

Factors Affecting the health literacy Status of Patients with type 2 Diabetes through Demographic Variables: A Case Study from Iran

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Research

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Abstract

Background

Health literacy is the ability of a person to acquire the process, understand the necessary health information, and make the health services needed for conscious health decisions. Low levels of health literacy can impair the healthcare and treatment of chronic diseases such as diabetes. Besides, diabetes is the most common metabolic disorder that affects patients' quantity and quality of life. Health literacy means cognitive and social skills, with the motivation and ability to understand and use health information, helping individuals maintain and promote their good health. This study focused on determining the factors that affect the health literacy status of type 2 diabetes patients through the role of the demographic variables.

Methodology

This descriptive-analytical research survey recruited a sample based on 280 diabetic patients at the Diabetes Research Center of Ayatollah Taleghani Hospital in Kermanshah in 2020 through a cross-sectional study design. This study selected the diabetes patients using the technique of a simple random sampling and study applied the tools of demographic information questionnaire and the functional, communicative and critical health literacy scale (FCCHL) to collect data of diabetes patients. This study used the SPSS version-23 on the received data sets to perform statistical analysis, including t-test, ANOVA, and multiple regression, to predict the factors affecting health literacy among diabetes patients.

Results

The results showed the mean age of the participants 55.80 ± 13.04 of diabetes patients. The mean and standard deviation of the health literacy score in diabetic patients indicated 2.70 ± 0.44 , respectively. The findings specify that there is a statistically significant relationship between health literacy, gender, education, occupation, income, and place of residence. The most robust predictors of health literacy are income variables ($\beta=0.170$), age ($\beta=0.176$), and employment ($\beta=0.157$).

Conclusion

The results of this research study specified that the health literacy rate of individuals with diabetic type 2 is an average level. The potential communicative and critical health literacy influence essential for communication and education for diabetes patients in the settings of the primary health care system. The findings indicate that communicative and critical health literacy related to patients' management and patients with functional health literacy looks passable in this study. The health information specialists need to recognize diabetes patients' demographic variables according to their needs. Health professionals' abilities to deliver health education resources seems critical, as it would improve health-related behavior by increasing literacy level.

Background

Health literacy (HL) determines the level of degree of how an individual can obtain, consume, and understand the necessary health services information to make suitable health decisions [1]. World Health Organization described that health literacy refers to social and cognitive skills, which states individuals' motivational level and personal capacity for accessing, understanding, and consuming the health information to promote and maintain health [2]. The focus of health literacy is beyond one's ability to read, identify, and absorb health information in text words. Health literacy explains the combination of personal data and skilled competence and how people use it to make appropriate health decisions. This proficiency helps seek, understanding, and read health-related information, which is useful for acquiring health information to improve the status of health and healthcare system management [3].

There are various dimensions of health literacy. Nutbeam provided a transparent, workable, and robust framework of health literacy based on three levels, such as critical, communicative, and functional [4]. In reality, functional health literacy is the basic level, such as individual writing and reading skills, which are useful for practical functionality in day-to-day situations [4]. Communicative health literacy determines an advanced level of individuals' literacy skills, allowing people to extract information and meaning derived from the various communication channels by putting them into practice to change the conditions. Critical health literacy refers to highly advanced skills, which help analyzing information to use knowledge to gain more control over events of individuals' lives and day-to-day circumstances [4, 5].

Health experts have paid more attention to the health literacy concept during the past few decades. They have emphasized personal responsibility to maintain and promote health literacy and self-management of chronic diseases and diabetes type 2,4 and 5 [6, 7]. A survey conducted in the US showed that more than 33% of individuals did not have appropriate health literacy [5]. Earlier study results indicated that 31% of the Iranian diabetes patients had adequate health literacy [8]. Health experts claim that health literacy is the silent epidemic as people with less health literacy rate have declining self-confidence, and they feel embarrassed to disclose their limited capacity to policymakers, health managers to control their chronic disease status [3]. Health literacy's primary objective is to increase health awareness and disease status among people, which helps achieve good results [1]. Besides, people with chronic diseases (such as diabetes, heart disease, and high blood pressure) and inadequate health literacy know less about the disease and experience more adverse results than those with more top health literacy levels [9].

The Institute of Medicine's committee working on health literacy described that HL's concept is individuals' concern who is involved in the protection and health promotion, early screening and disease prevention strategy, policymaking, and health care maintenance. The skills of health literacy are necessary to discuss and dialogue concerning information related to health promotion and protection. It helps in chart interpretation, decision-making to participate in research studies, applying medical tools and equipment for individual or family health care, including time measurement, medicines dosage, or voting on environmental and health issues [3]. The committee of the Medicine Institute working the concept of individuals' health literacy explained that the HL concept specifies individuals' concern for

their health promotion and health protection. Besides, the health literacy committee of the Medicine Institute described that health literacy is the concern of each individual involved in the protection and promotion of health, early screening, and prevention of diseases, health care policymaking, and maintenance.

