



ORIGINAL RESEARCH PAPER

Biochemistry

ASSOCIATION BETWEEN ESSENTIAL HYPERTENSION AND HYPOVITAMINOSIS D

KEY WORDS: Essential Hypertension, Hypovitaminosis D, Blood pressure

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ABSTRACT

Background: Essential hypertension (EH) results when the balance between vasoconstriction and vasodilatation is shifted in favor of vasoconstriction. This balance is controlled by the interaction of genetic and epigenetic factors. When there is an unstable balance, vitamin D deficiency as an epigenetic factor triggers a shift to the side of vasoconstriction.

Objective: The present study we try to find the association between vitamin D, and Blood pressure in both the study groups.

Materials and methods: The present study was carried out in the Department of Biochemistry on 60 subjects in the age group of 35-70 years, attended OP in Rama Medical College & Hospital, Kanpur. Among them 30 healthy subjects enrolled as control group remaining 30 Essential hypertension (EH) patients were served as case group. Serum 25hydroxyvitamin D levels were estimated by chemiluminescence immunoassay (CLIA).

Results: The concentration of serum 25-OH vitamin D levels were significantly ($p < 0.0001$) lower in cases (22.84 ± 7.2) as compared to the controls (32.57 ± 5.4).

Conclusions: In our present study we conclude that 25 OH vitamin D and age were correlated with EH. And vitamin D supplementation along with regular medication may help in regulating the BP.

INTRODUCTION:

One billion people worldwide suffer from hypertension (HTN) [1]. Of these patients, 95% have hypertension of unknown etiology, called essential hypertension (EH), and cannot maintain normal blood pressure (BP) without daily treatment [2]. Many signaling pathways are involved in BP regulation in EH. These include the angiotensin II -sympathetic nerve-CD4+ T cell system [3], a pathway consisting of a series of genes participating in the control of renal salt handling [4], and pathways mediating constriction and dilation of vascular smooth muscle (VSM) cells [5, 6]. Dysfunction of any one of these pathways leads to increased VSM tone and remodeling in resistance arteries, resulting in high BP.

Vitamin D has traditionally been associated with calcemic activities, namely, calcium and phosphorus homeostasis and bone. However, recent evidence from various lines of research suggested nontraditional roles of vitamin D in human health including cancer, autoimmune, infectious, respiratory, and cardiovascular diseases [7-9]. Vitamin D plays a key role in various steps of BP regulation. For example, Ang II induces HTN through increased central nervous activity-mediated T cell activation and per vascular infiltration [10], and vitamin D has been shown to suppress effectors T cell activity [11]. Thus, vitamin D deficiency may accelerate sympathetic outflow-stimulated T cell response.

Materials and methods:

Present study was conducted on 60 subjects aged between 25-65 years attended OP in Rama medical college, Kanpur, U.P. 30 healthy subjects were serving as control group. While 30 recently diagnosed (below 3 months) hypertensive patients were enrolled as case group.

Exclusion criteria:

- 1) Hypertension > 1 year of duration
- 2) Secondary hypertension
- 3) Diabetes mellitus, congestive heart failure, history of any atherosclerotic disease, urinary tract infection, any intercurrent illness, strenuous exercise and menstruation to

rule out any proteinuria due to other causes. All the subjects were informed and consent letter was taken.

Assessments:

The following data were collected from all patients at study entry: age (years), gender, duration of EH; smoking status, history of hypertension, systolic and diastolic blood pressure (mm Hg), height (cm), and weight (kg). Body mass index (BMI)(kg/m²) was calculated.

Biochemical analysis:

Using aseptic precautions 3 ml of venous blood was collected from antecubital vein in Fasting condition. Samples were centrifuged after 30 minutes; serum was isolated and used for the measurement of 25-OH Vitamin D by CLIA method (by COBAS E411 analyzer).

STATISTICAL ANALYSES:

All the values were expressed as Mean \pm SD. The statistical analysis was done using student 't' test and Pearson's correlations for comparison between two groups and a p-value of <0.05 was considered statistically significant.

Results:

The present study conducted on 60 subjects among them 30 people suffering with Essential hypertension were chosen as control (group-I) and 30 age and sex matched healthy subjects were served as case group (group-II).

Table-1 showing baseline Characteristics with Mean value and S.D

Parameters	Control group (n=30)	Case group (n=30)	P value
Age	37.4 \pm 10.4	49.8 \pm 8.6	0.001
Sex(M/F)	12/18	16/14	N.S
Systolic /Diastolic B.P	120/80	135/90	0.001
25-OH Vitamin D	32.57 \pm 5.4	22.84 \pm 7.2	0.001

Values are mean (SD) or percentages, as appropriate. *pvalue or difference between groups By t-test or chi-square, as a appropriate

Table 1 displays the baseline characters: The Mean age of the study population was (49.8± 8.6) significantly higher (p<0.001) when compared to control group 37.4±10.4.

The mean serum 25-OH Vitamin D levels (ng/mL) in controls was 32.57±5.4 ng/mL and that in cases was 22.84±7.2 ng/mL . Highly significant correlation found between two groups (p<0.0001).

Table -1 also displaying the Mean BP level between the control group (120/80) and study group (135/90). Significant difference found (p<0.001) between two enrolled groups.

Table- 2: Correlation of B.P. With 25-OH Vitamin D and age

Correlation	Case group	P value
B.P with 25-OH Vitamin D	-0.58	<0.001
B.P with Age	0.35	<0.001

Correlation of Serum BP with 25-OH Vitamin D and Age:

In EH patients mean BP levels showed a negative correlation with 25-OH Vitamin D. (r = -0.58) which was statistically highly significant (p<0.001)

Table- 2. BP and Age:

There was significant correlation found between BP and age (r = 0.35)

Discussion:

Essential hypertension (EH) results when the balance between vasoconstriction and vasodilatation is shifted in favor of vasoconstriction. The fact that a higher incidence of EH occurs during the winter, in people living in higher latitudes, and in those with deep skin pigmentation living far from the equator [12] makes it reasonable to speculate that vitamin D deficiency may contribute to increased prevalence of EH. Vitamin D deficiency as an environmental risk factor favors increased vascular tone, which may not play an important role in the regulation of normal BP homeostasis but serves as a trigger to contribute to the development of EH in vulnerable middle-aged people.

The first ever relation between vitamin D and EH was reported by Krause et al [13]. since this finding has raised considerable research interest in the relationship between vitamin D deficiency and EH.

Burgaz et al. [14] conducted a meta-analysis, to evaluate the association between circulating 25 (OH) D levels and HTN. They found an inverse relationship between serum 25 (OH) D concentrations and HTN incidence, and earlier cross-sectional studies [38-45] showed that BP was inversely and significantly correlated with 25(OH) D levels. In our present study, we also found similar results.

Conclusion:

In our present study we conclude that 25 OH vitamin D and age were correlated with EH. And vitamin D supplementation along with regular medication may help in regulating the BP.

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