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Original article

Hypovitaminosis D is an independent associated factor of overactive bladder in older adults

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ABSTRACT

Aim of the study: Urinary incontinence and vitamin D deficiency are common problems encountered in geriatric population. We aimed to investigate if there is a relationship between these conditions.
Subjects and method: Among 2281 patients who were admitted to our geriatric medicine outpatient clinic spanning the last three years, 705 patients with known vitamin D status, urinary incontinence and subtype, and calcium plus vitamin D therapy data were included in statistical analysis. Patients who are using calcium plus vitamin D therapy were excluded. SPSS (Statistical Package for Social Sciences) version 15.0 for Windows was used for statistical analysis and $p < 0.05$ was considered as statistically significant.
Results: Mean age of the study population was 72.3 ± 6.4 years and 62.8% were female. Plasma vitamin D level (OR: 0.968, 95%CI: 0.943–0.993, $p = 0.013$), MMSE (Mini Mental State Examination) score (OR: 0.944, 95%CI: 0.902–0.989, $p = 0.014$), and serum ALP (Alkaline Phosphatase) level (OR: 0.995, 95%CI: 0.992–0.998, $p = 0.001$) were found to be inversely correlated factors, and serum calcium level (OR: 1.772, 95%CI: 1.008–2.888, $p = 0.022$) was found to be a positively correlated factor of overactive bladder. Considering the different clinical subtypes of urinary incontinence, only urgency incontinence was associated with lower plasma vitamin D level ($p = 0.013$).
Conclusions: Vitamin D deficiency and insufficiency are independent associated factors for overactive bladder in older adults. This is explicable by effects of vitamin D on muscle growth and function.

1. Introduction

Urinary incontinence (UI) and hypovitaminosis D are prevalent problems of the geriatric population. Among aged women 33.7% of outpatients and 43% of institutionalized patients are reported to suffer from urinary incontinence (Aslan, Beji, Erkan, Yalcin, & Gungor, 2009; McGrother et al., 2004; Varlı, 2009). Despite this fact, it is not mentioned due to embarrassment of the patients and there are a variety of reasons that physicians cannot assess UI regularly. However, unfavorable consequences like pressure sores, urinary tract infection, social isolation, falls, and institutionalization indicates the importance of urinary incontinence.

Overactive bladder (OAB) is the most important underlying cause of urgency that leads to incontinence in both aged men and women (Bani-Issa, Almomani, Eldeirawi, 2013). Prevalence of vitamin D deficiency and insufficiency is reported to be 78% in older adults (Mithal et al., 2009). Vitamin D synthesis primarily depends on adequate sunlight exposure and hepatic and renal functionality; oral intake and gut absorption plays a minimal role in maintenance of vitamin D levels. Besides its usual role in gut absorption of calcium and phosphorus, extra-skeletal benefits are revealed by recent studies (Boucher, 2012). Skeletal and smooth muscle growth and function are reported to be affected by vitamin D status (Ward et al., 2010). We aimed to test the hypothesis that urinary incontinence is attributable to vitamin D deficiency or insufficiency in patients who were admitted to our geriatric medicine outpatient clinic.

2. Subjects and method

2.1. Study participants

Among 2281 patients who were admitted to our geriatric medicine outpatient clinic spanning the last three years, 705 patients with known vitamin D status, UI and subtype,

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calcium plus vitamin D therapy data were included in statistical analysis. Patients with missing information in terms of vitamin D levels, UI and subtype, and calcium plus vitamin D therapy status were excluded. In addition, patients known to be on calcium plus vitamin D therapy were excluded in order to ensure a more homogeneous cohort. Demographic data, comprehensive geriatric assessment test scores including Mini Mental State Examination (MMSE), Basic Activities of Daily Living (BADL), Instrumental Activities of Daily Living (IADL), Mini Nutritional Assessment-Short Form (MNA-SF), and Yesavage Geriatric Depression Scale and laboratory parameters were compared between patients with and without urinary incontinence (Barone, Milosavljevic, & Gazibarich, 2003; Fillenbaum, 1985; Folstein, Folstein, & McHugh, 1975; Keskinoglu et al., 2009; Lawton & Brody, 1969; Yesavage et al., 1982). "Reversible causes of incontinence" refers to preventable and potentially treatable conditions causing urinary incontinence like diuretic use, other medications causing urinary incontinence, hyperglycemia and hypercalcemia associated hyperosmolar state, urinary tract infections, restricted mobility, depression, dementia, delirium, constipation, stool impaction, and atrophic vaginitis (Yap & Tan, 2006). For the established causes, following definitions were made in conformation with the International Continence Society: "Urinary incontinence" as "The complaint of any involuntary loss of urine", "Urgency urinary incontinence" as "The complaint of involuntary leakage accompanied or immediately preceded by urgency", "Stress urinary incontinence" as "The complaint of involuntary leakage on effort or exertion, or on sneezing or coughing", "Overactive bladder" as "Urgency with or without urge incontinence, usually with frequency and nocturia" (Abrams et al., 2004).

