Sexual Function in Female Patients with Obstructive Sleep Apnea

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ABSTRACT

Introduction. Obstructive sleep apnea is defined as repetitive (≥5/hour) partial or complete cessation of breathing during sleep. Whereas obstructive sleep apnea is often considered to be associated with sexual problems in men, studies concerning effects of obstructive sleep apnea on female sexual function and distress are sparse.

Aim. To investigate sexual dysfunction and sexual distress in female patients with obstructive sleep apnea and to determine which factors are of importance for their sexual function.

Methods. We investigated 80 female patients (ages 28–64) admitted to a sleep laboratory and who after investigation received a diagnosis of obstructive sleep apnea. All subjects answered questions drawn from three self-administered questionnaires on sexuality. The results were compared with a population sample (N = 240).

Main Outcome Measure. Data from nocturnal respiratory recordings. Female Sexual Function Index, Female Sexual Distress Scale and four questions from Life Satisfaction-11 (Lisat-11).

Results. Female Sexual Function Index indicated that obstructive sleep apnea patients were at a higher risk for having sexual difficulties. Female Sexual Distress Scale showed significantly more sexual distress in the obstructive sleep apnea group. Manifest Female Sexual Dysfunction (combined data from Female Sexual Function Index and Female Sexual Distress Scale) showed that female patients with obstructive sleep apnea also had more sexual dysfunction. Severity of sleep apnea was, however, not related to any of these indices but consumption of psychopharmaca was. In Lisat-11, we found that obstructive sleep apnea females scored lower than women in the population sample regarding life as a whole but not regarding domains of closeness.

Conclusions. This study indicates that sexuality of women with untreated obstructive sleep apnea is negatively affected compared with a female population sample. This was not related to severity of obstructive sleep apnea, whereas psychopharmaca may act as an important confounder. **Petersen M, Kristensen E, Berg S, Giraldi A, and Midgren B. Sexual function in female patients with obstructive sleep apnea. J Sex Med 2011;8:2560–2568.**

Key Words. Obstructive Sleep Apnea; Sexual Distress; Sexual Difficulties; Sexual Dysfunction; Females; Life Satisfaction

Introduction

Obstructive sleep apnea (OSA) is defined as repetitive (≥5/hour) partial or complete cessation of breathing (hypopnea/apnea) during sleep because of upper airway collapse. OSA may cause sleep fragmentation and daytime tiredness, increase cardiovascular morbidity and mortality, and negatively affect neurocognitive function [1].

Literature on OSA and sexuality in men, especially on erectile dysfunction, is abundant. In women, the knowledge is scarce, and we are only aware of few previous studies focusing on sexual function in female patients with OSA [2–4]. In the Onem et al. study [2], the OSA subjects (N = 26) scored worse than reference subjects, but there was no quantitative relationship between the severity of the disease and the sexual dysfunction. Neither

did Subramanian et al. [4] in a study (N = 21) of younger OSA patients find any relationship between the severity of OSA and sexual function. On the other hand, in a group of 25 female patients, Köseoğlu et al. [3] showed that OSA negatively impacts sexual function in a dose-response fashion. However, there was no control group in that study.

All these studies were investigating sexual difficulties but did not include sexual distress. Female sexual difficulties in general include disorders of desire, sexual arousal, pain, and inhibited orgasm. Female sexual distress is characterized by a mental rather than a somatic problem with sexuality. Distress is not necessarily linked only to sexual difficulties but may also depend on individual expectations as well as on age [5,6]. Female sexual dysfunction is defined as a sexual difficulty combined with sexual distress [6]. A study by Laumann et al. [7], addressing four items—lack of interest in sex, inability to achieve orgasm, arousal problems, and pain during sex—showed that 43% of women in general report at least one kind of sexual difficulty. In addition, Shifren et al. [8] found that 22% of women in general report sexual related distress, defined as a score of at least 15 on Female Sexual Distress Scale (FSDS).

