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ORIGINAL PAPER

Evaluation of Sexual Function Among Women With or Without Diabetes

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Abstract
This descriptive study was conducted to compare the sexual function among women with and without diabetes. The study was conducted with 30 women with type 1 diabetes, 30 women with type 2 diabetes attending a diabetes policlinic at a university hospital and 30 women without diabetes, between the dates of September 2015 and December 2016. "Patient Information Form" and "The Female Sexual Function Index (FSFI)" were used for data collection. $p < 0.05$ value was accepted as statistically significant. There was a significant difference between the mean scores of desire, arousal, lubrication, orgasm, satisfaction and pain subscales of FSFI in women with type 1 diabetes, type 2 diabetes and without diabetes ($p < 0.05$). As the fasting plasma glucose level of women with type 1 diabetes increased, their sexual desire decreased. Women with type 2 diabetes experienced less arousal, as the duration of their diabetes increased, and they experienced less arousal and orgasm as their glycosylated hemoglobin value increased. As the post-prandial glucose level of women with type 2 diabetes increased, they experienced less arousal, orgasm, satisfaction and more pain in their sexual lives. The study results demonstrated that women with diabetes had more sexual concerns in comparison to women without diabetes, and women with type 2 diabetes had more sexual concerns compared to women with type 1 diabetes. It has been recommended to increase the awareness of nurses about the effects of diabetes on sexual health and assess sexual function of women with diabetes.

Keywords Sexual function · Woman · Type 1 diabetes · Type 2 diabetes · Turkey

Introduction

Diabetes is a metabolic disease that causes serious health problems with macrovascular and microvascular complications, which is prevalent around the whole world [1, 2]. According to the 2015 data of the International Diabetes Federation, there were 415 million individuals diagnosed with diabetes, and it was estimated that this number will

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reach 642 million in 2040 [3]. A study named The Turkish Epidemiology Survey of Diabetes, Hypertension, Obesity and Endocrine Disease (TURDEP-II) conducted by Satman et al. found that diabetes prevalence in Turkey was 13.7%, and 45.4% of the participants had been recently diagnosed, while 54.5% had been diagnosed with diabetes previously [4].

Sexual dysfunction is a problem in both men and women with a prevalence varying between 30 and 50% [5, 6]. It is more prevalent among women [6, 7] and was found approximately 30–78% of women [8]. A study found that the sexual dysfunction among women at the ages between 19 and 49 years was 37.9% [9]. Diabetes is a chronic disease that affects sexual functions too [10]. Especially the duration, medical treatment, age and glycemic control of diabetes are closely related to sexual dysfunction [11]. Sexual dysfunction is also prevalent among women with diabetes, and it's incidence was estimated as 20–80% [8, 11]. This is caused by the vascular and neuropathic problems caused by diabetes among women with diabetes [12]. Women with diabetes experienced sexual function disorders such as deterioration in sexual desire and arousal, and pain during sexual activity which cause stress, disruption of interpersonal relations and decrease in quality of life [8, 11]. In the study conducted by Elyasi et al. [13] sexual dysfunction was determined as 78.7% among women with type 2 diabetes. The most seen problems were lubrication 58%, loss of sexual desire 50%, and arousal 50%. Another study conducted for determining the sexual function states of women with diabetes, sexual dysfunction was found as 69%, and arousal problem was determined as 88.6%, and loss of sexual desire was found as 83.1% [14]. A study, demonstrated that sexual dysfunction among women with diabetes was higher when compared to women without diabetes [15]. In another study, it was determined that 23.4% of the women had a decrease in sexual desire, 23.2% in lubrication, 19.4% in orgasm, 17% in arousal and 17% experienced pain during sexual intercourse in their sexual life after being diagnosed with diabetes [16]. Especially in Turkish culture, sexuality is still a taboo that people usually do not talk about it easily. For this reason, sexuality is usually disregarded by patients and also health care professionals who usually more focus on the physiologic effects of diabetes. Although most of the patients with diabetes experienced problems related with their sexual life, they avoided talking about such concerns unless they were asked. In addition, there is little in the literature comparing the sexuality of women with type 1 diabetes, type 2 diabetes and without diabetes.

Method

Study Aim and Design

The aim of this descriptive study was to determine the effects of diabetes on women sexuality and compare the sexual function of women with and without diabetes.

