

Sleep disturbance in women who undergo surgical menopause compared with women who experience natural menopause

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Abstract

Objective: Women who undergo surgical menopause (SM) experience a relatively more acute and precipitous drop of estrogen compared with women who experience natural menopause (NM). Few studies, however, have compared sleep quality in women who experience natural versus SM.

Methods: Participants were 526 postmenopausal women (mean age 60.2 ± 7.64). All participants completed self-report questionnaires about insomnia symptoms, sleep-interfering behaviors, depression, sleep quality, and gynecological history. Analysis of covariance was conducted to compare women who experienced NM versus SM on sleep variables. Logistic regression analysis was used to determine whether NM or SM groups predicted insomnia status. Regression-based moderation analysis was conducted to explore the moderating effect of type of menopause on the relationship between sleep-interfering behaviors and insomnia symptoms.

Results: Among the sample, 81.6% ($n = 429$) reported going through NM and 18.4% ($n = 97$) reported going through SM. The SM group was significantly younger by 7.2 years ($P < 0.001$). Women in the SM group reported significantly worse sleep quality ($P = 0.007$), especially for sleep duration ($P = 0.001$) and habitual sleep efficiency ($P = 0.010$) compared with women in the NM group. Regression analysis indicated that individuals in the SM group were 2.131 (95% CI 1.055-4.303) times more likely to have insomnia compared with the NM group ($P = 0.027$). In addition, women in the SM group who displayed more sleep-interfering behaviors also had a higher severity of insomnia symptoms compared with women who experience NM ($\beta = 0.26$, $P = 0.03$).

Conclusions: Menopause can be both physically and psychologically challenging, but women who undergo SM experience worse sleep quality compared with women who experience NM, and may benefit from behavioral interventions.

Key Words: Insomnia – Menopause – Sleep – Sleep-interfering behaviors – Surgical menopause.

Menopause is characterized by reduced ovarian hormone levels and absence of ovarian function.^{1,2} With this change, many women experience

adverse symptoms, with insomnia being one of the most predominant and common symptoms.³ In the 2005 NIH State-of-the-Science Conference panel report on menopause-related symptoms, poor sleep quality and insomnia were identified as core symptoms of menopause.⁴ Several psychophysiological causes may influence insomnia symptoms in postmenopausal women, such as vasomotor symptoms (hot flashes and night sweats),⁵ hormonal changes,⁶ and increased hyperarousal.⁷ The prevalence of insomnia, defined as disturbed sleep associated with distress or impairment lasting 3 months or greater, is estimated at 39% to 60% in peri- and postmenopausal women.⁸ The prevalence rate of insomnia is highest among postmenopausal women (19.7%) compared with perimenopausal (15.9%) and premenopausal women (7.3%) in Korea.⁹

Two of the most common ways of becoming menopausal are through natural menopause (NM) and surgical menopause (SM). NM is defined as going through menopause without any obstetrics and gynecological surgery; in contrast, SM is defined as menopause that is induced by obstetrics and gynecological surgery such as bilateral oophorectomy.¹⁰ Women who undergo menopause by surgical means typically experience more psychological and physical difficulties compared with women who

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transition through menopause naturally.¹⁰⁻¹⁵ The increased severity of menopausal symptoms in women who undergo SM may further disrupt sleep. For example, hot flashes that occur at night frequently awaken women from sleep, and women with increased nocturnal hot flashes/night sweats may also experience more nocturnal awakenings that are unrelated to a vasomotor event.¹⁶⁻¹⁸ Severe menopausal symptoms that accompany SM may serve as a precipitating factor contributing to the onset of insomnia; however, it remains unclear whether women who undergo SM have more disturbed sleep compared with women who transition through NM.

