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Factors affecting the health literacy status of patients with type 2 diabetes through demographic variables: A cross-sectional study

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Abstract:

BACKGROUND: Health literacy (HL) 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. Besides, diabetes is the most common metabolic disorder that affects patients' quantity and quality of life. This study focused on determining the factors that affect the HL status of patients with type 2 diabetes (T2D) through the role of the demographic variables.

MATERIALS AND METHODS: This descriptive-analytical research survey recruited a sample based on 280 patients with T2D at the Diabetes Research Center of Ayatollah Taleghani Hospital in Kermanshah in 2020. This study selected patients with T2D using a simple random sampling technique. The study applied the demographic information questionnaire and the Functional, Communicative, and Critical HL Scale to collect data from patients with T2D. This study used the SPSS version 23 on the received data sets to perform statistical analysis, including *t*-test, analysis of the variance, and multiple regression, to predict the factors affecting HL among diabetes patients.

RESULTS: The study results showed that the mean age of the participating patients with T2D was 55.80 ± 13.04 . The results indicated the mean score and standard deviation of total HL score in patients with T2D 2.70 ± 0.44 . The findings specified a statistically significant relationship between HL, gender, education, occupation, income, and place of residence. Results indicated that β -coefficients of the multiple regression analysis and the income variable ($\beta = 0.170$), age ($\beta = 0.176$), and employment variable ($\beta = 0.157$). These are the most predictive of the HL of patients with T2D.

CONCLUSION: The results of this study specified that the HL rate of individuals with diabetes type 2 is average. The potential communicative and critical HL influence is essential for communication and education for diabetes patients in the primary health-care system settings. The findings indicate that communicative and critical HL related to patients' management and functional HL looks passable in this study.

Keywords:

Demographic factors, health centers, health literacy, type 2 diabetes

Introduction

Health literacy (HL) determines the level of degree of how an individual can obtain, process, and understand the necessary health services information to make suitable health decisions.^[1] The World Health Organization described that

HL refers to social and cognitive skills, which states individuals' motivational level and personal capacity for accessing, understanding, and processing the health information to promote and maintain health.^[2] The focus of HL is beyond one's ability to read, identify, and absorb health information in text words. HL explains the combination of personal data and skilled

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competence and how people use it to make appropriate health decisions. This proficiency helps seek, understand, and read health-related information, which is useful for acquiring health information to improve the status of health and health-care system management.^[3]

There are various dimensions of HL. Nutbeam provided a transparent, workable, and robust framework of HL based on three levels, such as critical, communicative, and functional.^[4] In reality, functional HL is the basic level, such as individual writing and reading skills, which are useful for practical functionality in day-to-day situations.^[4] Communicative HL 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 HL 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]

The Institute of Medicine's Committee working on HL described that HL's concept is individuals' concern who are involved in the protection and health promotion, early screening and disease prevention strategy, policymaking, and health-care maintenance. The skills of HL are necessary to discuss and dialog 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, medicine dosage, or voting on environmental and health issues.^[5] The Committee of the Medicine Institute working on the concept of individuals' HL explained that the HL concept specifies individuals' concern for their health promotion and health protection. Besides, the HL Committee of the Medicine Institute described that HL 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 experts have paid more attention to the HL concept during the past few decades. They have emphasized personal responsibility to maintain and promote HL and self-management of chronic diseases and diabetes type 2.^[6,7] A survey conducted in the US showed that more than 33% of individuals did not have appropriate HL.^[8] Earlier study results indicated that 31% of the Iranian diabetes patients had adequate HL.^[9] Health experts claim that HL is the silent epidemic as people with less HL 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] HL'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 HL know less about the disease and experience more adverse results than those with more top HL levels.^[10]

HL might influence the ability of patients to understand mathematical notions, such as risks and probability. HL skills are critical for patients' understanding of facing chronic diseases. Expertise skills are useful for medicine 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 HL 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.^[11]