Location and Date of the Study

The study was conducted in the diabetes policlinic of a university hospital in Edirne between September 2015 and December 2016.

Sample

The sample calculation of the study was made with an effect size of 1.05, confidence interval of 95% and the power of 90% via using GPower 3,1 software. It was calculated that twenty-five participants should be admitted to each group. Thirty participants were included in each group such as 30 women with type 1 diabetes, 30 women with type 2 diabetes which received outpatient treatment at the diabetes policlinic of a university hospital, and 30 women without diabetes who came to the polyclinic as a patient relative and/or who worked at the policlinic.

Study inclusion criteria for patient selection:

- Being over 18 and below 45 years of age.
- Not having gone through menopause.
- Not having any health problem that may lead to any sexual dysfunction other than diabetes.
- Not having any communication problems.
- Volunteering to participate in the study.

Data Collection

The study data were collected with the "Patient Information Form" and "The Female Sexual Function Index (FSFI)" by face to face interviews.

Patient Information Form

The Patient Information Form consisted of sociodemographic (age, duration of marriage, family type, educational status, working status, income status) and disease related [type of diabetes, duration of diabetes diagnosis, fasting plasma glucose (FPG), postprandial glucose and glycosylated hemoglobin (A1C) value, the existence of chronic diseases accompanying diabetes, and the presence of diabetes-related chronic complications] questions. Laboratory results were obtained from patients' medical records taken by hospital registration system.

The Female Sexual Function Index (FSFI)

The Female Sexual Function Index is a questionnaire developed by Rosen et al. to determine women sexual function [17]. In Turkey, validity and reliability of FSFI was made by Aygin and Aslan [18]. They demonstrated that FSFI is an assessment instrument that can be used safely for Turkish women.

The scale was developed as a multidimensional assessment instrument involving six sections and 19 items. In the scale there are six subscales: desire, arousal, lubrication, orgasm, satisfaction, and pain. Each item is scored between zero and five. Level of sexual desire was evaluated in first and second questions (score range 1–5); arousal frequency, arousal level, being sure and satisfaction were evaluated in third–sixth questions (score range 0–5); lubrication frequency or difficulty, frequency and difficulty of sustaining lubrication during intercourse were evaluated in seventh–tenth questions (score range 0–5); orgasm frequency, difficulty and satisfaction were evaluated

in eleventh–thirteenth questions (score range 0–5); satisfaction, rate of being close to spouse, and satisfaction level in sexual intercourse and in whole sexual life were evaluated in fourteenth–sixteenth questions (score range 0–1 and 5); pain or discomfort, and pain level during and after penetration were evaluated in seventeenth–nineteenth questions (score range 0–5). The highest total score to be obtained from the scale is 36.0 and the lowest total score is 2.0. The higher the score on the scale, the greater the sexual functioning of women. As the score increases, the sexual desire, arousal, lubrication, orgasm, satisfaction levels of women increase and the level of pain decreases.

The Cronbach alpha reliability coefficient of the scale was calculated as 0.82. The Cronbach alpha reliability coefficient of the scale was found as 0.96 in this present study.

Ethical Considerations

The Ethics Committee of Trakya University Medical Faculty Hospital approved this study (TUTF-BAEK 2015/137). The permission of Trakya University Health Center for Medical Research and Practice was taken to conduct the study. The permission was taken in order to use the FSFI from the researcher who conducted the scale's Turkish validity and reliability. The explanation was made to the participants who volunteered to participate in the study regarding the aim and application style of the research, and verbal permission was taken.

Data Analysis

The data obtained in the study were analyzed using SPSS (Statistical Package for Social Sciences) for Windows 20.0 programme. Number, percentage, average and standard deviation were used as descriptive statistics for the evaluation of the data. The Chi square analysis was used in the comparison of the individual variables between the groups. The Mann–Whitney U test and independent two sample *t* test were used in the comparison of the continuous quantitative data between two independent groups. The Kruskal–Wallis test and one-way ANOVA test were used in the comparison of continuous quantitative data between more than two independent groups. Pearson's correlation analysis was applied to examine the relationship between the constant variables of the study. $p < 0.05$ value was accepted as statistically significant.

