

RESEARCH

Open Access



# Designing a health literacy model for patients with diabetes

Tahereh Bano Borzuoi<sup>1</sup>, Fereshteh Kordestani<sup>2\*</sup> , Tahereh Ashktorab<sup>3</sup>, Yalda Delgoshaei<sup>2</sup> and Baharak Shirzad Kebria<sup>2</sup>

## Abstract

**Background** Low health literacy levels among individuals with type 2 diabetes are common and may be a fundamental barrier to increasing self-efficacy and self-care in patients. Therefore, the present study aimed to propose a model for educating health literacy in diabetic patients in hospitals affiliated with the Islamic Azad University of Medical Sciences, Tehran.

**Methods** This research was applied in terms of purpose, mixed-methods (qualitative-quantitative) in terms of data type, qualitative content analysis, and cross-sectional survey in the quantitative aspect (fitness of model). The statistical population in the qualitative section included 18 participants from experts in the field of health care. In the quantitative section, 220 educators working in hospitals affiliated with the Islamic Azad University of Medical Sciences, Tehran, were selected using stratified random sampling. Data collection tools included interviews in the qualitative section and research-made questionnaire in the quantitative section. For data analysis, coding was used in the qualitative section, and structural equation modeling was used in the quantitative section.

**Results** For this model, 6 dimensions, 17 components, and 78 items were identified. The results showed that the basic literacy dimension had a coefficient of 0.729, the specialized literacy dimension had a coefficient of 0.712, diabetes management had a coefficient of 0.654, social literacy dimension had a coefficient of 0.630, cultural literacy dimension had a coefficient of 0.605, and media literacy had a coefficient of 0.535, respectively, contributing the most to the health literacy of diabetic patients.

**Conclusion** Since the “Health Literacy Education” model has a good fitness, it is recommended that this model will be applied in different settings such as hospitals in order to improving the health level of patients.

**Keywords** Health literacy, Diabetic patients, Educational Model

\*Correspondence:

Fereshteh Kordestani

fe.kordestani92@gmail.com

<sup>1</sup>PhD Student in Educational Management, Central Tehran Branch, Islamic Azad University, Tehran, Iran

<sup>2</sup>Department of Educational Management and Higher Education, Central Tehran Branch, Islamic Azad University, Tehran, Iran

<sup>3</sup>Department of Nursing Management, Faculty of Nursing and Midwifery, Tehran Medical Sciences, Islamic Azad University, Tehran, Iran



© The Author(s) 2024. **Open Access** This article is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License, which permits any non-commercial use, sharing, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if you modified the licensed material. You do not have permission under this licence to share adapted material derived from this article or parts of it. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by-nc-nd/4.0/>.

## Background

Diabetes mellitus is a metabolic disorder associated with many serious medical, psychiatric, familial, occupational, and financial problems [1]. The most serious complications of diabetes include retinopathy, blindness, peripheral neuropathy, foot pain, stroke, heart attack, peripheral vascular disease, vascular disease, and amputation [2]. The global prevalence of diabetes was 9.3% in 2019, equivalent to 463 million people. Predictions for the prevalence of diabetes in 2030 and 2045 are estimated to reach 10.2% and 10.9%, respectively, equaling 578 million and 700 million people. The global prevalence of prediabetes in 2019 was 5.7%, accounting for 345 million people. Predictions for the prevalence of prediabetes in 2030 and 2045 are estimated to reach 8% and 6.8%, respectively, equaling 548 million and 345 million people [1]. In a study conducted on the prevalence of diabetes and prediabetes from 2014 to 2020 in 18 geographical regions of Iran among individuals aged 35 to 70, the prevalence rates were 13% and 27% in men and 17% and 24% in women, respectively. The findings of this study indicate that 15% of the adult population in Iran have diabetes, and more than 25% are in the prediabetes stage [3].

Diabetes imposes a significant burden on society, allocating 2.5–15% of healthcare budgets in various countries directly to itself, and when considering the indirect costs, these expenses will be multiplied several times. The burden of diabetes is not merely summarized in financial costs but also includes psychological and social expenses [4]. Studies results indicated that nearly half of patients with type 2 diabetes had insufficient health literacy, and this inadequate literacy imposes significant costs on diabetic patients each year [5–7].

Low health literacy is considered a potential barrier to improving health outcomes. Previous studies suggest that low health literacy is consistently associated with poor diabetes knowledge, less self-management behaviors, poor blood glucose control, and costly health care [8].

The World Health Organization has stated that low health literacy is a more widespread issue than some people think; the consequences of this lack of awareness and ignorance by healthcare providers and patients can be detrimental [9].

Afshar Badr et al. conducted a study titled “Developing a Health Literacy Model for Hypertensive Patients”, which showed that the presence of four factors—basic literacy, cognitive literacy, social literacy, and cultural literacy—can influence the health literacy of hypertensive patients [10].

Gowa et al. conducted research on “Sufficiency of Health Literacy and Its Impact on Diabetes Self-Management”. The results showed that health literacy directly correlates with self-monitoring, nutrition and exercise care, diabetes knowledge, self-care, and social support.

Overall, health literacy had a direct and significant correlation with self-care parameters in diabetic patients [11]. Jones conducted a study titled “Health Literacy, Self-Management, and Health Outcomes among Adults with Type 2 Diabetes”, which showed that numerical literacy is a vital aspect of health literacy for chronic diseases such as diabetes management [12]. Nayer and colleagues conducted a study titled “Identifying the Level of Health Literacy in Patients with Type 2 Diabetes”. The findings showed that the level of health literacy in patients with diabetes is low, posing a significant challenge to optimizing diabetes care. It is recommended that, in addition to healthcare service strategies, targeted educational and behavioral interventions for the elderly and those with less formal education are essential [13].

