Published in final edited form as:

Clin J Womens Health. 2001 December 1; 1(5): 244–252. doi:10.1053/cjwh.2001.30491.

Sleep Complaints of Postmenopausal Women

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Abstract

Objective—To study correlates of sleep problems in postmenopausal women.

Methods—Baseline questionnaire items related to sleep patterns and problems were administered to 98,705 postmenopausal women as part of the Clinical Trial and the Observational Study of the Women's Health Initiative.

Results—Less than 27% of the sample reported sleeping 8 hours or more. Many women reported that at least once a week they awoke several times at night (61%), fell asleep during quiet activities (52%), or reported other symptoms suggestive of insomnia or excessive daytime sleepiness. More frequent insomnia problems were reported among women who reported nocturnal sleep longer than the mode of 7 hours, as well as among women who reported very short sleep. Age, ethnicity, hormone replacement therapy, employment, marital status, diet, and season explained remarkably little of the variance in sleep duration or insomnia complaints; however, black women reported sleeping 0.45 hours on average less than whites, with the other minorities being intermediate between these groups.

Conclusions—The results suggest that simple abbreviation of sleep and demographic factors may be less important in the sleep complaints of postmenopausal women than other possible factors. Cognitive-behavioral processes, depression, and obesity with apnea may be among the causes.

Keywords

Sleep; insomnia; depression; menopause; obesity

Many national and international surveys have indicated that sleep complaints increase with age, and that insomnia complaints are particularly prevalent among women after menopause.¹⁻⁷ Postmenopausal women have had the highest rates of insomnia complaints in the population and the highest rates of hypnotic drug usage, especially chronic hypnotic consumption. There are far more awakenings within sleep in samples of aging adults than

among young adults, even among elders who do not complain of insomnia.⁸ Brugge et al found that insomnia complaints in women increased sharply close to the time of menopause and were relatively stable after menopause, regardless of the age of onset of menopause, which suggests that menopause rather than age is a determining influence among women.⁹ It is surprising that recent U.S. surveys found no excess of insomnia complaints among women older than age 64, partly because insomnia was rather prevalent among young women^{10,11}; this raises the question of whether contemporary changes in sleep habits or the increasing prevalence of hormone replacement therapy might be modifying the long-standing trends.

The Women's Health Initiative (WHI) is an ongoing exploration of critical health risks among postmenopausal women.¹² Special efforts have been made to include an adequate percentage of minority participants. As part of the baseline data collected for the WHI, 10 questionnaire items about sleep were asked along with queries about a variety of potential risk factors for sleep disturbance. The quality and quantity of responses provided an opportunity to further explore the symptoms of disturbed sleep among postmenopausal women and especially among minority women, whose sleep has previously been little examined.

Because the causes of sleep problems among postmenopausal women are poorly understood, a variety of potential causes were considered. Several studies suggest that low estrogen is a factor in the sleep complaints of postmenopausal women.¹³ Indeed, there is scattered evidence that hormone replacement therapy may partially relieve sleep complaints,¹³⁻¹⁶ so it was interesting to assess this effect in contemporary women, among whom hormone use has become more common. The importance of social factors, habits, and dietary constituents that may cause sleep symptoms were also examined, along with the impacts of age and ethnicity in this large and geographically diverse sample.

Material and Methods

The WHI has a complex multifaceted design.¹² For these analyses, baseline health questionnaires were examined from 98,705 women who entered the Clinical Trial or Observational Study between October 1, 1993, and February 28, 1997. After they signed informed consent consistent with the Declaration of Helsinki, the women provided from 97,848 to 98,143 valid answers to 9 sleep questions (some data were missing or miscoded). A tenth question about snoring was answered by 47,651 women, but most of the others indicated that they did not know whether they snored or left the question blank.

The text of key questions is shown in Table 1. To estimate the numerical frequency per week of reported symptoms, the 5 possible responses were interpreted as 0, 0.5, 1.5, 3.5, or 6 times per week. Several covariates of sleep complaints were derived from other health questionnaires that were administered.

