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Health Literacy and Health-Related Quality of Life among Type 2 Diabetic Patients in Ain Shams University Hospital

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A B S T R A C T

Background: The quality of life in patients with diabetes is generally low. It appears to be associated with several factors including health literacy. **Objective:** This study aimed to measure the level of health literacy, assess quality of life, and determine the relation between health literacy and quality of life among patients with type 2 diabetic attending endocrine outpatient clinic at Ain Shams University Hospital. **Methods:** A cross-sectional design was conducted. Recruitment was done using a systematic random sampling technique to select 250 type 2 diabetic patients aged 18 and older. An interview questionnaire is used to assess their health literacy, quality of life, and socio-demographic characteristics. **Results:** The mean age of the sample was 52.98 ± 11.90 years, with 64.4% being female. Most participants were married (79.2%), and 70.8% were not working. Around 74% never smoked. The mean of glycated hemoglobin (HbA1C) was 7.73 ± 1.44. The highest health literacy scores were observed in the "appraisal of health information" and "understanding health information enough to know what to do" scales. Using multiple linear regression analysis, health literacy score, age, university education, and having other chronic diseases were significantly independent predictors of quality of life. Additionally, the study findings revealed a significant effect of health literacy scores on all health-related quality of life dimensions. **Conclusions and recommendations:** Health literacy positively impacts the quality of life in patients with type 2 diabetes. Improving health literacy using a comprehensive educational program can improve patient's quality of life.

INTRODUCTION

The World Health Organization (WHO) defines health literacy (HL) as the cognitive and social abilities influencing a person's motivation and capacity to obtain, comprehend, and utilize information appropriately to preserve optimal vitality.[1] Since HL considers social, political, and environmental factors that impact a patient's ability to interact with health services and information, it is a more comprehensive concept than health education.[2] The HL was initially developed in the 1970s, primarily employing functional testing to assess people's reading, comprehension of medical language, and numeracy abilities. Later, the concept was expanded and changed to account for various factors that impact an individual's ability to access, understand, and use health services and information.[3]

Since type 2 diabetes mellitus (T2DM) is a chronic condition, individuals must adhere to clinical guidelines for the rest of their lives to enhance their quality of life, maintain their health, and reduce the

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Table 1: Socio-demographic and diabetic-related characteristics of the participants (N=250)

	Number	%
Gender:		
Male	89	35.6
Female	161	64.4
Marital status:		
Single	11	4.4
Married	198	79.2
Widowed	33	13.2
Divorced	8	3.2
Educational level:		
Illiterate	74	29.6
School education	123	49.2
University education and post-graduate	53	21.2
Occupation:		
Not working *	177	70.8
Blue collar	52	20.8
White collar	21	8.4
Smoking:		
Smoker	45	18
Ex-smoker	20	8
Never smoke	185	74
Glycemic status:		
Controlled (HbA1C≤7)	80	32
Uncontrolled (HbA1C>7)	170	68
Anti-diabetic treatment:		
Insulin	150	60
Oral hypoglycemic	100	40
Family history of diabetes:	183	73.2
Other chronic diseases:	175	70
	Mean	**SD**
Age in years	52.98	11.90
Smoking years	4.42	11.13
Number of cigarettes per day	2.60	6.18
Onset of diabetes	10.61	8.26
HbA1C	7.73	1.44

*SD: Standard Deviation, Not working * include females, students, and retired participants.*

risk of complications.[4] According to estimates, 10.5% of people in the world (536.6 million) aged 20 to 79 had diabetes in 2021, which was expected to rise to 12.2% (783.2 million) by 2045. The prevalence of diabetes was highest in people aged 75–79 years. Diabetes is the sixth most common disease in terms of the number of disability-adjusted life years (DALYs) it causes in people.[5]

Egypt ranks the 8th in the world for the frequency of diabetes, according to the International Diabetes Federation (IDF). In early 2020, there were 8,850,400 adult patients (with a prevalence of 15.2%) and 86,478 diabetes-related deaths annually.[6] Therefore, the focus on creating therapies to improve T2DM individuals' capacity to cope has increased over the past ten years. Numerous authors have claimed that determining instructional strategies, directing follow-ups, and attaining the best health outcomes for T2DM patients all depend on their level of health literacy.[4]

