Prevalence of night sweats in primary care patients

An OKPRN and TAFP-Net collaborative study

JAMES W. MOLD, MD, MPH; MIGI K. MATHEW, MD; SHUAIB BELGORE, MD, MPH; AND MARK DEHAVEN, PHD
Oklahoma City, Oklahoma, and Dallas, Texas

KEY POINTS FOR CLINICIANS

- Night sweats are a common experience for primary care patients, but they are frequently not reported to their physicians.
- There appear to be 2 somewhat distinct patterns of night sweats: pure night sweats and night and day sweats.
- A history of night sweats should prompt questions about menopause, panic attacks, sleep problems, and certain medications.

■ OBJECTIVE To estimate the prevalence and factors associated with night sweats among adult primary care patients.

■ STUDY DESIGN This was a cross-sectional study.

■ POPULATION Adult patients in 2 primary care practice-based research networks (PBRNs) during 1 week in the summer and 1 week in the winter in the years 2000 and 2001.

■ OUTCOMES MEASURES We measured the prevalence of pure night sweats and night and day sweats in all patients and subgroups defined by age and sex, clinical variables associated with night sweats, and the frequency, severity, and rate of reporting.

■ RESULTS Of the 2267 patients who participated, 41% reported experiencing night sweats within the last month, including 23% with pure night sweats and an additional 18% with day and night sweats. The prevalence of night sweats in both men and women was highest in the group aged 41 years to 55 years. In multivariate analyses, factors associated with pure night sweats in women were hot flashes and panic attacks; in men, sleep problems. Variables associated with night and day sweats in women were increased weight, hot flashes, sleep disturbances, and use of antihistamines, selective serotonin reuptake inhibitors (SSRIs), and other (non-SSRI, non-tricyclic) antidepressants; in men, increased weight, hot flashes, and greater alcohol use. A majority of patients had not reported their night sweats to their physicians, even when frequent and severe.

■ CONCLUSIONS Night sweats are common and under-reported. Pure night sweats and night and day sweats may have different causes. With regard to the etiologies of pure night sweats, panic attacks and sleep disorders need further investigation.

■ KEY WORDS Primary care; primary-based research network; diaphoresis; epidemiology. (*J Fam Pract 2002; 51:452–456*)

see COMMENTARY *about this article by I.R. McWhinney, MD*
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Night sweats have been attributed to tuberculosis, other acute and chronic febrile illnesses, menopause, pregnancy, hyperthyroidism, nocturnal hypoglycemia, other endocrine problems, neurologic diseases, sleep disorders (eg, sleep apnea and nightmares), malignancies, autoimmune diseases, coronary artery spasm, congestive heart failure, gastroesophageal reflux disease, psychiatric disorders, and certain medications. In 36 medical and surgical textbooks, night sweats were always discussed within sections covering specific diseases and never as a separate topic. References to the primary literature were never provided. We also searched Micromedix, a comprehensive source of information on medications, using "sweating" and "diaphoresis" as search terms.[1] Table W1 at http://www.jfpon-

From the University of Oklahoma Health Sciences Center, Oklahoma Center for Family Medicine Research, Department of Family and Preventive Medicine, Oklahoma City (J.W.M., M.K.M., S.B.) and the University of Texas Southwestern Medical Center, Department of Family Medicine, Dallas (M.D.) The authors report no competing interests. All requests for reprints should be addressed to James W. Mold, MD, MPH, University of Oklahoma Health Sciences Center, Oklahoma Center for Family Medicine Research, Department of Family and Preventive Medicine, 900 N.E. 10th Street, Oklahoma City, OK 73104.
E-mail: james-mold@ouhsc.edu.

line.com contains a comprehensive list of proposed causes of night sweats identified in our searches and accompanying references.

