

Pittsburgh Sleep Quality Index scores and their relationship with body measurements in late menopause patients

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Background/aim: With an increase in life expectancy, women live about one-third of their lives in the postmenopausal period. Our aim was to investigate the findings regarding quality of sleep and sleep apnea in postmenopausal women and research the relationship between sleep complaints and body measurements.

Materials and methods: The Pittsburgh Sleep Quality Index (PSQI) was administered to all participants and their height, weight, and neck circumferences were measured.

Results: A total of 206 patients (mean age: 61.4 ± 8.8 years) were included. Their mean weight gain after menopause was 8.1 ± 12.8 kg, and their mean neck circumference and body mass index was 39.7 ± 2.6 cm and 33.4 ± 2.1 , respectively. The rate of patients who snored each night increased from 3.4% to 13.2% ($P = 0.000$) after menopause. The rate of self-reported poor sleep quality was found in 57.8% of patients according to the PSQI global score (≥ 5). The prevalence of sleep medication usage increased from 5.8% to 11.2% with menopause. Although body measurements were a little lower in patients with a total PSQI score of less than 5, this difference was insignificant.

Conclusion: The prevalence of self-reported poor sleep quality was high in the postmenopausal period and the prevalence of snoring increased significantly with weight gain after menopause.

Key words: Pittsburgh Sleep Quality Index, postmenopause, weight gain, body mass index

1. Introduction

Menopause is a regression in the production of sex hormones with the loss of ovary activity and hence termination of menstruation characterized by the loss of reproductive functions. Hormonal changes such as declining estrogen levels during this period are frequently accompanied by a variety of secondary physiological, psychological, and behavioral changes (1). Menopause affects sleep regulation in addition to many other systems. The symptom constellation, including changes in appetite, nervousness, alterations in mood, headaches, hot flashes, joint and muscle pain, palpitations, and insomnia, is called “menopausal syndrome” (2). With the prolongation of mean survival around the world, women spend about one-third of their lives in menopause. In developed countries, the mean duration of life in women is about 80 years, and they spend 40% of this period in menopause (3). Therefore, a number of complaints and health problems that may arise during this period are becoming increasingly important. Sleep is one of the

most important physiological needs for a healthy life and is regarded as an important variable for quality of life and well-being. While the body is able to adapt to some of these menopausal changes, certain complaints, especially those associated with sleep, may continue. According to the US National Institutes of Health, sleep problems occur in 35%–60% of postmenopausal women (4). It is thought that vasomotor symptoms and alterations in hormone levels may trigger sleep problems (5). The role of weight gain in sleep quality in menopause is not clear. Although a higher body mass index (BMI) is strongly linked to short sleep duration in children, data on the influence of BMI on sleep duration in adults are contradictory (6). The aim of the present study is to investigate the incidence of findings regarding quality of sleep and sleep apnea in women who had not undergone hormone replacement therapy after menopause and to research the relationship between sleep complaints and body measurements such as weight and neck circumferences.

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2. Materials and methods

A questionnaire was administered to 206 women who referred to the menopause clinic of our university for follow-up and who had been in menopause for at least 5 years. Patients who received hormone replacement treatment for menopause and those who had malignancies or psychiatric disorders were excluded from the study. Before the study, written permission was received from the institution where the investigation was carried out and verbal informed consent was obtained from all patients.

Detailed questions were asked in the questionnaire about sleep symptoms before and after menopause and about complaints noticed by their relatives such as snoring and sleep apnea. The questionnaire as a data collection tool consisted of 3 parts. Sociodemographic variables were collected and the Pittsburgh Sleep Quality Index (PSQI) and Epworth Sleepiness Scale were completed. The PSQI, which provides information about sleep quality and sleep related disorders over a month's time, was developed by Buysse et al. in 1989 (7). The scale includes 24 questions overall, with 19 questions answered by the person him/herself and the remaining 5 answered by his/her bed partner. The self-answered questions are subjected to evaluation while those answered by bed partners provide data on sleep apnea. The first 19 self-answered questions evaluate 7 subscales, i.e. subjective sleep quality, sleep latency, duration of sleep, routine sleep activity, sleep disorders, the use of drugs for sleeping, and daytime dysfunction. Each item in the scale is scored between 0 and 3 (no difficulty to severe difficulty). The sum of the 7 subscale scores gives the overall PSQI score. The score of each subscale varies between 0 and 3. The range of overall PSQI score varies between 0 and 21. Sleep quality is evaluated as fine in those with an overall score of 5 or lower. The reliability and validity study of the scale in the Turkish population was carried out by Ağargün et al. (8). The Epworth Sleepiness Scale investigates excessive daytime sleepiness (<http://www.stanford.edu/~dement/epworth.html>). Patients are asked to rate their probability of falling asleep in the following 8 situations between 0 and 3: reading something in a sitting position, watching television, sitting in a public area without movement (theater, movie, meeting, etc.), being in a car for at least 1 h, lying down to rest in the afternoon, talking with someone in a seated position, after a lunch without having alcohol, and when stopping for a few minutes in traffic while travelling by car. According to this rating system, 0 = never, 1 = rarely, 2 = with moderate frequency, and 3 = very frequently. An overall score that is higher than 10 is considered as excessive daytime sleepiness. Frequency of snoring was also scored as follows: 0 = never, 1 = less than once a week, 2 = 1–2 times a week, 3 = 3–6 times a week, and 4 = constantly every night. The investigator filled in all questionnaires by asking the questions one by one.

