

## Original Paper

# Gestational Diabetes as a Predictor of Sexual Dysfunction in Pregnant Women



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## ABSTRACT

**Introduction:** Pregnancy is associated with changes in sexual function and perhaps many more sexual problems when accompanied by particular disorders such as gestational diabetes.

**Objective:** The present study was conducted to investigate factors associated with sexual functions in women with gestational diabetes.

**Materials and Methods:** The present analytical, cross-sectional study was conducted on 300 women with gestational diabetes (150) and low-risk pregnant women (150) attending clinics affiliated to Mazandaran University of Medical Sciences in the north of Iran in 2019. A multistage cluster random sampling method was used, and samples were selected by convenience sampling method. The study data were collected using a demographic and obstetrics questionnaire, female sexual distress scale-revised, prenatal distress questionnaire, world health organization quality of life questionnaire, depression, anxiety, stress questionnaire, and a female sexual function index. Data analysis was done by descriptive statistics indicators, the Chi-square test, t-test, and multivariate linear regression.

**Results:** The frequency of sexual dysfunction was 87.3% in women with gestational diabetes and 34.67% in low-risk pregnant women. Compared to women with low-risk-pregnancy, women with gestational diabetes reported lower sexual function scores ( $P=0.001$ ). Women with gestational diabetes experience lower quality of life ( $P<0.05$ ) than low-risk pregnant women. Besides, women with gestational diabetes experience higher levels of stress ( $P=0.001$ ), more prenatal concerns ( $P=0.014$ ), and higher sexual distress ( $P<0.05$ ). The linear regression test showed that gestational diabetes in pregnant women predicts a significant reduction in sexual desire ( $\beta=-0.599$ ;  $P=0.001$ ).

**Conclusion:** Gestational diabetes predicts a significant reduction in sexual function during pregnancy due to the physical and psychological effects of gestational diabetes. Thus, it is recommended that pregnant women with gestational diabetes should be trained and counseled about gestational diabetes control and sexual function.

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## Highlights

- Gestational diabetes is an increasing health problem throughout the world and one of the most common pregnancy complications.
- Women with gestational diabetes experience a lower quality of life than low-risk pregnant women because of their poorer physical health and mental health.
- Gestational diabetes has a negative and significant relationship with sexual function and reduces pregnant women's sexual function scores.
- The sexual function of women with gestational diabetes decreases due to low quality of life and increased stress and anxiety during pregnancy. Therefore, counseling for both gestational diabetes control and sexual function is essential.

## Plain Language Summary

The present study was conducted to investigate factors associated with sexual function in women with gestational diabetes. Changes in sexual function accompany pregnancy, and probably an increasing number of sexual problems accompany particular disorders such as gestational diabetes. Previous studies have shown contradictory results about the sexual function of women with gestational diabetes. Some have reported its reduction, and some reported no change. In the present study, it was decided to assess and compare women with gestational diabetes and low-risk pregnant women in terms of sexual function and related factors, and then examine the related factors with sexual function in patients with gestational diabetes, taking into account pregnancy as a possible independent factor. The results showed that compared to low-risk pregnant women, women with gestational diabetes reported lower sexual function scores. Gestational diabetes predicts a significant reduction in sexual desire during pregnancy. Besides, women with gestational diabetes experience higher stress levels, more prenatal concerns, and higher sexual distress. Thus, it is recommended that pregnant women with gestational diabetes should be trained and counseled about diabetes control and sexual function.

## Introduction

Sexual function is regarded as a part of women's health and a major part of life, a multidimensional phenomenon affected by psychological, biological, and interpersonal factors [1]. During pregnancy, sexual activity is affected by physical, psychological, and emotional changes and wrong beliefs and thoughts. Sexual issues are more affected when pregnancy becomes a high-risk pregnancy, which can be regarded as the cause of reduced quality of sexual life. Besides, sex life is put on hold when pregnancy is highly risky [2]. Changes in sexual function accompany pregnancy and probably increasing the number of sexual problems when accompanied by particular disorders such as gestational diabetes [3].