Education does not mean acquiring appropriate HL skills, which enables people to take care of their health promotion and protection effectively.^[12] Older adults and patients with chronic health conditions, such as asthma, diabetes, hypertension, and cardiovascular diseases, typically have limited HL.^[13,14] Patients with less HL 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.^[3,15] Many factors affect HL 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 HL 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.^[16] The most specific critical importance is how patients comprehend instructions related to the physician's prescribed medications.^[17] Accordingly, in diabetes patient care, HL affects the consequences of diabetes health care through diabetes patients' and physicians' relationships and self-care factors,^[18] which are closely associated with each other.^[11] Considering the importance of diabetes in Iran and the impact of HL on quality of life and diabetes control, it is evident that diabetes is one of the major stressors in life. Thus, its control is influenced by a complex network of behavioral factors, attitude, and health care. In this study, we investigated the factors that affect the HL status of patients with type 2 diabetes (T2D) and the role of demographic variables.

Type II diabetes

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.^[19] According to estimation, almost 11.40% of adults in Iran have diabetes mellitus. It would increase to 9 million Iranians by 2030, who would face the risk of developing diabetes mellitus.^[20] According to statistics, almost 80% of diabetes patients encounter deprived and inadequate health-care facilities in developing countries.^[21]

Diabetes is a lifetime chronic disease, and it leads to long-lasting involved complications when blood glucose elevates consistently.^[22] Multiple factors related to diabetes patients can affect glycemic control, helping prevent and treat chronic diabetes diseases.^[10] Patients with T2D have complex needs for their HL. 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 T2D must learn self-care management and high drug compliance, including the ability to read, analyze, and interpret nutrition and drug labels.^[23,24]

A study indicated that individuals with limited HL levels encounter more health management problems in their life.^[23] The past literature evidenced that diabetes patients with low health numeracy faced a higher level of body mass index and poor glycemic control.^[19,25] Such patients cannot smoothly manage their diabetes and face difficulties with diseases throughout their life.^[26] 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 HL.^[27] Adequate HL level helps diabetes patients to manage and control the insulin doses.^[23] They are likely to be prone to interpreting by reading labels of medicines correctly.^[18] Other factors that may distress an individual's information, skills, and knowledge about HL include cultural and social demographic 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 HL level, which leads to various problems in protecting and managing their diseases. This limitation influences individuals' ability to navigate the health-care 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]

Materials and Methods

Study design and selection of the sample size

This study employed a cross-sectional descriptive-analytical design from January to July 30, 2020. The study included a probabilistic sample of patients with T2D from the Diabetes Research Center of Ayatollah Taleghani Hospital in Kermanshah. The sampling method in this study was simple random sampling, and the samples were selected according to the list of patients in the Diabetes Research Center of Ayatollah Taleghani Hospital in Kermanshah who had records, and if they met the inclusion criteria, they participated in this study. 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 ($n = 280$) diabetes participants.

Cochran's sample size formula helps researchers draw a sample size from the target population under study. According to this formula's assumptions, the sample size should be greater than 5% of the overall population (sample size $>5\%$ of the total population, $1040 \times 0.05 = 0.52$) for categorical data at a 5% level of an alpha value (error of 5%). The obtained sample size has been drawn through the Cochran formula (95% confidence level and 5% error) according to selected inclusion criteria.

Inclusion and exclusion criteria

Inclusion criteria were T2D, age over 20 years, ability to speak, read, and write, at least six months after the diagnosis, and history of diabetes medication. Written informed consent was obtained from all patients with T2D. Patients with problems, including mental, cognitive, or physical health issue 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.

Measures

The study respondents' sociodemographics 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.

Functional, Communicative, and Critical HL (FCCHL) Questionnaire: This study has incorporated the translated version of the instrument in the Persian language. Ishikawa translated the FCCHL Scale in Persian to measure the HL skills among diabetes patients with T2D.^[28] There are 14 items on this survey form with subscales of communicative, functional, and critical levels of the disease in patients. The scales include five items each for functional and communicative HL, and four for critical HL. Each item was rated from 1 (never) to 4 (often). To obtain scores for each subscale, the scores for the items in each subscale were summed and divided by the number of constituent items. Scores were recoded for functional HL, and mean scores were calculated for each scale ranging from 1 (low HL) to 4 (high HL). Higher scores indicate higher levels of HL, and in contrast to most HL screening tools, there is no cutoff point.