Results

The mean age and duration of marriage of women with type 1 diabetes was 32.83 ± 7.43 years, 9.93 ± 8.84 years respectively; with type 2 diabetes 41.10 ± 5.61 years, 18.47 ± 8.12 years, respectively; and for the women without diabetes was as 35.10 ± 6.05 years, and 11.10 ± 7.11 years respectively (Table 1).

One third (33.3%) of women with type 1 diabetes graduated from primary school, 93.3% had a nuclear family; 60% of women with type 2 diabetes graduated from primary school, 83.3% of them had a nuclear and, 56.7% of women without diabetes had university graduation and 93.3% had a nuclear family (Table 1).

In this study, 60% of women with type 1 diabetes, 63.3% of women with type 2 diabetes were, and 73.3% of women without diabetes were salaried employees. The level of income was found as moderate in 66.7% of women with type 1 diabetes, 80% of women with type 2 diabetes and all women without diabetes (Table 1).

Table 1 Sociodemographic characteristics of women with and without diabetes

Sociodemographic characteristics		Women with diabetes				Women without diabetes		Statistics
		Women with type 1 diabetes (n = 30) X ± SD		Women with type 2 diabetes (n = 30) X ± SD		Women without diabetes (n = 30) X ± SD		
Age (year)		32.83 ± 7.43		41.10 ± 5.61		35.10 ± 6.05		F: 13.311 $p < 0.001$
Duration of marriage (year)		9.93 ± 8.84		18.47 ± 8.12		11.10 ± 7.11		F: 9.903 $p < 0.001$
		n	%	n	%	n	%	
Family type	Nuclear family	28	93.3	25	83.3	28	93.3	χ^2: 2.222 p: 0.389
	Large family	2	6.7	5	16.7	2	6.7	
Educational status	Primary school	10	33.3	18	60	8	26.7	χ^2: 16.392 p: 0.012
	Secondary school	1	3.3	2	6.7	0	0	
	High school	10	33.3	5	16.7	5	16.7	
	University	9	30	5	16.7	17	56.7	
Working status	Housewife	18	60	19	63.3	8	26.7	χ^2: 20.983 p: 0.007
	Retired	1	3.3	1	3.3	0	0	
	Student	0	0	1	3.3	0	0	
	Self-employment	0	0	2	6.7	0	0	
	Salaried employee	11	36.7	7	23.3	22	73.3	
Income	Low	9	30	4	13.3	3	10	χ^2: 5.346 p: 0.254
	Middle	20	66.7	24	80	24	80	
	High	1	3.3	2	6.7	3	10	

χ^2 Chi square test, F one way ANOVA test

The duration of diabetes diagnosis was 12.23 ± 8.02 years for women with type 1 diabetes, and 4.30 ± 3.98 years for women type 2 diabetes. A1C values of participants were found as 8.52 ± 2.07% for women with type 1 diabetes, and 6.63 ± 1.95% for women with type 2 diabetes. Of the women with type 1 diabetes, 23.3% had chronic complications, and 23.3% had diabetic neuropathy; of the women with type 2 diabetes, 63.3% had chronic complications, and 50% had retinopathy (Table 2).

The mean scores of women with or without diabetes obtained from FSFI total and it's subscales were given in Table 3. The sexual desire and arousal levels of women with type 1 diabetes were higher and they felt less pain when compared to women with type 2 diabetes. Women without diabetes experienced more sexual desire, arousal, lubrication, orgasm and satisfaction, and felt less pain when compared to women with type 2 diabetes (Table 3).

While, no significant difference was found between the mean scores of total scale and it's subscales, and the presence of diabetes related chronic complications in women