Sleep-interfering behaviors have been shown to perpetuate insomnia.^{19,20} One study reported that postmenopausal women engage in more sleep-interfering behaviors, such as watching television in bed and smoking to cope with sleep-onset difficulties despite its negative effects on sleep.²¹ This study was, however, qualitative and mainly relied on interview-based descriptive accounts of participants. Empirical studies investigating sleep-interfering behaviors in women who undergo SM and the effect that these behaviors have on sleep are very limited. Only a few quantitative studies have investigated sleep-interfering behavior in postmenopausal women, but these studies did not compare sleep-interfering behaviors based on type of menopause.^{22,23}

The present study aims to compare sleep quality, insomnia symptoms, and sleep-interfering behavior in women who underwent SM compared with NM. As women who undergo SM experience more severe menopausal symptoms compared with women who transition through NM, we hypothesized that women who undergo SM may experience more severe insomnia symptoms or are more negatively affected by insomnia symptoms compared with women who transition through NM. In addition, we aimed to investigate the moderating effect of type of menopause (SM or NM) in the relationship between sleep-interfering behaviors and insomnia symptoms.

METHODS

Participants

This study utilized a subsample from a larger study (Korean Genome and Epidemiology Study), a population-based cohort study that started in 2001. More information about the primary study has been described previously.^{9,24,25} The original participants were recruited from Ansan, South Korea (Table 1). We used data collected in 2012, which included the primary variables used in this study. Among the 1,524 participants who participated in the study in 2012, 526 women aged 50 to 79 years who completed questions about menopause status were included in the final analysis. Each participant signed an informed consent form. This study was approved by the institutional review board of Korea University Ansan Hospital.

Demographic variables

Participants completed information about income, marital status, alcohol use, menopause age, hormonal medication use, and menopausal duration. Marital status was divided into two groups: currently married and not married (single, divorced, widowed, etc.). Income was divided in four groups: less than \$850, \$850 to \$1,700, \$1,700 to \$2,550, and more than \$2,550, which was consistent with previous papers from this study.^{9,24,25} Alcohol use was assessed by asking participants how many grams of alcohol they consume per day. Age of menopause was assessed by a self-report questionnaire with an open type question "When did your menopause start?" For hormonal medication use, we used the question "Have you ever used or are using hormonal pills or injection after menopause?" Participants were able to select from the following responses: now using/have used before/never used before. To calculate duration since initiation of menopause, we subtracted age of menopause from current age.

TABLE 1. General characteristics of the sample

	Natural menopause (n = 429)	Surgical menopause (n = 97)	P
Age	60.43 (±7.58)	59.15 (±7.85)	0.137
Menopause age	50.14 (±3.23)	42.94 (±5.98)	<0.001 ^a
Menopausal duration	10.13 (±8.09)	16.22 (±9.85)	<0.001 ^a
Now married			
Yes	345 (80.4%)	76 (78.4%)	0.646
No	84 (19.6%)	21 (21.6%)	
Alcohol use	0.84 (±2.92)	1.51 (±5.70)	0.078
Income			
<\$850	79 (18.4%)	20 (20.6%)	0.451
\$850-\$1,700	64 (15%)	12 (12.4%)	
\$1,700-\$2,550	106 (24.7%)	22 (22.7%)	
>\$2,550	167 (39%)	43 (44.3%)	
BMI	24.42 (±3.05)	25.06 (±3.43)	0.470
Hormonal medication use			0.021 ^b
Now using	19 (4.4%)	8 (8.3%)	
Have used before	70 (16.4%)	24 (25.0%)	
Never used before	339 (79.2%)	64 (66.7%)	

Alcohol use is consuming alcohol grams per day.

Menopausal duration means duration of menopause, calculated by subtracting menopausal age from current age.

^aP < 0.001.

^bP < 0.05.

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Menopause status and obstetrics/gynecology history

Menopause status was determined based on presence of menstruation in the last 12 months. All women who responded that absence of menstruation during the last 12 months were classified as postmenopausal and included in the final analysis.²⁶ Additional questions about reason for menopause (natural/surgical) were completed. Based on the reason for menopause, participants were divided into NM group or SM groups. NM was defined as menopause induced by aging without any medical intervention, and SM was defined as menopause as a result of gynecological surgeries.

Insomnia and sleep quality

The Insomnia Severity Index (ISI) is a 7-item self-report questionnaire that evaluates insomnia symptom severity.²⁷ Participants are asked to respond to each question on a 5-point Likert Scale, with each question ranging from 0 to 4. A total score is calculated by summing up all items, with higher scores reflecting more severe insomnia symptoms. A cutoff score of 10 was used to determine clinically significant insomnia disorder.²⁸ Cronbach's α of the ISI in this sample was 0.880.

