, Franklin B, Cascio W, Hong Y, Howard G, Lipsett M, *et al*. Air pollution and cardiovascular disease: A statement for healthcare professionals from the Expert Panel on Population and Prevention Science of the American Heart Association. Circulation 2004;109:2655-71.
10. Ghorbani N, Yazdani-Charati J, Etemadinejad S, Ghorbani N. Relationship between air pollution and mortality rate due to chronic obstructive pulmonary diseases in Mashhad, Iran. Journal ofMazandaran Univ MedicalScience, 2019;28:161-8.
11. Foster M, Brice JH, Shofer F, Principe S, DeWalt D, Falk R, *et al*. Personal disaster preparedness of dialysis patients in North Carolina. Clin J Am Soc Nephrol 2011;6:2478-84.
12. Krousel-Wood MA, Islam T, Muntner P, Stanley E, Phillips A, Webber LS, *et al*. Medication adherence in older clinic patients with hypertension after Hurricane Katrina: Implications for clinical practice and disaster management. Am J Med Sci 2008;336:99-104.
13. Friedman DB, Tanwar M, Richter JV, Yoho DW. Disaster preparedness information needs of individuals attending an adult literacy center: An exploratory study. Community Lit J 2010;4:5.
14. Gorji HA, Jafari H, Heidari M, Seifi B. Cancer patients during and after natural and man-made disasters: A systematic review. Asian Pac J Cancer Prev 2018;19:2695-700.
15. O'Sullivan TL, Fahim C, Gagnon E. Asset literacy following stroke: Implications for disaster resilience. Disaster Med Public Health Prep 2018;12:312-20.
16. Satoh J, Yokono K, Ando R, Asakura T, Hanzawa K, Ishigaki Y, *et al*. Diabetes care providers' manual for disaster diabetes care. Diabetol Int 2019;10:153-79.
17. Tanaka M, Imai J, Satoh M, Hashimoto T, Izumi T, Sawada S, *et al*. Impacts of the G reat E ast J apan E arthquake on diabetic patients. J Diabetes Investig 2015;6:577-86.
18. Murakami A, Sasaki H, Pascapurnama DN, Egawa S. Noncommunicable diseases after the Great East Japan Earthquake: Systematic review, 2011–2016. Disaster Med Public Health Prep 2018;12:396-407.
19. Dye C. After 2015: Infectious diseases in a new era of health and development. Philos Trans R Soc B Biol Sci 2014;369:20130426. doi: 10.1098/rstb.2013.0426.
20. Çalışkan C, Üner S. Disaster literacy and public health: A systematic review and integration of definitions and models. Disaster Med Public Health Prep 2021;15:518-27.
21. Mirzaei M, Rahmaninan M, Mirzaei M, Nadjarzadeh A. Epidemiology of diabetes mellitus, pre-diabetes, undiagnosed and uncontrolled diabetes in Central Iran: Results from Yazd health study. BMC Public Health 2020;20:1-9. doi: 10.1186/s12889-020-8267-y.
22. Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes: Estimates for the year 2000 and projections for 2030. Diabetes Care 2004;27:1047-53.
23. Reisi M, Javadzade H, Mostafavi F, Jalilian F, Mahaki B, Sharifirad G. Effect of theory based education on blood sugar control in type-2 diabetic patients. Iran J Endocrinol Metab 2017;18:420-31.
24. Noohi E, Khandan M, Mirzazadeh A. Effective of electronic education on knowledge attitude and self-care in patient's diabetic type 2 refer to diabetic center of Kerman University of medical science**.** Iranian Journal of Nursing Research. 2011: 6(22: 73-80
25. Zabihirad J, Momeni K, Veisani Y, Asadollahi K. Direct costs of type 2 diabetes for insurance companies and patients covered by health insurance and social security insurance plans after the delivery of first-level services in Ilam, Iran in 2019. Iranian Journal of Endocrinol Metabolism 2021;22:405-13.