Many chronic diseases may cause sexual difficulties [6]. In one study, 40% of women with depression were found to have a sexual dysfunction [9], and in a study of type 2 diabetic women lack of libido was found in 77% and orgasmic dysfunction in 49% [10]. On the other hand, Wallner et al. [11] found no significant difference between women with and without type 2 diabetes, whereas they found that depression was more related to sexual dysfunction than diabetes per se. Esposito and Giugliano [12] showed that metabolic syndrome, including central obesity, insulin resistance, hypertension, and dyslipidemia, has strong influence on sexuality in both men and women and that sexual function in women was worse as the number of components of the metabolic syndrome increased [12]. In another study, this group also demonstrated a negative effect of body mass index (BMI) on sexual function in otherwise healthy women [13]. As OSA shares several of the components of the metabolic syndrome, it is relevant to investigate the specific effects of OSA.

Aims

Available data on effects of OSA on female sexual function and distress are sparse and the clinical importance of the problem is probably underestimated. The aim of the present study was to investigate sexual dysfunction and sexual distress in female patients with untreated OSA and to determine which factors are of importance for sexual function in this population.

Methods

Female patients with OSA were consecutively recruited from three sleep laboratories of one sleep clinic (ScanSleep) in Denmark, from October 2005 to January 2009. Only female patients with a confirmed diagnosis of OSA, considered to require treatment with continuous positive airway pressure (CPAP), more than 18 years old, and capable of reading and writing Danish were included into the study. Approximately 75% of the eligible patients were included (Figure 1). Informed consent was obtained, and the study was reviewed

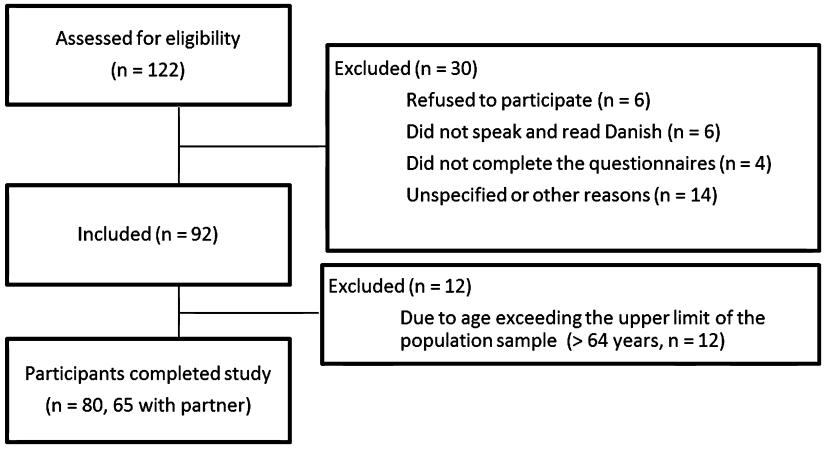

Figure 1 Flow chart of the study.

and approved by the Ethical Committee of Copenhagen.

Women used as controls were participants from a cross-sectional national survey of Danish women's sexual life. A total of 1,996 Danish women were identified from the central health registry. Criteria for selection were age 20–65 years and zip codes ensuring that the group reflected the population with regard to which part of the country they lived in. The women were mailed the questionnaires. From the respondents, we selected 240 women age-matched to the OSA group—three from the control group for each OSA patient. Data on age, BMI, permanent sexual relationship, and education were collected for both patients and normal subjects.

All patients were investigated for OSA using identical portable devices (EMBLETTA, Embla, Broomfield, CO, USA). The recording montage included nasal airflow and snoring using a nasal pressure catheter, respiratory movement with thoracic and abdominal bands (XactTrace, Embla, Broomfield, CO, USA), pulse oximetry, and body position. Apneas were diagnosed as cessation of breathing of more than 10 seconds. Hypopneas were diagnosed as reduction in airflow >30% associated with a desaturation of 4% or more. The apnea and hypopnea index (AHI) was calculated as the total number of apneas and hypopneas divided by estimated sleep time in hours. AHI 5–15 is considered mild sleep apnea, AHI 15–30 moderate sleep apnea, and AHI >30 severe sleep apnea.