By accepting the premise that health literacy can effectively impact health behavior, understanding, and perception of patients, it follows that the health literacy of diabetic patients is also influenced by various factors that need to be discovered and investigated. Health centers and related organizations involved in health must acquire fundamental and comprehensive understanding of the concept of health literacy, as it is a prerequisite for their effective performance in disease control and prevention. Therefore, numerous studies have been conducted to elucidate health literacy, its evaluation methods, and how it can be measured by researchers. However, most of these studies lack the necessary comprehensiveness. Based on this foundation, it is imperative to present a native model tailored to the needs of these centers and aligned with the goals of global health. In this research, we believe that conducting qualitative studies and involving top-tier experts familiar with health and medical matters will transform the concept of health literacy among diabetic patients into a measurable and tangible phenomenon.

## Methods

This study, in terms of its applied goal, utilizes mixed data (qualitative-quantitative). The qualitative aspect involves content analysis (conventional approach), while the quantitative dimension employs a cross-sectional survey method. The qualitative research population consisted of 18 experts in health education, medical education, nursing, and educational management with at least a PhD degree, selected using purposive sampling. In order to collect data, a semi-structured interview was used to obtain the participants’ opinions and ideas about health literacy and diabetic patients. Some research questions were: *What is the meaning of health literacy training for patients with diabetes? What are the factors that make up the health literacy education model for patients with diabetes?* In addition to the questions about health literacy and diabetes, demographic information such as age, gender, years of experience and education level were

investigated. Each interview lasted 45 to 75 min. Participants were obtained informed consent.

In the qualitative section, data analysis was conducted simultaneously with data collection. After each individual interview session, the recorded information was listened to at the earliest opportunity. All interviews were transcribed by hand and then typed. The researcher revised the typed material by listening again and comparing handwritten and typed notes to ensure accuracy. The main stages of content analysis were performed with adjustments for coding. MAXQDA version 20 was used for content analysis. The primary codes were extracted and at the end subcategory and category were identified. The accuracy of the data was checked according to Lincoln and Guba criteria [14].

Furthermore, structural equation modeling was utilized in the quantitative section to determine relationships between variables. In the quantitative section, the sample comprised hospital staff from Islamic Azad University of Medical Sciences, Tehran, selected using stratified random sampling with Cochran's formula, totaling 220 individuals. Data collection tool included a researcher-made questionnaire. This questionnaire was made according to the data of the qualitative section. For this purpose, SPSS version 25 and Smart PLS were employed. "Health Literacy Education" questionnaire has 78 items with Likert rating from "very much" till "very low". The total score is between 78 and 390. This questionnaire assess 6 dimensions of health literacy education included basic literacy (Questions 1 to 7), specialized literacy (Questions 8 to 34), social literacy (Questions 35 to 42), cultural literacy (Questions 43 to 52), media literacy (Questions 53 to 61) and diabetes management (Questions 62 to 78) (Table 1).

In the quantitative section, the sample consisted of 220 participants, including nurses, head nurses, supervisors, and internal medicine, endocrinology, and emergency physicians. These participants were selected from Farhikhtegan, Boali, and Amiralmomenin hospitals, which are under the supervision of the Islamic Azad University of Medical Sciences, Tehran with randomized stratified sampling (See Table 2 for demographic characteristics of the samples).

The Content validity ratio (CVR) was used for questionnaire validity. Initially, 10 experts were asked to evaluate each item based on a three-part spectrum (essential, useful but not essential, not necessary). The CVR value ranges from  $-1$  to  $+1$  according to Lawshe's Table [15]. An item was considered valid if its CVR value exceeded 0.3 based on the participation of 10 experts, and its reliability was 0.80 according to Cronbach's alpha coefficient. Also, validity and reliability were calculated and confirmed using the methods of item analysis and confirmatory factor analysis.

For the model design, the main concepts derived from qualitative research were considered, and relevant materials were found through literature review. Then, these findings were organized into a model with 6 dimensions and designed accordingly. In determining the acceptability of the model, two Delphi rounds were conducted using written opinions of stakeholders and questionnaire scores, and necessary changes were made to finalize the model. Regarding the status of each research dimension, t-test was used to examine the opinions of individuals' averages. A summary of the results of the one-sample t-test based on the average opinions of individuals is presented in Table 3. According to these results, basic literacy with an average of 2.73 had the highest importance (Table 3).

The Goodness of Fit (GOF) index is related to the overall fit of structural equation models. It allows the researcher to control the overall fit of their research model after fitting the measurement and structural parts. Trezona et al. [16] introduced values of 0.10, 0.36, and 0.25 as weak, moderate, and strong values for GOF. The results showed that the obtained GOF from the model was above 0.30, indicating an appropriate fit. Finally, using structural equation modeling techniques, the final health literacy model for patients with diabetes in the hospitals affiliated with the Islamic Azad University of Medical Sciences was drawn (Fig. 1).

## Results

Participants in the qualitative section of this study included 8 males and 10 females. Among them, 3 individuals were under the age of 39, 7 were aged between 40 and 45, 6 were aged between 46 and 50, and 2 were over 50 years old. They had work experience ranging from 10 to 30 years. Two participants were professors, 6 were associate professors, and 10 were assistant professors. Findings included six category, seventeen sub category including basic literacy (with sub category of reading and writing, listening, and comprehension), specialist literacy (with sub category of receiving disease-related information, understanding and evaluating disease-related information, decision-making and applying disease-related information, accessing nutritional information, processing nutritional information, decision-making and applying nutritional information), social literacy (with sub category of social interactions and establishing communications for learning), cultural literacy (with sub category of strengthening attitudes and insights, beliefs, and customs), media literacy (with sub category of print media literacy and electronic literacy), and diabetes management (with sub category of self-care behaviors, lifestyle modification, and self-efficacy in diabetes management and control), resulting in 78 items (Table 4).

