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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 ± 9.13 , and about 72% of the patients were women. The mean score of the total HRQOL was 53.07 ± 17.09 ; the highest score of HRQOL was related to the environmental domain (57.10 ± 10.52) and the lowest to the dimension of social health (45.68 ± 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 ± 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 Tomans¹ (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 ± 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 ± 17.09 . The highest and the lowest score of HRQOL were attributed to the environment dimension (57.10 ± 10.52) and social relations domain (45.68 ± 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

¹ 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)
Occupation	No	17 (5.7)
	Not mentioned	2 (6)
	Office worker	28 (9.3)
	Laborer	19 (3.3)
	Housekeeper	206 (68.7)
Monthly household income****	Retired/other***	47 (18.7)
	<500	171 (57)
	500–1000	71 (23.7)
	>1000	10 (3.3)
	Not mentioned	48 (16)

* Mean and standard deviation: 54.13 ± 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 ± 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 [#]	0.013 ^{β***}	0.073 ^{***}	0.145	0.116 ^{***}
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 ^{***}	0.072 ^{***}	0.437 ^{***}	0.051	0.532 ^{***}
Comorbidities [†]	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 ^{**}	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 ^{***}	0.967	0.598 ^{***}	
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 ^{****}	0.173	0.021 ^{****}	0.597	0.728 ^{***}
Diabetes-related complications [†]	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 ^{***}	0.236 ^{***}	0.638	0.710 ^{***}

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

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

[‡] 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.

[#] 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 [*]
PSH	290	54.96	12.73	57.70	10.80	53.93	13.26	0.016 ^{**}
SR	293	45.68	17.25	45.98	16.38	45.56	17.62	0.831 ^{**}
EH	281	57.10	10.52	58.18	9.46	56.69	10.88	0.292 [*]
Total QOL	297	53.07	17.09	57.23	15.57	51.46	17.34	0.246 ^{**}

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 ²
					Lower	Upper	
PH	Income ^a	2.94 (1.474)	0.137	0.049	0.009	5.820	0.122
	Nephropathy ^b	-3.639 (1.797)	-0.134	0.044	-7.182	-0.097	
PSH	Education level ^c	2.291 (0.852)	0.192	0.008	0.612	3.971	0.158
	Depression ^b	-8.250 (2.615)	-0.201	0.002	-13.406	-3.094	
	Renal disease ^b	-6.585 (2.444)	-0.182	0.008	-11.402	-1.767	
	Other diseases ^{*,b}	-3.756 (1.647)	-0.145	0.024	-7.002	-0.510	
SH	Marital status ^d	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 ^e	-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.

^a 1. <500, 2. 500-1000 and 3. >100.

^b 0. no, 1. yes.

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

^d 1. Single (Never married, divorced, widow), 2. Married.

^e 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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REFERENCES