Only 2 epidemiologic studies of night sweats were found in the English language literature. Lea and Aber[2] interviewed 174 patients randomly selected from the inpatient units of a university hospital and found that 33% of nonobstetric patients and 60% of obstetric patients reported having had night sweats during the previous 3 months. Twenty-six percent of those with night sweats reported that their nighttime sweating was severe enough to require bathing and changing of bed linens. Reynolds,[3] a gastroenterologist, queried 200 consecutive patients seen in his outpatient practice and found that 40% remembered experiencing night sweats at least once during the previous year. A total of 12% reported at least weekly night sweats. A review of the records of 750 patients at the Geriatric Continuity Clinic at the University of Oklahoma Family Medicine Center revealed that 10% reported having experienced night sweats during the previous month, when the question was asked as part of a standard review of systems questionnaire (J.W.M., unpublished data, 1999).

Our study was conducted in an effort to estimate the prevalence of night sweats in adult patients seen in primary care office settings, and to explore the associations of this symptom with demographic factors, physical characteristics, medical problems, and medications. We also sought to determine how distressing this symptom is to those who have it and to their sleep partners, whether patients are likely to report the symptom to their physicians, and what patients and their physicians think causes night sweats in individual cases.

METHODS

Physician members of the Oklahoma Physicians Resource/Research Network (OKPRN) and the Texas Academy of Family Physicians Research Network (TAFP-Net) enrolled consecutive patients 18 years and older seen in their clinics during a 1-week period in the summer and a second 1-week period in the winter in the years 2000 and 2001. Patients who agreed to participate signed a consent form and then helped the nurse and physician complete a brief questionnaire on a preaddressed, stamped data collection card. For those who declined to participate, a card was generated containing the physician's code number and the patient's age and sex. Questions elicited demographic information; information about a selected set of medical conditions; medications, vitamins, herbs, and alcohol used regularly; and information about recent experiences with night sweats. Participating physicians were asked to check the questionnaires for accuracy and to record their opinions regarding the cause of the patients' night sweats when they reported having had them. A laminated card with definitions of terms was provided to each physician.

"Night sweats" was defined as "sweating at night even when it isn't excessively hot in your bedroom." "Day sweats" was defined as "excessive sweating during the daytime." "Pure night sweats" was defined as night sweats, but not day sweats, and "night and day sweats" as the combination of the 2. The time interval was specified as "during the last month."

Completed questionnaires were mailed to the Oklahoma Center for Family Medicine Research for data entry and analysis. The data collection cards used by the Texas network included questions about race/ethnicity and panic attacks that were not included on the Oklahoma cards. Inadvertently, some of the Texas cards did not include the question about daytime sweating.

Statistix7 (Analytical Software, Tallahassee, Fla) was used for all statistical analyses. Medications were assigned to 1 of 47 categories according to their primary pharmacologic effects. Summary statistics were calculated for all participants and for the following subgroups: season (summer and winter), pattern of night sweats (excessive nighttime sweating only or night and day sweats), and age group. We anticipated that the majority of women with menopausal symptoms would be in the 41- to 55-year age group.

The two patterns of night sweats, "pure night sweats" and "night and day sweats," were analyzed separately, and by sex and age. Logistic regression was used to identify the most significant predictors of night sweats while controlling for other variables. Variables were entered into the logistic models if they had a univariate association with the dependent variable at a *P* value of less than .05. They were then removed one at a time, in the order of largest to smallest *P* value, if they had a *P* value of greater than .01 after controlling for other variables. Conservative *P* values were chosen because of the large numbers of variables considered, in order to reduce the probability of type 1 errors. When appropriate, 95% confidence intervals were calculated.

RESULTS

Study population

A total of 2267 patients of 31 different physicians participated in this study, including 1888 patients of 24 Oklahoma physicians and 379 patients of 7 Texas physicians. Their mean (standard deviation) age was 50.7 (18.8) years, with a range of 18 to 97 years. Sixty-nine percent were women. A total of 99% of

Oklahoma patients and 93% of Texas patients seen during the study weeks agreed to participate in the study. Among Texas participants, 53% were Hispanic whites, 33% were non-Hispanic whites, 13% were African Americans, and 1% were categorized as other. On the basis of prior OKPRN studies, we suspect that approximately 90% of Oklahoma patients were non-Hispanic whites, but exact proportions were not determined for this study.