Health literacy might influence the ability of patients to understand mathematical notions, such as risks and probability. Health literacy skills are critical for patients' understanding of facing chronic diseases. Health literacy might influence the ability of patients to understand mathematical notions, such as risks and probability. Health literacy skills are critical for patients' understanding facing chronic diseases [10]. Health literacy might influence the ability of patients to understand mathematical notions, such as risks and probability. Health literacy skills are critical for patients' understanding of facing chronic diseases. Expertise skills are useful for medicines dosage, time calculations, reading, as well as interpreting facts of nutrition written on nutrition labels. It helps in calculating cholesterol and blood sugar levels in patients [1]. If individuals have limited skills in health literacy for reading and proficiency, they are incompetent in understanding the reasons for their problems and diseases. As a result, such people are not proficient or skilled in managing their lifestyle factors, such as exercise and diet, to improve their health [10].

Education does not mean acquiring appropriate health literacy skills, which enables people to take care of their health promotion and protection effectively [11]. Older adults and patients with chronic health conditions, such as Asthma, Diabetes, Hypertension, and Cardiovascular diseases, typically have limited health literacy [12, 13]. Patients with less health literacy and chronic diseases have more tendency to have a higher risk of hospitalization, less drug compliance, and more significant problems in interpreting and reading drug labels [3, 14]. Many factors affect health literacy in patients, such as their gender, age, occupation, education level, and lifestyle behaviors. These elements include a diet plan, smoking, physical activities, and individuals' access to health care and protection services [3]. Health researchers claim that inadequate health literacy in diabetes education is one of the most significant vulnerabilities worldwide. Health protection literacy focuses on how effectively patients are skillful in attaining the necessary health information to process this knowledge to manage and control chronic diseases [15]. The most specific critical importance is how patients comprehend instructions related to the physician's prescribed medications [5]. Accordingly, in diabetes patient care, health literacy affects the consequences of diabetes health care through diabetes patients' and physicians' relationships and self-care factors [16], which are closely associated with each other [1]. Because patients with low literacy rate have less control of the disease, and the disease complications in this group are more serious, this is also due to the importance of diabetes in Iran. The impact of health literacy on quality of life and diabetes control, taking into account this study. The data was collected from the beginning of the Iranian coronavirus crisis. In this study, we investigated the factors that affect the health literacy status of type 2 diabetes patients and the role of demographic variables.

Type II diabetes

The patients of diabetes find it difficult to face this chronic disease as diabetes self-management involves a complex, lifelong, and poses challenges throughout patients' lives [17]. Diabetes is a lifelong chronic disease, and increasingly it has become a public health problem around the world. The statistics showed that over 425 million people were confirmed patients of diabetes by 2017, and according to prediction, there will be over 693 diabetes patients worldwide by 2045 [18]. Another study projected that there would be over 300 million diabetes patients by 2025 [19]. By 2030, almost 366 million individuals' would have diabetes type 2 Mellitus [20]. In Iran, diabetes types 10.8, 5.8, 3.0, and 14.0% prevail in men. Besides, and 14.0, 7.0, 3.0, and 19.4% exist in women with age group 25 to 34, 35 to 44 to 45 to 54 and 55 to 64 years, respectively [21]. According to estimation, Almost 11.40% of adults in Iran have diabetes mellitus. It would increase to 9 million Iranian by 2030, who would face the risk of developing diabetes mellitus [22]. According to statistics, almost 80% of diabetes patients encounter deprived and inadequate healthcare facilities in developing countries [23].

Diabetes is a lifetime chronic disease, and it leads to long-lasting involved complications when blood glucose elevates consistently [24]. Although suffering from diabetes influences all aspects of the patients' lifecycle. However, with the performance of self-care activities aimed at controlling symptoms and avoiding long-term complications, patients can lead a healthy life. [25]. Achieve the goal of targeted therapy. It is necessary to monitor the level of glucose in the blood regularly, strictly adhere to lifestyle measures and medications dosage, which can help continue to prevent health complications. Achieving treatment goals also requires a high ability to survive social and social challenges related to illness and diabetes support services associated with dynamic consumption [19]. Multiple factors related to diabetes patients can affect glycemic control, helping prevent and treat chronic diabetes diseases [26]. Numerous past studies have shown that the high prevalence of uncontrolled diabetes shows links to multiple health factors associated with poor blood sugar control around the world [27–29]. Patients with type 2 diabetes (T2D) have complex needs for their health literacy. They just need to manage their diet and control their blood sugar for the rest of their lives. Lifestyle changes are not easy, so patients with type 2 diabetes must learn self-care management and high drug compliance, including the ability to read, analyze, and interpret nutrition and drug labels [14].

A study indicated that individuals with limited health literacy levels encounter more health management problems in their life [14]. The past literature evidenced that diabetes patients with low health numeracy faced a higher level of BMI and poor glycemic control [10, 18]. Such patients cannot smoothly manage their diabetes and face difficulties with diseases throughout their life [30]. An earlier study indicated that poor health literacy leads to a higher hospitalization rate among people with diabetes [30]. There is compelling evidence that there is a close association between poor health of diabetics, poorly managed disease, poor self-care, and a low level of health literacy [30]. Adequate health literacy level helps diabetes patients to manage and control the insulin doses [14]. They are likely to prone to interpreting by reading labels of medicines correctly [31]. Other factors that may distress an individual's information, skills and knowledge about health literacy include cultural and social demographics factors, and individuals' lifestyle and environmental impacts. Patients' education level, age, race, and income level can affect an individual's ability to read, understand, and use health information to make correct health decisions.