26. Schiøtz M, Bøgelund M, Almdal T, Willaing I. Discrete choice as a method for exploring education preferences in a Danish population of patients with type 2 diabetes. Patient Educ Couns 2012;87:217-25.

27. Seddighi H, Salmani I. Gender differences in children mental health disorders after earthquakes in Iran: A systematic review. J Community Health Res 2019;8:54-64.
28. Sørensen K, Van den Broucke S, Fullam J, Doyle G, Pelikan J, Slonska Z, *et al*. Health literacy and public health: A systematic review and integration of definitions and models. BMC Public Health 2012;12:1-13. doi: 10.1186/1471-2458-12-80.
29. White III RO, Osborn CY, Gebretsadik T, Kripalani S, Rothman RL. Development and validation of a Spanish diabetes-specific numeracy measure: DNT-15 Latino. Diabetes Technol Ther 2011;13:893-8.
30. Brown LM, Haun JN, Peterson L. A proposed disaster literacy model. Disaster Med Public Health Prep 2014;8:267-75.
31. Seifi B, Ghanizadeh G, Seyedin H. Disaster health literacy of middle-aged women. J Menopausal Med 2018;24:150-4.
32. Gohardehi F, Seyedin H, Moslehi S. Prevalence rate of diabetes and hypertension in disaster-exposed populations: A systematic review and meta-analysis. Ethiopian J Health Sci 2020;30.
33. Arksey H, O'Malley L. Scoping studies: Towards a methodological framework. Int J Soc Res Methodol 2005;8:19-32.
34. Peters MD, Godfrey CM, McInerney P, Soares CB, Khalil H, Parker D. The Joanna Briggs Institute Reviewers' Manual 2015: Methodology for JBI Scoping Reviews The Joanna Briggs Institute, Australia: 2015.
35. Ryan GW, Bernard HR. Data management and analysis methods. Handbook of Qualitative Research. Vol. 2. 2000. p. 769-802.
36. Lincoln YS, Lynham SA, Guba EG. Paradigmatic controversies, contradictions, and emerging confluences, revisited. The Sage Handbook of Qualitative Research. Vol. 4. 2011. p. 97-128.
37. Allahbakhshi K, Khorasani-Zavareh D, Aghazadeh-Attari J, Mohebbi I. Natural disasters preparedness knowledge of patients with chronic diseases in Iran: A descriptive study on patients with diabetes and chronic obstructive pulmonary disease in Masih Daneshvari Hospital, Tehran, Iran. Iran Red Crescent Medical Journal. 2022;24: 1-10
38. Hartmann-Boyce J, Morris E, Goyder C, Kinton J, Perring J, Nunan D, *et al*. Diabetes and COVID-19: Risks, management, and learnings from other national disasters. Diabetes Care 2020;43:1695-703.
39. Ghosal S, Sinha B, Majumder M, Misra A. Estimation of effects of nationwide lockdown for containing coronavirus infection on worsening of glycosylated haemoglobin and increase in diabetes-related complications: A simulation model using multivariate regression analysis. Diabetes Metab Syndr 2020;14:319-23.
40. Aziz ARA, Alsabek MB. Diabetic foot and disaster; risk factors for amputation during the Syrian crisis. J Diabetes Complications 2020;34:107493. doi: 10.1016/j.jdiacomp.2019.107493.
41. Ceriello A, Standl E, Catrinoiu D, Itzhak B, Lalic NM, Rahelic D, *et al*. Issues of cardiovascular risk management in people with diabetes in the COVID-19 era. Diabetes Care 2020;43:1427-32.
42. Quast T, Feng L. Long-term effects of disasters on health care utilization: Hurricane Katrina and older individuals with diabetes. Disaster Med Public Health Prep 2019;13:724-31.
43. Seifi B, Seyedin H, Ghanizadeh G. The role of academic partnership in disaster risk management: A systematic review. Disaster Med Public Health Prep 2019;13:1047-58.
