

# Sexual dysfunction in diabetic women: prevalence and differences in type 1 and type 2 diabetes mellitus

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**Background:** The aim of this work was to evaluate the impact of diabetes on female sexuality and to highlight any differences between sexuality in the context of type 1 and type 2 diabetes mellitus (DM).

**Methods:** The subjects selected were 49 women with type 1 DM, 24 women with type 2 DM, and 45 healthy women as controls. Each participant was given the nine-item Female Sexual Function Index questionnaire to complete. The metabolic profile was evaluated by body mass index and glycosylated hemoglobin assay.

**Results:** The prevalence of sexual dysfunction (total score  $\leq 30$ ) was significantly higher in the type 1 DM group (25/49, 51%; 95% confidence interval [CI] 18–31) than in the control group (4/45, 9%; 95% CI 3–5;  $P=0.00006$ ); there were no significant variations in the type 2 DM group (4/24, 17%; 95% CI 3–4) versus the control group ( $P=0.630$ , not statistically significant). The mean total score was significantly lower in the type 1 DM group ( $30.2 \pm 6.9$ ) versus the control group ( $36.5 \pm 4.9$ ;  $P=0.0003$ ), but there was no significant difference between the type 2 DM group and the control group ( $P=0.773$ ). With regard to specific questionnaire items, the mean values for arousal, lubrication, dyspareunia, and orgasm were significantly lower only in the type 1 DM group versus the control group. The mean values for desire were reduced in type 1 and type 2 DM groups versus control group.

**Conclusion:** Type 1 DM is associated with sexual dysfunction. This may be due to classic neurovascular complications or to the negative impact of the disease on psychosocial factors. Larger and ideally longitudinal studies are necessary to better understand the relationship between DM and sexual dysfunction.

**Keywords:** diabetes mellitus, female sexuality, Female Sexual Function Index

## Introduction

Diabetes mellitus (DM) can potentially lead to multiple difficulties in various areas of life, ranging from quite well-known physical complications to psychological symptoms, which include disturbances in sexual function. However, this impact on sexual function has long been investigated mainly in men, and although there are some relevant papers in women dating back to the 1970s and 1980s,<sup>1–8</sup> this issue has not been specifically addressed until more recently.<sup>9–16</sup>

The studies in the literature are not all in agreement with regard to the existence of sexual dysfunction in diabetic women, with the reported prevalence varying between 25% and 71% according to Pontiroli et al.<sup>17</sup> It is possible that this wide variation in reported prevalence reflects the different populations evaluated and the study inclusion criteria used, such as the age considered (childbearing age or postmenopausal), body

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mass index (BMI), endocrine disorders, and possible drug treatments in the women studied.

For example, Enzlin et al<sup>18</sup> investigated sexual function in both male and female diabetic patients and found sexual dysfunction in 27% of women and 25% of men. However, while they found a correlation between BMI, duration of illness, and complications in men, the only correlation found in women was with a depressive syndrome. Some authors have considered only women with type 1 DM,<sup>19–22</sup> eg, Salonia et al,<sup>19</sup> who pointed out that diabetic women had decreased sexual function and increased sexual distress compared with control subjects during the luteal, but not follicular phase, of the menses. Other authors have considered only women with type 2 DM.<sup>23–27</sup> Among these, Ogbera et al<sup>25</sup> reported that a possible determinant of sexual dysfunction in women with DM was psychological morbidity. In addition, Erol et al<sup>23</sup> concluded that type 2 DM negatively affects female sexuality and, in particular, desire. They found no correlation with BMI or glycosylated hemoglobin (HbA<sub>1c</sub>) values. Yet other authors have taken into consideration women with diabetes without a distinction between type 1 DM and type 2 DM.<sup>28,29</sup> Among these, Copeland et al<sup>29</sup> reported low overall sexual satisfaction in diabetic women compared with nondiabetic women, and also reported a higher risk in insulin-treated diabetic women with problems, such as difficulty in lubrication and orgasm.

Finally, some research groups have investigated sexual dysfunction in diabetic women by separating type 1 DM and type 2 DM.<sup>30–35</sup> However, the Female Sexual Function Index (FSFI) questionnaire was used in only three such studies.<sup>31,33,34</sup> In addition, in the above-mentioned papers, HbA<sub>1c</sub> values were not reported and the age ranges were not consistent (21–60 years in Doruk et al,<sup>31</sup> 30–79 years in Wallner et al,<sup>33</sup> 18–55 years in Nowosielski et al,<sup>34</sup> and so in postmenopausal women). Wallner et al<sup>33</sup> did not report differences in sexual dysfunction in DM women versus controls, nor did they did not report the duration of DM. Further, Doruk et al<sup>31</sup> and Nowosielski et al<sup>34</sup> reported a significant prevalence of female sexual dysfunction in type 1 DM and type 2 DM, but did not consider BMI or HbA<sub>1c</sub>.

The aim of this work was to evaluate the impact of diabetes on female sexuality and to highlight any differences in this regard in the context of type 1 DM and type 2 DM.