Patients limited communication skills also jeopardize their health literacy level, which leads to various problems in protecting and managing their diseases. This limitation influences individuals' ability to navigate the healthcare system that paves the way for the patients to understand health-related matters, communicate with the providers of the health care system, clearly explain symptoms, and accurately fill out personal and health history forms [3].

Methods

Study design

This study employed a cross-sectional descriptive-analytical design from January to 30 July 2020. The study included a non-probabilistic sample of 280 patients with diabetes type 2 (T2D) from Diabetes Research Center of Ayatollah Taleghani Hospital in Kermanshah. The survey method consisted of patients of a statistical sample visiting the health centers, and the study applied a simple random sampling method to collect the required data sets. According to the past studies conducted and using Cochran's formula and considering $\alpha = 0.5$ and $d = 0.5$, this survey included a sample size of 280 diabetes participants.

Inclusion and Exclusion Criteria

This study set inclusion criteria for the respondents and recruited only those participants diagnosed with diabetes type 2 with the age range of 20 years and more during the last year. The authors included diabetes patients in these patients with sufficient language skills by receiving written informed consent. Patients with problems, including mental, cognitive, or physical health issues complications, which might influence their capability to perform the activities of diabetes self-management, were excluded. These health problems include blindness, end-stage renal disease, and limb amputation, as it could prevent patients' from completing the study questionnaire.

Instrument and data collection

The authors collected the required statistical data sets from the patients of diabetes who attended Primary Health Care centers and clinics. The study questionnaire consisted of two parts to receive the data from the respondents.

Demographic and Socioeconomic Factors

The study respondents' sociodemographic included their gender, age, education, marital status, occupation, monthly income levels, residential areas, medical treatment types, diabetes disease duration, history of diabetes in patients' families, and smoking, abdominal obesity, and diabetes complications.

Questionnaire and measurements

Health Literacy Questionnaire (FCCHL): This study has incorporated the translated version of the instrument in the Persian language. Ishikawa translated the Functional Communicative and Critical

Health Literacy scale (FCCHL) in Persian to measure the health literacy skills among diabetes patients with type 2 disease [32]. There are 14 items on this survey form with sub-scales of cumulative, functional, and critical levels of the disease in patients. The questionnaire shows the 4-points Likert-scale to evaluate the disease condition in patients, such as (4 = often, 3 = sometimes, 2 = rarely, 1 = never). The functional sub-scale has 5, cumulative sub-scale 5, and a critical subscale has 4 questions, respectively. The functional subscale is useful for receiving the patients' feedback, and they rate how often they require help from someone to read medication leaflets or the physician's instructions in the hospitals or pharmacies. The cumulative health literacy subscale helps to ask diabetes patients to rate how often they need information from different sources after diagnosed with diabetes disease. The critical health literacy subscale is useful for diabetes patients to evaluate how often they consider the credibility of the received information or how frequently they check whether the collected data is correct. The functional health literacy scores were reversed, and the higher score levels indicated higher levels of health literacy among diabetes patients.

The past literature showed that the Japanese diabetes patients used the critical, cumulative, and functional subscales, and the findings (Cronbach's $\alpha = 0.69, 0.81, \text{ and } 0.85$) indicated appropriate consistency of each scale. The higher scores on the scale showed a higher health literacy level [32]. The Persian version translated scale showed the Cronbach's alpha value ($\alpha = 0.82$) and it indicated an acceptable score for the subscale critical ($\alpha = 0.76$), cumulative ($\alpha = 0.80$) and functional ($\alpha = 0.91$), respectively. The reliability of the test-retest coefficient indicated a satisfactory outcome of $0.85(p < 0.01)$. The study evaluated the psychometric properties of the questionnaire. The findings of this survey affirmed that all the items of the FCCHL scales are a valid and reliable measure of the Iranian diabetes patients' health literacy skills, and these subscales are widely applicable to measure the various skills of health literacy among patients. The internal consistency was satisfactory for all the subscale of health literacy ($\alpha = 0.82$) and showed a satisfactory degree of scale-items consistency for each subscale ($\alpha = 0.76$ and 0.91). The past study showed similar results for the original scale of FCCHL [32] and the Dutch version for all the subscale items, respectively [33].

The study of Raisi et al. also confirmed the Persian version translated scale and its validity and reliability [34]. The findings showed that the Cronbach's alpha was 0.82 and a re-test value 0.85 . Besides, the Cronbach's value ($\alpha = 0.81$) in the current study was also appropriate to determine the reliability of the questionnaire. The authors received the consent from the study respondents and provided 15–20 minutes session to fill each questionnaire to collect the desired data sets duly.