TABLE 1

Percentage of patients with pure night sweats and night and day sweats

Patient group, by sex and age, in years	Pure night sweats % (95% CI)	Night and day sweats % (95% CI)	Any night sweats % (95% CI)
All patients	23 (21-24)	18 (16-20)	41 (39-43)
Men	22 (19-26)	12 (9-14)	34 (30-38)
18-40	20 (14-26)	14 (9-19)	35 (28-42)
41-55	25 (18-32)	14 (9-19)	40 (33-47)
56-69	24 (16-32)	12 (6-18)	38 (30-46)
70+	20 (13-27)	6 (2-10)	26 (19-33)
Women	23 (21-25)	21 (19-24)	44 (42-47)
18-40	22 (18-26)	19 (15-23)	42 (38-46)
41-55	29 (24-34)	32 (28-37)	61 (56-66)
56-69	22 (18-27)	23 (18-28)	43 (37-49)
70+	19 (14-24)	9 (5-13)	29 (24-34)

CI denotes confidence interval.

Prevalence of night sweats

The prevalence of pure night sweats, night and day sweats, and any night sweats are shown in Table 1. While the prevalence of night and day sweats was lower for older patients, severity tended to be greater. Severity and frequency were positively correlated for all categories of night sweats and for all subgroups of patients (overall Spearman coefficient = 0.33; $P < .001$). Overall, the frequencies of night sweats among those who reported the condition were: almost never, 18%; 1 to 3 nights per month, 38%; 1 to 3 nights per week, 27%; and 4 to 7 nights per week, 16%. Ten percent of both women and men with night sweats said that their night sweats were bothersome to others.

Frequency of reporting of night sweats

A minority of patients with night sweats (12%) had reported the symptom to their physicians. This was true even for those with severe night sweats (46%). Women younger than 70 years were more likely than men of the same age to have reported their night sweats to their physicians (15% vs. 6%; $P < .001$). The reverse was true for those 70 years and older (7% vs 13%; $P = .08$). Older patients with pure night sweats were more likely than younger patients to have reported them. After controlling for other variables, patients who were older (odds ratio [OR] = 1.03 per year of age; $P < .001$), those with night and day sweats (OR = 1.74; $P = .0015$), and those who reported that their night sweats bothered others (OR = 2.89; $P = .001$) were more likely to have reported the symptom to their physicians. Those who had reported their night sweats were also more likely to have hot flashes (OR = 2.98; $P < .001$) and to take estrogen (OR = 1.72; $P = .003$).

Factors associated with night sweats

The only variable associated with pure night sweats after controlling for all other variables was panic attacks. Variables associated with night and day sweats were younger age, greater body mass index, hot flashes, chronic infection, sleep disturbances, selective serotonin reuptake inhibitors (SSRIs), tricyclic antidepressants, "other" (non–SSRI, non-tricyclic) antidepressants, and xanthines.

For women, the only variable clearly associated with pure night sweats in the multivariate model was hot flashes. Panic attacks nearly reached significance ($P = .026$) and improved the regression model substantially (deviance reduced from 1446 to 87). Variables associated with night and day sweats were weight, sleep problems, hot flashes, antihistamines, SSRIs, and other (non–SSRI, non-tricyclic) antidepressants.

For men, the only variable associated with pure night sweats after controlling for other variables was sleep problems. After exclusion of sleep problems and sedatives from the model on the assumption that they might be the result rather than the cause of night sweats, significant predictors were hot flashes (OR = 2.70; 95% confidence interval [CI], 1.35-5.40; $P = .005$) and regular use of multivitamins (OR = 1.87; 95% CI, 1.17-2.99; $P = .009$). Variables associated with night and day sweats included greater weight, hot flashes, and greater alcohol use. The ORs and CIs are shown in Table 1.

