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Improving Diabetes Self-Help in Natural Disasters: Qualitative Parameters and Recommendations

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Abstract

Background: When natural disasters occur, people with diabetes face more physical and mental challenges than healthy individuals. Therefore, innovative programs and policies are crucial for providing ongoing education to patients on how to better manage their condition.
Objectives: The present study aimed to identify the components of empowerment literacy for diabetic patients during disasters.
Methods: The present research employed a qualitative content analysis approach using a conventional deductive method. Purposive sampling was conducted, and data were collected through semi-structured interviews. The panel consisted of 24 participants, including native Iranian endocrinologists, nurses, emergency medical center managers, and experts in the field of medical librarianship and information. These participants had direct experience in relief efforts during critical situations such as natural disasters. The interviews were recorded and transcribed into written format. Data analysis was performed using thematic analysis with the assistance of MaxQDA software.
Results: The content analysis resulted in identification of 10 main categories, 61 sub-categories, and five themes, including Disaster risk perception literacy, Medication literacy, Resilience literacy, Nutrition literacy, and Self-help literacy.
Conclusion: The obtained findings have informed the creation of targeted health literacy education materials for policymakers in disaster scenarios specifically designed for individuals with diabetes. Diabetic individuals, particularly those residing in disaster-prone areas, should possess knowledge of emergency and disaster policies to enhance their health literacy. They should actively manage their condition while keeping abreast of policymakers' guidelines.

Keywords: Diabetes mellitus, Health literacy, Natural disasters, Self-care, Self-help, Self-management

1. Background

Natural disasters such as earthquakes, floods, tornadoes, and hurricanes can significantly affect patients with diabetes. These events can disrupt regular access to healthcare services, medication supplies, and proper management of the condition. Disasters often lead to challenges in maintaining a healthy diet, monitoring blood sugar levels, and adhering to prescribed treatment plans. Additionally, the stress and trauma associated with disasters can affect blood glucose control and overall well-being (1-5). It is crucial to consider the specific needs of individuals with diabetes during disaster preparedness and response efforts to ensure their safety and minimize potential complications (6-9).

The increased occurrence of complications associated with diseases during a natural disaster highlights the importance of considering effective intervention strategies, particularly primary prevention practices. These practices include removing disease-causing agents and implementing optimal management approaches, which can help reduce healthcare costs for health systems and enhance the overall health literacy of individuals (9, 11). Despite numerous recommendations, including those from the World Health Organization, concerning the self-care of diabetic patients, there is a significant gap in addressing and improving their health literacy, specifically in the context of disaster situations. Additionally, in some articles, health literacy in the context of disasters has been described as the capacity of individuals to access, comprehend, assess, and employ disaster-related information to make informed decisions and adhere to everyday life guidelines (12, 15).

However, it is disconcerting that most of the content generated regarding the exposure of diabetic individuals to disasters is exclusively targeted at healthcare professionals, without any tailored content prepared for the patients themselves. There is a clear observation that individuals with diabetes have a relatively weak participation in taking proactive measures for self-help. Hence, our ongoing research endeavors to

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identify the empowering elements of self-help literacy among diabetic patients during disasters through qualitative investigation.

2. Objectives

The present study aimed to identify the components of empowerment literacy for diabetic patients during disasters.

3. Methods

3.1. Study design and setting

The present research employed a qualitative content analysis with a conventional deductive approach and was conducted in Iran over a period of six months, from September 2022 to early April 2023.

3.2. Participants and sampling

The participants were selected using a purposeful sampling method to achieve maximum diversity. The sampling process continued until data saturation was reached. Our study specifically targeted native Iranian endocrinologists (n=8), nurses (n=10), emergency medical center managers (n=4), and experts in the field of medical librarianship and information (n=2) with direct experience in relief efforts during critical situations such as natural disasters. We conducted our research in several cities across Iran, including Kerman, Kermanshah, Ilam, Bushehr, Tehran, Gulian, and Tabriz. Rigorous entry criteria were implemented to ensure the selection of qualified participants, and individuals unwilling to provide accurate information were excluded.