- [1] P.Z. Zimmet, D.J. Magliano, W.H. Herman, J.E. Shaw, Diabetes: a 21st century challenge, *Lancet Diab. Endocrinol.* 2 (1) (2014) 56–64.
- [2] S. Wild, G. Roglic, A. Green, R. Sicree, H. King, Global prevalence of diabetes: estimates for the year 2000 and projections for 2030, *Diabetes Care* 27 (5) (2004) 1047–1053 (PubMed PMID: 15111519. Epub 2004/04/28. eng).
- [3] L. Guariguata, D.R. Whiting, I. Hambleton, J. Beagley, U. Linnenkamp, J.E. Shaw, Global estimates of diabetes prevalence for 2013 and projections for 2035, *Diabetes Res. Clin. Pract.* 103 (2) (2014) 137–149 (PubMed PMID: 24630390. Epub 2014/03/19. eng).
- [4] A. Majeed, A.A. El-Sayed, T. Khoja, R. Alshamsan, C. Millett, S. Rawaf, Diabetes in the Middle-East and North Africa: an update, *Diabetes Res. Clin. Pract.* 103 (2) (2014) 218–222 (PubMed PMID: 24300017. Epub 2013/12/05. eng).
- [5] International Diabetes Federation (IDF). *Diabetes Atlas*. sixth ed. Brussels, Belgium: International Diabetes Federation; 2014.
- [6] WHO, Media Centre Fact Sheets. The Top 10 Causes of death. Deaths Across the Globe: An Overview, 2014, Available from: (<http://www.who.int/mediacentre/factsheets/fs310/en/index3.html>).
- [7] C.S. Burckhardt, K.L. Anderson, The Quality of Life Scale (QOLS): reliability, validity, and utilization, *Health Qual. Life Outcomes* 1 (2003) 60 (PubMed PMID: 14613562. Pubmed Central PMCID: PMC269997. Epub 2003/11/14. eng).
- [8] The World Health Organization Quality of Life assessment (WHOQOL), Position paper from the World Health Organization, *Soc. Sci. Med.* (1982) 41 (Nov (10)) (1995) 1403–1409 (PubMed PMID: 8560308. Epub 1995/11/01. eng).
- [9] C.H. Hennessy, D.G. Moriarty, M.M. Zack, P.A. Scherr, R. Brackbill, Measuring health-related quality of life for public health surveillance, *Public Health Rep.* (Washington, DC: 1974) 109 (Sep–Oct (5)) (1994) 665–672 (PubMed PMID: 7938388. Pubmed Central PMCID: PMC1403555. Epub 1994/09/01. eng).
- [10] O. Solli, K. Stavem, I. Kristiansen, Health-related quality of life in diabetes: the associations of complications with EQ-5D scores, *Health Qual. Life Outcomes* 8 (1) (2010) 18.
- [11] K. Venkataraman, H.L. Wee, M.K. Leow, E.S. Tai, J. Lee, S.C. Lim, et al., Associations between complications and health-related quality of life in individuals with diabetes, *Clin. Endocrinol.* 78 (6) (2013) 865–873 (PubMed PMID: 22775311. Epub 2012/07/11. eng).
- [12] R.J. Sigal, G.P. Kenny, D.H. Wasserman, C. Castaneda-Sceppa, R.D. White, Physical activity/exercise and type 2 diabetes: a consensus statement from the American Diabetes Association, *Diabetes Care* 29 (6) (2006) 1433–1438 (PubMed PMID: 16732040. Epub 2006/05/30. eng).
- [13] I. Krass, T. Dhippayom, Pharmaceutical care—impact on quality of life in patients with type 2 diabetes: a review, *Clin. Aud.* 5 (2013) 17–32.
- [14] R.R. Rubin, T.A. Wadden, J.L. Bahnson, G.L. Blackburn, F.L. Brancati, G.A. Bray, et al., Impact of intensive lifestyle intervention on depression and health-related quality of life in type 2 diabetes: the Look AHEAD Trial, *Diabetes Care* 37 (6) (2014) 1544–1553 (PubMed PMID: 24855155. Pubmed Central PMCID: PMC4030096. Epub 2014/05/24. eng).
- [15] P.E. Wändell, Quality of life of patients with diabetes mellitus. An overview of research in primary health care in the Nordic countries, *Scand. J. Prim. Health Care* 23 (2) (2005) 68–74.
- [16] P. Santhanam, R.A. Gabbay, T.F. Saleem, Poor quality of life scores in persons with higher A1Cs in type 2 diabetes, *Diabetes Res. Clin. Pract.* 92 (Jun (3)) (2011) e53–e54 (PubMed PMID: 21397970. Epub 2011/03/15. eng).
- [17] B. Issa, O. Baiyewu, Quality of life of patients with diabetes mellitus in a Nigerian Teaching Hospital, Hong Kong J. Psychiatry 16 (1) (2006) 27.
- [18] D. Wexler, R. Grant, E. Wittenberg, J. Bosch, E. Cagliero, L. Delahanty, et al., Correlates of health-related quality of life in type 2 diabetes, *Diabetologia* 49 (7) (2006) 1489–1497.
- [19] E.K. Fenwick, J. Xie, J. Ratcliffe, K. Pesudovs, R.P. Finger, T.Y. Wong, et al., The impact of diabetic retinopathy and diabetic macular edema on health-related quality of life in type 1 and type 2 diabetes, *Invest. Ophthalmol. Vis. Sci.* 53 (2) (2012) 677–684.
- [20] A.A. Papadopoulos, N. Kontodimopoulos, A. Frydas, E. Ikonomakis, D. Niakas, Predictors of health-related quality of life in type II diabetic patients in Greece, *BMC Public Health* 7 (1) (2007) 186.
- [21] A.A. Kiadaliri, B. Najafi, M. Mirmalek-Sani, Quality of life in people with diabetes: a systematic review of studies in Iran, *J. Diabetes Metab. Disord.* 12 (1) (2013) 54 (PubMed PMID:

24354933. Pubmed Central PMCID: PMC3937210. Epub 2013/12/21. eng).
- [22] A. Gholami, M. Azini, A. Borji, F. Shirazi, Z. Sharafi, E. Zarei, Quality of life in patients with Type 2 diabetes: application of WHOQoL-BREF scale, *Shiraz E-Med. J.* 14 (3) (2013) 162–171.
- [23] Z.H. Nejhad, H.M. Vardanjani, F. Abolhasani, M. Hadipour, K. Sheikhzadeh, Relative effect of socio-economic status on the health-related quality of life in type 2 diabetic patients in Iran, *Diabetes Metab. Syndr.: Clin. Res. Rev.* 7 (4) (2013) 187–190.
- [24] T. Aghamollaei, H. Eftekhari, D. Shojaeizadeh, K. Mohammad, M. Nakhjavani, F.G. Pour, Behavior, metabolic control and health-related quality of life in diabetic patients at Bandar Abbas diabetic clinic, Iran. *J. Public Health* 32 (3) (2003) 54–59.
- [25] M. Hadipour, F. Abolhasani, H. Molavi Vardanjani, S. Eybpoosh, Individual and environmental determinants of health related quality of life in Iranian patients with type II diabetes, *ISMJ* 16 (6) (2014) 428–435.
- [26] A. Majidpour, H. Adalatkhah, S. Sezavar, N. Aminisani, M. Shabani, A. Nemati, Research priorities in health field in Ardabil Province: an experience, *J. Ardabil Univ. Med. Sci.* 3 (3) (2003) 7–22.
- [27] M.I. Alamdari, N. Aminisani, B. Bashardoost, S. Shamshirgaran, M. Khodamoradzadeh, M. Shokrabadi, et al., Prevalence and risk factors of microalbuminuria in type 2 diabetic patients in a diabetic clinic of Ardabil-Iran, *Int. J. Endocrinol. Metab.* 4 (1) (2006) 8–12.
- [28] M.G.B.H. Iranparvar Alamdari, A. Yazdanboud, N. Amini Sani, S. Islam panah, M. Shokrabadi, Quality of care in 100 diabetic patients in a diabetes clinic in Ardabil, *J. Ardabil Univ. Med. Sci.* 12 (3) (2012) 239–247 (Full Text in Persian).
- [29] J. Ataei, S. Shamshirgaran, M. Iranparvar Alamdari, A. Safaeian, Evaluation of diabetes quality of care based on a care scoring system among people referring to diabetes clinic in Ardabil 2014, *J. Ardabil Univ. Med. Sci.* 15 (2) (2015) 207–219.
- [30] S.M. Skevington, M. Lotfy, K.A. O'Connell, The World Health Organization's WHOQOL-BREF quality of life assessment: psychometric properties and results of the international field trial. A report from the WHOQOL group, *Qual. Life Res.* 13 (2) (2004) 299–310.
- [31] World Health Organization, WHOQOL-BREF: Introduction, Administration, Scoring and Generic Version of the Assessment: Field Trial Version, 1996, Available at: (http://www.who.int/mental_health/media/en/76.pdf).
- [32] S. Nejat, A. Montazeri, K. Holakouie Naieni, K. Mohammad, S. Majdzadeh, The World Health Organization quality of Life (WHOQOL-BREF) questionnaire: translation and validation study of the Iranian version, *J. School Public Health Inst. Public Health Res.* 4 (4) (2006) 1–12.