Data Analyses

The applied descriptive statistics for data analysis to draw the study results from the received data sample of diabetes patients. The study performed various tests and reviews, including frequencies, percentages, mean and standard deviation scores, and t-test, an inferential statistics independent analysis to compare the scores of means of the two independent groups based on the quantitative variable of this model. The investigations covered patients' age, gender, residential location, family history with diabetes disease complications, and abdominal obesity. The study model performed ANOVA

test to compare the mean (M) scores based on the three or more groups associated with a quantitative variable. The ANOVA test covered diabetes patients' age, gender, education level, occupation, average monthly income, residential location, type of received treatment, duration of facing diabetes disease, smoking, and eating habits. In further steps, the investigators applied the multiple regression analysis based on the demographic variables to predict the degree of health literacy skills among diabetes patients. The investigators performed all the tests by using the SPSS software version-23 (SPSS Inc. of Chicago, IL, United States of America) at 0.05 level of the significance ($p < 0.001$).

Ethics statement

The principal investigators conducted this study in accordance with the Helsinki Declaration and followed the ethical standards for the scientific research procedures. The ethical committee from the school of health education and promotion of the Iran University, Tehran approved the protocol of this study to execute the survey for desired data sets of diabetes patients. The investigators informed and educated the study participants and told them about the objectives of this research before the execution of the survey. The authors assured them all the information is strictly confidential. The authors received the signed consent forms from the respondents' and investigators eliminated those participants who did not duly fill the forms. The ethical committee approved to include those participants who could not sign; however, their relatives or the data collectors had the permission to sign at the request of the study participants.

Results

Characteristics of the Study Population

Concerning the characteristics of the participants under study, the proportion of the female diabetes patients was 53.2%, and male patients were 46.8%, respectively. The participants' age ranged from 23 to 88 years old, and the scores of the standard deviation of the research units' age indicated 55.80 ± 13.04 years. Among the age group patients, the highest frequency was in the age group (69 – 60 years), which was 26.1%, and the lowest value was in the age group of (18–29) years. Besides, the married participants made up 76.8% of the population, and the rest were divorced, widowed, or single. Participants' education level indicated that 33.6% are illiterate, 41.8% are undergraduate degree holders, 12.5% have a diploma, and 12.1% have higher than a diploma. Besides, 48.2% of the participants are the homeowners, 17.5% are workers, 8.6% are government employees, 12.9% are self-employed, and 12.9% are retired workers. The highest income level (39.6%) of the respondents was between one 1 to two million Iranian Toman, and 30% of the participants had a minimum income level of less than one million Toman. Regarding the residential status, 95 percent of people live in cities, and 5% live in the villages. In terms of diabetes treatment, 22.1% of the diabetes participants used diet, 18.2% used insulin, 57.1% used contraceptives (pills), and 2.5% used insulin along with tablets to control the diabetes disease. In terms of the diabetes disease duration, 50% of abdominal obesity lasts less than five years, 29.3% of the patients between 6–10 years old have abdominal obesity, and 168 patients have 60% of abdominal obesity.

Besides, smokers are 16.8% of participants, pre-smokers are 5%, and patients who never smoke are 75.7% of the population. See Table for further details.

The results indicated 2.70 ± 0.44 means (M) and standard deviation scores of diabetes patients' health literacy with type 2, which specified the optimal status. Table 2 illustrates the indicators of health literacy related to subscales of cumulative, critical, and functional health literacy among diabetes patients' groups. Independent t-test results show that men's health literacy is higher than that of women ($t = 2.76$, $p = 0.027$). Besides, people living in urban areas have higher health literacy than rural areas ($t = 2.71$, $p = 0.023$). The one-way analysis of the variance (ANOVA) shows a significant relationship between health literacy and education, employment, and income ($p = 0.05$). Table 3 shows β coefficients results of the multiple regression analysis and the income variable ($\beta = 0.170$), age ($\beta = 0.176$) and employment variable ($\beta = 0.157$), which are the most predictive of the health literacy of diabetic patients. All these effect coefficients are showing statistically significant levels.

Table 1
Sample characteristics (n = 280)

Characteristic	Description	No. (%)	HL mean (sd) ^a	Statistical test	P-value
Gender	Male	131 (46.8%)	2.76 ± 0.39	Independent t-test	0.027
	Female	149 (53.2%)	2.64 ± 0.48		
Age 55.80 ± 13.04	18–29	4 (1.4%)	2.60 ± 0.19	One-way ANOVA	0.361
	30–39	31 (11.1%)	2.67 ± 0.48		
	40–49	62 (22.1%)	2.61 ± 0.45		
	50–59	65 (23.2%)	2.67 ± 0.43		
	60–69	73 (26.1%)	2.74 ± 0.43		
	70–79	34 (12.1%)	2.81 ± 0.38		
	> 80	11 (3.9%)	2.79 ± 0.65		
Marital status	Single	20 (7.1%)	2.55 ± 0.40	One-way ANOVA	0.479
	Married	215 (76.8%)	2.71 ± 0.45		
	Divorced	6 (2.1%)	2.71 ± 0.31		
	Windowed	3 (1.9%)	2.67 ± 0.44		
Educational status	illiterate	94 (33.6%)	2.63 ± 0.48	One-way ANOVA	0.028
	High school	117 (41.8%)	2.71 ± 0.37		
	Diploma	35 (12.5%)	2.71 ± 0.55		
	Above diploma	34 (12.1%)	2.80 ± 0.41		
Occupation status	Housewife	135 (48.2%)	2.64 ± 0.48	One-way ANOVA	0.000
n (%) = Frequency/Percent					