Gestational diabetes is defined as glucose intolerance during pregnancy [4] and increasing health problem throughout the world, and one of the most common pregnancy complications. In recent decades in some countries, including developing countries, the preva-

lence of gestational diabetes has risen by more than 30% and has become a global epidemic [5]. The prevalence of gestational diabetes in different Iran regions varies from 0.7% to 18.6%, and its average prevalence is 4.9%. Also, the prevalence of gestational diabetes in the center of Mazandaran Province is 10% [6].

The treatments of diabetes, such as insulin administration and dietary restrictions, are problematic in the patients' daily lives and reduce their quality of life [7]. Women with medical problems during pregnancy have reported significantly higher levels of depression symptoms and anxiety compared to women without complications [8]. Concerns about sex life increase when pregnancy is at risk. Illness during pregnancy leads to changes not only in women's bodily functions and structure but also in the body image, self-esteem, roles, and relationships. Besides, psychological reactions and medications used for the illness negatively affect sexual matters [2].

The experience of female sexual dysfunction in the third trimester of pregnancy has been well established,

but there is insufficient evidence on whether gestational diabetes mellitus can impair sexual function [9]. The data about female sexual function of women with gestational diabetes are controversial. In some studies, no significant differences were found between women with gestational diabetes and healthy women in terms of sexual function [10, 11]. Another study showed that women with gestational diabetes had a higher incidence of sexual dysfunction and lower scores for all domains than low-risk pregnant women [3, 9]. No study has been reported in Iran on the effect of gestational diabetes on sexual function.

Besides, pregnancy alone is a factor affecting change in sexual function. Thus, in the present study, it was decided to assess and compare women with gestational diabetes and low-risk pregnant women in terms of sexual function and related factors, and then examine the related factors with sexual function in women with gestational diabetes, taking into account pregnancy as a possible independent factor.

## Materials and Methods

This research was an analytical, cross-sectional study. This study was conducted on women with gestational diabetes and low-risk pregnant women attending clinics affiliated to Mazandaran University of Medical Sciences from May to September 2019. Based on  $\alpha=0.05$ ,  $\beta=1-0.80$ , and no similar study in this area, instead of the difference between the observed mean, the difference between the expected mean was used, and the difference between means was divided by the standard deviation (effect size= 0.4). The range of the effect size is between 0.2 and 0.8, which is usually considered average [12]. The sample size was calculated 150 in each group with gestational diabetes and the low-risk group.

The multistage sampling method was used in the present study. First, a cluster random sampling method was used so that each city of Mazandaran Province was taken as a cluster. In addition to the provincial capital, three other cities were randomly selected with a probability proportional to their populations. Thus, in the first stage, Behshar, Chaloos, Amol, and Sari cities were considered the selected clusters. Next, quota sampling was carried out, and the sample size per each of these four cities was determined proportional to the prevalence of gestational diabetes in these cities. Information was obtained from the Diabetes Research Center of Mazandaran University of Medical Sciences. Because all women with gestational diabetes in Sari, Behshahr, Chaloos, and Amol cities were 227, 86, 51, and 67, respectively. Therefore, the number of samples is determined

according to the number of women with gestational diabetes in each city, so 80, 30, 17, and 23 were taken from the mentioned cities, respectively.

Then, several medical centers were randomly selected until reaching the sample size in each city. In the final stage, from selected centers, the sample size is needed for women with gestational diabetes. In the last step, in the selected centers, the required sample of the necessary number of diabetic pregnant women and the same number of low-risk pregnant women was selected by convenient sampling method.

