

Prevalence of Sleep Problems and Quality of Life in an Older Population

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Study Objectives: To determine the prevalence of insomnia traits in a population and the effect of these traits on health-related quality of life.

Design: The Epidemiology of Hearing Loss Study is a population-based study in Beaver Dam, Wisconsin.

Setting: Participants were interviewed as part of the 5-year follow-up examination (1998-2000) of the Epidemiology of Hearing Loss Study. Participants were interviewed at the study office in Beaver Dam, WI, by telephone, or at their residence.

Participants: 2800 adults aged 53-97 years.

Interventions: N/A

Measurements and Results: Participants were asked to what extent they experienced difficulty getting to sleep, waking up at night and having

a hard time getting back to sleep, and waking up repeatedly during the night for any reason. A response of "often" or "almost always" was coded as positive for an insomnia trait. The SF-36 was administered to assess mental and physical function. Twenty-six percent of the population reported one insomnia trait, 13% reported two, and 10% reported three. All eight domains and the Mental and Physical Component Summary scores of the SF-36 decreased significantly (F-test for linear trend statistically significant at $p < 0.0001$) as the number of reported insomnia traits increased.

Conclusions: These results indicate that symptoms of insomnia are common among older adults and are associated with a decrease in health related quality of life.

Key words: Sleep, epidemiology, quality of life, aging, SF-36, insomnia

INTRODUCTION

SLEEP PROBLEMS HAVE BEEN SHOWN TO BE COMMON, ESPECIALLY IN OLDER ADULTS. The 1991 National Sleep Foundation survey found that 36% of the population ($n=1000$, aged >18 years) reported a current sleep problem, and those over 65 years reported more chronic insomnia than other age groups.¹ Likewise, Bixler et al reported the overall prevalence of current insomnia to be 32% in their sample ($n=1006$, aged 18-80 years) with participants older than 50 significantly more likely to report insomnia.² As people grow older, there are many reasons that sleep difficulties may arise. Changes in living arrangements, death of a spouse, bodily pain, nocturia, other physical or mental health conditions, and medications may all affect sleep patterns.³

The impact of sleep problems is important to consider when assessing quality of life in a population. It has been reported that those suffering from even occasional insomnia report more memory problems, impaired concentration, and less satisfaction with relationships than those who report no insomnia.⁴ Memory problems or impaired concentration in older adults may negatively affect quality of life and possibly raise concerns about mental competency.

In 1990, the National Institutes of Health convened a conference to assess the current knowledge of sleep disorders in older people.³ The conference concluded that there is a need for basic descriptive epidemiologic studies of sleep in older people. One purpose of these studies would be to determine the prevalence of sleep disorders in communities. As a population-based study of older adults, the Epidemiology of Hearing Loss Study (EHLS) has the ability to contribute important information about the prevalence of sleep problems in an older population and

the impact of these problems on quality of life.

METHODS

Study Population

Subjects are participants in the Epidemiology of Hearing Loss Study (EHLS), a population-based study of older adults in Beaver Dam, Wisconsin. EHLS is an ongoing study of hearing and sensory loss and quality of life in older adults. A detailed description of the study and its methods have been published elsewhere.⁵ Briefly, a private census was conducted in the city and township of Beaver Dam, WI, in 1987-88. All persons between the ages of 43 and 84 ($n=5924$) were invited to participate in the Beaver Dam Eye Study ($n=4926$, 83%).⁶ Participants alive ($n=4541$) as of March 1, 1993, were eligible to participate in the EHLS, which ran concurrent with the 5-year follow-up examination of the Beaver Dam Eye Study. The participation rate was 82% ($n=3753$) for the baseline EHLS examination.⁵ The data for this study were collected as part of the EHLS 5-year examination and interview in 1998-2000. The age range of participants during this examination phase was 53 to 97 years. Of the 3407 people eligible to participate, 2800 (82.2%) participated, 164 (4.8%) died prior to examination, 436 (12.8%) refused, and 7 (0.2%) were lost to follow-up. As part of this study, information was collected about quality of life and sleep problems. Informed consent was obtained prior to examination.

