
Annals of Clinical and Analytical Medicine

Assessment of Quality of Life among Type-2 Diabetic Patients in Al-Madinah, 2020

Abrar Ahmed Alharbi (1) *, Ruba Ahmed Alharbi (2), Osama Abdulwahab Alzahrani (3)

- (1) Family medicine resident in Joint Program of Family Medicine, Al-madinah, Saudi Arabia
(2) Department of Medicine, Faculty of Medicine, Umm Al Qura University, Makkah, Saudi Arabia
(3) Medical laboratory specialist, King Fahad armed forces Hospital in Jeddah, Saudi Arabia

Received 15/1/2022; revised 11/2/2022; accepted 21/2/2022

*Corresponding author

Abstract

Introduction: Diabetic patients are subjected to many events that could have a considerable influence on their quality of life. Therefore, measuring health-related quality of life (HRQoL) in Type 2 diabetic patients is essential as one of the objectives of the healthcare services. To assess the quality of life of type 2 diabetic patients in Al Madinah Al-munwarah.

Methods: A descriptive cross-sectional study was done among a representative sample of adult diabetic type 2 patients attending prince Abdul-Aziz bin Majid diabetes center in Al-Madinah city in North Western part in Saudi Arabia. A self-administered questionnaire composed of three main sections was utilized; Socio demographic data, clinical data and the Arabic version of the Short-Form 36-item survey (SF-36) to assess the health-related quality of life (HRQOL).

Results: The study included 235 type 2 diabetic patients, out of targeted 243, with a response rate of 96.7%. Females represented 51.1% of them. Their age ranged between 20 and 76 years with an arithmetic mean of 42.5 years and standard deviation (SD) of 12.3 years. The highest score was observed in mental health domain (60.09 ± 18.35), followed by physical functioning (45.21 ± 9.20), energy and vitality (44.06 ± 9.60) and bodily pain (43.06 ± 17.76) whereas the lowest were role limitation due to physical problems (26.19 ± 9.32) and role limitation due to mental health (25.87 ± 9.13). The overall QoL score ranged between 23.75-54.13 with a mean $\pm$ SD of 39.42 ± 5.41 . Among studied sociodemographic factors, there was a negative significant correlation between patients' age and total QoL score ($r = -0.152$, $p = 0.020$) while among diabetes-related factors, there was a negative significant correlation between patients' HbA1c% level and total QoL score ($r = -0.457$, $p < 0.001$).

Conclusions: Quality of life of type 2 diabetic patients was adversely impacted by some sociodemographic and diabetes-related factors. Therefore, social and psychological support of those patients should be a must.

Keywords: Quality of life, type 2 diabetes, short form-36, Saudi Arabia.

Introduction

Diabetes Mellitus (DM) is a major cause of morbidity and mortality and poses a great burden on community health and economic status [1]. The prevalence of diabetes among adults was estimated to be 6.4% in 2010 worldwide in 2010 and will raise up to 7.7% by 2030 which means an increase of 69% in numbers of diabetic adults in developing countries and a 20% in developed countries [2]. Additionally, the International Diabetes Federation (IDF) estimated that 642 million will be diabetics by 2040 [3].

The World Health Organization (WHO) documented that Saudi Arabia ranks the 2nd highest country in the Middle East, and 7th in the world as regard the prevalence of DM [4]. The prevalence of DM in Saudi Arabia is 23.9%. However, the worldwide average figure is lower than that figure (8.3%) [5]. Type 2 diabetes represents 90% of cases. An estimated 40% of patients with DM over the age of 30 are unaware of their disease [6]. Furthermore, 25.5% of those aged over 30 years are displaying signs of pre-diabetes [7]. It has been estimated that by the year 2035, 7.5 million Saudi patients aged between 20 and 79 years will be present [8].

Diabetic patients are subjected to many events that could have a considerable influence on their quality of life; namely restricted diet and lifestyle, comorbidities, treatment and development of diabetic complications [9]. Therefore, measuring health-related quality of life (HRQoL) in Type 2 diabetic patients is essential as one of the objectives of the healthcare service regarding diabetes is to improve the patients' HRQoL [10]. The World Health Organization defined quality of life (QoL) as "an individual's perception of their station in life in terms of the culture and value system in which they live, which is related to their goals, expectations, standards and concerns". It is composed of physical health, psychological health, social relationships, independence's level, relationships with the environment and beliefs [11].

Assessment of the QoL of diabetic patients can provide useful information that can be help in the

assessment and planning for different treatment approaches [12]. Understanding which dimensions of quality of life are associated with diabetes is important for clinical management and also for public health policy aimed at improving health outcomes for the diabetic patients [13]. In addition, complications of diabetes have important effects on patients' quality of life [14].

There is an increasing interest in the last two decades in the association between the glycemic control of diabetic patients and quality of life [15]. However, this association is inconsistent, though poor glycaemic control may result in an increase in the rate of complications that in turn lead to poor quality of life [16-17]. Diabetes mellitus rate has reached epidemic levels in Saudi Arabia and presents a real threat to the health and economy. Lack of published data regarding the assessment of quality of life among type 2 diabetic patients in Al-Medina city. This study aimed to assess the quality of life among type 2 diabetic patients in Al Madinah Al-munwarah during 2020.

