Patterns and predictors of female sexual dysfunction in diabetes mellitus

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ABSTRACT

Background. Sexual complications of people with diabetes mellitus (DM) are often neglected by the patients as well as clinicians. The neglect is more in women due to the associated stigma and taboo. Indian studies are scanty, varied and inconsistent, regarding the impact of DM on sexual functioning in women. We studied the patterns and predictors of sexual dysfunction in women with DM.

Methods. We did a cross-sectional questionnaire-based study comprising 50 participants in both the study (women with DM1 and DM2) and control groups (relatives/caregivers of patients and the hospital staff), selected randomly from the medicine outpatient department from May to August 2016. Approval from the institutional ethics committee was obtained. Clinical anxiety and depression were screened using the hospital anxiety and depression scale. Sexual dysfunction was assessed through female sexual function index scale (FSFI), and predictors were assessed by correlating FSFI scores with sociodemographic and clinical parameters.

Results. We found that 44% of women with DM had sexual dysfunction compared with 20% in the control group ($p < 0.01$). The pattern of sexual dysfunction was seen across the domains of desire, arousal, lubrication and orgasm. High body mass index, higher age, duration of DM, treatment with insulin and complications of DM predicted a greater degree of sexual dysfunction among women.

Conclusion. Sexual dysfunction is common in women with DM, irrespective of the type of DM and coexisting psychological factors such as depression and anxiety.

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INTRODUCTION

Diabetes mellitus (DM) has gained the status of an epidemic in India, with more than 62 million individuals currently diagnosed with the disease, second only to China.[1] The prevalence of DM is predicted to grow worldwide to 366 million by 2030, from 171 million in 2000, with the maximum increase in India.[2] Considering the extent to which DM is expected to grow in India, it is undoubtedly a challenging public health problem.

DM affects most spheres of human health. Multiple medical, psychological and sexual problems may arise as a complication of DM. Among these, impaired sexual functioning is a well-documented, yet often neglected complication. The focus on sexual health becomes more important as we observe a shift in age of onset of DM to a younger age, among the rural population and women.[3] Female sexual functioning is a vital component of physical and emotional well-being. While the study of sexuality in men has received a great deal of scientific attention, it is a relatively recent phenomenon that sexual dysfunction has been studied in women.[4,5]

Sexual problems among women are often neglected due to associated stigma, combined with discomfort in taking a sexual history and ignorance on the part of clinicians. Lack of standardized definitions and criteria of sexual dysfunction in women also adds to the apathy in research on this topic.[6] Among men, it has been shown that DM increases risk for erectile dysfunction, associated with a duration of DM and poor glycaemic control.[7] In contrast, sexual dysfunction among women with DM and its risk factors are less obvious. Further, similar to men, sexual problems may be the first sign and gateway to women's vascular status.[6]

Specifically, in developing traditional countries such as India, where talking about sex is taboo, data regarding female sexuality are scarce. There is no Indian study that has specifically evaluated female sexual dysfunction (FSD) in people with DM, despite the risk for developing complications being the same in men and women. There are discrepancies regarding the prevalence of sexual dysfunction and implicated factors among women with DM, worldwide. Most studies have included women with psychological problems such as depression or anxiety; this may have confounded the results. Hence, we evaluated the patterns of sexual dysfunction and its predictive factors in women with DM, without any comorbid anxiety or depression.

METHODS

We did a cross-sectional questionnaire-based study among women with DM in a government medical college and hospital in the National Capital Region of Delhi. The study was done under the Short-Term Studentship (STS) scheme of the Indian Council of Medical Research (ICMR) for MBBS

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students, and approval of the institutional ethical committee (IEC) was taken. Written informed consent was obtained from the study subjects.

The study was done in the medicine and psychiatry outpatient department (OPD) of the hospital. The study subjects were women with types 1 or 2 DM presenting to the medicine OPD, while healthy women (without DM and with normal serum glucose levels) were recruited from the relatives/caregivers of the patients and the hospital staff. Controls were matched with the study participants for their age, socioeconomic status, etc. Matching of cases and controls was done on a one-to-one basis. Fifty women were recruited in each group. Systematic random sampling was used for the selection of patients. Every third consenting participant was included in the study.

