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### Original research

# Predictors of health-related quality of life among people with type II diabetes Mellitus in Ardabil, Northwest of Iran, 2014



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#### ABSTRACT

**Aims:** The present study aims at investigating different dimensions of the Health-Related Quality of Life (HRQOL) and its determinants among type II diabetes Mellitus (T2DM) referred to diabetes clinic in Ardabil.

**Methods:** The present study was conducted through a cross-sectional method in which 300 people with T2DM were selected using a convenience sampling method between January and May 2014. Data were collected through 26-item structured and WHOQOL-BREF questionnaires. Data analysis was performed using descriptive and analytical statistical methods, independent t-test, Mann Whitney test, ANOVA, Kruskal Wallis, Welch test, and multivariable linear regression model using SPSS (V.20).

**Results:** The mean age of the participants was  $54.13 \pm 9.13$ , and about 72% of the patients were women. The mean score of the total HRQOL was  $53.07 \pm 17.09$ ; the highest score of HRQOL was related to the environmental domain ( $57.10 \pm 10.52$ ) and the lowest to the dimension of social health ( $45.68 \pm 17.25$ ). Based on multivariable linear regression, total QOL was influenced by gender, marital status, MHI, and comorbid renal disease. PH Dimension was associated with MHI and neuropathy; PSH with education level, comorbid depression, comorbid renal, and other disease; SR with marital, comorbid renal, and other disease; EH with marital status, Monthly household income (MHI), and education level.

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*Conclusion:* According to the results of this study, Predictors of the HRQOL in T2DM are associated with demographic and socioeconomic factors, comorbidities, and with less impact, diabetes complications, respectively. Moreover, diabetic patients had moderate HRQOL, and compared with men, scores of all domains were lower in women.

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## 1. Introduction

Over the last decades, non-communicable diseases such as diabetes have remarkably increased due to rapid urbanization, unhealthy lifestyle, and aging [1]. World Health Organization (WHO) indicates that the “diabetes epidemic” will continue in coming decades yielding enormous human and economic costs around the world [2].

387 million people were reported diabetic worldwide predicted to be risen to 592 million by 2035 [3]. In 2013, the prevalence of diabetes in Iran was reported 9.94% with more than 4.5 million patients predicted to increase to 8.4 million by 2035 [4]. Diabetes was the death cause of 5.1 million people in 2013 [5], and according to the latest report of WHO in 2014, it is the eighth cause of death in the world [6].

Due to the impossibility of complete treatment of chronic diseases, assessing the quality of life (QOL) among patients with such diseases is an important outcome measure [7]. According to the definition proposed by WHO, QOL is defined as “individuals’ perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards, and concerns” [8]. In most health-related literature, the term “health-related quality of life” (HRQOL) is gradually accepted instead of QOL that is a multi-dimensional structure of subjective evaluation of the good life including performance in relation to physical, mental and social subjects [9].

As one of the common chronic diseases, diabetes causes serious short- and long-term complications [10]. There is evidence that diabetes and its complications of diabetes have a negative impact on health related quality of life among people with diabetes [11].

In addition, healthy diet, adequate physical activity, medication, and daily test of blood sugar and preserving it in a normal range can have many benefits for diabetic patients affecting their HRQOL [12–14]. Some studies have shown the influence of demographic factors, socioeconomic status and clinical factors such as comorbidities, depression, and diabetes control on QOL among people with diabetes [15–20].

QOL among people with diabetes has been assessed in some studies conducted in different regions of Iran using different instrument and methodology. In general, the results of these studies have shown that people with diabetes had lower HRQOL score in comparison with non-diabetic people [21]. However, there is a limited number of studies examining the determinants of HRQOL among diabetic people in Iran [22–25].

Ardabil province is located in Northwest of Iran. People living in this area have Azari-Turkish background with different sociocultural values influencing their lifestyle. Diabetes is a research priority in Ardabil province [26], and previous

studies showed inadequate diabetes care and high prevalence of complications in this population [27–29]. Therefore, the assessment of HRQOL and its determinants plays an important role in enhancing the quality of healthcare and the management of the disease. The present study was designed and conducted to investigate different dimensions of HRQOL and its determinants among diabetic patients referring to diabetes clinic (as a reference center for secondary level of diabetes care) in Ardabil.