The same person using the same equipment measured participants' height, weight, and neck circumferences. Weight was measured using a calibrated hospital scale with subjects dressed in normal indoor clothing without shoes. Height was measured in centimeters against a wall using a fixed tape measure with subjects standing shoeless on a hard surface. BMI was calculated by dividing body weight by the square of height (kg/m^2).

Data obtained in the study were transferred to a computer using SPSS 13.0 and a database was formed. In the evaluation of data, mean, standard deviation, number, percentage, chi-square test, Student's t-test, one-way ANOVA, and Tukey post-hoc analysis methods were used with $P < 0.05$ considered statistically significant.

3. Results

A total of 206 patients with a mean age of 61.4 ± 8.8 years were included in the present study. Their mean age of menopause was 48.4 ± 4.0 years and mean duration of menopause was 12.7 ± 8.5 years (minimum: 5 years; maximum: 19 years). Their mean weight gain after menopause was 8.1 ± 12.8 kg, their mean neck circumference was 39.7 ± 2.6 cm, and their mean BMI was 33.4 ± 2.1 .

The mean Epworth Sleepiness Scale score was 4.1 ± 2.1 . Twenty-eight (13.6%) patients had a mean Epworth Sleepiness Scale score over 10 and 21% stated that they always took a nap during the daytime. The prevalence of self-reported poor sleep quality was found in 119 (57.8%) patients according to PSQI global scores (≥ 5). Spending more than 60 min falling asleep per night was observed in 9 (4.4%) patients and a total sleep time of less than 6 h/night was recorded in 48 (23.3%) patients. Waking frequently after falling asleep was found in 98 (47.6%) patients and 54 (26.2%) subjects found it difficult to sleep again after waking up. A total of 23 respondents (11.2%) reported using prescription sleep medications at least 'sometimes' and the prevalence of sleep medication usage increased from 5.8% to 11.2% with menopause. Mean scores are presented in Table 1.

The rate of patients who snored each night before menopause was 3.4%, increasing to 13.2% ($P = 0.000$) in the late menopausal period. With those who snored 3 times or less classified as 'occasional snorers' and those who snored 4 times or more as 'constant snorers', the effect of menopause was found to be statistically significant. We found that although height, weight, and BMI did not differ between groups, the neck circumferences in constant snorers was wider than in occasional snorers (40.16 ± 3.21 vs. 38.81 ± 4.49 cm, respectively; $P = 0.0023$). In addition, constant snorers gained more weight with menopause than occasional snorers. The number of patients who had witnessed apnea before and after menopause was 3 (1.46%) and 7 (3.4%), respectively ($P > 0.05$) (Figure 1).

Table 1. PSQI domain scores in late menopause women.

PSQI	Scores
Subjective sleep quality	1.9 ± 0.7
Sleep latency	1.4 ± 0.9
Sleep duration	1.7 ± 0.4
Habitual sleep efficiency	0.9 ± 1.1
Sleep disturbances	1.3 ± 0.8
Use of sleeping medications	0.3 ± 0.1
Daytime dysfunction	0.9 ± 0.1
PSQI total score	7.4 ± 2.3

Although weight, BMI, and neck circumference values were a little lower in patients with PSQI total scores of less than 5, we could not find any significant relationship between body measurements and PSQI total scores (Table 2). Mean PSQI scores according to BMI were also statistically insignificant (Figure 2).

4. Discussion

Sleep is an important factor influencing quality of life, performance, and productivity. An increase in sleep problems becomes more common and evident with age in both sexes, but especially postmenopausal women seem to be more prone to them. Sleep difficulties in the menopausal period are one of the most important complaints after night sweats and hot flashes. In a study by Kuh et al. (9) in the UK with over 1200 women, the risk of sleep disturbances relative to that among premenopausal women was higher by a factor of 1.5 for perimenopausal women and a factor of 3.4 for postmenopausal women. The prevalence of sleep difficulty varies between 14% and 53% in the menopausal period (9–11). In Timur and Sahin's study (12) of 887 women in the menopausal period carried out in Malatya, Turkey, the prevalence of sleep difficulty was found to be 54%. Similarly, in the present prospective study, self-reported poor sleep quality was found in 119 (57.8%) patients according to the PSQI global score (≥ 5). All

**Figure 1.** Prevalence of snoring and witnessed apnea before and after menopause.

questionnaires in our study were fully filled in during face-to-face interviews. We asked the women to compare their current situations to their situations before menopause, thus researching the rate of our patients who subjectively thought their sleep worsened after menopause.