The past literature showed that the Japanese diabetes patients used the critical, communicative, 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 HL level.^[28] The Persian version translated scale showed the Cronbach's alpha value ($\alpha = 0.82$), and it indicated an acceptable score for the subscale critical ($\alpha = 0.76$), communicative ($\alpha = 0.80$), 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' HL skills, and these subscales are widely applicable to measure the various skills of HL among patients. The internal consistency was satisfactory for all the subscales of HL ($\alpha = 0.82$) and showed a satisfactory degree of scale item consistency for each subscale ($\alpha = 0.76 \text{ and } 0.91$). The past study showed similar results for the original scale of FCCHL and the Dutch version for all the subscale items, respectively. The study of Raisi *et al.*^[29] also confirmed the Persian version translated scale and its validity and reliability. The findings showed that the Cronbach's alpha was 0.82 and a retest 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-min session to fill each questionnaire to collect the desired data sets duly.

Statistical analysis

The applied descriptive statistics for data analysis to draw the study results from the received data

sample of patients with T2D. 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 analysis of the variance (ANOVA) test to compare the mean (M) scores based on the three or more groups associated with a quantitative variable. The ANOVA test covered patients with T2D 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 HL skills among patients with T2D. The investigators performed all the tests by using the SPSS software version 23 (SPSS Inc. of Chicago, IL, United States of America) at level of 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 (IR.IUMS.REC.1399.781). 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 patients with T2D.

Results

Sociodemographic characteristics of the participants

In this study, the proportion of female patients with T2D was 53.2%, and male patients were 46.8%. The average age of the patients with T2D was 55.80 ± 13.04 years, and the majority (50%) were aged >50 years. Besides, the married patients with T2D made up 76.8% of the population, and the rest were divorced, widowed, or single. Participants' education level indicated that 41.8% are undergraduate degree holders. Besides, 48.2% of the patients with T2D are homeowners, 17.5% are workers, and 12.9% are retired. Regarding the residential status, 95% of people live in cities, and 5% live in the villages. In terms of diabetes treatment, 22.1% of the diabetes patients with T2D used diet, 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 <5 years, and 168 patients have 60% of abdominal obesity. Besides, smokers are 16.8% of participants,

presmokers are 5%, and patients who never smoke are 75.7% of the population [Table 1].

The mean HL score of patients with T2D was 2.70 ± 0.44 , indicating optimal HL. Table 2 illustrates the indicators of HL related to subscales of communicative, critical, and functional HL among patients with T2D groups. Independent *t*-test results show that men's HL is higher than that of women ($t = 2.76, P = 0.027$). Besides, people living in urban areas have higher HL than rural

areas ($t = 2.71, P = 0.023$). The one-way ANOVA shows a significant relationship between HL and education, employment, and income ($P \leq 0.001$).

In the results of stepwise multiple regression for predicting HL by demographic variables in the final model, three variables of income, age, and occupation were significant. They remained in the model that could predict 0.320 of the variances. Table 3 shows β -coefficient results of the multiple regression analysis and the income

Table 1: Sociodemographic and economic characteristics of the study diabetic patients (n=280)

