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Sexual Dysfunction in Male Patients with Prediabetes

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ABSTRACT

To investigate sexual dysfunction in male patients with prediabetes using the Golombok Rust Scale of Sexual Satisfaction (GRISS) and to analyze the relationship between sexual dysfunction and age, waist circumference, body mass index (BMI), alcohol, education and smoking.

The study included 30 male patients aged 18-65 with prediabetes and 27 male controls without any known disease. The GRISS questionnaire was used to determine sexual dysfunction. Insulin resistance levels were calculated using the participants' Homeostatic Model Assessment for Insulin Resistance (HOMA-IR) index.

Among all participants (n:57), the number of those with sexual dysfunction according to the survey was 54 (94.7%). 28 of them were in the prediabetic group (93.3%) and 26 were in the control group (96.3%). According to the subunit evaluation of the questionnaire, satisfaction and frequency subunits were found to be significantly higher in prediabetic cases compared to the control group (p:0.001, p:0.002, respectively). In prediabetic participants, a statistically significant positive correlation was found between age and the total score of the Sexual Satisfaction Scale, and the standard scores of the non-sensuality, frequency and non-communication subunits. In prediabetics, a statistically significant positive correlation was found between fasting blood glucose and the standard scores of the Sexual Satisfaction Scale indicating premature ejaculation and satisfaction subunit disorders, and between triglyceride levels and the standard scores of the Sexual Satisfaction Scale indicating satisfaction and frequency subunit disorders.

Although the frequency of sexual dysfunctions in prediabetic male patients increased, no significant difference was found between them in the general query when compared to the control group. A significant difference was found only in the frequency and satisfaction subgroups of the sexual dysfunction subgroups of the prediabetic group and the control group. It was found that these were negatively affected by the increased triglyceride levels. A relationship was also found between the increase in fasting blood sugar and premature ejaculation and lack of satisfaction. Treatment of prediabetes can improve sexual functions, especially satisfaction and frequency.

Keywords: Sexual Dysfunctions, Male, Prediabetes

Introduction

Prediabetes is defined by the American Diabetes Association as elevated blood glucose (fasting plasma glucose 100–125 mg/dl and/or 2-hour plasma glucose 140–199 mg/dl after an oral glucose challenge, and/or hemoglobin A1C 5.7–6.4%) (1). Prediabetes prevalence is reported as 6-38% depending on the diagnostic test and criteria used (2). It is estimated that 213,000 young adults in the United States had prediabetes in 2017 and that this number will increase to 239,000 by 2060, based on current growth rates (3). The prevalence of prediabetes has been increasing rapidly over the years in Turkey (4). Sexual dysfunction is also a very common problem in society and is associated with impaired quality of life (5). The importance of both prediabetes and sexual health problems for society is known.

When it comes to sexual dysfunction in men, the first thing that comes to mind is erectile dysfunction, but there may be other symptoms in the background. Erectile dysfunction (ED) is the most important cause of sexual dysfunction in men (6). It is estimated that by 2025, 322 million men worldwide will have varying degrees of ED (7). ED is a disorder that may result from organic factors, psychological factors, or a combination of these, including neurological, vascular, and hormonal abnormalities (6,8). In addition to well-known causes such as diabetes mellitus and hypertension, prediabetic lifestyle (obesity, lack of physical exercise) and lower urinary tract problems are also thought to be associated with the development of ED (9).

The aim of the study was to investigate the frequency of sexual dysfunction in male patients with prediabetes and its relationship with age, waist circumference, body mass index (BMI),

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insulin resistance, fasting/postprandial blood sugar, triglyceride level, and smoking.

Material and Methods

The study was conducted with a total of 57 men aged 18-65 who applied to the Endocrinology and Diabetes Polyclinic at Van Yuzuncu Yil University Faculty of Medicine between December 2019 and April 2020. All sexually active patients were divided into two groups: prediabetic and control groups. 30 male patients diagnosed with prediabetes and 27 males without any known disease were included in the study.