Characteristic	Description	No. (%)	HL mean (sd) ^a	Statistical test	P-value
	worker	49 (17.5%)	2.54 ± 0.34		
	Government employ	24 (8.6%)	2.88 ± 0.19		
	Self-employed	36 (12.9%)	2.74 ± 0.48		
	Retired	36 (12.9%)	2.95 ± 0.36		
Average monthly income	< 1 million	84 (30%)	2.60 ± 0.40	One-way ANOVA	0.000
	1 at 2 million	111 (39.6%)	2.64 ± 0.48		
	> 2 million	85 (30.4%)	2.87 ± 0.39		
Place of Residence	Urban	266 (95%)	2.71 ± 0.44	Independent t-test	0.023
	Rural	14 (5%)	2.43 ± 0.37		
Type of treatment	diet	62 (22.1%)	2.63 ± 0.38	One-way ANOVA	0.416
	Tablet	160 (57.1%)	2.70 ± 0.44		
	Insulin	51 (18.2%)	2.73 ± 0.49		
	Tablets and insulin	7 (2.5%)	2.89 ± 0.69		
Duration of diabetes, years	< 5 Year	140 (50%)	2.68 ± 0.44	One-way ANOVA	0.485
	6–10 Year	82 (29.3%)	2.67 ± 0.41		
	> 10 Year	58 (20.7%)	2.76 ± 0.50		
Family history of diabetes	Yes	181 (64.6%)	2.73 ± 0.41	Independent t-test	0.67
	No	99 (35.4%)	2.63 ± 0.49		
Complication of diabetes	Yes	86 (30.7%)	2.73 ± 0.41		0.351
n (%) = Frequency/Percent					

Characteristic	Description	No. (%)	HL mean (sd) ^a	Statistical test	P-value
	No	194 (69.3%)	2.68 ± 0.46		
Abdominal obesity	Yes	168 (60%)	2.73 ± 0.45	Independent t-test	0.82
	No	112 (40%)	2.64 ± 0.43		
Smoking status	Yes, smoke	47 (16.8%)	2.68 ± 0.38	One-way ANOVA	0.985
	Yes, before smoke	21 (.5%)	2.69 ± 0.43		
	No	212 (75.7%)	2.70 ± 0.46		
n (%) = Frequency/Percent					

^a Values are expressed as mean (SD) unless otherwise indicated.

Table 2

Responses proportion (n %) in each category of the 4-point rating scale for each HLS-Q14 item

Items	Description	Never	Rarely	Sometimes	Often
		N (%)	N (%)	N (%)	N (%)
On a scale from Never to Often, how easy would you say it is to:					
Functional HL		Mean ± SD = 2.66 ± 1.02			
1	Found that the print was too small to read	70 (25%)	57 (20.4%)	64 (22.9%)	89 (31.8%)
2	Found characters and words that you did not know	49 (17.5%)	70 (25%)	66 (23.6%)	95 (33.9%)
3	Found that the content was too difficult	51 (18.2%)	66 (23.6%)	71 (25.4%)	92 (32.9%)
4	Needed a long time to read and understand the content	64 (22.9%)	64 (22.9%)	70 (25%)	82 (29.3%)
5	Needed someone to help you read the content	56 (20%)	72 (25.7%)	65 (23.2%)	87 (31.1%)
Communicative HL		Mean ± SD = 2.60 ± 0.82			
1	Collected information from various sources	23 (8.2%)	82 (29.3%)	116 (41.4%)	59 (21.1%)
2	Extracted the information you wanted	36 (12.9%)	73 (26.1%)	121 (43.2%)	50 (17.9%)
3	Understood the obtained information	80 (28.6%)	74 (26.4%)	65 (23.2%)	61 (21.8%)
4	Communicated your thoughts about your illness to someone	68 (24.3%)	71 (25.4%)	85 (30.4%)	56 (20%)
5	Applied the obtained information to your daily life	24 (8.6%)	84 (30%)	109 (38.9%)	63 (22.5%)
Critical HL		Mean ± SD = 2.82 ± 0.75			
1	Considered whether the information was applicable to your situation	36 (12.9%)	81 (28.9%)	86 (30.7%)	77 (27.5%)
2	Considered the credibility of the information	23 (8.2%)	59 (21.1%)	124 (44.3%)	74 (26.4%)
3	Checked whether the information was valid and reliable	18 (6.4%)	61 (21.8%)	109 (38.9%)	92 (32.9%)