The Pittsburgh Sleep Quality Index (PSQI) is a self-report questionnaire that measures sleep quality and sleep disturbances.²⁹ It consists of seven subscales: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. The total score ranges from 0 to 21, with higher scores reflecting more sleep difficulties. Cronbach's α of the PSQI in this sample was 0.747. Compared with the ISI, the PSQI is more focused on sleep quality such as sleep depth and comfort.⁵⁰

In measuring self-reported sleep, we used both the ISI and PSQI because they assess different dimensions of sleep. The ISI is specifically designed for assessing an insomnia disorder based on the Diagnostic and Statistical Manual of Mental disorders (DSM-IV), and was developed to consider subjective feelings of impairment and psychological distress from insomnia symptoms.²³ However, the ISI only concentrates on three core symptoms—sleep-onset difficulties, sleep maintenance difficulties, and early morning awakenings. In contrast, the PSQI measures both sleep quality and sleep disturbance, which is a broader and more complex concept compared with insomnia disorder in that it assesses depth and/or restfulness of sleep. Other studies investigating sleep in postmenopausal women also utilized both the ISI and PSQI.³⁰⁻³⁵

Thus, in this study, insomnia symptoms and sleep quality are distinguished based on the following operational definitions. Insomnia symptoms are based on insomnia disorder criteria,³⁶ representing three major symptoms—sleep-onset difficulties, sleep maintenance difficulties, and early morning awakenings. Sleep quality includes the following components—sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, sleeping medication usage, and daytime dysfunction.

Sleep-interfering behaviors

The Sleep Behavior Scale (SBS) is a 12-item self-report questionnaire assessing sleep-interfering behaviors.²⁰ Items on this questionnaire assess the extent in which the participant engages in sleep-interfering behaviors, such as consuming alcohol or drinking caffeine, having heavy meals or engaging in active things before bed, or taking a long nap more than 30 minutes. All items are measured on a 5-point Likert scale from 1 to 5, with higher scores reflecting more engagement in sleep-interfering behaviors. Cronbach's α of the SBS in this sample was 0.573.

Depression

The Beck Depression Inventory (BDI) is a 21-item self-report questionnaire that evaluates the severity of depression symptoms.³⁷ Participants respond to the degree that they experience depression symptoms during the past 2 weeks. Each question is measured on a 5-point Likert scale, with total scores ranging from 0 to 63. Higher total scores indicate higher severity of depressive symptoms. We excluded the sleep item (item no. 16) for total score calculation. Cronbach's α of the BDI in this study was 0.870.

Data analysis

SPSS Statistics version 21 (IBM Corp., Armonk, NY) was used for data analysis. For the main analysis, we conducted Analysis of Covariance (ANCOVA), comparing insomnia severity, sleep-interfering behaviors, sleep quality, and depression symptoms between NM and SM groups after adjusting for marital status, income, alcohol, age of menopause, hormonal medication use, and menopausal duration. Our covariates (marital status, income, alcohol use) were selected based on prior studies of Korean postmenopausal women.^{9,38} Other covariates (menopause age, hormonal medication use, and menopausal duration) were entered into the model because there was a significant difference between groups on these variables in the present study.

In addition, to investigate the association of insomnia in SM compared with NM, logistic regression analyses were conducted. The dichotomous dependent variable was insomnia symptoms measured by ISI using a cutoff score of 10. Menopausal group (natural/surgical) was entered as the predictor variable, and menopause age, hormonal medication use, and menopausal duration were entered as covariates. At first, menopausal group was solely entered to investigate the crude model. Subsequently, covariates (menopause age, hormonal medication use, menopausal duration) and menopausal group were entered as a multivariate model.

