

## Health Literacy, Knowledge and Relevant Factors in Patients with Type 2 Diabetes Presenting to a Diabetes Clinic in Zahedan in 2014

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### ABSTRACT

**Objectives:** Health literacy is a major factor contributing to the effective control and prevention of diabetes. Diabetes patients with low health literacy have a lower adherence to self-care activities and blood sugar control. The present study was conducted to assess health literacy, knowledge and relevant factors in patients with type 2 diabetes presenting to a diabetes clinic in Zahedan, Iran, in 2014.

**Methods:** The present descriptive, analytical, cross-sectional study was conducted on 182 patients with type 2 diabetes selected through convenience sampling in 2014. A valid and reliable health literacy and knowledge inventory was used. Data were analyzed in SPSS-16 using descriptive statistics and the linear regression analysis.

**Results:** The majority of the participating patients were woman (75.8%), illiterate (38.5%) and married (85.2%). A total of 31.3% of the patients had an adequate health literacy, 61.5% had a marginal and 7.1% an inadequate health literacy, while 58% had a high level of knowledge. A statistically significant relationship was observed between health literacy and the level of education ( $P < 0.001$ ) and gender ( $p < 0.049$ ); that is, men had a higher health literacy than women. No statistically significant relationships were observed between health literacy and the other demographic variables assessed ( $P > 0.05$ ).

**Conclusion:** The study revealed the majority of patients with type 2 diabetes to have marginal health literacy, while health literacy was lower in women than in men. Simple training programs are recommended to be designed for improving health literacy, especially among women and people with lower levels of education.

**Keywords:** Health literacy, Knowledge, Type 2 diabetes

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## Introduction

Type 2 diabetes accounts for 90-95% of all types of diabetes [1]. Increased blood sugar causes degradation, dysfunction and failure of different body organs, especially the eyes, kidneys, nerves, heart and vessels [2]. According to an International Diabetes Federation report of 2014, 387 million people across the world suffer from diabetes and this figure is predicted to increase to above 592 million by 2035. Diabetes led to 4.9 million deaths in 2014 [3]. The most recent statistics in Iran (2013) reported the number of patients with diabetes and the mortality rate associated with the condition to be 5,214,550 and 38,000 [4]. According to the World Health Organization's estimates, the number of patients with diabetes in Iran will approach 7 million by 2030 [5].

Health literacy is a major factor involved in the more efficient control and prevention of diabetes [6]. Health literacy is the key to public health and the first priority in improving the quality of health services [7]. Health literacy is defined as "the capacity to acquire, process and understand essential information and the services required for making proper health decisions" [8, 9] and consists of a series of skills, including reading, listening, speaking, analyzing, decision-making and calculating, and the ability to apply them within the context of health [10].

Health literacy goes beyond the mere ability to read written materials and indicates understanding information in a way that enables the active control of one's health [11]. Health literacy also involves the understanding of complex terms, sharing personal information with healthcare

providers, making decisions about healthy lifestyle habits and being involved in self-care and chronic disease management [9].

Low health literacy is associated with an increased rate of mortality and hospitalization, a lower use of preventive services, poor adherence to medical prescriptions, difficulty communicating with health specialists, a poor knowledge about diseases and poor self-management skills [12]. Low health literacy is more common among older people, low-income groups and those vulnerable to non-communicable diseases [13]. In a study by Reisi, 79% of the older people examined had an inadequate health literacy [14]. Low health literacy health has been reported to be linked to gender and the level of education, the latter of which was found to have the strongest correlation with health literacy [15]. The annual costs of healthcare in people with a very low health literacy is reported to be four times higher than in the general public [16]. One out of every three patients with diabetes suffers from a low health literacy. Low health literacy has also been known to be associated with poor levels of knowledge about diabetes. A study conducted by Mahmoudi showed very low health literacy in patients with diabetes, which was also associated with worse outcomes, such as retinopathy and poorer blood sugar control [17].

Despite the important role of health literacy in health behaviors, few studies have examined this subject in Iran and even fewer have been conducted on health literacy in diabetic patients, excluding those conducted by Tol, Mahmoudi and Rafizadeh [6, 17 and 18]. Diabetes is a complicated disease that requires knowledge and the regular self-control of blood-sugar and therefore

necessitates more research. The present study was conducted to examine health literacy, knowledge and relevant factors in patients presenting to a diabetes clinic in Zahedan, Iran, with type 2 diabetes.