Methods

This is a descriptive cross-sectional study included adult diabetic type 2 patients who were attending prince Abdul-Aziz bin Majid diabetes center in Al-madinah city in North Western part in Saudi Arabia. Prince Abdul-Aziz bin Majid diabetes center is the only diabetes center that serve whole Madinah region. We included all Saudi Adult diabetic patients flowing up at Prince Abdul-Aziz bin Majid Diabetes center who diagnosed within the least 6 months. Sample size was calculated based on the following assumptions; a total number of 4103 diabetic type-2 registered patients from the Prince Abdul-Aziz bin Majid Diabetes center in Madinah city. Acceptable margin of error of 5% with confidence interval of 95% with expected prevalence of poor QOL equals to 78.7% (according to a previous Saudi study) [19]. Accordingly, the minimum sample size using Raosoft online sample size calculator was 243. Additional 10% was considered for possible drop out.

A systemic random sampling, method of sampling was used in this study. Every third patient that came to

the clinic was interviewed using the prepared questionnaire, until sample size was reached.

A questionnaire which consists of two parts was used with every patient. The first part of the questionnaire contains socio demographic characteristics which included age, gender, marital status, employment status, and level of education. In addition, clinical data were collected from the patients' records such as duration of diabetes, complications, Hemoglobin (HbA1c) measurements in the previous 6 months. The second part of the questionnaire contains Arabic version of the Short-Form 36-item survey (SF-36) to assess the HRQOL, which has been reported as valid and reliable [20]. The SF-36 includes of thirty-six questions measuring eight health concepts: Physical functioning, role-physical, bodily pain, Mental health, role emotional, social functioning, vitality, general health perceptions.

Data entry and analysis were carried out using SPSS (Statistical Package for Social Sciences), version 26. Non-parametric statistical tests were used since the data were abnormally distributed; Mann-Whitney to compare between two different groups and Kruskal-Wallis to compare between more than two different groups. P-value < 0.05 will be considered for significance. The proposal was submitted for ethical approval by research ethical committee in Al-Madinah. Approvals were taken from: Joint Program of family medicine in Al-Madinah Al-Munwarah and Prince Abdul-Aziz bin Majid Diabetes center. Consent of the participants was considered as essential pre request for enrollment in the study. Confidentiality of the response of the participant was ensured by keeping the collected data secured and used only for study purpose.

Results

The study included 235 type 2 diabetic patients, out of targeted 243, with a response rate of 96.7%. The sociodemographic characteristics of the participants are summarized in Table 1. Females represented 51.1% of them. Their age ranged between 20 and 76 years with an arithmetic mean of 42.5 years and standard deviation (SD) of 12.3 years. Majority of them (89.8%) were married and employed (71%).

More than two-thirds (69.8%) were university graduated (table 1).

Duration of type 2 diabetes was 5 years or less among about two-thirds (65.5%) of patients. Diabetic complications were observed among 61.3% of patients; mainly peripheral neuropathy (20.5%), retinopathy (16.2%) and cardiovascular diseases (14%) (table 2). Poor glycemic control (HbA1c% >7) was reported among most of the patients (79.6%).

The rage, mean and standard deviation for the eight domains of type 2 diabetic patients' quality of life were summarized in Table 3. The highest score was observed in mental health domain (60.09±18.35), followed by physical functioning (45.21±9.20), energy and vitality (44.06±9.60) and bodily pain (43.06±17.76) whereas the lowest were role limitation due to physical problems (26.19±9.32) and role limitation due to mental health (25.87±9.13). The overall physical component score mean±SD was 38.99±4.79 whereas that of mental component score was 40.14±7.22. The overall QoL score ranged between 23.75-54.13 with a mean±SD of 39.42±5.41.

There was a negative significant correlation between patients' age and physical functioning components of QOL ($r=-0.394$, $p<0.001$). The highest physical functioning domain score was reported among students (48.64±7.74) whereas the lowest was observed among retired patients (38.33±10.49), $p=0.002$. Physical functioning score were higher among university graduated patients compared to elementary school graduated (46.07±9.10 vs. 34.0±8.94), $p=0.044$. There was a negative significant correlation between patients' HbA1c% level and physical functioning components of QOL ($r=-0.153$, $p=0.019$). Physical functioning score was lowest among patients with duration of diabetes exceeded 10 years (40.0±10.22) and highest among those with duration <5 years (46.26±8.62), $p=0.041$. Patients with complications were more likely to have lower physical functioning score than those without complications (43.99±9.76 vs. 47.14±7.91), $p=0.035$ (table 4).

There was a negative significant correlation between patients' age and role limitation by physical functioning components of QOL ($r=-0.217$, $p=0.001$).

Table 1: Sociodemographic characteristics of the participants (n=235)

Characteristics	Frequency	Percentage
Gender		
Male	115	48.9
Female	120	51.1
Age (years)		
Range	20-76	
Mean±SD	42.5±12.3	
Marital status		
Single	21	8.9
Married	211	89.8
Divorced	3	1.3
Job status		
Not working	22	9.4
Employee	167	71.0
Student	22	9.4
Retired	24	10.2
Educational level		
Elementary	5	2.1
Intermediate	11	4.7
Secondary	43	18.3
University	164	69.8
Postgraduate	12	5.1

None of the studied medical factors (duration of diabetes, diabetic complications and HbA1c% level) was significantly associated with role limitation by physical functioning components of QOL as seen in table 5. None of the studied sociodemographic factors (gender, age, marital status, job status and educational level) was significantly associated with mental health component of QOL. There was a negative significant correlation between patients' HbA1c% level and mental health components of QOL ($r=-0.388$, $p<0.001$) as demonstrated in table 6. There was a negative significant correlation between patients' age

and role limitation by mental health components of QOL ($r=-0.191$, $p=0.003$). None of the studied medical factors (duration of diabetes, diabetic complications and HbA1c% level) was significantly associated with role limitation by mental health components of QOL as illustrated in table 7.

