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Original Article

The Effect of Workshop Educational Method on the Health Literacy of Patients With Type 2 Diabetes

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Abstract

Background: Type 2 diabetes mellitus (T2DM) is a chronic disease with significant financial, psychological, and social impacts, and health literacy plays a crucial role in managing diabetes. Thus, it is essential to enhance literacy in this area through education, especially interactive workshops. This study aimed to determine the effect of the workshop educational method on the health literacy of patients with T2DM in Aran and Bidgol villages, Iran.

Methods: This study was conducted as a quasi-experimental study. The research sample consisted of 120 type 2 diabetic patients (equally assigned to test and control groups) who met the inclusion criteria and were randomly selected from Hossein Abad and Kagari health centers under the coverage of Aran and Bidgol health centers. In this study, a census was performed rather than using a sampling. The intervention group was subjected to the training sessions for four weeks. Patients' information, including socio-demographic factors, health literacy, nutrition knowledge, and nutrition behaviors, was collected before and after the intervention using a questionnaire. The data were analyzed by SPSS 26 using an independent samples T-test, paired samples T-test, and Chi-square test.

Results: The results revealed a significant enhancement in the mean scores of awareness, behavior, and health literacy of the test group following the educational intervention ($P<0.001$).

Conclusion: Overall, it was found that educational intervention significantly improves health literacy, awareness, and nutritional behaviors in patients with T2DM.

Keywords: Health literacy, Nutrition, Behavior, Diabetes mellitus, Educational intervention

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Introduction

Diabetes is a metabolic disorder characterized by the body's inability to produce or effectively utilize insulin, leading to disruptions in blood sugar regulation (1). Type 2 diabetes mellitus (T2DM) is a chronic, progressive, and highly prevalent disease (2) that not only results in financial costs but also brings psycho-social problems and creates a psychological burden for the involved people (3). According to the research results of 2019, the global prevalence of diabetes was equal to 9.3% (463 million people). It is expected to reach 10.2% (578 million) and 10.9% (700 million) by 2030 and 2045, respectively (4).

In 2019, diabetes prevalence was notably higher in urban areas (10.8%) compared to rural regions (7.2%). Additionally, its prevalence was higher in high-income countries (10.4%) than in low-income countries (4%). Alarmingly, one in every two individuals (50.1%) remained unaware of their condition, highlighting a significant global challenge in diabetes detection and awareness (5). According to a study on 164 000 35–70-year-old individuals from different races (based on age, gender, residential area (urban or rural), ethnicity, economic status, socio-demographic risk factors, and the level of awareness of diabetes and blood sugar control) and 18 geographical regions of Iran, the prevalence of diabetes and pre-diabetes was 17% and 24% in men and 13% and 27% in women in 2014–2020 (6).

In Iran, there are about 4 million diabetic patients, and it has also been reported that 7.3% of the adults are diabetic (7). According to the National Program on the Prevention and Control of Diabetes, the prevalence of diabetes has been 3.07% in rural areas (8). The most serious complications of diabetes are retinal damage, blindness, peripheral neuropathy, leg pain, heart attack

and stroke, peripheral vascular disease, blood vessel disease, and amputation. Diabetes causes atherosclerosis and increases heart disease and stroke. Further, diabetic people often suffer from cardiovascular disease 2–4 times more than normal people (9).

Health literacy is a key factor in raising awareness, leading to improved disease prevention and management (10). It is a cognitive-social competency that influences individuals' motivation to acquire, comprehend, and utilize health information. Individuals with higher health literacy tend to manage physical and mental health challenges more effectively (11). Limited health literacy is prevalent among individuals with T2DM and is linked to unfavorable health outcomes, including challenges in disease management and treatment adherence (12). The findings of the research by Mogessie et al showed that patients with T2DM had insufficient health literacy. They indicated that this insufficient literacy imposes a lot of costs on diabetic patients every year, is considered a serious obstacle for management, and can affect patients' participation in self-care (13). Shafiei and Nasiri (3) . Ghorbani Nohouji et al (14) highlight the significant role of health literacy and psychological well-being in diabetes management, demonstrating their impact on improving the quality of life for individuals with T2DM. Health literacy among type 2 diabetic patients is very low, and the promotion of health literacy is extremely critical (15). French and Wojtowicz emphasize that it is not the patient's responsibility to understand the provided information (16). Although a short lecture may work for raising health literacy awareness, longer interactive workshops (90–120 minutes) are more effective for covering basic information and practicing communication skills (17).