Sleep

Difficulty initiating and maintaining sleep was ascertained by three questions previously used in the University of Wisconsin Sleep Cohort Study:^{7,8} To what extent do you: (1) Have difficulty getting to sleep? (2) Wake up and have a hard time getting back to sleep? (3) Wake up repeatedly? ^{7,8} Participants could respond never, rarely (1/month), sometimes (2-4 times/month), often (5-15 times/month) or almost always (16-30 times/month). A participant was considered to be positive for an "insomnia trait" if they responded "often" or "almost always." Each participant could therefore have a maximum of three "insomnia traits." Reporting "never," "rarely," or "sometimes" was considered negative for an insomnia trait due to the infrequent occurrence of the problem (once a week or less often). Participants were asked to respond to these questions regardless of the reason for the sleep disturbance, and if they

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were taking medications to help with sleep, they were asked to report their experience when not taking the medications.

Quality of Life

Health-related quality of life was ascertained using the Medical Outcomes Study (MOS) Short Form Health Survey (SF-36).⁹ The SF-36 questions ascertain function, well-being, disability, and personal evaluation for both physical and mental health. The individual questions are grouped into eight domains to measure the following health concepts: (1) Physical Functioning, (2) Role-Physical, (3) Bodily Pain, (4) General Health, (5) Vitality, (6) Social Functioning, (7) Role-Emotional and (8) Mental Health. The scores calculated for each domain range from 0 to 100, with increasing score indicating better quality of life. The eight domains can also be combined into two summary scores, the physical component summary score (PCS) and the mental component summary score (MCS), which have been shown to be accurate summary measures of the eight domains.¹⁰ Physical Functioning, Role-Physical, and Bodily Pain scores contribute the most to the PCS, while the Mental Health, Social Functioning, and Role-Emotional domains contribute the most to the MCS.¹⁰ Vitality correlates with both the MCS and PCS. All scores were calculated according to the recommended guidelines and algo-

rithms.^{9,10}

Statistical Analyses

All statistical analyses were done using SAS.¹¹ Categorical variables were assessed using contingency tables. Mean adjusted SF-36 scores by number of insomnia traits were evaluated using the general linear models (GLM) procedure in SAS. Various potential confounders were controlled for in the analyses and were defined as follows. Hearing was assessed using manual pure-tone audiometry following American Speech, Language and Hearing Association Guidelines.¹² Hearing loss was defined as a pure-tone average of thresholds at 0.5, 1, 2, and 4 kHz > 25 decibels hearing level (dB HL).⁵ Additional health information used in these analyses were collected during the 10-year follow-up examination of the Beaver Dam Eye Study, a concurrent study of age-related ocular disorders in the same population-based cohort.¹³ Visual acuity was measured binocularly, with the participant's current prescription, if applicable, using the Early Treatment Diabetic Retinopathy Study Chart R.¹³ Impaired vision was defined as a current binocular visual acuity of 20/40 or worse. Arthritis and chronic disease history were self-reported. Participants reporting that a doctor told them they had cancer (any kind except skin), cardiovascular disease (stroke, myocardial infarction, or angina), diabetes, emphysema, or bronchitis were considered to have a chronic disease. Education level was divided into less than 12 years or 12 or more years. Smoking was categorized as current smoker, past smoker, or never smoked. Participants who reported they had smoked at least 100 cigarettes in their lifetime were considered smokers; past smokers were no longer smoking by the time of the interview. Direct information on nocturia was not available, but participants were asked how often they had difficulty holding their urine until they could get to a toilet (incontinence). Participants were categorized into three levels; those who reported 1) never or hardly ever, 2) sometimes, or 3) most or all the time have difficulty holding their urine. Alcohol use was assessed by asking participants how much beer, wine, and liquor they consumed per week. The total amount of alcohol consumed was converted to grams per week and divided into five categories: non-drinkers, 0-14, 15-74, 75-140, and > 140 grams per week.¹⁴

RESULTS

Table 1 shows the population characteristics and the frequency of reported sleep problems. The mean age of the population was 69.3 years, and 80% of the population had at least 12 years of education. Only about 10% of the population were current smokers. One-third of the population reported one or more chronic diseases, and slightly less than half reported suffering from arthritis. Half the population has at least a mild hearing loss, and 6.0% had vision impairment. The most common sleep complaint was waking up repeatedly during the night (36%). Almost half of the population (49.0%) reported at least one insomnia trait, and 10% reported all three.