## 2. Methods

### 2.1. Subjects and study design

The present study was carried out using a cross-sectional method. 300 individuals with T2DM having the study inclusion criteria and referring to diabetes clinic of Imam Khomeini Hospital during January and May 2014 were selected through a convenience sampling method. The study inclusion criteria include diagnosis of T2DM, age range 20 to 70 years of old, having a caring record in the clinic, residing the urban regions of the province, and not having special and debilitating diseases (hemophilia and thalassemia). Exclusion criteria were unwillingness to participate in the study and having other types of diabetes.

The present study was approved by the Ethics Committee of Tabriz University of Medical Sciences, and at the beginning of the study, the informed consent was completed in written form for all patients.

### 2.2. Measurements

Data collection was carried out by two trained interviewers using questionnaire. The questionnaire had two main parts. In part one, general information including age, gender, place of residence, marital status, Monthly household income (MHI), health insurance, education level, treatment methods (diet only, oral medications, insulin injection, insulin plus oral medications), comorbidities (hypertension (HTN), depression, renal disease, Cardiovascular disease (CVD) and stroke, other diseases including blood lipid, thyroid dysfunction, arthritis and cancer) disease duration, and complications (neuropathy, retinopathy, nephropathy and Cardiovascular complications) were collected.

In second part, the 26-item quality of life (WHOQOL-BREF) questionnaire was employed to assess the HRQOL among study participants. This questionnaire consists of 26 questions the first two of which are designed to check the general HRQOL and the level of the individual's perception of the quality of his/her life, and the remaining 24 questions evaluate the four domains of HRQOL including physical health (PH)

(7 questions), psychological health (PSH) (6 questions), social relationships (SR) (3 questions), and environmental health (EH) (8 questions). A 5-point Likert scale was used to score the questionnaire (not at all, a little, a moderate amount, very much, and an extreme amount). Each question was assigned 1 to 5 points. The highest score in each dimension indicates better HRQOL. During data analysis, questionnaires containing more than 20% unanswered items were crossed out. After the raw score was calculated for each domain, the scores can be analyzed and converted into scales of 0–100 or 4–20 according to the guidelines of WHO [30,31]. In the present study, 0–100 scale was employed. This questionnaire has been translated and validated in 40 languages in different countries. Validation of the Persian version was examined by Nejat et al. [32] and its validity and reliability were also approved.

### 2.3. Statistical analysis

The data were analyzed using SPSS version 20. In addition to descriptive statistical methods (mean  $\pm$  SD and frequency (percent)), independent t-test, Mann–Whitney test, ANOVA (followed with Tukey HSD post hoc analysis), Kruskal Wallis (the post hoc analysis was pursued with Bonferroni corrected Mann–Whitney test by Comparing pairwise subgroups), and Welch test were applied in order to analyze the scores of life quality according to demographic data, treatment methods, and disease characteristics given the parametric and non-parametric conditions of the data. Furthermore, multivariable linear regression model was performed to estimate the relationships between the independent factors with quality of life dimensions (PH, PSH, SR, EH and total HRQOL) Scores (as dependent variables). The significance level in the present study was set at ( $p < 0.05$ ).

## 3. Results

The mean age of the participants was  $54.13 \pm 9.13$  about 72% of whom were female, 88% married, 51% illiterate, 94% with health insurance, and the Monthly income of 67.9% was reported to be less than 500,000 Tomans<sup>1</sup> (Table 1). Approximately, 60% of the patients used oral medication. The most frequent comorbidity was HTN (38.3%) 37.7% of which had only one disease. Moreover, the mean duration of disease was  $7.74 \pm 5.89$  years. The most frequent diabetes complications were neuropathy (23.7%) and retinopathy (20.7%), respectively (Table 2).

