




Comparison of sexual functions in women with and without type 1 diabetes

Selda Celik^{1*} , Meltem Demirgöz Bal² , Meral Kelleci³ 

SUMMARY

OBJECTIVE: This study aimed to investigate female sexual function in patients with type 1 diabetes by comparing female sexual function index scores between women with and without type 1 diabetes.

METHODS: A total of 62 women with type 1 diabetes and 69 age-matched women without diabetes but with similar backgrounds were enrolled in the patient and control groups, respectively. All participants were sexually active and had no systemic diseases other than diabetes in the patient group.

RESULTS: The frequency of female sexual dysfunction was significantly higher, and the mean female sexual function index score was significantly lower in women with diabetes compared to the control group ($p=0.01$). There was a significant relationship between sexual dysfunction and duration of diabetes, glycosylated hemoglobin test, and body mass index ($p<0.05$).

CONCLUSION: This study demonstrates that female sexual dysfunction is more common among women with type 1 diabetes than among women without type 1 diabetes. Patients with type 1 diabetes should be evaluated in terms of sexual health. Health professionals should give more attention to and provide guidance regarding sexual function in women with type 1 diabetes.

KEYWORDS: Diabetes mellitus, type 1. Sexuality. Sexual dysfunctions, psychological. Sexual dysfunction, physiological.

INTRODUCTION

Diabetes mellitus (DM) is a disease that is rapidly increasing worldwide, and it is one of the most common chronic diseases that is seen in all countries. Diabetes is classified primarily as type 1 diabetes, type 2 diabetes, and gestational diabetes. Type 1 diabetes can affect people at any age, but usually develops in children or young adults^{1,2}. Diabetes leads to microvascular (such as retinopathy, nephropathy, and neuropathy), macrovascular (cardiovascular system), and urological (lower urinary system dysfunction, sexual dysfunction, and urinary system infections) complications³. Diabetes mellitus is one of the important causes of sexual dysfunction (SD), which is more common and problematic in patients with type 1 diabetes compared to the normal population⁴⁻⁷. The pathogenesis of SD in women with diabetes is controversial, and hyperglycemia, infection, vascular, neuronal, and psychosocial disorders have all been implicated^{8,9}. Diabetic neuropathy leads to vaginal wall changes, pelvic floor dysfunction, and weakened muscle tone. Neuropathic damage to the autonomic nervous system disrupts the orgasm process and causes delayed stimulation and lower desire. Insufficient vaginal lubrication results

in painful sexual intercourse. In hyperglycemic states, dehydration of the mucous membranes and frequent urogenital infections may lead to reduced vaginal lubricity, dyspareunia, burning, itching, tightness, and vaginal dryness or discharge^{6,10,11}. Studies on the prevalence of SD in women with type 1 diabetes have yielded varying results. This rate was reported to be 27% by Enzilin et al.⁴, 35% by Maiorino Ke et al.⁶, and 71% by Doruk et al.⁵. These highly discrepant results regarding the prevalence of female SD in patients with type 1 diabetes may be attributed to cultural differences. However, it is now recognized that this issue is not being adequately addressed and remains an important problem.

The evaluation of women's SD is challenging for both patients and healthcare professionals. Personal taboos related to sex, privacy issues, and limited experience with female sexual function are factors that make it difficult to identify sexual problems. Unfortunately, advanced clinical methods for evaluating SD in women are limited. The female sexual function index (FSFI) is an assessment tool developed to standardize the evaluation of female sexual function. The FSFI has gained widespread international acceptance because it comprises subscales

¹University of Health Sciences, Hamidiye Faculty of Nursing – Istanbul, Turkey.

²Marmara University, Health Sciences Faculty, Midwifery Department – Istanbul, Turkey.

³Cumhuriyet University, Faculty of Health Sciences, Nursing Department – Sivas, Turkey.

*Corresponding author: seldacelik40@gmail.com

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that facilitate the classification of SD and has been evaluated in validity and reliability studies in different countries¹². However, women with type 1 diabetes receive less attention in research and clinical practice. In this study, we investigated the prevalence of female SD in type 1 diabetes by comparing the FSFI scores in women with and without type 1 diabetes.

METHODS

Study design

This case-control study compared the sexual function in women with and without type 1 diabetes.