Variable	Description	n (%)	HL mean \pm SD ^a	Statistical test	P
Gender	Male	131 (46.8)	2.76 \pm 0.39	Independent <i>t</i> -test	0.027
	Female	149 (53.2)	2.64 \pm 0.48		
Age	18-29	4 (1.4)	2.60 \pm 0.19	One-way ANOVA	0.361
	30-39	31 (11.1)	2.67 \pm 0.48		
	40-49	62 (22.1)	2.61 \pm 0.45		
	50-59	65 (23.2)	2.67 \pm 0.43		
	60-69	73 (26.1)	2.74 \pm 0.43		
	70-79	34 (12.1)	2.81 \pm 0.38		
	>80	11 (3.9)	2.79 \pm 0.65		
Marital status	Single	20 (7.1)	2.55 \pm 0.40	One-way ANOVA	0.479
	Married	215 (76.8)	2.71 \pm 0.45		
	Divorced	6 (2.1)	2.71 \pm 0.31		
	Windowed	3 (13.9)	2.67 \pm 0.44		
Educational status	illiterate	94 (33.6)	2.63 \pm 0.48	One-way ANOVA	0.028
	High school	117 (41.8)	2.71 \pm 0.37		
	Diploma	35 (12.5)	2.71 \pm 0.55		
	Above diploma	34 (12.1)	2.80 \pm 0.41		
Occupation status	Homemaker	135 (48.2)	2.64 \pm 0.48	One-way ANOVA	<0.001
	worker	49 (17.5)	2.54 \pm 0.34		
	Government employ	24 (8.6)	2.88 \pm 0.19		
	Self-employed	36 (12.9)	2.74 \pm 0.48		
	Retired	36 (12.9)	2.95 \pm 0.36		
Average monthly income	<1 million	84 (30)	2.60 \pm 0.40	One-way ANOVA	<0.001
	1 at 2 million	111 (39.6)	2.64 \pm 0.48		
	>2 million	85 (30.4)	2.87 \pm 0.39		
Place of residence	Urban	266 (95)	2.71 \pm 0.44	Independent <i>t</i> -test	0.023
	Rural	14 (5)	2.43 \pm 0.37		
Type of treatment	diet	62 (22.1)	2.63 \pm 0.38	One-way ANOVA	0.416
	Tablet	160 (57.1)	2.70 \pm 0.44		
	Insulin	51 (18.2)	2.73 \pm 0.49		
	Tablets and insulin	7 (2.5)	2.89 \pm 0.69		
Duration of diabetes, years	<5 year	140 (50)	2.68 \pm 0.44	One-way ANOVA	0.485
	6-10 year	82 (29.3)	2.67 \pm 0.41		
	>10 year	58 (20.7)	2.76 \pm 0.50		
Family history of diabetes	Yes	181 (64.6)	2.73 \pm 0.41	Independent <i>t</i> -test	0.67
	No	99 (35.4)	2.63 \pm 0.49		
Complication of diabetes	Yes	86 (30.7)	2.73 \pm 0.41	Independent <i>t</i> -test	0.351
	No	194 (69.3)	2.68 \pm 0.46		
Abdominal obesity	Yes	168 (60)	2.73 \pm 0.45	Independent <i>t</i> -test	0.82
	No	112 (40)	2.64 \pm 0.43		
Smoking status	Yes, smoke	47 (16.8)	2.68 \pm 0.38	One-way ANOVA	0.985
	Yes, before smoke	21 (0.5)	2.69 \pm 0.43		
	No	212 (75.7)	2.70 \pm 0.46		

^aValues are expressed as mean \pm SD unless otherwise indicated. ANOVA=Analysis of the variance, n (%)=Frequency/percent, SD=Standard deviation, HL=Health literacy

Table 2: Response proportion (n %) in each category of the 4-point rating scale for each health literacy scale-Q14 item

Items	Description	Never, n (%)	Rarely, n (%)	Sometimes, n (%)	Often, n (%)
On a scale from never too 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)
4	Collected information to make health-related decisions	34 (12.1)	71 (25.4)	115 (41.1)	60 (21.4)
Total HL		Mean±SD=2.70±0.44			

The item number corresponds to the specific item number in the Ishikawa HL Survey Questionnaire (HL-FCCHL-Q14). n (%)=Frequency/percent, SD=Standard deviation, HL=Health literacy, FCCHL=Functional, Communicative, and Critical HL Scale

Table 3: Multiple regression analysis for demographic variables and health literacy

Variables	B	SE	β	t	P
Constant	2.061	0.136		15.142	<0.001
Average monthly income	0.098	0.038	0.170	2.544	0.011
Age	0.006	0.002	0.176	3.066	0.002
Occupation	0.047	0.020	0.157	2.349	0.020

This table report results from the sequential multiple regression analysis with HL 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<0.01. SE=Standard error

variable (β = 0.170), age (β = 0.176), and employment variable (β = 0.157), which are the most predictive of the HL of patients with T2D.