All participants' age, weight, height, BMI (body mass index), waist circumference, education status, smoking and/or alcohol use were recorded. No additional tests were requested within the scope of the study. Patients' fasting blood glucose (FBG), postprandial blood glucose (PBG), HbA1c (Hemoglobin A1c), ALT (Alanine aminotransferase), creatinine, TSH, (Thyroid stimulating hormone), LDL (Low density lipoprotein), HDL (High density lipoprotein), triglyceride, insulin test results were evaluated retrospectively through our hospital's electronic patient record system. Those with FBG100-125 mg/dl and oral glucose tolerance test 2nd hour blood glucose (OGTT-2) <140 mg/dl were defined as Impaired Fasting Glucose (IFG), those with FBG <100 mg/dl and OGTT-2: 140-199 mg/dl were defined as Impaired Glucose Tolerance (IGT), and those with both FBG: 100-125 mg/dl and OGTT-2: 140-199 mg/dl were defined as IFG+IGT (17). Those with IFG or IGT, or in cases where these two were present together (IFG+IGT) or HBA1c values between 5.7–6.4% (39–47 mmol/mol) were evaluated as prediabetes (10).

The BMI values of the participants in the study were calculated with the formula weight (kg) / height² (m^2). Those with BMI values between 18.5-24.9 kg/m^2 were considered normal, those with 25-29.9 kg/m^2 were considered overweight, and those over 30 kg/m^2 were considered obese. The participants' HOMA-IR indexes (Homeostatic Model Assessment for Insulin Resistance) were calculated with the formula fasting blood glucose (mg/dl) x fasting insulin (μu/ml) / 405. HOMA-IR index values of 2.49 and above were considered insulin resistance (11).

All patients included in the study were informed about the study, and informed consent forms were obtained from all of them. The Golombok Rust Sexual Satisfaction Inventory (GRISS) questionnaire, which has been proven to be sensitive and reliable in previous studies, was applied to the participants (12,13). The GRISS questionnaire questions the quality of sexual intercourse and sexual dysfunctions. These questionnaire forms were given to the patients, filled out by the patients and returned to us, and confidentiality was taken as the basis for all these procedures.

The total score is obtained by summing the scores of the 28 questions in the GRISS questionnaire. In our study, the raw scores obtained were converted into standard scores and evaluated. High scores indicate deterioration in sexual functions and the quality of the relationship. In our study, both the total and the scores obtained from the subheadings were used in the evaluation of the questionnaire. Scores of 5 and above indicate a problem in that subheading.

The analysis of the obtained data was done using the IBM SPSS Statistics 22 program. $P < 0.05$ was accepted as the statistical significance limit.

Results

Participants were 57 men in total, 30 (52.6%) of whom were prediabetic and 27 (47.4%) were healthy controls. There was no significant difference in age between the two groups (p:0.09). The median age was 51 in the prediabetic group and 41 in the control group. The youngest and oldest participants were 24 and 64 in the prediabetic group and 31 and 62 in the control group, respectively.

None of the participants were drinking alcohol. Only 10 (17.5%) patients in all patient groups were smoking. 6 of them were prediabetic and 4 were in the control group. No statistically significant difference was found between the two groups in terms of smoking status (p:0.607).

In the correlation analysis, a positive statistically significant relationship was found between the age of prediabetic individuals and the total of the Sexual Satisfaction Scale (SSS), and the subunit standard scores (SS) indicating non-sensuality, frequency and non-communication (p:0.010, r:0.460; p:0.010, r.0.463; p:0.018, r:0.429; p:0.013, r:0.450).

When all groups were classified according to BMI values; 13 (22.8%) of the patients were considered normal weight, 28 (49.1%) were overweight, and 16 (28.1%) were obese. According to BMI values, 3 (10%) of the prediabetic patients were normal weight, 13 (43.3%) were overweight, and 14 (46.7%) were

Table 1: Statistical Comparison of Demographic and Laboratory Characteristics of the Groups with the Mann-Whitney U Test (Values are Reported as Median (min-max)