**Table 1** Questionnaire “Health Literacy Education” Model • in your opinion, to what extent are the following items used in the field of health literacy education for patients with diabetes?

No	Criteria	very much	Much	medium	low	Very low
1	Ability to read written information related to diabetes					
2	Ability to read food labels					
3	Ability to read drug labels and attachments					
4	Ability to read consent forms					
5	Understanding the meaning and concept of signs and contents written on signboards in health care centers					
6	Ability to understand verbal information provided by doctors, nurses, pharmacists, insurers					
7	Ability to explain symptoms and physical conditions to specialists and caregivers					
8	The ability to obtain information about the symptoms of diabetes					
9	Ability to obtain information about the complications of diabetes					
10	Ability to obtain information about diabetes control					
11	Ability to obtain information about the prevention of complications of diabetes					
12	Ability to obtain information about risk factors in patients with diabetes					
13	Ability to comprehend and evaluate information related to the complications of diabetes					
14	Ability to comprehend and evaluate information related to the control of diabetes					
15	Ability to comprehend and evaluate information related to the prevention of disease complications					
16	Ability to comprehend and evaluate information related to the treatment of diabetes					
17	Ability to comprehend and evaluate risk factors in patients with diabetes					
18	Ability to apply information related to the symptoms of diabetes					
19	Ability to apply information related to the complications of diabetes					
20	Ability to apply information related to the control of diabetes					
21	Ability to apply information related to the prevention of diabetes complications					
22	Ability to apply information related to the treatment of diabetes					
23	Ability to obtain dietary information					
24	Ability to receive nutritionist’s consultation					
25	Ability to understand food pyramid information					
26	Ability to obtain information on nutritional value tables					
27	Ability to change diet according to blood sugar level					
28	The ability to distinguish between useful and harmful foods for diabetes					
29	Paying attention to the amount of sugar and fat in food					
30	Adapting diet plan to exercise					
31	skill of evaluating the necessity of following a diet					
32	Consider the importance of the consumption of fruits, vegetables and legumes					
33	Knowledge about the amount of calories and carbohydrates in food					
34	Appropriate arrangement of meals					
35	Membership in NGOs related to diabetes (diabetes association/special diseases association)					
36	Active interaction in NGOs related to diabetes (diabetes association/special diseases association)					
37	Participation in treatment decisions					
38	Encouraging family members to support the patient					
39	Ability to learn through individual counseling					
40	Ability to learn through group sessions					
41	Ability to obtain information from experts and caregivers					
42	Ability to strengthen social communication skills					
43	Trust in doctors and treatment specialists in the field of diabetes					
44	Respect and adherence to the recommendations of specialists and doctors					
45	paying attention to the recommendations about nutrition, health care and sports activities in field of prevention and treatment of diabetes					
46	Cultural and ethnic backgrounds affecting diabetes					
47	Cultural beliefs in the field of diabetes					
48	Spiritual attitude about diabetes					
49	The role of collective beliefs in diabetes control					
50	trust in co-treatment with traditional and modern approaches					

**Table 1** (continued)

No	Criteria	very much	Much	medium	low	Very low
51	Adjustment of traditional food orders with doctor's order					
52	Taking herbal and traditional medicines as prescribed by the doctor					
53	Ability to use brochures and pamphlets related to diabetes					
54	Ability to use educational booklets related to diabetes					
55	Ability to use educational posters related to diabetes					
56	Ability to use newspapers, journals and books related to diabetes					
57	Using the knowledge of mass media such as radio and television					
58	The ability to use social media and internet related to diabetes					
59	The skill of using medical programs in the media					
60	Media information transfer and exchange skills					
61	Ability to use technology to find disease-related information					
62	Eye, kidney and foot care skills					
63	Complying with personal hygiene					
64	Weight and blood pressure control skills					
65	Complying with prescribed diet					
66	Doing regular sports activities					
67	Regular use of medications as prescribed					
68	proper and timely injection of insulin if needed					
69	Ability to quit smoking					
70	The ability to adjust physical activity according to the condition of the disease					
71	Ability to modify food pattern					
72	Ability to manage stress					
73	The amount of social activity					
74	The skill of regular physical activity to achieve optimal blood sugar levels					
75	Ability to adjust food/medication/ and exercise plan according to blood sugar level					
76	perceive the need for regular discussions with a specialist about treatment					
77	Regular periodical visits by endocrinologists					
78	Teaching new and diverse methods of insulin injection and sugar control					