Severe overweight was defined as body mass index (BMI) of more than 32.2 kg/m² in referencing BMI to sleep symptoms.¹⁷ Probable major depression or dysthymia was defined using a screen intended for 2-stage case finding,¹⁸ although our San Diego group found that most cases detected by this algorithm may not meet DSM-IV diagnostic criteria for major depression by psychiatric interview.¹⁹

Each woman was asked to identify her racial or ethnic group as (1) American Indian or Alaskan Native, (2) Asian or Pacific Islander, (3) black or African-American, (4) Hispanic/Latino, (5) white (not of Hispanic origin), or (6) other.

Mantel-Haenszel analyses were computed to determine characteristics associated with each sleep complaint, controlled for age and ethnicity. Multiple regression was used to obtain

rough estimates of the combined strength of associations among variables, controlling for age and ethnicity and recognizing the limitation that most items were not continuous variables with Gaussian distributions. In the model that used reported sleep duration as the dependent variable, each 5-year age class, each minority ethnic class, each marital status (currently married, separated or divorced, widowed, never married), each level of cigarette use, etc was entered as an independent pseudo-variable coded 1 if the subject fell in that class or 0 if the subject was a member of a different class. Women who reported that they were using “any female hormones like estrogen (Premarin; Wyeth-Ayerst Laboratories, St Davids, PA) or progesterone (Provera; Pharmacia Corporation, Peapack, NJ)” were scored as hormone users, those who reported no use in the past 3 months were scored as nonusers, and those who reported use in the previous 3 months but not at the time of the questionnaire were excluded from analyses concerning hormone use. From the dates of interviews, the season of the year was assigned an angle from zero to 360°, and the sine and cosine components of seasonality were then analyzed in quartiles. Based on evidence that 5 items form the major sleep complaint factor (Dr. Douglas Levine, unpublished data), an insomnia score was created by summing the reported frequencies of trouble falling asleep, waking up several times a night, waking up earlier than planned, trouble getting back to sleep, and the “typical night's sleep.” Scores of 1 to 5, respectively, were assigned for the increasing reported frequencies of the first 4 symptoms, with scores of 5 to 1 assigned for the responses regarding the typical night's sleep. The logarithm of the sum of these scores, which has a roughly Gaussian distribution, was then defined as an insomnia summary score. This insomnia score was also modeled as a dependent variable in multiple regression.

Results

The sample consisted of whites (84%), blacks (9%), Hispanics (3%), and other minorities (Asian, Pacific Islander, Native American, and other; 4%). The women were ages 50 to 54 (18%), ages 55 to 59 (22%), ages 60 to 64 (21%), ages 65 to 69 (20%), ages 70 to 74 (14%), and ages 75 to 79 (6%).

Symptom Frequency and Sleep Duration

Sleep symptoms and the reported durations of sleep are summarized in Table 1. Repeated awakenings and falling asleep during quiet activities were the most frequently reported symptoms, occurring in three quarters of the sample. Waking up earlier than planned, trouble getting back to sleep after awakening early, and napping were also reported frequently. Trouble falling asleep and use of medication to fall asleep were reported only by a minority. Only 34% of those who answered the question reported snoring at least 3 times per week. The mean reported sleep duration was 6.88 hours. Fewer than 27% of the sample reported sleeping 8 hours or more on a typical night. Neither sleep durations nor symptoms were substantially seasonal.

Age Effects

There were no consistent age trends in reported sleep durations (Fig 1). Among symptoms, only reports of napping during the day showed an appreciable age trend, rising from an estimated 0.6 times per week at age 50 to 54 to 1.4 times per week at age 75 to 79 in the combined ethnic groups ($P < .001$). All of the complaints showed statistically significant linear trends with age, but the age effects were generally insubstantial in magnitude and not entirely monotonic.

Ethnicity Effects

As shown in Fig 1, black women reported an average of 0.45 hours less sleep (all ages combined) than white women. The Hispanic and other minority groups were intermediate.