	Prediabetic(n=30)	Control(n=27)	P Value
Age(year)	51(22-64)	41(31-62)	0.090
Height(cm)	170(155-183)	173(162-184)	0.130
Weight (kg)	85.5(67-104)	77(62-120)	0.460
BMI(kg/m²)	29.4(23.5-37.2)	26.3(20.5-38.3)	0.002
Waist Cir.(cm)	102(88-120)	96(82-120)	0.005
FBG*(mg/dl)	97.5(81-119)	88(74-99)	0.000
PBG**(mg/dl)	108(65-157)	N/A	N/A
HbA1c(%)	5.9(5.7-6,4)	5.4(4.9-5.6)	0.000
Insulin(IU/ml)	9.1(2.6-24)	7.3(3.3-13.1)	0.014
HOMA-IR	2.1(0.5-6.1)	1.5(0.7-2.5)	0.001
ALT(U/l)	33(15-162)	26(17-95)	0.179
TSH(μIU/ml)	1.3(0.3-5.2)	1.7(0.5-3.2)	0.472
LDL(mg/dl)	123(31-229)	110(77-172)	0.146
HDL(mg/dl)	37.5(27-67)	37.9(29-54)	0.581
Triglycerid(mg/dl)	169.5(82-499)	146(59-483)	0.310
Creatinine (mg/dl)	0.94(0.67-1.2)	0.8(0.6-1.1)	0.025

*Fasting Blood Glucose **Postprandial Glucose

Table 2: Distribution of Patients with Problems According to SSS Standard Scoring into Prediabetic and Control Groups (Mann-Whitney U test)

	Prediabetic	Control	Total	P Value
SSS* Total SS**	28(%93.3)	26(%96.3)	54(94.7)	0.617
SSS Impotence SS	28(%93.3)	22(%81.5)	50(%87.7)	0.173
SSS Premature Ejac. SS	26(%86.7)	25(%92.6)	51(%89.5)	0.467
SSS Sensuality SS	25(%83.3)	25(%92.6)	50(%87.7)	0.218
SSS Avoidance SS	21(%70)	15(%55.6)	36(%63.2)	0.259
SSS Satisfaction SS	16(%53.3)	3(%11.1)	19(%33.3)	0.001
SSS Frequency SS	20(%66.7)	7(%25.9)	27(%47.4)	0.002
SSS Communication SS	25(%83.3)	20(%74.1)	45(%78,9)	0.392

* Sexual Satisfaction Scale ** Standard Score

obese. As a result of BMI evaluation, 10 (37%) of those in the control group were normal weight, 15 (55.6%) were overweight, and 2 (7.4%) were obese. The remaining demographic data and blood biochemistry analysis data of the patients included in the study are given in Table 1.

When the height and body weight averages of the two groups were compared, no significant difference was found (p:0.130 and p:0.460, respectively). However, a significant difference was found in BMI values between the groups (p:0.002). In the prediabetic group analysis, there was no significant correlation between BMI and SSS total and subunits.

Median waist circumference was 102 cm in prediabetics and 96 cm in the control group. When waist circumference was compared between the two groups, a significant difference was found (p=0.005). A positive statistically significant relationship was found in the correlation analysis between the waist circumference of prediabetic individuals and the standard score indicating SSS non-communication disorder (p:0.049, r:0.362).

The ABG and HbA1c values of the prediabetic group were significantly higher compared to the control group (p:0.000, p:0.000, respectively). In the correlation analysis between the FBG and SSS standard scores indicating premature ejaculation and satisfaction disorders in the prediabetic group, a positive statistically significant relationship was found (p:0.042, r:0.373; p:0.013, r:0.447). A positive statistically significant relationship was found between the PPG and SSS communication standard scores of prediabetic individuals (p:0.018, r:0.436). However, no significant relationship was found between HbA1C and SSS total and subunit correlation analysis in prediabetics.

In the prediabetic group, insulin and HOMA-IR index were significantly higher than the control group (p:0.014, p:0.001, respectively). There was

no significant correlation between insulin levels, HOMA-IR values and CDS total and subunits of prediabetic individuals.

When ALT, TSH, LDL, HDL and triglyceride levels were compared between the prediabetic and control groups, no significant difference was found (p:0.179, p:0.472, p:0.146, p:0.581, p:0.310). A positive statistically significant relationship was found in the correlation analysis between the TG levels of prediabetic individuals and the standard scores indicating SSS satisfaction and frequency subunit disorders (p:0.001, r:0.595; p:0.012, r:0.452).