Climacteric vasomotor symptoms may in themselves have an altering effect on sleep. In the Study of Women's Health Across the Nation in the USA, hot flashes, night sweats, and sleep were evaluated in 12,603 multiethnic women between the ages of 40 and 55 (13). In that study, a significant relation (odds ratio: 1.99) was found between sleep trouble and hot flashes (95% confidence interval: 1.81–2.19). Dzaja et al. (14) found vasomotor symptoms in 68%–85% of symptomatic menopausal women and sleep problems in 51%–77%. Mood disorders can also be associated with fluctuating estrogen levels that occur during reproductive cycle events, particularly during the menopausal transition. Thus, mood disorders, and especially depression, can also cause sleep-related problems (15). Pérez-López et al. researched 169 postmenopausal women aged 48 to 68 years and found that 45% of the women experienced depression (Center for Epidemiologic Studies Depression Scale, scores of ≥ 10), and 34.9% had severe menopausal symptoms (16). One of the limitations of our study was that the prevalence of vasomotor and depression symptoms was not investigated. Female sex hormone receptors are not only involved in reproductive behavior but also have been found to regulate sleep and mood (17). On the other hand, the strength of our study was that we included only late menopausal patients who

Table 2. Relationship between body measurements and PSQI total scores.

Body measurements	PSQI total score		P
	<5	≥ 5	
Weight (kg)	71.1 ± 5.6	72.8 ± 4.8	>0.05
Height (cm)	161 ± 4	159.9 ± 4.4	>0.05
BMI	32.9 ± 2.3	33.8 ± 3.3	>0.05
Neck circumference (cm)	39.2 ± 2.1	40.1 ± 2.3	>0.05
Mean weight gain after menopause (kg)	8.0 ± 4.8	8.4 ± 3.1	>0.05

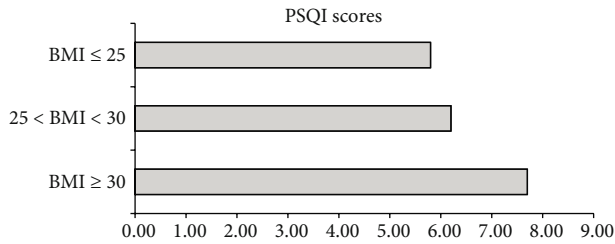


Figure 2. PSQI scores according to BMI.

did not receive hormone replacement therapy in order to exclude the effect of sex hormones and vasomotor symptoms.

Epidemiologic studies have demonstrated a bidirectional relationship between insufficient sleep and weight gain. Sleep disorders occurring in the postmenopausal period should not be attributed to menopause exclusively and other causes of sleep disorders should also be taken into consideration. The increase in sleep apnea findings in this period may be associated with increasing age and weight gain (18). It was established that our patients gained approximately 8 kg with menopause. Increase in neck circumference may also lead to susceptibility to sleep apnea. A neck circumference of over 38 cm is evaluated as a risk factor in women (19). Neck circumference, BMI, and age were found to be the strongest predictors of sleep-related breathing disorders. This suggests that menopause could cause a different body fat distribution with an increase of fat in the periumbilical region of the body with an increase in neck circumference (20). Lucchesi et al. (21) investigated the relationship between menopause and nocturnal awakenings with headaches and found that

it was more common in obese women. One of the major symptoms of sleep apnea syndrome in women is snoring. The rate of our patients who stated that they snored every night increased from 3.4% to 13.2% after menopause. Both Resta et al. and Bixler et al. (22,23) reported that the prevalence of obstructive sleep apnea syndrome was higher among postmenopausal women in comparison with premenopausal women. A large study by Young et al. (24) demonstrated that menopause was a significant independent risk factor for sleep-related breathing disorders after adjusting for age, BMI, smoking, and other potential confounding factors.

Several longitudinal studies presented mixed findings concerning the association of sleep quantity and quality with weight gain. Subjects who weigh more may sleep less, perhaps because of comorbidities or altered sleep quality, and subjects who sleep less may gain weight because of increased appetite, late-night eating, or insufficient physical activity due to daytime sleepiness (25,26). It was also suggested that both short and long sleep durations may be associated with higher BMI. Some studies found a U-shaped association with increased risk of obesity for both short and long sleepers (27,28). Studies of identical and fraternal twins suggested that sleep deprivation may promote the expression of genes related to obesity (29). In the present study, we could not find such a relationship between sleep duration and BMI, perhaps due to the fact that our study group was very homogeneous.

In conclusion, the prevalence of self-reported poor sleep quality was high in this study. Although we could not find any significant relationship between body measurements and PSQI scores, sleep-related breathing disorders should be kept in mind, especially in snorers.

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