Data of subjective daytime sleepiness were collected using the Epworth Sleepiness Scale (ESS). The ESS assesses the likelihood of the patient dozing off or falling asleep in eight daily situations using a score between 0 and 3. The maximum score is 24 with a score of 10 or more being taken to indicate clinically relevant levels of daytime sleepiness [14,15].

If AHI >5 coincides with ESS score >10, indicating daytime sleepiness, the condition is termed obstructive sleep apnea syndrome, whereas an AHI >5 independent of EES score is termed obstructive sleep apnea.

It is important to know that high scores of AHI are not necessarily associated with high scores of ESS, for which reason patients with mild sleep apnea can have significant daytime sleepiness and patients with severe sleep apnea can have no particular daytime sleepiness.

Accordingly, AHI and ESS are considered independent variables.

Main Outcome Measures

Data on sexual function, sexual-related distress, and life satisfaction were obtained using three validated self-administered questionnaires: Female Sexual Function Index (FSFI), FSDS, and four questions from Life Satisfaction-11 (LiSat-11).

FSFI

FSFI is a validated 19 items measure of female sexual function for women with a sexual partner. The 19 items are assigned to six domains: desire (two items), arousal (four items), orgasm (three items), pain (three items), vaginal lubrication (four items), and sexual satisfaction (three items). Higher scores indicate better sexual function [16]. FSFI has a score ranging from 2 to 36. The scores can be dichotomized with a cutoff at 26.55 differentiating women with and without sexual difficulties. When scoring $\leq$26.55, the respondent is likely to have a sexual difficulty [17].

FSDS

FSDS consists of 12 validated questions measuring sexual-related personal distress in women. The distress is scored on a scale from 0 to 6 for each item, with higher score indicating higher distress. The total range of the scale is 0–72. FSDS scores can also be dichotomized with a cut-off score at 15. Scoring $\geq$15 indicates sexual distress [18].

Manifest Female Sexual Dysfunction (MFSD)

MFSD is present when the respondent has both sexual difficulty (FSFI $\leq$ 26.55) and sexual distress (FSDS $\geq$ 15) [19,20].

LiSat-11

LiSat-11 [21] is a validated 11-item questionnaire measuring life as a whole and 10 domains of life with levels of satisfaction ranging from 1 (very dissatisfied) to 6 (very satisfied). From LiSat-11, we selected four questions. One question investigated general satisfaction with life (life as a whole). The other three questions investigated domains of closeness (sexual life, partner relationship, and family life). This subset of questions was identical to that used in our parallel study on sexual dysfunction in males with OSA [22].

Statistical Analysis

Descriptive statistics (mean and standard deviation [SD]) were used to summarize the clinical and anthropometric data. For descriptive purposes,

Table 1 Anthropometric, social, and medical data of obstructive sleep apnea (OSA) female patients and the population sample

	OSA	Population sample	*P*
N	80	240	
Age mean (SD)	51.0 (8.8)	51.3 (8.8)	0.744[a]
Age ≥45, N (%)	59 (74)	182 (76)	0.765[aa]
Having a sexual partner, N (%)	65 (81)	204 (85)	0.481[aa]
Education ≥ 10 years, N (%)	68 (85)	218 (91)	0.147[aa]
Medication			
Cardiovascular medication[†], N (%)	36 (45)	56 (23)	0.000[aa]
Psychopharmaca[‡], N (%)	20 (25)	26 (11)	0.003[aa]
Antidiabetics[§], N (%)	6 (8)	9 (4)	0.218[aa]
BMI mean (SD)	33.5 (7.5)	25.0 (4.3)	0.000[a]
BMI range	20–64	18–46	
BMI ≥30, N (%)	54 (68)	29 (12)	0.000[aa]
AHI, mean (SD)	34.3 (26.5)		
ESS, mean (SD), N = 57	10.5 (4.2)		

[a]Student's *t*-test; [aa]Chi-square test.
[†]Digoxin, antihypertensive, diuretics, beta blockers, calcium antagonists, ACE-inhibitors.
[‡]Anti-psychotics, anxolytics, hypnotics, antidepressants.
[§]Given oral or as injections.
SD = standard deviation; BMI = body mass index; AHI = apneas and hypopneas index; ESS = Epworth Sleepiness Scale.