3.3. Data collection tool and technique

The interviews were conducted using a semi-structured interview approach. The interview process was conducted by first author under the supervision of Dr. H.A, Dr. M.H, and Dr. G.A. Convenient locations and times were chosen for both the interviewer and interviewees. Interviews were conducted in person at physicians' clinics, administrators' offices, professors' rooms, or hospitals, with each interview lasting 1-1.5 h. Several specialized types of panels were held to oversee the interviews. Participants were asked about the impact of disasters on the lives of diabetic patients, their plans to cope with disasters, and the challenges they may face. The discussions also explored factors that could enhance the literacy and preparedness of diabetic patients, including medication preparedness, storage, and usage during disasters, as well as awareness of dietary considerations. The interviews aimed to saturate existing notions and gather new insights using probing questions. Data analysis was performed through thematic analysis. The recorded interviews were transcribed and analyzed using MaxQDA software (version 11) to identify main themes and sub-themes.

3.4 Trustworthiness of qualitative data

To assess the accuracy and quality of the present study, the Guba and Lincoln evaluation method was applied, which includes criteria such as credibility, dependability, confirmability, and transferability (16). To ensure validity, the extracted findings were given to the interviewees to indicate the extent of similarity between their opinions and those of the researchers introduced as the expected capabilities of diabetic patients in the face of disasters. In addition, the research team reviewed the study to ensure the reliability of the research. In terms of confirmability, the newly extracted themes, and conceptual codes indicate that the findings of the study are not based on the researcher's assumptions and biases, and the study process or results were not biased. Furthermore, in terms of transferability, a comprehensive explanation of the findings was provided to allow individuals who are interested in using these results in other contexts to perform reliable assessments.

4. Results

The demographic characteristics of the study are presented in Table 1.

Table 1. Demographic profile of the participants

Demographic Characteristics of the Participants	
Categories	**n (%)**
Age (Y)	
3‧-4‧	7 (29/16)
4‧-5‧	12 (0.50)
>5‧	5 (20/83)
Gender	
Male	14 (58.33)
Female	10 (41.66)
Teaching and Medical Experience	
3 -15	8 (33/33)
15 -25	11 (45.83)
>25	5 (20.83)
Educational attainment	
Ph.D.	17 (66.66)
Physician	8 (33.33)

Regarding literacy components of patients with diabetes in response to disasters, five themes, 10 main categories, and 61 sub-categories were extracted as follows:

Table 2. Exploring Themes through Semi-Structured Interviews

Themes	Sub-themes	Key insights
Disaster risk perception literacy	a. Disaster risk assessment, analysis, and management	(a) evacuation preparedness during disasters (planning, identifying, and evaluating dangers to the home, such as dilapidated housing lot). (P1-15)
		(a) preparedness kit (birth certificate, health insurance card or medical records, and cash). (P1)
		(a) Choosing the ideal spot for a medicine pack. (P1–12).