N (%) = Frequency/Percent

Items	Description	Never	Rarely	Sometimes	Often
		N (%)	N (%)	N (%)	N (%)
4	Collected information to make health-related decisions	34 (12.1%)	71 (25.4%)	115 (41.1%)	60 (21.4%)
Total Health literacy		Mean ± SD = 2.70 ± 0.44			
N (%) = Frequency/Percent					

SD: Standard deviation

The item number corresponds to the specific item number in the Ishikawa Health Literacy Survey Questionnaire (HL- FCCHL -Q14)

Table 3
Regression analysis for Demographic Variables and health literacy

Variables	R ²	R square	Adjusted R square	p-value	Standardized β coefficient	p-value
Model 1 ^a	0.234	0.055	0.051	0.000	0.234	0.000
-Average monthly income						
Model 2 ^b	0.290	0.084	0.078	0.000		
-Average monthly income					0.251	0.000
-age					0.172	0.003
Model 3 ^c	0.320	0.102	0.093	0.000		
-Average monthly income					0.170	0.011
-age					0.176	0.002
-Occupation					0.157	0.020
Note. This table report results from the sequential multiple regression analysis with health literacy as the dependent variable. The independent variables 'Average monthly income', 'age,' and 'Occupation' were entered in the report in three sequential steps. Statistical significance was assumed at p < 0.05.						

Discussion

The concept of health literacy has gained the attention of the health researcher world. Simonds (1974) introduced this idea to the nursing literature the first time. The past research documented a few references related to health literacy by 1992. Health literacy originates from the field of public health,

where it advanced in health education, protection, promotion, and primary health prevention [35]. As a result, healthy literacy is a relatively innovative concept for the health staff, including nurses, with few references associated with health literacy, which appear in nursing and health education literature [36, 37]. In recent times, patients have to encounter the difficulties of complex healthcare systems. Patients have to acquire sufficient knowledge to understand the multifaceted information and find solutions to the complex health care systems. Accordingly, it is vital to evaluate health literacy among diabetes patients and provide them easy-to-understand and required support information associated with health literacy level. Hence, assessing patients' health literacy is critical to provide the necessary support to diabetes patients, as diabetes needs expensive medical treatment and self-care. It is essential that diabetes patients' understand health information, such as symptoms and signs of their diseases. Patients require to know how to control and manage the disease [35]. This study focused on investigating the influential factors that affect the health literacy status of patients' with type-2 diabetes through demographic variables.

This study survey revealed that the average level of health literacy of diabetes patients with type 2 indicated 2.70 ± 0.44 . The findings specified a favorable condition. Researchers conducted national research surveys, and studies reported 56% of the health literacy level among Iranian people, which is a limited or inappropriate level of the public health status. The findings of this study are in line with the previous national-level studies. This study revealed that mean scores of the patients' demographic variables and health literacy are better than the findings of the earlier studies in Iran. However, the study place, patients' age, gender, residential locations, and sample size of the population are helpful to describe the difference of the study findings [38]. The results of the current study are almost equal to the average level of health literacy of diabetic patients with the studies done by Reisi et al. [39], Tahery et al. [40], Rafiezadeh et al. [41], Yeh et al. [6], Reisi et al. [42] and patients with severe kidney problems in Japan [43]. This finding is consistent with the results of a study done by Maleki et al. [8]. On the other hand, Tehrani Banihashemi et al. [44] and Reisi's et al. [34] studies have finally reported the level of health literacy in Iran, which is not consistent with the findings of the current study.

Likewise, the results of this study revealed that the field of health literacy, the subjects performed poor performance. Therefore, the lowest score of health literacy in diabetic patients related to this field of health literacy and on the other hand the highest average rating in the health literacy field is related to critical health included numeracy skills (ability to use quantitative information) and using this information to make further decisions. The results of the study Reisi et al. [39], Lai et al. [43] received the lowest score in terms of performance. In the van der Vaart's study [45], patients with rheumatoid arthritis received the highest score in terms of performance. Since the above study was conducted in the Netherlands, where the literacy rate and reading and writing skills are 96.5% [46], thus, compared to the current study, the high level of functional health literacy in the studied people seems reasonable, which was inconsistent with the results of the present study.

Scholars argued that skills related to operational, communicative, and critical health literacy are necessary. The essential factors for improving self-care in diabetic patients are vital because these skills

increase patients' self-confidence to communicate efficiently with health service providers and improve the health and abilities of patients to participate and cooperate with the health care system. These capabilities eventually permit patients to receive and evaluate the information they need from different communication channels and finally apply it in practice. Critical health literacy is a prerequisite for achieving a correct understanding of the political and social factors and determinants that provide the environment for health promotion and healthy living. Because of the broader skills range related to functional, communicative, and critical health literacy, their direct association with self-care in diabetic patients is possible. These levels of health literacy, social and cognitive knowledge, provides skills, and necessary understanding is for proper management of the disease by patients [43].

A study reported that diabetes patients with a higher level of critical and communicative health literacy skills actively applied required information to manage the situations, and they achieved accomplishments successfully. Thereby, better health literacy skills are useful in attaining improved self-efficacy [47]. Ishikawa and Yano conducted a study, explained that diabetes patients with a better health literacy level would end to describe a better participation level, and enhanced self-efficacy to control diabetes disease [48].

