Prevalence of Nocturia in United States Men: Results From the National Health and Nutrition Examination Survey

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Abbreviations and Acronyms

BMI = body mass index

BPE = benign prostatic enlargement

LUTS = lower urinary tract symptoms

NHANES = National Health and Nutrition Examination Survey

POR = prevalence odds ratio

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Purpose: We estimated the prevalence of nocturia in the United States male population and identified associated factors.

Materials and Methods: Data were analyzed for 5,297 men (20 years old or older) who participated in the 2005–2006 and 2007–2008 cycles of the NHANES, a cross-sectional survey of the United States noninstitutionalized population. Getting up 2 or more times at night to urinate was coded as nocturia. Potential factors included age, race/ethnicity, education, waist circumference, self-reported health status, chronic diseases, and prior diagnosis of benign prostatic enlargement and/or prostate cancer (men 40 years old or older). Prevalence and prevalence odds ratios were estimated from a multivariable logistic regression analysis using appropriate sampling weights.

Results: The prevalence of nocturia was 21% (weighted 95% CI 19.3–23.0). Nocturia increased in prevalence with age ($p < 0.001$) from 8.2% (CI 6.7–10.2) in men 20 to 34 years old up to 55.8% (CI 51.3–60.2) in men 75 years old or older. More nonHispanic black men had nocturia (30.2%, CI 26.7–34.1) than other racial/ethnic groups (20.1%, CI 18.1–22.1, $p < 0.001$). Significant factors included 10-year increase in age (POR 1.5, CI 1.5–1.6), nonHispanic black race/ethnicity (POR 2.0, CI 1.6–2.7), fair/poor self-rated health (POR 1.5, CI 1.2–1.9), major depression (POR 2.5, CI 1.6–3.9), hypertension (POR 1.4, CI 1.0–1.9) and arthritis (POR 1.3, CI 1.0–1.7). Among men 40 years old or older benign prostatic enlargement (POR 1.4, CI 1.1–1.8) and prostate cancer (POR 1.6, CI 1.0–2.4) were associated with nocturia.

Conclusions: After adjusting for age and race norms nocturia was common among United States men. NonHispanic black men had greater odds of nocturia even when controlling for other factors.

Key Words: nocturia, male, prevalence, epidemiology, prostatic diseases

NOCTURIA (waking at night to void[1]) is one of the most bothersome LUTS.[2,3] In addition, frequent nocturia has been linked to poor self-rated health,[4] negative effects on sleep,[5] depression[6] and falls.[7] Recent epidemiological studies of nocturia have suggested that experiencing at least 2 episodes nightly is likely to cause significant bother.[8]

Few studies have assessed the prevalence of nocturia in a population based sample of adult men that includes significant ethnic or racial diversity.[4,9–13] Some population based studies of nocturia are specific to regional variations among different ethnic or racial groups,[10–13] but few are representative of the racial, ethnic

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and economic diversity in a nationally representative United States sample.[4,9] Since 1999 the selection of participants for the NHANES has attempted to mirror the diverse population composition of the United States to provide reliable statistical estimates. It is important to compare these prevalence estimates with those of other populations worldwide and to identify risk factors that may warrant further investigation. Included in the NHANES 2005–2006 and 2007–2008 was a question that assessed the frequency of nocturia. Given the dearth of population based epidemiological data on nocturia among men in the United States, the goal of our analysis was to provide prevalence estimates and to identify independent risk factors for nocturia in men using data from this 4-year period.

METHODS

NHANES 2005–2006 and 2007–2008

The NHANES program consists of cross-sectional health surveys conducted by the National Center for Health Statistics of the Centers for Disease Control and Prevention (http://www.cdc.gov/nchs/nhanes.htm). The NHANES provides estimates of the health status of the United States population by selecting a nationally representative sample of the noninstitutionalized population using a complex, stratified, multistage, probability cluster design. The NHANES 2005–2006 oversampled persons 60 years old or older, and black, Mexican American and low income white individuals to provide more reliable estimates for these groups. In the NHANES 2007–2008 all Hispanic groups were oversampled, not just Mexican Americans. The National Centers for Health Statistics Ethics Review Board approved the protocol and all participants provided written informed consent.