The PROCESS Macro for SPSS³⁹ was used to examine the type of menopause as a moderator in the relationship between sleep-interfering behavior and insomnia symptoms. We intended to investigate the interaction effect of sleep-interfering behaviors and type of menopause in predicting insomnia symptoms. PROCESS model 1 was utilized for moderator analysis, and SBS scores were entered as a predictor (X), ISI scores were used as the criterion variable (Y), and type of menopause was set as a moderator (M). Compared with

TABLE 2. Analysis of covariance about differences of sleep and mood disturbances between NM and SM (N = 526)

	Natural menopause (N = 429) M ± SD	Surgical menopause (N = 97) M ± SD	P
ISI	4.88 ± 4.74	6.86 ± 6.62	0.052
SBS	14.75 ± 3.63	15.70 ± 4.89	0.177
PSQI			
Total	4.75 ± 3.00	5.85 ± 3.33	0.007 ^a
Sleep quality	0.99 ± 0.63	1.19 ± 0.69	0.050
Sleep latency	1.31 ± 0.63	1.42 ± 0.69	0.283
Sleep duration	1.17 ± 1.02	1.54 ± 1.04	0.001 ^a
Habitual sleep efficiency	0.44 ± 0.83	0.76 ± 1.03	0.010 ^b
Sleep disturbance	0.36 ± 0.50	0.36 ± 0.53	0.515
Use of sleeping medication	0.18 ± 0.67	0.14 ± 0.58	0.481
Daytime dysfunction	0.33 ± 0.70	0.46 ± 0.75	0.287
BDI	8.87 ± 6.57	10.87 ± 8.92	0.053

ISI, Insomnia Severity Index; SBS, Sleep Behavior Scale; PSQI, Pittsburgh Sleep Quality Index; BDI, Beck Depression Inventory.

^aP < 0.01.

^bP < 0.05.

hierarchical regression, the PROCESS model 1 has an inherent characteristic in which the interaction term (XM) is generated automatically. A moderation effect is considered to exist when the effect of the predictor in predicting the criterion variable is influenced by the strength and direction of the moderator.⁴⁰ After this analysis, the conditional effect of SBS scores on ISI scores based on the type of menopause was examined. We set the confidence level at 0.05, considering <0.05 as a significant moderating effect. Bootstrapping is a process that utilizes a random resampling process based on the collected sample and calculates CIs.⁴¹ The 5000-replicate bootstrap analysis was used to evaluate the CIs in this study.⁴²

RESULTS

Demographic information

Among the total sample of 526 women, the majority of women reported transitioning into menopause naturally (n = 429, 81.6%), whereas 97 (18.4%) participants reported undergoing SM. There were no significant differences in age (NM: 60.43 ± 7.58 vs SM: 59.15 ± 7.85 y old, P = 0.137); however, age of menopause was significantly different between the two (NM: 50.14 ± 3.23 vs SM: 42.94 ± 5.98, P < 0.001); hormonal medication use was also significantly different between groups (4.4% vs. 8.3% for NM and SM, respectively, P = 0.021); and menopausal duration was significantly different (NM: 10.13 y vs SM: 16.22 y, P < 0.001). All other demographic variables did not differ significantly between SM and NM groups (Table 1).

Differences in sleep quality between groups

For the PSQI, the NM group scored under the cutoff score of 5 (4.75 ± 3.00), whereas the SM group scored above the clinical threshold, indicating poor sleep quality (5.85 ± 3.33). ANCOVA was conducted to compare sleep quality between groups after controlling for covariates (menopause age, hormonal medication use, menopausal duration, marital status, alcohol use, income). In unadjusted and adjusted models, sleep

TABLE 3. Logistic regression model for insomnia by menopause group (N = 526)

	Crude OR (95% CI)	P	Multivariate OR (95% CI)	P
Natural menopause	1.0 (Reference)	—	1.0 (Reference)	—
Surgical menopause	2.325 (1.353-3.997)	0.002 ^a	2.131 (1.055-4.303)	0.027 ^b

Controlling menopause age, hormonal medication use, menopausal duration.

^aP < 0.01.

^bP < 0.05.

quality was significantly different between the two groups. Women who underwent SM reported worse sleep quality than women who transitioned through NM (P = 0.007). Among the subscales of PSQI, women who underwent SM reported shorter sleep duration (P = 0.001) and worse habitual sleep efficiency (P = 0.010) compared with women who transitioned through NM (Table 2). Other sleep and mood indices were not significant, although there was a trend toward significance for insomnia (ISI) and depression (BDI) symptom severity (P = 0.052, P = 0.053, respectively).