Establishing these workshops requires a clear definition of the concept, a comprehensive overview of the problem's scope, and an emphasis on the fact that low health literacy impacts all societal groups, not only those with low education or socioeconomic status (18,19).

An effective way to demonstrate the healthcare experiences of individuals with low health literacy is to engage local patient advocates or adult literacy students, allowing them to share first-hand accounts of their interactions with the healthcare system. Their insights provide valuable perspectives that can help identify barriers and improve patient-centered care (20). The Paulo Freire Adult Education Model is one of the prominent and influential approaches in adult education. This model is based on principles such as critical awareness, collaborative learning, and activism. In addition, it views education as an interactive and dialogue-centered process between teachers and students, helping individuals develop the ability to critically analyze their social, political, and economic conditions and bring about positive changes in society. In addition, this approach helps people to have a more active role in society and achieve social justice (21,22). One study utilized Freire's Adult Education Model to address self-medication behaviors among older adults. The study involved 132 participants aged over 60 divided into intervention and control groups. It employed validated tools based on the Health Belief Model and self-medication behaviors questionnaire (23). Among all health issues, nutrition health education is a key component of most training programs for disease management (18). One of the essential components of health literacy is nutritional literacy, which refers to individuals' ability to access, process, and understand nutritional information. These skills are also essential for making appropriate dietary decisions (24). Health education and appropriate behavioral and corrective methods are among the most effective and cost-effective ways to prevent and control diabetes (25). It is noteworthy that increased health literacy can affect the lives of diabetics (26). Among the educational methods suitable for the educational intervention of rural areas, it seems that the Kolb model is of top priority.

In 1984, Professor David Kolb of Harvard University published the book "Experiential Learning", which lays out the basis of the theory and practice of experiential education. In this theory, learning is defined as the process of creating knowledge through the transformation of experience. The learning process is divided into four cyclical phases in which learners absorb direct experiences and transform them into abstract concepts. This theory encourages learners to experiment and create new experiences (27). Kolb's theory also describes two different ways of transforming experience, namely, reflective observation and active experiment. Some people are good at carefully observing other people and reflecting on what happened, while others choose to start doing things immediately and making reflective observations while doing, which belongs to the positive experiment type (28). It also presents a model of learning as a cone with four types, including diverging (good at observing and reflecting), assimilating (good at understanding and organizing information logically), converging (good at practical application of ideas), and accommodating (learning from practical experience and acting on intuition). Each type has distinct strengths in acquiring and transforming knowledge (29). Workshops as the driving force for the integration of experiential learning and participatory planning are applied in this study aimed at measuring the effect of nutritional behaviors on promoting the health of diabetes in the selected villages of Aran and Bidgol, Iran.

Materials and Methods

Study Subjects

The samples of this semi-experimental study were all type 2 diabetic patients (N = 120) who met the criteria for entering the study in Hossein Abad and Kagazi health centers under the coverage of Aran and Bidgol health centers, who were randomly selected and divided into two control (n = 60) and intervention (n = 60) groups. It should be noted that the census was used in this study. The

inclusion criteria included an age range of 18–65 years, individuals diagnosed with diabetes with active cases covered by the Health House in Hussein Abad and Kaghazi villages, the ability to read and write, and willingness to participate in the study. On the other hand, the exclusion criteria were incomplete questionnaire responses and a lack of willingness to continue participating in the study. The required permission and the written consent were obtained from relevant authorities and the subjects, respectively. To respect the confidentiality principle, each participant was assigned a code to remain anonymous.

Study Intervention

Based on the demographic characteristics of the participants (adult women with primary education from rural areas) and Freire's model of adult education, the intervention was divided into five sessions, including four oral sessions and one practical workshop. During the practical workshop, all women, a culinary trainer, and a nutritionist (as a supervisor) participated in cooking traditional, healthy food suitable for diabetic patients.

The training sessions were conducted over four weeks. Considering the impact of nutrition education on health literacy, the participants' health literacy level was assessed prior to the intervention. The program was then designed based on the obtained results. In the sessions, patients were directly informed about preparing healthy foods for diabetic patients to enhance their understanding of covered topics. Participants also observed the process of cooking healthy meals and had their questions answered. The training was tailored to the usual dietary habits and income levels of the participants. The educational program for the intervention group is provided in Table 1.

Study Variables

Four questionnaires were used to collect data.

A demographic questionnaire was utilized to collect data about gender, age, marital status, occupation, and income levels.

