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To assess female sexual functioning and severity of insomnia in females with diagnosis of depression: A hospital based cross sectional study

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Abstract
Objectives: To study the prevalence and severity of sexual dysfunction and insomnia in female patients of clinically diagnosed depression.
Methods: The study was carried out on 210 females fulfilling the ICD-11 criteria for depression including first episode of depression, "recurrent depressive disorder, and bipolar affective disorder with current episode of depression" were included in the study. FSFI, ISI and HDRS scales were used to assess female sexual dysfunction, insomnia and depression.
Results: Mild, moderate, severe, and very severe depression was present in 28 (13.33%), 85 (40.48%), 60 (28.57%), and 37 (17.62%) participants. Female sexual dysfunction was present in 154 (73.33%) patients. In 3 (1.43%) of the patients there were no clinically significant insomnia, 95 (45.24%) had subthreshold insomnia, and 88 (41.90%) had moderate clinical insomnia, and 24 (11.43%) had severe clinical insomnia. Compared to women without sexual dysfunction, those with sexual dysfunction had significantly higher mean total HDRS score (19.92 ± 6.01 vs. 17.61 ± 4.73, P=0.01).HDRS score showed significantly positive correlation with insomnia severity index (ISI) (r= 0.272, P=0.0001) and negative correlation with FSFI (r= -0.323, p<0.0001).
Conclusion: The prevalence of sexual dysfunction was 73.33%. Depression had significant correlation with sexual dysfunction as well as insomnia.

Keywords: Depression, insomnia, sexual dysfunction

Introduction
Depression is common mental disorder that causes a persistent feeling of sadness and loss of interest. It has been estimated by the World Health Organization that globally 3.8% of the population has depression, which includes 5% adults and 5.7% of people with age more than 60 years. This 3.8% accounts for over 280 million people with depression. In comparing men against women, it has been seen that women have 50% more chances of experiencing depression than men. Notwithstanding, even suicide is very common in depression and every year around 7 lakh people commit suicide in depression. In India, National Mental Health Survey states that among every 20 Indians, there is one person with depression. Depression is common mental disorder causing a continuous depressed mood along with that it brings with itself other changes in the woman related to appetite, fatigue, anxiety, poor concentration, decisions making recently it has been linked to sexual dysfunction among females and sleep related problems.2,5,11 Evidence remains discrepant in this regard. To further elaborate the association the present study to determine the prevalence of FSD and Correlation of sexual dysfunction with insomnia and grade of severity of depression.

Materials and Methods
The study was conducted in the Department of Psychiatry at the Maharishi Markandeshwar Institute of Medical Sciences and Research, Mullana (Ambala) for a period of 15 months. 210 Females who fulfilled the ICD-11 criteria for depression and attended Department of Psychiatry at the 'Maharishi Markandeshwar Institute of Medical Sciences and Research, Mullana (Ambala)' during the study period, i.e. from toJuly 2022 to May 2024.

Institutional Review Board Statement

The study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Review Board (or Ethics Committee) of Maharishi Markandeshwar Institute of Medical Sciences & Research (MMIMS&R), Mullana, Ambala (Project No - IEC-169-P).

Inclusion criteria

- Participants who are willing to participate in this study.
- Participants fulfilling the ICD-11 criteria for depression including first episode of depression, Bipolar Affective Disorder with current episode of depression, and Recurrent Depressive Disorder.
- Participants who were married and sexually active.
- Participants aged between 18-45 years of age.
- Participants who were not receiving any psychiatric medication for a current illness.

Exclusion criteria

- Participants who did not give written or informed consent.
- Participants who were not experiencing any kind of obstetric or gynecological complaints.
- Participants who have attained menopause.
- Participants who were indulging in any kind of substance abuse.
- Participants with any organic cause for clinically diagnosed depression.
- Participants with Co-existing medical co-morbidities.

After satisfying the inclusion & exclusion criteria, the enrolled patients were explained about study and data was filled in the pre-designed study performer which comprised of socio-demographic data and the data based on the scales. Three scales were used that is HDRS, FSFI and the ISI. The questions were explained to the patients in vernacular language and the answers were recorded by the principal investigator herself. The outcome measures were prevalence of FSD among depressed patients and the severity of insomnia seen among them.

Statistical analysis

Data representation was done in the form of numbers, percentages, mean with standard deviation and median with interquartile range. Normality of the data was assessed by Shafiro-Wilk test. Non-parametric tests were applied for analyzing the data which did not follow normal distribution. Qualitative variables were associated using independent t-test while qualitative variables were associated using chi-square test. Fisher's exact test was only used in special cases where expected cell value was less than 5. For assessing any correlations such as between depression score, FSD score and insomnia score, Pearson correlation coefficient was used. Microsoft Excel spreadsheet was filled with the data and a special software named “Statistical Package for Social Sciences (SPSS) software version 25.0 (IBM, Chicago, USA)” was used for analysis. A p-value of less than 0.05 was considered statistically significant.

Results and Observations

The study was carried out at “Department of Psychiatry at the Maharishi Markandeshwar Institute of Medical Sciences and Research, Mullana (Ambala)”. 210 females fulfilling the ICD-11 criteria for depression including “first episode of depression, Recurrent Depressive Disorder, Bipolar Affective Disorder with current episode of depression” were included in the study. Prevalence and nature of sexual dysfunction in female patients of clinically diagnosed depression was studied and results are as follows.