**Table 2** Demographic characteristics of samples of the quantitative section (n = 220)

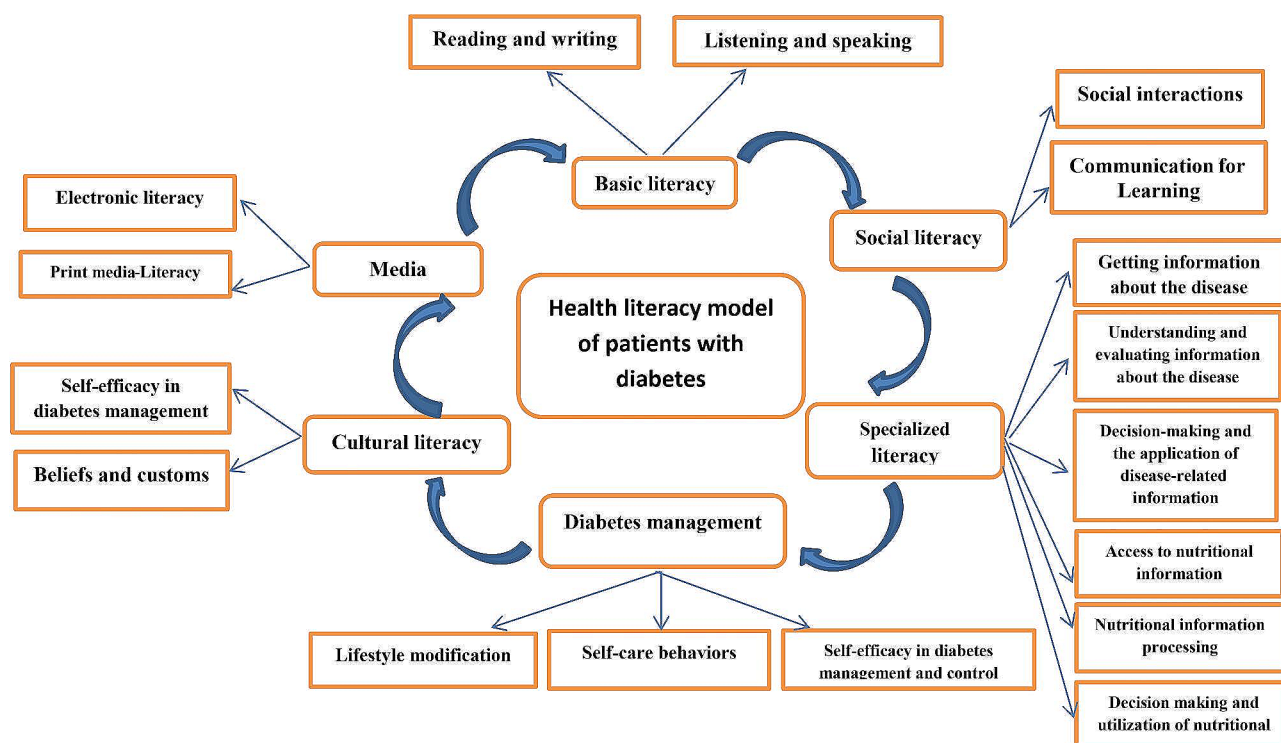
Variables and Categories	Ferquency	Percent age (%)
Age(years) 22–32	21	9.5
33–42	92	41.82
43–52	82	37.27
>53	25	11.36
Sex Female	136	61.82
Male	84	38.18
Current role Staff Nurse	121	55.00
Head Nurse	15	6.82
Supervisors Nurse	10	4.55
Internists and endocrinologists	74	33.64
Hospital Farhikhtegan	92	41.82
Amiralmoemenin	52	23.64
Bo Ali	76	34.55

Participants in the quantitative section of this study included 61.82% females and 38.18% males. Among them, 21 individuals were aged between 22 and 32, 92 were aged between 33 and 42, 82 were aged the age of 39, 7 were aged between 40 and 45, 6 were aged between 46 and 50, 25 were aged over 50 years old. Demographic characteristics of samples show in Table 2.

**Table 3** Summary of one-sample t-test results for research variables

Research variables	Mean	T test Value	P-value	95%confidence interval	
				Lower limit	upper limit
Basic literacy	2.73	14.15	0.00	0.45	0.60
Specialized literacy	2.51	8.08	0.00	0.29	0.48
Social literacy	2.40	13.68	0/00	0.46	0.61
Cultural literacy	2.20	19.00	0.00	0.64	0.78
Media literacy	2.21	13.87	0.00	0.51	0.68
Diabetes management	2.32	15.29	0/00	0.39	0.50
Total	3.38	13.15		0.42	0.58

The average opinion of the respondents about the dimension of basic literacy is 2.73, with t-test 14.15, specialized literacy of 2.51, with t-test 8.08, social literacy of 2.40, with t-test 13.68, cultural literacy of 2.20, with t-test 19, media literacy of 2.21, with t-test 13.87, diabetes management of 2.32, with t-test 15.29, and the significance level of 0.001 confirms the difference between



**Fig. 1** Conceptual model of health literacy education in patients with diabetes

**Table 4** Sub category and category of qualitative section

Category	Sub category
Basic literacy	Reading and writing
	Listening and speaking
Specialized literacy	Get information about the disease
	Understanding and evaluating information about the disease
	Decision-making and the application of disease-related information
	Access to nutritional information
	Nutritional information processing
	Decision making and utilization of nutritional information
Social literacy	Social interactions
	Communication for learning
Cultural literacy	Strengthening attitude and insights
	Beliefs and customs
Media literacy	Print media literacy
	Electronic literacy
Diabetes management	Self-care behaviors
	Lifestyle modification
	Self-efficacy in diabetes management and control

the averages in the current and optimal situation for 6 dimensions (Table 3).

Results were showed the output model of Smart PLS software, presenting a summary of the results related to the standardized factor loadings of the research variables. Path analysis results revealed the direct effect of

the basic literacy(  $\beta=0.729, t=5.729, p<0.0001$ ), specialist literacy( $\beta=0.712, t=5.538, p<0.0001$ ), social literacy ( $\beta=0.630, t=5.919, p<0.0001$ ), cultural literacy ( $\beta=0.605, t=8.509, p<0.0001$ )and diabetes management ( $\beta=0.654, t=7.159, p<0.0001$ ), on “Health Literacy Education” Model for patients with diabetes was significant (Figs. 2 and 3).