The diet knowledge questionnaire was employed for collecting information about the number of meals, types of healthy foods, and healthy cooking methods. The diet behavior questionnaire was also used to investigate eating behavior. The validity and reliability of these questionnaires were assessed and confirmed in previous research. Amini et al evaluated the validity and reliability of this questionnaire. The content validity method was applied to assess validity. Additionally, reliability was evaluated using the test-retest method, with a two-week interval between the two assessments. The findings indicated that the correlation coefficient between the two sets of responses was 84% (30).

Awareness Questionnaire

This questionnaire contains 8 questions and aims to determine the level of awareness of diabetic patients in various nutritional fields related to diabetes. In response to each question, one right option and one wrong option are considered, and to neutralize guess answers, an "I don't know" option has also been added to the answer options of each question. Scores of 0, 1, and 2 were allocated to wrong, I don't know, and correct answers, respectively. The minimum and maximum predicted scores for this questionnaire are 0 and 16, respectively.

Behavior Questionnaire

This questionnaire encompasses 15 questions and is used to determine the behavior of diabetic patients in different nutritional fields associated with diabetes. One correct option and one incorrect option are taken into consideration in response to each question, and to neutralize guess answers, an "average" option has also been added to the answer options of each question. For incorrect, average, and correct answers, scores of 0, 1, and 2 are taken into account, respectively. The minimum predicted score for this questionnaire is 0, while the maximum score is 30.

Validity and Reliability of Nutritional Knowledge and Behavior Questionnaires of Patients With Diabetes

After reviewing various scientific sources, books, and previous questionnaires, the researcher meticulously completed the questionnaires, ensuring brevity and clarity. For content validity assessment, coordination between the measurement tool and research purpose was evaluated by health professionals (10 health education doctoral students). Both qualitative and quantitative approaches were employed in this study. During the qualitative content review, experts provided feedback, leading to necessary modifications in the questionnaire items. Two relative coefficients—content validity ratio (CVR) and content validity index—were utilized for the quantitative evaluation of content validity. The average CVR score for the awareness variable was calculated at 0.94, while the performance variable achieved a CVR of 0.88. Furthermore, the bisection method was applied, and the correlation coefficient for both the knowledge and performance sections was determined to be 0.7.

Health Literacy for Iranian Adults Questionnaire

The Health Literacy for Iranian Adults questionnaire was utilized to evaluate the health literacy levels of individuals aged 18–65. This tool is designed based on key health literacy components, including accessing, reading comprehension, understanding, critical assessment, decision-making, and practical application of health-related information. The questionnaire follows a five-point Likert-type scale, ensuring a structured approach to response categorization. Reading skills are scored on a 5-point scale ranging from "completely easy" (5), "easy" (4), "neither easy nor difficult" (3), and "difficult" (2) to "completely difficult" (1). For the remaining four dimensions of health literacy, scoring is structured as 5 for "always", 4 for "most of the time", 3 for "sometimes", 2 for

Table 1. Comprehensive Framework for Educational Workshops to Enhance Health Literacy in Type 2 Diabetes Patients in Aran and Bidgol Villages

Session	Objectives	Educational Content	Teaching Methods	Learning Styles	Teaching Tools	Duration
1	Raising awareness about diabetes	Definition of type 2 diabetes and risk factors	Lectures and group discussions	Auditory and visual learning	Posters, slides, and handouts	90 minutes
2	Familiarization with diabetes management principles	Healthy eating, physical activity, and medication use	Practical demonstration and questions and answers	Kinesthetic and visual learning	Sample foods and Charts	120 minutes
3	Empowering participants for health monitoring	Home monitoring of blood glucose and blood pressure	Hands-on workshops and practices	Kinesthetic learning	Monitoring devices	90 minutes
4	Enhancing knowledge about diabetes complications	Acute and chronic complications of diabetes	Case studies and group discussions	Analytical and collaborative learning	Patient case files	120 minutes
5	Practical workshop on healthy traditional cooking	Cooking traditional healthy meals for diabetic patients with supervision	Practical cooking sessions	Kinesthetic, emotional, and visual learning	Cooking equipment and ingredients	120 minutes

"rarely", and 1 for "never". The scoring method involves first calculating a raw score for each individual across different domains by summing their item responses. To normalize these scores into a 0–100 range, a transformation formula is applied, subtracting the minimum possible raw score and dividing by the difference between the maximum and minimum possible scores. The Health Literacy for Iranian Adults questionnaire was developed and psychometrically validated by Montazeri et al (31), who confirmed its strong validity and reliability. In this study, Cronbach's alpha was calculated to assess reliability, yielding a coefficient of 0.95, indicating high internal consistency (31).