Association between type of menopause and insomnia symptoms

Both SM and NM groups scored in the clinically nonsignificant range for the ISI (under the cutoff score of 10). Logistic regression analysis was conducted to investigate the association between insomnia symptoms. The independent variable was type of menopause (SM/NM), whereas the dependent variable was clinical insomnia (utilizing a cutoff point of 10 on the ISI). After controlling for menopausal age, hormonal medication use, and menopausal duration, women who underwent SM had a 2.13 higher odds ratio of having clinical insomnia symptoms compared with NM women (95% CI [1.055-4.303]; Table 3).

Moderating effect of menopausal reason in the relationship between sleep-interfering behavior and insomnia

The main effect of sleep-interfering behaviors in predicting insomnia was significant ($\beta = 0.37$, P = 0.02). An interaction effect was also significant between sleep-interfering behaviors and type of menopause in predicting insomnia symptoms ($\beta = 0.26$, P = 0.03; NM: Effect = 0.6363, SE = 0.0626, Bootstrapped 95% CI [0.5133-0.7593] vs SM: Effect = 0.8997, SE = 0.1036, Bootstrapped 95% CI [0.6962-1.1033]; Table 4,

TABLE 4. Moderating effect of menopause reason in insomnia symptoms (N = 477)

		Coefficient	SE	P
Step 1	Sleep-interfering behavior	0.37	0.16	0.02 ^a
Step 2	Menopause reason	-2.69	1.92	0.16
Step 3	Menopause reason × sleep-interfering behavior	0.26	0.12	0.03 ^a

^aP < 0.05.

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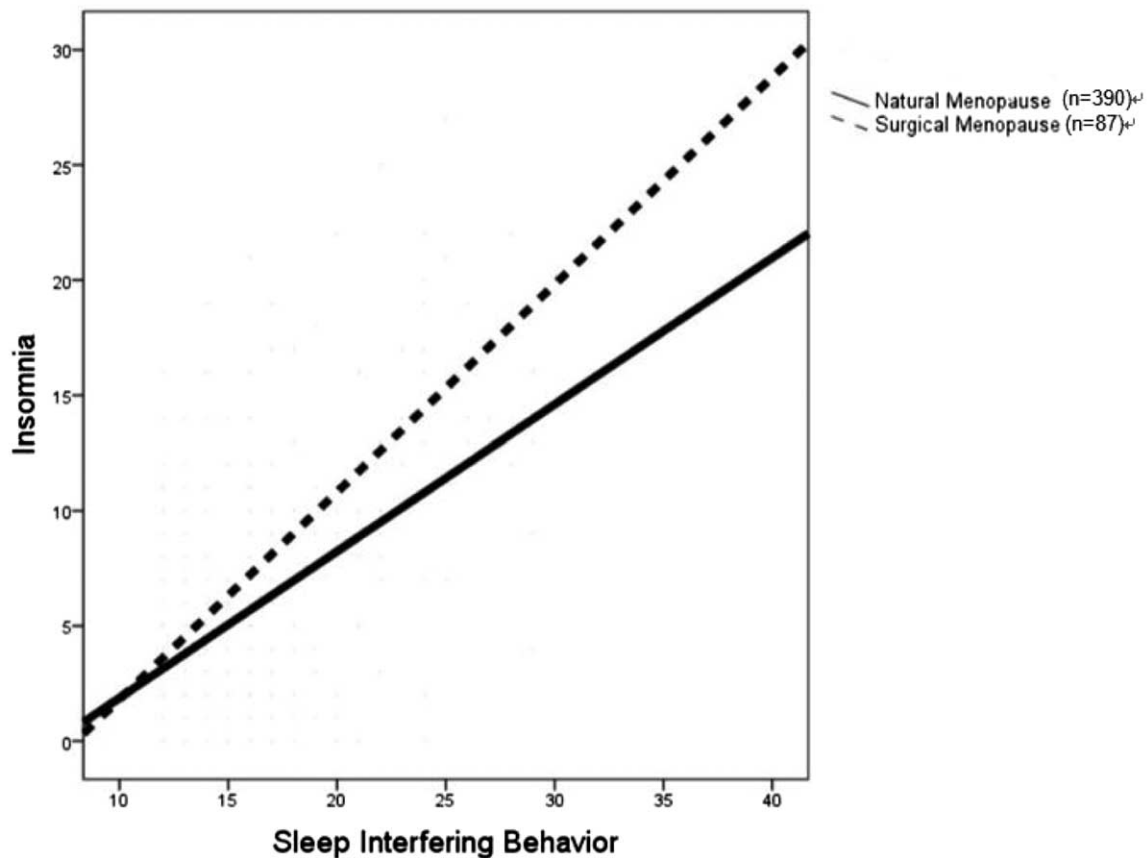


FIG. 1. The moderation effect of menopause reason in the relationship between sleep-interfering behavior and insomnia.