## Materials and Methods

The present descriptive, analytical, cross-sectional study was conducted on 182 patients presenting to the Diabetes Clinic of Ali Asghar Hospital in Zahedan, Iran, with type 2 diabetes in 2014 and selected through convenience sampling.

In a pilot study conducted on 30 patients, the standard deviation of the score of health literacy was calculated as 9.5. The sample size required for the study was calculated as 174 using the following equation and considering  $\alpha=0.05$  and  $d=2$ . With regard to the data on the score of knowledge, the required sample size was determined as 100.

$$N = \frac{z^2 \cdot S^2}{d^2} \quad \text{Eq. 1}$$

The larger estimate of 174 was deemed as the acceptable sample size and a total of 182 patients ultimately entered the study.

The study inclusion criteria consisted of having been diagnosed with diabetes by a specialist since at least a year ago (so as to have proof of the diagnosis, a history of pharmacological therapy and an active medical record in the diabetes clinic) and submitting written consent forms for participation in the research project. The study exclusion criteria consisted of unwillingness to participate in the study and poor physical conditions for responding to the questionnaire items.

A three-section inventory was used in this study. The first section of the inventory covered the patients' demographic information with six items on the variables of age, gender, level of education, employment status, marital status and years since the diagnosis of diabetes. The second section consisted of the Health Literacy Questionnaire (HLQ) with four parts, including the ability to access information, understand information, reading comprehension and calculation. The questionnaire was designed using the test of functional health literacy in adults (TOFHLA), which has been translated into Persian in previous studies and has an approved validity and reliability [15]. The TOFHLA framework was taken as the model and changes were made to its different sections on the ability to access information, understand information, reading comprehension and calculation. The questionnaire was localized in order to become more applicable for the region under study as well as for diabetic patients, and its validity and reliability were once again measured.

The HLQ used in this study thus consists of 36 items, including a part on the ability to access information (10 items), for which correct answers are given 1 point and wrong answers zero points, a part on the ability to understand information (10 items), which is scored based on the Likert scale with options including Always (given 3 points), Sometimes (2 points) and Never (1 point), a part on the ability to calculate (11 items), for seven items of which correct answers receive 1 point and wrong answers zero points, and three others items of which are given either 0, 1, 2, 3 or 4 points, and a final part on reading comprehension (5 items), four items of which are given either 0, 1, 2

or 3 points and one item 0, 1, 2, 3 or 4 points. The total score of health literacy was calculated by adding the scores of the four parts and ranged from 0 to 75. A final score of 51-75 was taken to indicate an adequate health literacy, a score of 25-50 as a marginal and a score of 0-24 as an inadequate health literacy. The third section of the inventory assessed the patients' knowledge through a questionnaire consisting of 17 items on symptoms of the disease, blood sugar control, effective health-promoting self-care measures, the role of physical activity and nutrition in the promotion of health, complications of diabetes, strategies for the prevention of infection in the organs, the proper administration of medications and the proper method of insulin injection. The items in this section were given 2 points for any correct answers, 1 point for any 'I Don't Know' answers and zero points for any incorrect answers. The final score of knowledge ranged from 0 to 34. A score of 24-34 in this questionnaire was taken to indicate a high level of knowledge, a score of 11-22 a moderate and a score of 0-10 a poor level of knowledge.

The validity of the health literacy and knowledge inventory was assessed using the method of content validity. Data were first collected by a review of reliable books and articles on type 2 diabetes, and their content was then studied and assessed by ten experts, including doctoral advisors, supervisors and diabetes specialists. The CVR and CVI of the items of the HLQ (CVR= 0.87 and CVI= 0.83) and the knowledge questionnaire (CVR= 0.86 and CVI= 0.84) were calculated and the final inventory was then prepared and used after applying the revisions. The reliability of the questionnaires was determined through

examining the internal consistency of their items. A total of 30 of the participating patients thus completed the two questionnaires. Cronbach's alpha values of 0.88 and 0.78 confirmed the internal consistency of the HLQ and the knowledge questionnaire. The inventory was thus found to have a favorable validity and reliability.