WHO defines the health-related quality of life (HRQOL) as " a person's assessment of his or her place in life, in the context of the culture and value system in which he or she lives, in connection to his or her objectives and aspirations, norms and concerns ". T2DM is a chronic condition; thus, individuals must manage it for the rest of their lives. Additionally, when it comes to chronic disorders, HRQOL plays a significant role in medical decision-making, competing with the effectiveness and safety of treatments.[7]

Health literacy has a favorable and profound influence on the quality of life (QOL) subscales: physical, mental, social, and environmental health. A previous study reported that QOL may be predicted by health literacy. Individuals with inadequate health literacy may disregard their well-being and make unhealthy choices, affecting their QOL.[8]

While many studies address the level of health literacy, or QOL, among individuals with type 2 diabetes, few studies have been conducted in Egypt. Therefore, there is a need to explore the relationship between health literacy and QOL among Egyptian type 2 diabetic individuals. This research aimed to ascertain the relationship between health literacy and quality of life among type 2 diabetic patients attending the outpatient endocrine clinic at Ain Shams University Hospital and evaluate their health literacy level.

METHODS

A Cross-sectional research was conducted on individuals with type 2 diabetes aged ≥18 years who were attending the outpatient endocrine clinic at Ain Shams University Hospital. The data collection period was extended from October 2022 to March 2023.

The sample size was calculated using power analysis and sample size software 2011 (PASS 11). By using the confidence level of 95%, a margin of error of ±0.10, and after reviewing previous study results,[3] which

Table 2: Relation between health literacy scales and socio-demographic and diabetic-related characteristics among the study participants (N=250)

Variables	Health literacy scales								
	scale 1	scale 2	scale 3	scale 4	scale 5	scale 6	scale 7	scale 8	scale 9
	Mean score (SD)								
Overall Score	**2.84±0.53***	**2.87±0.49**	**3.01±0.42**	**2.83±0.53**	**3.10±0.56**	**3.26±0.65**	**3.34±0.68**	**3.30±0.86**	**3.71±1.11**
Education level #									
Illiterate	2.65 (0.48)	2.74 (0.44)	2.93 (0.3)	2.84 (0.44)	3.04 (0.55)	3.26 (0.64)	3.24 (0.74)	3.49 (0.62)	3.59 (0.72)
School education	2.87 (0.48)	2.9 (0.49)	2.98 (0.41)	2.8 (0.51)	3.14 (0.56)	3.41 (0.65)	3.5 (0.67)	3.54 (0.62)	3.77 (0.58)
University and post-graduate	2.94 (0.46)	3.08 (0.43)	3.19 (0.48)	2.89 (0.42)	3.16 (0.52)	3.49 (0.85)	3.43 (0.82)	3.77 (0.61)	3.98 (0.72)
P-value	**0.001**	**<0.001**	**0.001**	**0.501**	**0.002**	**0.104**	**0.059**	**0.028**	**0.005**
Occupation #									
Not working	2.79 (0.5)	2.86 (0.48)	3.01 (0.35)	2.82 (0.48)	3.12 (0.54)	3.34 (0.69)	3.36 (0.75)	3.54 (0.59)	3.75 (0.64)
Blue collar	2.83 (0.38)	2.88 (0.47)	2.94 (0.5)	2.79 (0.46)	3 (0.59)	3.35 (0.68)	3.48 (0.67)	3.52 (0.67)	3.73 (0.74)
White collar	3.1 (0.54)	3.14 (0.36)	3.19 (0.6)	3 (0.45)	3.14 (0.57)	3.81 (0.68)	3.67 (0.66)	4 (0.63)	3.95 (0.67)
P-value	**0.021**	**0.039**	**0.064**	**0.202**	**0.364**	**0.013**	**0.131**	**0.005**	**0.396**
Gender!									
Male	2.79 (0.46)	2.87 (0.43)	3.02 (0.45)	2.82 (0.44)	3.06 (0.51)	3.36 (0.77)	3.35 (0.78)	3.52 (0.66)	3.69 (0.72)
Female	2.84 (0.5)	2.91 (0.5)	3 (0.39)	2.83 (0.49)	3.12 (0.57)	3.4 (0.65)	3.44 (0.7)	3.61 (0.6)	3.81 (0.64)
P-value	**0.491**	**0.507**	**0.680**	**0.847**	**0.397**	**0.681**	**0.337**	**0.226**	**0.167**
Glycemic status !									
Controlled	2.95 (0.47)	2.99 (0.44)	3.11 (0.39)	2.95 (0.42)	3.11 (0.45)	3.59 (0.65)	3.61 (0.7)	3.78 (0.62)	3.89 (0.64)
Uncontrolled	2.76 (0.48)	2.85 (0.49)	2.96 (0.41)	2.77 (0.49)	3.09 (0.59)	3.29 (0.7)	3.31 (0.72)	3.48 (0.61)	3.71 (0.68)
P-value	**0.004**	**0.023**	**0.006**	**0.003**	**0.746**	**0.001**	**0.002**	**0.001**	**0.045**
Family history of diabetes!									
No	2.87 (0.46)	2.91 (0.45)	3.04 (0.41)	2.88 (0.41)	3.12 (0.48)	3.43 (0.61)	3.42 (0.58)	3.63 (0.65)	3.88 (0.62)
Yes	2.8 (0.5)	2.89 (0.48)	2.99 (0.41)	2.81 (0.49)	3.09 (0.58)	3.37 (0.73)	3.4 (0.78)	3.56 (0.62)	3.72 (0.68)
P-value	**0.898**	**.711**	**0.393**	**0.288**	**0.686**	**0.504**	**0.882**	**0.437**	**0.095**
Other chronic diseases!									
No	2.89 (0.53)	2.99 (0.53)	3.05 (0.49)	2.81 (0.51)	3.16 (0.57)	3.53 (0.68)	3.69 (0.66)	3.71 (0.69)	3.84 (0.72)
Yes	2.79 (0.46)	2.85 (0.44)	2.99 (0.37)	2.83 (0.46)	3.07 (0.54)	3.32 (0.7)	3.29 (0.73)	3.52 (0.59)	3.73 (0.64)
P-value	**0.119**	**0.039**	**0.308**	**0.002**	**0.230**	**0.026**	**<0.001**	**0.030**	**0.240**