According to the result, the contribution of each factor to the health literacy of patients with diabetes was determined. The results showed that among the dimensions of health literacy in patients with diabetes, the basic literacy dimension with a coefficient of 0.729, the specialist literacy dimension with a coefficient of 0.712, diabetes management with a coefficient of 0.654, social literacy with a coefficient of 0.630, cultural literacy with a coefficient of 0.605, and media literacy with a coefficient of 0.535, respectively, had the highest contribution to the health literacy of patients with diabetes (Table 5).

**Discussion**

This research found that the “Health Literacy Education” Model of diabetic patients comprises six dimensions: *basic health literacy, specialized health literacy, social health literacy, cultural health literacy, media health literacy, and diabetes management*, which is in agreement with the findings of health literacy model of patients with hypertension of Afshar Badr et al. [10]. However, due to the nature of diabetes disease and in order to increase

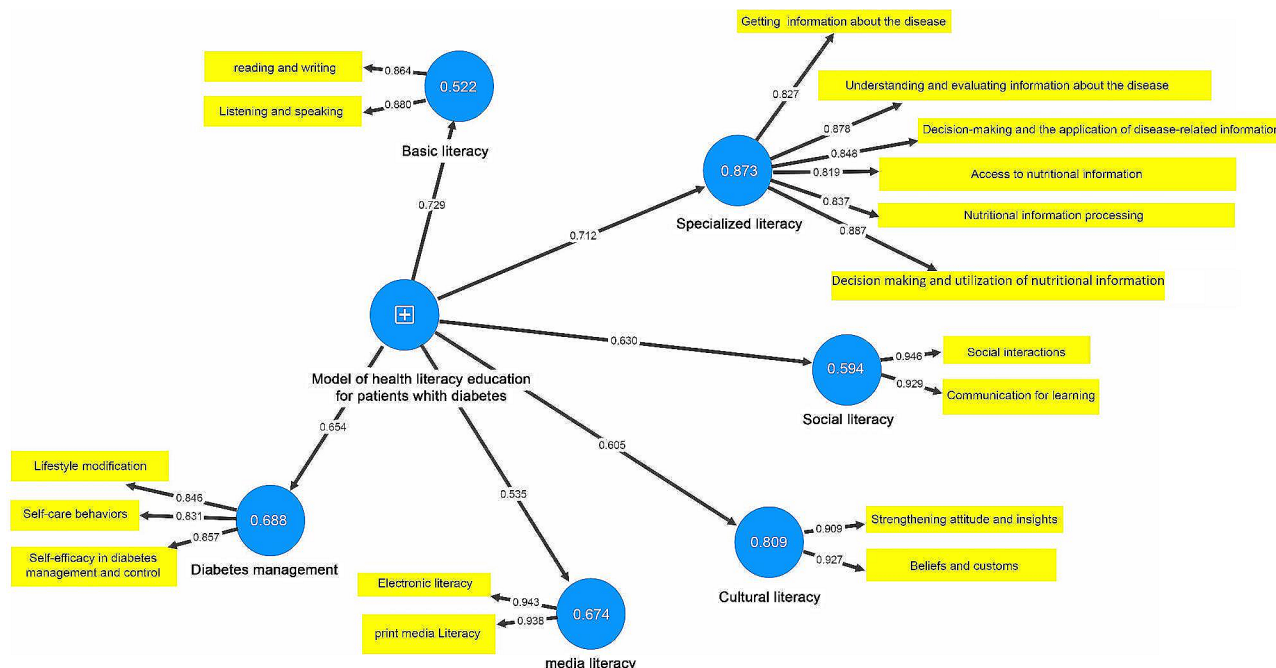


Fig. 2 Partial least squares pattern (measurement pattern)