To comply with research ethics, the patients were informed about the voluntary nature of participation in the study. They then submitted informed written consent forms before entering the study based on the inclusion and exclusion criteria and completed the inventory. It should be noted that an interviewer read the inventory items for those who were illiterate or less literate or who preferred this method of filling out the questionnaires. These steps were taken only after obtaining permissions from the Research and Technology Deputy of Zahedan University of Medical Sciences, the School of Health, and the Diabetes Clinic of Ali Asghar Hospital. Once the inventories were completed, the data obtained were analyzed in SPSS-16 using descriptive (tables of absolute and relative frequency, mean and standard deviation) and inferential (linear regression) statistics at a significance level lower than 0.05.

## Results

The present study was conducted on 182 patients with type 2 diabetes. Table 1 shows the demographic details of the patients. As shown in the table, 62.1% of the patients and in 63.2% of the patients, 4-14 years had passed since the diabetes diagnosis (with a mean time since diagnosis of  $9.1 \pm 6.08$  years).

**Table 1.** The demographic details of the patients

Variable		Frequency	Percentage
<b>Gender</b>	Male	44	24.2
	Female	138	9.9
<b>Age</b>	Below 39	18	75.8
	40-59	113	62.1
	Over 60	51	28
<b>Level of Education</b>	Illiterate	70	38.5
	Primary School	62	34.1
	Diploma		
	Middle School	22	12.1
	Diploma		
	High School	19	10.4
	Diploma		
	Associate Degree	9	4.9
<b>Employment Status</b>	Unemployed	14	7.7
	Laborer	7	3.8
	Employed	4	2.2
	Self-Employed	4	2.2
	Housewife	125	68.7
	Retired	28	15.4
<b>Years since the Diabetes Diagnosis</b>	Less than 3	34	18.7
	4-9	65	35.7
	10-14	50	27.5
	Over 15	33	18.1
<b>Marital Status</b>	Single	5	2.7
	Married	155	85.2
	Divorced	5	2.7
	Widowed	17	9.3

Moreover, most of the patients were female (75.8%), illiterate (38.5%) and married (85.2%). According to the results (Table 2), the mean total score of health literacy was  $43.02 \pm 12.5$  out of 75 (57.36% of the full score). Of the different health literacy skills examined, the highest score was obtained in the ability to understand information, with the mean score of  $21.78 \pm 4.38$  out of 30 (72.6% of the full score), and the lowest score in the reading comprehension skill, with the mean score of  $6.13 \pm 4.16$  out of 16 (38.31% of the full score). The mean score

of knowledge was  $22 \pm 4.6$  out of 34 (64% of the full score).

**Table 2.** The mean scores obtained in the different health literacy skills and knowledge

Variable	Full Score	Mean & SD	Percentage of the Full Score
<b>Ability to access information</b>	10	$4.2 \pm 26.02$	42.6
<b>Ability to understand information</b>	30	$21.4 \pm 78.38$	72.6
<b>Reading comprehension</b>	16	6.4	13.16
<b>Ability to calculate</b>	19	$10.4 \pm 84.65$	57.05
<b>Health literacy</b>	75	$43.12 \pm 02.5$	57.36
<b>Knowledge</b>	34	$4 \pm 22.6$	64

To examine the predictive variables of health literacy, the participants' age, gender, level of education, employment status, marital status and years since the diagnosis of diabetes were entered into the linear regression model; the output of the model consisted of only two variables, namely the level of education and gender. The score of health literacy increased by 7.1 per each unit of increase in education. The score of health literacy increased by 3.2 units in men compared to in women, since gender is a binary variable (female= 2 and male= 1). The results obtained showed that 31.3% of the participants had an adequate health literacy, 61.5% had marginal and 7.1% had inadequate health literacy. Moreover, 58% of the patients had a high level of knowledge, 40.4% had a moderate and 1.6% a poor level of knowledge.

**Table 3.** The predictors of health literacy in the linear regression model

Model	Unstandardized Coefficient		Standardized Coefficient	T	P-Value
	B	Std. Error	Beta		
Constant Value	33.790	3.497		9.664	<0.001
Education	7.10	0.594	0.665	11.964	<0.001
Gender	3.206	1.617	-0.110	1.98	0.049

\*P-values less than 0.05 indicate statistically significant relationships

**Table 4.** The absolute and relative frequency distribution of health literacy and knowledge in the participating patients .

