Pelvic Physical Therapy Distance Journal Club

Lifestyle habits associated with nocturnal urination frequency: The Nagahama study
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Introduction: Nocturia may increase mortality due to increased falls and fractures. People with Nocturia have been shown by these researchers to also have a smaller dip in BP. This decreased circadian BP dip is also associated with cardiovascular disease and mortality. So interventions to decrease nocturia may improve QOL and also mortality risk.

Nocturia is multifactorial and can be caused by nocturnal polyuria. Studies have shown that salt sensitivity can cause increased urine formation due to sodium excretion/natriuresis (increased urine with increased salt), during sleep. Other studies have shown that a reduction of salt intake can lead to decreased nocturnal urinary frequency and urine production. Other studies have shown that stimulating increased natriuresis during the daytime can decrease nocturnal urine production. The authors theorize that since Potassium enhances “salt wasting”, high consumption of potassium rich foods could reduce nocturia. Also caffeine could enhance natriuresis and salt rich foods could increase nocturia.

There are also studies linking sleep disordered breathing with nocturia and also sleep duration with nocturia. This study theorized a possible relationship (due to “salt wasting”), between time elapsed between dinner and bedtime, with nocturia.

Aim: To clarify dietary habits, eating behavior s and sleep characteristics associated with nocturia, to identify modifiable lifestyle factors for improving nocturia.

Study Design: Cross-sectional

Methods: Study was approved by Kyoto University Graduate School of Medicine and Nagahama Municipal review board.

Population was from a data set of a longitudinal Nagahama, cohort study, recruited between 2008-2010 from the general population of Nagahama, Japan, who qualified. Age for this study was 64.5, +/- 7 years. 5683 were included.

Inclusion criteria: middle aged to elderly, with written consent

Exclusion criteria: no sleep diary kept, pacemaker, hemodialysis, obstructive sleep apnea therapy, severe renal function decline, lack of urinary data due to menstruation or failure to collect urine, incomplete clinical measurements or questionnaire response (including food intake frequency) and outliers in sleep parameters (suspected shift workers).

Measurements:
- Frequency of Nocturnal Urination: recorded in a 7 day sleep diary (optional investigation for participants who requested an exam of sleep-disordered breathing). Mean frequency calculated. Subjective frequency was assessed with the International Prostate Symptom Score.
- Frequency of food intake, (see 2.3, p. 3), assessing 43 most commonly consumed items, with analysis of green vegetables and dairy, miso soup, green tea and coffee due to their potential influence on salt intake and salt wasting. Measures were in “times/week” for green vegetables and dairy and “times per day” for miso soup, green tea and coffee.
• Unfavorable eating behaviors were assessed using yes/no questions (see 2.4, p 3): (a) do you have dinner within 2 hours pre-bed more than 3 days/week? (b) do you snack after dinner more than 3 days a week? (c) do you have a habit of eating rapidly? (c) do you skip breakfast more than 3 days/week?
• Sleep parameters of duration and typical bedtime were assessed with Pittsburgh- assessing sleep habits and disturbance and possible presence of an MD dx of sleep apnea
• Basic clinical parameters – (see 2.6, p. 3): were made with a personal health record and also including blood and spot urine samples taken from 8 AM to 2 PM. Urinary Na, K and creatinine were measured daily.
  Hypertension, measured in blood pressure, Diabetes as measured with blood glucose, antihyperglycemic treatment and renal function was measured in creatinine. Alcohol consumption was measured in “go”: 1 go = 22 g ethanol (0.74 fluid oz.)
• Statistical Analysis: Values as mean, +- SD. ANOVA used to assess group differences in nocturnal urination frequency. Linear or logistic regression model was used to identify independently associated nocturia factors. P<.05 was considered statistically significant.

Results: 4676 participants actually recorded number of nocturnal voids for 7 days. Nocturnal voids were more frequent in the elderly and there was some variation between subjective vs sleep diary recorded frequency (Figure 1B). Sleep diary-based nocturnal void frequency > 1.5x/noc was “close to the generally accepted clinically relevant subjective frequency of > or= 2x/noc”.
  Table 2 summarizes the results of the multiple linear regression analysis for nocturia frequency. Habitual coffee intake (x/day), as well as a later bedtime, was inversely related to nocturnal urination frequency. This is despite the linear correlation of coffee intake and bedtime (up to 11:00 PM: 1 cup, +/- 1.0, up to 12:00: 1.3c, +/- 1 c, and after 12:00: 1.5 c +/- 1 c). This is also despite age stratification and sex, suggesting not due to BPH.
  Green vegetable intake was inversely associated in nocturia, but only with the younger sub population (Figure 2), (< 65 y/o), suggesting “salt wasting” (increased daytime voiding for elimination of salt) due to increased potassium, may be significant with subjects who have better renal function.
  Association of a late dinner and nocturia disappeared after adjusting for typical bedtime (maintaining relevance of time between dinner and bed), see Figure 2D. Odds ratios of these lifestyle habits are listed in last paragraph of p. 4.

Discussion: This was the first large-scale study that clarified a potential involvement of coffee intake in nocturnal urination frequency. It was a large scale cross-sectional study in a general population looking at habitual intake of some foods/drinks as well as typical bedtime, as determinants of nocturnal urinary frequency. They found that although they didn’t examine the timing of coffee drinking, they found that daytime coffee drinking enhances diuresis and natriuresis (excretion of of large amounts of urine, with large amounts of sodium), which may decrease night time urine production.
  They also found that the association of eating large amounts of potassium-rich vegetables (such as greens), and enhanced natriuresis, could be caused by the same mechanism. No studies have clarified the effects of coffee on nocturia but people with nocturia are often advised to restrict fluids or coffee manage nocturia. Although their study does not support overall restriction of coffee intake by any age group, they recommend further randomized studies to clarify causality between coffee intake and nocturnal urination.
  They found an association between dinner “just before bedtime” and nocturnal urination frequency, vs a later bedtime (and adjusting for typical bedtime), showing that having more time elapsed between dinner and bedtime resulted in less nocturnal frequency. They surmised that this is because there was more time after dinner and before sleep, to excrete sodium and water.
They explained the inverse association between spot urine sodium excretion (daytime) and nocturia as possibly pointing to salt sensitive individuals, who excrete more sodium at night, (therefore having more nocturia than non-salt sensitive people).

**Limitations:** Type of antihypertensive wasn’t considered (some diuretics- loop diuretics taken more than 6 hours pre-bedtime reduce nocturia effect). But they included the use of antihypertensives in general so don’t consider it a significant bias. Secondly, they recorded frequency but not amount of food intake. Also, typical amounts of food and coffee may vary across different populations. Further studies across different populations would strengthen their findings. Third, they didn’t investigate other fluids than coffee or green tea, but they are commonly ingested in Japan, so this wasn’t a serious bias. Fourth, they evaluated lifestyle habits using a questionnaire, which could have caused misclassifications.

**Strengths:** Large population with a wide range of information on lifestyle habits reportedly inversely related to nocturia (including smoking). They were able to rule out the confounding effect of benign prostatic hypertrophy with age stratified and sex separated analyses. Using a several day bladder diary to examine effects of lifestyle on nocturia, enabled more precision.

**Discussion Questions:**
1) Given the result of this study, how likely are you to recommend coffee, eating more greens (if under 65 y/o) or a longer period between dinner and bedtime, to your patients with nocturia?
2) What other lifestyle recommendations do you give your patients with nocturia?