Table 1: Age of patient distribution.

Age of patient	Frequency	Percentage
18 to 30 years	42	20.00%
31 to 40 years	85	40.48%
41 to 50 years	70	33.33%
>50 years	13	6.19%
Total	210	100.00%

The age distribution of the patients was as follows: 85 cases (40.48%) were between 31 to 40 years, 70 cases (33.33%) were between 41 to 50 years, 42 cases (20.00%) were between 18 to 30 years and13(6.19%) were >50 years. (Table 1, figure 1).

Table 2: Type of family distribution.

Type of family	Frequency	Percentage
Joint	146	69.52%
Nuclear	64	30.48%
Total	210	100.00%

Analysis of family types revealed that 69.52% of the cases, or 146 families, were joint families, while 30.48% (64 families) were nuclear. (Table 2, figure 2).

Table 3: Locality distribution.

Locality	Frequency	Percentage
Rural	93	44.29%
Urban	117	55.71%
Total	210	100.00%

The locality distribution of the patients indicated that 44.29% (93 individuals) resided in rural areas, whereas 55.71% (117 individuals) were from urban locales, from a total of 210 cases. (Table 3, figure 3).

Table 4: Socio economic class distribution

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Socio economic class	Frequency	Percentage
Lower (<1230)	10	4.76%
Lower middle (1230-2464)	56	26.67%
Middle (2465-4109)	128	60.95%
Upper middle (4110-8219)	16	7.62%
Total	210	100.00%

Socio-economic classification showed that 4.76% (10 individuals) belonged to the lower class, 26.67% (56 individuals) to the lower-middle class, and the largest portion, 60.95% (128 individuals), belonged to the middle class. The upper-middle class comprised 7.62% with 16 individuals. (Table 4, figure 4).

Table 5: Total HDRS score distribution.

Total HDRS score	Frequency	Percentage	Mean ± SD
Mild depression	28	13.33%	19.3 ± 5.8
Moderate depression	85	40.48%	
Severe depression	60	28.57%	
Very severe depression	37	17.62%	

The total HDRS score distribution among the cases was as follows: 85 cases (40.48%) had moderate depression, 60 cases (28.57%) had severe depression, 37 cases (17.62%) had very severe depression, and 28 cases (13.33%) had mild depression. The mean total HDRS score was 19.3 ± 5.8. (Table 5, figure 5).

Table 6: Association of age of patient with grades of depression.

Age of patient	Mild (n=28)	Moderate (n=85)	Severe (n=60)	Very severe (n=37)	Total	P value
19 to 30 years	7 (25%)	20 (23.53%)	9 (15%)	6 (16.22%)	42 (20%)	0.883
31 to 40 years	10 (35.71%)	36 (42.35%)	26 (43.33%)	13 (35.14%)	85 (40.48%)	
41 to 50 years	10 (35.71%)	24 (28.24%)	21 (35%)	15 (40.54%)	70 (33.33%)	
>50 years	1 (3.57%)	5 (5.88%)	4 (6.67%)	3 (8.11%)	13 (6.19%)	
Total	28 (100%)	85 (100%)	60 (100%)	37 (100%)	210 (100%)	

The association of age with severity of depression showed no significant difference (p = 0.883). Patients aged 31 to 40 years had the highest prevalence across all grades of depression: 35.71% in mild, 42.35% in moderate, 43.33% in severe, and 35.14% in very severe depression. Those aged 41 to 50 years also had significant representation: 35.71% in mild, 28.24% in moderate, 35% in severe, and 40.54% in very severe depression. Patients aged 18 to 30 years and those over 50 years had lower prevalence rates across all depression grades (Table 6, figure 6).

Table 7: Association of type of family with grades of depression.

Type of family	Mild (n=28)	Moderate (n=85)	Severe (n=60)	Very severe (n=37)	Total	P value
Joint	20 (71.43%)	66 (77.65%)	38 (63.33%)	22 (59.46%)	146 (69.52%)	0.136
Nuclear	8 (28.57%)	19 (22.35%)	22 (36.67%)	15 (40.54%)	64 (30.48%)	
Total	28 (100%)	85 (100%)	60 (100%)	37 (100%)	210 (100%)	

The distribution of family types among different grades of depression shows no significant association (p = 0.136). Joint families are more common across all depression grades: 71.43% in mild, 77.65% in moderate, 63.33% in severe, and 59.46% in very severe depression. In contrast, nuclear families are less prevalent, with 28.57% in mild, 22.35% in moderate, 36.67% in severe, and 40.54% in very severe depression. The overall trend indicates that individuals from joint families have a higher representation in all categories of depression (Table 7, figure 7).

Table 8: Association of locality with grades of depression.

Locality	Mild (n=28)	Moderate (n=85)	Severe (n=60)	Very severe (n=37)	Total	P value
Rural	13 (46.43%)	38 (44.71%)	24 (40%)	18 (48.65%)	93 (44.29%)	0.852
Urban	15 (53.57%)	47 (55.29%)	36 (60%)	19 (51.35%)	117 (55.71%)	
Total	28 (100%)	85 (100%)	60 (100%)	37 (100%)	210 (100%)	

The distribution of locality among different grades of depression showed no significant association (p = 0.852). Individuals from rural areas made up 46.43% of those with mild depression, 44.71% with moderate depression, 40% with severe depression, and 48.65% with very severe depression. Urban residents accounted for 53.57% of those with mild depression, 55.29% with moderate depression, 60% with severe depression, and 51.35% with very severe depression. Overall, there was a slightly higher representation of urban individuals across all grades of depression, but the difference was not statistically significant (Table 8, figure 8).