Discussion

This study focused on investigating the influential factors that affect the HL status of patients' with type 2 diabetes through demographic variables. This study survey revealed that the average level of HL of diabetes patients with T2D indicated 2.70 ± 0.44. The findings specified a favorable condition. Researchers conducted national research surveys, and studies reported 56% of the HL 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 HL 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.^[30] The results of the current study are almost equal to the average level of HL of patients with T2D with the studies done by Reisi *et al.*^[29] and Tahery *et al.*^[31] and patients with severe kidney problems in Japan.^[32] This finding is consistent with the results of a study done by Maleki *et al.*^[33] Studies have finally reported the level of HL in Iran, which is not consistent with the findings of the current study.

Likewise, the results of this study revealed that in the field of HL, the subjects performed poor performance. Therefore, the lowest HL score in T2D patients and the highest average rating in the field of HL are associated with health and numeracy skills (ability to use quantitative information). Making further decisions based on this information is crucial for future implications. The results of the study done by Khiyali *et al.*^[24] and Lai *et al.*^[32] received the lowest score in terms of performance. In the van der van der Vaart *et al.*'s study,^[34] 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%^[35] thus, compared to the current study, the high level of functional HL in the studied people seems reasonable, which was inconsistent with the results of the present study.

A study reported that patients with T2D with a higher level of critical and communicative HL skills actively applied required information to manage the situations,

and they achieved accomplishments successfully. Thereby, better HL skills are useful in attaining improved self-efficacy.^[36] Ishikawa and Yano conducted a study which explained that diabetes patients with a better HL level would end to describe a better participation level, and enhanced self-efficacy to control diabetes disease.^[28]

The results revealed that there was a significant relationship between gender and HL of type 2 patients with T2D; these results are consistent with the study of Yeh *et al.*^[37] Though, the results were inconsistent with the results of the studies done by Pooryaghob *et al.*,^[38] Noroozi *et al.*,^[39] and von Wagner *et al.*^[40] The results of the study done by Maleki *et al.*^[33] and Khosravi *et al.*^[41] and Tahery *et al.*^[31] disclosed that there was a significant relationship between gender and HL and men's HL 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 HL in type 2 patients with T2D; these results are consistent with the review of Charoghchian Khorasani *et al.*^[42] research. However, the results were inconsistent with the results of the studies done by Yeh *et al.*,^[37] and Tahery *et al.*^[31] 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 patients with T2D, 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 HL of patients with T2D. These results are consistent with the study of Ansari *et al.*,^[30] and Almigbal *et al.*^[15] Nevertheless, it was inconsistent with the results of the study done by Alidosti *et al.*^[43] It can probably attribute to the age range of the subjects studied and most of them being married in this age group.

The results of the current study disclosed that there is a significant relationship between education and HL of patients with T2D. These results are consistent with the investigations of Yeh *et al.*,^[37] Sahrayi *et al.*,^[44] and Ansari *et al.*^[33] According to the study by Izadirads *et al.*, having a higher education and a functional employment history has led to an increase in the frequency of HL.^[45] Patients with lower levels of education also have lower levels of HL and have difficulty understanding and applying health information, application and administration of drugs, and understanding medical prescriptions, so they require specialized training and attention.^[46] However, it is vital to note that during clinical appointments,

physicians need to regulate their communication according to the patient's actual HL. Some simple techniques for this purpose include the use of simple language, low speed, and the participation of prominent family members in discussions.^[47]

The results of the current study indicated that there is a significant relationship between job and HL of patients with T2D. These results are consistent with the studies done by GNoroozi *et al.*,^[39] Khosravi *et al.*,^[41] and Izadirad *et al.*^[45] Nonetheless, the results were not consistent with the results of the study conducted by Kooshyar *et al.*^[48] This can be due to their appropriate education level in this study.

