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# COMPARISON OF VITAMIN D LEVELS IN PATIENTS OF LUTS WITH AND WITHOUT BPH

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## Abstract

**Background:** Lower urinary tract symptoms (LUTS) in aging males are commonly attributed to benign prostatic hyperplasia (BPH). Emerging evidence suggests that Vitamin D may influence prostate health through its anti-inflammatory, immunomodulatory, and anti-proliferative effects mediated via Vitamin D receptors in prostatic tissue.

**Objective:** To assess the association between serum Vitamin D levels in males with LUTS, comparing those with and without BPH.

**Methods:** A hospital-based case-control study was conducted by Biochemistry Department in collaboration with Urology Department at SMS Medical College, Jaipur. A total of 120 male patients aged 50–75 years presenting with LUTS were recruited. Sixty patients with BPH (confirmed by ultrasound and PSA < 4 ng/ml) formed the case group, while 60 age-matched LUTS patients without BPH served as controls. Serum Vitamin D levels were measured using chemiluminescence method, and levels <20 ng/ml were considered deficient. Statistical analysis was performed using Student's t-test and chi-square test.

**Results:** The mean age in LUTS without BPH Cases group was 61.57 ± 6.27 years which was slightly lower than LUTS with BPH cases group (62.35 ± 7.58 years). This difference was statistically not significant (p value =0.6169). The mean Serum Vitamin D levels for LUTS with BPH cases was 13.98 ± 5.90 ng/ml which was significantly lower (p value < 0.05) than the serum vitamin D levels in patients of LUTS without BPH which was 18.83 ± 7.04 ng/ml. Mean Serum PSA levels for LUTS without BPH Cases was 2.09 ± 1.05 ng/ml and for LUTS with BPH Cases was 2.71 ± 0.98 ng/ml which was significant statistically (p value < 0.05). The mean value of Serum PSA was slightly higher for LUTS with BPH Cases when compared to LUTS without BPH Cases

**Conclusion:** A significant association was found between Vitamin D deficiency and the presence of BPH among men with LUTS. These findings suggest a potential role of Vitamin D supplementation in the prevention or management of BPH-related LUTS.

**Keywords:** LUTS, BPH, Vitamin D, prostate volume, chemiluminescence, aging males.

## INTRODUCTION

Lower urinary tract symptoms (LUTSs) are a group of symptoms related to storage and voiding functions of the urinary bladder. It can be due to various abnormal structural and neurological causes affecting the urinary bladder or the prostate. LUTSs in elderly males have been linked mainly to benign prostatic hyperplasia (BPH) [1]. Vitamin D3 (calcitriol) or (1,25 dihydroxy cholecalciferol) deficiency has been studied recently in various health problems as it has an impact on metabolic functions of different organs and systems in the human body [2]. Previous studies on the pharmacology of lower urinary tract showed that Vitamin D receptor may have a potential role in the future treatment of LUTS[3].Intake

of Vitamin D supplement and Vitamin D analogue has been shown to be associated with a decrease in BPH prevalence and a decrease in prostatic size[4,5].

Evidence indicates that low vitamin D, especially the active 25 hydroxyvitamin D (25-OH D), is deficient in BPH patients and may be closely associated with the disease pathophysiologic processes [6,7]. Vitamin D is involved in bone health by promoting calcium absorption in the gut and maintaining serum calcium and phosphate concentrations, and by its action on bone growth and reorganization through osteoblasts and osteoclasts cells. Moreover, during the last three decades, novel actions of vitamin D have been discovered. Active vitamin D is known to regulate cell proliferation and differentiation and has a key role in the responses of the immune and nervous systems. Current effects of vitamin D include xenobiotic detoxification, oxidative stress reduction, neuroprotective functions, antimicrobial defense, immunoregulation, *anti*-inflammatory/anticancer actions, and cardiovascular benefits [8]. The biologically active form of vitamin D3 is 1,25-dihydroxyvitamin D3. The molecular mechanism involved in vitamin D signalling is widely established. Furthermore, vitamin D has pronounced immunoregulatory and anti-inflammatory properties and acts by regulating the growth of prostate stromal cells. [9]

The current study aims to find the relationship between serum levels of Vitamin D and LUTS in the Indian males presenting with lower urinary tract symptom above 50 years of age.