Table 2 Diabetic characteristics of women with type 1 and type 2 diabetes

Metabolic characteristics	Women with type 1 diabetes (n = 30) X ± SD		Women with type 2 diabetes (n = 30) X ± SD		Statistics
Duration of diabetes diagnosis (year)	12.23 ± 8.02		4.30 ± 3.98		t: 4.854 $p < 0.001$
FPG (mg/dl)	147.57 ± 84.98		148.03 ± 73.28		t: − 0.023 p: 0.982
Post-prandial glucose (mg/dl)	195.90 ± 120.11		216.27 ± 91.65		t: − 0.738 p: 0.463
A1C (%)	8.52 ± 2.07		6.63 ± 1.95		t: 3.078 p: 0.004
Presence of chronic complications	n	%	n	%	Statistics
Chronic complications					
Yes	7	23.3	19	63.3	χ^2: 9.774 p: 0.002
No	23	76.7	11	36.7	
Diabetic retinopathy					
Yes	6	20	15	50	χ^2: 5.934 p: 0.015
No	24	80	15	50	
Diabetic nephropathy					
Yes	2	6.7	2	6.7	χ^2: 0.000 p: 1.000
No	28	93.3	28	93.3	
Diabetic neuropathy					
Yes	7	23.3	12	40	χ^2: 1.926 p: 0.165
No	23	76.7	18	60	
Diabetic feet/foot wounds					
Yes	0	0	3	10	χ^2: 3.158 p: 0.076
No	30	100	27	90	
Amputation					
Yes	0	0	0	0	–
No	30	100	30	100	

t independent two-sample *t* test, χ^2 Chi square test

Table 3 Total mean score and subscales mean scores of FSFI of women with or without diabetes

Total score and subscales of FSFI	Women with diabetes		Women without diabetes	Statistics
	Women with type 1 diabetes (n = 30) X ± SD	Women with type 2 diabetes (n = 30) X ± SD	Women without diabetes (n = 30) X ± SD	
Desire	3.05 ± 0.89[1]	2.43 ± 0.97[2]	2.98 ± 0.71[3]	F: 4.579 *p*: 0.013 [1–2]*p*: 0.021 [2–3]*p*: 0.048
Arousal	3.38 ± 0.86[1]	2.73 ± 0.97[2]	3.57 ± 0.73[3]	F: 7.973 *p*: 0.001 [1–2]*p*: 0.012 [2–3]*p*: 0.001
Lubrication	3.93 ± 1.01[1]	3.40 ± 1.19[2]	4.01 ± 0.70[3]	F: 3378 *p*: 0.039 [2–3]*p*: 0.05
Orgasm	3.69 ± 1.00[1]	3.20 ± 1.02[2]	3.93 ± 0.72[3]	F: 4.919 *p*: 0.009 [2–3]*p*: 0.008
Satisfaction	3.90 ± 0.84[1]	3.50 ± 1.01[2]	4.10 ± 0.63[3]	F: 3.985 *p*: 0.022 [2–3]*p*: 0.018
Pain	4.14 ± 0.88[1]	3.44 ± 1.25[2]	4.24 ± 0.83[3]	F: 5.636 *p*: 0.005 [1–2]*p*: 0.023 [2–3]*p*: 0.008
Total score of FSFI	22.10 ± 4.33[1]	18.70 ± 4.77[2]	22.84 ± 3.20[3]	F: 8.448 *p* < 0.001 [1–2]*p*: 0.006 [2–3]*p*: 0.001

F One way ANOVA test

[1]women with type 1 diabetes

[2]women with type 2 diabetes

[3]women without diabetes

with type 1 diabetes ($p > 0.05$), a significant difference was found in women with type 2 diabetes. In women with type 2 diabetes; those with chronic complications experienced more pain, patients with diabetic nephropathy experienced less orgasm, and those with diabetic neuropathy had less lubrication and experienced more pain ($p < 0.05$) (Table 4).

As the FPG levels of women with type 1 diabetes increased, mean score of desire subscale decreased ($r = -0.457$, $p = 0.011$) (Table 5). As the duration of marriage increased, mean scores of desire, arousal, lubrication and satisfaction subscales of women type 2 diabetes decreased respectively ($r = -0.405$, $p = 0.027$), ($r = -0.379$, $p = 0.039$), ($r = -0.397$, $p = 0.03$), ($r = -0.484$, $p = 0.007$). Among women with type 2 diabetes; as the duration of diabetes diagnosis increased, the mean score of the arousal subscale decreased ($r = -0.389$, $p = 0.034$); as the post-prandial glucose levels increased, the mean scores of the arousal, orgasm, satisfaction and pain subscales decreased respectively ($r = -0.497$, $p = 0.005$), ($r = -0.436$, $p = 0.016$), ($r = -0.504$, $p = 0.005$; $r = -0.375$, $p = 0.041$). Also it was found that as the A1C levels of women

Table 4 Comparison between the presence of diabetic complications among women with type 1 and type 2 diabetes and the subscales of FSFI