The highest score of social functioning domain of QOL was observed among patients with intermediate school level (40.0 ± 4.47) whereas the lowest was reported among postgraduate patients (32.50 ± 6.22), $p=0.024$. None of the studied medical factors (duration of diabetes, diabetic complications and HbA1c% level) was significantly associated with social functioning components of QOL as shown in table 8. None of the studied sociodemographic factors (gender, age, marital status, job status and educational level) was significantly associated with mental health component of QOL. None of the studied medical factors (duration of diabetes, diabetic complications and HbA1c% level) was significantly associated with bodily pain components of QOL as presented in table 9.

Female patients had higher general health score than males (38.10 ± 5.49 vs. 34.68 ± 6.13), $p<0.001$. There was a negative significant correlation between patients' age and general health components of QOL ($r=-0.214$, $p=0.001$). There was a negative significant correlation between patients' HbA1c% level and general health components of QOL ($r=-0.180$, $p=0.006$) as illustrated in table 10. Female patients had higher energy and vitality score than males (46.33 ± 9.02 vs. 41.70 ± 9.64), $p<0.001$. There was a negative significant correlation between patients' HbA1c% level and energy and vitality components of QOL ($r=-0.366$, $p<0.001$) as in table 11.

In table 12, there was a negative significant correlation between patients' age and physical component of QOL score ($r=-0.245$, $p=0.001$). Physical component of QOL score was lowest among patients with duration of diabetes exceeded 10 years (36.7 ± 4.4) and highest among those with duration <5 years (39.3 ± 4.7), $p=0.030$. There was a negative

Table 2: Clinical characteristics of the participants

Characteristics	Frequency	Percentage
Duration of diabetes in years		
	154	65.5
<5	57	24.3
5-10	24	10.2
>10		
Diabetic complications		
	91	38.7
No	144	61.3
Yes	48	20.5
Peripheral neuropathy	8	3.4
Diabetic foot	33	14.0
Cardiovascular disease	16	6.8
	38	16.2
Nephropathy	1	0.4
Retinopathy		
Fatty liver		

significant correlation between patients' HbA1c% level and physical component of QOL score ($r=-0.320$, $p<0.001$). In table 13, none of the studied sociodemographic factors (gender, age, marital status, job status and educational level) was significantly associated with mental component of QOL. There was a negative significant correlation between patients' HbA1c% level and mental component of QOL score ($r=-0.550$, $p<0.001$). There was a negative significant correlation between patients' age and total QOL score ($r=-0.152$, $p=0.020$). There was a negative significant

correlation between patients' HbA1c% level and total QOL score ($r=-0.457$, $p<0.001$) as in table 14.

Discussion

Diabetes mellitus is a relatively common disease in the kingdom of Saudi Arabia, characterized by a significant burden on both health and economic status of the affected population, which consequently could influence their quality of life [22]. Therefore, this study assessed quality of life of type 2 diabetic patients in Al Madinah Al-munwarah 2020 and identified factors associated with its deterioration.

In the present study, score of physical functioning was one of the highest reported (mean=45.21), although it is lower than those reported by others. Albader, et al reported a mean score of 61.6 among type 2 diabetic patients in Riyadh. In another Iranian study carried out by Kazemi-Galougahi et al,[23] the mean score was 57.42. It was even higher in other studies carried out in Greece (64.5),[24] Norway (77.32) [25] and France (63.2) [26]. All the aforementioned studies utilized SF-36 scale for assessing QoL as done in the current study.

In the present study, the mean score of roles limited by physical functioning was 26.19, which represented one of the lowest reported scored indicating that it is highly affected by type 2 diabetes. Close figure (29.57) was reported in another Iranian study [23]. However higher scores were reported by Papadopoulos et al. (62%),[24] Ribu et al. (62.2),[25] Albader, et al (59.8) (22), and Clouet et al. (57.6)[26]. The mean score of bodily pain observed in this study was 43.06. Comparable figure (41.6) has been reported in Iran study [23]. However, higher scores were reported in Riyadh, Saudi Arabia (67.2) [22], Greece (73) [24], China (77)[27] and France (53.3) [26]. Regarding the general health domain, the mean score in this study was 36.43 which is close to what has been observed in Iran (37.23) [23]. However, is lower than those observed in Greece (48.9) [24], China (42.08) [27], Riyadh (Saudi Arabia) (46.2) [22] and France (46.4) [26].

The mean score of the energy and vitality domain of QOL was 44.06 in the present study. It was 61.3 in a study carried out in Riyadh (Saudi Arabia,[22] while it was lower in a study carried out in Iran (38.46) [23], comparable to what has been reported in a study

carried out in France (45.7) [25] and lower in a study carried out in Greece (56.9) [24].