(#) ANOVA test, (!) independent t-test, (*) mean ± SD, P-value < 0.05 is considered statistically significant.
Scale 1: Feeling understood and supported by health care providers, Scale 2: Having sufficient information to manage my health, Scale 3: Actively managing on my health, Scale 4: Social support for health, Scale 5: Appraisal of health information, Scale 6: Ability to actively engage with healthcare providers, Scale 7: Navigating the healthcare system, Scale 8: Ability to find good health information, Scale 9: Understanding health information is enough to know what to do.

showed that the correlation between the score of health-related quality of life by EQ-VAS scale and health literacy scale 8 "ability to find good health information" was (r = 0.49), a sample size of at least 250 type 2 diabetic patients was deemed sufficient to achieve study objectives. A systematic random sampling method was utilized to collect the data.

Data collection tool: An Arabic interview-structured questionnaire was adopted from previous studies. [3, 9, 10, 11] Translation and back translation were performed, and a committee of three experts from the public health department at Ain Shams University reviewed and approved the final version. The questionnaire consisted of four main sections. *Section 1:* Socio-demographic information, including age, sex, marital status, occupation, educational level, smoking habit, and past medical history. *Section 2:* Detailed diabetic history**,** including the onset of diabetes, glycemic status, and family history of diabetes. *Section 3:* The health literacy questionnaire (HLQ) is a robust psychometric multidimensional questionnaire comprising nine independent scales, each with a four- or six-item Likert scale. The HLQ has undergone validation and translation into numerous languages, including Arabic. [2] The nine scales are: Feeling understood and supported by health care providers, Having sufficient information to manage my health, Actively managing my health, Social support for health, Appraisal of health information, Ability to actively engage with healthcare providers, Navigating the healthcare system, Ability to find good health information, Understanding health information is enough to know what to do. Responses to the initial five scales are rated as follows: 1 (strongly disagree), 2 (disagree), 3 (agree), and 4 (strongly agree). Responses to (scales 6 to 9) and rated as follows: 1 (impossible or always difficult), 2 (generally difficult), 3 (occasionally difficult), 4 (generally easy), and 5 (always easy). A greater score on each scale corresponds to a higher degree of HL. [10] *Section 4:* Health-