## Materials and methods

### Participants

We selected 49 women with type 1 DM and 24 women with type 2 DM attending our outpatient clinic (Endocrinology

and Diabetology Unit, Sant'Andrea Hospital) from January 2009 to October 2013, along with 45 healthy control women (without diabetes and with normal serum glucose levels) recruited from the administrative staff at the clinic.

All participants met the following inclusion criteria: premenopausal status; age 18–45 years; no concomitant pathologies; no use of medications (except for antidiabetic agents); no hormonal abnormalities (in luteinizing hormone, follicle-stimulating hormone, estradiol, prolactin, and androgens); no menstrual abnormalities; heterosexual; in a steady relationship for at least one year; and absence of sexual disorder in the male partner. The study excluded women who reported not having had sexual intercourse during the previous 4 weeks. The women with type 1 DM were on insulin and those with type 2 DM were taking oral antidiabetic drugs (metformin and/or secretagogues). The study was conducted according to the guidelines laid down by the hospital ethics committee.

### Metabolic profile

The metabolic profile was evaluated by calculation of BMI (kg/m<sup>2</sup>) and determination of HbA<sub>1c</sub>.

### Questionnaire

Each patient was given the nine-item FSFI questionnaire to complete, following the procedures used by Kaplan et al.<sup>36</sup> The FSFI includes six domains, which were analyzed to identify and assess symptoms of sexual dysfunction. Specific domains analyzed in the FSFI include desire (questions one and two; possible score from two to ten), arousal (questions three and four; possible score from two to ten), lubrication (question five; possible score from one to five), orgasm (question six; possible score from one to five), satisfaction (questions seven and eight; possible score from two to ten), and dyspareunia (question nine; possible score from one to five). The total score can range from nine to 45. Like Erol et al,<sup>23</sup> we considered a total score  $\leq 30$  as indicative of sexual dysfunction. Recently, a six-item questionnaire has been validated,<sup>37</sup> but we followed Erol et al because our study was started prior to the availability of the six-item version. The questionnaire was completed independently by the patients in order to avoid any possible influence and/or interference on the part of health professionals.

### Data analysis

The statistical analysis was performed using the Student's *t*-test to compare the score on a single item, and Fisher's Exact test to calculate differences between groups. The level of

statistical significance used was  $P < 0.05$ . The 95% confidence interval was also calculated. All tests were performed using Statistical Package for the Social Sciences software (SPSS Inc., Chicago, IL, USA).

## Results

### Age, HbA<sub>1c</sub>, BMI, and history of DM

The results are summarized in Table 1. Mean subject age did not differ significantly between the three groups ( $35.9 \pm 4.9$  years in the type 1 DM group [ $P = 0.805$ ] and  $36.6 \pm 5.2$  years in the type 2 DM group [ $P = 0.102$ ] versus  $35.6 \pm 5.4$  years in controls). BMI was significantly higher in women with type 2 DM ( $24.8 \pm 5.1$ ) than in controls ( $23.0 \pm 1.7$ ;  $P = 0.03$ , Table 1); there was no significant difference between the type 1 DM group ( $23.9 \pm 3.0$ ) and controls in this regard ( $P = 0.06$ ). However, the duration of disease was found to be significantly longer in women with type 1 DM ( $17.1 \pm 9.0$  years) than in those with type 2 DM ( $7.6 \pm 3.4$  years;  $P = 0.000$ ). No significant differences were seen for mean HbA<sub>1c</sub> levels between women with type 1 DM ( $7.3 \pm 1.1$ ) and those with type 2 DM ( $7.1 \pm 1.9$ ;  $P = 0.489$ ).

## Questionnaires

The results are summarized in Table 2. The prevalence of sexual dysfunction (total score  $\leq 30$ ) was significantly higher in the type 1 DM group (25/49 women, 51%) than in the control group (4/45 women, 9%), but there were no significant variations in the type 2 DM group (4/24 women, 17%) versus the control group. The mean total scores were significantly lower in women with type 1 DM (total score  $30.2 \pm 6.9$ ) when compared with the control group (total score  $36.5 \pm 4.9$ ;  $P = 0.0003$ ), there was no significant difference ( $P = 0.773$ ) between the type 2 DM group and the control group. With regard to each individual item, mean values for arousal, lubrication, dyspareunia, and orgasm were significantly lower

**Table 1** Subject age, body mass index, age of onset and duration of diabetes mellitus, and glycosylated hemoglobin levels

	Type 1 DM (n=49)	Type 2 DM (n=24)	Control (n=45)
Age (years)	$35.9 \pm 4.9$	$36.6 \pm 5.2$	$35.6 \pm 5.4$
BMI (kg/m <sup>2</sup> )	$23.9 \pm 3.0$	$24.8 \pm 5.1^*$	$23.0 \pm 1.7$
Age of DM onset (years)	$17.7 \pm 9.8^{**}$	$30.4 \pm 6.4$	–
DM duration (years)	$17.1 \pm 9.0^{**}$	$7.6 \pm 3.4$	–
HbA <sub>1c</sub>	$7.3 \pm 1.1$	$7.1 \pm 1.9$	–

**Notes:** Values are shown as the mean  $\pm$  standard deviation.  $^*P < 0.05$  versus control;  $^{**}P < 0.05$  versus type 2 DM.