The inclusion criteria were: (i) consenting women in the age group of 18–45 years; (ii) premenopausal status, with no major comorbid psychiatric disorders; (iii) not using any medications except for anti-diabetic agents; (iv) no menstrual abnormalities; and (v) in a steady relationship and cohabiting with spouse for at least one year. We excluded (i) women who reported not having had sexual intercourse during the previous 4 weeks; (ii) taking psychotropic drugs except for benzodiazepines; (iii) who had had a mastectomy and bilateral hystero-oophorectomy or sexual disorders before developing DM; and (iv) those with major psychiatric disorders such as depression and anxiety as assessed clinically by the psychiatrist and using the hospital anxiety and depression scale (HADS).

The patients were assessed on various clinical and sociodemographic parameters. The complications of DM were assessed with the help of a general medicine and ophthalmology specialist after the participants were selected. This was done using uniform criteria for all the patients. The complications assessed included diabetic neuropathy, nephropathy and retinopathy. Nephropathy was determined using renal function test and urine screening for micro-albuminuria. Neuropathy was determined clinically by a medicine specialist. Retinopathy was determined by an ophthalmologist using indirect ophthalmoscopy.

We used a standardized sociodemographic form, and a clinical parameters and investigations form.

Female sexual function index scale

The test was administered in English by undergraduate students of medicine under the supervision of their guide. It was explained to the participant in Hindi, if required. The questionnaire assesses key dimensions of sexual functioning in women in the past 1 month. The female sexual function index (FSFI) consists of 19 questions covering six domains: desire (2 questions), arousal (4 questions), lubrication (4 questions), orgasm, satisfaction and pain (3 questions each). Responses to each question relate to the previous month and are scored from 0 (no sexual activity) or 1 (suggestive of dysfunction) to 5 (suggestive of normal sexual activity). Individual domain scores are obtained by adding the scores of the individual questions that comprise the domain and multiplying the sum by the domain factor provided in the FSFI for each domain. The full-scale score is obtained by adding the 6 domain scores. The minimum score possible is 2 and the maximum is 36. The cut-off score used to demarcate sexual dysfunction on the total FSFI score was obtained from a validation study that compared FSFI scores in women with documented sexual dysfunction with those of dysfunction-free volunteers and determined a total score <26.55 to denote sexual dysfunction. The cut-off scores to determine the presence of difficulties on the 6 domains of the FSFI were obtained from published sources; accordingly, scores <4.28 on the desire domain, <5.08 on the arousal domain, <5.45 on the lubrication domain, <5.05 on the orgasm domain, <5.04 on the satisfaction domain and <5.51 on the pain domain were used to classify participants as having difficulties in that domain. The FSFI has been shown to discriminate reliably between women with and without female sexual arousal disorder and with or without female orgasmic disorder on each of the 6 domains: desire, arousal, lubrication, orgasm, satisfaction and pain and has validated psychometric properties.[8]

Hospital anxiety and depression scale (HADS)

HADS is a 14-item scale that has items for the assessment of both anxiety and depression. It is among the best tools for detection of anxiety and depression in people with physical health problems. It has high specificity and sensitivity for screening women with clinical anxiety and depression.[9]

Statistical analysis was carried out using the SPSS software, 21st version. The sociodemographic variables, and FSFI and HADS scores were compared between the study participants and controls using independent *t*-test. Pearson's correlation coefficient was used to assess the correlation between FSFI scores and sociodemographic/illness-related parameters. A value of $p<0.05$ was considered statistically significant.

RESULTS

A total of 148 women were screened for inclusion in the study. However, 26 women refused to participate citing reasons such as discomfort talking about sexual issues and time constraints. On assessment, 16 women were found to have high scores on HADS and were excluded. Six women did not have sexual relations in the past 4 weeks. Hence, 100 women were studied.

Sociodemographic characteristics between the study group and controls matched well (Table I). The mean age of the study group was 37.8 years, suggesting relatively younger women with DM. Similarly, most women were homemakers from nuclear families, reflecting the demographics of the catchment area. The mean (SD) duration of illness was 4.8 (11.66) years and the mean (SD) HBA1c was 7.95 (13.05).