Participants

The study was conducted between October and December 2020. Women who presented to the diabetes outpatient clinic of a training and research hospital for follow-up comprised the case group. This group included 62 women who were diagnosed with type 1 diabetes, were sexually active with a partner, were between the ages of 18 and 45 years, were literate, and consented to participate in the study. Patients who were using any antidepressant, anxiolytic, antiepileptic, or estrogen-based (oral/vaginal) drugs; had a history of vaginal surgery or hysterectomy; were pregnant; had any sexually transmitted disease; or were peri/postmenopausal were excluded from the study. Patients who were directed to the nurse for education and consultancy after the routine diagnosis and treatment are included in the study.

The sample size was calculated based on a power of 80%, confidence interval of 95%, and significance level of $p < 0.05$. The nondiabetic control group included 69 volunteers who were sexually active, were between the ages of 18 and 45 years, and had no systemic diseases or depression.

Levels of serum glucose and HbA1c were measured using Cobias Roche diagnostic kits and an auto-analyzer in the biochemistry laboratory of the hospital. Height and weight measurements were obtained with the participants lightly dressed and without shoes. Body mass index (BMI) was calculated by dividing weight (kg) by height squared (m^2).

Data collection tools

The participants (patients with and without type 1 diabetes) filled out forms in a suitable meeting room in the outpatient clinic. Data collection took approximately 20 min.

Information form

This form was developed by the researchers and consisted of two sections. The first section included questions on sociodemographic

data including age, education level, employment status, economic status, family type, and duration of marriage. The second part included four questions on the duration of diabetes, BMI, and level of HbA1c.

Female sexual function index

This instrument was developed by Rosen et al.⁹ to evaluate female sexual function. The index includes a total of 19 items questioning sexual function/problems within the last week in 6 subdimensions, namely, desire, arousal, lubrication, orgasm, satisfaction, and pain. The first 2 items question the frequency and level of sexual desire (1–5 points); items 3–6 question arousal level, confidence, and satisfaction (0–5 points); items 7–10 question the frequency/difficulty of lubrication and maintaining lubrication (0–5 points); items 11–13 question orgasm frequency, difficulty, and satisfaction (0–5 points); items 14–16 question satisfaction with the amount of closeness with a partner, sexual relationship, and overall sex life (1–5 points); and items 17–19 question the frequency and level of pain during and after penetration (0–5 points). Total FSFI score ranges from a minimum of 2 to a maximum of 36, with scores below 26.55 indicating SD¹². Aygin and Aslan¹³ conducted the reliability and validation study of the FSFI for Turkey in 2005.

Statistical analysis

All data were summarized as mean \pm standard deviation (minimum–maximum) or as number and percentage. Parametric data were compared using Student's *t*-test and nonparametric data using χ^2 analysis. Multiple regression analysis was used to examine the relationship between the groups. Significance was accepted at $p < 0.05$.

Ethical considerations

Written permission was obtained from the Marmara University Non-Interventional Clinical Research Ethics Committee (24.09.2020/53) and the institution where the study was conducted prior to data collection. In addition, all study participants were informed about the nature of the study and that participation was on a voluntary basis. Informed consent was obtained from all participants.

RESULTS

The study sample consisted of 131 participants (62 in the case group, 69 in the control group). The mean ages of the diabetic and control groups were 34.32 ± 7.5 years (range: 20–47

years) and 34.17 ± 7.7 years (range: 20–47 years), respectively. The groups were similar in terms of sociodemographic characteristics ($p > 0.05$) (Table 1).

In the type 1 diabetic group, the mean HbA1c level was $8.16 \pm 1.36\%$ (range: 5.6–13.1%), the mean duration of diabetes was 13.2 ± 7.2 (range: 2–31) years, and the mean BMI was 24.9 ± 4.0 (range: 20.7–28.4) kg/m^2 . All women in the type 1 diabetic group were receiving intensive insulin therapy (four times a day).

The FSFI total and subscale scores of the women with and without diabetes are shown in Table 2. The diabetic group had

significantly lower sexual desire, arousal, satisfaction, as well as total scores compared to the control group ($p < 0.01$).

The frequency of SD was significantly higher in the diabetic group ($n=47$, 77%) than that in the control group ($n=28$, 40%) ($\chi^2=16.01$, $p=0.01$). HbA1c, BMI, and duration of diabetes differed significantly based on the presence of SD ($p < 0.05$) (Table 3).

female sexual function index score and other variables were analyzed by multiple regression analysis. No significant difference was found in the multiple regression analysis to determine the relationship between FSFI scores and HbA1c, BMI, and diabetes durations ($F: 1.510$, $p > 0.05$) (Table 4).

Table 1. The participants' characteristics.