Table 3: Relation between health-related quality of life dimensions and health literacy score among study participants (N=250)

Health-related quality of life dimensions	Prevalence N (%)	Total HL score		ANOVA	P-value
		Mean	±SD		
Mobility					
No problem	102 (40.8)	29.66	3.64	2.016	0.006
Slight to moderate	128 (51.2)	28.60	3.26		
Severe to unable	20 (8)	25.40	2.48		
Self-care					
No problem	169 (67.6)	29.53	3.41	2.504	<0.001
Slight to moderate	68 (27.2)	27.54	3.21		
Severe to unable	13 (5.2)	25.46	3.28		
Usual activity					
No problem	113 (45.2)	29.86	3.82	2.934	<0.001
Slight to moderate	114 (45.6)	28.31	2.88		
Severe to unable	23 (9.2)	25.78	2.86		
Pain					
No problem	29 (11.6)	30.41	3.87	3.133	<0.001
Slight to moderate	202 (80.8)	28.88	3.35		
Severe to unable	19 (7.6)	25.16	2.52		
Anxiety					
No problem	50 (20)	29.18	5.06	2.737	<0.001
Slight to moderate	187 (74.8)	28.86	3.00		
Severe to unable	13 (5.2)	26.00	2.55		

related quality of life: EQ-5D-5 L is a Euro_QOL Group-developed generic European HR_QOL measure. It is validated in English and translated into many languages, including Arabic.[3] The EQ-5D-5L consists of two parts: five aspects of health are evaluated in the initial section: mobility, self-care, daily activities, pain or discomfort, and anxiety or depression. Respondents are graded on a five-point scale based on the severity of the issues: 1 for absence, 2 for mild, 3 for moderate, 4 for severe, and 5 for extreme. The subsequent segment comprises the "EQ-VAS," a visual analog scale that provides an individualized subjective evaluation of health status on a thermometer-like scale ranging from 0 to 100. Here, 0 represents the worst health status, and 100 represents the most significant health status imaginable. The interviewer inquired about the patient's health condition on the day of the questionnaire. They were requested to indicate the appropriate scale level with an "X" in the provided box.[11]

Pilot study: A two-week pilot study was conducted among ten percent of the sample size to assess the questionnaire's comprehensibility and patient understanding. Some questions were modified to be more explicit, and the data from the pilot study was not included in the final analysis.

Data analysis: After revision, cleaning, and computer data entry, analysis was performed using version 24 of the SPSS software program (IBM Corp., Armonk, NY, USA). Means and standard deviations were employed to characterize the quantitative data, while numbers and percentages illustrated the qualitative information. Significance was deemed to exist when $P < 0.05$. The cumulative health literacy score of the participants was determined, and the percentages of scores, mean, and standard deviation were utilized to assess health literacy levels and evaluate quality of life. The study employed the independent student t-test and ANOVA test to examine the association between health literacy scales and quality of life with the participants' diabetic-related and socio-demographic characteristics. Linear regression models were constructed to examine the predictors of quality of life.

RESULTS

Two hundred and fifty participants were involved in the current study, with a mean age of 52.98 ± 11.90 years. Among them, 64.4% were female. Most of them (79.2%) were married, and approximately half of the participants (49.2%) had a school education. Most participants (70.8%) were not working, and about

Table 4: Relation between visual analog scale and socio-demographic and diabetic-related characteristics among the study participants (N=250)

