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Research Article | **Internal Medicine**

Effect of Sexual Dysfunction on Quality of Life in Men with Type 2 Diabetes Mellitus

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Abstract

Introduction. Sexual dysfunction is a significant complication of diabetes mellitus (DM). Men with DM may develop erectile dysfunction and a lack of sexual desire due to the nature of the disease and its complications.

This study aimed to assess the effect of sexual dysfunction on the quality of life (QoL) in men with type 2 DM.

Methods. This study utilized a single-center, descriptive design and was carried out between November 15, 2021, and August 24, 2022. It included 378 male patients with type 2 DM treated at the internal medicine outpatient clinic at a university hospital in Türkiye. The data were collected using the Personal Information Form developed by the researchers, the Arizona Sexual Experiences Scale (ASEX), and the Diabetes-Specific Quality of Life Scale (DSQOL). Descriptive statistics, Kruskal-Wallis test, Mann-Whitney U test, Spearman correlation coefficient, and multiple regression analysis were used to assess the data.

Results. Among male patients with type 2 DM participating in the study, the mean ASEX score was 14.47 $\pm$ 3.37 and the DSQOL score was 2.92 $\pm$ 0.31. The relationship between the mean ASEX and DSQOL scores and various factors such as age, education status, employment status, regular health check-ups, duration of diagnosis, type of treatment, fasting blood glucose level, HbA1c level, and body mass index was found to be statistically significant ($p < 0.05$). A negative correlation was identified between the mean ASEX and DSQOL scores ($p < 0.001$). Additionally, multiple regression analysis revealed that QoL, duration of diagnosis, marital status, and education status were significant factors influencing the sexual dysfunction levels of the participants ($p < 0.001$).

Conclusions. This study found that as individuals' levels of sexual dysfunction increased, their QoL decreased. Therefore, it is recommended to assess sexual dysfunction thoroughly and implement training programs aimed at improving sexual health to enhance individuals' QoL.

Keywords

Type 2 Diabetes Mellitus; Male; Sexual Dysfunction; Quality of Life

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Introduction

Diabetes mellitus (DM) is a chronic metabolic condition characterized by hyperglycemia, resulting from impaired insulin secretion, insulin action, or a combination of both [1]. The International Diabetes Federation reported that 537 million people worldwide had DM in 2021, with projections suggesting this number could rise to 783 million by 2045 [2]. More than six million individuals in Türkiye are estimated to have type 2 DM, with a reported prevalence of 13.7% according to findings from the Turkish Diabetes Epidemiology Survey (TURDEP-II) [3]. DM is a lifelong disease that negatively affects life expectancy and quality of life (QoL) due to the complications it causes. It imposes a significant social and economic burden due to workforce losses. Additionally, sexual dysfunction is a notable complication of DM [4].

Sexuality is a vital part of life. Complications of DM cause sexual dysfunction, including low sexual desire, ejac-

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ulation disorders, and impotence [5]. Compared to those without DM, the risk of erectile dysfunction was found to be approximately 3.5 times higher in diabetics [6]. DM can affect sexual psychophysiology at various stages. In men with DM, vascular damage and neuropathy due to hyperglycemia can lead to erectile dysfunction or the burden of a chronic disease such as DM can lead to stress or depression and reduce sexual desire [6, 7]. The prevalence of DM-related sexual dysfunction in men with type 2 DM ranges from 32% and 90%, depending on the selected population, age, and DM duration [8–10]. The variation in these rates stems from different diagnostic criteria for sexual dysfunction, differences in methodology, and population characteristics [8].

When sexual life encounters difficulties, it can adversely affect other aspects of life, ultimately impacting the overall QoL [11]. Sexual satisfaction is highly susceptible to fluctuations in an individual's life circumstances. Conversely, alterations in sexual satisfaction can have profound physiological, biological, sociological, and psychological ramifications on the individual [12]. It has been reported that especially men experience low self-esteem due to the perceived loss of masculinity and decreased sexual and emotional intimacy in partner relationships [13]. Some studies have shown that sexual dysfunction in men can be improved through interventions such as testosterone therapy, weight control, diet, and lifestyle changes [14, 15]. Untreated sexual dysfunction impairs the patient's QoL and may lead to psychosocial problems and eventually disrupt treatment adherence for DM, creating a challenging cycle that is difficult to break.