The mean score of total HRQOL was  $53.07 \pm 17.09$ . The highest and the lowest score of HRQOL were attributed to the environment dimension ( $57.10 \pm 10.52$ ) and social relations domain ( $45.68 \pm 17.25$ ), respectively. There was a significant difference between men and women in psychological domain ( $p < 0.05$ ) (women with lower level than men) (Table 3). Scores of HRQOL among the patients only using diet as treatment was higher in all domains (except for social relations). The lowest score of HRQOL in all aspects was observed among patients

<sup>1</sup> 1 US dollar equals to 3200 Tomans, 1 Toman equals to 10 Islamic Republic of Iran's Rials).

**Table 1 – Demographic data of 300 T2DM patients referring to diabetes clinic of Ardabil in 2014.**

Variable	Variable	N (%)
Age*	20–30	4 (1.3)
	31–40	23 (7.7)
	41–50	57 (19)
	51–60	143 (47.7)
	61–70	73 (24.3)
Gender	Male	83 (27.7)
	Female	217 (72.3)
Marital Status	Single**	36 (12)
	Married	264 (88)
Education level	Illiterate	153 (51)
	Elementary	81 (27)
	Secondary	34 (11.3)
	High School/Diploma	22 (7.3)
Health Insurance	University Degree	10 (3.3)
	Yes	281 (93.7)
	No	17 (5.7)
Occupation	Not mentioned	2 (6)
	Office worker	28 (9.3)
	Laborer	19 (3.3)
	Housekeeper	206 (68.7)
	Retired/other***	47 (18.7)
Monthly household income****	<500	171 (57)
	500–1000	71 (23.7)
	>1000	10 (3.3)
	Not mentioned	48 (16)

\* Mean and standard deviation:  $54.13 \pm 9.13$ .  
 \*\* Never married, divorced, widow.  
 \*\*\* Driver, self-employed, income without job, unemployed.  
 \*\*\*\* Amounts are in 10000 Rials (1 US dollar equals to 32000 Islamic Republic of Iran's Rials).

with renal diseases. Moreover, the lowest HRQOL score in all aspects was observed among patients with four comorbidities, and only in social health, there was a significant difference among these groups domain ( $p < 0.05$ ). There was a significant difference between the subgroups of disease duration in physical and mental dimensions ( $p < 0.05$ ) (Table 2).

As indicated by multivariable linear regression results, total HRQOL is influenced by gender ( $b: -5.787$ , 95% CI:  $-10.742$  to  $-0.833$ ), marital status ( $b: 8.058$ , 95% CI:  $0.683$  to  $15.433$ ), MHI, and comorbid renal disease ( $b: 4.553$ , 95% CI:  $0.597$  to  $8.508$ ), ( $b: -9.829$ , 95% CI:  $-16.573$  to  $-3.084$ ), respectively. PH dimension was associated with MHI and neuropathy; PSH with education, depression, renal and other disease; SR with marital status, renal and other disease; EH with marital status, MHI and education level (Table 4).

## 4. Discussion

In the present study, the 26-item questionnaire of HRQOL (WHOQOL-BREF) was utilized in order to investigate HRQOL and its determinants among people with T2DM referring to diabetes clinic (reference center) in Ardabil.

In this study, the mean score of total HRQOL was  $53.07 \pm 17.09$ . Compared to some studies [33–35], people with T2DM had average scores of HRQOL in this study; In contrast, it was higher for most patients [36–38] in comparison with some studies that found unfavorable score of HRQOL.