	Desire		Arousal		Lubrication		Orgasm		Satisfaction		Pain	
	Type 1 diabetes	Type 2 diabetes	Type 1 diabetes	Type 2 diabetes	Type 1 diabetes	Type 2 diabetes	Type 1 diabetes	Type 2 diabetes	Type 1 diabetes	Type 2 diabetes	Type 1 diabetes	Type 2 diabetes
Chronic complications												
Yes	3.07 ± 0.67	2.29 ± 1.02	3.43 ± 0.67	2.58 ± 1.01	4.07 ± 0.73	3.20 ± 1.18	3.71 ± 1.10	3.09 ± 1.09	3.95 ± 0.45	3.33 ± 1.13	4.10 ± 1.30	3.07 ± 1.27
No	3.04 ± 0.96	2.68 ± 0.87	3.37 ± 0.92	2.98 ± 0.87	3.89 ± 1.09	3.75 ± 1.19	3.68 ± 0.99	3.39 ± 0.89	3.88 ± 0.93	3.79 ± 0.70	4.16 ± 0.75	4.09 ± 0,97
Statistics	U: 80.00 *p*: 0.98	U: 90.00 *p*: 0.52	U: 80.00 *p*: 0.98	U: 80.00 *p*: 0.29	U: 75.00 *p*: 0.79	U: 74.00 *p*: 0.19	U: 73.50 *p*: 0.79	U: 84.00 *p*: 0.37	U: 79.00 *p*: 0.94	U: 84.50 *p*: 0.38	U: 73.00 *p*: 0.71	U: 56.00 *p*: 0.03
Diabetic retinopathy												
Yes	3.08 ± 0.74	2.37 ± 0.99	3.46 ± 0.73	2.60 ± 0.99	3.96 ± 0.73	3.33 ± 1.17	4.00 ± 0.87	3.13 ± 1.05	3.89 ± 0.46	3.47 ± 1.01	3.94 ± 1.36	3.18 ± 1.32
No	3.04 ± 0.94	2.50 ± 0.98	3.36 ± 0.90	2.85 ± 0.96	3.93 ± 1.08	3.47 ± 1.25	3.61 ± 1.03	3.27 ± 1.02	3.90 ± 0.91	3.53 ± 1.05	4.19 ± 0.75	3.71 ± 1.17
Statistics	U: 71.50 *p*: 0.98	U: 111.00 *p*: 0.95	U: 69.50 *p*: 0.90	U: 98.00 *p*: 0.55	U: 70.50 *p*: 0.94	U: 103.00 *p*: 0.69	U: 52.50 *p*: 0.31	U: 101.00 *p*: 0.63	U: 66.00 *p*: 0.75	U: 104.50 *p*: 0.73	U: 69.00 *p*: 0.87	U: 86.50 *p*: 0.27
Diabetic nephropathy												
Yes	2.75 ± 0.35	2.75 ± 0.35	3.00 ± 0.35	1.88 ± 1.24	4.50 ± 0.71	2.75 ± 2.47	4.67 ± 0.00	1.50 ± 0.71	3.50 ± 0.71	4.17 ± 0.24	4.67 ± 0.47	4.50 ± 0.71
No	3.07 ± 0.92	2.41 ± 1.00	3.41 ± 0.88	2.79 ± 0.94	3.89 ± 1.02	3.45 ± 1.13	3.62 ± 1.00	3.32 ± 0.93	3.93 ± 0.85	3.45 ± 1.03	4.11 ± 0.90	3.37 ± 1.26
Statistics	U: 19.00 *p*: 0.44	U: 24.50 *p*: 0.77	U: 20.00 *p*: 0.50	U: 13.50 *p*: 0.23	U: 16.50 *p*: 0.33	U: 23.50 *p*: 0.71	U: 6.00 *p*: 0.07	U: 4.50 *p*: 0.05	U: 16.00 *p*: 0.30	U: 15.00 *p*: 0.27	U: 18.00 *p*: 0.40	U: 11.50 *p*: 0.16
Diabetic neuropathy												
Yes	3.07 ± 0.67	2.17 ± 1.01	3.43 ± 0.67	2.58 ± 0.72	4.07 ± 0.73	2.79 ± 1.12	3.71 ± 1.10	2.97 ± 1.12	3.95 ± 0.45	3.19 ± 1.25	4.10 ± 1.30	2.58 ± 1.16
No	3.04 ± 0.96	2.61 ± 0.93	3.37 ± 0.92	2.82 ± 1.11	3.89 ± 1.09	3.81 ± 1.09	3.68 ± 0.99	3.35 ± 0.94	3.88 ± 0.93	3.70 ± 0.78	4.16 ± 0.75	4.02 ± 0.97
Statistics	U: 80.00 *p*: 0.99	U: 83.50 *p*: 0.29	U: 80.00 *p*: 0.98	U: 84.00 *p*: 0.31	U: 75.00 *p*: 0.79	U: 53.00 *p*: 0.02	U: 73.50 *p*: 0.73	U: 84.00 *p*: 0.30	U: 79.00 0.94	U: 89.50 *p*: 0.42	U: 73.00 *p*: 0.71	U: 43.00 *p*: 0.05
Diabetic feet/foot wounds												
Yes	–	3.00 ± 0.50	–	3.08 ± 0.80	–	3.50 ± 0.66	–	3.78 ± 0.51	–	3.44 ± 0.51	–	2.67 ± 1.15
No		2.37 ± 1.00		2.69 ± 0.99		3.39 ± 1.25		3.14 ± 1.04		3.51 ± 1.06		3.53 ± 1.25
Statistics		U: 25.00 *p*: 0.27		U: 35.00 *p*: 0.70		U: 40.50 *p*: 1.00		U: 26.00 *p*: 0.31		U: 29.00 *p*: 0.41		U: 25.50 *p*: 0.29