Ethnic differences were consistent across ages. As compared with whites, a higher percentage of black and Hispanic women reported sleep of less than 7 hours or greater than 10 hours. A higher percentage of other minority women reported sleep of less than 7 hours, but fewer women in the “other minorities” group reported long sleep. The estimated frequencies per week of sleep symptoms are presented by ethnic group in Table 2. All χ^2 comparisons of symptoms among the 4 ethnic groups were highly significant ($P < .001$). Minority subjects reported more trouble falling asleep, more falling asleep during quiet activities, more napping during the day, and more snoring, but minority subjects reported less waking several times during the night and less use of sleep aids. Exploratory logistic regression models indicated that snoring and napping were not greater among black women when obesity was controlled. Ethnic comparisons for waking earlier than planned and trouble getting back to sleep were inconsistent across ages.

Correlates of Sleep Duration and Insomnia

As illustrated in Fig 2, sleep complaints had a distinct U-shaped relationship to the reported typical hours of sleep. Each symptom was reported to occur more commonly both among those with the shortest reported sleep and also among those with the longest sleep durations as compared with those with intermediate sleep durations. Use of sleep aids, napping during the day, and snoring were reported to be least frequent among those typically sleeping 7 hours (the mode). Falling asleep in quiet activities, trouble falling asleep, and waking several times a night were least frequent among those who typically sleep 8 hours. Waking earlier than planned and trouble getting back to sleep were least frequent among those who typically sleep 9 hours.

Characteristics examined for relationship to insomnia symptoms included current use of “female hormones,” frequency per week of moderate/strenuous activity greater than 20 minutes, number of cigarettes per day, alcoholic drinks per week, employment status (employed, not working, retired, homemaker, disabled), marital status, family income, season of the year of questionnaire, servings of fruits and vegetables per day, cups of regular coffee per day, and BMI (ie, weight in kilograms divided by height in meters squared). Using multiple regression to estimate the combined magnitude of linear relationships with all of these characteristics (adjusting for age and ethnicity by including these variables in the model), the adjusted R^2 of .026 for the insomnia score indicated that less than 3% of the variance could be explained by the predictors, although each of the insomnia components was statistically, significantly related to almost all of the independent variables ($P < .001$ in almost all χ^2 tests).

All of these characteristics were also significantly related to reported sleep duration ($P < .001$ in Mantel-Haenszel analyses controlled for ethnicity and age), but none of the monotonic relationships was substantial (ie, all Spearman rank order correlations were $< .10$).

In multiple regression, the adjusted R^2 of .039 indicated that age, ethnicity, and all of the other factors explained less than 4% of the variance in reported sleep duration. These low correlations were also attributable in part to U-shaped associations with reported sleep durations, as illustrated for severe overweight and depression in Fig 3. Further, as illustrated in Fig 4, lack of current hormone use, lack of at least moderate activity (exercise), being disabled, and lack of family income of more than \$10,000 were reported the least frequently among those who were sleeping 7 hours. Reciprocal to obesity, low weight (BMI of less than 23.1 kg/m²) was reported most often by those who were sleeping 7 hours. Avoidance of cigarettes, being currently married, eating more than 2 servings of fruits and vegetables a day, and using coffee were found most among those who were sleeping 8 hours. Not working was reported least and being employed most among those sleeping 6 hours. Being

retired and drinking alcohol at least 7 times per week were found most among those sleeping 9 hours. Of variables considered, only being a homemaker was monotonically more common among those with longer reported sleep durations.

The linear associations were somewhat stronger for symptoms, which did not reflect insomnia. BMI was related to snoring, falling asleep in quiet activities, waking up several times at night, and napping during the day (Spearman rank order correlations of .34, .08, and .07, respectively, $P < .001$). Napping during the day was also negatively related to being employed ($r_s = -0.18$; $P < .001$). Incidentally, napping during the day had only a weak negative association with reported coffee use ($r_s = -0.06$, $P < .001$), and the association of other sleep symptoms with coffee use was even weaker.