The baseline HAD-Anxiety and HAD-Depression scores of the two groups were comparable, suggesting that differences in FSFI scores were unlikely due to either comorbid condition (Table I). We found that 22 women with DM had sexual dysfunction compared with 10 controls ($p<0.01$). On comparing the domains of FSFI, we found that women with DM had significantly lower scores ($p<0.01$) on arousal, desire, lubrication and orgasm (Table II). This also reflected in total FSFI scores, which were significantly low in women with DM. The parameters of satisfaction and pain were not affected significantly.

The FSFI scores correlated positively with the age, duration of DM, body mass index (BMI), type of treatment, complications of DM (retinopathy, nephropathy and neuropathy) and comorbid conditions such as coronary

TABLE I. Comparative analysis of sociodemographic variables, hospital anxiety and depression scores and prevalence of sexual dysfunction between cases and controls

Sociodemographic variables	Cases (*n*=50)	Controls (*n*=50)	p value
Age (years)	37.80	37.20	0.523
Religion (n)			
Hindu	45	47	0.356
Muslim	2	3	
Christian	1	0	
Sikh	2	0	
Family type (n)			
Nuclear	31	29	0.430
Joint	19	21	
Residence (n)			
Urban	33	30	0.210
Rural	17	20	
Occupation (n)			
Employed	20	18	0.680
Homemaker	30	32	
Family income in ₹			
<10 000/month	26	25	0.890
>10 000/month	24	25	
Education (n)			
Till V standard	31	31	1.000
Above V standard	19	19	
HAD-A rating score (out of 21)	3.64	3.30	0.622
HAD-D rating score (out of 21)	4.01	3.58	0.086
Sexual dysfunction (FSFI <26.55), *n* (%)	10 (20)	22 (44)	<0.001

HAD-A hospital anxiety and depression scale-anxiety HAD-D hospital anxiety and depression scale-depression FSFI female sexual function index

artery disease (CAD) and cerebrovascular accident (CVA). Women with DM who were older, had a higher BMI, greater duration of DM and receiving insulin therapy had significantly more sexual dysfunction (Tables III and IV).

The independent variables (age, sociodemographic characteristics, status of DM, etc.) were subjected to multivariate regression analysis with sexual dysfunction as a categorical-dependent variable (Table V). Age, increasing number of family members, presence of DM and employment among study population had a positive association with the presence of sexual dysfunction.

TABLE II. Comparison of mean (SD) female sexual function index (FSFI) scores in different domains

FSFI domain	Study group (*n*=50)	Control group (*n*=50)	p value
Desire	3.8 (0.42)	4.1 (0.55)	<0.001
Arousal	4.1 (0.30)	4.5 (0.35)	<0.001
Lubrication	4.9 (0.27)	5.3 (0.33)	<0.001
Orgasm	4.1 (0.39)	4.3 (0.57)	0.014
Satisfaction	4.9 (0.26)	5.0 (0.28)	0.067
Pain	4.4 (0.44)	4.4 (0.46)	0.895
FSFI-total	26.1 (1.47)	27.6 (1.90)	<0.001

DISCUSSION

We found that women with DM had a significant reduction in FSFI score compared with healthy controls, suggesting a decline in sexual function. Further, more than twice the number of women with DM had sexual dysfunction compared with controls (44% *v*. 20%). This trend has been observed in other studies too[10–13] that range across various cultures, religions, lifestyle habits, sexual behaviours and ethnic groups. Almost all suggest significantly higher prevalence of sexual dysfunction among women with DM, both types 1 and 2.[4,10–18]

Previous studies have reported prevalence of FSD in up to 90% of women with DM (Table VI). The prevalence rates for FSD for type 1 DM have been 25%–75%, while for type 2 DM these are 9%–90%. These high rates of sexual dysfunction may be attributed to the higher prevalence of depression among women with DM (an independent risk

TABLE III. Correlation of sociodemographic parameters and illness-related parameters with female sexual function index (FSFI) scores in females with diabetes

FSFI total	Age	Number of children	Diabetes		Number of anti-DM medication	Body mass index	HbA1c	Blood sugar	
			Duration	Age at onset				Fasting	Post-prandial
Pearson correlation	–0.33	–0.155	–0.553	0.265	–0.128	–0.59	0.033	–0.083	–0.034
Significant (two-tailed)	0.001	0.122	0.000	0.063	0.376	0.000	0.822	0.567	0.815