Features	Women with diabetes (n=62) Mean±SD	Women without diabetes (n=69) Mean±SD	Statistical analysis	
			χ^2	p
Age (years)	34.3 ± 7.5 (range: 18–45)	34.2 ± 7.7 (range: 18–45)	35.192	0.276
Educational level (years)				
<8 years	19 (30.6%)	60 (87.0%)	45.087	0.677
>8 years	43 (69.4%)	9 (13.0%)		
Employment status				
Working	20 (32.3%)	11 (15.9%)	4.813	0.588
Not working	42 (67.7%)	58 (84.1%)		
Economic status				
Income < expenses	12 (19.4%)	36 (52.2%)	16.396	0.314
Income \geq expenses	50 (80.4%)	33 (44.9%)		
Family type				
Nuclear	55 (88.7%)	54 (78.3%)	2.552	0.110
Extended	7 (11.3%)	15 (21.7%)		
Marriage duration (years)	12.7 ± 9.5 (range: 1–28)	14.3 ± 8.7 (range: 1–27)	33.187	0.458

SD: standard deviation.

Table 2. Comparison of female sexual function index scores in women with and without diabetes.

	Women with diabetes (n=62) Mean±SD	Women without diabetes (n=69) Mean±SD	p
Desire	3.54 ± 1.13	4.31 ± 1.04	<0.01
Arousal	4.00 ± 1.42	4.66 ± 1.03	<0.01
Lubrication	4.91 ± 1.30	5.08 ± 1.21	0.440
Orgasm	4.57 ± 1.17	4.87 ± 1.23	0.153
Satisfaction	3.21 ± 1.05	5.00 ± 1.09	<0.01
Pain	5.00 ± 1.93	5.28 ± 1.14	0.137
Total FSFI score	20.81 ± 4.06	23.27 ± 4.27	<0.01

FSFI: female sexual function index; SD: standard deviation.

Table 3. Comparison of glycosylated hemoglobin test, body mass index, and duration of diabetes in women with type 1 diabetes based on the presence of sexual dysfunction.

	Sexual dysfunction (n=47)	No sexual dysfunction (n=15)	p*
HbA1c (%)	8.00±1.32	8.64±1.38	<0.05
BMI (kg/m ²)	24.89±4.00	26.53±4.23	<0.05
Duration of diabetes (years)	13.09±7.18	13.53±7.42	<0.05

BMI: body mass index. *Student's t-test.

Table 4. Multiple regression analysis of female sexual function index scores and variables.

		B	Beta	t	p	95%CI for B	
						Lower bound	Upper bound
FSFI	(Constant)	46.963		2.564	0.013	10.295	83.631
	HbA1c (%)	2.641	0.267	0.026	0.470	0.032	5.250
	BMI (kg/m ²)	0.001	0.002	0.017	0.986	-0.058	0.059
	Duration of diabetes (years)	0.053	0.028	0.223	0.824	-0.422	0.527
R=0.269, R ² =0.072, Adjusted R ² =0.024, F=1.510, p=0.221							

FSFI: female sexual function index; BMI: body mass index.

DISCUSSION

This study aimed to investigate female sexual function in patients with type 1 diabetes by comparing FSFI scores between women with and without type 1 diabetes. In this study, the mean FSFI score was 20.8±4.1 for patients with type 1 diabetes and 23.3±4.3 for the control group. Similar to our study, Pontiroli et al.¹⁴ determined in their meta-analysis of 3,168 women with diabetes and 2,823 controls that female SD was relatively common and that women with diabetes had lower FSFI scores than controls, indicating greater SD. In a recent study, Bak et al.¹⁵ reported that type 1 diabetes was associated with sexual disorders in a third of affected women. Ahmed et al.¹⁶ found that the mean total FSFI score was significantly lower in type 1 diabetes mellitus (21.1±3.9) than in type 2 diabetes mellitus (26.4±4.2), and both were significantly lower than in the control group (31.5±5.8). Similarly, Zamponi et al.¹⁷ found that female SD (total FSFI score≤19) was significantly more prevalent in patients with type 1 diabetes compared to controls (12/33, 36.4% versus 2/39, 5.2%, respectively; p=0.010).