Student's *t*-tests and chi-square test were used when comparing study data to reference subjects.

Menopause was considered a more relevant variable than age per se, but because menopausal state was not known for all subjects, we subdivided the material according to age with a cut-off value of 45 years as a proxy for menopause. BMI was also analysed as a dichotomous variable with BMI ≥30 as the obesity limit.

The first statistical step was to apply Pearson's correlation to relate FSFI, FSDS, and MFSD to age, BMI, OSA, AHI, ESS, cardiovascular medication, psychopharmaca, antidiabetics, and education.

Based on the results from the correlation analysis, we decided to include age, BMI, and the use of psychopharmaca in the next step which was multiple regression analyses with FSFI, FSDS, and MFSD as the dependent variables. Because of the focus on OSA in this article, we included AHI in the analyses for OSA patients although no correlation was found in the correlation analysis. A significance level of $P \leq 0.05$ was used for all statistical analyses.

Results

Ninety-two female OSA patients aged 28–71 years answered the questionnaires. Because the age distribution of the population sample was 28–64 years, we excluded all OSA patients aged ≥65 (N = 12) (Figure 1). The resulting number of OSA patients included in the study was 80 (65 with a partner), mean age 51.0 (SD = 8.8). The population sample included 240 subjects (204 with a partner), mean age 51.3 (SD = 8.8). ESS data were collected from only 57 patients, because of a late change of procedures. ESS mean value was 10.5 (SD = 4.2). AHI mean value was 34.3 (SD = 26.5). The anthropometric, social, and medical data for the OSA patients and the population sample are presented in Table 1. Antipsychotics were used in 1%, anxiolytics were used in 3%, hypnotics were used in 1%, and antidepressants were used in 24% of the OSA patients. Results of the correlation analyses are presented in Table 2, suggesting age, BMI, psychopharmaca, and a diagnosis of OSA as the relevant variables for the final analysis.

FSFI

Whereas 40% (N = 81) of the subjects from the population sample scored ≤26.55 in FSFI indicating sexual difficulty, 71% (N = 46) of the OSA patients fell below that level ($\chi^2 = 18.5$, $P < 0.001$). This difference was present in both age groups (age <45 years $\chi^2 = 9.6$, $P \leq 0.05$ and age ≥45 years $\chi^2 = 10.5$, $P < 0.05$) (Figure 2).

To evaluate if age ≥45, BMI ≥30 or psychopharmaca had any impact on FSFI we performed a linear regression analysis. Including OSA females (N = 65) and the population sample (N = 204), we found OSA ($P < 0.001$) and age ≥45 ($P = 0.03$) to have a negative impact on FSFI. In the OSA group we also included AHI in the regression analysis. Use of psychopharmaca showed a negative impact on FSFI ($P = 0.037$), whereas AHI hardly even showed a trend ($P = 0.084$).

Table 2 Correlations between Female Sexual Function Index (FSFI), Female Sexual Distress Scale (FSDS), and Manifest Female Sexual Dysfunction (MFSD) vs. age ≥45 years, body mass index (BMI) ≥30, education, psychopharmaca, cardiovascular medication, antidiabetics, obstructive sleep apnea (OSA) yes/no, apnea hypopnea index (AHI), and Epworth Sleepiness Scale (ESS)

	OSA patients and population sample			OSA patients only		
	FSFI	FSDS	MFSD	FSFI	FSDS	MFSD
FSFI	1			1		
FSDS	0.517**	1		0.470**	1	
MFSD	0.653**	0.770**	1	0.614**	0.776**	1
Age ≥45 years	0.128*	–0.078	0.043	0.025	–0.127	0.008
BMI ≥ 30	0.131	0.146**	0.110*	0.135	0.124	0.114
Education	–0.114	–0.052	–0.073	–0.110	–0.130	–0.169
Psychopharmaca	0.009	–0.013	–0.016	–0.233	–0.245*	–0.163
Cardiovascular medication	0.048	0.024	0.072	–0.084	–0.073	0.003
Antidiabetics	0.066	–0.003	–0.053	0.059	–0.007	–0.032
OSA yes/no	–0.262**	–0.209**	–0.209**	—	—	—
AHI	—	—	—	0.231	–0.030	–0.009
ESS	—	—	—	0.064	0.118	0.151