44. Sadikot S. International Diabetes Federation Brussels. Belgium: Chaussee de la Hulpe; 2017. p. 1-125.
45. Nomura S, Blangiardo M, Tsubokura M, Ozaki A, Morita T, Hodgson S. Postnuclear disaster evacuation and chronic health in adults in Fukushima, Japan: A long-term retrospective analysis. BMJ Open 2016;6:e010080. doi: 10.1136/bmjopen-2015-010080.
46. Lee DC, Gupta VK, Carr BG, Malik S, Ferguson B, Wall SP, *et al*. Acute post-disaster medical needs of patients with diabetes: Emergency department use in New York City by diabetic adults after Hurricane Sandy. BMJ Open Diabetes Res Care 2016;4:e000248.
47. Tomio J, Sato H. Emergency and disaster preparedness for chronically ill patients: A review of recommendations. Open Access Emerg Med OAEM 2014;6:69-79.
48. Tanaka K, Nakayama M, Kanno M, Kimura H, Watanabe K, Hayashi Y, *et al*. Aftercare for the prevention of a secondary health disaster in survivors of major earthquakes. Hypertens Res 2013;36:759-61.
49. Fujihara K, Saito A, Heianza Y, Gibo H, Suzuki H, Shimano H, *et al*. Impact of psychological stress caused by the Great East Japan Earthquake on glycemic control in patients with diabetes. Exp Clin Endocrinol Diabetes 2012;120:560-3.
50. Allweiss P, Albright A. Diabetes, disasters and decisions. Diabetes Management 2011;1:369.
51. Fonseca VA, Smith H, Kuhadiya N, Leger SM, Yau CL, Reynolds K, *et al*. Impact of a natural disaster on diabetes: Exacerbation of disparities and long-term consequences. Diabetes Care 2009;32:1632-8.
52. Mori K, Ugai K, Nonami Y, Kirimura T, Kondo C, Nakamura T, *et al*. Health needs of patients with chronic diseases who lived through the Great Hanshin earthquake. Disaster Manag Response 2007;5:8-13.
53. Kirizuka K, Nishizaki H, Kohriyama K, Nukata O, Arioka Y, Motobuchi M, *et al*. Influences of The Great Hanshin-Awaji Earthquake on glycemic control in diabetic patients. Diabetes Res Clin Pract 1997;36:193-6.
54. Kario K, Matsuo T, Kobayashi H, Yamamoto K, Shimada K. Earthquake-induced potentiation of acute risk factors in hypertensive elderly patients: Possible triggering of cardiovascular events after a major earthquake. J Am Coll Cardiol. 1997;29:926-33.
55. Panahi S, Heidarpour M, Atighechian G, Heidari Z, Norouzinia R, Ashrafi-rizi H. Improving diabetes self-help in natural disasters: Qualitative parameters and recommendations running title: Diabetes during disasters: Diabetes during disasters. Iran Red Crescent Medical Journal 2023;25.9: 1-10. doi.org/10.32592/ircmj.2023.25.9.3059.
56. Borzouei S, Eslahchi M, Esna-Ashari F. Adherence and related factors in pregnant women with gestational diabetes. Acta Med Iranica 2021;59:550.
57. Norouzadeh R, Roshan AG, Hosseinkhani SN. The relationship between health literacy of elderly diabetics and adherence to treatment, Babol, Iran, 2021. Qom Univ Med Sci J 2021;14. doi: 10.29252/qums.14.12.70.
58. Zor M, Bayer N, Gölbaşi Z. Analysis of the relationship between the use of traditional and complementary medical practices and health literacy levels in individuals with type II diabetes mellitus. Age 2021;57:14-58.
59. Reisi M, Mostafavi F, Javadzade H, Mahaki B, Tavassoli E, Sharifirad G. Communicative and critical health literacy and self-care behaviors in patients with type 2 diabetes. Iran J Diabetes Metab 2015;14:199-208.