Fig. 1). Thus, women who underwent SM and engaged in more sleep-interfering behaviors reported greater insomnia severity compared with women who transitioned through NM who engaged in the same level of sleep-interfering behaviors.

DISCUSSION

The main findings from this study revealed that women who undergo SM reported lower sleep quality and have 2.13 times higher odds of having clinical levels of insomnia symptoms compared with women who transition through NM. In addition, women who underwent SM and engaged in sleep-interfering behaviors had a stronger impact on their insomnia symptom severity compared with women who transitioned through NM. To the best of our knowledge, this is the first published study to explore insomnia symptoms and sleep quality comparing types of menopause, especially considering the context of sleep-interfering behaviors.

The findings of this study have merit in that it is the first study to compare type of menopause on insomnia symptoms, especially in association with sleep-interfering behavior. Distinguishing the impact of type of menopause on sleep is especially important as a rather substantial proportion of women transition through menopause through gynecological surgery. In our study, 18% of the sample reported undergoing SM, which was similar to other studies using large community-based samples showing 15% to 18% of women who

underwent SM.^{13,43} Although gynecological surgeries are often associated with drastic hormonal changes and contribute to psychological difficulties and changes in sexual and cognitive function,^{12,15} sleep quality and insomnia symptoms in this population are often overlooked and education or treatment are generally not tailored to women based on type of menopause. Although current sleep practices do not recommend treating SM and NM differently, our study suggests that women who undergo SM are more vulnerable to poor sleep quality and may require more clinical attention.

Sleep quality in surgically postmenopausal women

Our study found lower levels of sleep quality in women who underwent SM compared with women who transition through NM, with the SM women reporting worse sleep quality measured by the PSQI. This was consistent with prior studies that have investigated sleep quality in women who underwent SM.^{44,45} Butts et al investigated women with BRCA 1 and BRCA 2 who underwent bilateral salpingo oophorectomies, and found that 61.2% of their sample reported worse sleep quality. Consistent with this study, a meta-analysis investigating insomnia symptoms in women who underwent SM and pre/postmenopausal women revealed that women who undergo SM have higher prevalence of insomnia symptoms.⁴⁵

In the present study, women who underwent SM reported shorter sleep duration and worse habitual sleep efficiency

on subscales of the PSQI compared with women who transitioned through NM. This was consistent with a prior study that also reported shorter sleep duration and more wake after sleep-onset after hysterectomies.⁴⁶ In addition to pain, this may be explained by the abrupt steroid hormone changes after surgery.¹⁷ Women who experience NM typically have a slower transition through a “perimenopausal stage,” which takes several years during NM and is characterized by a gradual decrease of estrogen. Compared with women who transition through NM, women who undergo SM experience an abrupt change in circulating hormones which may result in increased severity of insomnia symptoms.⁴⁷

In addition, hot flashes are one of the factors highly associated with awakenings during night sleep in postmenopausal women.⁴⁸ Baker et al investigated the association between awakenings and hot flashes in perimenopausal women using PSG and found 27.2% of awakenings were associated with hot flashes.⁴⁸ Precipitous drops in circulating hormone levels after gynecological surgery may contribute to increased vasomotor symptom severity and may, in turn, be associated with shorter sleep duration and lower sleep efficiency in women who underwent SM compared with women who transition through NM. Nonetheless, in a clinical context, women who had a hysterectomy or bilateral oophorectomy may be especially vulnerable to insomnia symptoms. Thus, providing education before surgery on what women may expect in terms of sleep and other menopausal symptoms after their surgery may be extremely helpful as a preventive measure.