The inclusion criteria for women with gestational diabetes and low-risk women are similar, except in diabetes. The inclusion criteria were women with gestational diabetes and low-risk pregnant women with a low-risk pregnancy who currently live with their husbands, have reading and writing literacy, no sexual abstinence during pregnancy (due to threatened preterm labor, placenta previa, and premature rupture of membranes, and, spouse's lack of erectile dysfunction and premature ejaculation (as reported by women), the couples with no known psychological or physical diseases, or addiction to opioids and stimulants (as reported by women). Diagnosis of gestational diabetes in pregnant women was based on screening for gestational diabetes during 24-28 weeks of pregnancy by taking the two-hour Oral Glucose Tolerance Test (OGTT) by taking 75 g of glucose [13] in the last month. The study exclusion criterion was declining to complete the questionnaires.

Data collection tools included the following questionnaires: demographic and obstetrics questionnaire, female sexual function index (FSFI), prenatal distress questionnaire, female sexual distress scale-revised, WHO quality of life-BREF (WHOQOL-BREF), depression anxiety and stress scale (DASS).

### Demographic and obstetrics questionnaire

This tool examines 11 items of age, couple's education and occupation, duration of the marriage, number of pregnancies, history of miscarriage, history of gestational diabetes, and pregnancy age.

### Female Sexual Function Index (FSFI)

This 19-item scale was designed by Rosen et al. (2000) and assessed sexual function in 6 domains of desire (items 1-2), arousal (items 3-6), lubrication (items 7-10), orgasm (items 11-13), satisfaction (items 14-16), and pain (items 17-19). Each item scores from 0 (no sex over

the last month) to 5 (better functioning). Total scores of each domain are multiplied by a certain coefficient (desire by 0.6, arousal and lubrication by 0.3, orgasm, satisfaction, and pain by 0.4). The total score is the sum of these scores, with a maximum of 36 and a minimum of 2 [14]. The validity and reliability of this tool have been confirmed in previous studies. The Persian version of this tool has high reliability and construct validity, with the Cronbach alpha for each domain, and the whole scale has been found  $\geq 0.7$  [15]. Since the cut-off score of 26.55 was obtained by the original designer of this questionnaire and a few studies on sexual function in women with gestational diabetes, this cut-off score was used. So for comparison between studies of this cut-off score in the present study was used [14].

#### Female Sexual Distress Scale-Revised (FSDS-R)

This 13-item scale was used to assess women's sexual distress, scoring based on a 5-point Likert scale from never=0 to always=4 points. The total score is the sum of scores of these 13 items and varies from 0 to 52 points. The higher total score indicates higher sexual distress [16]. In this study, the psychometric Persian version was used [17].

#### WHO Quality of Life-BREF (WHOQOL-BREF)

In this 26-item questionnaire, the first two items are analyzed separately. The first item assesses the person's perception of the general quality of life, and the second, his perception of general health. This questionnaire is based on a 5-point Likert-type scale, while items 3, 4, and 26 scores in reverse. Its domains include physical health, mental health, social relationships, and environment. Each domain scores between 4 and 20 points, where 4 shows the worst quality of life and 20 the best in that domain [18]. In this study, the psychometric Persian version was used [19].

#### Depression, Anxiety, and Stress Scale (DASS)

The factor construct of the short form of this scale (DASS-21) has been assessed by Crawford and Henry (2005) in Australia. This scale contains 21 items and assesses depression, anxiety, stress with 7 items each, and scoring based on a 4-point scale from 0 to 3 points. Items 1, 6, 8, 11, 12, 14, and 16 assess stress, items 3, 5, 10, 13, 16, 17, and 21 assess depression, and 2, 4, 7, 9, 15, 19, and 20 anxiety, with scores ranging from 0 to 21 points [20]. In this study, the psychometric Persian version was used [21].

#### Prenatal distress questionnaire

Scoring in this 12-item scale is based on a 5-point Likert scale (never=0 and always=4). Total score varies from 0 to 48, and higher scores indicate greater concerns during pregnancy [22]. In this study, a psychometric Persian version was used [23].

The scores from all the above questionnaires were converted into percentages using the following equation:  $(\text{Score}-\text{Min})/(\text{Max}-\text{Min}) \times 100$  and reported.