Discussing sexuality and sexual functions is challenging for both the patient and the healthcare worker [16], and therefore, sexual dysfunction, which is a treatable condition, cannot be neglected in men with DM [17]. Regardless of the patient's cultural background, age, gender, or personal characteristics, every healthcare worker should feel comfortable discussing sexuality with their patients. However, it is the medical personnel's responsibility to encourage the patient to share their sexual problems [5]. Diabetic patients should be questioned about sexual dysfunction, and those who need treatment should be directed to specialized clinics for appropriate care [17].

According to the literature, despite the high prevalence of sexual dysfunction in individuals with DM, it remains an unspoken issue [17, 18]. There is a scarcity of studies directly assessing the impact of sexual dysfunction on QoL [19, 20]. To bridge these knowledge disparities, it is crucial to research QoL among men experiencing erectile dysfunction.

This study **aimed** to assess the effect of sexual dysfunction on the QoL in men with type 2 DM.

Materials and Methods

Study Design

The study employed a descriptive, cross-sectional design and was carried out between November 15, 2021, and August 24, 2022, at a university hospital.

Setting and Sample

The study examined male patients with type 2 DM treated in the Endocrinology Department of Akdeniz University Hospital. A sample calculation was made before the study was initiated. The sample size was calculated as 378 individuals on the G-Power 3.1.9.7 software, based on a correlation value=0.2, α=0.050 and power (1-β)=0.95. The targeted sample size was reached during the data collection period. The study included male individuals who received a diagnosis of type 2 DM at least six months prior, consented to participate, and presented no communication barriers. The exclusion criteria for the study were the use of drugs that might affect sexual function, a history of pelvic surgery, and alcohol or substance abuse. Data collection was conducted in person, and individuals who declined participation, did not respond to all questions during the interview, or withdrew from the study, were excluded from the analysis.

Data Collection

Based on the literature review, data collection utilized the Personal Information Form, the Arizona Sexual Experiences Scale (ASEX), and the Diabetes-Specific Quality of Life Scale (DSQOL).

Personal Information Form

The researchers developed this form after reviewing the literature [6, 8, 17]. It encompasses the following variables: participants' age, marital status, education status, employment status, smoking status, alcohol consumption, regularity of health check-ups, comorbid chronic conditions, diagnosis time, treatment method (oral antidiabetics, insulin, insulin+oral antidiabetics), fasting blood glucose concentration, glycated haemoglobin (HbA1c) levels, and body mass index (BMI).

Body Mass Index (BMI)

To measure the patients' body weights, an electronic weight scale (Tanita Inner Scan BC 532) with a maximum capacity of 150 kg and a precision of 0.1 kg was utilized. Height was measured using a rigid tape measure. Using the weight and height data, the patients' BMI values were calculated in kg/m^2 units. In compliance with the standards of the World Health Organization (WHO), BMI was categorized as underweight ($\leq$ 18.5 kg/m^2), normal (18.5-24.9 kg/m^2), overweight (25.0-29.9 kg/m^2), class I obese (30.0-34.9 kg/m^2), class II obese (35.0-39.9 kg/m^2), and class III obese ($\geq$ 40 kg/m^2) [21].

Biochemical Data

Fasting blood glucose and HbA1c values were obtained from patient files after obtaining consent from the patients and permission from the institution.

Arizona Sexual Experiences Scale (ASEX)

This scale, developed by McGahuey *et al.* to quickly and easily screen and identify sexual problems experienced by patients, consists of 5 items evaluated on a six-point Likert scale, with separate forms for men and women [22]. It requires participants to evaluate their experiences over the past week. Soykan conducted a validity and reliability

study of the Turkish version of the scale and determined the cutoff score to be 11 [23]. Individuals scoring ≥ 11 are deemed to be at a heightened risk of experiencing sexual dysfunction. The increase in scores is directly related to the severity of the condition. The Crohbach's alpha value of the Turkish version of the scale was 0.92 [23]. In our study, the Cronbach's alpha value for the scale was calculated to be 0.74.