Variable	Score	Absolute Frequency	Relative Frequency
<b>Knowledge Score</b>			
High	23-34	91	58
Moderate	11-22	88	40.4
Poor	0-10	3	1.6
<b>Health Literacy Score</b>			
Adequate	51-75	57	31.3
Marginal	25-50	112	61.5
Inadequate	0-24	13	7.1

## Discussion and Conclusion

The results revealed a mean health literacy score of 43.02 in the patients. It may therefore be concluded that the level of health literacy was marginal in the examined type 2 diabetes patients. In line with the present findings study, Karimi et al. [19], Ozadmir [20], Schilinger [21], Tol [6] and Khosravi [22] also found the level of health literacy in their participants to be marginal. Meanwhile, the level of health literacy was inadequate in the diabetic patients examined in the study by Kooshyar [23] and adequate in the pregnant women examined in the study by Ghanbari [24]. The present study found a high level of knowledge in the diabetic patients examined. Similarly, the level of knowledge was favorable in the diabetic patients examined by Tol. This

good level of knowledge may be attributed to the numerous training sessions and research projects conducted in this clinic.

The results also revealed that the type 2 diabetes patients examined obtained the lowest scores in the reading comprehension skill, suggesting that instructional materials are written for patients with a high level of knowledge. This finding was similar to the results obtained by Khadijeh Ahmadzadeh, who showed that instructional materials are little intelligible to patients and are more suitable for patients with university education [25]. Estrada et al. also showed that 88% of these instructional materials are written for people at the 9th grade level or above [26]. The results of a study by Lisa showed that people with low health literacy have difficulty not only in reading, but also in verbal communication with the healthcare providers [27].

One of the main barriers to health literacy is difficulty reading the materials provided and establishing verbal communication with the healthcare providers. Most health materials have been written for people at the 10th grade level or above. However, health materials should be written for people at the 5th grade level so as to ensure that people with low health literacy can also comprehend them [28]. Diabetic patients with inadequate health literacy are weaker in

the control of their blood sugar compared to patients with adequate health literacy [29]. Health authorities and diabetes clinics should emphasize this difference, because patients with low health literacy are less successful in the control of their condition.

Education is one of the factors affecting health literacy. A low level of education, difficulty with written communication and little familiarity with medical terms impair the ability to successfully interact with the healthcare system. The healthcare system needs to accommodate people with low health literacy so as to minimize the effect of education on the level of health literacy. People can obtain health information by receiving training through the media using simple images and cultural examples, communication in a simple language and simpler instructions that facilitate comprehension [30]. Based on the results of the regression analysis, level of education and gender are predictors of health literacy, as the score of health literacy increased by 7.1 per each unit of increase in education and women's level of health literacy was also found to be lower than that of men. The lower level of health literacy in women was often due to their lower levels of education. Most studies have reported the level of education as a predictor of health literacy and men's level of health literacy as higher than women's [7, 17 and 23]. Nevertheless, in a study by Paasche-Orlow, the low health literacy did not correlate with gender, although it did with the level of education [31]. Patients comprehend and memorize 50% of the information they hear from their physicians, and this act may greatly influence the patients' safety and adherence. People with a low level of education often have difficulty comprehending written information, such as drug doses, instructions

and warning labels, discharge instructions, consent forms for treatment and participation in studies and general information on diseases, nutrition, prevention and health services [30].

A limitation of the present study involved the completion of the inventory, as the illiterate among the patients had difficulty filling out the inventory and an interviewer had to read the items to them and write down their answers. Moreover, many of the literate patients could not complete the inventory by themselves due to their poor eyesight caused by diabetes.

Patients with type 2 diabetes had marginal health literacy in this study and women's level of health literacy was found to be lower than men's. Given that most diabetic patients are female and have a low level of education, it is recommended that instructional materials and medical pamphlets be written in a simple language suiting the patients' level of comprehension and simple comprehensible words be used in verbal communication between the patients and the physicians or healthcare providers, so as to increase health literacy in this group. Improving health literacy in patients with diabetes results in more favorable outcomes with regard to the control and treatment of diabetes and is necessary given the existing levels of health literacy in these patients. This group requires more attention and more studies need to be conducted on their conditions.

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## Conflicts of Interest

The authors have no conflicts of interest regarding to this research.

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