After completing the informed consent form, willing and eligible women with gestational diabetes and low-risk pregnant women completed the self-reporting questionnaires. Due to the exclusion of 15 pregnant women, other eligible samples were invited to participate in the study to obtain the required number of samples in each group.

Data were analyzed in SPSS v. 23 (IBM Corporation, and Armonk, NY). The normal distribution of data was assessed using the Kolmogorov-Smirnov test. The quantitative variables were described using mean, standard deviation, the Chi-square test, t-test, and qualitative variables by frequency (percentage). Multivariate linear regression was used to assess factors associated with sexual function and its domains.  $P < 0.05$  was taken as a significant level.

#### Results

A total of 300 women with gestational diabetes ( $n=150$ ) and low-risk pregnant women ( $n=150$ ) with respectively Mean $\pm$ SD age of  $31.31 \pm 0.46$  years and  $28.73 \pm 0.41$  years, duration of marriage of  $8.95 \pm 0.43$  years and  $7.43 \pm 0.35$  years, number of pregnancies of  $2.24 \pm 0.09$  and  $1.87 \pm 0.07$  and gestational age of  $34.35 \pm 0.18$  weeks and  $34.78 \pm 0.2$  weeks participated in the present study. Women with gestational diabetes had significantly higher age ( $P=0.001$ ), duration of marriage ( $P=0.006$ ), number of pregnancies ( $P=0.001$ ), history of miscarriage, and history of diabetes, and 40% of them used insulin. The demographic and obstetrics details of women with gestational diabetes and low-risk pregnant women are presented and compared in Table 1.

Based on the cut-off point of 26.55, of 36 FSFI questionnaires, 87.3% of women with gestational diabetes and 34.67% of low-risk pregnant women had sexual dysfunction, which was statistically different ( $P=0.001$ ).

The Mean $\pm$ SD score of sexual function was  $22.36 \pm 0.29$  in women with gestational diabetes, which was significantly

**Table 1.** Comparison of women with gestational diabetes and low-risk pregnant women in terms of demographic and obstetrics characteristics

Variables	Group	No. (%) (n=150)		Sig.
		Gestational Diabetes	Low-risk Pregnancy	
Mother's education	Below diploma	38 (25.3)	23 (15.3)	0.06*
	Diploma	62 (41.4)	67 (44.7)	
	University	50 (33.3)	60 (40)	
Mother's occupation	Housewife	129 (86)	134 (89.3)	0.09**
	Employed	21 (14)	16 (10.7)	
Spouse's education	Below diploma	40 (27)	48 (32)	0.8*
	Diploma	64 (43)	51 (34)	
	University	46 (31)	51 (34)	
Spouse's occupation	Employed	46 (31)	56 (37.3)	0.34**
	Self-employed	104 (69)	94 (62.7)	
History of miscarriage	Yes	56 (37.3)	28 (18.7)	0.001**
	No	94 (62.7)	122 (81.3)	
History of diabetes	Yes	31 (20.7)	6 (4)	0.001**
	No	119 (79.3)	144 (96)	

\*Mann-Whitney test, \*\* $\chi^2$ .

( $P=0.001$ ) lower than that in low-risk pregnant women ( $25.24 \pm 0.64$ ). Comparing the scores of sexual function domains showed that women with gestational diabetes experience significantly lower sexual desire ( $P=0.001$ ), satisfaction ( $P=0.001$ ), and greater pain ( $P=0.004$ ) compared to low-risk pregnant women (Table 2). The Mean $\pm$ SD score of quality of life was  $86.15 \pm 2.12$  in women with gestational diabetes, which was significantly ( $P=0.001$ ) lower than that in low-risk pregnant women ( $90.83 \pm 1.03$ ).

Comparison of study groups in terms of the total score of DASS was significantly higher in women with gestational diabetes compared to low-risk pregnant women. Prenatal distress was significantly higher ( $P=0.014$ ) in women with gestational diabetes than in low-risk pregnant women (Table 3).