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Table 2 Continue

		(a) submitting medical information in health systems. (P2,3,8,9)
		(a) Emergency phone number. (P2,3,8,11)
		(a) Social participation (attending an association preparedness program and being informed about the diagnostic and treatment process). (P1,2,3,14,15)
		(a) A deep understanding of the attitudes and beliefs toward self-care and socio-cultural and religious norms regarding this notion; being informed about health effects. (P2, 3, 14, 15)
		(a) Assessing necessary donated medical and health supplies. (P2,3,11)
		(a) accurate analysis and assessment of the validity of information in catastrophes. (P3,6,8)
		(a) Accepting participation in counseling and psychotherapy sessions to improve one's mental health. (P1)
		(a) How to access, comprehend, and analyze health information. (P22, 24)
	b. First aid preparedness	(b) Having access to seasonal clothing, gloves, shoes, and socks (suitable attire to minimize trauma), as well as hygiene products (cotton pieces, tissue papers). (P3,4)
		(b) How to escape from disaster. (P2,3,7,8,12)
		(b) learning self-examination skills. (P4,8,13,14,17,20,22)
		(b) learning to give an injection and the skills of wound sterilization and dressings (emergency and medical).
	a. medication knowledge	(a) a booklet containing information on medicines and side effects (P1–12).
		(a) familiarity with insulin dosing. (P2,3,4,12)
		(a) recognizing approved syringes and needles (when the special syringe is not available). (P4,7)
		(a) Being informed about the effects of stopping taking medicines (non-adherence to medication and treatment). (P8,10)
		(a) knowledge of specific storage conditions of drugs (for example temperature, humidity, light, and impact-free). (P1-12)
Medication Literacy	b. Organizing medicines	(b) knowledge of standard herbal medicines alternative to medical therapies. (P2,3,5,7)
		(b) knowing how to mix different types of insulin. (P1,2,3,10,11)
		(b) being informed about the side effects of taking metformin (which is used to lower gastrointestinal symptoms after meals).
		(b) Taking glipizide, repaglinide, and glibenclamide before meals. (P6,8,10)
		(b) Taking an acarbose tablet with the first bite of a meal. (P8)
		(b) keeping a medicine kit on hand, containing a blood sugar test kit and test strips, a test pen, a needle, an ice pack, and urine test strips. (P1-12)
	a. Psychological/ mental adaptation	(a) learning how to manage blood pressure, tension, anxiety, and incontinence; maintaining composure; overcoming sleep disorders; and awareness of hormonal shifts such as progesterone and adrenal gland activity. (P1-12)
		(a) The regulation of neuroendocrine changes, including those involving epinephrine, adrenaline, insulin, progesterone, female hormones, urine incontinence, disruptions within the adrenal gland, and mental/emotional resilience (P10,12)
	b. Behavioral management	(b) showing interest to attend in therapy and counseling sessions (P1)
		(b) impairment in social functioning caused by residing at a shelter and resilience on the long-term housing solution. (P2,3,12)
		(b) Drug addiction. (P3,12)
Resilience Literacy		(b) Developing social skills (knowing: how to communicate with search and rescue operation specialists ((the emergency team)) and health care providers, how to show patience and tolerance, how to control anger-related behaviors, how to deal with language diversity and regional dialects, and how to ask questions from healthcare professionals). (P2,5,3-8,10,12)
		(b) Social prejudices that make people feel shame for talking about their illnesses. (P2,3,5,10,12)
		(b) Developing personal worldview (working on spiritual and religious beliefs to accept the facts such as being injured, loss of loved ones, loss of material capital, and facing unemployment). (P1,2,3,4,11,12,15)
		(b) Content control (ability to comprehend and analyze health messages, and give a rational response to visual and aural news). (P1,2,3,11,12)
		(b) knowing how to adapt to and comply with cultural-therapeutic resources (participating in field research and/or medical intervention studies, using printed or web-based resources regarding diabetes and catastrophes). (P1,3,8,12)
	a. Nutrition pattern	(a) prepared meals, delaying consumption of regular dietary habits, changing diet, and reducing metabolism (P1)
		(a) recommendations for fresh/dried fruits and vegetables intake; drinking liquids (water, tea, dairy). (P2, 6,7,9,10,11)
Nutrition Literacy		(a) recommendations for canned/preserved foods intake (P1,5,7,8)
		(a) malnutrition (P10)
		(a) Eating too much because of the fear of running out of food (P6,10)
		(a)Technique for counting carbohydrates (P1, 10)
		(a) Biodiversity (the use of conventional and natural remedies); (P3)
		(b) strictly selecting imported food products (P2, 3, 7, 12)

