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Original Article

Predictive Factors of Self-care Behaviors in Elderly Patients With Type 2 Diabetes Based on the Information Therapy Model

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Abstract

Background: Information therapy is transforming healthcare by prioritizing patient-centered care, thus emphasizing the delivery of relevant information to empower individuals in managing their health. In this regard, this study aimed to design an information therapy model and determine the predictive factors of self-care behaviors in elderly patients with type 2 diabetes (T2DM).

Methods: This descriptive-analytical cross-sectional study involved 253 elderly diabetic patients referring to healthcare centers, internal medicine offices, and specialized diabetes clinics in Hamadan in 2024. The required data were gathered using a closed questionnaire and then analyzed with SPSS 22 software through independent t-tests. Finally, AMOS 24 was utilized to measure model fit.

Results: Participants had an average age of 69 years, with a majority being male and holding high school diplomas. Physicians and health professionals accounted for the highest rate of referrals and users at 92.8%, followed by traditional media at 82.2%. The findings confirmed that patients who sought information from healthcare staff, peers, and families had higher knowledge scores compared to those who did not. Moreover, traditional media users demonstrated increased knowledge levels ($P<0.05$). Path analysis revealed that social networks (coefficient=0.11) and digital media (0.22) significantly impacted knowledge, thus affecting attitudes toward self-care behaviors (0.45). Then, the attitude had a significant impact on the occurrence of self-care behavior (0.26, $P<0.05$).

Conclusion: Enhancing knowledge and improving attitudes are crucial for developing effective information therapy strategies for elderly patients with T2DM, ultimately promoting sustainable self-care behaviors.

Keywords: Aged, Diabetes mellitus, Type 2, Information therapy, Self-care, Elderly health education, Digital media in diabetes care, Healthcare empowerment

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Introduction

Information therapy can be defined as "timely access to evidence-based health information" designed to meet the specific needs of patients. This information is provided as part of the healthcare process so that individuals can make more informed decisions about their health and enhance their understanding of their health conditions (1). This type of therapy primarily aims to improve education, increase participation in self-care, and reduce healthcare costs. By providing targeted information, patients can better understand their medical conditions and treatment options, leading to improved health outcomes (2). Information therapy empowers patients to actively participate in their healthcare and take greater responsibility for their well-being (3,4). Patients' satisfaction with the healthcare system increases when they feel informed and are involved in their care decisions (4,5). Ultimately, by equipping patients with knowledge, this approach can reduce unnecessary medical visits and interventions, thereby lowering overall healthcare costs (1,4).

Overall, information therapy represents a fundamental shift toward patient-centered care in the healthcare system. By focusing on delivering the right information at the right time to the right person, this approach empowers individuals to take control of their health, ultimately leading to better outcomes and more efficient use of health resources (5,6).

Moreover, this type of therapy is effective in managing chronic diseases, particularly in situations where patients require accurate and up-to-date information. Type 2 diabetes (T2DM) is one such chronic disease where patients need continuous education and new information regarding blood sugar management, appropriate diets, and physical activity. Information therapy can help them better understand these aspects, increase motivation for self-care, and enhance self-management and control of their condition (7).

Leong et al demonstrated that a social media-based program effectively increases knowledge, attitudes, and self-care activities among diabetic patients (8). Likewise, Bahrehmand et al reported that implementing a self-care education program via the mobile messaging platform WhatsApp enhances self-care behaviors among diabetes patients (9).

Self-care can be categorized into physical, mental, emotional, social, and spiritual dimensions. Physical self-care requires a healthy lifestyle and attention to one's environment. This aspect includes eating healthy foods, drinking sufficient water and fluids, engaging in physical activities, getting enough sleep and rest, maintaining personal hygiene, and consulting healthcare teams. Mental and emotional self-care encompasses feelings about oneself and the ability to manage emotions and cope with problems. Emotional health reflects an individual's ability to connect with emotions. Social self-care involves the need for belongingness, love, and affection. As social beings, humans benefit from social activities that help maintain good physical and mental health through interpersonal relationships. Spiritual self-care helps individuals connect with the creator of existence and understand the meaning of life. Some recommendations for enhancing spiritual self-care include worshiping and praying, engaging in charitable acts, participating in religious ceremonies, and reciting or listening to verses from the Quran (7,10).