Table 9: Association of socio-economic class with grades of depression.

Socio economic class	Mild (n=28)	Moderate (n=85)	Severe (n=60)	Very severe (n=37)	Total	P value
Lower (<1230)	2 (7.14%)	4 (4.71%)	2 (3.33%)	2 (5.41%)	10 (4.76%)	0.531
Lower middle (1230-2464	10 (35.71%)	25 (29.41%)	14 (23.33%)	7 (18.92%)	56 (26.67%)	
Middle (2465-4109)	14 (50%)	53 (62.35%)	37 (61.67%)	24 (64.86%)	128 (60.95%)	
Upper middle (4110-8219)	2 (7.14%)	3 (3.53%)	7 (11.67%)	4 (10.81%)	16 (7.62%)	
Total	28 (100%)	85 (100%)	60 (100%)	37 (100%)	210 (100%)	

The distribution of socio-economic class among different grades of depression showed no significant association (p = 0.531). Lower socio-economic class (<1230) had a small representation: 7.14% in mild, 4.71% in moderate, 3.33% in severe, and 5.41% in very severe depression. The lower middle class (1230-2465) comprised 35.71% in mild, 29.41% in moderate, 23.33% in severe, and 18.92% in very severe depression. The middle class (2465-4100) had the highest representation with 50% in mild, 62.35% in moderate, 61.67% in severe, and 64.86% in very severe depression. The upper middle class (4110-8210) was least represented with 7.14% in mild, 3.53% in moderate, 11.67% in severe, and 10.81% in very severe depression. Overall, the middle class had the highest prevalence across all depression grades (Table 9, figure 9).

Table 10: Insomnia severity index distribution.

Insomnia severity index	Frequency	Percentage	Mean ± SD
No clinically significant insomnia	3	1.43%	15.71 ± 4.01
Subthreshold insomnia	95	45.24%	
Clinical insomnia {Moderate severity}	88	41.90%	
Clinical insomnia {Severe}	24	11.43%	

The distribution of the Insomnia Severity Index among the cases was as follows: 95 cases (45.24%) had subthreshold insomnia, 88 cases (41.90%) hadclinical insomnia of moderate severity, 24 cases (11.43%) had clinical insomnia of severe severity, and 3 cases (1.43%) had no clinically significant insomnia. The mean Insomnia Severity Index of the study subjects was 15.71 ± 4.01, with a median (IQR) of 15 (13.25-18). (Table 10, figure 10).

Table 11: Descriptive statistics of domains of FSFI and total FSFI score.

Domains of FSFI and total FSFI score	Mean ± SD	Median (25^{th}-75^{th} percentile)	Range
Desire	3.77 ± 0.88	3.6(3.6-4.2)	0.6-5.4
Arousal	3.18 ± 1.15	3(2.4-4.275)	0.3-5.7
Lubrication	3.18 ± 1.17	3(2.4-4.3)	0-5.2
Orgasm	3.17 ± 1.59	2.8(2-4.8)	0-6
Satisfaction	3.33 ± 1.14	3.6(2.4-4)	0.8-5.6
Pain	3.53 ± 1.43	3.6(2.4-4.8)	0-6
Total FSFI	20.15 ± 6.43	19.25(15.75-27.6)	2.3-31.8

The mean values (± SD) of the study subjects for desire, arousal, lubrication, orgasm, satisfaction, pain, and total FSFI were as follows: desire (3.77 ± 0.88), arousal (3.18 ± 1.15), lubrication (3.18 ± 1.17), orgasm (3.17 ± 1.59), satisfaction (3.33 ± 1.14), pain (3.53 ± 1.43), and total FSFI (20.15 ± 6.43). The median (IQR) values for these parameters were: desire (3.6 [3.6-4.2]), arousal (3 [2.4-4.275]), lubrication (3 [2.4-4.3]), orgasm (2.8 [2-4.8]), satisfaction (3.6 [2.4-4]), pain (3.6 [2.4-4.8]), and total FSFI (19.25 [15.75-27.6]) (Table 10, figure 11.1 and 11.2).

Table 12: Female sexual dysfunction distribution.

Female sexual dysfunction	Frequency	Percentage
With	56	26.67%
Without	154	73.33%
Total	210	100.00%

Female sexual dysfunction was present in 154 cases (73.33%) and absent in 56 cases (26.67%). (Table 12, figure 12).

Table 13: Association of age of patient with FSD

Age of patient	Females with sexual dysfunction(n=154)	Females without sexual dysfunction(n=56)	Total	P value
18 to 30 years	23 (14.94%)	19 (33.93%)	42 (20%)	0.001*
31 to 40 years	58 (37.66%)	27 (48.21%)	85 (40.48%)	
41 to 50 years	62 (40.26%)	8 (14.28%)	70 (33.33%)	
>50 years	11(7.14%)	2(3.57%)	13 (6.19%)	
Total	154 (100%)	56 (100%)	210 (100%)	

***Fisher's exact test**

Compared to females without sexual dysfunction, females with sexual dysfunction had a higher prevalence in the 41 to 50 years age group (40.26% vs. 14.28%) and a lower prevalence in the 18 to 30 years age group (14.94% vs. 33.93%) and the 31 to 40 years age group (37.66% vs. 48.21%). The prevalence was slightly higher in the over 50 years age group (7.14% vs. 3.57%). The differences were statistically significant (p = 0.001) (Table 13, figure 13).