**Table 2 – Different dimensions of QOL according to the clinical aspects of diabetes among 300 T2DM patients.**

Variable	Subgroups	N (%)	PH	PSH	SR	EH	Total QOL
Disease duration (year)	5>	108 (36)	86.58 (11.89)	58.25 (12.49)	48.07 (15.93)	58.81 (10.82)	56.60 (16.66)
	5–10	118 (39.3)	53.51 (11.66)	52.86 (11.76)	45.98 (18.19)	56.25 (10.41)	51.48 (16.03)
	11–15	42 (14)	55.54 (11.21)	53.46 (15.53)	41.87 (19.59)	57.13 (10.78)	51.52 (21.50)
	15<	30 (10)	52.12 (11.90)	54.44 (11.16)	42.56 (12.49)	54.35 (8.65)	50.00 (14.68)
	p	–	0.003 <sup>#</sup>	0.013 <sup>β***</sup>	0.073 <sup>***</sup>	0.145	0.116 <sup>***</sup>
Therapeutic methods	Only diet	35 (11.7)	59.10 (10.85)	59.17 (14.21)	48.10 (13.90)	59.72 (7.93)	58.5 (18.13)
	Oral medication	179 (59.7)	55.94 (12.02)	55.44 (12.76)	45.79 (17.12)	57.61 (10.73)	54.52 (17.07)
	Insulin Injection	66 (22)	53.07 (13.08)	53.54 (13.17)	45.69 (18.72)	55.87 (10.95)	49.04 (17.10)
	Oral medication + insulin injection	13 (4.3)	50.32 (14.66)	53.57 (15.27)	50.38 (22.49)	55.26 (13.20)	52.72 (20.28)
	p	–	0.175 <sup>***</sup>	0.072 <sup>***</sup>	0.437 <sup>***</sup>	0.051	0.532 <sup>***</sup>
Comorbidities <sup>†</sup>	Blood pressure	115 (38.3)	54.30 (11.24)	53.57 (13.51)	43.02 (16.46)	55.58 (10.36)	51.10 (16.76)
	Depression	19 (6.3)	53.02 (11.50)	49.20 (11.43)	47.92 (18.37)	60.38 (10.96)	50.00 (18.63)
	Renal disease	18 (6)	50.41 (10.74)	49.05 (9.96)	38.43 (15.47)	53.75 (10.93)	44.59 (15.46)
	Cardiovascular disease and stroke	23 (7.7)	52.09 (10.08)	52.34 (13.25)	41.36 (14.87)	56.54 (10.98)	48.90 (17.72)
	Other diseases <sup>**</sup>	34 (11.3)	53.26 (11.49)	51.88 (9.80)	41.18 (14.26)	55.22 (10.29)	51.08 (16.26)
	Non	66 (22)	59.93 (13.42)	59.11 (12.31)	53.79 (19.13)	59.23 (9.18)	58.14 (16.63)
p	–	0.261	0.994	0.939 <sup>***</sup>	0.967	0.598 <sup>***</sup>	
Number of comorbidities	0	66 (22)	59.93 (13.42)	59.11 (12.31)	53.79 (19.13)	59.23 (9.18)	58.14 (16.63)
	1	113 (37.7)	56.36 (12.94)	56.46 (13.55)	46.89 (17.41)	58.43 (11.40)	52.93 (17.51)
	2	63 (21)	55.44 (12.43)	55.00 (12.48)	42.50 (18.58)	56.20 (10.58)	51.59 (19.12)
	3	26 (8.7)	59.07 (10.75)	54.65 (14.06)	53.21 (16.17)	57.55 (10.34)	55.29 (16.27)
	4	7 (2.3)	54.08 (4.34)	44.64 (3.96)	39.29 (22.42)	54.02 (5.62)	50.00 (10.21)
	p	–	0.254 <sup>****</sup>	0.173	0.021 <sup>****</sup>	0.597	0.728 <sup>***</sup>
Diabetes-related complications <sup>†</sup>	Neuropathy	71 (23.7)	52.52 (13.41)	54.17 (14.16)	44.44 (22.45)	57.28 (12.43)	49.64 (19.15)
	Retinopathy	62 (20.7)	51.82 (11.91)	53.14 (11.95)	42.64 (18.61)	55.02 (10.79)	49.80 (17.60)
	Nephropathy	12 (4)	45.83 (10.64)	47.57 (8.42)	38.89 (10.86)	50.00 (7.13)	40.63 (16.96)
	Cardiovascular complications	22 (7.3)	52.11 (10.61)	52.48 (13.57)	37.50 (13.65)	56.72 (11.84)	48.21 (17.36)
	Non	161 (53.7)	57.56 (10.87)	55.86 (12.03)	47.27 (15.25)	57.73 (9.47)	56.37 (15.14)
	p	–	0.083	0.173 <sup>***</sup>	0.236 <sup>***</sup>	0.638	0.710 <sup>***</sup>

Abbreviations: QoL: quality of life; PH: physical health; PSH: psychological health; SR: social relationships; EH: environmental health.