Surgical menopause and sleep-interfering behavior

In our study, type of menopause moderated the relationship between sleep-interfering behaviors and insomnia symptoms. Thus, despite engaging in the same degree of sleep-interfering behavior, women who underwent SM were more likely to have higher insomnia symptoms compared with women who underwent NM. This could, in part, be associated with mood changes during the menopausal transition, which is highly related with insomnia symptoms in postmenopausal women.⁴⁹ Middle-aged women who report increased depressed mood show higher tendencies of spending time awake in bed.⁵⁰ Prior studies have also reported that women who undergo SM have a higher prevalence of depression.⁵¹ It is possible women who undergo SM may extend their time in bed spent awake, which subsequently contributes to conditioned arousal and insomnia.^{19,52,53} In addition, one study reported that time in bed, total sleep time at night, and napping were increased during the 24-hour period after a hysterectomy.⁴⁶ Thus, the surgery itself may serve as a precipitating factor for SM women and the extended time in bed and napping after surgery may serve as a perpetuating factor for insomnia.

Our results can also be interpreted from a cognitive-behavioral framework which proposes that cognition, behavior, and mood interact and influence each other. Stronger negative attitudes toward menopause may manifest in less health-promoting behavior such as finding information and engaging

in preventive health practices.⁵⁴ Some studies found that women who underwent SM and women receiving hormone therapy (HT) had stronger negative attitudes toward menopause compared with women who transition through NM.^{55,56} Consistent with this framework, women who undergo SM and also experience negative attitudes about menopause may engage in less sleep-promoting behaviors. It may be helpful for clinicians to explore maladaptive, sleep-interfering behaviors of patients who are undergoing SM and also report insomnia symptoms. Future studies should also explore the relationship between attitudes toward menopause and sleep-interfering behaviors of midlife women, and how it may influence insomnia symptoms.

In addition, the interaction of sleep-interfering behaviors and type of menopause suggests that women who undergo SM and also engage in sleep-interfering behaviors may have a stronger negative effect on their sleep. A previous study reported the interaction between poor sleep quality and sleep-interfering behaviors as a powerful predictor of persistent insomnia.²⁰ According to the 3P model of insomnia by Spielman,⁵⁷ there are three factors that contribute to insomnia, including (1) predisposing, (2) precipitating, and (3) perpetuating factors. In application of this model on postmenopausal women, menopause and menopause-producing gynecological surgeries could serve as the precipitating factor which heightens the risk of insomnia for these women, and sleep-interfering behaviors may serve as perpetuating factors in which the insomnia is maintained. This may, in part, explain the higher prevalence of insomnia in postmenopausal women compared with pre- and perimenopausal women. Consistent with the results in this study, women who undergo SM showed worse sleep quality compared with women who transition through NM, and may require additional clinical attention regarding sleep-interfering behavior.

Limitations

This study was a cross-sectional one investigating the differences between types of menopause (SM vs NM). Future studies are needed to investigate the natural course of menopausal symptoms in association with sleep quality, and the interplay between behavioral and physiological factors to better guide treatment. Second, this study relied on subjective reports of menopause and sleep. Additional studies utilizing objective measures of menopause (eg, follicle-stimulating hormone levels) and sleep (eg, polysomnography, actigraphy) may be able to provide more information about differences and mechanisms about why women who undergo SM experience more sleep difficulties compared with women who transition through NM. In dividing the participants into natural or SM group, we relied on self-reported information about type of menopause (natural or surgically induced). Finally, we were not able to consider and distinguish insomnia due to menopause-onset or prolonged insomnia before menopause. To understand insomnia symptoms in women who undergo SM in more depth, investigating the exact time of onset may be useful in future studies.

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CONCLUSIONS

This study compared sleep disturbance of women who underwent SM compared with women who transitioned naturally through menopause. Women who undergo SM reported worse sleep quality (particularly shorter sleep duration and lower sleep efficiency) compared with women who transitioned through NM. In addition, women who underwent SM had 2.13 times higher odds of reporting clinical levels of insomnia compared with women who transitioned through NM. Finally, sleep-interfering behaviors had a more significant impact on the sleep of women who underwent SM compared with women who transitioned through NM. Sleep is often overlooked in the course of potential consequences of gynecological surgery and induced menopause, and often type of menopause is not considered when providing education or intervention in this population. Our study suggests that assessing sleep quality may be particularly important in women who undergo gynecological surgery that results in menopause because they may be more vulnerable to poor sleep quality.

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