Chronic T2DM is one of the most common diseases among the elderly, and its prevalence increases with age across all human societies; thus, it is reported that the highest incidence of diabetes typically occurs in the oldest age group of that society (11). In addition, the under-researched role of digital media among older populations has significant implications for their social adaptation, literacy needs, and overall well-being. As digital technologies become increasingly integral to daily life, understanding how older adults engage with these tools is essential to promoting inclusion and addressing their unique challenges. Research suggests that the use of digital media is positively correlated with social adjustment in older adults, enhancing their self-efficacy and promoting positive aging (12). The ability to communicate and create online content fosters intergenerational connections and enables older adults to effectively navigate the digital landscape (13). Therefore, due to the progressive and often hidden nature of this disease, the existence of an informative approach that is therapeutic, affordable, and effective for enhancing knowledge and understanding about it seems essential for controlling and preventing its progression. Overall, there is a necessity for education aimed at self-care for the elderly regarding diabetes. For this purpose, this study seeks to design an information therapy model and identify the predictive factors of self-care behaviors in elderly patients with T2DM.

Materials and Methods

Study Design and Subjects

The present descriptive-analytical cross-sectional study was conducted in Hamadan in 2024. Elderly individuals with T2DM who visited health service centers, internal medicine specialists' offices, and specialized diabetes clinics in Hamadan were selected using a convenience sampling method and participated in this study. The inclusion criteria included the age of 60 years or older, a definitive diagnosis of T2DM by an internal medicine specialist or an endocrinologist, a history of T2DM for at least one year, the ability to communicate verbally in Persian, and literacy in reading and writing. On the other hand, other underlying diseases, psychological disorders, and incomplete questionnaire responses were considered the exclusion criteria. According to the recommendations for questionnaire design and path analysis, a sample size of at least 10 subjects per question is necessary. Additionally, the expected correlation between the constructs was at least 0.20. A sample size of 258 individuals was estimated considering a power of 90%, a Type I error rate of 0.05, and a two-tailed hypothesis. The calculations were performed using G*Power, version 3.1.9.2.

Data Collection

The data collection method involved a researcher-made questionnaire, the validity and reliability of which had been confirmed. To psychometrically evaluate the questionnaire, an initial version with 64 questions was developed based on a qualitative study (7) and relevant literature on the self-care behaviors of patients with T2DM. The content validity ratio (CVR) and content validity index (CVI) were used to assess both qualitative and quantitative validity. The initial questionnaire was reviewed by a panel of 12 experts from fields such as knowledge and information science, health education and promotion, epidemiology, internal medicine, and endocrinology specialists. The questions were evaluated by the expert panel regarding writing style, grammatical rules, and the adequacy of the number of questions for each construct (CVR = 0.86, CVI = 0.92). After making changes based on the content validity assessment, the

questionnaire was completed by a sample of elderly individuals with T2DM (n = 10). This stage aimed to assess face validity (14) by evaluating the difficulty level (understanding phrases and words), appropriateness (relevance and suitability of phrases to the dimensions of the questionnaire), and ambiguity (the likelihood of misinterpretations or inadequacies in word meanings) of the questionnaire items. Ultimately, the number of questions was reduced to 43. To assess the internal consistency of responses to the questions, Cronbach's alpha test was utilized, which confirmed a reliability coefficient of $\alpha = 0.82$.