Population sample N = 240, OSA N = 80 (ESS only on N = 57 OSA patients).
*Correlation is significant at the 0.05 level (two-tailed). **Correlation is significant at the 0.01 level (two-tailed).

FSDS

Significantly ($\chi^2 = 14.0$, $P < 0.001$), more women with OSA, 51% (N = 41), scored ≥15 on the FSDS compared with the population sample, 28% (N = 68), indicating that OSA women are more sexually distressed. This difference was also independent of age (age <45 years $\chi^2 = 5.4$, $P \leq 0.05$ and age ≥45 years $\chi^2 = 8.6$, $P < 0.05$) (Figure 3).

To evaluate if age ≥45, BMI ≥30, or psychopharmaca had any impact on FSDS, we performed a linear regression analysis. Including OSA females (N = 80) and the population sample (N = 240), we found OSA to have a negative impact on FSDS ($P = 0.004$). In the OSA group (N = 74), we also included AHI in the regression analysis. Use of psychopharmaca showed a negative impact on FSDS ($P = 0.011$), whereas no impact was found of age ≥45, BMI ≥30, or AHI.

MFSD

Twenty-one (48%) of the OSA patients and 44 (22%) of the population sample (χ^2 13.9, $P \leq 0.001$) had both sexual difficulties and sexual distress resulting in MFSD. The difference was found in both age groups (age <45 years $\chi^2 = 5.6$, $P \leq 0.05$ and age ≥45 years $\chi^2 = 8.9$, $P < 0.05$) (Figure 4).

To evaluate if age ≥45, BMI ≥30, or psychopharmaca had any impact on MFSD, we performed a linear regression analysis. Including OSA females (N = 65) and the population sample (N = 204), we found OSA to have a negative

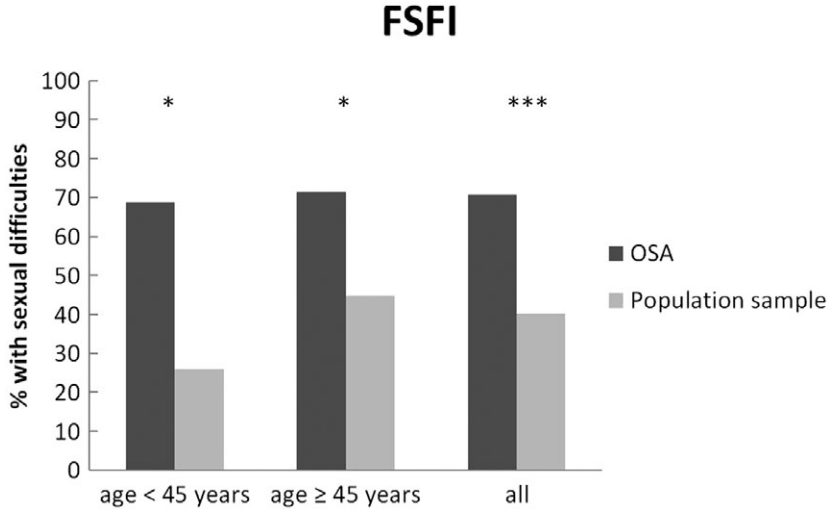

Figure 2 Percentage of OSA patients (N = 65) and population sample (N = 204) scoring ≤ 26.55 in Female Sexual Function Index indicating sexual difficulties, grouped by age with a cut-off value of 45 years. Pearson chi-square test. *$P \leq 0.05$ ***$P \leq 0.001$. OSA = obstructive sleep apnea.