In the present study, the men score of roles limited by mental functioning was 25.87, which was the lowest reported score indicating that it was the highly affected one by type 2 diabetes. Higher figures were reported by others in Iran (37.78) [23], Greece (63.6) [24], France (55) [25] and Riyadh (Saudi Arabia) (73) [22]. Regarding the social functioning domain, the mean score in this study was 34.47, which is lower than those reported by others elsewhere; in Iran (47.81) [23], Greece (74.8) [24], France (68.3) [25] and Riyadh (Saudi Arabia) (82.4) [22]. The highest reported domain of QoL in the current study was that of the mental health with a mean score of 60.09. This was higher than that reported from Iran (46.63) [23], Riyadh (Saudi Arabia) (54.4) [22] and France (55.4) [25]. However, it was comparable to that reported in Greece (60.1) [25].

Among studied sociodemographic factors affecting the QoL of type 2 diabetic patients in the present study, patients' age was negatively correlated with physical functioning, role limitation by physical functioning, role limitation by mental health, and general health domains of QoL. Additionally, it was negatively correlated with physical component of QoL as well as the overall QoL. In a study conducted in Iran [23], patients' age was negatively correlated with physical functioning, vitality, mental health, and mental component score domains. However, a positive correlation has been observed between patient's age and physical functioning in Greece [24]. No relation between age and QoL has been observed in a study carried out in Finland [28]. Overall affection of patients' age on QoL has been confirmed by others.

In the current study, female patients had higher general health and vitality scores than males. Impact of patients' gender on QoL has been observed by others [24,26]. In Iran, gender was associated with only social functioning domain of QoL [23]. Cetin et al. study observed higher QoL score in men than women type 2 diabetic patients in Turkey, which also has been reported in a previous studies carried out in Saudi Arabia.

In this study, physical functioning domain score was highest in students and lowest in retired patients. Also, the highest score of social functioning domain of QoL

was observed among patients with intermediate school level whereas the lowest was reported among postgraduate patients. The influence of higher education on QoL has been confirmed by others [23, 24, 26].

Physical functioning score were higher among university graduated patients compared to elementary school graduated in the current study. In another recent study carried out in Riyadh (Saudi Arabia), employed patients had worse general health [22].

Physical functioning and the whole physical component of QoL score were lowest among patients with duration of diabetes exceeded 10 years in the current study. Other studies carried out in Iran and Riyadh (19, 20) found no correlation between duration of disease and diverse quality of life domains. However, there was a reverse relationship between duration of disease and diverse quality of life domains in studies carried out in Greece [24] and Saudi Arabia [18, 22]. Patients with complications were more likely to have lower physical functioning score than those without complications in this study. Impact of diabetic complications on total QoL has been previously documented by others.

The current study revealed a negative correlation between the level of HbA1c% and some domains of QoL; physical functioning, mental health, general health, and energy and vitality. Moreover, high HbA1c% negatively impacts both the physical and mental components as well as the overall QoL of type 2 diabetic patients. The adverse impact of poor glycemic control on QoL has been observed by others [19].

The study has some limitations. The design of the study as a cross-sectional one does not allow causality but only association between variables. Being a single-center study, could impact the generalizability of results. However, Prince Abdul-Aziz bin Majid diabetes center, where the study was conducted is the only diabetes center that serve whole Madinah region. Finally, some important factors that could impact the QoL were not included in this study such as type of diabetes therapy, psychological factors, and some habits such as smoking and practicing physical activity. Despite of those limitations, the study

identified some vital factors that could affect the QoL of type 2 diabetic patients.

Conclusions

Findings of this study confirmed those of numerous previous that diabetes mellitus related factors particularly development of complications, longer duration and poor glycemic control affected negatively the QoL of type 2 diabetic patients. The highest affected domains were the role played due to physical or /and mental impairment while the least affected was mental health. In addition, some important sociodemographic factors of patients, particularly age and gender should be considered in affection of QoL.

Health care workers managing type 2 diabetic patients should be aware of the factors that could impact the patients` QOL; both sociodemographic and diabetes related and directed their practice to overcome the impact of these factors on patients

Conflict of interests

The authors declared no conflict of interests.