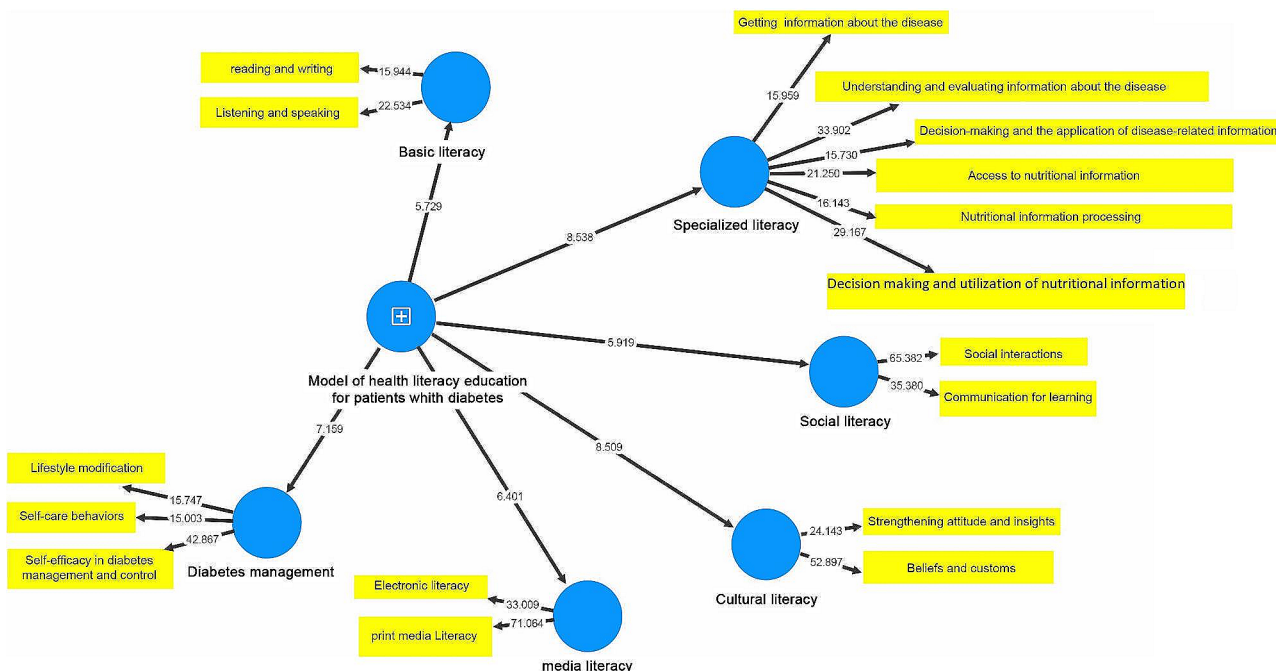


Fig. 3 t-value statistics of the research model with the bootstrap technique

the quality and efficiency of the health literacy model in diabetic patients, in addition to the components of Afshar Badr et al., two components of media literacy and diabetes management have also been added to the model discussed in this research. Also, another difference between the model of this research and the model of Afshar Badr et al. is the use of specialized literacy instead

of the cognitive literacy, which has helped to improve the quality of the model of this research. Among these dimensions, the highest coefficient (0.729) pertains to the *basic health literacy* dimension. Two components were identified for this dimension, with reading and writing receiving the most attention from experts and specialists. Basic health literacy refers to skills and strategies related

**Table 5** Structural model of health literacy education for patients with diabetes

Dimensions affecting the education of health literacy of patients with diabetes	Path coefficient	T coefficient	Effect size	P-value
Basic literacy	0.729	5.729	0.969	0.001
Specialized literacy	0.712	8.538	0.733	0.001
Social literacy	0.630	5.919	0.673	0.001
Cultural literacy	0.605	8.509	0.721	0.001
Media literacy	0.535	6.401	0.851	0.001
Diabetes management	0.654	7.159	0.820	0.001

to reading, speaking, writing, and interpreting numerical figures. In the study by Afshar Badr and colleagues [10], basic health literacy was introduced as an influential factor with components of reading, writing, and knowledge. This concept was consistent with definitions related to basic health literacy. Additionally, this section was aligned with the research of Zeidi and colleagues [17] and Sharbatian and Azarnia [18]. Researchers such as Osborne and Dodson [16], and Sharbatian and Azarnia [18] believed that having literacy in reading and writing is not necessarily effective in the qualitative development of basic literacy and should not be considered as an axis, therefore, it was inconsistent with the results of this research.

For the specialized health literacy dimension with a coefficient of 0.712, six components were identified. Among these, the component of decision-making and the use of disease-related information received the most attention from experts and specialists. This finding is consistent with the results of researchers such as Trezona, Dadson, and Osborne [19], Mohammadi and colleagues [20], Zarcadoolas and colleagues [21], and Tseng and colleagues [8]. Salemi and colleagues [22] and Fadaiyan Arani and colleagues [23] mentioned in their research that the ability to utilize information related to diabetes symptoms and nutritional behaviors constitutes a significant part of specialized health literacy, which aligns with the findings of this study.

For diabetes management with a coefficient of 0.654, the components of self-care behaviors, lifestyle modification, and self-efficacy in diabetes management and control were identified. Ahmadi and colleagues [24] demonstrated in their study that self-efficacy is the strongest predictor of self-care behaviors in patients with diabetes, which is consistent with the findings of this research. The results of studies by Zeidi and colleagues [17] showed that lifestyle modification can contribute to the health of individuals and enhance self-care behaviors. The findings of the present study are in line with the research by Moshavvegh and colleagues [25], Shafiei and colleagues [26] and Macpherson and colleagues [27].

For the social literacy dimension with a coefficient of 0.630, two components were identified: social interactions and establishing connections for learning. Almgibal and colleagues concluded that social literacy is one of

the necessary and influential skills for educating patients with diabetes health literacy and emphasized its role in establishing effective communication with others [5]. The findings of this study are consistent with the results of research by Afshar and colleagues [28], AhmadiPour and colleagues [29], and Mogessie [30].

For the cultural literacy dimension with a coefficient of 0.605, components such as enhancing attitudes and insights, beliefs, and customs were identified. A study conducted at Valencia University in Spain titled "Post-Cultural" indicates that in today's interconnected world, the development and enhancement of cultural literacy is one of the essential tasks of educational institutions [31]. Cultural literacy is an acquirable and teachable ability that translators of any language, regardless of their nationality and culture, can attain through a conscious learning process [32]. This finding is consistent with the studies conducted by AhmadiPour and colleagues [29] and Afshar Badr and colleagues [10]. In Kamali et al.'s research, it mostly refers to self-efficacy in the management and control of diabetes, and cultural literacy is mentioned as an aid carrier to promote health literacy, which will be inconsistent with this research [33].

For the media literacy dimension with a coefficient of 0.535, the components include print literacy, electronic literacy, and according to the findings of studies by Salemi et al. [22], Kamali and Sarafzadeh [33], and Raeisi Nafchi et al. [34], they highlighted that the ability to use virtual spaces related to diabetes plays a significant role in media literacy and ultimately contributes to health literacy.