Discussion

The mean for reported sleep in this large sample was 6.9 hours for whites and somewhat less for minorities. Like other contemporary samples of postmenopausal women, most participants in the WHI reported that they typically slept less than 8 hours per night, which no longer is the population norm.¹¹ Women who reported that they were not employed or were retired slept, on average, 0.1 to 0.2 hours longer than others, which suggests that occupational stresses are no more than a minor factor in contemporary sleep durations.

Reported sleep problems were quite common. Difficulties with maintaining sleep (awakening during the night or awakening early) were reported more frequently than trouble falling asleep (Tables 1 and 2). Because age effects on insomnia symptoms were minor within the age span of 50 to 79 years, the results are consistent with the interpretation that insomnia is increased less by progressive aging than by menopausal status. Nevertheless, hormone replacement therapy, which we had expected to have major effects, had little impact on these questionnaire responses. Although in some studies estrogen replacement therapy appeared to benefit sleep subjectively,¹⁶ it did not increase objective sleep duration in several well-designed studies.²⁰⁻²² There may be some disparity between subjective and objective effects.²² Because our analyses combined heterogeneous forms and doses of hormone replacement therapy, retrospectively determined effects of adequate estrogen and progesterone doses may not have been measured adequately. The prospective WHI Clinical Trial should provide more precise data concerning effects of hormone replacement on sleep.

Considering findings from other studies, it was surprising how little of the variance in insomnia complaints could be explained by age; ethnicity; hormone replacement therapy; and factors such as exercise, cigarette, alcohol, and coffee consumption; family income and employment; and marital status. Apart from snoring, BMI had only very weak relationships to sleep complaints. Although potassium in diet was previously reported to be a factor in midsleep awakenings,²³ consumption of fruits and vegetables (which might reflect potassium) was little correlated with any symptom. Compared with these diverse demographic characteristics, medical and depressive comorbidities have been found to be more important correlates of insomnia.^{24,25}

It is commonly supposed that insomnia symptoms and daytime sleepiness both result from curtailed sleep at night. However, studies have shown that the majority who complain of insomnia report sleep durations within the normal range,^{5,26,27} as was seen in these data. Moreover, patients with insomnia may often be hyperalert during the day rather than sleepy.²⁸

A surprising perspective on sleep complaints is presented by Fig 2. There were U-shaped distributions of symptoms versus typical sleep durations. Both insomnia complaints and reports of daytime sleepiness were associated with nocturnal sleep durations that were long

as well as those that were short. As suggested by Fig 2 and Table 1, most of those who reported various sleep complaints reported the modal sleep duration (7 hours) or greater. A variety of demographic factors also had U-shaped relationships to sleep duration (eg, Figs 3 and 4), although the vertex of the distributions varied from 6 to 9 hours of reported sleep. Figures 3 and 4 suggest that women who sleep at least 9 hours, and in some respects those who slept 8 hours, were less healthy than those who slept 7 or even 6 hours.

It is perplexing that women reporting typically 8, 9, or 10 hours of sleep at night might nevertheless report frequent trouble with sleep. Insomnia complaints might arise sometimes from a tendency to negatively attribute abnormality to sleep latencies, sleep durations, or awakenings that are within normal limits. Some sleep complaints might arise from mistaken beliefs that the average healthy postmenopausal woman sleeps 8 hours without interruption, which is hardly the case. Moreover, people who increase their time in bed in an attempt to unnecessarily increase their sleep are likely to thereby increase their sleep latencies and midsleep awakenings.²⁹ Napping and falling asleep during the day also increased with reported long sleep at night. Daytime sleepiness may result from poor sleep at night, but in a circular process, napping also tends to cause decreased nocturnal sleep efficiency. Circadian rhythm malsynchronization may be an underlying influence on poor sleep.³⁰

Often, insomnia complaints may be an aspect of the negativistic cognitive disorder seen among depressed people, who form a negative view of self and who voice somatic complaints that lack objective validation.³¹ Depression is intimately related to sleep complaints.^{24,25} Sleep complaints are among the diagnostic symptoms used for nosologic identification of depression.³² Depressed mood predicts the incidence of insomnia,²⁵ and insomnia complaints likewise predict the future incidence of major depression.⁴ Major depression is far more common among women than among men.³³ Although the prevalence of major depression may not increase with aging, milder subsyndromal depressions become more prevalent.^{34,35} The sleep disturbances objectively observed among depressed patients are often mild and nonspecific. Correlations reported between objective measures of sleep disturbance and subjective complaints are often rather weak.^{26,27,36} Because the frequency of depression in these postmenopausal women had a U-shaped association to reported sleep duration similar to the distributions of sleep symptoms (Figs 2 and 3), a proportion of sleep complaints may arise from depression in the absence of any actual sleep curtailment.