Procedures

Participants were interviewed in their homes, and then underwent standardized physical examination including measurement of height, weight and abdominal girth, and a private interview at a mobile examination center. The interview included questions about symptoms of nocturia for all participants 20 years old or older. Men 40 years old or older were also asked questions related to prostate conditions during this private interview.

To define nocturia we used the question, "During the past 30 days, how many times per night did you most typically get up to urinate, from the time you went to bed at night until the time you got up in the morning?" Response options included choices ranging from 0 to 4, or 5 or more. Nocturia was also categorized as 0, 1, 2 or 3 or more times per night, consistent with the International Continence Society definition of nocturia (1 or more times a night)[1] and similar in wording to the validated nocturia question from the AUA symptom index.[14] For prostate conditions the question "Have you ever been told by a doctor or health professional that you had an enlarged prostate gland?" defined BPE. The question "Have you ever been told by a doctor or health professional that you had prostate cancer?" identified those men who had prostate cancer.

In interviews conducted in the household, participants self-reported race/ethnicity, which was then categorized as nonHispanic white, nonHispanic black, Hispanic (including Mexican American) and other/mixed race/ethnicity. Given the literature on nocturia and racial/ethnic differences among men,[9–13] nonHispanic black men were analyzed separately from all other racial/ethnic groups. Age was categorized in 15-year increments from ages 20 to 34 years and 10-year increments over the age of 35 years, with all participants 75 years old or older in the same category. Education was categorized as at least some level of high school education (including a General Education Development credential or equivalent) or more than high school. The poverty income ratio (an indicator of socioeconomic status that uses the ratio of income to the family's poverty threshold set by the United States Census Bureau) was categorized as less than 1 (below the poverty threshold), 1 to 2 (1 to 2 times the poverty threshold) and more than 2 (more than 2 times the poverty threshold). From body measurements data BMI was calculated as weight in kilograms divided by height in meters squared and categorized as less than 25.0 (underweight/normal weight), 25.0 to 29.9 (overweight) and 30.0 or more (obese). Waist circumference was measured and recorded in cm. Waist circumference was then dichotomized as at or above the 75th percentile for the overall NHANES sample (109.7 cm).

Data on disease status were ascertained through the question "Has a doctor or other health professional told you that you had [disease]?" In addition to hypertension 5 disease types identified as leading causes of death or morbidity in a prior NHANES analysis were also examined in this study, namely arthritis, cerebrovascular accident, chronic lower respiratory tract disease (self-reported emphysema, chronic bronchitis or asthma), coronary heart disease (coronary disease, angina or myocardial infarction) and diabetes mellitus (taking insulin and/or diabetic pills).[15] These disease types were categorized as 0, 1 and 2 or more.

Self-described general health status was defined by the question "Would you say that in general your health is excellent, very good, good, fair, or poor?" Responses to this question were aggregated into 2 categories of excellent, very good or good health vs fair or poor health. Depression was assessed in a private interview at the mobile examination centers using the validated Patient Health Questionnaire-9. This questionnaire yields scores from 0 to 27 and scores of 10 or greater are used to define major depression.[16]

Statistical Analysis

The NHANES 2005–2006 and 2007–2008 data for participants 20 years old or older were combined to provide robust sample sizes. All analyses were calculated using STATA® 8.2, which incorporated the design effect, appropriate sample weights, and the stratification and clustering of the complex NHANES sample design.[17] The sample weights adjust for unequal probabilities of selection and nonresponse. For this analysis we defined nocturia as occurring 2 or more times per night to capture nocturia that was clinically significant.[8] Pearson's chi-square test was used to assess the association between nocturia outcomes, and demographic and medical characteristics. Estimates with relative standard errors greater than 30% were identified as statistically unreliable. Multivariable logistic regression