The designed questionnaire consisted of several sections. In the first section, demographics, socioeconomic status, disease-related conditions, and lifestyle were assessed. The easiest media (traditional media, digital media, and social networks) and sources of information (family, peers, and healthcare staff) for obtaining information related to self-care in diabetes were evaluated by two questions. The knowledge was assessed through seven questions, such as *"I know where to go for information regarding diabetes self-care."* Responses to knowledge questions were recorded as yes/no. The attitude was measured using ten questions, such as *"I believe that obtaining information related to diabetes self-care expands my knowledge and understanding of the disease"*, using a Likert-type scale ranging from strongly disagree to strongly agree. The role of media and sources of information was measured in relation to four self-care domains (physical, psychological, social, and spiritual dimensions). Each domain consisted of six questions. The questionnaires were self-administered, and data collection took place at a time that did not interfere with patients' treatment schedules.

Statistical Analysis

The data were presented as numbers (percentages) and means (standard deviations). An independent t-test was conducted to compare the means of the model constructs based on information therapy resources for acquiring diabetes self-care information. The obtained data were analyzed using SPSS 22. The hypothesized model illustrating the impact of in-person and distant information therapy on knowledge, attitudes, and self-care behaviors was created using AMOS software, version 24. The interrelationships among the variables included in the hypothesized model were evaluated using path coefficients. The goodness-of-fit indices were assessed, including the comparative fit index, goodness-of-fit index, and normed fit index, with a minimum acceptable cutoff of more than 0.90. Additionally, the root mean square error of approximation values below 0.10 indicated a better model fit. The statistical significance level was set at $P \leq 0.05$.

Results

For data collection, questionnaires were initially distributed among 280 patients who met the inclusion criteria. After collecting completed questionnaires and removing incomplete or distorted responses, a total of 253 questionnaires were used for data extraction and analysis. The mean (± SD) age of the participants was 69.00 (± 6.76) years. Among the studied subjects (N = 253), 129 were male (50.9%). Most of the elderly had a high school diploma (27.6%). The history of T2DM among approximately half of the patients was 5 years or less (46.6%). About 80.6% of the elderly used oral medications to manage their condition. Other demographic information about the studied patients is presented in Table 1.

The cumulative percentage of in-person information therapy resources used by patients to obtain information related to self-care for T2DM is illustrated in Figure 1A. Healthcare professionals and experts had the highest referral rate (92.8%), while friends and peer patients had the lowest rate (39.5%).

Figure 1B depicts the cumulative percentage of distant information therapy resources utilized by patients. Traditional media (radio, television, books, educational pamphlets, journals, and newspapers) and social media platforms (Eitaa, Telegram, Instagram, X, YouTube, and the like) had the highest (82.2%) and lowest (42.7%) usage rates, respectively. Digital media, including the Internet (general search), relevant databases, specialized diabetes websites, emails, and SMS notifications, ranked second in terms of usage.

Table 2 presents the distribution of the average scores of the model constructs based on the use of in-person information therapy resources. The knowledge score in patients who utilized "healthcare staff", "friends and peers", and "family members and relatives" for information was higher than that of patients who did not use these sources. The attitude score of patients who used "healthcare staff" and "family members and relatives" for information was also higher than that of patients who did not employ these sources. However, patients who relied on "friends and peers" for information had a lower attitude score. Patients who relied on family members for information had significantly higher scores ($P < 0.05$) in knowledge (Cohen's effect size = 0.29), attitude (Cohen's effect size = 0.29), psychological self-care (Cohen's effect size = 0.27), and spiritual self-care (Cohen's effect size = 0.24).

The distribution of the mean scores of the model constructs based on the use of distant information therapy resources is provided in Table 3. The knowledge score of patients who used "traditional media" for obtaining information was higher than that of patients who did not utilize this media (Cohen's effect size = 0.78, $P < 0.05$). However, patients who employed digital media (Cohen's effect size = 0.64) and social networks (Cohen's effect size = 0.39) had lower knowledge scores ($P < 0.05$). A similar pattern was found for the impact of the use of distant information therapy resources on attitudes. Traditional media significantly contributed to social self-care status (Cohen's effect size = 0.35). The use of digital

Table 1. Frequency of Demographic Characteristics of the Studied Community (N = 253)

