



STUDY OF SERUM VITAMIN D LEVELS AS A RISK FACTOR IN ESSENTIAL HYPERTENSION

General Medicine

Dr. Aditi Randev PG JR, Muzaffarnagar Medical College & Hospital (U.P)

Dr. Ila Pahwa* Professor & HOD, Muzaffarnagar Medical College & Hospital (U.P) *Corresponding Author

Dr. Anju Mittal Associate Professor, Muzaffarnagar Medical College & Hospital.

ABSTRACT

Introduction: Vitamin D deficiency has historically been related to poor bone production, leading to the development of children's rickets and osteoporosis in adults. New analysis and information has shown that Vitamin D deficiency maybe a risk factor for many chronic diseases like hypertension, diabetes mellitus, dyslipidemia, cardiovascular disease, Tuberculosis and auto immune diseases. The exact etiology and pathogenesis of Essential hypertension is not very well understood, it leads to nonspecific and less effective treatment. The lack of well-controlled high BP may lead to target organ damage. **Aim & Objectives:** To assess risk factor potential of serum Vitamin D using statistical analysis. To study association between serum Vitamin D and hypertension. **Material & Methods:** The study was conducted on patients of (OPD/IPD) of Department of General Medicine, Muzaffarnagar Medical College & Hospital, Muzaffarnagar, U.P for a period of 18 months. The study was conducted on 50 hypertensive cases and 50 age and sex matched controls. **Results:** Prevalence of Vitamin D deficiency in hypertensive patients were 62% (31). Among the non hypertensives 2% (1) had Vitamin D deficiency (P value < 0.001). Among hypertensives, the mean vitamin D level was 18.93 ± 7.90 and among non hypertensives, mean vitamin D level was 29.56 ± 7.26 (P value < 0.005). **Conclusion:** The hypertensive patients had lower levels of vitamin D as compared to controls. Systolic blood pressure and diastolic pressure were found to be inversely correlated to vitamin D levels among cases. In this study, Vitamin D was found to be an independent risk factor that is associated with primary essential hypertension.

KEYWORDS

Serum 25, OH Vitamin D, Essential Hypertension, Hypertension, Vitamin D deficiency

INTRODUCTION

Vitamin D is a steroid molecule and is lipid soluble, mainly produced by the skin and absorbed into the diet from the GIT, that governs the expression of a wide number of genes. Vitamin D deficiency has historically been related to poor bone production, leading to the development of children's rickets and osteoporosis in adults. In recent years, focus has been put on the role of vitamin D in regions outside of the ones identified historically. New analysis and information has shown that Vitamin D deficiency maybe a risk factor for many chronic diseases like some cancers, hypertension, diabetes mellitus, dyslipidemia, cardiovascular disease, Tuberculosis and auto immune diseases.

Worldwide, 1 billion people suffer from hypertension.^[1] Of these, 95% have hypertension of unknown etiology, called essential hypertension, and cannot maintain normal blood pressure without daily treatment.^[2] As the exact etiology and pathogenesis of Essential hypertension is not very well understood, it leads to nonspecific and less effective treatment. The lack of well-controlled high BP may lead to target organ damage.

Thus, Essential Hypertension has become one of the major risk factors for heart attack, stroke, chronic heart failure, and renal failure.^[3]

AIM & OBJECTIVES

- To assess risk factor potential of serum Vitamin D using statistical analysis.
- To study association between serum Vitamin D and hypertension.

MATERIAL & METHODS

The study was conducted on patients attending the out patient department (OPD/IPD) of Department of General Medicine, Muzaffarnagar Medical College & Hospital, Muzaffarnagar, U.P

Study Duration:

April 2021 to September 2022 (18 months). The study was conducted on 50 hypertensive cases and 50 age and sex matched controls.

Inclusion Criteria:

Essential hypertension diagnosed using JNC 7 Classification^[4], Age 18-65 years, Both genders (male & female) included.

Exclusion Criteria:

Secondary hypertension, Cerebrovascular disease, Cardiovascular disease, Diabetes mellitus, Dyslipidemia, Chronic kidney disease, Chronic liver disease, Smoker

Selection of Cases and Controls:

Hypertensive subjects (Cases) were identified as those having systolic blood pressure (SBP) ≥ 140 mmHg and diastolic blood pressure (DBP) ≥ 90 mmHg, or subjects with self-reported hypertension. Incident hypertension was considered a recently developed hypertension with SBP ≥ 140 mmHg and DBP ≥ 90 mmHg at baseline and three consecutive visits or based on the Joint National Committee VII criteria^[4].