DM diabetes mellitus HBA1c glycosylated haemoglobin

TABLE IV. Correlation of categorical sociodemographic and illness-related parameters with sexual dysfunction

Parameter	Sexual dysfunction		Total	p value
	No (28)	Yes (22)		
Religion				
Hindu	27	18	33	0.247
Muslim	1	1	2	
Christian	0	1	1	
Sikh	0	2	2	
Family				
Nuclear	17	14	31	0.833
Joint	27	10	37	
Residence				
Urban	20	13	33	0.361
Rural	8	9	17	
Family income (₹)				
<10 000/month	13	13	26	0.374
>10 000/month	15	9	24	
Education				
Till V standard	16	15	31	0.423
Above V standard	12	7	19	
Occupation				
Employed	10	10	20	0.485
Homemaker	18	12	30	
Treatment				
Oral hypoglycaemic agents	24	9	33	<0.001
Oral hypoglycaemic agents and insulin	4	13	17	
*Complications of diabetes**				
Yes	1	12	13	<0.001
No	27	10	37	
Comorbid conditions†				
Yes	0	5	5	0.008
No	28	17	45	
Family history of diabetes				
Yes	9	13	22	0.057
No	19	9	28	

* include presence of retinopathy, nephropathy and neuropathy
† include presence of coronary artery disease and cerebrovascular accidents
sexual dysfunction defined as female sexual function index (FSFI) score <26.55

factor for sexual dysfunction) in these studies. However, we excluded clinical depression and anxiety in our study group, which could explain for a moderate rate of sexual dysfunction. Prevalence rates also vary depending on the criteria used to define sexual dysfunction in different studies and the study sample.[6]

The reduction was seen across most items of FSFI (desire, arousal, lubrication, orgasm and pain) compared with controls ($p<0.01$). Various vascular, metabolic and neuronal complications associated with DM could be responsible for this reduction in FSFI scores and the different domains.[19] A few studies showed that nitric oxide synthase and vasoactive intestinal polypeptide, which mediate vaginal vasocongestion and lubrication, are impaired in women with DM.[20] Further, hyperglycaemia is hypothesized to reduce hydration of the mucus membranes including vagina, resulting in poor vaginal lubrication, silent vaginal inflammation and dyspareunia.[6]

Desire was significantly reduced among women with DM, in spite of ruling out clinical depression, suggesting that factors other than psychological are also involved. The probable reasons suggested are androgen insufficiency leading to poor general condition, lethargy, loss of interest, fatigue, vasomotor symptoms and headache. Thyroid disorders and high prolactin levels also affect vaginal lubrication, orgasm and arousal and are associated with increased coital pain.[21]

The data regarding FSD in DM are inconsistent. Most previous work has shown reduction in desire among women with DM (20%–80%), while others have found no effect on desire.[4,12,15,25–27] Similarly, variable results have been seen in arousal problems, ranging from 14% to 76% to no effect.[4,14–17,25–27] Difficulty in orgasm is most consistently reported ranging from 10% to 84%.[4,12,15–17] Dyspareunia rates have varied from 0% to 40% across studies, with higher prevalence in type 2 DM.[14,17,18] The rates of all these domains vary depending upon the criteria used for definitions, scales used for cut-off limits and type of DM.

On evaluating factors associated with FSD in DM, the presence of complications such as retinopathy, nephropathy and neuropathy were the most significant predictors for

TABLE V. Logistic regression analysis to identify predictors of sexual dysfunction among study population (n=100)

Item	Adjusted odds ratio	95% confidence interval		p value*
		Lower bound	Upper bound	
Age	1.229	1.022	1.477	0.028*
Number of family members	4.441	1.484	13.287	0.008*
Diabetes present	7.093	1.794	28.046	0.005*
Diabetes absent	Reference			
Nuclear family	0.215	0.043	1.076	0.061
Joint family	Reference			
Residing in urban area	0.957	0.209	4.381	0.955
Residing in rural area	Reference			
Family income <₹10 000	1.245	0.229	6.779	0.800
Family income ≥₹10 000	Reference			
Educated till primary school	1.145	0.193	6.791	0.882
Educated above primary school	Reference			
Occupation: Employed	18.476	2.255	151.346	0.007*
Occupation: Homemaker	Reference			