Several previous studies have shown that women with type 1 diabetes experience sexual problems at rates varying between 18 and 71%^{4-7,18-20}. In the study conducted by Doruk et al.⁵ in Turkey, SD was reported at a rate of 71% among women with type 1 diabetes and 37% in the control group. Similar to that study, we determined SD rates of 76 and 40% in the type 1 diabetes and control groups, respectively, which are higher than the rates reported in other studies. The high rate of SD

in women with diabetes may be due to neurogenic, psychogenic, or vascular factors. Duration of diabetes, age, microvascular complications, cultural factors, and psychological factors are other risk factors. However, there may also be sociocultural reasons related to Turkish society, such as women's perception of sexuality, behaviors such as tending to conceal their problems and feeling ashamed, and reluctance to discuss sexuality-related problems⁶. The wide variation in the prevalence of female SD observed in various studies may be due to differences in the characteristics of the sample groups other than diabetes, the different sociocultural environments in which the studies were conducted, or the use of different measurement tools to evaluate sexual function.

The symptoms of diabetes-related SD are complicated but generally include conditions such as reduced or absent interest, sexual desire, and arousal, a decrease in lubrication and consequent dyspareunia, and difficulty or inability to achieve orgasm²¹. Although various rates have been reported in the literature, diabetes can impact all stages of female sexual function to varying degrees. In the Turkish study conducted by Doruk et al.⁵, women with diabetes showed significant decreases in sexual desire, arousal, and lubrication compared to the control group. The most frequently affected domains in women with type 1 diabetes were desire (85%), arousal (76%), orgasm (66%), pain (61%), satisfaction (61%), and lubrication (57%). Enzlin et al.⁴ reported SD in the area of desire in 17%, lubrication in 14%, orgasm in 14%, and pain in 12% of women with

type 1 diabetes. In a study by Basson et al.²¹, problems with lubrication were reported by 40.2% of women with type 1 diabetes and 34.0% of controls, while dyspareunia was reported by 31.5 and 26.12%, respectively. In contrast, another study of women with type 1 diabetes showed that diabetes affected arousal, lubrication, satisfaction, orgasm, and pain, but not sexual desire²². Mazzilli et al.²⁰ found that women with type 1 diabetes more frequently reported problems with arousal, lubrication, dyspareunia, and orgasm compared to controls, whereas desire was significantly lower in both type 1 and 2 diabetes compared to the control group. Nowosielski et al.²³ determined that women without diabetes experienced more sexual desire, arousal, and orgasm than women with type 1 diabetes. In our study, mean scores for sexual desire, arousal, and satisfaction were significantly lower in women with type 1 diabetes compared to women without diabetes, while there were no significant differences between the two groups in the areas of orgasm and pain. The discrepancies in these results may be related to many biological, physiological, psychological, cultural, and personal reasons, as well as the impact of women's perception of sexuality.

The frequency of SD was significantly associated with the duration of diabetes, HbA1c level, and BMI in this study ($p < 0.05$). Maiorino³ reported a significant association between HbA1c, BMI and diabetes duration, consistent with our study. Interestingly, Maiorino's study was conducted in a much younger population than our study. Similarly, Abu Ali et al.²⁴ compared women with and without diabetes and determined that the incidence of SD increased with higher BMI and diabetes duration in women with diabetes. Contrary to our findings, in the current systematic review and meta-analysis of Murgel et al., it was determined that there was no relationship between BMI, hirsutism, and SD in women with polycystic ovary syndrome²⁵. Contradictions between the results of the study may be due to the fact that sexuality is complex by nature and is affected by individual characteristics. For example, in the study of Lerner

et al., women with hypoactive sexual desire were found to have predominant depressive and anxious moods. These women avoided perceiving themselves as sexual and tended to negatively evaluate their capacity to have sexual intercourse with their partners²⁶. As a result, since sexuality is multidimensional, it may not be correct to explain the event with a limited number of variables. SD in women with diabetes may be affected by both physiological and psychological factors. In addition, as the time spent with diabetes increases, additional problems caused by diabetes may increase SD.

Study limitations

The results of this study cannot be generalized because it was conducted with individuals who presented to a single hospital within a specific time frame and agreed to participate in the study. In addition, important variables that may affect sexuality such as women's mental states, depression and anxiety, childhood traumas, and erectile dysfunction of women's spouses were not discussed in this study.

CONCLUSION

This study underlined that SD is higher in women affected by type 1 diabetes than in healthy controls. This could be due to the duration of diabetes, HbA1c, and body mass index. However, it may not be correct to explain sexual function only with these variables. Many variables should be considered when evaluating patients with type 1 diabetes in terms of sexual health.

AUTHORS' CONTRIBUTIONS

SC: Conceptualization, Data curation, Writing – original draft, Writing – review & editing. **MDB:** Conceptualization, Data curation, Formal Analysis, Writing – original draft, Writing – review & editing. **MK:** Writing – original draft, Writing – review & editing.

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