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Table 2 Continue

Self-help (or Self-Diagnosis) Literacy	b. Food safety	(a) recognizing blood sugar fluctuations and intensified hyperglycemia (P1–12)
		(a) recognizing diabetic coma symptoms (P2, 9)
	a. Short-term side effects recognition	(a) recognizing high blood pressure symptoms (P1–12)
		(a) recognizing hyperlipidemia symptoms (P20–24)
		(a) recognizing diabetic foot ulcers (P1–12)
		(b) Recognizing symptoms of urinary tract infections.
		(b) recognizing diabetic ketoacidosis (DKA) and electrolyte abnormalities (P10)
	b. Macrovascular symptoms recognition	(b) recognizing soft tissue infections, edema, or cellulitis (P1,3,4,8,9,12)
		(b) recognizing heart attack symptoms (P11, 13, 17, 20)
		(b) recognizing ischemic heart disease (CVD) symptoms. (P2,6,8,10,16,17)
		(b) recognizing deep vein thrombosis (DVT) symptoms (P14, 18, 21, 22)
		(a) Recognizing stroke symptoms (also known as cerebral vascular accident, CVA) (P7,11,16,20-24)
	c. Micro-vascular symptoms recognition	(c) recognizing retinopathy, cataracts, impaired vision, and retinal hemorrhage. (P3,8)
		(c) recognizing neuropathy (hands- and feet-related nerve injury). (P4,5)
		(c) recognizing nephropathy (kidney disease) (P3,5,8).

In the following, every topic is explained, and several quotes from the interviewees are presented below to define better the findings from the interview.

4.1. Disaster risk perception literacy

The literacy of disaster risk plays a crucial role in motivating individuals to avoid risks, reduce harm, and diminish adaptation to or ignore risks. By interviewing experts, it has been concluded that for the first step, patients with diabetes should make a plan in the event of disasters, which plays a part in two dimensions: first the assessment, analysis, and management of risk, and then preparedness for first aid. The interviewees believed that disaster risk reduction requires mental and functional skills empowerment in diabetes patients that address their intensified symptoms in the event of disasters.

Interviewees (1-24): "Since the diabetic patient has more physical and mental problems than the normal person, the patient is recommended to participate in preparedness maneuvers that make him aware of the threats posed by additional risks. The patient should identify his vulnerability. For example, if he is living in the earthquake region, he needs to know how strong his property is, or if he is living in dilapidated areas, is there a way that allows him to escape from the danger? Also, damages caused by other hazards should be identified".

Interviewees (1, 2, 3, 7, 12, 18, 23): The point that was strongly emphasized by experts was that "the patient needs to learn first aid principles to keep himself healthy and save his life due to the increasing number of disasters and their consequences such as burns, suffocation, electric shock, falling from heights, animal and insect bites, various poisonings, and so forth".

Interviewees (3, 6, 13, 15, 21): "It is recommended that the diabetic patient attend training programs on insulin administration, medication dosage calculation, bandaging techniques, and suturing skills".

4.2. Medication Literacy

Most research findings indicated pharmaceutical literacy challenges faced by health experts in the event of natural disasters, and most of these challenges need to be addressed first by the healthcare system and then by diabetic patients. Based upon their experiences, experts explained that diabetic patients usually face challenges such as lack of access to medicines, destruction of storage, shortage of diabetes medication (insulin and syringes), overcrowding in front of pharmacies with panic-buying, and destruction of pharmacies and medication storage. Such challenges interfere with accessing diabetes medications and may contribute to anxiety, psychological problems, increased blood glucose levels, or intensified hyperglycemia, resulting in hospitalization, diabetic shock, and eventually stroke.

In this regard, experts offered some recommendations for diabetic patients which reduce these challenges and improve conditions in the damaged area:

Interviewees (1-24): "It is necessary to teach patients to store their medications, latest prescription copy, tests, and insurance documents in the emergency kit to help them receive treatment more quickly in the event of disasters. We frequently experienced this in disasters".

Interviewees (1-24): "In addition to complete knowledge about the disease, diabetes patients need to know the oral medications use, insulin injection, calculation of insulin doses, time to wait between meals, and how much insulin is needed".

Interviewees (1,7): "Patients need to put their medications into an easily accessible bag; for example, the glucometer can be put into a backpack or bag which is placed at the closest distance to the patients. These medications also need to be stored properly, for instance in a cold solution. They should not be exposed to air or placed elsewhere that potentially lead to the loss of potency".