Men and women were the most similar in their reported prevalence of waking repeatedly during the night (Table 2). More than 25% of both men and women in the youngest age group (53-59 years) reported waking repeatedly, and there was a significant increase in the reported prevalence by age group for both men and women ($p < 0.0001$ for both). More than 40% of men and women in the 80 to 97 year age group reported this problem.

The prevalence of the other two insomnia traits, difficulty getting to sleep and waking and having a hard time getting back to sleep, differed between men and women. Difficulty getting to sleep was reported almost twice as often by women as men (Table 2). More than 20% of women in each age group had difficulty getting to sleep, whereas the highest reported prevalence among men for this problem was 17.8% for those aged 80 to 97 years. Difficulty getting to sleep increased slightly with age in both men and women, but the increase was not statistically significant for women ($p = 0.07$) or men ($p = 0.08$). Waking and having a hard time getting back to sleep was also reported more often by women

Table 1—Population Characteristics

	n	%
N=2800		
Mean age = 69.3 years, Standard Deviation = 9.8		
Men	1158	41.4
Women	1642	58.6
Race		
Non-Hispanic White	2773	99.0
Native American	14	0.5
Other/Don't know	13	0.5
Education		
<12 years	552	19.7
≥12 years	2246	80.3
Smoking History		
Current	261	9.8
Past	1130	42.4
Never	1275	47.8
Alcohol Intake (grams/week)		
Non-drinker	638	24.0
0-14	1124	42.3
15-74	405	15.2
75-140	245	9.2
>140	247	9.3
History of Arthritis		
Yes	1222	46.1
No	1429	53.9
Reported Number of Chronic Diseases		
0	1704	64.2
1	729	27.5
2 or more	222	8.4
Incontinence		
Never/hardly ever	1612	60.9
Sometimes	822	31.1
Most/all the time	213	8.1
Impaired Vision		
Yes	157	6.0
No	2447	94.0
Hearing Loss		
Yes	1380	51.9
No	1281	48.1
Insomnia Traits		
Difficulty getting to sleep	576	21.2
Wake up/hard back to sleep	655	24.1
Wake repeatedly	984	36.2
Reported number of Insomnia Traits		
0	1384	51.0
1	716	26.4
2	347	12.8
3	267	9.8

Table 2—Individual insomnia traits by age and gender

	Difficulty getting to sleep [†]		Wake up/Hard back to sleep [†]		Wake Repeatedly [†]	
	Women n (%)	Men n (%)	Women n (%)	Men n (%)	Women n (%)	Men n (%)
Age (years)						
53-59	84 (24.9)	30 (11.5)	79 (23.4)	35 (13.5)	91 (27.0)	67 (25.8)
60-69	118 (23.4)	52 (12.7)	146 (29.0)	82 (20.1)	183 (36.3)	119 (29.2)
70-79	142 (30.6)	48 (14.4)	140 (30.2)	62 (18.6)	197 (42.6)	140 (41.9)
80-97	79 (28.0)	23 (17.8)	77 (27.2)	34 (26.6)	124 (44.0)	63 (48.8)
p-trend*	0.07	0.08	0.22	0.008	<0.0001	<0.0001
Total	423 (26.7)	153 (13.5)	442 (27.8)	213 (18.9)	595 (37.5)	389 (34.4)

*Mantel-Haenszel Chi-Square test for overall trend

[†] Number reporting “often” or “almost always” experience this sleep problem

than men, except for the 80 to 97-year-old age group where the prevalence was similar. Whereas the reported prevalence increased only slightly by age group for women, for men the reported prevalence almost doubled (13.5% to 26.6%) from age 53 to 59 years to age 80 to 97 years ($p < 0.01$).

The SF-36 mean summary scores for the study population were consistently higher than the published norms for the US general population. For example in those 65 years and older, the PCS for the study participants was 43.8 for men and 42.1 for women, as compared to the U.S. general population norms, which were 42.0 for men and 41.0 for women.¹⁰ The MCS for study participants 65 years and older was 55.4 and 54.7 for men and women, respectively, versus 52.5 and 51.4 for men and women in the US general population norms.¹⁰ The results were similar for those under 65 years when compared by age group and gender.