The results revealed that there was a significant relationship between gender and health literacy of type 2 diabetic patients; these results are consistent with the study of Yeh et al. [49]. Though, the results were inconsistent with the results of the studies done by Pooryaghob et al. [50], Charoghchian Khorasani et al. [51] Noroozi et al. [52] and Von et al. [53]. The results of the study done by Maleki et al. [8] and Le et al. [54] Khosravi et al. [55], Tahery et al. [40] disclosed that there was a significant relationship between gender and health literacy and men's health literacy was higher than women, which is consistent with the current study. It could be due to men's higher education than women's.

In the current study, there was no significant relationship between the average ages of people with health literacy in type 2 diabetic patients; these results are consistent with the review of Charoghchian Khorasani et al. [51] research. But, the results were inconsistent with the results of the studies done by Yeh et al. [49], Noroozi et al. [52], and Tahery et al. [40]. As a result, when reading comprehension is a necessary skill for receiving information, age is a factor that should be considered. Hence, when providing information to diabetic patients, it should not be limited to print media, and other teaching methods such as lecturing and group discussion should be used, as older people may be less literate.

The results of the current study disclosed that there was no significant relationship between marital status and health literacy of diabetic patients. These results are consistent with the study of Ansari et al. [38], Mohammadi et al. [13], and Almigbal et al. [56]. Nevertheless, it was inconsistent with the results of the study done by Alidosti et al. [57]

The results of the current study disclosed that there is a significant relationship between education and health literacy of diabetic patients. These results are consistent with the investigations of Yeh et al. [49], Rafiezadeh Gharrehtapeh et al. [58], Noroozi et al. [52], Sahrayi et al. [59], and Ansari et al. [38]. Likewise, in other studies, education is an active factor in the level of health literacy [8, 23, 60, 61]. Izadirads et al.

study, it has been reported that having higher education and functional job status has led to an increase in the level of health literacy [62]. Patients with lower levels of education also have lower levels of health literacy and have difficulty understanding and applying health information, application and administration of drugs, and understanding medical prescriptions; so, they require specialized training and attention [63]. However, it is vital to note that during clinical appointments, physicians need to regulate their communication according to the patient's actual health literacy. Some simple techniques for this purpose include the use of simple language, low speed, and the participation of prominent family members in discussions [44]. In a study on a 10-year study of a cohort in the United States it was found that low levels of education were associated with reduced physical activity, and the higher the level of education, the greater the physical activity. Generally, it assumed that the higher the level of literacy of people, the higher their health awareness. Thus, the healthier their lifestyle and the lower the prevalence of type 2 diabetes. [64] it could result because of the group with higher education, which is more likely to have more senior health-seeking behavior. Critical thinking was leading to them obtaining more information on health and better health literacy.

The results of the current study indicated that there is a significant relationship between job and health literacy of diabetic patients. These results are consistent with the studies done by Getaye Tefera et al. [26], Rafiezadeh Gharrehtapeh et al. [58], Noroozi et al. [52], Khosravi et al. [55] and Izadirad et al. [62]. Nonetheless, the results were not consistent with the results of the study conducted by Kooshyar et al. [65].

The results of the current study revealed that there is a significant relationship between monthly income and health literacy of diabetic patients, which is consistent with the results of studies done by Tefera Getaye et al. [26], Charoghchian Khorasani et al. [51], Reisi et al. [39], and Ansari et al. [38]. This result was inconsistent with the results of the study conducted by Mashi et al. [31].

The results of the current study disclosed that there was no significant relationship between the accommodation and health literacy of diabetic patients. These results are consistent with the results of studies done by Tefera Getaye et al. [26], Noroozi et al. [52], and Tehrani Banihashemi et al. [44].

The results of the present study revealed that there was no significant relationship between the type of treatment and health literacy for diabetic patients. These results are consistent with the studies done by Noroozi et al. [52], and Seyedoshohadaee et al. [66]. The results of Osborn et al.'s study [67] presented a significant relationship between health literacy scores and drug compliance. The results of Mancuso and Rincon's study in diabetic patients indicated a low rate of adherence to diet and medication in diabetic patients. However, the rate of adherence to diet and medication in diabetic patients reported 36–54% in Rubin and Richard's studies [68]. In the study of Osborn et al. [67], there was a statistically direct and significant relationship between health literacy scores and adherence to drugs among diabetic patients, which is not consistent with the results of the present study. In another study by Noureldin et al., it was found that patients with health literacy with adequate heart failure had better adherence to diets than those with inadequate health literacy. Also, health literacy could be an essential factor in sustainable drug

interventions. So that in different studies, diverse responses have been designed to improve the level of health literacy in patients and have achieved positive results based on the effectiveness of interventions to improve health literacy in following patients' drug therapies [69]. In their study, Raehl et al. showed that the health literacy level of elderly patients is significantly related to their adherence to their medication regimen [70]. At large, patients with a higher level of education are more aware of the disease complications, self-care, and how to take medication and follow a diet. They have more access to educational resources [71].