Multivariate linear regression was used to show the relationship between sexual function and other variables. The following variables were used in the model as independent variables: gestational diabetes; demographic and obstetrics details; mother's age; duration of the marriage; the number of pregnancies; the number of miscarriages; and history of gestational diabetes,

which was significant in both groups; anxiety, stress, depression, concerns about childbirth; concerns about the body weight and image; concerns about emotions and relationships; sexual distress; physical health; mental health; social relations; environmental health; general health; and quality of life.

The linear regression results showed that gestational diabetes has a negative and significant relationship with sexual function ( $P=0.01$ ), and gestational diabetes reduces pregnant women's sexual function score by 18% (Table 4).

## Discussion

In this study, 87.3% of women with gestational diabetes and 34.7% of low-risk pregnant women had sexual dysfunction. In a study conducted by Ribeiro in Brazil, 59% of women with gestational diabetes and 63% of healthy pregnant women in their third trimester [11], and in a study conducted by Souza in Portugal, 66.7% of women with gestational diabetes and 38.9% of low-risk pregnant women in the second trimester suffered from sexual dysfunction [3]. Besides, according to Hajnasiri study, the frequency of sexual dysfunction in pregnant



**Table 2.** Comparison of women with gestational diabetes and low-risk pregnant women in terms of sexual function and its domains

Group Scale (Range of Score)	Mean±SD		Sig.*
	Gestational diabetes (n=150)	Low-risk pregnancy (n=150)	
	Score (0-100)		
Desire (1.2-6)	45.41±1.4	73.73±1.21	0.001
Arousal (0-6)	62.43±1.27	63.97±2.56	0.6
Lubrication (0-6)	63.33±1.27	70.27±2.87	0.03
Orgasm (0-6)	48.9±1.15	51.97±0.13	0.2
Satisfaction (0-6)	61.56±1.17	84.04±1.13	0.001
Pain (0-6)	80.13±1.85	71.42±2.37	0.004
Sexual function (2-36)	59.89±0.86	68.35±1.89	0.001

\* Independent t-test.

women in Iran is 33.3% [24], which was in line with our research. Still, no study on sexual function in women with gestational diabetes has been conducted in Iran.

It seems that gestational diabetes affects women's sexual function through both biological mechanisms and psychosocial factors. Hyperglycemia can lead to increased serum prolactin resulting in changes in neurotransmitters, which are potentially connected with sexual dysfunction [25]. Besides, as shown by the present and other studies, sexual dysfunction in women with gestational diabetes may be due to their high stress and anxiety [3]. On the other hand, compulsory lifestyle, including constant blood glucose control, insulin injection, and adjustment of insulin dosage, can affect the quality of life of mothers with gestational diabetes. These particular living conditions can affect their life and sexual function.

The results showed that women with gestational diabetes had a lower score in sexual desire compared to low-risk pregnant women. Other studies have shown that diabetes can significantly affect the willingness and ability to participate in sexual activities. Such cases can be due to diabetes-induced psychological problems or the adverse effects of medications used by these patients [9, 26]. Sexual desire reduces during pregnancy, especially in the third trimester [1]. Additionally, 80% of women with gestational diabetes do not think about sex, which may be due to their reduced sexual desire following high-risk pregnancy stresses [1]. Psychological changes such as concerns about pregnancy and change in lifestyle and physical symptoms such as fatigue, insomnia, and increased urination can be among other causes of reduced sexual desire [27]. Because gesta-

tional diabetes causes physical and psychological complications in a woman with diabetes, it causes sexual dysfunction in women with gestational diabetes.

In this study, sexual satisfaction was significantly lower in women with gestational diabetes than low-risk pregnant women. Sexual pleasure depends on sexual desire, can lead to long-term positive outcomes if favorable [28]. Reduced sexual satisfaction has a relationship with particular conditions such as illness and intercourse pain [29].

