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Authors: R.Bosch, M. Blanker, F. Groeneveld, A. Bohnen, A. Prins, R. Bernsen
Institution: Department of Urology and General Practice, Erasmus University and Academic Hospital Rotterdam

Title: THE EPIDEMIOLOGY OF INCREASED NOCTURNAL VOIDING FREQUENCY (NOCTURIA): COMMUNITY-BASED STUDY IN MEN BETWEEN 50 AND 78 YEARS

Aims of the Study:

Community based data derived from frequency-volume (FV) charts are needed to accurately determine the prevalence of the bothersome symptom nocturia. We determined age specific prevalence rates of nocturia in men between 50 and 78 years and examined which determinants influence the prevalence of nocturia.

Methods:

The data were obtained as part of a community based study of male urogenital tract problems and general health status, as previously described in detail (BJU Intern. 85: 665-671, 2000). Men 50-78 years old residing in a commuter town were evaluated to gain information on male urogenital tract dysfunction and the prevalence and determinants of clinical BPH. The study consisted of phase 1, in which data on 1688 participants were collected via self-administered questionnaires and during a visit to a health center, and phase 2, in which 1661 (98.4% of the participants) visited a urology outpatient clinic. All men provided written informed consent. The questionnaire included the International Prostate Symptom Score (IPSS) and questions on chronic disease history, smoking habits, alcohol consumption and current medications. Measurements included blood pressure, serum PSA, transrectal ultrasound including prostatic volumetry, uroflowmetry and post-void residual urine volume.

The participants completed a 3-day FV-chart. The time of arising and bedtime were noted on the charts. Diurnal and nocturnal urinary frequency was determined from the time of arising on day 1 until that time on day 3. The number of voids during waking and sleeping hours was estimated as the mean of 2 days or nights. We defined nocturia as voiding for which sleep was interrupted. Nocturnal polyuria was defined as nocturnal urine volume greater than 35% of 24-hour total urine volume. Urine production (UP) for each hour of the day was determined according a previously described method (Scan.J.Urol.Nephrol. 30: 257-263, 1996). Nocturnal UP per hour was estimated as the mean between 1 a.m. and 6 a.m. because 90% of the men were asleep in this period. Clinical BPH was defined as an IPSS>7 and prostate volume>30 ml and Qmax<15ml/sec.

To investigate the possible effect of variables on nocturia 2 or more and 3 or more times we performed multiple logistic regression analysis. The following characteristics were tested: age, diabetes mellitus, cardiovascular symptoms, hypertension, diuretic use, alcohol consumption, smoking, post-void residual urine volume greater than 50 ml, nocturnal polyuria and clinical BPH. The effects of variables on nocturnal UP per hour were studied using linear regression analysis.

Results:

A total of 1597 men (95% of responders) completed the 3-day FV-chart. The percentage of men with a nocturnal voiding frequency of 2 or more and 3 or more, respectively, was determined for 5-year age strata, using the data recorded on the FV-charts and alternatively by analysing the answers given to the

IPSS nocturia-question (Table 1).

Table : **Prevalence of increased nocturnal voiding frequency (nocturia)**

Age strata	Prevalence of Nocturia 2 or more times Based on FV-charts	Prevalence of Nocturia 2 or more times Based on IPSS questionnaire	Prevalence of Nocturia 3 or more times Based on FV-charts	Prevalence of Nocturia 3 or more times Based on IPSS questionnaire
50-54 yrs	29.5%	18.7%	4.8%	10%
55-59 yrs	32.7%	17.0%	4.3%	5.1%
60-64 yrs	42.0%	25.1%	10.7%	5%
65-69 yrs	55.0%	32.5%	14.7%	7.5%
70-78 yrs	59.3%	47.7%	21.5%	14.4%

Multiple logistic regression analysis was used to identify independent determinants of nocturia 2 or more times and of nocturia 3 or more times. Statistically significant determinants ($p<0.05$) were: advancing age, clinical BPH and diuretic use for nocturia 2 or more times; and advancing age, clinical BPH and nocturnal polyuria for nocturia 3 or more times The influence of nocturnal polyuria was further explored by analysing the effects of various determinants on nocturnal urine production per hour. This multiple linear regression analysis yielded several significant determinants of nocturnal urine production per hour. Advancing age ($p<0.001$) and 24-hour polyuria of more than 2500 ml ($p<0.001$) were associated with a higher production. Smokers ($p<0.01$) and men with a reduced urinary flow rate ($p<0.01$) have a lower production. Alcohol consumption, hypertension, cardiovascular symptoms, diabetes, postvoid residual urine (>50ml), prostate enlargement (>30ml), and medication use were non-significant factors.

Discussion and Conclusion:.

In the community, nocturia 2 or more times has a strong positive correlation with advancing age, clinical BPH and diuretic use. Its prevalence is high. In addition to advancing age and clinical BPH, nocturnal polyuria is an independent determinant of nocturia 3 or more times whereas diuretic use is not. Nocturnal UP per hour is increased in advancing age and 24-hour polyuria. We cannot readily explain why smoking or a reduced Qmax is associated with a lower production. In men between 50 and 59 years the prevalence of nocturia 3 or more times, is overestimated whereas the prevalence of nocturia 2 or more times is underestimated by the use of the IPSS questionnaire. This questionnaire underestimates the prevalence of nocturia 2 and 3 or more times in men over the age of 60.