Interviewee (3): "In addition to the injectable medications, the patient needs access to some oral medications. If his insulin vial is broken, or the syringe gets dirty and becomes non-standard, he can

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use the pills instead until he reaches the health center and visits a doctor".

Interviewees (10, 16, 22): "In critical situations, an increased dosage of medications for patients is possible since they experience stress and anxiety. Generally, stress increases blood glucose level and elevates the patient's need for medication".

Interviewee (2): "It is essential to keep in mind the insulin expiration date, store a vial of insulin after the first usage, notice signs of spoiled insulin, and recognize authorized syringes and needles for insulin injection".

Interviewee (17): "When the insulin vial is opened, the patient needs to keep it in the coldest possible place or at room temperature for up to 28 days, considering the lack of access to a refrigerator. Unopened insulin vials should be kept away from direct light, and the temperature should not exceed 30°C".

4.3. Nutritional Literacy

Most diabetes nutrition specialists emphasize that if patients have no other choice but to live in a camp within the first few days of the disaster, they need to consult a nutritional expert and describe their medical symptoms. This will encourage the nutrition specialist to put them first for getting warm and freshly cooked foods and recommend a special diet based on the patient's physical condition at that time.

Interviewee (3): "Patients need to avoid eating cold and canned foods that are distributed. We recommend them to avoid foods and drinking with additives due to their high blood pressure".

Interviewee (3): "Another problem is access to safe drinking water because people with diabetes are susceptible to infection and poisoning. As most of them are elderly, safe water is important, and they need to only obtain it from relief organizations".

Interviewee (14): "Stress increases the body's need for glucose, so the patients are suggested to eat more frequent, smaller meals and not to miss incorporating fiber foods into their diet".

Interviewee (1): "Nutritionists usually do not recommend eating canned foods and suggest the intake of healthy vegetables, legumes, and fiber-rich foods in the first few days after a disaster. If a person has renal complications related to diabetes, he needs to consume less meat".

Interviewees (1, 8, 19, 20, 22): "Patients should not use any carbohydrates such as potatoes, rice, and pasta. Solid and dry food intake, such as pistachios, walnuts, almonds, and biscuits, should be increased. Liquids such as safe water, milk, and dairy products should be taken. Patients should also avoid soda and alcoholic and sweet drinks".

4.4. Resilience Literacy

It should be noted that physical damage is not only caused by floods and earthquakes. If people survive a disaster, they may face self-care issues regarding psychological resilience during the camping life or the days living in a damaged area.

Interviewees (3, 5, 6): "According to experts, discussions concerning the psychological preparedness of diabetic persons during disasters highlight the importance of depression. Complications such as neuropathy, nephropathy, atherosclerosis, and dialysis develop in patients with type 1 and type 2 diabetes who have been taking medication and insulin for a long time. Others are prone to develop depression or at least experience a low mood".

Interviewee (5): "Unfortunately, diabetic patients always demonstrate feelings of loneliness throughout the treatment because of practicing self-care and the harsh reputation of diabetes as a silent killer which is a long-term companion of them. whether patients want it or not, depressive symptoms will manifest in them. To reduce the severity of such symptoms, the health literacy of patients should be at an adequate level".

Interviewees (5, 2, 8, 10, 11, 18): "Diabetic patients usually do not have a good lifestyle and have little hope in their lives. I think they are at a high risk of mental health problems and need to receive more psychological treatment and counseling sessions. Their problems need to be detected, and health caregivers are expected to strengthen patients' mental health".

Interviewees (3, 11, 20, 22, 12): "Patients are recommended to try to develop social relationships with Red Crescent organizations and healthcare centers. A friendly and strong social relationship is known as an essential component of mental health and is considered an extremely useful support during life crises".