U Mann–Whitney U test

with type 2 diabetes increased, the mean scores of the arousal and orgasm subscales decreased respectively ($r = -0.658$, $p = 0.002$; $r = -0.491$, $p = 0.033$) (Table 5).

Discussion

Microvascular complications emerge as a result of the thickening and damages that occur in the capillary membrane because of hyperglycaemia [19, 20]. Retinopathy, which is prevalent among microvascular complications is the most important factor that leads to blindness in adult patients with diabetes [21, 22]. Diabetic retinopathy is observed in 60% of all patients with type 1 diabetes and 60% of patients with type 2 diabetes 20 years after being diagnosed with diabetes [22, 23]. In this study, the presence of diabetic retinopathy was determined as 20% of women with type 1 diabetes, and in 50% of women with type 2 diabetes. Other studies also demonstrated that retinopathy was the most seen diabetes complication in different populations [12, 24–26]. Nowosielski and Plinta [27] determined retinopathy in 36.1% of women with type 1 diabetes and 26.3% of women with type 2 diabetes. This present study found no significant relationship between retinopathy and sexual function of women with diabetes. Similar to this finding, Durgun [28] also reported that there was no significant difference between the sexual functions of women who had type 2 diabetes with and without retinopathy. However, a study carried out by Abu Ali et al. [8] on the sexual functions of women with diabetes living in Jordan, found that retinopathy affected the sexual functions of women negatively. In addition, Vafaeimanesh et al. [29] determined a significant difference between retinopathy and sexual dysfunction, but reported no association between diabetic neuropathy and sexual dysfunctions among women with type 2 diabetes.

Diabetic neuropathy is a nerve system damage caused when the glycemic control could not be taken under control. It is a complication that causes sexual dysfunction most in individuals with diabetes [19, 23]. Neuropathy decreases sexual desire, causes prolongation of stimulation levels and painful sexual contact in women [20, 30, 31]. In this study, diabetic neuropathy was determined in 23.3% of women with type 1 diabetes and 40% of women with type 2 diabetes.

Nowosielski and Plinta [27] reported neuropathy in 25.7% of women with type 1 diabetes. In the study carried out by Demirci et al. [32] neuropathy was determined as 92.3% of the patients with type 2 diabetes. Another study conducted in Iran found that 57.3% of the patients aged between 40 and 44, with type 2 diabetes had diabetic neuropathy [13]. In present study, while women with type 1 diabetes did not experience sexual problems due to neuropathy, women with type 2 diabetes experienced sexual problems related with neuropathy. This may be due to the younger age of women with type 1 diabetes. Also women with type 2 diabetes had less lubrication and more pain during sexual intercourse when compared to women with type 1 diabetes. Similar to this result, Topcu [33] determined the presence of neuropathy in 41.8% of women with type 2 diabetes and found that the prevalence of sexual function disorder was higher among women with neuropathy. Another study carried out by Durgun [28], a significant difference was found between women with and without neuropathy in terms of arousal, lubrication and sexual satisfaction.