<sup>β</sup> Significant differences according to the post hoc test related to disease duration <5 with 5–10 years.

<sup>‡</sup> Significant differences according to the post hoc test related to existence of 2 and 3 comorbidities.

\* The patient can have more than one disease or more than one complication.

\*\* Blood lipid, thyroid dysfunction, arthritis, cancer.

\*\*\* p was reported based on Kruskal Wallis test and the rest based on ANOVA.

\*\*\*\* p was reported based on Welch test.

<sup>#</sup> Significant differences according to the post hoc test related to disease duration <5 with 5–10 and >15 years.

**Table 3 – The status of different domains of life quality according to the gender of 300 people with T2DM.**

QOL aspects	No. of patients	Total		Men		Women		p
		Mean	SD	Mean	SD	Mean	SD	
PH	290	55.48	11.97	55.73	10.41	55.38	12.54	0.824 <sup>*</sup>
PSH	290	54.96	12.73	57.70	10.80	53.93	13.26	0.016 <sup>**</sup>
SR	293	45.68	17.25	45.98	16.38	45.56	17.62	0.831 <sup>**</sup>
EH	281	57.10	10.52	58.18	9.46	56.69	10.88	0.292 <sup>*</sup>
Total QOL	297	53.07	17.09	57.23	15.57	51.46	17.34	0.246 <sup>**</sup>

Abbreviations: QoL: quality of life; PH: physical health; PSH: psychological health; SR: social relationships; EH: environmental health.

\* p was reported based on Independent t-test.

\*\* p was reported based on Mann Whitney test.

**Table 4 – Multivariate linear regression models of significant factors predicting QoL domains in patients with T2DM.**

QoL domains	Variables	B (SE)	Beta	p-Value	95% CI of B		Adjusted R <sup>2</sup>
					Lower	Upper	
PH	Income <sup>a</sup>	2.94 (1.474)	0.137	0.049	0.009	5.820	0.122
	Nephropathy <sup>b</sup>	−3.639 (1.797)	−0.134	0.044	−7.182	−0.097	
PSH	Education level <sup>c</sup>	2.291 (0.852)	0.192	0.008	0.612	3.971	0.158
	Depression <sup>b</sup>	−8.250 (2.615)	−0.201	0.002	−13.406	−3.094	
	Renal disease <sup>b</sup>	−6.585 (2.444)	−0.182	0.008	−11.402	−1.767	
	Other diseases <sup>*,b</sup>	−3.756 (1.647)	−0.145	0.024	−7.002	−0.510	
SH	Marital status <sup>d</sup>	20.505 (2.922)	0.383	<0.001	14.751	26.260	0.238
	Renal disease	−7.701 (2.799)	−0.149	0.006	−13.213	−2.188	
	Other diseases	−6.290 (1.955)	−0.176	0.001	−10.140	−2.440	
EH	Marital status	5.286 (2.212)	0.149	0.018	0.927	9.646	0.134
	Income	3.276 (1.214)	0.179	0.007	0.884	5.668	
	Education level	1.897 (0.674)	0.196	0.005	0.568	3.226	
Total QoL	Gender <sup>e</sup>	−5.787 (2.513)	−0.148	0.022	−10.742	−0.833	0.148
	Marital status	8.058 (3.741)	0.138	0.032	0.683	15.433	
	Income	4.553 (2.007)	0.144	0.024	0.597	8.508	
	Renal disease	−9.829 (3.422)	−0.194	0.004	−16.573	−3.084	

Abbreviations: QoL: quality of life; PH: physical health; PSH: psychological health; SR: social relationships; EH: environmental health.

\* Blood lipid, thyroid dysfunction, arthritis, cancer.

<sup>a</sup> 1. <500, 2. 500–1000 and 3. >100.