BMI and snoring are major correlates of sleep disordered breathing,³⁷ and both had U-shaped relationships with reported sleep duration. This supports the hypothesis that in women, sleep apnea could be one factor that produces increased symptoms both among those with long sleep and among those with short sleep. Epidemiologic studies show that sleep respiratory disturbances are extremely common in women of this age group,³⁸ although population surveys have indicated that sleep apnea is age-related rather than being specifically menopause-related and is more prevalent among men.^{37,39} Increased obesity in long sleepers was not observed among men in a study wherein increased insomnia was found.⁴⁰ The U-shaped distributions for symptoms are similar to the curve for mortality risk, wherein both long and short reported sleep durations are associated with increased mortality.^{5,41-44} The current data as well as mortality data indicate that reported sleep of 9 hours or more may be associated with poor health. In some aspects, even 8 hours of sleep does not appear ideal.

Falling asleep during quiet activities was reported 1.67 times per week on average, with napping reported least commonly. Daytime sleepiness may result from disturbed sleep at night or from weakening in the circadian regulation of sleep timing,^{45,46} but may also result from sleep apnea. Although seasonal affective disorder, often associated with hypersomnia symptoms, affects a substantial portion of premenopausal women,⁴⁷ virtually no seasonality

was found in any of the aspects of sleep measured here. It should also be observed that napping is considered normal in many cultures and may often be harmless.

An important finding was that minority women reported sleeping less typically than white women (Fig 1). Reduced sleep among minority women was confirmed by the first author using wrist activity recordings of a San Diego subsample of WHI participants (unpublished). Likewise, a San Diego population survey of ages 40 to 64 showed shorter sleep among minority than white women, using wrist activity recording.⁴⁸ The short sleep of minority women might result nonspecifically from poor general health or from increased obesity, social stresses, sleep apnea, or depression,⁴⁹ which may be more common among the minority women. More research is needed to determine the remediable impairments.

Minority women reported more snoring, more falling asleep in quiet activities, and slightly more napping. These symptoms might be consistent with more sleep apnea among minorities,^{50,51} and may in part be related to the greater obesity among minority women. Increased reported sleep greater than 10 hours in minorities might be consistent with sleep apnea. Most insomnia symptoms were not consistently elevated among the minority women. In other studies, black women have been found to report insomnia complaints less frequently,⁵² but to have a higher incidence of insomnia.⁴⁹

In 3 ways, these results should discourage the use of hypnotic drug treatments. First, the majority of the insomnia complaints were associated with average or long sleep, so increasing sleep duration might be misdirected. Second, the most popular contemporary hypnotics, zolpidem and zopiclone, are relatively ineffective or may exacerbate awakening early, which was reported more commonly than trouble falling asleep. Third, sleep apnea (which hypnotics may exacerbate) may be a common factor.

In conclusion, as anticipated from previous studies, these questionnaires demonstrated that self-reports of disturbed sleep are extremely frequent among postmenopausal women. The surprising findings are the abbreviated sleep among minority women, the relatively weak associations of reported sleep problems with estrogen use and various social and dietary variables, the high percentage with insomnia symptoms who reported a modal sleep duration or longer, and the high frequency of symptoms of excessive sleepiness. These findings might suggest that reported sleep problems are not predominantly a reflection of curtailed sleep, but more a reflection of cognitive-behavioral disturbances, napping, depression, sleep apnea, circadian factors, or unknown factors that require further research.