Statistical Analysis

The collected data were entered into SPSS statistical software (version 20) and analyzed using descriptive statistics, such as means and standard deviations (SD). Independent samples T-test, paired samples T-test, and chi-square test were employed for inferential statistics, and a *P*-value of less than 0.05 was considered statistically significant.

Results

The mean age (±SD) of the test and control groups was 49.10 (±8.58) years and 47.66 (±10.49) years, respectively ($P=0.366$). The mean (±SD) of the disease duration in the test group was 6.48 (±3.52) years, while it was 7.18 (±6.13) years in the control group ($P=0.262$, Table 2).

The Chi-square test demonstrated no significant differences between the test and control groups in terms of demographic variables, including education, occupation, and marital status ($P>0.05$, Table 2).

Based on the results of the independent samples t-test, no significant difference was found between the test and control groups regarding gender ($P>0.05$, Table 2).

The findings of the study revealed that there was no significant difference in the mean scores of awareness, behavior, and health literacy between the test and control groups before the intervention. However, after the intervention, this difference became significant ($P<0.05$, Table 3).

Table 2. Comparison of the Frequency Distribution of Individual Characteristics Between Test and Control Groups

Variables	Group	Intervention Group	Control Group	*P* value
	Category	Frequency (%)	Frequency (%)	
Education	Elementary	54 (90)	51 (85)	0.390
	Primary	3 (5)	7 (11.7)	
	Diploma	3 (5)	2 (3.3)	
Occupation	Unemployed	2 (3.3)	4 (6.7)	0.357
	Worker	14 (23.3)	21 (35)	
	Employee	4 (6.7)	3 (5)	
	Retired	4 (6.7)	1 (1.7)	
	Housewife	36 (60)	31 (51.7)	
Marital status	Married	60 (100)	58 (96.7)	0.154
	Spouse deceased	0 (0.0)	2 (3.3)	
Awareness methods	Healthcare workers and treatment	45 (75)	46 (76.7)	0.023
	Internet	10 (16.7)	1 (1.7)	
	Radio and television	3 (5)	9 (15)	
	Friends	1 (1.7)	1 (1.7)	
	I don't know	1 (1.7)	3 (5)	
Gender	Woman	41 (68.3)	39 (65)	0.701
	Man	19 (31.7)	21 (35)	

Note. Chi-square test.

Discussion

the findings of this quasi-experimental study confirmed that the nutrition education-based health literacy intervention through class sessions and workshops improved the health literacy, knowledge, and nutritional behaviors of T2DM patients living in rural areas.

The results demonstrated that the average health literacy scores significantly increased in the intervention group, which is consistent with the result of the study by Tol et al, examining the impact of health literacy education on diabetic patients (32).

The findings of the present study are in line with the results of the study by de Lima et al (33). Likewise, Paes et al concluded the educational intervention increased the knowledge of people with DM2 regarding their disease,

Table 3. Comparison of Mean and Standard Deviation of Awareness, Behavior, and Health Literacy Before and After the Intervention in Test and Control Groups

Variables	Group	Before Intervention	After Intervention	Paired Samples T-Test	Average difference
		Mean (SD)	Mean (SD)		Mean (SD)
Awareness	Intervention	14.08 (2.15)	16.00 (0.000)	$P<0.001$	1.91 (2.15)
	Control	13.5 (2.24)	13.60 (2.09)	$P=0.91$	0.033 (2.43)
	Independent samples T-test	$P=0.201$	$P<0.001$		$P<0.001$
Behavior	Intervention	20.1 (2.31)	25.76 (1.18)	$P<0.001$	1.91 (2.15)
	Control	20.03 (2.81)	23.10 (2.75)	$P<0.001$	0.033 (2.43)
	Independent samples T-test	$P=0.881$	$P<0.001$		$P<0.001$
Health literacy	Intervention	145.4 (25.00)	183.03 (16.98)	$P<0.001$	37.55 (15.28)
	Control	150.40 (23.77)	157.61 (23.58)	$P<0.001$	7.21 (8.24)
	Independent samples T-test	$P=0.272$	$P<0.001$		$P<0.001$

Note. SD: Standard deviation.

consequently positively influencing health literacy (34). De Oliveira Tito Borba et al (35) reported that after the educational intervention, there was a significant increase in awareness about diabetes, positive attitude toward self-care, physical activity, variety of diets, and less consumption of oil and fat. Maleki et al (36), examining the impact of the educational intervention on the health literacy of type 2 diabetic patients attending Imam Ali, Ali Asghar, and Khatam Zahedan clinics, indicated that prior to the intervention, there were no significant differences in awareness, behavior, or health literacy between the experimental and control groups. However, following the intervention, the trained group demonstrated notably higher mean values for awareness, behavior, and health literacy compared to the control group.