References

1. Hogan H, Dall T, Nikolov P: Economic costs of diabetes in the US in 2002. *Diabetes Care* 2003, 26:917-932.
2. Shaw JE, Sicree RA, Zimmet PZ: Global estimates of the prevalence of diabetes for 2010 and 2030. (2009) *Diabetes Res Clin Pract* 87(1):4-14
3. International Diabetes Federation. IDF Diabetes atlas. 7th ed.; 2015. <http://www.diabetesatlas.org/>
4. Al Dawish MA, Robert AA, Braham R, Al Hayek AA, Al Saeed A, Ahmed RA, et al. Diabetes Mellitus in Saudi Arabia: A Review of the Recent Literature. *Curr Diabetes Rev.* 2016;12(4):359-368
5. Diabetes in the Gulf: The policy challenge. Available at: <https://eiperspectives.economist.com/healthcare/diabetes-gulf-policy-challenge>. [last cited November 11, 2015]
6. Alqurashi KA, Aljabri KS, Bokhari SA. Prevalence of diabetes mellitus in a Saudi community. *Ann Saudi Med.* 2011; 31(1): 19-23.
7. Al-Rubeaan K, Al-Manaa HA, Khoja TA, Ahmad NA, AlSharqawi AH, Siddiqui K, Alnaqeb D, Aburishheh KH, Youssef AM, Al-Batel A, Alotaibi MS, Al-Gamdi AA. Epidemiology of abnormal glucose metabolism in a country facing its epidemic: SAUDI-DM study. *Journal of Diabetes.* 2015; 7:622–632.
8. Guariguata L, Whiting DR, Hambleton I, Beagley J, Linnenkamp U, Shaw JE. Global estimates of diabetes prevalence for 2013 and 2030. *Diabetes* 2014; 63: 137-149.
9. Massi-Benedetti M. The cost of diabetes type II in Europe: the CODE-2 study. *Diabetologia.* 2002;45:1-4. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/12136404>
10. Standards of medical care in diabetes-2016 abridged for primary care providers. American Diabetes Association. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4714725/ClinDiabetes>. 2016;34:3–21.
11. World Health Organization. Health statistics and information systems. Measuring Quality of Life, 2012. Available at: <http://www.who.int/healthinfo/survey/whoqol-qualityoflife/en/>
12. Trikkalinou A, Papazafiropoulou AK, Melidonis A. Type 2 diabetes and quality of life. *World J Diabetes.* 2017;8(4):120–129. doi:10.4239/wjd.v8.i4.120
13. Lindsay G, Inverarity K, McDowell JRS. Quality of Life in People with Type 2 Diabetes in Relation to Deprivation, Gender, and Age in a New Community-Based Model of Care. *Nursing Research and Practice.* 2011;ID 613589:1-8
14. Aluscombe F. Health-related quality of life measurement in type 2 diabetes. *Value in Health* 2000;3(suppl 1):S15-S28.
15. Sundaram M, Kavookjian J, Patrick JH, Miller L-A, Madhavan SS, Scott V. Quality of life, health status and clinical outcomes in Type 2 diabetes patients. *Quality of Life Research* 2007 Mar;16(2):165–177
16. Nitiyanant W, Chetthakul T, Sang-A-kad P, Therakiatkumjorn C, Kunsuikmengrai K, Yeo JP. A survey study on diabetes management and complication status in primary care setting in Thailand. *J Med Assoc Thai* 2007; 90:65-71.

17. Kamarul IM, Ismail AAA, Naing L, Wan Mohamad WB. Type 2 diabetes mellitus patients with poor glycaemic control have lower quality of life scores as measured by the Short Form-36. *Singapore Med J* 2010; 51(2): 157-162
18. Al Hayek AA, Robert AA, Al Saeed A, Alzaid AA, Al Sabaan FS. Factors associated with health-related quality of life among Saudi patients with type 2 diabetes mellitus: A cross-sectional survey. *Diabetes Metab J* 2014;38:220-229
19. Al-Shehri FS. Quality of life among Saudi diabetics. *Journal of Diabetes Mellitus*, 2014; 4: 225-231.
20. Abdulmohsin SA, Coons SJ, Draugalia JR, Hays RD. Translation of the RAND 36-item Healthsurvey (SF 36) into Arabic. Published by RAND, WashingtonDC, 1997.
21. AL-Aboudi IS, Hassali MA, Shafie AA, Hassan A, Alian A Alrasheedy AA. A cross-sectional assessment of health-related quality of life among type 2 diabetes patients in Riyadh, Saudi Arabia. *SAGE Open Medicine* 2015; 3: 2050312115610129
22. Mohammad FA, Yohannan A. Effect of self-learning package on quality of life of diabetic patients at Mohaiel Asser Region, KSA. *International Journal of Diabetes Research* 2017; 6(1): 7-15
23. Kazemi-Galougahi MH, Ghaziani HN, Ardebili HE, Mahmoudi M. Quality of life in type 2 diabetic patients and related effective factors. *Indian J Med Sci* 2012;66:230-7.
24. Papadopoulos AA, Kontodimopoulos N, Frydas A, Ikonomakis E, Niakas D. Predictors of health-related quality of life in type II diabetic patients in Greece. *BMC Public Health* 2007; 7:186.
25. Ribu L, Hanestad BR, Moum T, Birkeland K, Rustoen T. A comparison of the health-related quality of life in patients with diabetic foot ulcers, with a diabetes group and a nondiabetes group from the general population. *Qual Life Res* 2007;16:179-89.
26. Clouet F, Excler-Cavallier G, Christophe B, Masson F, Fasquel D. Type 2 Diabetes and Short Form 36-items Health Survey. *Diabetes Metab* 2001; 27:711-7.
27. Tang WL, Wang YM, Du WM, Cheng NN, Chen BY. Assessment of quality of life and relevant factors in elderly diabetic patients in the Shanghai community. *Pharmacoepidemiol Drug Saf* 2006;15:123-30.
28. Hanninen J, Takala J, Keinanen-Kiukaanniemi S. Quality of life in NIDDM patients assessed with the SF-20 questionnaire. *Diabetes Res Clin Pract.* 1998;42:17-27.

Table 3: Description of the eight domains of the quality-of-life SF-36 scale score among type 2 diabetic patients

Domain	Range	Mean±SD
Physical functioning (10 items)	20-60	45.21±9.20
Role limitation due to physical problems (4 items)	20-50	26.19±9.32
Bodily pain (3 items)	20-100	43.06±17.76
General health (5 items)	20-52	36.43±6.04
Energy and vitality (4 items)	20-70	44.06±9.60
Social functioning (2 items)	20-60	34.47±7.22
Role limitation due to mental health (3 items)	20-40	25.87±9.13
Mental health (5 items)	20-100	60.09±18.35
Physical component	24-53	38.99±4.79
Mental component	23.33-60	40.14±7.22
Overall QOL	23.75-54.13	39.42±5.41

Table 4: Factors associated with physical functioning domain among type 2 diabetic patients