In this study, women with type 2 diabetes had lower FSFI total mean scores compared to women with type 1 diabetes and without diabetes. In the study carried out by Dilek [34], the mean FSFI scores of women with type 1 diabetes were higher than the women with type 2 diabetes. Topcu [33] reported that sexual dysfunction occurs in the areas of

Table 5 Comparison between some individual variables of women with and without diabetes and the subscales of FSFI

Some individual variables		Desire			Arousal			Lubrication		
		Women with diabetes		Women without diabetes	Women with diabetes		Women without diabetes	Women with diabetes		Women without diabetes
		Type 1 diabetes (n = 30)	Type 2 diabetes (n = 30)	Without diabetes (n = 30)	Type 1 diabetes (n = 30)	Type 2 diabetes (n = 30)	Without diabetes (n = 30)	Type 1 diabetes (n = 30)	Type 2 diabetes (n = 30)	Without diabetes (n = 30)
Age (year)	r_p	0.084	−0.356	0.080	−0.076	−0.350	−0.031	0.034	−0.328	−0.335
	p	0.658	0.053	0.673	0.689	0.058	0.872	0.858	0.077	0.071
Duration of marriage (year)	r_p	0.064	−0.405	−0.034	−0.140	−0.379	−0.145	−0.052	−0.397	−0.301
	p	0.738	0.027	0.860	0.461	0.039	0.444	0.785	0.030	0.106
Duration of diabetes diagnosis (year)	r_p	0.184	−0.004	–	0.343	−0.389	–	−0.071	−0.039	–
	p	0.332	0.985		0.064	0.034		0.711	0.839	
FPG (mg/dl)	r_p	−0.457	−0.134	–	−0.335	−0.340	–	−0.324	−0.135	–
	p	0.011	0.481		0.070	0.066		0.081	0.477	
Post-prandial glucose (mg/dl)	r_p	−0.094	−0.274	–	−0.158	−0.497	–	−0.337	−0.245	–
	p	0.621	0.143		0.406	0.005		0.069	0.191	
A1C (%)	r_p	−0.313	−0.445	–	−0.330	−0.658	–	−0.121	−0.161	–
	p	0.127	0.056		0.107	0.002		0.565	0.510	

Table 5 (continued)

Some individual variables		Orgasm			Satisfaction			Pain		
		Women with diabetes		Women without diabetes	Women with diabetes		Women without diabetes	Women with diabetes		Women without diabetes
		Type 1 diabetes (n = 30)	Type 2 diabetes (n = 30)	Without diabetes (n = 30)	Type 1 diabetes (n = 30)	Type 2 diabetes (n = 30)	Without diabetes (n = 30)	Type 1 diabetes (n = 30)	Type 2 diabetes (n = 30)	Without diabetes (n = 30)
Age (year)	r_p	−0.102	−0.211	−0.187	−0.012	−0.346	−0.276	−0.178	−0.077	−0.037
	p	0.593	0.262	0.322	0.950	0.061	0.140	0.346	0.687	0.845
Duration of marriage (year)	r_p	−0.047	−0.237	−0.247	−0.118	−0.484	−0.333	−0.258	−0.269	0.076
	p	0.806	0.206	0.189	0.536	0.007	0.072	0.168	0.150	0.690
Duration of diabetes diagnosis (year)	r_p	0.330	−0.120	–	0.252	−0.176	–	−0.083	0.156	–
	p	0.075	0.526		0.178	0.352		0.663	0.409	
FPG (mg/dl)	r_p	−0.322	−0.266	–	−0.218	−0.308	–	−0.411	−0.279	–
	p	0.082	0.155		0.247	0.098		0.024	0.135	
Post-prandial glucose (mg/dl)	r_p	−0.165	−0.436	–	−0.077	−0.504	–	−0.242	−0.375	–
	p	0.383	0.016		0.686	0.005		0.198	0.041	
A1C (%)	r_p	−0.223	−0.491	–	−0.019	−0.360	–	−0.011	0.047	–
	p	0.284	0.033		0.928	0.130		0.957	0.849	