Table 14: Association of type of family with FSD.

Type of family	Females with sexual dysfunction(n=154)	Females without sexual dysfunction(n=56)	Total	P value
Joint	108 (70.13%)	38 (67.86%)	146 (69.52%)	0.752
Nuclear	46 (29.87%)	18 (32.14%)	64 (30.48%)	
Total	154 (100%)	56 (100%)	210 (100%)	

The distribution of family type was comparable between females with and without sexual dysfunction. For joint families, the proportions were 70.13% vs. 67.86%, respectively, and for nuclear families, the proportions were 29.87% vs. 32.14%, respectively (p value = 0.752) (Table 14, figure 14).

Table 15: Association of locality with FSD.

Locality	Females with sexual dysfunction(n=154)	Females without sexual dysfunction(n=56)	Total	P value
Rural	63 (40.91%)	30 (53.57%)	93 (44.29%)	0.102
Urban	91 (59.09%)	26 (46.43%)	117 (55.71%)	
Total	154 (100%)	56 (100%)	210 (100%)	

The distribution of locality was comparable between females with and without sexual dysfunction. For rural areas, the proportions were 40.91% vs. 53.57%, respectively, and for urban areas, the proportions were 59.09% vs. 46.43%, respectively (p value = 0.102) (Table 15, figure 15).

Table 16: Association of socio-economic class with FSD.

Socio economic class	Females with sexual dysfunction(n=154)	Females without sexual dysfunction(n=56)	Total	P value
Lower (<1230)	6 (3.90%)	4 (7.14%)	10 (4.76%)	0.48
Lower middle (1230-2464)	39 (25.32%)	17 (30.36%)	56 (26.67%)	
Middle (2465-4109)	98 (63.64%)	30 (53.57%)	128 (60.95%)	
Upper middle (4110-8219)	11 (7.14%)	5 (8.93%)	16 (7.62%)	
Total	154 (100%)	56 (100%)	210 (100%)	

The distribution of socio-economic class was comparable between females with and without sexual dysfunction. For the lower class (<1230), the proportions were 3.90% vs. 7.14%, respectively; for the lower middle class (1230-2465), the proportions were 25.32% vs. 30.36%; for the middle class (2465-4109), the proportions were 63.64% vs. 53.57%; and for the upper middle class (4110-8219), the proportions were 7.14% vs. 8.93%(p value = 0.48). (Table 16, figure 16).

Table 17: Association of total HDRS score with FSD.

Total HDRS score	Females with sexual dysfunction(n=154)	Females without sexual dysfunction(n=56)	Total	P value
Mild depression	16 (10.39%)	12 (21.43%)	28 (13.33%)	0.035‡
Moderate depression	62 (40.26%)	23 (41.07%)	85 (40.48%)	
Severe depression	43 (27.92%)	17 (30.36%)	60 (28.57%)	
Very severe depression	33 (21.43%)	4 (7.14%)	37 (17.62%)	
Mean ± SD	19.92 ± 6.01	17.61 ± 4.73	19.3 ± 5.78	0.01†

Total HDRS scores were found to have a significant association with sexual dysfunction (p value = 0.035) (Table 17; figure 17).

Table 18: Association of insomnia severity index with FSD.

Insomnia severity index	Females with sexual dysfunction(n=154)	Females without sexual dysfunction(n=56)	Total	P value
No clinically significant insomnia	3 (1.95%)	0 (0%)	3 (1.43%)	0.261
Subthreshold insomnia	72 (46.75%)	23 (41.07%)	95 (45.24%)	
Clinical insomnia {Moderate severity}	59 (38.31%)	29 (51.79%)	88 (41.90%)	
Clinical insomnia {Severe}	20 (12.99%)	4 (7.14%)	24 (11.43%)	
Mean ± SD	15.73 ± 4.12	15.66 ± 3.7	15.71 ± 4.01	0.907

Female Sexual Dysfunction was found to have no significant association with severity of insomnia according to ISI (p value = 0.261) (Table 18; figure 18).

Table 19: Correlation (r value) of HDRS score with FSFI and ISI.

Correlation	HDRS	FSFI	ISI
HDRS	1	-0.323	0.272
FSFI	-0.323	1	-0.209
ISI	0.272	-0.209	1

The Pearson correlation coefficients between the scales FSFI, ISI, and HDRS reveal the following relationships: HDRS and FSFI have a negative correlation of r=-0.323, indicating that higher HDRS scores are associated with lower FSFI scores. HDRS and ISI exhibit a positive correlation of r=0.272, suggesting that higher HDRS scores are associated with higher ISI scores. Lastly, ISI and FSFI showed a negative correlation in scores; r=-0.209, indicating that higher ISI scores are associated with lower FSFI scores. (Table 18, figure 18-20)

Discussion

Depression is common mental disorder causing a continuous depressed mood along with that it brings with itself other changes in the woman related to appetite, fatigue, anxiety, poor concentration, decisions making recently it has been linked to sexual dysfunction among females and sleep related problems.2,5, [11] Evidence remains discrepant in this regard. To further elaborate the association the present study was conducted on 210 females fulfilling the ICD-11 criteria for depression including first episode of depression to determine the prevalence of FSD and correlation of sexual dysfunction with insomnia and grade of severity of depression.