Demographic and Economic Status	Number (%)
Gender	
Male	129 (50.99)
Female	124 (49.01)
Age (years)	
60–65	99 (39.13)
66–70	61 (24.11)
>70	93 (36.76)
Marital status	
Without a spouse (single-divorced-widowed)	70 (27.67)
Married	183 (72.33)
Education level	
Elementary	44 (17.39)
Cycle	53 (20.95)
Diploma	70 (27.67)
Post-diploma	33 (13.04)
Bachelor's degree	39 (15.42)
Master's degree and above	14 (5.53)
Employment status	
Employed	67 (26.48)
Housewife	86 (33.99)
Retired	100 (39.53)
Economic status	
Good	32 (12.65)
Average	155 (61.26)
Poor	66 (26.09)
Difficulty in meeting expenses (past 6 months)	
Yes	83 (32.81)
No	170 (67.19)
Disease-Related Status	**Number (%)**
Duration of illness (y)	
5 years and less	118 (46.64)
6–10	68 (26.88)
More than 10	67 (26.48)
Type of treatment	
Diet	9 (3.56)
Oral medication	204 (80.63)
Insulin injection	18 (7.11)
Medicine and insulin	22 (8.70)
Complications	
Yes	39 (15.42)
No	214 (84.58)
Lifestyle-Related Status	**Number (%)**
Smoking	
Yes	60 (23.72)
No	193 (76.28)
Exercise activity	
Yes	132 (52.17)
No	121 (47.83)

media (Cohen's effect size = 0.34) and social networks (Cohen's effect size = 0.36) increased scores of spiritual self-care.

The AMOS software (version 24) was used to design and determine the impact of in-person and distant information therapy on the knowledge, attitudes, and self-care behaviors of elderly patients with T2DM. As shown in Figure 2, the designed model fits the data well, with the comparative fit index, normed fit index, and normed fit index exceeding the threshold of 0.90, and the root mean square error of the approximation index being less than 0.10. The significant pathways leading to self-care behaviors were digital media to knowledge, social networks to knowledge, knowledge to attitude, and attitude to self-care behaviors (with standardized correlation coefficients of 0.22, 0.11, 0.45, and 0.26 at $P < 0.05$, respectively).

Discussion

The present study designed an information therapy model and identified predictive factors for self-care behaviors in elderly patients with T2DM. The resulting model demonstrated a good fit. Path analysis results indicated that social networks and digital media directly influenced knowledge, thus directly affecting attitudes. In addition, attitudes had a significant direct effect on the self-care behaviors of the studied elderly. Evidence suggests that a sequential relationship exists between knowledge, attitudes, and behavior, indicating that to change behavior and support its sustainability, it is necessary to enhance knowledge and improve attitudes (15).

In this study, digital media and social networks had a direct impact on increasing the knowledge of the studied patients. Although the highest use of information therapy resources was reported from in-person and distant sources, specifically healthcare providers and traditional media, path analysis results confirmed that digital media and social networks had a significant direct effect on increasing knowledge. This finding underscores the importance of distant information therapy resources in raising knowledge among diabetic patients regarding their condition and adopting self-care behaviors. In recent years, with increased internet access and the ability of individuals in society to utilize it, digital media and social networks have become some of the easiest and most accessible sources for obtaining health information (7). Diabetic patients require accurate and reliable information due to the nature of their disease and the necessity for continuous self-care, enabling them to take more informed actions in managing their condition (16). Bahrehmand et al found that implementing educational programs via the Internet and virtual messaging has not only increased knowledge but also enhanced self-care behaviors among diabetic patients, thus serving as an effective method for preventing adverse outcomes associated with diabetes (9). Leong et al concluded that social network-based programs could effectively increase knowledge, attitudes, and self-care activities among diabetic patients. This intervention