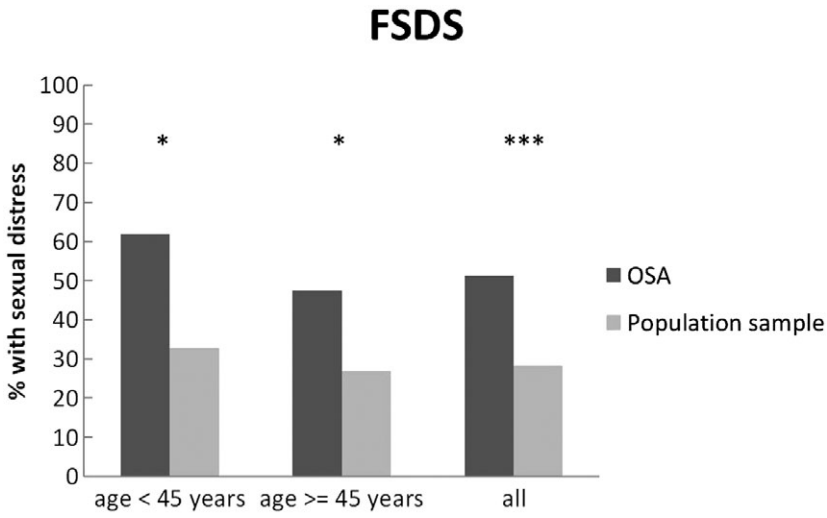

Figure 3 Percentage of OSA patients (N = 80) and population sample (N = 240) scoring ≥ 15 in Female Sexual Distress Scale indicating sexual-related distress, grouped by age with a cut-off of 45 years. Pearson chi-square test. *$P \leq 0.05$ ***$P \leq 0.001$. OSA = obstructive sleep apnea.

impact on MFSD ($P \leq 0.001$). In the OSA group (N = 60), we also included AHI in the regression analysis. Use of psychopharmaca showed a negative impact on MFSD ($P = 0.04$), whereas no impact was found of age ≥45, BMI ≥30, or AHI.

LiSat-11

Scores on Life as a Whole were significantly lower for the OSA group than for the population sample ($P < 0.001$) but none of the three domains on closeness: family life, partner relationship, and sexual life showed any significant differences.

Discussion

The study comprises female patients with sleep apnea severe enough to be candidates for treatment with CPAP. To the best of our knowledge, this study is the first investigating both sexual difficulties, sexual-related distress, and sexual dysfunction in a substantial number of female OSA patients comparing the results with an age-matched randomly selected population sample with three subjects for each patient. This sample was not screened for sleep apnea, therefore we cannot claim that all subjects were normal. The expected frequency of OSA in women is approximately 1.2% [23], which would correspond to three subjects in our population sample. Any occurrence of OSA in this group would, however, diminish rather than enhance true differences. We therefore consider the choice of comparison subjects to be valid.