#### Limitation and strengths

Since a qualitative approach was used in the first stage of the research, this method has some strengths and weaknesses. Among its strengths are detailed investigation and providing in-depth information on the subject of the research. Another strength of this work is the study of the two dimensions of electronic literacy and the diabetes management that has not been studied in previous researches. But due to the small size of research samples, its generalizability is limited. In the quantitative stage, due to the large volume of items, there was a possibility of the participants' inaccuracy. Of course, this issue was solved to a large extent by giving enough time to the



participants and frequent references of the researcher and emphasizing the importance of accurate answers.

## Conclusion

Finally, with the understanding obtained from the dimensions and components and their respective impact, In regard with "Health Literacy Education" model has a good fitness, it is recommended that this model will be applied in different settings such as hospitals in order to improving the health level of patients. The results can also show planners and policymakers that can be used to all the requirements of diabetic patient education and make proper planning by taking into account all the necessary things for patient education.

## Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12913-024-11382-5>.

Supplementary Material 1

Supplementary Material 2

## Acknowledgements

This article is extracted from a PhD thesis in Educational Management at Islamic Azad University, Central Tehran Branch, Faculty of Psychology and Educational Sciences, Department of Educational Management and Higher Education, approved with ethics code IR.IAU.CTB.REC.400.035. The research was conducted in hospitals affiliated with the Islamic Azad University Tehran Medical Sciences. In the course of this research, the management and staff of these hospitals have provided the utmost cooperation. Therefore, I extend my sincere appreciation and gratitude to all officials and staff of these hospitals.

## Author contributions

Tahereh Bano Borzoui wrote the main manuscript text. Fereshteh Kordestani and Tahereh Ashktorab had supervisor role. Yalda Delgoshaei and Baharak Shirzad Kebria had advisor role. All authors reviewed the manuscript.

## Funding

No funding was received by any of the authors.

## Data availability

Data is provided within the manuscript or supplementary information files.

## Declarations

### Ethics approval and consent to participate

This study has been approved by the ethics committee of Islamic Azad University, Central Tehran Branch, Faculty of Psychology and Educational Sciences, Department of Educational Management and Higher Education, approved with ethics code IR.IAU.CTB.REC.100.035. Written informed consent was obtained prior to data collection. All methods were carried out in accordance with relevant guidelines and regulations.

### Consent for publication

Not Applicable.

### Competing interests

The authors declare no competing interests.

Received: 8 April 2024 / Accepted: 31 July 2024

Published online: 05 August 2024

## References

1. Saeedi P, Petersohn I, Salpea P, Malanda B, Karuranga S, Unwin N, et al. Global and regional diabetes prevalence estimates for 2019 and projections for 2030 and 2045: results from the International Diabetes Federation Diabetes Atlas. *Diabetes Res Clin Pract Elsevier*. 2019;157:107843.
2. Adams J, White M, Sorour M, Nasser G. Structural Model of Quality of Life in Patients with Type II Diabetes Based on Health Beliefs and Self-efficacy Mediated by Self-management Behaviors. *Journal of Diabetes Nursing*. 2020 Oct 1:1237–49. *Br J Sports Med [Internet]*. 2003;37(2):106 LP-114. <http://bjsm.bmj.com/content/37/2/106.abstract>
3. Khamseh ME, Sepanlou SG, Hashemi-Madani N, Joukar F, Mehrparvar AH, Faramarzi E, et al. Nationwide Prevalence of Diabetes and Prediabetes and Associated Risk factors among Iranian adults: analysis of data from PERSIAN Cohort Study. *Diabetes Ther Res Treat Educ Diabetes Relat Disord*. 2021;12(11):2921–38.
4. Mehrtak M, Hemmati A, Bakhshzadeh A. Health Literacy and its Relationship with the medical, dietary Adherence and exercise in Patients with Type II Diabetes mellitus. *J Heal Lit [Internet]*. Assistant Professor of Health Services Management, School of Health Management and Information Sciences, Ardabil University of Medical Sciences, Ardabil, Iran; 2018;3(2):137–44. [https://literacy.mums.ac.ir/article\\_11516.html](https://literacy.mums.ac.ir/article_11516.html)
5. Almigbal TH, Almutairi KM, Vinluan JM, Batais MA, Alodhayani A, Alonazi WB, et al. Association of health literacy and self-management practices and psychological factor among patients with type 2 diabetes mellitus in Saudi Arabia. *Saudi Med J Saudi Med J*. 2019;40(11):1158.
6. AbbasZadeh Bazzi M, Karimiaval M. Relationship between health literacy and self-care behaviors in diabetic patients type II referred to the center of diabetes control and prevention in Zabol. *J Heal Lit. Mashhad University of Medical Sciences. Iranian Association of Health ...*; 2018;3(1):10–9.
7. Olorunfemi O, Health, Literacy. Medication belief, and demographic factors as correlates of Medication Adherence in Person with Diabetes Mellitus. *J Diabetol Vol*. 2023;14(2):101.
8. Tseng H-M, Liao S-F, Wen Y-P, Chuang Y-J. Stages of change concept of the transtheoretical model for healthy eating links health literacy and diabetes knowledge to glycemic control in people with type 2 diabetes. *Prim Care Diabetes Elsevier*. 2017;11(1):29–36.
9. Organization WH. Health literacy development for the prevention and control of noncommunicable diseases: volume 4: case studies from WHO national health literacy demonstration projects. World Health Organization; 2022.
10. Afshar Badr Z, Shirzad Kebria B, Khosravi P, Korsestani F. Presenting a health literacy model for hypertensive patients in Shahid Rajaei Heart Hospital. *J Healthc Manag Sci Res Branch Islamic Azad Univ*. 2021;12(1):103–14.
11. Guo X, Zhai X, Hou B. Adequacy of health literacy and its effect on diabetes self-management: a meta-analysis. *Aust J Prim Health CSIRO Publishing*. 2021;26(6):458–65.
12. Jones SC, Health, Literacy. Self-Management and Health outcomes among adults with type 2 diabetes Mellitus. Northcentral University; 2022.
13. Nair SC, Al Saraj Y, Sreedharan J, Vijayan K, Ibrahim H. Health literacy levels in patients with type 2 diabetes in an affluent Gulf country: a cross-sectional study. *BMJ Open Br Med J Publishing Group*. 2023;13(2):e069489.
14. Guba EG, Lincoln YS. Fourth generation evaluation. Sage; 1989.
15. Lawshe CH. A quantitative approach to content validity. *Pers Psychol Lond*. 1975;28(4):563–75.
16. Trezona A, Dodson S, Osborne RH. Development of the organisational health literacy responsiveness (Org-HLR) framework in collaboration with health and social services professionals. *BMC Health Serv Res Springer*. 2017;17:1–12.
17. Zeidi IM, Morshedi H, Otaghvar HA. A theory of planned behavior-enhanced intervention to promote health literacy and self-care behaviors of type 2 diabetic patients. *J Prev Med Hyg Pacini Editore*. 2020;61(4):E601.
18. Sharbatyian M, Azarnia F. Study of health literacy components of citizens of Mashhad based on health-oriented approach. *MOTALEATE FARHANGI-EJTMAEI KHORASAN*; 2021.
19. Trezona A, Dodson S, Osborne RH. Development of the Organisational Health Literacy Responsiveness (Org-HLR) self-assessment tool and process. *BMC Health Serv Res BioMed Cent*. 2018;18(1):1–10.
20. Mohammadi NK, Zali A, Zeinivand M, Rezaei Z, Teymouri M, Karimy MJ et al. Scoping review of Literacy and Health status in Iran, and their link in local researches: successes, challenges, and the way ahead. *J Heal F*. 2021;9(3).
21. Zarcadoolas C, Pleasant A, Greer DS. Advancing health literacy: a framework for understanding and action. Volume 17. Wiley; 2006.