4.5. Self-help literacy

Experts state that responding to emergency situations is believed to be one of the major factors required for the health literacy of diabetes patients during disasters. Such literacy needs knowledge, previous experience, calmness, and quick evaluation of physical conditions in patients to be fully understood by them. This is because, in the first few hours of a crisis, a doctor, nurse, or a more experienced person than the patient may not be present. Therefore, it is expected that the patient takes responsibility while keeping his composure and performs diagnostic actions to for saving his life.

Interviewees (1-24): "One of the most frequently said concerns by the experts was the lower limb ulceration, as patients have long been in the conditions that may result in the development of arteriosclerosis. Regarding this, the blood flow to the lower limbs is reduced, the risk of injury is increased, and they will not be able to recover quickly. Therefore, it is recommended that they wear appropriate shoes that do not provoke foot nerve to prevent developing ulcers or amputations".

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Interviewee (9): “Sensation in the feet of a diabetic person is decreased, so it is recommended that they check the soles of their feet with a mirror three times a week and always wear closed-toe shoes”.

Interviewee (5): “Due to neuropathy, tissue damage caused by trauma in diabetic patients is less felt, so they may walk barefoot around the debris left by floods and earthquakes and become infected and develop ulcers without realizing it; therefore, regular head-to-toe nail assessment should be performed”.

Interviewee (2): “Excessive weight gain sometimes causes increased blood pressure. They need to have appropriate physical activity to prevent weight gain or a high BMI,”.

Interviewees (3, 5, and 12): “If a person has visual problems, he may make mistakes in preparing for injection and may develop diabetic coma”.

5. Discussion

The majority of previous studies have focused on self-care for diabetic patients under normal everyday conditions. Therefore, the present study aimed to develop health literacy scenarios for diabetic patients, specifically in disaster situations, as reports show crises place a double economic and psychological burden on them. All experts stressed the importance of comprehensive preparedness planning for diabetic patients. During rescue and relief efforts, it seems diabetic patients lacked preparation in terms of having emergency kits or understanding disaster risks related to their condition. They saw themselves as ordinary individuals and heavily relied on medical and healthcare groups for assistance. This mindset further exacerbated their physical challenges. Their self-perception and reliance on others, rather than self-sufficiency, made their situation physically even more difficult.

For those suffering from diabetes, maintaining control of their condition is critical, even during emergencies such as natural disasters. Adhering to medication regimens and a proper diet is especially important when accessing to normal healthcare resources may be disrupted. However, staying on top of diabetes management can become challenging in chaotic crisis situations without proper planning and knowledge. Experts note that a person's level of health literacy regarding their diabetes greatly impacts how well they are able to continue self-care and treatment during disasters. Those with higher understanding of their condition tend to adhere better to protocols when usual support systems break down. Simply educating patients on small adjustments they can make to medications or diets in an emergency can empower better crisis management. While unforeseen disasters are unpredictable, some types of severe weather events like floods or storms are reasonably foreseeable. As such, diabetic patients have an important personal responsibility to plan ahead. Maintaining a prepared at-home supply of necessary medications and appropriate emergency foods allows for more control immediately following a disaster when local resources may be scarce.

Developing resilience is key for successfully navigating diabetes through difficult emergency situations. When normal support systems break down and accessing healthcare resources becomes difficult, those living with diabetes must be able to adapt, solve problems, and think creatively to maintain control of their blood sugar levels. Resilient individuals are able to roll with unforeseen challenges rather than feeling overwhelmed. They have the internal strength and confidence to make tough decisions about their care. Developing routines to check blood sugar levels regardless of external circumstances helps promote stability during times of crisis. Support from family members, medical providers, and diabetes communities can also help bolster resilience by providing a reliable source of guidance and encouragement when routine care is disrupted. With resilient mindsets and supportive networks in place, diabetic patients are better equipped to withstand stressful emergencies with minimal health consequences.