r_p Pearson correlation analysis

sexual desire, arousal and lubrication while investigating the sexual functions of women with type 2 diabetes. Elyasi et al. [13] determined that approximately 80% of the women with type 2 diabetes had sexual dysfunction problem. Vafaeimanesh et al. [29] stated that half of women with type 2 diabetes had sexual dysfunctions. Bal et al. [15] found that women with type 2 diabetes had more problems in their sexual functions when compared to those without diabetes. In the same study, the most frequent problem was reported as the decrease in sexual desire, while lubrication problem was less frequent [15]. Durgun [28] reported that 55.9% of women with type 2 diabetes had sexual dysfunction; 60.2% of the women had sexual desire problems, 58.1% had sexual satisfaction problems, 55.9% had lubrication problems, 54.8% had pain, 52.7% had arousal problems, and 51.6% had orgasm disorders [28]. Aksoy [14] stated in his study that women with type 1 diabetes had more sexual dysfunctions than women with type 2 diabetes.

This study found that the sexual desire, arousal, lubrication and sexual satisfaction of the women with type 2 diabetes decreased as their duration of marriage increased. Altin [35] stated that there is a statistically significant difference between the average score of desire and pain subscales of FSFI of women with diabetes according to their duration of marriage, whereas Aksoy [14] did not determine a significant difference between the durations of marriage and sexual functions of women.

In this study, women without diabetes had more desire, arousal, lubrication, orgasm and sexual satisfaction in their sexual life and had less pain during sexual intercourse when compared to women with type 2 diabetes. Similar to this finding, another study found that women without diabetes had more desire, arousal, lubrication, orgasm and satisfaction in their sexual life and felt less pain during sexual intercourse when compared to women with type 2 diabetes [36]. Wallner et al. [37] found that women with type 1 diabetes had more pain during sexual intercourse when compared to women without diabetes, while women with type 2 diabetes had less orgasm than women without diabetes. Ozturk [38] stated that women without diabetes had more lubrication and orgasm during sexual intercourse when compared to women with type 2 diabetes.

This present study determined that women with type 1 diabetes experienced higher desire and arousal and felt less pain in their sexual lives when compared to women with type 2 diabetes. Similar results were obtained in the study done by Nowosielski and Plinta [27]. Mazzili et al. [39] reported that women with type 1 diabetes had less desire, arousal, lubrication and orgasm and felt more pain in their sexual lives when compared to women without diabetes. Moreover, women with type 2 diabetes felt less sexual desire when compared to women without diabetes [39].

The sexual arousal levels of women with type 2 diabetes decreased as their duration of diabetes diagnosis increased. The study results of Fatemi and Taghavi [40] and Abu Ali et al. [8] demonstrated that sexual functions of women with type 2 diabetes were negatively affected as their duration of diabetes diagnosis increased. Altin [35] reported statistically significant difference between the mean scores of desire, lubrication, orgasm and pain subscales of FSFI and the duration of diabetes diagnosis, whereas some studies reported no significant difference between the sexual function and diabetes duration of women with diabetes [13, 14, 34, 41].

This study demonstrated that the arousal levels of women with type 2 diabetes decreased as their A1C values increased, and they experienced less orgasm. In addition, Bal et al. [15] determined that sexual function problems were more prevalent as A1C values increased in women with type 2 diabetes compared to women without diabetes, whereas Wang et al. [41], Aksoy [14] and Durgun [28] reported that no significant difference between the A1C values and sexual functions of women with type 2 diabetes.

Limitations

The study was conducted in a university hospital in Edirne, Turkey. Thus the results could not be generalized to other women with or without diabetes. Few studies in the area of sexuality of women with type 1 diabetes were available in the literature was another limitation.

Conclusions and Recommendations

Diabetes is one of the chronic diseases that may lead to sexual dysfunction. This current study also found that diabetes had negative effects on sexual functions. Women with diabetes had more sexual concerns than women without diabetes, and women with type 2 diabetes had more sexual concerns than women with type 1 diabetes.

As health care professionals, nurses and physicians should increase their awareness of the effects of diabetes on sexual health, and make regular assessments about sexual health of women with diabetes in routine visits. Furthermore, curricula that explain the effects of diabetes on female sexuality should be prepared, and more studies should be conducted that investigate the sexual health of women with diabetes.

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