According to the results, women with gestational diabetes have significantly higher pain scores than low-risk pregnant women. This result may be due to their reduced sexual desire that can lead to the non-lubrication of vagina and intercourse pain. Besides, since diabetes increases the likelihood of infection, the more prevalent vaginal infection in women with diabetes can be the reason for their higher intercourse pain score [9].

The results showed that the mean score of quality of life was significantly lower in women with gestational diabetes compared to low-risk pregnant women. This difference is due to their lower scores of physical and psychological health compared to low-risk pregnant women. The physical and psychological complications due to gestational diabetes that cause negative changes in various aspects of health affect the quality of life of women with gestational diabetes [30]. Additionally, the reduced quality of life of women with gestational diabetes seems to be due to the limitations borne by women when following a specific dietary regimen and treatment to maintain their own and their fetus health; additional responsibility (dietary regimens, visits), finan-

**Table 3.** Comparison of women with gestational diabetes and low-risk pregnant women

		Mean±SD		Sig.*
		Gestational Diabetes (n=150)	Low-risk Pregnancy (n=150)	
Scale (range-score)	Domains (range-score)	Score 0-100		
Quality of life Questionnaire (WHO-QOL) (26-130)	Physical health (7-35)	44.57±0.96	56.62±1.29	0.001
	Mental health (6-30)	59.58±1.04	64.83±1.05	0.001
	Social relations (3-15)	64.94±2.11	68.33±1.25	0.2
	Environmental health (8-40)	57.77±1.08	61.85±1.22	0.7
	Quality of life and health (2-10)	63.58±2.3	67.83±1.23	0.1
Total score		57.84±2.04	62.34±0.99	0.05
Depression, Anxiety, Stress (0-63)	Depression (0-21)	15.97±1.09	14.16±1.1	0.24
	Anxiety (0-21)	18.86±1.14	18.32±1.01	0.7
	Stress (0-21)	37.3±0.83	26.16±1.18	0.001
	Total score	24.04±0.9	19.55±0.96	0.001
Prenatal Distress (0-48)	Childbirth and infant (5-25)	51.33±1.9	43.47±1.8	0.003
	Body weight and image (3-15)	40.78±1.9	37.78±1.9	0.3
	Emotions and relationships (4-20)	24.83±1.7	21.58±1.4	0.13
	Total score	39.86±1.5	34.75±1.4	0.014
Sexual distress (0-52)		7.67±0.92	5.24±0.81	0.05

\* The independent t-test

cial pressures (expensive food items, medical costs) and the conflict between feeding style and cultural customs (alternative foods, lack of information about traditional foods) affect their quality of life [7] because the physical and psychological dimensions of quality of life in women with gestational diabetes have decreased, so the sexual function of these women is impaired because the sexual function may be affected by physical and psychological factors.

In this study, the total score in DASS and stress alone were significantly higher in women with gestational diabetes than in low-risk pregnant women. Indeed, pregnancy is a highly stressful period for mothers, exacerbated by a high-risk pregnancy [31]. The frequent metabolic changes due to gestational diabetes require regular visits to doctors and medical corrections, which can cause stress and confusion in a sensitive situation like pregnancy [32]. Moreover, stress, depression, and anxiety are among the individual's most critical psychological reactions diagnosed with a new disease, such as

gestational diabetes [33]. Because the sexual function is influenced by psychological factors, women with gestational diabetes have sexual dysfunction.

Our results indicated that concerns during pregnancy in women with gestational diabetes were significantly higher compared to low-risk pregnant women. Among various dimensions of these concerns, concern about childbirth and the infant was significantly higher. Fears and concerns are the most critical themes in the experience of women with gestational diabetes [31] and the strongest predictor of their quality of life [27]. Women have reported concerns about fetal health or the infant's health, preterm childbirth and reduced fetal movement, fetal growth retardation, and death with gestational diabetes [31]. Thus, fears and worries reduce the quality of life and mental health and lead to sexual dysfunction.