Factors	Physical functioning score		p-value
	Mean±SD	Median (IQR)	
Gender			
Male	45.51±9.27	50 (40-50)	0.661*
Female	44.92±9.16	50 (40-50)	
Age (years)	r**=-0.394		<0.001
Marital status			
Single	43.81±7.40	50 (40-50)	0.430 [†]
Married	45.28±9.41	50 (40-50)	
Divorced	50.0±0.2	50 (50-50)	
Job status			
Not working	45.0±11.44	45 (40-52)	0.002 [‡]
Employee	45.77±8.44	50 (40-50)	
Student	48.64±7.74	50 (50-50)	
Retired	38.33±10.49	40 (30-47.5)	
Educational level			
Elementary	34.0±8.94	40 (25-40)	0.044 [‡]
Intermediate	41.82±11.68	40 (30-50)	
Secondary	43.86±8.15	48 (40-50)	
University	46.07±9.10	50 (40-50)	
Postgraduate	46.0±8.90	46 (40-50)	
Duration of diabetes in years			
<5			0.041 [‡]
5-10	46.26±8.62	50 (40-50)	
>10	44.56±9.63	50 (40-50)	
	40.0±10.22	40 (30-50)	
Diabetic complications			
No			0.035*
Yes	47.14±7.91	50 (40-50)	
	43.99±9.76	49 (40-50)	
HbA1c%	r=-0.153	0.019**	

Table 5: Factors associated with role limitation by physical functioning domain among type 2 diabetic patients

	Role limitation by physical functioning score		p-value
	Mean±SD	Median (IQR)	
Gender			
Male	26.78±9.44	20 (20-40)	0.239*
Female	25.63±9.20	20 (20-40)	
Age (years)	r**=-0.217		0.001
Marital status			
Single	23.10±7.15	20 (20-20)	0.311 [†]
Married	26.49±9.46	20 (20-40)	
Divorced	26.67±11.54	20 (20-20)	
Job status			
Not working	28.18±10.06	20 (20-40)	0.378 [†]
Employee	26.14±9.37	20 (20-40)	
Student	27.50±9.73	20 (20-40)	
Retired	23.54±7.59	20 (20-20)	
Educational level			
Elementary	29.0±10.25	25 (20-40)	0.679 [†]
Intermediate	25.45±9.34	20 (20-40)	
Secondary	25.12±8.83	20 (20-40)	
University	26.49±9.52	20 (20-40)	
Postgraduate	25.42±8.91	20 (20-36.25)	
Duration of diabetes in years			
<5			0.064 [†]
5-10	27.14±9.77	20 (20-40)	
>10	25.09±8.63	20 (20-32.50)	
	22.71±6.75	20 (20-20)	
Diabetic complications			
No	26.45±9.46	20 (20-40)	0.971*
Yes	26.22±9.26	20 (20-40)	

Table 6: Factors associated with mental health domain among type 2 diabetic patients

Factors	Mental health score		p-value
	Mean±SD	Median (IQR)	
Gender			
Male	60.17±18.64	60 (40-80)	0.900*
Female	60.0±18.15	60 (60-75)	
Age (years)	r**=0.067		0.307
Marital status			
Single	63.81±21.56	60 (50-80)	0.568 [‡]
Married	59.81±10.10	60 (40-80)	
Divorced	53.33±11.55	60 (40-60)	
Job status			
Not working	60.91±17.97	60 (55-80)	0.946 [‡]
Employee	60.12±19.07	60 (40-80)	
Student	59.09±16.88	60 (40-65)	
Retired	60.91±17.97	60 (60-60)	
Educational level			
Elementary	52.0±30.33	60 (60-80)	0.349 [‡]
Intermediate	61.82±20.89	60 (60-80)	
Secondary	65.12±18.04	60 (60-80)	
University	59.39±17.78	60 (40-75)	
Postgraduate	53.33±17.75	60 (40-60)	
Duration of diabetes in years			
<5			0.545 [‡]
5-10	59.09±18.05	60 (40-80)	
>10	62.46±16.93	60 (60-80)	
	60.83±23.20	60 (40-75)	
Diabetic complications			
No	57.80±17.50	60 (40-60)	0.116*
Yes	61.53±18.79	60 (60-80)	

*Mann-Whitney test

**Spearman correlation coefficient

[‡]Kruskal-Wallis test

Table 7: Factors associated with role limitation by mental health domain among type 2 diabetic patients

Factors	Role limitation by mental health score		p-value
	Mean±SD	Median (IQR)	
Gender			
Male	26.43±9.38	20 (20-40)	0.355*
Female	25.33±8.88	20 (20-40)	
Age (years)	r**=-0.191		0.003**
Marital status			
Single	22.86±7.17	20 (20-40)	0.283 [†]
Married	26.16±9.26	20 (20-40)	
Divorced	26.67±11.55	20 (20-20)	
Job status			
Not working	28.18±10.06	20 (20-40)	0.282 [†]
Employee	25.75±9.08	20 (20-40)	
Student	27.27±9.85	20 (20-40)	
Retired	23.33±7.61	20 (20-20)	
Educational level			
Elementary	28.0±10.95	20 (20-40)	0.940 [†]
Intermediate	25.45±9.34	20 (20-40)	
Secondary	25.12±8.83	20 (20-40)	
University	26.10±9.24	20 (20-40)	
Postgraduate	25.0±9.05	20 (20-35)	
Duration of diabetes in years			
<5			0.069 [†]
5-10	26.75±9.49	20 (20-40)	
>10	24.91±8.69	20 (20-30)	
	22.50±6.76	20 (20-20)	
Diabetic complications			
No	25.71±9.09	20 (20-40)	0.833*
Yes	25.97±9.18	20 (20-40)	