- [33] B. Patel, B. Oza, K. Patel, S. Malhotra, V. Patel, Health related quality of life in type-2 diabetic patients in Western India using World Health Organization Quality of Life-BREF and appraisal of diabetes scale, *Int. J. Diabetes Dev. Countries* 34 (2) (2014) 100–107.
- [34] B.A. Kolawole, S.K. Mosaku, R.T. Ikem, A Comparison of two measures of quality of life of Nigerian clinic patients with type 2 Diabetes Mellitus, *Afr. Health Sci.* 9 (3) (2009) 161–166.
- [35] W. Bani-Issa, Evaluation of the health-related quality of life of Emirati people with diabetes: integration of sociodemographic and disease-related variables, *EMhj* 17 (11) (2011) 825–830.
- [36] W. Mustapha, Z.S. Hossain, K. Loughlin, Management and impact of diabetes on quality of life among the Lebanese Community of Sydney: a quantitative study, *J. Diabetes Metab.* 5 (329) (2014) 2.
- [37] S. Sadeghieh, S. Arshi, M. Iranparvar, F. Amani, H. Siahpoosh, The impact of diabetes on quality of life in type II diabetic patients, *J. Ardabil Univ. Med. Sci.* 8 (4) (2009) 394–402.
- [38] V. Jain, S. Shivkumar, O. Gupta, Health-related quality of life (hr-qol) in patients with type 2 diabetes mellitus, *North Am. J. Med. Sci.* 6 (2) (2014) 96–101.
- [39] V. Bhate, S. Abhyankar, Health related quality of life in type 2 diabetic patients with special emphasis on gender and mode of treatment, *Indian J. Health Wellbeing* 5 (3) (2014) 350–353.
- [40] M.E.E. Sedaghati, A. Ghanbari, Quality of life in patients with type 2 diabetes compared with non-diabetics, *J. Babol Univ. Med. Sci.* 9 (5) (2007) 55–60.
- [41] F.A. Costa, J.P. Guerreiro, C. Duggan, An audit of diabetes dependent quality of life (ADDQoL) for Portugal: exploring validity and reliability, *Pharm. Pract.* 4 (3) (2006) 123–128.
- [42] M.M. Collins, T. O'Sullivan, V. Harkins, I.J. Perry, Quality of life and quality of care in patients with diabetes experiencing different models of care, *Diabetes Care* 32 (4) (2009) 603–605.
- [43] L. Lynn, B.J. Hess, W. Weng, R.S. Lipner, E.S. Holmboe, Gaps in quality of diabetes care in internal medicine residency clinics suggest the need for better ambulatory care training, *Health Aff.* 31 (1) (2012) 150–158.
- [44] Santos MABd, L.B. Ceretta, G.Z. Réus, H.M. Abelaira, L.K. Jornada, M.T. Schwalm, et al., Anxiety disorders are associated with quality of life impairment in patients with insulin-dependent type 2 diabetes: a case-control study, *Rev. Bras. Psiquiatr.* 36 (4) (2014) 298–304.
- [45] A.M. Fal, B. Jankowska, I. Uchmanowicz, M. Sen, B. Panaszek, J. Polanski, Type 2 diabetes quality of life patients treated with insulin and oral hypoglycemic medication, *Acta Diabetol.* 48 (3) (2011) 237–242.