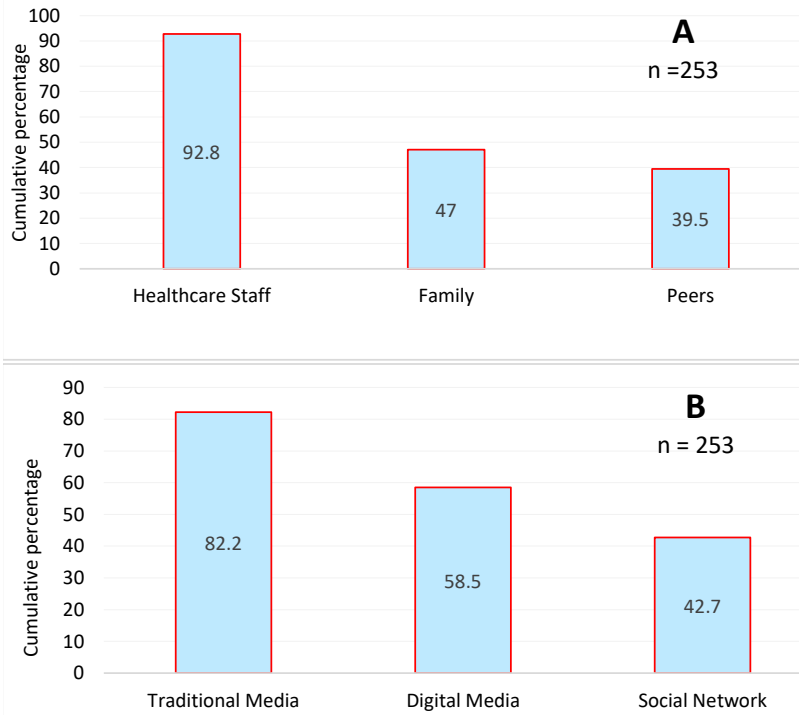

Figure 1. Information Therapy Resources for Acquiring Diabetes Self-Care Information: **(A)** In-Person Information Therapy and **(B)** Distant Information Therapy

Table 2. Comparison of the Distribution of Mean Scores of Model Constructs According to the Use of In-Person Information Therapy Resources

	Healthcare Staff			Peers			Family		
	Yes (n=235)	No (n=18)	*P* Value	Yes (n=100)	No (n=153)	*P* Value	Yes (n=119)	No (n=134)	*P* Value
Knowledge	11.61±0.13	11.11±0.62	0.32	9.65±2.11	9.27±2.03	0.15	9.73±2.11	9.14±2.00	0.02
Attitude	23.26±6.06	22.77±7.21	0.74	23.14±5.60	23.29±6.48	0.84	24.18±6.16	22.38±6.02	0.01
Physical self-care	12.49±3.30	13.72±3.56	0.13	12.51±3.50	12.63±3.22	0.77	12.36±3.18	12.77±3.46	0.33
Mental self-care	13.21±3.68	12.38±3.05	0.35	12.94±3.44	13.29±3.76	0.45	12.63±3.45	13.61±3.74	0.03
Social self-care	13.25±3.98	14.16±3.55	0.35	12.81±3.23	13.66±4.35	0.09	13.21±3.55	13.41±4.30	0.69
Spiritual self-care	14.23±4.45	14.38±5.01	0.89	13.81±4.01	14.53±4.76	0.20	13.67±3.99	14.76±4.84	0.05
Self-care behaviors	53.20±12.01	54.66±11.33	0.61	52.07±10.22	54.12±12.93	0.18	51.89±10.59	54.57±12.95	0.07

Table 3. Comparison of the Distribution of Mean Scores of Model Constructs According to the Use of Distant Information Therapy Resources

