

VITAMIN D, URINARY INCONTINENCE, AND LOWER URINARY TRACT SYMPTOMS AMONG US MEN: RESULTS FROM THE NATIONAL HEALTH AND NUTRITION EXAMINATION SURVEY

Hypothesis / aims of study

Vitamin D receptors are known to exist in prostate and bladder tissue and agonists for the vitamin D receptor may have anti-inflammatory and anti-proliferative properties.[1] Vitamin D deficiency could influence the development of benign prostatic hyperplasia (BPH) and subsequent lower urinary tract symptoms. Recent NHANES data among women suggest that women with one or more pelvic floor disorders, including urinary incontinence (UI), have lower vitamin D levels (<30 ng/ml) than those without any pelvic floor disorders.[2] Less is known about the relationship of vitamin D levels and lower urinary tract symptoms (LUTS) in men. Our objectives were to estimate the prevalence of vitamin D deficiency in men with LUTS in a population-based sample of men and to identify the associations between vitamin D levels and individual LUTS.

Study design, materials and methods

Data are from 2387 men (≥20 years of age) who participated in the 2005-2006 cycle of the National Health and Nutrition Examination Survey (NHANES), a cross-sectional, nationally representative survey of the US non-institutionalized population. Men were interviewed in their homes and then underwent standardized physical examinations and venipuncture in a mobile examination center. Individual LUTS included nocturia (coded as ≥2 episodes at night), incomplete emptying ("trouble with bladder feeling empty"), and hesitancy ("having trouble starting to urinate"). UI was assessed by the Incontinence Severity Index (ISI). Vitamin D was measured with a Diasorin radioimmunoassay method and dichotomized as ≥30 ng/mL (normal) and <30 ng/mL (insufficiency levels).[3] To evaluate the association of vitamin D insufficiency and individual LUTS and UI, unadjusted and adjusted analysis controlling for covariates were performed with multivariable logistic regression using appropriate sample weights. Covariates retained in the multivariable models included age (10-year increments); race/ethnicity (African American vs other); education (at least high school or more); body mass index (kg/m²); self-reported health status (fair/poor vs excellent/very good/good); chronic diseases (count); and current smoking status (yes/no).

Results

Among the 2158 (90%) of men who had vitamin D measured, data on the prevalence of the following individual LUTS were available: nocturia (n= 2008), difficulty with bladder emptying (n=1312), hesitancy (n=1322), and UI (n=2013). The weighted prevalence of having UI and individual LUTS by vitamin D status is reported in Table 1. Vitamin D levels ranged from 2 to 56 ng/mL, median 19 ng/mL, and mean 19.9±8.0 ng/mL. The majority of men (89%) had vitamin D levels <30 ng/mL. Vitamin D levels <30 ng/mL were associated with having an increased risk of UI (Table 2), even after adjusting for all covariates, OR 2.0 (95% CI 1.0, 4.1). In examining associations for individual LUTS and vitamin D levels (Table 2), lower vitamin D levels were not associated with nocturia, incomplete emptying, or hesitancy. Lower vitamin D levels were not associated with a history of BPH or prostate cancer.

Table 1: Weighted Prevalence for UI and Individual LUTS by Vitamin D Levels

<i>Variable</i>	<i>Vitamin D≥30 ng/mL (%, 95% CI)</i>	<i>Vitamin D<30 ng/mL (%, 95% CI)</i>	<i>P value</i>
Urinary incontinence	7.9 (4.8, 12.7)	12.5 (10.8, 14.4)	0.05
Nocturia (≥2 episodes/night)	14.8 (12.0, 18.1)	20.1 (17.3, 23.1)	0.01
Incomplete emptying	7.6 (3.9, 14.30)	10.1 (8.5, 12.0)	0.37
Hesitancy	5.2 (1.9, 13.2)	8.1 (6.1,10.7)	0.38

Table 2: Unadjusted and Adjusted Prevalence Odds Ratios for UI and Individual LUTS and Vitamin D Levels Below 30 ng/mL

<i>Variable</i>	<i>Unadjusted POR (95% CI)*</i>	<i>Adjusted POR (95% CI)**</i>
Urinary incontinence	1.7 (1.0, 2.8)	2.0 (1.0, 4.1)
Nocturia (≥ 2 episode/night)	1.5 (1.1, 1.9)	1.1 (0.8, 1.6)
Incomplete emptying	1.4 (0.7, 2.8)	1.1 (0.6, 2.2)
Hesitancy	1.6 (0.5, 4.9)	1.6 (0.4, 6.0)

*POR= Prevalence Odds Ratio

**Adjusted for age, race/ethnicity, education, body mass index, chronic diseases, self-rated health, and current smoking status

Interpretation of Results

Low vitamin D levels are prevalent among US men > 20 years of age. Lower vitamin D levels were associated with UI in men participating in the NHANES even after controlling for other risk factors. While lower vitamin D levels were associated with nocturia in the unadjusted analysis, no associations was seen among low vitamin D levels and individual LUTS (nocturia, incomplete emptying, or hesitancy) in multivariable analysis.

Concluding Message

In a cross-sectional, population-based survey of men in the US, low vitamin D levels were associated with UI and not with other lower urinary tract symptoms. These results are similar to findings among US women.[2] Further studies are warranted to assess the relationship between vitamin D and the pathogenesis of UI.

References

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2. Badalian SS and Rosenbaum PF. Vitamin D and pelvic floor disorders in women. Results from the National Health and Nutrition Examination Survey. Obstet Gynecol. 2010;115:795-803.
3. Hansen KE, Jones AN, Lindstrom MJ, et al. Vitamin D insufficiency: disease or no disease? J Bone Miner Res. 2008;23:1052-1060.

<i>Specify source of funding or grant</i>	Funded in part by a Career Development Award to A. Markland
<i>Is this a clinical trial?</i>	No
<i>What were the subjects in the study?</i>	HUMAN
<i>Was this study approved by an ethics committee?</i>	Yes
<i>Specify Name of Ethics Committee</i>	US Centers for Disease Control
<i>Was the Declaration of Helsinki followed?</i>	Yes
<i>Was informed consent obtained from the patients?</i>	Yes