<sup>b</sup> 0. no, 1. yes.

<sup>c</sup> 1. Illiterate, 2. Elementary, 3. Secondary, 4. High School/Diploma, 5. University Degree.

<sup>d</sup> 1. Single (Never married, divorced, widow), 2. Married.

<sup>e</sup> 1. male, 2. female.

In the present study, most important independent predictors of HRQOL and its different dimensions among people with T2DM were some demographic and socioeconomic factors and comorbidities. Based on our finding, scores of all domains were lower in women that were statistically significant in psychological domain. This findings are in agreement with the results of many previous studies [24,33,36,37,39,40]. In contrast, in another study; however, gender had no remarkable effect on HRQOL [34]. The main reason for this could be related to different definitions of men and women for optimal living and the consideration of different standards for QOL. Another reason may be related to higher women's concerns about the status of their disease and inconsistency between responsibilities of housekeeping and issues related to diabetes management and self-care. HRQOL has also been associated with MHI and education level. These findings correspond with recent studies conducted in Iran and other parts of the world [15,20,22,23]. Education level positively affected the QOL in the PSH and EH domains. This association has been reported in different studies [15,20,22]. Marital status as a criterion of social support and social and economic status was another important variable positively predicting a patient's HRQOL in SH and EH domains (*b*: 20.505) and (*b*: 5.286), respectively. However, in our study, similar to Bani-Issa's study, marital status was not associated with PH or PSH domains [35].

In regard with comorbidities and diabetes complications, neuropathy as a complication of diabetes was significantly associated with PH (*b*: −3.639). This finding was confirmed by Solli et al. in Norway [10]. Overall, HRQOL score was significantly the lowest among patients with renal diseases

compared to those suffering from other diseases and complications. Other studies also confirmed that people with T2DM demonstrated poorer HRQOL in presence of complications [41–43]. Comorbid depression was the most important negative predictor associated with worse HRQOL in PSH domain (*b*: −8.250). This was in agreement with other studies reporting this associations [18,44].

Other findings of this study indicated that the HRQOL total or subtotal scores were different according to the number of comorbidities, type of treatment, and duration of disease. However, in multivariate regression model, this difference was not remained statistically significant. In this study, the lowest score was observed among people with four comorbidities (39.22 ± 22.42). Similarly, the results of the study conducted by Patel showed a reverse and significant relationship between the number of comorbidities and HRQOL score [33]. The results of this study also indicated that HRQOL was higher in all domains among patients with shorter duration of disease, and it decreases almost in all dimensions with an increase in disease duration. In studies conducted by Hadipour, Aghamollaei, and Patel, it was also concluded that there was a reverse and significant relationship between disease duration and scores of HRQOL [24,25,33]. Probably, by increasing the duration of the disease, the emergence of diabetes complications increases, and treatments, diet, and restrictions related to disease control adversely affect HRQOL in diabetic patients.

The highest and lowest scores of HRQOL were related to patients with diet treatment and those with insulin injection plus oral medication, respectively. In addition, the scores of HRQOL were lower almost in all domains among the patients



using insulin injection than other groups. Similarly, other studies reported that HRQOL among patients using oral medications was higher than those injecting insulin or taking oral medications [42,44,45]. However, the results of other studies indicated that there was no significant difference between HRQOL of patients using insulin injection and those taking oral medication [37,39].

This study had some limitations. First, we used the convenience sampling method. Although this provides a non-representative study population, incomplete personal information in medical records, and address change because of housing status, death, or migration were the main reasons for using this method of sampling instead of a random sampling. The authors recommend future studies use a more rigorous sampling method to improve finding generalizability. Second, this study was conducted in a governmental sector that might be different with private sector reflecting the QOL among more affluent people receiving different diabetes care and management.

## 5. Conclusion

According to the results of this study, predictors of the HRQOL in T2DM are associated with demographic and socio-economic factors, comorbidities, and with less impact, diabetes complications, respectively. Moreover, people with T2DM had moderate HRQOL, and compared with men, scores of all domains were lower in women.

## Conflict of interest

The authors state that they have no conflict of interest.

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