Age

In the present study, the majority [85 (40.48%)] of the patients belonged to the age group of 31 to 40 years, followed by 41 to 50 years [70 (33.33%)] with 20% in 19-30 years range and 6.19% with >50 years range. Among other studies, Reddy RM *et al*., [7] reported that out of 135 women with depression (18-45 years), the mean age was 32.09±5.68 years. Sreelakshmy *et al*., [31] studied 142 women with depression (18-45 years), with the mean age being 37.7 years. Devkota L *et al*., [28] reported that the mean age of the women was 35.37 ± 10.34 years. The majority (74.51%) of the women were of 26-50 years age group. The age group of our studies and other studies were similar indicating that depression is more prevalent in the forties.

Type of family

In this study, 146 (69.52%) of the patients were from joint families, while 64 (30.48%) were from nuclear families.In a similar study, Reddy RM *et al*., [7] reported that out of 135 females with depression, 79(58.51%) belonged to nuclear family, 45(33.33%) to extended family, and 11 (8.14%) to joint family. In the study by Pawar N *et al*., [4] 14 (9.7%) of the patients were from joint family, 46 (21.3%) from nuclear family, and 37 (15.1%) from three generation family. This shows that nuclear families have more depression which can

be because families are needed for care, comfort and cure. They contribute to the emotional environment the depressed person inhabits. A system of joint families is better in this regard as there can be more members to support a person emotionally, and socio-economically [61].

Locality/Residence

In this study, 117 (55.71%) of the patients were from urban area, while 93 (44.29%) were from rural area.Among other studies, in the study by Reddy RM *et al*., [7] out of 135 females with depression, 44(32.59%) belonged to rural area, 63(46.66%) to semi urban area, and 28 (20.74%) to urban area. In the study by Muhammad T, [4] which included women with depression (> 60 years), 4935 (32.2%) were from urban area and 8806 (67.8%) from rural area. The statistics show that depression can be prevalent in rural or urban area as it may depend on various other factors like income, type of family, age of patient and socio-economic status [61].

Socioeconomic status

In the present study, majority of the patients, i.e. 128 (60.95%) individuals), were from the middle class, followed by 56 (26.67%) from lower-middle class, 16 (7.62%) from upper-middle class, and 10 (4.76%) from lower class.Among other studies, in the study by Reddy RM *et al*., [7] out of 135 females with depression, 33(24.44%) belonged to lower class, 82(60.74%) to middle class, and 20 (14.81%) to high class.Sreelakshmy K *et al*. [31] reported that 50% of the women belonged to low socioeconomic status and remaining 50% to middle socioeconomic class.In the study by Chandel S *et al*., [56] 46 (48.9%) belonged to upper class, 38 (40.4%) to upper middle class, and 10 (10.6%) to middle class. Since our hospital caters to primarily middle class, this may be the reason why the patients belonged primarily to middle and lower-middle class in our study.

Depression

All women enrolled in the study had diagnosed depression wherein mild depression was present in 28 (13.33%) participants, moderate depression in 85 (40.48%), severe depression in 60 (28.57%), and very severe depression in 37 (17.62%) participants. Grades of depression showed no significant association with age, locality and socio-economic status of the patients. Among other studies, Reddy RM *et al*. [7] reported that out of 135 women with depression, mild depression, moderate depression, and severe depression were present in 47.40%, 44.44%, and 8.15% of the women, respectively. Devkota L *et al*. [28] reported that minimal depression was present in 36(53.3%) women, moderate depression in 30 (29.4%), severe depression in 21 (20.6%), and mild depression in 15 (14.7%) women. In the study by Abhivant *et al*., [36] moderate depression was present in 22 (44.89%) women, severe depression in 16(32.65%), and extreme depression in 11(22.44%) women. In the study by Chandel S *et al*., [56] mild/moderate and severe depression were present in 67% and 33% of the women, respectively. Likewise, the studies also found that grades of depression showed no significant association with age, locality and socio-economic status of the patients. This indicated that these factors did not affect the depression severity.

For assessing depression, HDRS scale was used. The HDRS is widely regarded as the benchmark for measuring depression. It includes 17 items assessed through a semi-structured interview. Eight of these items are evaluated on five-point scale (where 0 stands for absent; 1 as mild; 2 as mild to moderate; 3 as moderate to severe; 4 as very severe), while the other nine items use a three-point scale (where 0 stands for absent; 1 as mild; 2 as clearly present). The total score ranges from 0 (least severe) to 52 (most severe). A positive response was the reduction of 50% or more in the HDRS-17 total score from the baseline [].

In the present study, the mean HDRS score was 19.3 ± 5.8. In the study by Liu X *et al*., [34] ASEX scale was used for measuring sexual dysfunction. In the study by Reddy RM *et al*., [7] HAM-D score was used for assessing depression.The mean HAM-D score was 14.60 which indicates more responses for moderate depression, co inciding with our present study. However, Sreelakshmy K *et al*., [31] reported that the mean HAM-D score was 25.05±5.88, pointing more towards severe depression.Overall, HDRS scale seems to be the standard scale to assess depression with majority studies supporting greater incidence of moderate depression.