## METHODOLOGY

This study was done in tertiary care centre of northern India by the Department of Biochemistry in collaboration with Department of Urology, SMS medical college, Jaipur, Rajasthan. This was a hospital based case control study done in 2023 and 2024. Patients with a history of neurogenic bladder, Stricture urethra, Carcinoma of bladder or prostate and Vesical calculi and serum PSA level > 4 ng/ml were excluded. 120 patients aged between 50 to 75 years, presenting with Benign prostate enlargement and Lower urinary tract symptom with a negative urine dip for urinary tract infection and PSA < 4 ng/ml were studied.

60 Eligible cases of LUTS with BPH were included on 1st come 1st basis. Age and Gender matched 60 case of LUTS without BPH reported just next to each selected case of LUTS with BPH were considered as control.

### BLOOD SAMPLING

Both study groups were investigated regarding Vitamin D level. Vitamin D was estimated by Chemiluminescence method in automated Advia Centaur analyser. Vitamin D levels less than 20 ng/ml were considered deficient.

### STATASTICAL ANALYSIS

Continuous data was summarized in terms of mean and SD. Difference in two means was analyzed using student 't' test. Discrete data was summarized in terms of proportion. Difference in proportion was analyzed using chi square test.

## RESULTS

The mean age in LUTS without BPH Cases group was 61.57 ± 6.27 years which was slightly lower than LUTS with BPH cases group 62.35 ± 7.58 years. This difference was statistically not significant (p value =0.6169; Table 1). The mean Serum Vitamin D levels for LUTS with BPH cases was 13.98 ± 5.90 ng/ml which was significantly lower (p value < 0.05) as compared to the serum vitamin D levels in patients of LUTS without BPH which was 18.83 ± 7.04 ng/ml. Mean Serum PSA levels for LUTS without BPH Cases was 2.09 ± 1.05 ng/ml and for LUTS with BPH Cases was 2.71 ± 0.98 ng/ml which was significant statistically (p value < 0.05). The mean value of Serum PSA was slightly higher for LUTS with BPH Cases when compared to LUTS without BPH Cases (Table 2).

**Table 1: Comparison of Mean Age between LUTS without BPH Cases (Group 1) and LUTS with BPH Cases (Group 2)**

| Test/ Parameters | LUTS without BPH Cases (Group 1) (n=60) | LUTS with BPH CASES (Group 2) (n=60) | P-value |
|---|---|---|---|
| Age (Years) | 61.57 ± 6.27 | 62.35 ± 7.58 | 0.6169 (NS) |

***Values are in Mean ± SD**

*** P-value as obtained on applying student's t-test**

**Table 2: Comparison of Mean Serum Vitamin D Levels and Serum PSA in patients of LUTS without BPH (Group 1) and LUTS with BPH (Group 2)**

| Test/ Parameters | LUTS without BPH Cases (Group 1) (n=60) | LUTS with BPH CASES (Group 2) (n=60) | P-value |
|---|---|---|---|
| Serum Vitamin D | | | |

| | | | |
|---|---|---|---|
| **(ng/ml)** | 18.83 ± 7.04 | 13.98 ± 5.90 | < 0.05(S) |
| **Serum PSA (ng/ml)** | 2.09 ± 1.05 | 2.71 ± 0.98 | < 0.05(S) |

***Values are in Mean ± SD**

***P-value as obtained on applying student's t-test**

## DISCUSSION

Benign prostatic hyperplasia (BPH) is a chronic progressive condition which impacts a substantial number of older men. BPH is a common problem that affects the quality of life in approximately one third of men older than 50 years. BPH is histologically evident in up to 90% of men by age 85 years. As many as 14 million men in the United States have symptoms of BPH [10]. Worldwide, there were 94 million prevalent cases of BPH in 2019, compared with approximately 51 million cases in 2000[11].