The results of the current study revealed that there is a significant relationship between monthly income and HL of patients with T2D, which is consistent with the results of studies done by Charoghchian Khorasani *et al.*,^[42] Reisi *et al.*,^[24] and Ansari *et al.*^[30] This result was inconsistent with the results of the study conducted by Mashi *et al.*^[18] Low levels of HL are more common in the elderly, immigrant population, illiterate people, low-income people, people with low mental health, and people with chronic diseases such as T2D. Hypertension, thereby placing these people as groups at risk of unpleasant effects of low levels of HL, is critical.

The results of the current study disclosed that there was no significant relationship between the accommodation and HL of patients with T2D. These results are consistent with the results of studies done by Tefera Getaye *et al.*,^[10] Noroozi *et al.*,^[39] and Tehrani Banihashemi *et al.*^[47]

The results of the present study revealed that there was no significant relationship between the type of treatment and HL for patients with T2D. These results are consistent with the studies done by Noroozi *et al.*,^[39] and Seyedoshohadaee *et al.*^[49] In another study by Noureldin *et al.*, it was found that patients with HL with adequate heart failure had better adherence to diets than those with inadequate HL. Furthermore, HL could be an essential factor in sustainable drug interventions, so that in different studies, diverse responses have been designed to improve the level of HL in patients and have achieved positive results based on the effectiveness of interventions to improve HL in following patients' drug therapies.^[50] 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.^[51]

The results of the current study disclosed that there was no significant relationship between the mean duration of diabetes and the HL of patients with T2D. In this regard, studies by Noroozi *et al.*,^[39] Maliki *et al.*,^[33] and

Souza *et al.*^[52] also suggested that HL was not associated with the duration of the disease. It was expected that as the duration of the disease progresses, the level of the patient's HL and their experiences will increase. Therefore, in order to increase the level of HL 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 HL of patients with T2D. These results are consistent with the study of Teferaet Getaye *et al.*^[10] and are not compatible with the research of Tol *et al.*^[53] 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 HL of patients with T2D. Hence, 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 HL of patients with T2D. In the study of Rahimi *et al.*, it was reported that abdominal obesity was widespread in patients with T2D, which is similar to the present study.^[54]

In this study, no significant correlation was observed between HL and smoking in patients with diabetes. These results are consistent with the research done by Mohammadpour *et al.*^[55] In Friis *et al.*'s study, the correlation between HL and self-care behaviors in patients with T2D was examined, and it was found that there was no significant correlation between HL, tobacco use, and alcohol, which was consistent with the current study.^[56]

Based on multiple regression test, in this study, among the demographic variables with the HL of patients with T2D, 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 HL associated with reading, arithmetic, and comprehension to control diabetes disease. These

skills of HL are critical tools to help patients with T2D 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' HL, including age, gender, education, ethnicity, residential location, psychological distress, and socioeconomic status. However, as the FCCHL scales are a recently developed measure, additional studies are needed to confirm their reliability and validity and to focus on other psychometric properties of the questionnaire. Although the use of simple random sampling from one diabetes clinic may be supposed to limit the generalization of the results, the results are nevertheless of major significance for Iranian patients with T2D.

Limitations and suggestions

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 simple random sampling based on patients with T2D 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. 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 patients with T2D. One of the strengths of this study is that for the first time, the issue of HL has been done on patients with T2D.

Conclusion

This research study revealed that the highest average showed a link to critical HL, and the lowest percentage indicated an association with communicative HL in patients with T2D. The effectiveness of communicative and essential HL on diabetes control yielded satisfactory results. It is even appropriate for people with functional HL. Besides, patients with T2D income level, age, and occupation variables are the most important independent predictors of HL. Functional, communicative, and critical HL 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. The study findings indicated that a higher level of HL would increase better health-related behaviors from the patients.

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Conflicts of interest

There are no conflicts of interest.

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