Female sexual dysfunction

For assessing FSD, FSFI scale was used where higher scores indicate better sexual functioning [58, 5]. In the present study, the mean FSFI score was 20.15 ± 6.43. In the study by Liu X *et al*., [34] ASEX score was used for measuring sexual dysfunction. The mean ASEX score was 19.6 ± 5.5. MujawarS *et al*. [6] found that in 53 women with depression, the mean FSFI score was 20.67. Reddy RM *et al*. [7] reported that the mean FSFI score was 27.79±3.38. Sreelakshmy K *et al*. [31] reported that the mean FSFI score was 15±5.2.

As per the FSFI cutoff values of 26.55, Female sexual dysfunction was present in 154 (73.33%) patients in our study which had FSFI score of <26.55. Similar findings were reported by Liu X *et al*., [34] who found that out of 273 patients with depression, sexual dysfunction was present in 75.3% females.Sreelakshmy K *et al*. [31] reported 90% prevalence of sexual dysfunction was present among depressed females. Pindikura RK *et al*. [33] found that out of 40 women with major depressive disorder, sexual dysfunction was present in 26(65%) women.Liu X *et al*. [34] reported that out of 273 patients with depression, sexual dysfunction was present in 75.3% females. Abhivant *et al*. [36] found that in 49 women with depressive disorder, clinical sexual dysfunction was present in 33(67.34%) women. In the study by Devkota L *et al*., [28] (2022) among 102 women with depression, sexual dysfunction was present in 58.82% women. In the study by Chandel S *et al*., [56] sexual dysfunctions were present in95.7% of the women.

This coincides with the fact that the prevalence of sexual dysfunction is significantly higher among patients with depression compared to the general population [5, 6, 7]. A meta-analysis including 12 studies on patients with depressive and persistent depressive disorders observed that sexual dysfunction was present in 82.75% of women and 63.26% of men [7].

Association of age of patient with FSD

Compared to women without sexual dysfunction, those with sexual dysfunction had significantly more women of 41 to 50 years age group (47.40% vs. 17.86%) and in the over 50 years age group (7.14% vs. 3.57%), p=0.001). Similarly, Pindikura RK *et al*., [33] reported that age was significantly associated with sexual dysfunction (P=0.038). Liu X *et al*.

[34] found that the age ≥45years was associated with sexual dysfunction (OR=2.33). On the contrary, Devkota L *et al.* [28] found that age showed no significant association with sexual dysfunction (P=0.19). In contrast, Sreelakshmy K *et al.* [31] found that sexual dysfunction showed no significant association with age of the patient (p=0.516). The reason can be that with increasing age, sexual feelings also wane off more in depressed women. This decline has been seen to begin in a woman's late 20s to late 30s [5]. Though the precise reason remains unknown, it can be ascribed to the relatively lower female hormones and the presence of depression in our study cohort.

Association of type of family with FSD

There was no significant association of type of family with FSD (P=0.752). Similarly, Devkota L *et al.* [28] found that type of family showed no significant association with sexual dysfunction (P=0.079). The statistical indifference in our study and other studies show that type of family had no significant impact on the FSD in depressed females.

Association of locality with FSD

There was no significant association of locality with FSD (P=0.102). Similarly, Devkota L *et al.* [28] found that residence showed no significant association with sexual dysfunction (P=0.176). The statistical indifference in our study and other studies show that residence had no significant impact on the FSD in depressed females.

Association of socio-economic class with FSD

There was no significant association of socio-economic class with FSD (P=0.48). Similarly, Pindikura RK *et al.* [33] reported that socioeconomic class was not significantly associated with sexual dysfunction (P=0.123). Sreelakshmy K *et al.* [31] also found that sexual dysfunction showed no significant association with socioeconomic status (p=0.763). The statistical indifference in our study and other studies show that socio-economic status had no significant impact on the FSD in depressed females.

Insomnia

Insomnia was assessed by ISI which is a questionnaire that individuals complete themselves to evaluate insomnia symptoms experienced in the preceding two weeks [5].

In our study, it was found that in 3(1.43%) of the patients there were no clinically significant insomnia, 95 (45.24%) had subthreshold insomnia, and 88 (41.90%) had moderate clinical insomnia, and 24 (11.43%) had severe clinical insomnia. The mean Insomnia index severityscore was 15.71 ± 4.01.

Among other studies, in study by McCall WV *et al.*, [4] including 51 participants with major depressive disorder, out of which two-third were women, at baseline insomnia severity score was in the moderate to severe range, with mean Insomnia index severityscore being 20.7 ± 4.0.Choi YH *et al.* [5] compared insomnia severity score in participants with insomnia and depression (n=75) to those with insomnia only (n=215). There was significantly higher mean ISI score in those with insomnia and depression compared to individuals with insomnia only (17.0 vs. 12.0, p<0.001).