Diabetes-Specific Quality of Life Scale (DSQOL)

This scale, developed by Jacobson *et al.*, consists of 46 items and asesses four sub-dimensions: psychological satisfaction with treatment, psychological impact, DM-related anxiety related, and social/occupational anxiety [24]. Each item on the scale is scored between 1 and 5 points. The items in the 'psychological satisfaction with the treatment' subdimension (items 22-24) are scored from 1 ('very satisfied') to 5 ('not at all satisfied'), while items in other subdimensions are scored from 1 ('never') to 5 ('always'). The total score on the scale ranges from 46 to 230. The total score and scores for each sub-dimension are divided by the number of items within that sub-dimension [24]. Yildirim (2007) conducted a validity and reliability study of the Turkish version of the scale, finding a Cronbach's alpha value of 0.89 for the total scale and ranging from 0.80 to 0.94 for the individual sub-dimensions [24]. In our study, the Cronbach's alpha value for the total scale was found to be 0.82.

Data Analysis

The study data were analyzed using the SPSS 21 software package. Descriptive statistics were employed for data analysis. Categorical variables were presented as frequencies and percentages. Continuous variables were expressed as mean (M) and standard deviation (SD). For assessing the normality of data distribution, the Kolmogorov-Smirnov test was used. Due to the non-normal distribution of our data, the Mann-Whitney U test was used for comparing two groups with continuous variables, and the Kruskal-Wallis analysis of variance was applied for comparing more than two groups. The Dunn-Bonferroni test was used to determine the difference between groups. Spearman correlation and multiple regression analyses were conducted, with statistical significance set at α=0.05. Additionally, the Cronbach's alpha value was calculated to assess the reliability of the scales used.

Results

Male patients' descriptive characteristics are presented in Table 1. Most patients were married, employed, had a comorbid condition in addition to DM, used oral antidiabetic treatment, and engaged in regular exercise. However, only half of the participants were primary school graduates, had a balanced income/expense ratio, and smoked (Table 1).

As shown in Table 2, there were no differences in ASEX scores with respect to the presence of other chronic comorbidities or marital status. Similarly, no significant differences in DSQOL scores were revealed regarding marital status, alcohol consumption, or smoking (Table 2).

Table 1. Descriptive characteristics of the participants (n=378).

Variables	Mean±SD	
Age, years	55.06±8.12	
Diagnosis time, years	7.02±4.31	
Fasting blood glucose, mg/dl	176.61±54.87	
HbA1c, %	7.58±1.30	
BMI, kg/m^2	28.00±2.97	
Variables	n	%
Marital status		
Married	343	90.7
Single	35	9.3
Education level		
Primary school	99	26.2
High school	191	50.5
Undergraduates and above	88	23.3
Employment status		
Employed	337	89.2
Unemployed	41	10.8
Smoking status		
Yes	221	58.5
No	157	41.5
Alcohol consumption status		
Yes	41	10.8
No	337	89.2
Comorbid chronic disease		
Yes	295	78.0
No	83	22.0
Treatment method		
Oral antidiabetics	295	78.0
Insulin	6	1.6
Insulin+oral antidiabetics	77	20.4
Regular exercise status		
Yes	255	67.5
No	123	32.5
Regular health check-up status		
Yes	151	39.9
No	227	60.1

Notes: BMI – body mass index; HbA1c – glycated haemoglobin; SD – standard deviation.

A notable negative correlation (rho=-0.559, $p < 0.001$) was observed between the mean total scores on the ASEX and DSQOLS among diabetic men. This measurement result showed that men experiencing sexual dysfunction had lower QoL.

The results of multiple regression analysis examining the factors influencing sexual dysfunction among participants are given in Table 3. Accordingly, a significant relationship was found between QoL, diagnosis duration, marital status, and education status variables and sexual dysfunction scores.

Discussion

The importance of understanding the impact of meeting the sexual needs of diabetic patients on their QoL has been highlighted in the literature [20]. This study aimed to assess how sexual dysfunction affects the QoL in men with type 2 DM.