The prevalence of BPH in White and African-American men is similar. However, BPH tends to be more severe and progressive in African-American men, possibly because of the higher testosterone levels, 5-alpha-reductase activity, androgen receptor expression, and growth factor activity in this population. The increased activity leads to an increased rate of prostatic hyperplasia and subsequent enlargement and its sequelae.BPH is now a big health problem, which not only influences the life quality of patients but also brings heavy burden to society. Clinical BPH refers to the lower urinary tract symptoms (LUTS) associated with benign prostatic enlargement leading to bladder outlet obstruction. Lower urinary tract symptoms (LUTSs) are a group of symptoms related to storage and voiding functions of the urinary bladder. It can be due to various abnormal structural and neurological causes affecting the urinary bladder or the prostate [12]. There are several lines of evidence suggesting a potential role of vitamin D in the development of BPH. Vitamin D3 is the form of vitamin D, and some of its analogues have been described as potent regulators of cell growth and differentiation of prostatic cells. Vitamin D3 binds to the vitamin D receptor (VDR), a member of the nuclear receptor super family, and modulates a variety of biological functions [13]. The biologically active form of vitamin D3 is 1,25-dihydroxyvitamin D3. The molecular mechanism involved in vitamin D signalling is widely established. Vitamin D increases prostate cell differentiation and apoptosis and decreases cell proliferation by binding to the vitamin D receptor (VDR) [14]. Vitamin D plays a pivotal role in calcium homeostasis and potentially promotes health outcomes, via cancer prevention and modulation of immune function. Vitamin D has pronounced immunoregulatory and anti-inflammatory properties and acts by regulating the growth of prostate stromal cells [15]. It has been hypothesized that a vitamin D-deficient state is associated with high circulating total PSA levels. The current study aimed to find the association between serum levels of Vitamin D and LUTS in BPH cases. This can help in the development of new therapeutic strategies to promote healthy prostate health in the aging male population.

The following study was conducted in the department of biochemistry in collaboration with the department of urology at SMS medical college and attached hospital, Jaipur.Sixty male patients presenting with LUTS aged between 50 to 75 years, presenting with BPH and LUTS with negative urine dip for UTI and PSA <4 ng/ml were enrolled in study. Age, gender matched 60 cases of LUTS without BPH were considered as control. In our study, the mean age in LUTS without BPH Cases group 61.57 ± 6.27 years was slightly lower than LUTS with BPH cases group (62.35 ± 7.58 years). This difference was statistically not significant (p value =0.6169). The mean Serum Vitamin D levels for LUTS with BPH cases was 13.98 ± 5.90 ng/ml which was significantly lower (p value < 0.05) than the serum vitamin D levels in patients of LUTS without BPH which was 18.83 ± 7.04 ng/ml. Mean Serum PSA levels for LUTS without BPH Cases was 2.09 ± 1.05 ng/ml and for LUTS with BPH Cases was 2.71 ± 0.98 ng/ml which was significant statistically (p value < 0.05). The mean value of Serum PSA was slightly higher for LUTS with BPH Cases when compared to LUTS without BPH Cases.

Our results were also supported by study of Yeo etal. [16] who observed that Vitamin D supplementation suppressed the increase in the prostate volume and improved the LUTS. Although there was no direct effect on serum testosterone levels, vitamin D supplementation helped improve hypogonadal symptoms. Similarly, A randomized controlled trial suggested a promising result with vitamin D supplementation on BPH. The study indicated that vitamin D analogue decreased 2.9% prostate volume in BPH patients; however, no significant changes were found in scores of urological symptoms. Data from an American survey in 2005–2006 showed that low-level Vitamin D was highly prevalent among adult men in the US, and Vitamin D deficiency was associated with moderate-severe urinary incontinence and the presence of at least one LUTS [17]. Several in vitro and animal studies have reported the effect of vitamin D on prostate growth and LUTS. Vitamin D analogs have a positive effect on the inhibition of cellular prostate growth and apoptosis in prostate cells [18]. Also, a previous study strongly favoured a link between the renin angiotensin system and vitamin D and BPH pathogenesis [19]. Yalcınkaya et al. reported associations among the renin-angiotensin system, vitamin D, and BPH pathogenesis[20]. Studies showed that vitamin D was inversely associated with prostate volume, and involved in prostatic cell differentiation and proliferation, which were associated with BPH [21]. Haghsheno et al reported that low vitamin D was independently associated with BPH in men and that supplementation with vitamin D was able to alleviate symptomatic BPH [22]. Vitamin D insufficiency is likely to result in calcium dyshomeostasis and consequent abnormal detrusor contractility [23]. Schroder et al found that vitamin D3 analogue was able to reduce the negative functional changes of detrusor smooth muscle in a rat model with bladder outlet obstruction and showed obvious suppressive effects

on bladder sensory signalling [24].Similarly, a study in bladder cell lines revealed the role of vitamin D in modulating bladder smooth muscle function [25].

## CONCLUSIONS

The study concluded that vitamin D deficiency was negatively correlated with total PSA levels in individuals with BPH. Vitamin D and total PSA are indicators of prostate health status in men. A total PSA screening tool can reflect the prostate health status of men and help identify the need for vitamin D supplementation, which can be implemented at the earliest. Hence, a routine biochemistry panel for screening prostate health in men should consider vitamin D levels along with total PSA levels so that individuals deficient in vitamin D are identified and interventional strategies can be planned for their well-being.

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