TABLE VI. Recent clinical studies on sexual dysfunction in women with diabetes mellitus

Author(s) (year), reference	Type of diabetes	*n*	Prevalence of sexual dysfunction (%)	Sexual domains affected
Mazzilli *et al*. (2015)[19]	1	49	51	Arousal, desire, lubrication, dyspareunia, and orgasm
	2	24	9	Desire
Elyasi *et al*. (2015)[22]	2	150	78.7	Desire, lubrication, arousal, orgasm
Sharifiaghdas *et al*. (2012)[23]	2	45	66.7	Desire, arousal sensation and pain
Esposito *et al*. (2010)[24]	2	595	53	No control group
Nowosielski *et al*. (2010)[25]	1	118	26.5	Desire, arousal, lubrication
	2	146	42.2	All
Ogbera *et al*. (2009)[26]	2	58	88 (non-significant)	Desire, arousal, satisfaction
Wallner *et al*. (2010)[18]	1	26	Not reported	Dyspareunia
	2	75	No correlation	
Olarinoye and Olarinoye (2008)[14]	2	51	Significantly higher female sexual dysfunction (prevalence not reported)	Arousal, orgasm, pain, satisfaction
Abu Ali *et al*. (2008)[15]	Both	613	59.6	Desire, arousal, lubrication, orgasm
Mezones-Helguin *et al*. (2008)[27]	Both	36	75	All
Doruk *et al*. (2005)[16]	Both	18	71	Arousal, lubrication, orgasm
	Both	25	42 (non-significant)	Arousal

sexual dysfunction. This has also been shown in previous studies.[13,23,27] This may be due to neurovascular impairment that leads to reduction in sexual well-being.

We found that age, BMI, duration of DM, insulin therapy and comorbid CVA/CAD were also significantly associated with FSD. There has been great variability in the literature regarding these predictors. Esposito *et al*.[24] found age and metabolic syndrome to be significantly associated with FSD. A few other studies have also found some association between factors such as BMI, duration of DM and age of patient with FSD.[5,24] In general, determinants of FSD in women with type 2 DM include age, duration of DM, BMI and vascular complications.[5,14,15] However, the same may not be true for those with type 1 DM. Enzelin *et al*. did not find any correlation with FSD and BMI in type 1 DM.[11] Many other studies have similarly not found any or minimal association with most sociodemographic and illness-related variables in both types of DM.[13,14,27] We found, on multivariate analysis, age, presence of DM, employment and number of family members to be significant independent predictors of FSD. Physical inactivity at work, altered dietary practices and chronic stress could be related to higher sexual dysfunction among the employed.

Our study has certain important limitations. We did not classify women with type 1 or 2 DM. This could have given us mixed results in terms of predictors and domains of sexual dysfunction. Thyroid, prolactin and androgen analysis was not done before recruitment due to infrastructure limitations, and could have affected our results. The questionnaire was administered in English rather than in the vernacular language.

Nonetheless, in all probability, our study is the first from India to systematically assess FSD in DM. We ruled out anxiety and depression and this helped in assessing other independent predictors of FSD.

Conclusion

We found that FSD is common in DM, irrespective of coexisting psychological factors such as depression and anxiety. FSD in those with DM may be predicted by existing complications such as retinopathy, nephropathy and neuropathy. High BMI, higher age, duration of DM, treatment with insulin and comorbid CVA and CAD may predict a higher degree of FSD.

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Conflicts of interest. None declared

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Erratum

In the Clinical Case Report titled 'Disseminated *Mycobacterium abscessus* infection in a patient on haemodialysis' by Fernandes A, Chitralli DK, Srividya S, Sreekumar G, published in *Natl Med J India* 2023;**36:**93–4, the affiliation of Dr Anisha Fernandes should be read as 'Department of Microbiology, Kasturba Medical College, Mangalore, Manipal Academy of Higher Education, Manipal, India'.

We regret the error.

—Editors