The mean age of the sample was 55.06 $\pm$ 8.12 years,

Table 2. Comparison of descriptive features with mean scores on the Arizona Sexual Experiences Scale and Diabetes-Specific Quality of Life Scale (n=378).

	Variables	ASEX		DSQOL	
Age	<50 years	13.10±2.66[a]	p<0.001 c>b>a	3.05±0.23[a]	p<0.001 a>b>c
	50-60 years	14.00±3.04[b]		2.97±0.27[b]	
	>60 years	16.34±3.59[c]		2.72±0.33[c]	
Marital status	Married	14.38±3.30	p=0.21	2.91±0.30	p=0.35
	Single	15.34±3.92		2.94±0.34	
Education status	Primary school	15.85±3.25[a]	p<0.001 a>b>c	2.89±0.34[a]	p=0.01 c>b, a
	High school	14.58±3.11[b]		2.90±0.30[b]	
	Undergraduates and above	12.65±3.25[c]		3.00±0.28[c]	
Employment status	Employed	14.18±3.30	p<0.001	2.94±0.30	p<0.001
	Unemployed	17.38±3.73		2.66±0.38	
Smoking status	Yes	14.80±3.50	p=0.01	2.90±0.32	p=0.20
	No	14.00±3.13		2.94±0.28	
Alcohol consumption status	Yes	15.68±3.67	p=0.01	2.92±0.32	p=0.95
	No	14.32±3.30		2.92±0.30	
Regular health check-up status	Yes	13.78±3.35	p<0.001	2.99±0.30	p<0.001
	No	14.92±3.31		2.87±0.30	
Comorbid chronic disease	Yes	14.57±3.52	p=0.21	2.90±0.32	p=0.01
	No	14.09±2.76		2.97±0.26	
Diagnosis time	<5 years	13.05±2.54[a]	p<0.001 c>b>a	3.09±0.27[a]	p<0.001 a>b>c
	5-10 years	14.30±3.09[b]		2.91±0.26[b]	
	>10 years	17.92±3.48[c]		2.58±0.26[c]	
Treatment method	Oral antidiabetics	13.74±2.89[a]	p<0.001 b>c>a	2.99±0.27[a]	p<0.001 a>c>b
	Insulin	17.33±3.14[b]		2.46±0.07[b]	
	Insulin+oral antidiabetics	17.03±3.73[c]		2.68±0.28[c]	
Fasting blood glucose	<110 mg/dl	13.68±3.27[a]	p<0.001 c>b>a	2.99±0.35[a]	p<0.001 a,b>c
	110-140 mg/dl	13.80±2.93[b]		2.96±0.27[b]	
	>l40 mg/dl	16.71±3.44[c]		2.74±0.28[c]	
HbA1c level	<6.5%	12.90±3.32[a]	p<0.001 c>b>a	3.04±0.38[a]	p<0.001 a>b>c
	6.5-7.5%	13.91±2.76[b]		2.97±0.26[b]	
	>7.5%	16.38±3.63[c]		2.75±0.28[c]	
BMI	<24.9 kg/m²	12.85±2.29[a]	p<0.001 c>b>a	2.99±0.24[a]	p<0.001 a>b>c
	25-29.9 kg/m²	14.26±3.24[b]		2.94±0.31[b]	
	>30 kg/m²	16.20±3.69[c]		2.79±0.27[c]	

Notes: the Mann-Whitney U test was used in two groups with continuous variables; the Kruskal-Wallis analysis of variance was applied for more than two groups and the Dunn-Benferroni test was used to determine the difference between groups (superscript indecies); ASEX – Arizona Sexual Experiences Scale; DSQOL – Diabetes-Specific Quality of Life Scale; HbA1c – glycated haemoglobin; BMI – body mass index.

Table 3. Regression analysis of Arizona Sexual Experiences Scale scores in relation to descriptive features and Diabetes-Specific Quality of Life Scale scores in patients with type 2 diabetes mellitus.