22. Salemi A, Khaniki H, Sabouri Khosrowshahi H, Hashemi S. The relationship between Social Media Consumption by the users and Media Literacy (in the domain of Tehran's Health). *J Interdiscip Stud Commun Media IRIB Univ*. 2021;4(12):5–36.
23. Fadaian Arani E, Amin Shokravi F, Tavakoli Ghouchani H. The relationship between health literacy and nutrition behaviors in patients with type 2 diabetes mellitus. *J North Khorasan Univ Med Sci J North Khorasan Univ Med Sci*. 2018;9(4):49–55.
24. Ahmadi A, Niknami S, Ghaffari M. Determinants of self-care behaviors among people with type II diabetes: a one-decade systematic review. *J Diabetes Nurs J Diabetes Nurs*. 2021;9(3):1604–21.
25. Moshavvegh S, Goodarzi N, Emamipour S, Sepah Mansour M. Development of a health model in patients with type 2 diabetes based on psychological toughness, health literacy, self-efficacy and health beliefs mediated by self-management behaviors and social support. *J Res Behav Sci J Res Behav Sci*. 2021;19(1):24–34.
26. Shafiei H, Nasiri S. The role of health literacy, psychological well-being and self-efficacy in prediction the quality of life of patients with type 2 diabetes. *Heal Psychol Payame Noor Univ*. 2020;9(33):7–22.
27. MacPherson H, Elliot B, Hopton A, Lansdown H, Birch S, Hewitt C. Lifestyle advice and self-care integral to acupuncture treatment for patients with chronic neck pain: secondary analysis of outcomes within a randomized controlled trial. *J Altern Complement Med Mary Ann Liebert Inc*. 2017;23(3):180–7. 140 Huguenot Street, 3rd Floor New Rochelle, NY 10801 USA.
28. Afshar HS, Doosti M. Investigating the impact of job satisfaction/dissatisfaction on Iranian English teachers' job performance. *Iran J Lang Teach Res ERIC*. 2016;4(1):97–115.
29. Ronak Ahmadipour M, Moazzami, Sadiqeh Tutian IK. Identifying the systematic elements of promoting cultural literacy; subject of study: Iran's education. *J Sociol Res*. 2020;14(3).
30. Mogessie HM, Gebeyehu MA, Kenbaw MG, Tadesse TA. Diabetic health literacy and associated factors among diabetes mellitus patients on follow up at public hospitals, Bale Zone, South East Ethiopia, 2021. *PLoS one*. Volume 17. Public Library of Science San Francisco, CA USA; 2022. p. e0270161. 7.
31. Shliakhovchuk E. After cultural literacy: New models of intercultural competency for life and work in a VUCA world. *Educ Rev Taylor Francis*. 2021;73(2):229–50.
32. Jamali M, Sadeghzadeh Ghamsari A, Salehi Amiri R, Farmahini Farahani M. Investigating the current Situation of the management of cultural literacy Promotion in the Educational System of Iran. Volume 8. *Socio-Cultural Strateg*. Institute for Strategic Research Expediency Council; 2020. pp. 31–51. 4.
33. Kamali M. Assessment of Health Literacy among patients with diabetes: development of a model for the Improvement of Health Literacy. *Iran Red Crescent Med J*. 2021;23(10).
34. Raeisi Nafchi A, Danaei A, Zargar SM. Explaining the dimensions and components of media health literacy with a critical approach: a grounded theory. *Payesh (Health Monit. Payesh (Health Monitor))*. 2020;19(2):197–203.

### Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.