Interestingly, 32 men (5%) reported hot flashes, and those who did were more likely to report night sweats of both types. Men with hot flashes were evenly distributed across age categories. Their night sweats were more frequent, but not more severe, and they were more likely to bother others than those without hot flashes. Men with hot flashes were more likely to have told their physicians

about their night sweats. After controlling for other variables, men with hot flashes were much more likely to have panic attacks (OR = 28.28; $P < .001$).

Patients 70 years and older made up 19.5% of our sample (N=429). The only factor associated with pure night sweats in the multivariate model was sleep disturbances (OR = 2.04; = 95% CI, 1.21-3.42; P =.007). Exclusion of sleep disturbances left no associated variables. Variables associated with night and day sweats were hot flashes (OR = 15.14; = 95% CI, 6.43-35.68; $P < .001$) and corticosteroids (OR = 5.45; 95% CI 1.58-18.86; P =.007).

TABLE 2

Associations between independent variables and night sweats in men and women after using logistic regression modeling to control for all other variables

Patient group	Pure night sweats		Night and day sweats	
	Variable	OR (95% CI)	Variable	OR (95% CI)
All	Panic attacks	4.80 (1.69-13.63)	Age*	0.99 per yr (0.98-0.99)
			BMI	1.03 per unit (1.02-1.05)
			Hot flashes	7.23 (5.45-9.58)
			Chronic infections	2.05 (1.22-3.42)
			Sleep problems	1.54 (1.16-2.04)
			SSRIs	1.82 (1.22-2.70)
			TCAs	2.43 (1.25-4.74)
			Other antidepressants	2.85 (1.66-4.89)
			Xanthines	5.48 (1.60-18.81)
Men	Sleep problems	2.54 (1.7-3.8)	Weight	per lb (1.00-1.02)
			Hot flashes	9.41 (4.50-19.8)
			Alcohol	3.87 (1.60-9.20)
Women	Hot flashes	3.35 (1.13-9.95)	Weight	1.01 per lb (1.00-1.01)
	Panic attacks	4.47 (1.20-16.69)	Sleep problems	1.74 (1.30-240)
			Hot flashes	6.75 (5.00-9.20)
			SSRIs	2.01 (1.30-3.10)
			Other antidepressants	2.85 (1.70-5.90)
			Antihistamines	1.88 (1.20-2.90)

*Younger age was associated with a greater likelihood of night and day sweats. Otherwise, presence of or increasing amount of each variable was associated with a greater likelihood of night sweats.

OR denotes odds ratio; CI, confidence interval; BMI, body mass index; SSRIs, selective serotonin reuptake inhibitors; TCAs, tricyclic antidepressants.

Suspected causes

In cases where patients reported night sweats, only 19% of the patients and 18% of their physicians recorded opinions regarding causation. The suspected causes listed by patients and physicians were similar. Both groups listed menopause most frequently (48% and 44%, respectively). Other etiologies proposed were stress (12% and 8%) and medications (9% and 10%). Physicians listed diabetes as a possible cause in 11% of cases while only 4% of patients listed it. Other suspected causes included obesity, pregnancy, gastroesophageal reflux disease, sleep discomforts, and ambient temperature.

DISCUSSION

As far as we know, this is the first systematic study of night sweats in a primary care population. It is exploratory in nature, and, because of its cross-sectional design, no firm conclusions can be drawn about causation.

Both pure night sweats and night and day sweats are extremely common, with a peak prevalence in men and women 41 to 55 years of age. In contrast to pure night sweats, night and day sweats are experienced infrequently by patients 70 years and older. The factors associated with pure night sweats are somewhat different than those associated with night and day sweats, suggesting different, though probably overlapping, sets of causes. The different associations seen for men and women, and for older and younger patients, are also noteworthy. Patients often fail to report night sweats to their primary care physician, even when frequent and severe, associated with sleep disturbances, or bothersome to others.

Because of the sampling method (ie, consecutive patients rather than a random sample of active patients), the prevalence estimates reflect the frequency at which physicians can expect to encounter patients with this symptom, rather than the prevalence of night sweats among active patients. Since patients with more symptoms probably see physicians more often, we assume we have overestimated the true prevalence of night sweats in the larger population. Participating physicians were also not selected randomly. It is impossible to know how this may have affected our results.