Reporting “often” or “almost always” to any of the three sleep questions resulted in a significant decrease in both the MCS and PCS adjusted scores in men and women as compared to those reporting fewer or no sleep problems. No single sleep complaint appeared to have a greater impact than another on the mean PCS and MCS scores (results not shown). When SF-36 mean scores were analyzed by number of insomnia traits, there was a statistically significant decrease in every domain of the SF-36 with increasing number of insomnia traits (Table 3). This decrease remained after adjusting for possible confounders of the relationship between sleep problems and quality of life. The fully adjusted Analysis of Covariance (ANCOVA) models included history of arthritis, number of chronic diseases, education level, smoking, incontinence,

alcohol use, and impaired vision. Models for women also included hearing loss; hearing loss was not statistically significant for men. Use of medications containing sedatives and history of prostate enlargement were both independent predictors of quality of life but did not significantly affect the relationship between number of insomnia traits and quality of life and were not kept in the final model. The largest decrease in mean SF-36 scores by insomnia trait were in the Role-Physical domain for men and the Role-Emotional domain for women.

DISCUSSION

This study is consistent with other studies in demonstrating a high prevalence of difficulty initiating and maintaining sleep in older adults.^{2,15,16} It also demonstrates that these sleep problems may have a negative impact on health-related quality of life. Overall, almost half (49.0%) of the EHLS population reported at least one insomnia trait occurring at least 5 times a month or more. The Established Populations for Epidemiologic Studies of the Elderly (EPESE) study, which included only participants 65 years of age and older, found a prevalence of difficulty initiating and maintaining sleep in each of three cohorts to be 35% to 45%.¹⁵ Considering the differences in the mean age of the populations (EPESE cohorts mean age 73.3-74.5, EHLS mean age 69.3 years) and other methodologic differences, the prevalences are quite comparable between EPESE and EHLS. For example, 16% to 25% of women and 10% to 19% of men in the EPESE cohorts reported difficulty falling asleep, as compared to 26.7% of the women and 13.5% of the men in the EHLS population.¹⁵

Difficulty initiating sleep was not significantly associated with increasing age in either men or women, and it was reported more frequently by women than men for all age groups. Bixler et al reported in their study a significantly higher prevalence of difficulty falling asleep in those over age 51, as compared to those aged 50 years or less, and women were more likely to report this problem than men.² Whereas the women in the EHLS had a high prevalence of difficulty getting to sleep (26.7% overall), this sleep problem did not increase significantly from age 53 to 59 years to 80 to 97 years. This study did find a significant association between increasing age and waking repeatedly for men and women and for waking up and having a hard time getting back to sleep for men. An association between increasing age and disturbed sleep maintenance was found in men in a Dutch

Table 3—Adjusted mean SF-36 scores by number of insomnia traits*

	Women [†]				Men [‡]			
	Number of Insomnia Traits				Number of Insomnia Traits			
	0	1	2	3	0	1	2	3
Number with trait [§]	758	393	236	198	626	323	111	69
SF-36 Domains								
Physical Function	61.8	59.3	55.3	56.9	63.7	60.6	56.8	54.6
Role Physical	59.5	59.1	50.3	46.7	65.2	57.7	48.0	47.1
Bodily Pain	68.9	66.7	63.3	58.2	73.7	68.5	65.7	61.7
General Health Perception	63.6	62.7	58.0	54.2	63.8	59.9	55.5	53.7
Vitality	56.7	51.3	47.4	44.9	59.2	54.0	49.3	48.0
Social Function	81.4	79.3	76.7	72.1	82.5	78.5	73.6	71.9
Role Emotional	86.3	83.6	79.1	72.5	81.4	77.9	75.2	73.0
Mental Health Index	77.1	73.3	69.4	65.2	80.9	77.1	74.2	71.0
PCS	40.9	40.5	38.5	38.1	42.4	40.5	38.3	37.6
MCS	54.0	52.1	50.7	48.0	54.2	52.5	51.1	50.0

PCS-Physical Component Score, MCS-Mental Component Summary Score

*All F-tests for linear trend were statistically significant ($p < 0.0001$)

[†] Women’s scores adjusted for age, arthritis, number of chronic diseases, education, vision impairment, hearing loss, smoking, alcohol use, and incontinence

[‡] Men’s scores adjusted for age, arthritis, number of chronic diseases, education, vision impairment, smoking, alcohol use, and incontinence

[§] Observations used for calculating means may be fewer due to missing data

population as well.¹⁷ It should also be noted that studies have differences in methods and definitions of insomnia and difficulty initiating and maintaining sleep that may not allow for precise comparisons between studies.