In this study, women with gestational diabetes had significantly higher sexual distress compared to low-risk pregnant women. In other studies, women with gesta-

**Table 4.** The multivariate linear regression results for predicting factors related to sexual function of pregnant women (N=300)

Variables		SE	Standardized Coefficients Beta	Sig.*	CI95% Interval	
					Lower	Upper
Gestational diabetes		0.911	-0.188	0.01	-4.143	-0.557
Age (y)		0.076	-0.112	0.1	-0.022	0.279
Duration of marriage		0.108	-0.002	0.1	-0.209	-0.216
Number of pregnancies		0.667	-0.033	0.7	-1.522	1.104
History of miscarriage		1.158	0.042	0.6	-1.754	2.911
History of diabetes		1.232	0.051	0.4	-1.458	3.391
Sexual distress		0.073	0.051	0.43	-0.085	0.201
Quality of life	Physical health	0.108	-0.088	0.23	-0.082	0.343
	Mental health	0.157	0.09	0.26	-0.13	0.488
	Social relations	0.159	-0.005	0.95	-0.323	0.301
	Environmental health	0.021	0.004	0.95	-0.04	0.043
	General health	0.223	-0.005	0.94	-0.421	0.457
Depression anxiety Stress scale	Depression	0.21	0.152	0.11	-0.073	0.753
	Anxiety	0.194	-0.126	0.14	-0.668	0.096
	Stress	0.2	-0.108	0.24	-0.63	0.158
Prenatal Distress	About childbirth and infant	0.099	-0.04	0.59	-0.248	0.14
	Body weight and image	0.165	0.071	0.35	-0.169	0.482
	Emotional and relationship	0.163	0.021	0.78	-0.276	0.365

tional diabetes also had higher sexual distress. There has been a positive relationship between general health status and sexual distress [34]. In fact, in the present study, diabetes negatively affects the patients' sexual behavior through its effect on their health and quality of life. They have been reported to have higher sexual distress and sexual dysfunction.

Our results indicated significant differences between the group of women with gestational diabetes and low-risk pregnant women in terms of age, duration of the marriage, number of pregnancies, history of miscarriage, and history of diabetes. Aging, number of pregnancies, history of miscarriage, and diabetes are among the risk factors for gestational diabetes [35], and therefore, such results were to be expected.

Results showed that gestational diabetes significantly predicts reduced sexual function in pregnant women.

Hence, biologically-rooted diabetes can adversely affect sexual function by creating psychological problems such as stress, emotional turmoil, interpersonal problems, or a combination of these factors [36]. However, in a multivariate regression model, only gestational diabetes remained a variable related to sexual function.

Women with gestational diabetes reported lower sexual function scores compared to low-risk pregnant women, which was due to their lower sexual desire and satisfaction and higher experience of pain, women with gestational diabetes experience a lower quality of life due to their poorer physical and mental health compared to low-risk pregnant women, besides, higher stress and concerns during pregnancy. The linear regression test showed that gestational diabetes in pregnant mothers predicts a significant reduction in sexual desire. Thus, it is recommended to educate and counsel preg-



nant women with gestational diabetes about diabetes control and sexual function.

Considering the Iranian culture and religion, the present study limitations were women's feelings of shame and embarrassment and refraining from talking about sexual issues. We tried to reduce the effect of these limitations by self-reporting questionnaires and giving assurances about the confidentiality of data.

## Ethical Considerations

### Compliance with ethical guidelines

The study was approved by the Ethics Committee of Shahid Beheshti University of Medical Sciences (Code: IR.SBMU.PHARMACY.REC.2018.263). All participants signed an informed consent form.

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### Authors' contributions

Conceptualization: Masoumeh Simbar, Ommolbanin Zare, Giti Ozgoli, Adeleh Bahar and Hamid Alavimajd; Writing the original draft: Masoumeh Simbar, Ommolbanin Zare; Data collection: Ommolbanin Zare; Data analysis: Masoumeh Simbar, Hamid Alavimajd; Reviewing the final edition: All authors.

### Conflict of interest

The authors declared no conflict of interest.

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