According to the SSS Standardized scores, patients with scores below 5 were evaluated as normal. According to the SSS, 28 (93.3%) of the prediabetic group and 26 (96.3%) of the control group were determined as problematic. No significant difference was found between the groups in terms of the SSS total standardized score (p:0.617). The comparison of the number of patients with scores of 5 and above according to the SSS standardized scoring for all patients and groups is shown in Table 2.

According to the SSS impotence standardized score, 28 (93.3%) of the prediabetic patients and 22 (81.5%) of the control group were found to be dysfunctional. According to the SSS premature ejaculation standardized score, 26 (86.7%) of the prediabetic patients and 25 (92.6%) of the control group were found to be dysfunctional. When the prediabetic and control groups were compared, no significant difference was found between the groups in terms of SSS impotence standardized score and premature ejaculation standardized score (respectively; p:0.173, p:0.467). No significant difference was found between the groups in terms of SSS sensuality standardized score, avoidance standardized score and communication standardized score (respectively; p:0.218, p:0.259, p:0.392).

According to the SSS standardized satisfaction score, 16 (53.3%) of the prediabetics and 3 (11.1%) of the control group were found to be dysfunctional. When the two groups were compared, a significant difference was found in the SSS standardized satisfaction score, to the detriment of the prediabetics (p: 0.001).

According to the SSS frequency standardized score, 20 (66.7%) of the prediabetic group and 7 (25.9%) of the control group were found to be dysfunctional. When the two groups were compared, a significant difference was found in the SSS frequency standardized score, to the detriment of the prediabetic group (p:0.002).

Discussion

The most important cause of sexual dysfunction in men is erectile dysfunction (ED) (6). In studies conducted in different countries on the prevalence of ED, the prevalence of ED has been reported as at least 28.3% and at most 53.9% (14,15,16). In the study conducted by the Turkey ED Prevalence Study Group formed by Akkus et al. in 2002, the prevalence of ED was found to be 69.2%, of which 33.2% had mild ED, 27.5% had moderate ED, and 8.5% had complete ED (17). In this study, we found a much higher rate of ED in our healthy control group compared to the studies mentioned above (81.5%). When compared with the study of Akkuş and his group, our study can be interpreted as an increase in the frequency of ED in the society.

In studies conducted using IIEF-15 (International Index of Erectile Function) and SHIM (Sexual Health Inventory for Men) in patients with diabetes mellitus (DM), the prevalence of ED was found to be between 33-75% (18). In the study conducted by Sargın et al. on 304 patients with type 2 diabetes, the prevalence of ED was found to be 62.5% (19). In a study conducted by Yamasaki et al. in Japan, the prevalence of ED was found to be 66% in 82 patients with Type 2 diabetes and 20% in 25 healthy subjects taken as a control group (20). In a study conducted by Al-Hunayan et al. in Kuwait on 323 newly diagnosed Type 2 DM patients, the prevalence of ED was found to be 31%. In this study, which did not have a control group, a significant relationship was found between BMI and smoking status of the patients and erectile dysfunction (21). In our study, we did not observe a correlation between BMI and any sexual dysfunction subgroup in the prediabetic patient group. Although some studies found the relationship between smoking habits and ED to be statistically significant, some other studies did not find this relationship to be statistically significant (15,17,19,21,22). In our study, smoking rates were similar between the groups. Therefore, no comment could be made on the relationship between smoking and ED.

There is no study yet on prediabetes patients using the Golombok-Rust Sexual Satisfaction Scale (GRISS). However, there are studies in the literature using GRISS with diabetic patients. In a comprehensive study conducted on diabetic patients, the rate of sexual dysfunction was found

to be 69.3%. In our study, this rate was found to be 93.3%, with the patient group being prediabetes. In the same study, the subgroups evaluated as problematic in order of frequency were listed as frequency, sensuality, satisfaction, non-communication, impotence, premature ejaculation and avoidance (23). In our study, we determined the frequency order of the subgroups evaluated as problematic as impotence, premature ejaculation, sensuality, non-communication, avoidance, frequency and satisfaction.