	Traditional Media			Digital Media			Social Network		
	Yes (n=208)	No (n=45)	*P* Value	Yes (n=148)	No (n=105)	*P* Value	Yes (n=108)	No (n=145)	*P* Value
Knowledge	9.68±2.05	8.2±1.70	0.000	8.89±1.88	10.17±2.09	0.000	8.97±1.74	9.75±2.23	0.002
Attitude	23.71±6.08	21.02±5.99	0.007	22.20±5.95	24.67±6.14	0.001	22.93±5.50	23.45±6.58	0.50
Physical self-care	12.60±3.22	12.51±3.81	0.87	12.37±3.40	12.88±3.21	0.22	12.33±3.44	12.77±3.24	0.30
Mental Self-care	13.03±3.45	13.71±4.40	0.25	12.83±3.63	13.60±3.61	0.09	12.68±3.48	13.50±3.45	0.07
Social self-care	13.04±3.58	14.62±5.21	0.01	13.27±4.12	13.39±3.73	0.82	13.16±4.15	13.44±3.81	0.58
Spiritual self-care	14.06±4.38	15.08±4.89	0.16	14.86±4.64	13.38±4.12	0.009	15.18±4.85	13.55±4.07	0.004
Self-care behaviors	52.74±11.19	55.93±14.84	0.10	53.34±12.39	53.26±11.36	0.95	53.37±12.62	53.26±11.48	0.94

was also beneficial for patients with low health literacy regarding diabetes. Additionally, the results revealed that social networks are a potentially useful tool for providing diabetes information to patients (8), which is in line with those of the current study.

Beyond increasing knowledge, virtual media have the potential to positively affect glycemic indicators, particularly hemoglobin A1c (HbA1c) levels in diabetic patients (17). Distant information therapy methods, such as SMS, have been introduced as effective tools for information transfer and knowledge enhancement (18,19). Yarahmadi et al reported that information therapy for type 2 diabetic patients via text messaging has positive effects on controlling HbA1c levels in these patients; given that this approach is simple, inexpensive, and effective, it is recommended for healthcare providers and treatment

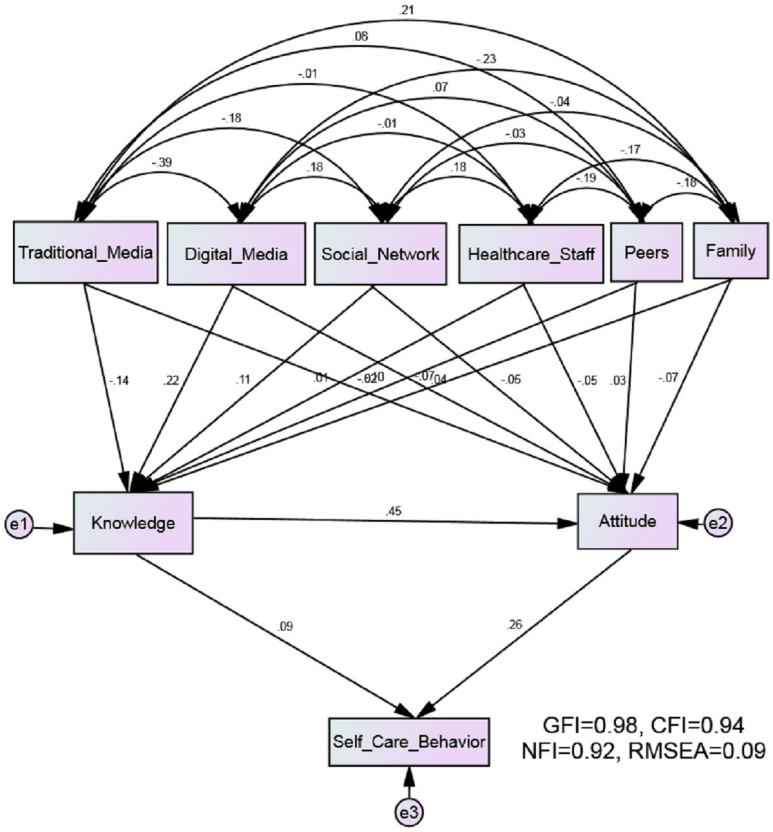

Figure 2. The Path Model for the Impact of In-Person and Distant Information Therapy on the Knowledge, Attitudes, and Self-Care Behaviors of the Studied Patients

groups (20).