	ASEX				
	B	SE	β	t	p
Marital status	1.576	0.469	0.136	3.392	0.001
Employment status	-1.657	0.197	-0.346	-7.482	0.001
Diagnosis time	0.118	0.036	0.454	2.326	0.021
DSQOL	-4	0.442	-0.369	-7.985	0.001

Notes: R = 0.691; Adjusted R^2 = 0.478; F = 23.712; p = 0.001.
ASEX – Arizona Sexual Experiences Scale; DSQOL – Diabetes-Specific Quality of Life Scale.

with most participants being married and employed; however, only half of the participants were primary school graduates. The mean DM duration was 7.02 ± 4.31 years and the majority of diabetics had a comorbid condition, used oral antidiabetic treatment, engaged in regular exercise, had a balanced income/expense ratio, and smoked. These findings were consistent with the socio-demographic and disease-related characteristics reported in previous studies on diabetic patients, reflecting the typical profiles of diabetic men in Türkiye and other countries [7, 10, 11, 13].

The mean ASEX and DSQOL scores of the participants in our study were 14.47 ± 3.37 and 2.92 ± 0.31, respectively. Similar to our study, Bahar *et al.* reported a mean sexual dysfunction score of 16.98 ± 43.79, with 62.2% of participants experiencing sexual dysfunction [26]. In a study conducted among patients with DM in Africa,

the prevalence of sexual dysfunction was found to be 97.3% [18]. Another study involving men with DM reported a mean sexual dysfunction score of 17.03 (±SD=3.47) and a sexual dysfunction rate of 71.5% [19]. León-Jiménez *et al.* found that individuals with DM exhibited low QoL scores. Nearly half of those diagnosed with type 2 DM were reported to experience QoL ranging from moderate to poor [27]. These findings showed that men with DM tended to have high scores on the ASEX, high prevalence of sexual dysfunction, and lower QoL.

According to our findings, participants over the age of 60 years were more likely to experience sexual problems and reported lower QoL. Similarly, a systematic review found a significant increase in the prevalence of sexual dysfunction with age [11]. Furthermore, age was found to significantly impact QoL among individuals with DM [20]. Similar studies emphasized that age was a major risk factor for developing sexual dysfunction in most individuals with DM, with the prevalence of sexual dysfunction increasing and QoL decreasing as age advances [10, 18, 28, 29]. These findings suggest that as sexual dysfunction increases with age, QoL correspondingly declines.

An evaluation of our study findings revealed that literate individuals had higher levels of sexual dysfunction than those with primary and secondary education and above. Studies have shown that individuals with lower education levels tend to have poorer QoL and lower sexual function compared to those with higher education levels [10, 20, 27]. The level of education generally increases health awareness and facilitates access to health services, which may be an important factor in preventing and treating sexual problems. Furthermore, this may be attributed to the fact that individuals with higher education levels are more likely to prioritize their health and have greater access to healthcare services.

When the relationship among employment status, QoL, and sexual dysfunction was evaluated, it was seen that unemployed individuals in this study experienced significantly higher levels of sexual dysfunction and lower QoL compared to employed ones. Regression analysis further supported the relationship between sexual dysfunction and employment status. Consistent with our findings, Abedini *et al.* reported that the mean QoL score was significantly higher among employed individuals [30]. In a study by Bahar *et al.*, the rate of sexual dysfunction among retired men was higher compared to other groups [26]. This finding suggests that employed individuals may have better QoL and sexual function due to easier access to treatment options and greater social engagement.

The literature states that smoking and alcohol use are important risk factors for the development of macro- and microvascular complications of DM, cause erectile dysfunction by increasing vasoconstriction and penile venous leakage, and adversely affect sexual functions [12]. The results of our study supported this finding, showing that those who smoked and consumed alcohol experienced significantly higher levels of sexual dysfunction. However, contrary to our study, some research found no significant relationship between sexual function and smoking or alcohol consumption [7, 31]. This difference might be attributed to variations in sample size and changes in alcohol consumption rates in the sample groups. The inconsistency of results in the literature underscores the need for more comprehensive studies on this topic.