Table 8: Factors associated with social functioning among type 2 diabetic patients

Factors	Social functioning score		p-value
	Mean±SD	Median (IQR)	
Gender			
Male	34.96±7.06	30 (30-40)	0.365*
Female	34.0±7.38	30 (30-40)	
Age (years)	r**=-0.048		0.461
Marital status			
Single	36.19±9.21	30 (30-40)	0.562 [‡]
Married	34.36±6.97	30 (30-40)	
Divorced	30.0±10.0	30 (02-30)	
Job status			
Not working	33.18±5.68	30 (30-40)	0.826 [‡]
Employee	34.49±7.42	30 (30-40)	
Student	34.55±8.33	30 (30-40)	
Retired	33.18±5.68	30 (30-40)	
Educational level			
Elementary	34.0±5.48	30 (30-40)	0.024 [‡]
Intermediate	40.0±4.47	40 (40-40)	
Secondary	34.65±6.31	30 (30-40)	
University	34.21±7.59	30 (30-40)	
Postgraduate	32.50±6.22	30 (30-40)	
Duration of diabetes in years			
<5	34.87±87±7.25	30 (30-40)	0.196 [‡]
5-10			
>10			
	34.39±7.32	30 (30-40)	
	32.08±9.58	30 (30-37.5)	
Diabetic complications			
No	35.60±8.33	30 (30-40)	0.278*
Yes	33.75±6.35	30 (30-40)	

*Mann-Whitney test

**Spearman correlation coefficient

[‡]Kruskal-Wallis test

Table 9: Factors associated with bodily pain among type 2 diabetic patients

Factors	Bodily pain score		p-value
	Mean±SD	Median (IQR)	
Gender			
Male	43.5±18.0	40 (40-60)	0.818*
Female	42.7±17.6	40 (25-60)	
Age (years)	r=**0.070		0.278
Marital status			
Single	49.5±20.6	40 (40-60)	0.251 [†]
Married	42.6±17.3	40 (40-60)	
Divorced	33.3±23.1	20 (20-20)	
Job status			
Not working	38.2±16.2	40 (20-60)	0.407 [†]
Employee	43.2±18.1	40 (40-60)	
Student	41.8±16.2	40 (20-60)	
Retired	47.5±17.5	40 (40-60)	
Educational level			
Elementary	40.0±14.1	40 (30-50)	0.128 [†]
Intermediate	54.6±12.9	60 (40-60)	
Secondary	44.2±15.5	40 (40-60)	
University	42.3±18.7	40 (40-60)	
Postgraduate	40.0±14.8	40 (25-55)	
Duration of diabetes in years			
<5			0.872 [†]
5-10	42.99±18.40	40 (20-60)	
>10	43.86±17.90	40 (40-60)	
	41.67±13.08	40 (40-40)	
Diabetic complications			
No	43.49±20.45	40 (40-60)	0.304*
Yes	41.53±15.70	40 (25-60)	

Table 10: Factors associated with general health among type 2 diabetic patients

Factors	General health score		p-value
	Mean±SD	Median (IQR)	
Gender			
Male	34.68±6.13	36 (28-40)	<0.001*
Female	38.10±5.49	36 (36-40)	
Age (years)	r=-0.214		0.001
Marital status			
Single	35.42±4.78	36 (32-40)	0.753 [†]
Married	36.51±6.19	36 (32-40)	
Divorced	37.33±2.31	36 (36-36)	
Job status			
Not working	38.36±6.13	38 (32-41)	0.326 [†]
Employee	36.50±6.10	36 (32-40)	
Student	35.64±5.64	36 (32-40)	
Retired	34.83±5.72	36 (32-39)	
Educational level			
Elementary	32.80±9.12	36 (24-40)	0.742 [†]
Intermediate	35.64±6.80	36 (32-40)	
Secondary	36.56±5.13	36 (32-40)	
University	36.63±6.15	36 (32-40)	
Postgraduate	35.33±5.87	36 (29-39)	
Duration of diabetes in years			
<5			0.231 [†]
5-10	36.7±6.2	36 (32-40)	
>10	36.5±6.1	36 (32-40)	
	34.55±4.4	36 (32-36)	
Diabetic complications			
No	36.3±6.2	36 (32-40)	0.567*
Yes	36.5±6.0	36 (32-40)	

Table 11: Factors associated with energy and vitality among type 2 diabetic patients

Factors	Energy and vitality score		p-value
	Mean±SD	Median (IQR)	
Gender			
Male	41.70±9.64	40 (35-50)	<0.001*
Female	46.33±9.02	45 (45-83.75)	
Age (years)	r=**0.043		0.514
Marital status			
Single	45.24±10.78	45 (40-52.5)	0.910 [†]
Married	43.96±9.55	45 (35-50)	
Divorced	43.33±2.89	45 (40-45)	
Job status			
Not working	45.91±9.34	45 (40-55)	0.641 [†]
Employee	44.01±9.93	45 (35-50)	
Student	42.27±8.27	42.5 (35-50)	
Retired	44.38±8.76	45 (40-50)	
Educational level			
Elementary	40.0±15.41	40 (25-55)	0.506 [†]
Intermediate	44.55±11.28	40 (40-55)	
Secondary	46.28±9.00	45 (40-55)	
University	43.81±9.43	45 (35-50)	
Postgraduate	40.83±9.49	45 (31-48.75)	
Duration of diabetes in years			
<5			0.681 [†]
5-10	43.6±9.5	45 (35-50)	
>10	45.1±9.6	45 (40-50)	
	44.8±10.2	45 (36.25-52.5)	
Diabetic complications			
No	42.7±9.4	45 (35-50)	0.099*
Yes	44.9±9.7	45 (40-50)	

