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## Prevalence of sleep problems in individuals with multiple sclerosis

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### Abstract

**Background**—Sleep disturbance in multiple sclerosis has received little research attention despite the potential influence it may have on disease impact.

**Objective**—To estimate the prevalence of sleep disorders in a large community sample of individuals with multiple sclerosis.

**Methods**—A cross-sectional self-report survey of 1063 persons with multiple sclerosis. Sleep was assessed using the Women’s Health Initiative Insomnia Rating Scale and Medical Outcomes Study Sleep measure.

**Results**—The prevalence of sleep problems in multiple sclerosis is significantly higher than in the general population or other chronic diseases and may affect women with multiple sclerosis more than men.

**Conclusion**—Sleep disturbance should routinely be evaluated in patients with multiple sclerosis and new interventions developed.

### Keywords

insomnia; medical outcomes study sleep measure; multiple sclerosis; sleep adequacy; sleep disturbance; women’s health initiative insomnia rating scale

### Introduction

Sleep disorders are a prevalent health concern in the general population and have been linked to depression, distress, impaired social functioning, hospitalizations, chronic medical conditions, and mortality [1]. Among individuals with chronic illnesses, sleep dysfunction can potentially increase disease impact and is associated with poorer mental health, lower work productivity, and higher utilization of health care services [2]. Individuals with multiple sclerosis (MS), a chronic disease of the central nervous system, are at risk for increased co-morbidity associated with sleep problems. Studies to date suggest that persons with MS may have significantly more sleep problems than the general population, though prevalence estimates range from 25% ( $n = 28$ ) [3] to 54% ( $n = 143$ ) [4]. Past studies have reported on relatively small samples, so the objective of this study was to determine the prevalence of sleep problems in a large community sample of individuals with MS and compare the prevalence of sleep problems in these individuals to normative populations.

## Methods

Data were collected through a self-report mailed survey of individuals recruited through the Greater Washington chapter of the National Multiple Sclerosis Society (NMSS). Letters of invitation were sent to 7806 individuals on the NMSS mailing list, of whom 1477 responded (19% response rate); 1362 of these persons were eligible for participation. Eligibility criteria included self-report of a confirmed diagnosis of MS and age of at least 18 years. Eligible individuals were mailed a self-report survey; reminder letters were sent to non-responders between 3–6 weeks later. A subset received an additional reminder call, but this procedure was dropped once recruitment goals were met. In all, 1077 persons returned surveys (79% response rate), and individuals were called up to four times to collect missing data. Surveys from 1063 individuals were considered complete and included in the analysis. A second anonymous one-page survey of demographics was sent to individuals on the NMSS mailing list to examine potential recruitment bias and reasons for non-response to the initial solicitation. Additional information on non-responders was not available as letters of invitation were sent by the NMSS, and study investigators did not have access to the mailing list. All study procedures were approved by the Human Subjects Division, University of Washington.

Surveys contained questions on demographics, psychosocial, and functional or disease specific characteristics. Information on sleep was collected using the Medical Outcomes Study Sleep (MOSS) measure [1] and the Women's Health Initiative Insomnia Rating Scale (WHIIRS) [5]. The MOSS measure was designed to evaluate six sleep constructs, whereas the WHIIRS evaluates insomnia symptoms. Both scales have been validated in large populations and have normative scores available for comparison [5-7]. Normative comparison populations for the MOSS measure include individuals with several chronic diseases (hypertension, diabetes, congestive heart failure, recent myocardial infarction, and depression) and individuals from the general population selected through random digit dialing, described elsewhere [6,8]. The comparison population for the WHIIRS included post-menopausal women who participated in the Women's Health Initiative, also described elsewhere [5]. Sleep scales were scored as recommended [5,7] and descriptive statistics generated to describe demographics and sleep status. Scores on the MOSS subscales range from 0–100, with the exception of sleep quantity, and from 0–20 on the WHIIRS. Higher scores on the MOSS reflect more of the attribute indicated by the subscale name, and worse sleep is indicated by a higher score on the WHIIRS. A single indicator of mild, moderate, or severe sleep problems was calculated from item 12 of the MOSS measure based on recommendations of Manocchia, *et al.* [2] Student *t*-tests were calculated to identify significant differences in sleep scores between populations when possible.

## Results

Study participants were primarily women ( $n = 865$ , 81.4%), Caucasian ( $n = 977$ , 91.9%), and married or living with a significant other ( $n = 734$ , 69.1%). Participants had a mean age of 50.9 years (SD: 11.7) and mean disease duration of 13.7 years (SD: 10.2). Information from the anonymous demographic survey ( $n = 1046$ ) indicated that many individuals on the mailing list did not have MS (13%) or did not remember the initial survey invitation (34%). Study participants were slightly younger, more educated, and those with MS had mean disease duration shorter than respondents of the anonymous questionnaire.