The prolongation of DM duration is believed to cause vascular and neurological complications, which in turn increase the likelihood of experiencing sexual dysfunction. As the duration of the diagnosis lengthens, the rate of sexual dysfunction rises, negatively impacting QoL [31]. According to this study, individuals with a disease duration of more than 10 years experienced higher levels of sexual dysfunction and lower QoL. Similarly, it has been stated that men with DM for more than 10 years are four times more likely to experience sexual dysfunction compared to those who have had the diagnosis for 5 years or less [32]. Numerous studies in the literature corroborate this discovery, indicating a positive correlation between the duration of DM and sexual dysfunction, alongside a negative correlation with QoL [19, 31, 33].

In diabetic patients, fasting blood glucose and HbA1c levels are good indicators of glycemic control. Long-term high fasting blood glucose and HbA1c values are associated with higher complication rates in DM patients [29]. Our study revealed a significant relationship between fasting blood glucose and HbA1c levels and sexual dysfunction and QoL. Their high values were linked to increased sexual dysfunction and decreased QoL. A meta-analysis found that individuals with DM whose HbA1c level was below 7% had a 7% lower risk of developing sexual dysfunction compared to those with higher HbA1c levels [8]. In studies resembling ours, a significant association was observed between fasting blood glucose and HbA1c levels and both QoL and sexual dysfunction [30, 31, 34].

According to the study findings, individuals with a BMI of $\geq$ 30 kg/m^2 had higher levels of sexual dysfunction and lower QoL compared to other groups. A study revealed a notable correlation between BMI and erectile dysfunction severity [11]. A meta-analysis found that individuals with DM and a BMI of $\geq$ 30 kg/m^2 were 1.26 times more likely to develop sexual dysfunction [8]. Another study demonstrated a significant association between BMI and QoL, indicating that individuals with normal BMI tended to exhibit better QoL [35]. This finding aligns with the outcomes reported in other studies in the literature.

Regression analysis revealed lower levels of sexual dysfunction in married participants compared to single ones. A study found that while marital status had no direct relationship with sexual dysfunction, anxiety levels were lower in married individuals compared to their single counterparts [36]. In another study, marital status was shown to affect sexual dysfunction in women, with no significant relationship found in men. The difference in our study is thought to be attributed to the low number of single men in our sample [7].

Sexual satisfaction is emphasized as a crucial determitant of QoL for individuals [12]. Sexual dysfunction has been reported to strongly lower QoL in men with DM. Hence, early identification of sexual dysfunction is impera-

tive for enhancing their QoL [6]. Our study observed a significant negative correlation between participants' mean scores on the ASEX and DSQOLS. Regression analysis further supported this finding, indicating that as sexual function improved, individuals' QoL also increased. A study conducted in New York, similar to our research, reported that sexual dysfunction in individuals with DM directly affected their QoL [37]. Numerous studies in the literature have shown that better sexual life positively affects QoL of patients and reduces their anxiety and depression scores [32, 38, 39]. The findings indicate that sexual dysfunction significantly reduces QoL by directly impacting various aspects of individuals' lives. The study further suggests that positive factors contributing to sexual satisfaction can enhance QoL for patients with DM.

Limitations

This study has several limitations. The results of this study may not be applicable to all men with DM, as the results are specific to patients who were treated at the health institution where the research was conducted and who consented to participate. In addition, the data collected in our study may not fully and accurately capture the experiences of men with sexual dysfunction due to potential embarrassment during data collection. Despite this limitation, the study serves as a valuable guide for understanding the effect of sexual dysfunction on QoL in male patients with DM.

Conclusions

In our study, it was found that as the levels of sexual disfunction in individuals with type 2 DM decreased, their QoL improved. Additionally, sexual disfunction was significantly associated with marital status, employment status, and DM duration. To improve patients' QoL, thorough evaluating cases of sexual dysfunction is recommended. Additionally, based on our study results, close monitoring of patients in terms of variables affecting sexual dysfunction is crucial.

Ethical Statement

The study adhered to all the principles outlined in the Declaration of Helsinki. Ethical approval was acquired from the Non-Invasive Clinical Research Ethics Committee of Burdur Mehmet Akif Ersoy University, and written consent was obtained from the institution where the research took place (Decision Number: GO 2021/353, Date: November 03, 2021).

Informed Consent

Patients who met the inclusion criteria were informed about the purpose and scope of the study, and their verbal and written consent were obtained.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflict of Interest

The authors declare that no conflicts exist.

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