The results of the current study disclosed that there was no significant relationship between the mean duration of diabetes and the health literacy of diabetic patients. In this regard, studies by Noroozi et al. [52], Maliki et al. [72] and Souza et al. [73] also suggested that health literacy was not associated with the duration of the disease. It expected that as the duration of the disease progresses, the level of the patient's health literacy and their experiences will increase. Therefore, in order to increase the level of health literacy of patients, it is necessary to take steps to promote the provision of educational classes and the use of simple educational tools, understandable and straightforward expressions for patients, especially those with lower education and higher age.

The results of the current study indicated that there was no significant relationship between family history and health literacy of diabetic patients. These results are consistent with the study of Teferaet Getaye et al. [26] and, are not compatible with the research of Tol et al. [74], this may be due to a lack of sensitivity and a lack of attention to the consequences of the illness.

The results of the present study disclosed that there was no significant relationship between diabetes complications and the health literacy of diabetic patients. So, it was not possible to compare the findings with the previous results. Accordingly, it was not possible to compare the findings with the earlier results.

The results of the current study indicated that there was no significant relationship between abdominal obesity and the health literacy of diabetic patients. In the study of Afkhami et al. [75], it was reported that abdominal obesity was widespread in patients with type 2 diabetes, which is similar to the present study.

In this study, no significant correlation was observed between health literacy and smoking in patients with diabetes. These results are consistent with the research done by Mohammadpour et al. [76]. In Friis et al.'s study, the correlation between health literacy and self-care behaviors in diabetic patients was examined, and it was found that there was no significant correlation between health literacy, tobacco use, and alcohol, which was consistent with the current study [77].

Based on multiple regression tests, in this study, among the demographic variables with the health literacy of diabetic patients, it was shown that among the imported variables, income, age, and employment variables remained as predictive variables in the final model. Accordingly, it was not possible to compare the findings with the previous results. Consequently, it was not possible to compare the findings with the previous results.

At present, treatment and diabetes management is challenging and complex. It requires special attention and the skills of health literacy associated with reading, arithmetic, and comprehension to control diabetes disease. These skills of health literacy are critical tools to help diabetes patients make appropriate and timely health decisions. Many factors may affect HL, such as age, school enrollment, race, socioeconomic status, and psychological distress. Several factors affect individuals' health literacy, including age, gender, education, ethnicity, residential location, psychological distress, and socioeconomic status.

Limitation of the study

The scientific studies end up with some restrictions. This research survey reported some limitations, which are helpful for future investigations. The sample of this study used a convenience sample based on diabetes patients selected from targeted health centers. Therefore, the study findings are limited to this sample, and the results are not generalizable to other medical respondents' settings. Another limitation involved in this research survey reported the difficulty in instruments answering. The diabetes illiterate participants encountered problems filling the survey forms, and the investigators had to read the scale-items to the patients and record their answers accordingly. Besides, many literate diabetes patients faced difficulty with completing the inventory items because of their weak eyesight caused by diabetes disease. Further studies with specific geographic regions in various cultures can enrich the generalizability of the results. The results derived from this statistical sample suggest designing more studies on the area of health promotion with multiple factors, which would implement the results of this study on diabetes patients.

Conclusions

This research study revealed that the highest average showed a link to critical health literacy, and the lowest percentage indicated an association with communicative health literacy in diabetic patients. The impact of communicative and essential health literacy on diabetes management, even for patients whose functional health literacy presented adequate results. Besides, diabetes patients' income level, age, and occupation variables are the most important independent predictors of health literacy. Functional, communicative, and critical health literacy provides patients with social and cognitive knowledge and the skills needed to properly manage the disease. Communicative and critical skills increase patients' self-confidence; this allows them to communicate effectively with health care providers. Thus, health information specialists are essential in order to recognize diabetes patients' demographic variables. Patients' requirements and capacity are also necessary to achieve health education resources. The study findings indicated that a higher level of health literacy would increase better health-related behaviors from the patients.

Abbreviations

HL

Health literacy;
FCCHL
Functional, Communicative, and Critical Health Literacy scale;
T2DM
Type 2 diabetes;
HPA
Health Promotion Administration;
SAS
Statistical Analysis System;
SPSS
Statistical Product and Service Solutions

Declarations

Ethics approval and consent to participate

The study was approved by the Research Ethics Committee of Iran University of Medical Sciences (Code: IR. IUMS.REC. 1398.1277). Informed written and oral consent was obtained from all participants prior to participation in the study. All the procedures performed in the study involving human participants were based on the ethical standards of the Institutional Research Committee and the Helsinki Declaration and its later amendments or comparable ethical standards.

Consent for publication

Not applicable.

Availability of data and materials

The dataset used and analysed during the current study is available from the corresponding author upon reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' Contributions

MM and AZ conceptualized and designed the study. AZ was responsible for data collection. BM, and AZ performed data analysis, MM and FEFA drafted the manuscript. All authors read and approved the final draft of the manuscript.

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