	Mean	±SD	Test	P-value
Gender				
Male	68.37	16.35	0.445 #	0.657
Female	69.25	14.27		
Marital status				
Single	72.27	20.17		
Married	69.82	14.87		
Widowed	63.33	13.39	2.100$	0.101
Divorced	65.63	14.00		
Education level				
Illiterate	62.84	14.05		
School education	69.72	14.18		
University and post-graduate	75.66	15.19	12.668$	<0.001*
Occupation				
Not working	66.36	14.80		
Blue collar	75.10	14.23	9.601$	<0.001**
White collar	75.48	12.64		
Smoking				
Smoker	69.22	16.31		
Ex-smoker	61.75	17.19	2.538$	0.081
Never smoke	69.65	14.31		
Glycemic status				
Controlled	73.81	14.35	3.603#	<0.001
Uncontrolled	66.65	14.81		
Anti-diabetic treatment				
Insulin	67.73	16.09		
Oral hypoglycemic	70.75	13.11	1.561#	0.120
Family history of diabetes				
No	67.61	13.83	0.846#	0.399
Yes	69.43	15.44		
Chronic diseases				
No	76.33	13.66	5.374#	<0.001
Yes	65.77	14.48		

*# Independent t-test, $ ANOVA test *The significant difference (Post hoc test) was between illiterate, school-educated, and university-educated. ** The significant difference (Post hoc test) was between not working with either white or blue collar but not between white and blue collar.*

three-quarters (74%) reported never smoking. The mean onset of diabetes was 10.61 ± 8.26 years, and the mean HbA1C was 7.73 ± 1.44. About two-thirds of the participants (68%) had uncontrolled diabetics, and most of them (60%) were on insulin as an anti-diabetic treatment. Additionally, 70% of participants reported having other chronic diseases; as shown in Table 1.

Regarding patient scores for the first five HL scales, the highest mean score (3.10) was observed on scale 5 (appraisal of health information), and the lowest mean score (2.82) was observed on scales 1 and 4 (feeling understood and supported by healthcare providers and social support). Most participants displayed a positive attitude toward these first five domains. Concerning the second set of four HL scales, the highest average score (3.71) was detected on scale 9 (understand health information). Most participants sometimes exhibited a problematic attitude toward navigating the healthcare system. Generally, participants had a generally easy attitude towards finding good health information and understanding health information domains, as illustrated in

Table 2. The study participants' mean total health literacy score was 28.28 ± 3.69, ranging from 17 to 37 (data not tabulated).

By addressing socio-demographic and diabetic-related factors and their relation to HL across all scales, statistically significant associations were observed among almost all scales of health literacy and the educational level ($P < 0.05$), except for three scales: the fourth, sixth, and seventh scales. University-educated and post-graduates significantly had higher HL scores than illiterate patients (as shown in Table 2). Additionally, the study showed a significant negative correlation between the HL score and age ($r = -0.224$, $P<0.001$) (data not tabulated).

There were statistically insignificant relations between 5 scales of health literacy and occupation ($P > 0.05$): the third scale (actively managing my health), the fourth scale (social health support), the fifth scale (appraisal of health information), the seventh scale (navigating the healthcare system), and the ninth scale (understanding health information enough to know what to do). HL scale scores were higher in white-collar than in blue-collar or non-working individuals (Table 2).

Moreover, there were statistically significant relations among all scales of HL and the glycemic status of diabetics ($P < 0.05$), except for the fifth scale (appraisal of health information). The Participants with controlled blood glucose level had a significantly greater level of HL (Table 2).

A statistically significant association was observed between the health-related quality of life dimension and health literacy ($P < 0.05$). A higher level of health literacy was related to a better quality of life (Table 3).

Concerning health-related quality of life, more than half of cases (51.2%) had slight to moderate problems with mobility. Most participants (67.6%) had no problem with self-care activities. Less than half of the participants (45.6%) had slight to moderate difficulties in their usual activities. Most participants (80.8%) had slight to moderate pain. Additionally, most participants (74.8%) reported slight to moderate anxiety (Table 3). The mean VAS score of the participants is high (68.94 ± 15.02), as displayed in Table 4.

Regarding the relation between QOL and socio-demographic criteria, the present research revealed a significant association with the educational level ($P < 0.05$). VAS was better among university-educated and post-graduates (mean = 75.66 ± 15.19) than other groups. Additionally, a statistically significant correlation was observed among QOL and occupation ($P < 0.05$), with VAS being better in the white collar group (mean =75.48 ± 12.46) compared to the non-working group (Table 4). A significant negative correlation existed between VAS score and age ($r = -0.383$, $P <0.001$). (data was not tabulated)

Concerning the relation between QOL and diabetic-related factors, the current study revealed an association between QOL and glycemic status, as the mean score of VAS was higher among controlled diabetics (mean = 73.81 ± 14.35). Additionally, a statistically significant association was observed between VAS and patients having other chronic diseases, with the VAS score being higher in patients who did not have other chronic diseases (Table 4).