**Abbreviations:** BMI, body mass index; DM, diabetes mellitus; HbA<sub>1c</sub>, glycosylated hemoglobin.

**Table 2** Female Sexual Function Index total score and domain scores

	Type 1 DM (n=49)	Type 2 DM (n=24)	Control (n=45)
Total score	$30.2 \pm 6.9^*$	$36.2 \pm 4.1$	$36.5 \pm 4.9$
Desire	$4.7 \pm 1.4^*$	$5.4 \pm 1.2^*$	$6.8 \pm 1.7$
Arousal	$6.8 \pm 2.4^*$	$8.8 \pm 1.4$	$8.4 \pm 1.7$
Lubrication	$3.9 \pm 1.4^*$	$4.7 \pm 0.7$	$4.5 \pm 0.9$
Orgasm	$3.4 \pm 1.3^*$	$4.2 \pm 1.1$	$4.3 \pm 1.0$
Satisfaction	$7.6 \pm 1.7$	$8.5 \pm 1.3$	$7.8 \pm 1.9$
Dyspareunia	$3.7 \pm 1.3^*$	$4.6 \pm 0.5$	$4.6 \pm 0.9$

**Notes:** Values are shown as the mean  $\pm$  standard deviation.  $^*P < 0.05$  versus control.

**Abbreviation:** DM, diabetes mellitus.

in the type 1 DM group than in the control group, but not in the type 2 DM group versus the control group. Mean values for desire were significantly reduced in the type 1 and type 2 DM groups when compared with the controls. Finally, no significant variations in the satisfaction item were found between the three groups.

## Discussion

While the study of male sexuality has received a great deal of scientific attention, it has only been relatively recently that sexual dysfunction has been studied in women<sup>9–36</sup> and suggestions made as to possible therapeutic measures.<sup>12,38</sup> In this study, we examined the possible impact of DM on female sexuality and considered separately women with type 1 DM and those with type 2 DM.

In women with type 1 DM, we found a significant reduction in total score on the FSFI and in most of the items canvassed (desire, arousal, lubrication, dyspareunia, and orgasm) when compared with the control group. This reduction could be due to metabolic and neurovascular factors responsible for the development of complications of DM. In fact, some studies have demonstrated that vasoactive intestinal polypeptide and nitric oxide synthase, which are the principle mediators of vaginal vasocongestion and lubrication, are impaired in diabetic women.<sup>39</sup> In addition, it has been hypothesized that hyperglycemia, by reducing hydration of the mucus membranes, including those in the vaginal tissue, results in poor vaginal lubrication and dyspareunia.<sup>40</sup> Moreover, clinically silent vaginal inflammation, which is very frequent in diabetic women, could account for dyspareunia.<sup>23</sup> Unexpectedly, satisfaction was not reduced when compared with the control group. This could be explained by the fact that, despite negative feelings regarding some sexual items, the possibility to have sexual intercourse determines satisfaction similar to control group women.

As far as women with type 2 DM are concerned, we found no significant variations either in total score or in individual items considered on the FSFI when compared with controls, except for desire. The reason for this substantial discrepancy could be the duration of disease, rather than different genetic pathogenesis. In fact, in our study, the duration of DM was significantly longer in women with type 1 DM than in those with type 2 DM.

The low desire score, found also in women with type 2 DM, suggests that this may be due to a state of depression and/or non-acceptance of this pathological condition, and development of a woman's attitude towards sexuality and her body, probably because DM is a chronic progressive disease.<sup>5,23</sup>

Comparing our results with those of other researchers who have studied women with type 1 DM and type 2 DM, our findings are in partial agreement with those of Doruk et al,<sup>31</sup> who reported a high prevalence of sexual dysfunction in women with type 1 DM, even if in disagreement with the single domains. However, our results are in disagreement with those of Wallner et al,<sup>33</sup> who found no differences between diabetic women and controls and with those of Nowosielski et al<sup>34</sup> who reported that the prevalence of female sexual dysfunction is significantly higher in type 2 DM women.

These discrepancies probably reflect the fact that the inclusion criteria for our study were strict (premenopausal women aged 18–45 years, no concomitant pathologies; normal hormonal profile and menses), whereas in the above-mentioned studies, patient age was heterogeneous (some also included postmenopausal women), and duration of DM, BMI, and HbA<sub>1c</sub> levels were not reported.

Our study has some limitations, including: a small sample size because of the study population coming from a single center; presence of potential confounding variables (mood disorders, BMI, medications, body image, socioeconomic/education status); and limited generalizability, given that patients were recruited from one clinic and that there were many exclusion criteria. In conclusion, our data show that type 1 DM is associated with sexual dysfunction. This may be due to the classical neurovascular complications of DM as well as the negative impact of the disease on psychosocial factors.

## Disclosure

The authors report no conflicts of interest in this work.

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