Correlation between severity of depression and FSD

In the present study, HDRS score was higher in FSD (19.92 ± 6.01 vs. 17.61 ± 4.73 in non-FSD, P=0.01). Overall, there was a significant negative correlation between FSFI and HDRS (r= -0.323, P<0.0001) indicating that with the increasing severity of depression, Female sexual dysfunction increased. Likewise, Pindikura RK *et al.* [33] found that severity of depression showed significant association with sexual dysfunction (p<0.001). Reddy RM *et al.* [7] also reported that severity of depression was significantly associated with sexual dysfunction (P = 0.000). Sreelakshmy K *et al.* [31] reported that sexual dysfunction was not significantly associated with severity of depression as assessed by HAM-D score (p=0.589).

Devkota L *et al.* [28] reported that there was an increase in prevalence of sexual dysfunction with increase in severity of depression, as it was 76.19% in women having severe depression.

In study by Ghajarzadeh M *et al.*, [75] FSFI was used for measuring sexual dysfunction and BDI for depression in 100 women with migraine. BDI was significantly negatively correlated with FSFI ((r = −0.1, P = 0.001).

This shows that as depression increases, FSD increases. This may be because depression inhibits the desire for physical pleasure by causing alterations in the neurotransmitters that control sexual arousal [25].

Correlation between depression and insomnia

We found a significantly positive correlation between HDRS score and ISI, with correlation value of 0.272, P=0.0001 - indicating that as depression increased, insomnia also increased. Similarly, Terauchi *et al.* [35] reported that in 237 women, non-restorative sleep (NRS) showed strong association with depression (OR: 1.128, P=0.016). In systematic review by Li L *et al.*, [37] including 34 studies, insomnia showed positive association with depression, with risk ratio being 2.27 (p<0.001). İzci *et al.* [51] reported that among 56 breast carcinoma patients, HADS score was used for depression assessment. HADS was significantly positively correlated with PSQI (r=0.61, p=0.000).

Majumdar A *et al.* [41] found that abnormal depression was the independent predictors of poor sleep quality, (with OR of 4.3 and P-value of 0.01) in women. In the study by Choi YH *et al.*, [72] out of 116 participants with depression, 75 (64.7%) had insomnia. In patients with depressive symptoms, there was significantly higher prevalence of insomnia symptoms compared to those without depressive symptoms (64.7% vs. 8.3%, respectively, p< 0.001).

Khadka R *et al.* [43] reported that among 380 women (2 to 12 months postpartum), there was a significant association between postpartum depression with poor sleep quality with an odds ratio of 3.20 (p<0.05). In the study by Shaun MM *et al.*, [45] compared to women without depression, those with depression had 2.5 times higher for poor sleep quality with odds ratio of 2.55 (p<0.05).Kadam KS *et al.* [46] reported that depression showed significant correlation with poor sleep quality (r=0.6752, p<0.0001). In the study by Seehuus M *et al.*, [49] on 703 participants, out of which 319 were females and 337 were males. On regression analysis, depressive symptoms were strongly predictive of insomnia (β=0.47, p<0.001). Mitchell KR *et al.* [30] reported that women with poor sleep quality were 1.48 times more likely to report FSD (95% CI 1.21-1.80, p< 0.001). This shows that with rising severity of depression, sleep also goes on decreasing which is acceptable as loss of sleep is one of the components of depression symptoms.

Correlation between insomnia and sexual dysfunction

Compared to women without sexual dysfunction, those with sexual dysfunction had similar insomnia severity index(15.73 ± 4.12 vs. 15.66 ± 3.7, P=0.907).Similar findings were reported by Kalmbach *et al*., [50] who found that insomnia severity index was similar in women with sexual dysfunction and without sexual dysfunction (13.77±3.23 vs. 16.44±4.24, p=0.71). This showed that all depressed women have insomnia irrespective of the presence of sexual dysfunction.

However, when we specifically analysed the sexual dysfunction with respect to insomnia severity, we found a negative correlation between ISIandFSFI score (r= -0.209, P=0.002), indicating that as FSFI score increased - insomnia decreased or conversely as FSD increased, insomnia increased. In corroboration, Pigeon WR *et al*. [5] reported that insomnia showed association with higher rates of sexual dysfunction in normal adult women ($p< .001$). On regression analyses, insomnia showed significant association with sexual function ($\beta = 0.12$; $p< .01$). Agrawal P *et al*. [5] reported that in women with sleep apnea, insomnia, and circadian rhythm sleep disorder, there were significantly higher odds of sexual dysfunction in comparison with controls. When compared to controls, among women with sleep apnea and insomnia, there were higher odds of hypoactive sexual desire disorder, female sexual arousal disorder, and female orgasmic disorder.

Few studies determined this association in different population diseased subsets. In study by Ghajarzadeh M *et al*., [5] PSQI was used for assessment of sleep quality and BDI was used for evaluating depression in 100 women with migraine - where BDI was significantly positively correlated with PSQI ($r = 0.42$, $P< 0.001$). İzci *et al*. [51] found that among 56 breast carcinoma patients, PSQI was significantly negatively correlated with ASEX (r = −0.22, p=0.02) before treatment. Similarly, in the study by Dursun *et al*., [55] on 54 participants with fibromyalgia, there was negative correlation between PSQI with FSFI (r=−0.213, p=0.076).Kalmbach *et al*. [50] reported that in 150 postmenopausal women with insomnia, there was significant association of insomnia symptoms with "poor sexual arousal, orgasmic dysfunction, sexual distress, and sexual dissatisfaction".