Gender differences were especially noticeable for difficulty getting to sleep and for waking up and having a hard time getting back to sleep. In those aged 53 to 59 years, almost one-quarter of the women had difficulty falling asleep while only 11.8% of men reported this problem. There was no difference between men and women for the wake-repeatedly trait. Common knowledge would point to increasing prostate problems in men as they age as the reason for the age-related increase in waking repeatedly. However, the similarity between men and women for the prevalence of this trait suggests that this may not be the primary reason for this problem or that nocturia may be a problem for women as well. The prevalence of reported waking up at night and having a hard time getting back to sleep in men did approach the same prevalence that women reported but only among those 80 to 97 years of age. Similar gender differences have been reported in other studies.¹⁵⁻¹⁷ One study comparing recorded sleep to self-reported sleep satisfaction has suggested that elderly women may be more accurate reporters of sleep quality than elderly men.¹⁸

The Beaver Dam SF-36 mean summary scores were slightly higher than the published US general population norms for the same age group and gender. These results would seem to indicate that the study population is comparable to, or has slightly better health and quality of life than the general US population sample. Differences in the mean scores might also be a reflection of a small-city population versus a sample that may have included participants from rural areas and larger urban centers.

It is evident in this study that reporting frequent sleep difficulties was associated with a decrease in health-related quality of life. Every domain and both summary scores of the SF-36 showed a significant decrease in score with an increase in the number of reported insomnia traits. This relationship remained after adjusting for other possible confounders, which indicates that sleep may have an independent effect on quality of life rather than just marking other conditions. A decrease in mean SF-36 scores due to sleep problems has been reported in other studies. Zammit et al found a significant difference in all domains between cases with insomnia and the control group (mean ages of the cases and controls were 44 and 37 years, respectively).¹⁹ Similarly, Leger et al, in a sample of the French population (aged ≥ 18), found significant differences in all domains where good sleepers and mild insomniacs had higher mean SF-36 scores than severe insomniacs, and good sleepers had higher scores than mild insomniacs.²⁰

The greatest decrease in mean SF-36 scores by number of insomnia traits were in the Role-Physical, Role-Emotional, Bodily Pain, and Vitality domains. The questions that are scored for the Role-Physical and Role-Emotional domains inquire if a participant's physical health or emotional problems, respectively, have caused them to cut down, accomplish less, or limit them in their work or activities. The Vitality score is assessed using four questions that inquire about how often the participant feels they have a lot energy and how often they are tired. Intuitively, it would be thought that the Role-Physical, Role-Emotional, and Vitality domains would show the most changes if sleep problems exist. It makes sense that a person who is not sleeping well would report being tired and unable to accomplish as much as they would like. It is also logical that sleep problems would be associated with bodily pain. Arthritis and other chronic conditions that commonly cause pain were controlled for in the models, but other unknown conditions may have been present.

The major strength of this study is that it is population based. It shows how widespread sleep problems are in an older community and that these problems do have an effect on the quality of life of the people who report them. Additionally, it provides evidence that the more sleep problems that are present, the greater the effect on quality of life. The limitations of this study include the possibility of unknown factors that affected both sleep and quality of life that were not controlled for in the mod-

els. One such factor could be depression, which many times is highly correlated with insomnia. Depression was not assessed in this study. However, while there may be some residual confounding, we controlled for numerous factors that may have affected quality of life. The study population is primarily non-Hispanic White, and these results may not be applicable to minority populations.