The present study defines self-help literacy for diabetic patients as the ability to independently advocate, self-monitor, solve problems, and appropriately seek assistance. These skills are especially critical during natural disasters when usual support systems may fail. Diabetic patients must develop the ability to recognize changing symptoms, treat issues confidently, and make adjustments to their care without relying on external support resources. Skills such as emergency planning, self-monitoring routines, and knowledge of basic medical adjustments empower diabetic patients to weather crises independently if needed. While effective self-care is critical for long-term diabetes management, this important aspect of "self-help literacy" has been overlooked in research. This represents a significant gap, as empowering patients with skills for independent problem-solving and resilience building could dramatically improve health outcomes. Developing strong self-help abilities through education does not solely rely on individual motivation, it requires systematic support. Healthcare policies must make prioritizing literacy a strategical priority on par with medical treatment. Targeted programming is needed to disseminate easy-to-understand knowledge and cultivate confidence in self-advocacy, crisis navigation, and health autonomy. By strengthening self-help as a core competency, the sector can equip patients with lifelong tools rather than brief solutions.

Important research has confirmed the conceptual codes and challenges derived from interviews in this field. Studies have shown that natural disasters such as earthquakes can worsen diabetes symptoms and lead to the exacerbation of other comorbidities, including

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increased blood pressure, fluctuations in hypoglycemia, hyperglycemia, and PTSD-related issues. It has been emphasized that individuals with diabetes require special care and monitoring in such emergency situations. However, these studies have not specifically addressed the promotion of awareness and diabetes literacy during disasters. Instead, they have focused more on enhancing the knowledge of healthcare and emergency response professionals in this context (17-27).

Here is a brief scenario sample focusing on a diabetic person's health literacy and self-management during a natural disaster based on interview codes:

"Amir Hossein has lived with type 1 diabetes for 20 years. When a powerful hurricane hits his coastal town, he shelters in place as the roads become impassable. The stress of evacuating causes his blood sugar to spike. With emergency responders overwhelmed, healthcare facilities are badly damaged. In the chaotic first days after the storm passes, Amir Hossein relies on his diabetes self-management skills. Without refrigeration, Amir Hossein worries about his insulin supply spoiling. Remembering his training, he packs the cooler with ice from his backup freezer supplies. Thanks to preparedness training, he has a 3-day supply of insulin safely stored along with non-perishable foods like nuts to manage his blood sugar. On the night, Amir Hossein's blood sugar drops dangerously low. In the dark, he maintains composure through breathing exercises before locating glucose pills in his preparedness bag. He trusts his senses to dose correctly without a glucometer. As power is still out, Ahmed checks his blood sugar levels manually without his usual glucometer. He paces insulin doses and carb intake based on symptoms like hunger and fatigue. When upset stomach threatens a low blood sugar episode, Amir Hossein is able to quickly stabilize with fast-acting carbs he wisely packed. On the third day, food supplies grow low but emergency services have yet to reach Amir Hossein's neighborhood. Recalling disaster nutrition guidelines, he rations his remaining canned goods and dried snacks to curb hyperglycemic fluctuations. By the end of the week, emergency clinics begin operating near Amir Hossein's shelter. He confidently describes his self-care efforts and insulin adjustments to a visiting doctor. Impressed by Amir Hussein's resilient literacy, the doctor ensures he receives enough supplies to sustain his diabetes management until full services."

6. Conclusion

Ultimately, our study presented important themes related to health literacy in disaster situations and their implications for diabetes self-management. These findings provide valuable criteria for guiding future research efforts in assessing effective literacy practices. It is crucial for individuals with diabetes to possess problem-solving skills and think creatively, especially when routine care is disrupted during disasters. Through targeted education, diabetics can strengthen their self-help abilities, fostering greater resilience and self-sufficiency during unpredictable times. By enhancing their health literacy, patients are better equipped to navigate the health consequences of disasters and adapt their self-management strategies until full recovery of medical infrastructure. The focused efforts to enhance self-help skills outlined in our study offered diabetic patients a sense of confidence and improved their health protection when facing disasters. By promoting stronger health literacy, we enable individuals with diabetes to better cope with challenging circumstances and mitigate potential adverse effects.

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Footnotes

Conflicts of Interest:
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