The multiple linear regression for predictors of quality of life among study participants (R^2 of the model = 0.571) showed that total health literacy score, age, university education, and having other chronic diseases were significantly independent predictors of quality of life among the diabetic patients ($P < 0.05$), as presented in Table 5.

DISCUSSION

Social media, creative communication, artificial intelligence, and the growing pressure on individuals to take greater responsibility for their health have rendered health literacy essential in healthcare settings. Adequate health education is also required. HL is now considered a way to achieve health and well-being, a factor that can lessen health disparities within target communities, and a significant element in determining QOL for individuals in many different contexts. [12]

Regarding health literacy, the results of the current study revealed that healthy literacy scales are affected by educational level (for all scales except the fourth, sixth, and seventh scales). Patients with higher educational levels have higher health literacy scores, enabling them to retrieve, understand, and communicate health information. The current study aligns with the research results conducted in Egypt, where health literacy was assessed. [2] By comparing three different levels of education (illiterate, primary, and above primary), differences were observed in all the HL scales, except for the fourth scale (social support for health), which showed no association with education level. At the same time, there is

Table 5: Predictors of quality of life among study participants using multiple linear regression (N=250)

Variables in the Equation	B	SE	P-value	F	P-value	R^2
Total HL score	1.232	.239	<0.001			
Age	-0.287	0.074	<0.001			
School education*	3.763	1.888	0.047			
University education*	7.646	2.317	0.001	19.644	<0.001	0.571
Hyperglycemia	-0.790	0.574	0.170			
Other chronic diseases	-5.018	1.890	0.008			
Constant	54.846	10.283	<0.001			

**Reference group: illiterate*

disagreement concerning the sixth scale. This study identified the most significant differences (ES > 0.8) across the remaining scales, particularly for the seventh scale (navigating the health care system), the eighth scale (ability to find good health information), and the ninth scale (understanding health information is enough to know what to do). [2] Moreover, a study conducted in Bangladesh endeavored to find a relationship between HL and socio-demographic status in type 2 diabetic cases. The study demonstrated that education was independently related to the level of HL. [13] Additionally, another study focused on the relationship between HL and diabetes burden in the elderly. This study found that HL level was associated with educational level (P < 0.001). The HL scores of illiterate participants were lower than those of primary school, secondary, high school, and university graduates. [14]

Most HL scales were significantly related to occupation, except for the third, fourth, fifth, seventh, and ninth scales. White-collar workers, including those in professional occupations, typically have high education and knowledge. A systematic review including 30 articles aimed at elucidating the meaning of specific work-related HL demonstrated a strong relationship between individual employment and his health literacy ability. **[15]** Given that most people spend a considerable amount of their lives at work, workplaces can be beneficial in promoting the adoption and application of HL policies.

Concerning diabetic - related characteristics, the current study revealed that a person's ability to look up medical information to improve his health is reduced with increasing age and the number of chronic conditions. Being under 55 was strongly associated with greater HL on nearly all scales. A greater number of opportunities for continuing education among younger adults has been associated with a reduced risk of chronic illness.[16]

In the current study; the level of HL was not affected by gender across all scales. This behavior contrasts with research performed on type 2 diabetic individuals investigating the impact of HL on QOL, which found a significant relationship between gender and HL, with males achieving higher scores than females (P < 0.009). **[8]** This difference between the two studies may arise from the difference in the level of education among men and women. In the current study, most males and females were school-educated.

Furthermore, the current study showed an association between HL scales and the glycemic status of individuals with diabetes, except for the fifth scale (appraisal of health information), as HL scores among the controlled group were higher than among the uncontrolled group. This can be explained as having health literacy about disease awareness, enabling patients to manage their condition and be vigilant of the signs and symptoms of the diseases. Similarly, a study on type 2 diabetes in Burkina Faso stated that low scores on HL scale one, "feeling understood and supported by healthcare providers", were associated with high fasting blood glucose (7 mmol/L). The same pattern was observed among patients with the most extended duration of diabetes. [3] These findings highlight the vital role of interactions with and trust in healthcare providers in disease management and control.