Mean scores on the MOSS measure (Table 1) indicated that women with MS had more sleep disturbance, shortness of breath at night, and overall sleep problems than men with MS (all comparisons  $P \leq 0.002$ ), other chronically ill populations (CIP) (all comparisons  $P \leq 0.001$ ), or the general population. Women also ranked sleep adequacy worse (vs men:  $P \leq 0.001$ ; CIP  $P \leq 0.001$ ) despite reporting less snoring than men ( $P = 0.02$ ) and more hours of sleep per night

than CIP ( $P \leq 0.001$ ). Daytime somnolence was also higher in women with MS than in men ( $P = 0.04$ ) or CIP ( $P \leq 0.001$ ). Men with MS reported higher sleep difficulty on the MOSS measure domains of daytime somnolence and overall sleep problems (Table 1) than other CIP (both comparisons  $P \leq 0.001$ ) or the general population. Men also reported less sleep adequacy ( $P = 0.006$ ) and more snoring ( $P = 0.01$ ) than CIP. When using the MOSS single indicator of sleep problems, as defined by Manocchia, *et al.* [2], 13.3% of the MS population had mild sleep problems, 21.5% moderate, and 30.0% severe.

Responses to the WHIIRS summarized in Table 2 indicate that both women and men with MS have significantly higher levels of insomnia than Caucasian women in the WHI in age groups between 50–69 years (all comparisons  $P \leq 0.001$ ). Regarding gender differences, women with MS under the age of 60 reported higher levels of insomnia symptoms, though not significant.

## Conclusions

Individuals with MS have significantly more difficulties in sleeping than the general population or previously studied CIP based on their responses to two sleep instruments in this study. In addition, women with MS appear to be at higher risk of sleep disturbance than men, and the prevalence of moderate or severe sleep problems in men and women combined is 51.5%. This is significantly higher than the prevalence estimates of moderate or severe sleep problems in the MOSS population (33.1%) of CIP [2] and similar to the estimate published by Tachnbana, *et al.* in a small MS population [4]. Data from Stanton, *et al.* in 60 individuals with MS similarly found that 53% had middle insomnia (night waking) and 58% terminal insomnia (early awakening) [9]. Taken together, these studies indicate that over 50% of individuals with MS have significant sleep problems.

Although the initial response rate is 19%, the demographics of our study population are highly similar to the Sonya Slifka MS study population [10], a cohort thought to be broadly representative of the MS population. This response rate is also artificially low as not all individuals invited were eligible for participation (i.e., did not have MS). Therefore, the true prevalence of sleep problems may be higher or lower than indicated here because of response or recruitment bias. However, because of the similarity with the Slifka study population and the broad service area of the Greater Washington Chapter of the NMSS, we feel the bias in prevalence estimates is likely small.

Future studies of sleep disturbance in MS and development of successful interventions in this population are of great need given the high prevalence and potential effect of sleep on overall disease impact. Sleep has been linked to other co-morbidities in MS such as pain, depression, and fatigue [9,11], and some evidence suggests that sleep is especially important in MS to maximize brain plasticity, a particularly important process in individuals with a neurodegenerative disease [12]. It may be true that interventions to improve sleep will also have an impact on cognitive and psychosocial functioning, as well as fatigue. Clinicians should routinely ask about sleep and include treatment of sleep disorders in a comprehensive care plan for MS patients.

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**Table 1**

Comparison of Medical Outcomes Study Sleep (MOSS) scale domain scores in individuals who have multiple sclerosis (MS), are chronically ill, and members of the general population

	Multiple sclerosis women <i>n</i> = 865	Multiple sclerosis men <i>n</i> = 197	Chronically ill <sup>a</sup> population <i>n</i> = 3445	USA general <sup>b</sup> population <i>n</i> = 1011
	Mean (SD)	Mean (SD)	Mean (SD)	Mean
Sleep disturbance (initiation and maintenance)	37.38 (26.07)	31.08 (21.48)	29.20 (23.37)	24.47
Snoring <sup>c</sup>	30.56 (32.00)	36.38 (32.04)	30.89 (30.25)	28.33
Respiratory/Shortness of breath	17.39 (25.21)	11.57 (21.00)	13.29 (21.82)	9.45
Sleep quantity <sup>c</sup> (hours/night)	7.12 (1.48)	6.91 (1.68)	6.93 (1.40)	6.79
Sleep adequacy	46.79 (26.66)	55.53 (24.69)	60.67 (25.38)	60.47
Daytime somnolence	41.38 (24.79)	37.36 (23.75)	26.41 (19.82)	21.89
Sleep problems index II	40.10 (20.08)	33.64 (16.88)	29.15 (18.04)	25.79

<sup>a</sup>From Spritzer and Hays [7].

<sup>b</sup>From Hays, *et al.* [6].

<sup>c</sup>Individuals with MS missing some data. Snoring: women: *n* = 828, men: *n* = 188; sleep quantity: women: *n* = 800, men: *n* = 186.

**Table 2**

Comparison of Women's Health Initiative Insomnia Rating Scale (WHIRS) scores by age and sex between individuals with multiple sclerosis (MS) and the women's health study population

Age group, years	Multiple sclerosis men		Multiple sclerosis women		Womens health <sup>a</sup> study norms	
	Mean (SD)	n	Mean (SD)	n	Mean (SD)	n
49 or less	9.38 (5.33)	74	10.09 (5.23)	379	—	—
50–59	9.01 (4.74)	70	10.20 (5.52)	303	6.45 (4.43)	22,393
60–69	9.61 (5.15)	38	9.55 (5.13)	146	6.65 (4.37)	22,337
70–79	8.31 (4.59)	13	8.65 (4.74)	26	7.09 (4.42)	11,001
80–88	7 (1.41)	2	6.70 (5.72)	10	—	—

<sup>a</sup>Data are norms for Caucasian women from Table 4 of Levine, *et al.* [5].