In conclusion, this study shows that sleep problems are common in older adults and these sleep problems may have a significant impact on quality of life. Therefore, sleep quality should be considered an important factor when assessing the health of older adults, and if problems are present, measures should be taken to improve the quality of sleep whenever possible.

REFERENCES

1. Ancoli-Israel S, Roth T. Characteristics of insomnia in the United States: results of the 1991 National Sleep Foundation survey. *I. Sleep* 1999;22:S347-53
2. Bixler EO, Kales A, Soldatos CR, Kales JD, Healey S. Prevalence of sleep disorders in the Los Angeles metropolitan area. *Am J Psychiatry* 1979;136: 1257-62
3. Anonymous. National Institutes of Health Consensus Development Conference Statement: The treatment of sleep disorders of older people March 26-28, 1990. *Sleep* 1991; 14;2:169-77
4. Roth T, Ancoli-Israel S. Daytime consequences and correlates of insomnia in the United States: results of the 1991 National Sleep Foundation survey II. *Sleep* 1999;22:S354- 8
5. Cruickshanks KJ, Wiley TL, Tweed TS, et al. Prevalence of hearing loss in older adults in Beaver Dam, Wisconsin. The epidemiology of hearing loss study. *Am J Epidemiol* 1998;148:879-86
6. Klein R, Klein BEK, Linton KL, DeMets DL. The Beaver Dam eye study: visual acuity. *Ophthalmology* 1991;98:1310-5
7. Young T, Palta M, Dempsey J, Skatrud J, Weber S, Badr S. The occurrence of sleep-disordered breathing among middle-aged adults. *N Engl J Med* 1993;328:1230-5
8. Wetter DW, Young TB. The relation between cigarette smoking and sleep disturbance. *Prev Med* 1994;23:328-34
9. Ware JE, Snow KK, Kosinski M, Gandek B. SF-36 health survey: manual and interpretation guide. Boston: The Health Institute, New England Medical Center. 1993 2nd ed
10. Ware JE, Kosinski M, Keller SD. SF-36 physical & mental health summary scales: a user's manual. Boston: Health Assessment Lab, New England Medical Center, 1994 5th ed
11. SAS Institute, Inc. SAS/STAT User's Guide, Version 8. Cary, NC: SAS Institute Inc., 1999; 3884
12. American Speech-Language-Hearing Association. Guidelines for manual pure tone audiometry. 1978;20(4):297-301
13. Klein R, Klein BEK, Lee KP, Cruickshanks KJ, Chappell RJ. Changes in visual acuity in a population over a 10-year period. The Beaver Dam Eye Study. *Ophthalmology* 2001;108:1757- 66
14. Popelka MM, Cruickshanks KJ, Wiley TL, Tweed TS, Klein BEK, Klein R. Moderate alcohol consumption and hearing loss: a protective effect. *J Am Geriatr Soc* 2000;48:1273-8
15. Foley DJ, Monjan AA, Brown SL, Simonsick EM, Wallace RB, Blazer DG. Sleep complaints among elderly persons: an epidemiologic study of three communities. *Sleep* 1995;18;6:425-32
16. Baldwin CM, Griffith KA, Nieto FJ, O'Connor GT, Walsleben JA, Redline S. The association of sleep-disordered breathing and sleep symptoms with quality of life in the Sleep Heart Health Study. *Sleep* 2001;24;1:96-104
17. Middelkoop HAM, Smilde-van den Doel DA, Neven AK, Kamphuisen HAC, Springer CP. Subjective sleep characteristics of 1485 males and females aged 50-93: effects of sex and age, and factors related to self-evaluated quality of sleep. *J Gerontol Med Sci* 1996;51A;3:M108- 15
18. Hoch CC, Reynolds III CF, Kupfer DJ, Berman SR, Houck PR,

- Stack JA. Empirical note: self-report versus recorded sleep in healthy seniors. *Psychophysiology* 1987;24;3:293-9
19. Zammit GK, Weiner J, Damato N, Sillup GP, McMillan CA. Quality of life in people with insomnia. *Sleep* 1999;22:S379-85
20. Leger D, Scheuermaier K, Philip P, Paillard M, Guilleminault C. SF-36: evaluation of quality of life in severe and mild insomniacs compared with good sleepers. *Psychosom Med* 2001;63;49-55