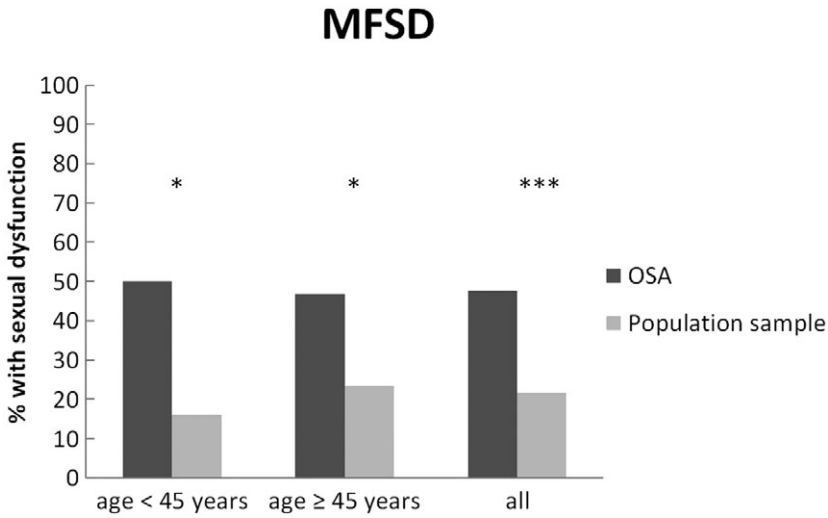

Figure 4 Percentage of OSA patients (N = 65) and population sample (N = 204) scoring ≥15 in Female Sexual Distress Scale and ≤ 26.55 in Female Sexual Function Index indicating Manifest Female Sexual Dysfunction, grouped with a cut-off value of 45 years. Pearson chi-square test. *$P \leq 0.05$ ***$P \leq 0.001$. OSA = obstructive sleep apnea.

Our results confirm observations of previous studies that women with diagnosed OSA have more sexual difficulties than women without OSA [2–4]. Our results also show that sexual dysfunction is not related to severity of OSA, an observation that is further strengthened by the fact that our patients had a broader AHI range than in previous studies.

Our study did not find BMI to have impact on sexual function. These results are well in line with at least one previous study [4] in women, finding no correlation between obesity and overall scores in FSFI. In contrast to our study, Pillar and Shehadeh [24] showed a relation between obesity, sexual function, and OSA, and Murugan and Sharma [25] found obesity to affect sexual function in both female and male OSA patients. In a previous study in male OSA patients, Petersen et al. [22] also found that obesity affected the data. Thus, the literature agrees that AHI does not quantitatively affect sexual function and sexual-related distress, whereas there is disagreement concerning the impact of obesity.

Consequently, it may be possible that neither AHI nor BMI play a key role for sexual function or sexual-related distress. For instance, Kadioglu et al. [26] and Yaylali et al. [27], using the FSFI questionnaire, reported that obesity does not affect sexual function but found that depression may play a major role for sexual dysfunction. Also Shifren et al. [8] found an increased incidence (odds ratio [OR] 2.4) of depression in patients with sexual related distress.

Unfortunately, we did not have specific questionnaires on depression in our study, but we found that 24% of the women with OSA were using antidepressants, compared with 11% in the population sample. The high use of antidepressants and other medications may reflect a selection bias as the likelihood of being referred to a sleep laboratory may be higher in patients with regular medical contacts. We found a significant relationship between the use of antidepressants and sexual difficulties and sexual-related distress within the OSA group. This may indirectly support the hypothesis that depression plays a role in female sexuality. Also in other chronic illnesses, depression has been found to be so important for sexual function that screening for depression is suggested in all patients with chronic illness and sexual dysfunction [6,9].

In a recently published study on sexual dysfunction in women with diabetes mellitus, it is furthermore concluded, "that sexual dysfunction in women with diabetes mellitus is linked less to organic factors and more to psychological factors, especially coexisting depression" [28].

Our data show that age >45 negatively affects sexual function but not sexual-related distress. Similar results have been shown in several studies [8,29–31]. That sexual-related distress is not negatively affected by age may reflect that the ability to cope with sexual difficulties improves with increasing age. This is indeed concluded by Hartmann et al. [32], who also suggests five factors to interact: age, quality and age of partnership, menopause status, sexual experience and mental health, and personality factors.

Well-being has been shown to be an important factor for female sexual satisfaction [7,33], and Li-Sat 11 in general reflects well-being. Li-Sat 11 data in the present study show a general dissatisfaction with Life as a Whole in OSA women but no difference to the population sample concerning domains of closeness (family life, partner relationship and sexual life). This may seem contradictory and similar data from our study in men do not show this discrepancy [22]. One may speculate that the female perception of the conflict between sexual difficulties and closeness is less pronounced than in men.

Conclusions

We conclude that female OSA patients have an increased prevalence of sexual difficulties and sexual-related distress resulting in sexual dysfunction. Sexual difficulties and sexual-related distress is not linked to AHI or BMI. Depression may play an important role, and we believe that depression per se is under-recognized as an eliciting factor for sexual difficulties, sexual-related distress, and sexual dysfunction in OSA and other chronic illnesses.

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