We were surprised that so few of our independent variables were associated with pure night sweats: only panic attacks (all patients), sleep disorders (men and older patients), and hot flashes (women). Factors not associated with pure night sweats included obesity; diabetes, insulin, or oral

hypoglycemic agents; acute or chronic infections; gastroesophageal reflux disease; or thyroid medications. Pure night sweats were also not specifically associated with estrogen and progesterone, although they were associated with hot flashes. There was also no association of pure night sweats and alcohol consumption.

The fact that physicians and their patients could only speculate on a cause for night sweats in 1 out of 5 cases suggests a lack of familiarity with the multitude of suspected causes, a failure to detect certain common causes (eg, sleep disorders and panic attacks), or, most likely, that many common causes of night sweats have yet to be elucidated. If the last is correct, it may be an example of the bias in the primary and secondary clinical literature that occurs when clinical research is carried out primarily in the subspecialty clinics of academic medical centers.[4-7] Our findings speak to the need for greater support for primary care practice-based research.[8,9]

In retrospect, the omission of the variable "panic attacks" from the Oklahoma cards was a mistake, since this variable was correlated with pure night sweats in women. It may have been more strongly associated with pure night sweats in men as well, if the number of respondents to this question had been larger. Also, some men complained of hot flashes, and when they did, they were more likely to have night sweats and panic attacks, suggesting that both hot flashes and night sweats in men should prompt physicians to ask additional questions about panic disorder. Although race was also omitted from the Oklahoma cards, this variable did not seem to be associated with differences in night sweats prevalence or association among those for whom this information was available.

The definition and description of night sweats used in this study were arbitrary and may have influenced the prevalence rates obtained. We attempted to exclude environmental temperature as a cause. Although the definitions provided clearly stated "within the last month," the data collection cards did not specify a time interval. This may have resulted in some variation in interpretation.

The decisions that were made regarding logistic modeling strategies were conservative and may have excluded some important variables. However, with so many variables and no basis on which to judge a priori, we felt that a conservative approach was best. The decision to include in the models variables (eg, sleep problems and sedatives that might be considered consequences) rather than causes of night sweats, was also arbitrary and may have affected the results. An alternative explanation of the associations found between night sweats and sleep problems is that those who are unable to sleep for other reasons are more likely to notice excessive sweating than those who are asleep.

Future studies should more carefully examine factors found in this study to be associated with night sweats, such as panic attacks and sleep disorders, and other potential etiologic factors not considered, such as tobacco abuse, allergic diseases, migraines, congestive heart failure, and chronic lung disease. Given the high prevalence, future studies examining etiology should include appropriate control groups. Case-control and prospective studies should evaluate the natural history of both night sweats patterns and their association with quality and length of life. The potential value of night sweats as a clue to the early diagnosis of important under-recognized pathologies, such as sleep disorders and panic attacks, should be investigated. Finally, randomized trials of treatments to reduce the frequency, severity, and impact of night sweats should be undertaken once the potential causes have been better elucidated.

ACKNOWLEDGMENTS · This research was made possible by a grant from the American Academy of Family Physicians Foundation. We would like to acknowledge the assistance of Lavonne Glover in preparing the manuscript and to the following practicing family physicians and their staff who made time in their busy schedules to collect the data: Nathan Boren, Jo Ann Carpenter, Stephen Cobb, Ed Farrow, Cary Fisher, Helen Franklin, Kurt Frantz, David Hadley, Terrill Hulson, Joe Jamison, Dee Legako, Migy Mathew, Tomas Owens, John Pittman, Mike Pontious, Paul Preslar, R. Scott Stewart, David Strickland, Clinton Strong, Terry Truong, Keith Underhill, Kyle Waugh, Dan Woiwode, Mike Woods, Rick Edwards, Bob C. Jones, Leah R. Mabry, Tom Mueller, Mike Ragsdale, Hugh Wilson, Frank D. Wright, and Samuel T. Coleridge.

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