2.2. Statistical analyses

Numbers and frequencies of the patients were shown for the categorical variables. The numerical parameters which were normally distributed after evaluating by histograms, analytical methods and probability plots were shown as mean ± SD. The skew distributed numerical parameters were shown as median (minimum-maximum). To evaluate the differences between categorical parameters, chi-square test was used. On the other hand, Student *T*-test was used for evaluating differences between normally distributed numerical variables of two groups. Mann-Whitney *U* test was also used for skew distributed parameters of two groups. Kruskal-Wallis test was used to compare median vitamin D levels between therapy and control groups. Logistic regression analysis was performed to identify independent associated factors for both urinary incontinence and overactive bladder. SPSS (Statistical Package for Social Sciences) version 15.0 for Windows was used for statistical analysis and $p < 0.05$ was considered as statistical significant.

3. Results

In this cross sectional analysis, we analyzed our database and excluded 1231 patients due to absence of vitamin D status, 80 patients due to absence of urinary incontinence presence and subtype data, 161 patients due to calcium plus vitamin D therapy, and 104 patients due to missing calcium or vitamin D usage data (Fig. 1). Mean age of the total study population was 72.3 ± 6.4 years and 62.8% was female. Number of patients with incontinence was 295 (41.8%). Demographic data, comprehensive geriatric

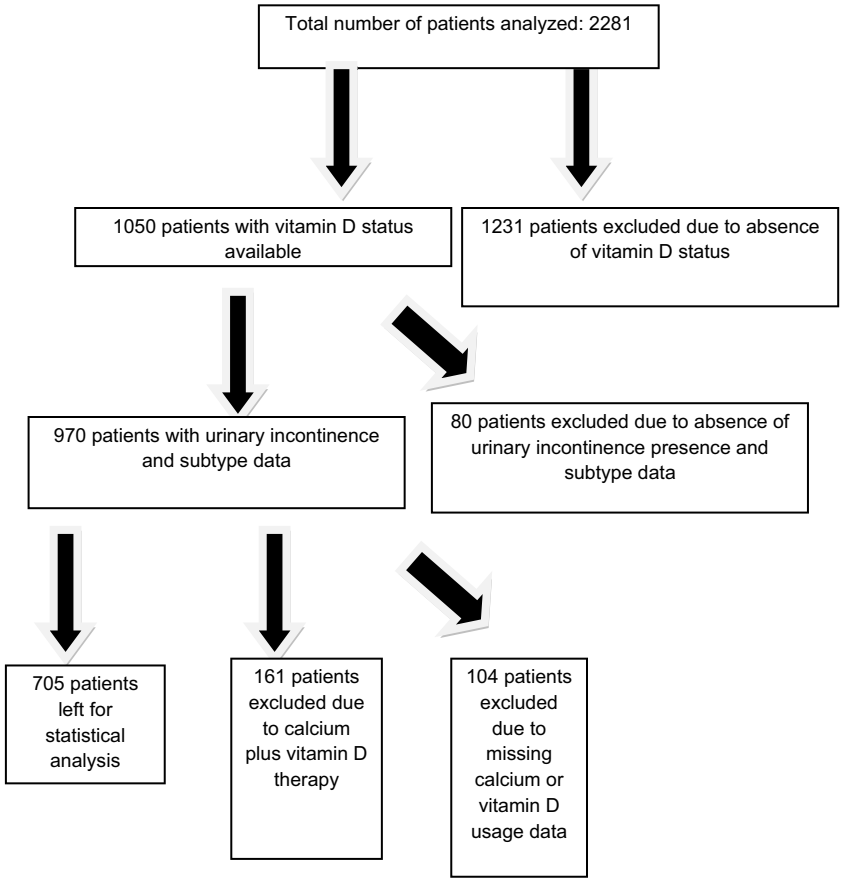

Fig. 1. Flow chart showing selection of study participants.