Acknowledgments

The authors wish to thank Ms. Liza Noonan, Garnet Anderson, PhD, Matthew Marler, PhD, and Robert Langer, MD, MPH, for their assistance in this study.

Supported by the National Institutes of Health (Women's Health Initiative, HL55983, HL62180, AG15763).

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FIGURE 1. The mean of reported typical night's sleep durations is plotted by 5-year age categories for different ethnic groups

FIGURE 2. The mean frequencies per week of sleep symptoms are plotted versus the reported hours of sleep on a typical night

FIGURE 3. The percentage of volunteers with severe overweight and depression is plotted versus the reported hours of sleep on typical night, showing U-shaped distributions ($P < .001$)

FIGURE 4. The percentage of volunteers with several demographic characteristics is plotted versus the reported hours of sleep, showing U-shaped distributions

TABLE 1

Sleep Questions and Symptom Rates

	No, Not in Past 4 Weeks	Yes, Less Than Once a Week	Yes, 1 or 2 Times a Week	Yes, 3 or 4 Times a Week	Yes, 5 or More Times a Week
Did you take any kind of medication or alcohol at bedtime to help you sleep?	77%	9%	6%	3%	6%
Did you fall asleep during quiet activities like reading, watching TV, or riding in a car?	25%	23%	26%	16%	10%
Did you nap during the day?	48%	22%	17%	8%	4%
Did you have trouble falling asleep?	59%	19%	13%	6%	4%
Did you wake up several times a night?	22%	17%	21%	18%	22%
Did you wake up earlier than you planned to?	41%	22%	19%	11%	7%
Did you have trouble getting back to sleep after you woke up too early?	48%	20%	17%	9%	6%
Did you snore?	43%	10%	13%	11%	23%
	Very Sound or Restful	Sound or Restful	Average Quality	Restless	Very Restless
Overall, was your typical night's sleep during the past 4 weeks:	13%	29%	42%	14%	2%
	5 or Less Hours	6 Hours 7 Hours	8 Hours	9 Hours	10 or More Hours
About how many hours of sleep did you get on a typical night during the past 4 weeks?	8%	28% 38%	22%	4%	0.5%

TABLE 2

Ethnic Effects on Frequency of Symptoms Per Week

Symptoms in the Past 4 Weeks	White	Black	Hispanic	Other Minorities	All
Medication or alcohol at bedtime	0.61 (0.60-0.62)	0.43 (0.41-0.46)	0.55 (0.50-0.59)	0.38 (0.34-0.42)	0.58 (0.57-0.59)
Fall asleep during quiet activities	1.61 (1.60-1.63)	2.05 (2.01-2.09)	1.89 (1.83-1.96)	1.97 (1.91-2.02)	1.67 (1.66-1.68)
Nap during the day	0.89 (0.88-0.90)	0.92 (0.89-0.95)	0.90 (0.85-0.95)	1.18 (1.14-1.23)	0.91 (0.90-0.91)
Trouble falling asleep	0.70 (0.69-0.70)	0.76 (0.73-0.76)	1.00 (0.94-1.00)	0.73 (0.69-0.73)	0.72 (0.71-0.72)
Wake up several times at night	2.37 (2.35-2.38)	2.05 (2.01-2.09)	2.02 (1.96-2.09)	2.15 (2.09-2.21)	2.32 (2.31-2.33)
Wake up earlier than planned	1.20 (1.19-1.21)	1.21 (1.17-1.24)	1.33 (1.27-1.39)	1.21 (1.16-1.26)	1.21 (1.20-1.21)
Trouble getting back to sleep	1.01 (1.00-1.02)	0.96 (0.93-0.99)	1.18 (1.13-1.24)	0.94 (0.90-0.99)	1.00 (1.00-1.01)
Snore	1.93 (1.91-1.95)	2.58 (2.51-2.64)	2.77 (2.66-2.87)	2.10 (2.00-2.19)	2.02 (2.00-2.04)

NOTE. Mean frequency (95% confidence intervals) are shown for each symptom. For each complaint, the 4-way contrast among the ethnic groups was highly significant ($P < .001$).