Currently, various informational resources are available for patients seeking health information, including traditional media, healthcare staff, peers, the Internet, and social networks (16). Each of these resources can lead to increased knowledge, improved attitudes, and enhanced self-care behaviors among diabetic patients. What is crucial is that patients must develop the ability to discern accurate information. With the emergence of social networks and increased internet accessibility in recent years, a vast communication domain has been created where health-related information becomes readily available to individuals in society, especially patients (21). This situation has raised challenges in health domains as individuals face an overload of online information that can often be unreliable, leading to confusion and disruption in effective healthcare delivery (22). Therefore, considering the diversity of informational resources available to patients, it seems necessary for patients to benefit from these resources to enhance their knowledge and better manage their disease, provided that adequate training is offered regarding distinguishing valid information from invalid data.

Another finding of this study was that knowledge about self-care behaviors directly influenced individuals' attitudes, which significantly impacted their self-care actions. Self-care behaviors are conscious and purposeful actions undertaken by individuals or with assistance from others to maintain and promote their health; for individuals with diabetes, these behaviors include adhering to proper dietary guidelines, appropriate medication compliance, and sufficient physical activity, recognizing symptoms of blood sugar fluctuations, and caring for feet and eyes (23). Many patients lack sufficient knowledge about diabetes management, which can lead to short-term and long-term complications of diabetes due to insufficient attention to self-care behaviors (24). Consequently, focusing on increasing diabetic patients' knowledge is a critical component of educational programs related to diabetes management. Self-care behaviors are influenced by individual knowledge, beliefs, attitudes, and values, as well as the social and cultural characteristics of patients (25). Patients with greater knowledge tend to have more favorable attitudes toward adopting self-care behaviors (26). Evidence shows that attitude is one of the predictors of self-care behaviors in individuals with T2DM (27,28). Improving attitude is considered another essential component of educational programs since fostering a positive attitude toward self-care among diabetic patients can lead to enhanced self-care practices (25). The World Health Organization recognizes education as a fundamental principle for changing attitudes and promoting self-care behaviors in diabetes management (29). Complications from diabetes can be reduced by providing appropriate education and reliable information (30). Currently, informing patients while enhancing their

knowledge level and improving their attitudes is regarded as one of the important methods for advancing treatment processes and managing chronic diseases globally (31), such that expanding information access and improving attitudes among diabetic patients have succeeded in reducing blood sugar levels while boosting motivation and intention toward engaging in self-care practice (25,32-34). These findings indicate that designing and implementing information therapy programs aimed at increasing knowledge and improving attitudes toward self-care behaviors can enhance sustainability in these practices among diabetic patients.

The current study had four limitations. First, due to the elderly nature of the participants studied, fatigue or lack of patience may have influenced their responses and the obtained results. Second, the results were not differentiated based on the duration of illness among elderly participants, and duration may have affected their knowledge, attitudes, and adoption of self-care behaviors. Third, although efforts were made in this study to sample from various service centers for patients, the fact remains that the samples were selected non-randomly. Therefore, the potential impact of selection bias on the results should be considered, which may somewhat limit the generalizability of the findings. Finally, the path analysis model can vary in different scenarios based on socioeconomic variables or disease-related conditions. Fourth, given that the information was collected through self-report, it may have introduced bias.

Conclusion

The results revealed that the only direct predictor of self-care behaviors in elderly patients with T2DM was their attitude toward adopting these behaviors. Knowledge could directly influence this attitude. Thus, it is essential to focus on enhancing knowledge and improving attitudes when designing and implementing information therapy related to T2DM to promote sustainability in self-care practices. It is suggested that longitudinal and qualitative studies be conducted to assess long-term effects and explore patients' perspectives on information-seeking behavior in different populations, respectively.

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Authors' Contribution

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Competing Interests

None declared.

Ethical Approval

The Ethics Committee of the Islamic Azad University, Hamedan Branch, has approved this study (IR.IAU.H.REC.1403.010). Furthermore, to adhere to ethical considerations, the purpose of the study, confidentiality of patient names, and the right to withdraw from the study at any stage were explained to each participant before conducting the study. After expressing their willingness to participate in the study, written informed consent was obtained from the patients.

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