Prediabetes is thought to be associated with erectile dysfunction (ED) as well as increasing the risk of diabetes and cardiovascular disease (CVD). This has been explained by metabolic syndrome (MS) and obesity leading to a decrease in testosterone levels. The relationship between hypogonadism and MS has also been described in patients with ED in various studies (24,25,26). The fact that ED patients are commonly included in the CVD risk group suggests that abnormalities in the penile arterial vasodilator system play an important role in the pathophysiology of ED (5). In this study, although not significant, the ED rate was found to be higher (93.3%) in the prediabetes group than in the healthy control group, as expected. We also found a positive correlation between increased waist circumference, which is a marker of metabolic syndrome, and the communication subunit of the Sexual Satisfaction Scale (SSS), and high triglyceride levels and the satisfaction and frequency subunits of the SSS.

In a study conducted by Kalter et al. from Israel on hypertensive patiens; a statistically significant relationship was found between dyslipidemia and ED (27). In a study conducted by Yamasaki et al. from Japan on ischemic heart patients; a significant relationship was found between ischemic heart disease and ED, but no significant relationship was found between dyslipidemia and ED (20). Again, ın China, Bai et al. found a statistically significant relationship between dyslipidemia and ED in individuals with cardiovascular disese (22). In a study conducted by Ponholzer et al. in Austria, a statistically significant relationship was found between dyslipidemia and ED in hypertensive patients (28). In our study, lipid parameters were found to be similar in the comparison between the study and control groups. However, we also found a positive correlation between high triglyceride levels and SSS satisfaction and frequency subunits in the prediabetes group, supporting the aforementioned studies. This result is quite remarkable when compared to the aforementioned studies, as our study group has not yet encountered the devastating consequences of insulin resistance such as hypertension and coronary artery disease.

In our study, we did not find any significant statistical difference in total GRISS scores between prediabetic men and the control group. In the analysis of the subgroups of the scale, we found that there was a statistically significant problem in the frequency and satisfaction subgroups in prediabetics. However, we did not find any significant differences in the premature ejaculation, impotence, avoidance, sensuality and non-communication subgroups. There are a limited number of studies evaluating sexual functions in prediabetic men. In these studies, the most common sexual dysfunction in prediabetic male patients was determined to be ED (29,30,31). In our study, no significant difference was found between the control group and prediabetic patients in terms of ED, but the most common problem in the prediabetic group was ED.

According to the literature, the second most common sexual dysfunction in male patients is premature ejaculation. The relationship between DM or impaired fasting glucose and premature ejaculation has not been clearly established (32). In our study, premature ejaculation was the second most common problem in all groups and no significant difference was found between the groups. Limited studies have reported that the subgroups of prediabetes, such as IFG and IGT, may also negatively affect male sexual life (8). In addition, in one study, the presence of IFG was associated with a high risk for severe impotence and overt hypogonadism in male patients with sexual dysfunction (30). In our study, we also found a positive statistically significant relationship between fasting blood glucose (FBG) and premature ejaculation and satisfaction disorders in the prediabetic group. The same relationship was also observed between postprandial blood glucose (PBG) and non-communication in the SSS.

Our study is one of the few studies investigating sexual dysfunction in prediabetic men. However, the relatively small number of cases is a limitation of our study. More comprehensive studies on the subject are needed in the prediabetic population.

In conclusion, various sexual dysfunctions were frequently observed in prediabetic male patients in our study. A significant difference was found between the groups in the frequency and satisfaction subgroups of sexual dysfunction, being higher in prediabetics. In same group; positive correlation was found between FPG and

premature ejaculation and satisfaction subgroup SSS standard score, between PPG and non-communication subgroup SSS standard score, and between TG level and frequency subgroup SSS standard score.

As a result of the detailed examination, a positive statistically significant relationship was found between age and total SSS standard score (SP), sensuality, frequency, non-communication subgroup SSS standard score and between waist circumference and non-communication subgroup SSS standard score in the prediabetic group.

Our study has shown that insulin resistance affects the reproductive system before it becomes apparent through any disease such as hypertension and coronary artery disease.

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