

Role of Vitamin D Supplementation in Hypertension

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Abstract Role of Vitamin D supplementation was studied in patients with hypertension. One hundred hypertensive patients (group I) were given conventional antihypertensive drugs while another 100 patients (group II), in addition, were supplemented with Vitamin D₃ (33,000 IU, after every 2 weeks, for 3 months). Besides diastolic and systolic blood pressure, serum calcium, phosphorous, alkaline phosphatase, albumin, albumin-corrected calcium, and 24 h urinary creatinine levels were estimated in both the groups before the start of treatment and after 3 months. Vitamin D supplementation showed a more significant decrease in systolic blood pressure. This group also showed a significant increase in serum calcium as well as albumin-corrected calcium with a decrease in phosphorous. Results of the study confirm that Vitamin D supplementation has a role in reducing blood pressure in hypertensive patients and that it should be supplemented with the antihypertensive drugs. More extensive studies with a larger group, to draw a definite conclusion, are in progress.

Keywords Vitamin D supplementation · Hypertension · Blood pressure

Introduction

Vitamin D is known to play an important role in calcium homeostasis. Several workers have reported that Vitamin D also has a role in blood pressure regulation and heart health [1, 2]. Rostand [3] observed that cases of high blood pressure

increase during winter and in the places that are far away from the equator, both are the situations where a decrease in available sunlight leads to lower Vitamin D production. Scragg et al. [4] have shown that administration of Vitamin D to older adults with existing high blood pressure decreases both systolic and diastolic blood pressure. On the other hand, Forman et al. [5] found no association between Vitamin D intake from diet and supplements, and the risk of incident hypertension. Due to conflicting reports, it was planned to study the role of Vitamin D supplementation in patients with hypertension.

Materials and Methods

Two hundred patients having hypertension (above 35 years of age), attending medicine out patient's department, were selected for the study. They were divided into two groups. Group I included every alternate patient who received conventional antihypertensive drugs while the remaining 100 patients were included in group II who in addition, were also supplemented with Vitamin D₃ (33,000 IU, after every 2 weeks, for 3 months). Exclusion criteria were—proteinuria, diabetes mellitus, any pre-existing renal disease, or history/evidence of any medication including antioxidants. All the patients were assessed for routine laboratory investigations.

Five milli litre over night fasting venous blood was collected in a plain vial, aseptically. Serum was separated and analyzed, immediately, for various biochemical parameters. Serum calcium was estimated using O-cresolphthalein complexone [6], serum phosphorus according to Fiske and Subbarow [7], alkaline phosphatase according to King and Armstrong [8], albumin by dye-binding method using bromocresol green [9], and urine creatinine by

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Table 1 Effect of Vitamin D supplementation on blood pressure, serum calcium, phosphorus, alkaline phosphatase, albumin, albumin-corrected calcium and 24 h urinary creatinine levels in hypertensive patients

Parameters	Group I		Group II	
	Before treatment	After 3 months	Before treatment/ supplement	After 3 months
Blood pressure (mmHg)				
Diastolic	78.1 ± 0.69	80.2 ± 0.73	77.4 ± 0.55	78.7 ± 0.55
Systolic	148.8 ± 0.73	145.2 ± 0.83*	149.1 ± 0.88	141.6 ± 0.92*, **
Serum calcium (mg/dl)	8.75 ± 0.07	8.60 ± 0.06	8.57 ± 0.03	9.33 ± 0.06*, **
Serum phosphorous (mg/dl)	3.51 ± 0.05	3.63 ± 0.04	3.57 ± 0.03	3.06 ± 0.05*, **
Serum alkaline phosphatase (KAU)	8.18 ± 0.18	7.88 ± 0.17	8.14 ± 0.13	7.32 ± 0.15
Serum albumin (g/dl)	3.58 ± 0.04	3.50 ± 0.03	3.59 ± 0.03	3.51 ± 0.03
Albumin-corrected calcium (mg/dl)	5.0 ± 0.05	5.0 ± 0.06	4.9 ± 0.03	5.4 ± 0.05*, **
24 h urinary creatinine (mg/dl)	1465 ± 22.3	1502 ± 23.8	1482 ± 22.8	1484 ± 20.1

Values are mean ± SE for 100 patients in each group

* $P < 0.05$ when compared with the corresponding mean value before treatment

** $P < 0.05$ when compared with the after 3 month's mean value of group I

modified Jaffe's reaction [10]. Albumin-corrected calcium was calculated (to obtain a reasonable estimate of the free calcium) according to Payne et al. [11], who suggested that albumin-corrected calcium gives an estimate of the free calcium level when albumin levels are within the normal range. These parameters, including systolic and diastolic blood pressure were determined at the time of the first visit of the patient as well as after 3 months of treatment. Results were statistically analyzed by Student's *t*-test.

Results and Discussion

Results of the present study demonstrate that diastolic blood pressure remained unaltered while systolic blood pressure was significantly decreased after 3 months of Vitamin D supplementation to patients with hypertension receiving antihypertensive treatment when compared with the group without supplementation. Vitamin D supplementation also resulted in an increase in serum calcium, which was found to be significantly higher than the mean value for the control group as well as the value before the start of the supplementation. Mean value for serum phosphorus was found to be significantly reduced (Table 1). Martins et al. [12] have shown that low Vitamin D levels are associated with a higher risk of having hypertension. Pfeifer et al. showed that 800 IU of Vitamin D₃ plus 1200 mg of calcium significantly reduces blood pressure after 8 weeks compared to the group receiving 1200 mg of calcium alone [13]. Vitamin D has also been shown to play a critical role in the regulation of renin-angiotensin system and thus has an influence on the regulation of blood pressure [14, 15]. It has also been demonstrated that calcium regulating hormones and renin-angiotensin system coordinately mediate blood

pressure regulation via altering cellular concentrations of sodium and calcium ions. Thus, it is clear that Vitamin D supplementation has a role in the regulation of blood pressure and that it should be supplemented with the anti-hypertensive drugs to the patients with hypertension.

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