This research highlights the importance of simplifying information and utilizing health education experts to design educational programs suited to the abilities and skills of the target group. Therefore, health literacy strategies help individuals more easily access and process health information, enabling them to make more informed decisions.

It is emphasized that before designing educational programs, needs assessment and evaluation of the health literacy level of the target community using appropriate tools are essential for preparing programs and educational content that meet their needs.

Based on the results of this research, the average score of awareness of sick patients increased significantly from the educational intervention, underscoring the positive effect of the educational intervention. The results of the studies of Heydari et al (37), Amini et al (30), and Sharifirad et al (38) are also consistent with the findings of the present study. Sriklo et al (39) showed that the intervention group had higher self-management scores than the control group after receiving the learning program. Further, it was confirmed that the steps of learning could improve the self-management of adults with uncontrolled T2DM by enabling them to reassess the structure of assumptions and expectations that frame their thinking, feeling, and action, followed by the development of health literacy, which is an influential factor in diabetes self-management.

Therefore, it is necessary to continue educational programs to raise awareness to the highest level. In this context, it seems essential to pay special attention to illiterate patients with an unfavorable economic level.

Regarding performance, the results of the study indicated the positive effectiveness of the educational intervention and the improvement of the average scores of bad behavior from the educational center. The findings of this study corroborate the results of Amini et al (30), Rezaei et al (40), Scain et al (41), and Mardani et al regarding the change of nutritional behaviors in diabetic patients (42).

According to the results of this research, patients will perform better if they continuously attend training courses, thereby leading to lifestyle improvement, prevention of disease complications, and disease control.

In addition, it can be indicated that interventions provided by the researcher used for promoting health literacy and adoption of nutritional behaviors will lead to successful results; thus, they can probably be utilized in other health interventions.

Regarding the educational intervention designed in this study, the presence of two different features played an effective role in encouraging the subjects to adopt nutritional behaviors. These features are as follows:

1. Paying attention to the media interests of the investigated people, using PowerPoint software, presenting images, and holding a cooking workshop to implement the educational intervention.
2. Paying attention to the health literacy level of the examined people and designing an educational program according to their health literacy level.

Suggestions for Further Research

- Considering that low health literacy is a gap between the teacher and the audience, before designing any educational program and in the needs assessment stage, it is necessary to evaluate the health literacy of the target community with one of the tools available to measure health literacy. The level of health literacy skills of people should be considered when designing educational content, selecting the teaching method, and implementing the teaching process.
- Doctors and health workers are the main sources of information for the majority of diabetic patients. Therefore, it is necessary for doctors to adjust their communication according to the actual health literacy of the patient. Some simple techniques can be considered for this purpose, such as using simple language and slow speed and involving important family members in discussions.

This study had some limitations. The main limitation of the research was the low literacy of most of the participants; as a result, the questionnaires were completed by the health center workers, which caused a waste of time and a possible inadvertent bias in filling out the questionnaires. Another limitation of the study was the limited population. Accordingly, the results may not be generalizable to other populations. Therefore, it is suggested that researchers conduct other studies in this field in other regions with different cultural characteristics.

Conclusion

It was revealed that nutrition education-based health literacy intervention has a significant positive effect on the nutritional behaviors of rural patients with T2DM. Hence, it is recommended that other researchers use the workshop method to educate rural diabetic patients with primary education levels to promote their health status. In this study, education through educational workshops with nutrition experts and cooking instructors was welcomed by diabetic patients; thus, it is suggested that comprehensive health service centers discuss essential topics related to the health of diabetic patients, taking into account their health literacy level and holding training workshops for these patients.

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Authors' Contribution

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Competing Interests

The authors confirm that there is no conflict of interests related to this research.

Ethical Approval

This study is part of research approved by Tarbiat Modarres University, Tehran, Iran (ethical code IR.TMU.REC.1395.445).

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