Regarding QOL, the education level, occupation, the glycemic status of diabetics, and having other chronic diseases were among factors that affect QOL by VAS as reported in this research. The VAS score was higher with better QOL among university-educated, post-graduate, and white-collar workers than other groups. Controlled diabetics and patients without other chronic diseases had better QOL. Educational level and occupation can increase a person's awareness and perception,

improving his quality of life by increasing his knowledge about his health and ability to prevent diseases.

In agreement with these results, a study conducted on Iranian patients with type 2 diabetes to investigate the impact of employment on QOL stated that a noteworthy association was observed between employment status and quality of life ($P < 0.001$); gainfully employed individuals exhibited a higher QOL. Additionally, patients with diabetes diagnosed for a minimum of five years showed a superior quality of life ($P < 0.001$).[8]

Similar to the current study's findings, a study conducted in Greece to demonstrate the relationship between diabetic patients' HRQOL and medication adherence revealed that cases with two or more comorbidities, older age groups, and the use of oral anti-diabetic medication were more likely to report mobility issues. Older age, unemployment, marriage, poor glycemic control, having two or more comorbidities, and worse medication adherence were all linked to an increased risk of self-care issues.[17]

Regarding predictors of QOL among studied participants, the present study showed that the total HL score, age, school and university education, and other chronic diseases were significant independent predictors for VAS scores ($R^2 = 57\%$). Consistent with the results of the present investigation, a study conducted among patients with type 2 diabetes in Greece revealed that non-diabetic comorbidity, female sex, diabetic complications, and years with diabetes were predictors of reduced quality of life. Additionally, older age, less education, single status, obesity, hypertension, and hyperlipidemia were associated with a lower QOL ($R^2 = 42\%$).[18]

Regarding the HL and HRQOL dimensions, the current study found that better QOL in all dimensions were associated with better HL. In congruence with these results, a systematic review including 22 articles on the relationship between HL and an active lifestyle stated a favorable relationship between HRQOL and HL in fifteen observational research studies emphasizing grownups or older individuals. 19 Similarly, a previous investigation established a statistically significant association between insufficient HL and diminished self-care behaviors among individuals diagnosed with type 2 diabetes mellitus, resulting in elevated blood glucose levels. 20 This finding aligns with the results of numerous prior investigations linking inadequate health literacy to reduced self-care practices, ultimately leading to uncontrolled diabetes**.** 21-20 Due to their low health literacy, many elderly diabetic patients often face challenges in reading medication labels, obtaining health information, or comprehending recommendations from their healthcare provider. 21

***Limitations*:** The cross-sectional design inherently possesses limited power to determine the causal effect. Furthermore, despite being validated, VAS is still subjective (self-reported) tool liable for reporting bias.

CONCLUSIONS

In summary, the current study documented the association between HL and QOL. Health literacy among study participants was high and positively impacting their quality of life. Total HL score, age, school and university education, and other chronic diseases were independent predictors of QOL. Policymakers, health officials, and healthcare professionals should recognize the importance of patients' health literacy. In order to guarantee an adequate quality of life, individuals with diabetes must possess a considerable degree of health literacy. This can be accomplished by promoting a comprehensive educational program to improve health literacy in patient with type 2 diabetes.

Ethical Considerations

This research received approval from the research ethics committee at the Faculty of Medicine, Ain Shams University (approval number: FWA 000017585). Administrative approval was obtained from the hospital authority and the head of the endocrine department at Ain Shams University. Informed consent was obtained from participants, and data confidentiality was preserved through questionnaire anonymity.

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***List of abbreviations*:** T2DM, Type 2 Diabetes Mellitus; WHO, World Health Organization; MENA, Middle East and North Africa Region; IDF, International Diabetes Federation; HL, Health literacy; QOL, Quality of life; HRQOL, Health-related quality of life; VAS, Visual analog scale; EQ-5D-5 L, The 5-level EQ-5D.

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