Table 12: Factors associated with physical component of quality-of-life score among type 2 diabetic patients

Factors	Physical component of QOL score		p-value
	Mean±SD	Median (IQR)	
Gender			
Male	38.4±5.1	38 (34-41)	0.097*
Female	39.6±4.4	39 (36-42)	
Age (years)	r=-0.245		<0.001**
Marital status			
Single	39.4±5.8	39 (34-42.5)	0.934 [†]
Married	39.0±4.7	39 (35-42.2)	
Divorced	38.1±4.0	38 (34.2-38)	
Job status			
Not working	39.1±3.9	38.6 (36.8-41.4)	0.693 [†]
Employee	39.1±4.8	39 (35-42.40)	
Student	39.2±4.4	40.4 (36-42.4)	
Retired	37.7±5.6	38.5 (33.7-41.3)	
Educational level			
Elementary	35.2±7.3	37.2 (28.6-40.7)	0.485 [†]
Intermediate	40.4±4.7	40 (38.2-43)	
Secondary	39.2±3.9	39.2 (37-42)	
University	39.1±4.9	39 (35.4-42.2)	
Postgraduate	37.5±4.2	37.1 (34.5-41.2)	
Duration of diabetes in years			
<5			0.030 [†]
5-10	39.3±4.7	39.5 (36.1-42.8)	
>10	39.0±5.1	39 (36.3-42.2)	
	36.7±4.4	37.2 (32.5-39.2)	
Diabetic complications			
No	39.5±4.9	39.4 (36.2-42.8)	0.298 [†]
Yes	38.6±4.7	39 (35.4-42)	

Table 13: Factors associated with mental component of quality-of-life score among type 2 diabetic patients

Factors	Mental component of QOL score		p-value
	Mean±SD	Median (IQR)	
Gender			
Male	40.5±7.6	40 (36.7-46.7)	0.400*
Female	39.8±6.8	40 (33.3-43.3)	
Age (years)	r=-0.041		0.533**
Marital status			
Single	41.0±8.1	40 (36.7-46.7)	0.503 [†]
Married	40.1±7.2	40 (36.7-43.3)	
Divorced	36.7±3.3	36.7 (33.3-36.7)	
Job status			
Not working	40.8±7.0	40 (36.7-43.3)	0.988 [†]
Employee	40.1±7.5	40 (33.3-46.7)	
Student	40.3±7.0	40 (35.8-46.7)	
Retired	39.6±5.9	40 (36.7-43.3)	
Educational level			
Elementary	38.0±11.7	40 (26.7-38.3)	0.335 [†]
Intermediate	42.4±7.0	40 (40-46.7)	
Secondary	41.6±6.6	43.3 (36.7-46.7)	
University	39.9±7.2	40 (34.2-43.3)	
Postgraduate	36.9±7.0	38.3 (30.8-43.3)	
Duration of diabetes in years			
<5			0.392 [†]
5-10	40.2±7.3	40 (36.7-43.3)	
>10	40.6±6.9	40 (36.7-46.7)	
	38.4±7.7	36.7 (33.3-43.3)	
Diabetic complications			
No	39.7±7.3	40 (33.3-43.3)	0.554 [†]
Yes	40.4±7.2	40 (36.7-46.7)	

Table 14: Factors associated with total quality of life score among type 2 diabetic patients

Factors	Total QOL score		p-value
	Mean±SD	Median (IQR)	
Gender			
Male	39.2±5.8	40.1 (35.3-43.3)	0.664*
Female	39.6±5.1	40.1 (36.3-43.4)	
Age (years)	r=-0.152		0.020**
Marital status			
Single	40.7±6.3	40.3 (35.6-44.4)	0.742 [†]
Married	39.4±5.4	40.1 (35.3-43.3)	
Divorced	37.6±3.8	37.5 (33.9-37.5)	
Job status			
Not working	39.7±4.7	39.1 (37.3-41.6)	0.865 [†]
Employee	39.5±5.6	40.3 (35.3-43.5)	
Student	39.6±5.2	40.3 (36.3-43.7)	
Retired	38.4±5.4	39.2 (34.2-42)	
Educational level			
Elementary	36.2±8.9	38.5 (27.9-43.4)	0.436 [†]
Intermediate	41.2±5.2	40.3 (37.3-42.8)	
Secondary	40.1±4.6	40.3 (36.4-43.6)	
University	39.4±5.5	40.1 (35.2-43.5)	
Postgraduate	37.3±5.0	37.8 (33.5-41.6)	
Duration of diabetes in years			
<5			0.157 [†]
5-10	39.7±5.4	40.3 (35.8-43.5)	
>10	36.9±5.5	40.3 (35.6-43.3)	
	37.4±5.2	37.1 (33.4-41.4)	
Diabetic complications			
No			0.820 [†]
Yes	39.6±5.6 39.3±5.3	40.3 (35.3-43.5) 40.2 (35.8-43.2)	