Summary

- The study was conducted in the Department of Psychiatry at the Maharishi Markandeshwar Institute of Medical Sciences and Research. 210 females fulfilling the ICD-11 criteria for depression using FSFI, ISI and HDRS scales were used for assessment.

Socio demographic factors distribution

- The majority [85 (40.48%)] of the patients belonged to the age group of 31 to 40 years, followed by 41 to 50 years [70 (33.33%)] with 20% in 19-30 years range and 6.19% with >50 years range.
- 146 (69.52%) of the cases were from joint families, while 64 (30.48%) were from nuclear families.
- 117 (55.71%) of the cases were from urban area, while 93 (44.29%) were from rural area.
- Majority of the patients, i.e. 128 (60.95%) individuals), belonged to the middle class, followed by 56 (26.67%) from lower-middle class, 16 (7.62%) from upper-middle class, and 10 (4.76%) from lower class.

Severity of depression

- Mild depression was present in 28 (13.33%) participants, moderate depression in 85 (40.48%), severe depression in 60 (28.57%), and very severe depression in 37 (17.62%) participants.
- The mean HDRS score was 19.3 ± 5.8. The mean FSFI score was 20.15 ± 6.43.

Sexual dysfunction distribution

- Female sexual dysfunction was present in 154 (73.33%) patients.

Grades of insomnia

- In 3(1.43%) of the patients there were no clinically significant insomnia, 95 (45.24%) had subthreshold insomnia, and 88 (41.90%) had moderate clinical insomnia, and 24 (11.43%) had severe clinical insomnia. The mean Insomnia index severityscore was 15.71 ± 4.01.
- There was significantly positive correlation between HDRS score and insomnia severity index, with correlation value of 0.272, P=0.0001.
- There was significantly weak negative correlation between insomnia severity index and sexual dysfunction, i.e. FSFI score (r= -0.209, P=0.002).
- There was significantly weak negative correlation between grade of severityand sexual dysfunction, i.e. FSFI score (r= -0.323, $p<0.0001$).
- Compared to women without sexual dysfunction, those with sexual dysfunction had significantly more women of 41 to 50 years age group (47.40% vs. 17.86%) and in the over 50 years age group (7.14% vs. 3.57%), p=0.001).
- Compared to women without sexual dysfunction, those with sexual dysfunction had significantly higher mean total HDRS score (19.92 ± 6.01 vs. 17.61 ± 4.73, P=0.01).

Conclusion

- The prevalence of sexual dysfunction in women with depression was 73.33%.
- Depression showed significantly weak correlation with insomnia (r= 0.272, P=0.0001).
- Grade of severityshowed significantly weak negative correlation with sexual dysfunction (r= -0.323, $p<0.0001$).
- There was significantly weak negative correlation between insomnia and sexual dysfunction (r= -0.209, P=0.002).
- Higher HDRS scores are associated with lower FSFI scores.
- HDRS and ISI exhibit a positive correlation suggesting that higher HDRS scoresare associated with higher ISI scores.
- FSFI and ISI showed a negative correlation in scores indicating that higher ISI scores are associated with lower FSFI scores.
- Higher age showed significant association with sexual dysfunction.
- None of the other factors like socioeconomic status, type of family, and locality were associated with sexual dysfunction.

To sum up, the prevalence of sexual dysfunction in women with depression was 73.33%. Depression showed a significant correlation sexual dysfunction and insomnia. Sexual dysfunction was also significantly associated with increased age and increased insomnia. Overall, depression remains intricately associated with FSD and increased insomnia and awareness must be created to diagnose and manage them in cases with depression.

Strengths of the study

- The study included a significant number of participants (210 females), which enhances the reliability and generalizability of the findings.
- Participants were selected based on the ICD-11 criteria for depression, ensuring that the study focuses on clinically diagnosed cases, thereby enhancing the validity of the results.
- The study considered various socio-demographic variables such as age, type of family, locality, and socio-economic class. This diversity helps in understanding the relationship between these variables and sexual dysfunction among females with depression.
- The study provides clear correlations between depression severity (HDRS score), insomnia severity, and sexual dysfunction (FSFI score). This clarity helps in understanding the interplay between these factors.
- The study examines the impact of various socio-demographic factors on sexual dysfunction, even though no significant associations were found for family type, locality, or socio-economic class, providing a comprehensive overview.

Limitations of the study

- The study design wascross-sectional and thus causal relationships between depression and sexual dysfunction could not be assessed.
- It was conducted at a single centre.
- Sexual dysfunction and insomnia were assessed using self-reported measures, which can introduce bias due to social desirability or recall inaccuracies.
- There was no research done on the use of antipsychotics and antidepressants, which can have an impact on sexual function.
- Factors such as marital discord, domestic violence, and sexual dysfunction in a spouse were not considered.
- Participants more than 50 years were also found to be menopausal which is known to effect sexual functioning and depression. Thus, acting as a confounding factor.

Future recommendations

- Spontaneous identification and interventions aiming at reducing sexual dysfunction in depressed female patients should be implemented. These could include pharmacological treatments, psychotherapy, and lifestyle modifications.
- Future studies should include additional factors such as hormonal levels, physical health conditions, medication side effects, and psychological factors that might influence sexual dysfunction in depressed females and could include a larger sample size.
- Further studies should evaluate the how different treatments for depression (e.g., antidepressants, cognitive-behavioral therapy) impact sexual dysfunction.

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