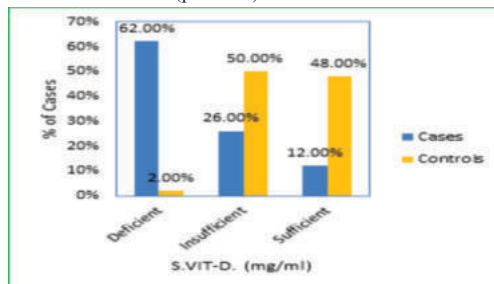
Non hypertensive subjects (Controls) were defined as those with SBP ≤ 120 mmHg and DBP ≤ 80 mmHg at baseline and three consecutive visits without the use of antihypertension medications.

Investigations:

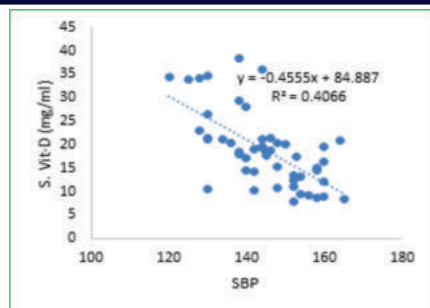
Serum 25 OH Vitamin D level was measured by Vitamin D Quantification Elisa Kit. The following investigations to rule out secondary causes of hypertension were also carried out-CBC, Fasting and post prandial blood glucose, Liver function test, Kidney function test Fasting Lipid profile, ECG

RESULTS

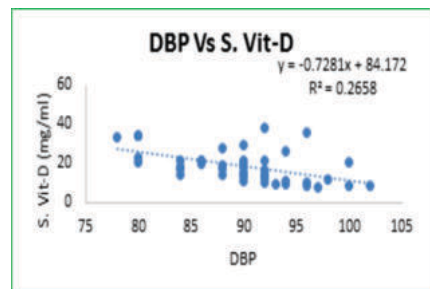
Among total participants (100), 32% had vitamin D deficiency, 38% had vitamin D Insufficiency, and 30% (68) had vitamin D sufficiency. Prevalence of Vitamin D deficiency, vitamin D insufficiency and normal levels of Vitamin D in hypertensive patients were 62% (31), 26% (13) and 12% (6) respectively. Among the non hypertensives 2% (1) had Vitamin D deficiency, 50% (25) had Vitamin D insufficiency and 48% (24) had normal serum Vitamin D levels. (P value < 0.001). Among hypertensives, the mean vitamin D level was 18.93 ± 7.90 and among non hypertensives, mean vitamin D level was 29.56 ± 7.26 (P value < 0.005). Systolic blood pressure increased with lower levels of vitamin D (p < 0.005). Diastolic blood pressure also increased with lower levels of vitamin D (p < 0.005).



Graph 1: Distribution of vitamin D status between cases and controls



Graph 2: Correlation between systolic BP and vitamin D status of cases



Graph 3: Correlation between diastolic BP and vitamin D status of cases

DISCUSSION

In our study, prevalence of Vitamin D deficiency was found to be higher among hypertensives as compared to the non hypertensives. Ahmad et al. showed mean vitamin D levels of 24.1 ± 16.3 ng/mL in cases and 39.8 ± 11.1 ng/mL in controls^[4]. Holick et al. reported vitamin D levels of 26.4 ± 4.9 ng/mL in cases and 36 ± 5 ng/mL in controls^[5]. Priya et al. showed vitamin D levels of 15.15 ± 12.51 ng/mL in cases and 33.59 ± 16.69 ng/mL in controls in their study^[6]. Gowda and Khan showed a mean value of serum vitamin D of 19.9 ng/mL in cases and 32.2 ng/mL in controls^[7].

In this study, we found Vitamin D deficiency in 62% of the hypertensive subjects and in 2% of controls, which is similar to the findings noted by others. This study also shows that, serum 25-hydroxyvitamin D deficiency showed an inverse correlation with hypertension among the cases ($p < 0.0001$); these findings are in line with other studies. Qi et al. noted the same finding in their study (odds: 1.22; 95% CI: 1.01–1.48)^[8]. Forman et al. (odds: 2.67; 95% CI: 1.05–6.79)^[9] also noted similar findings (odds: 1.22; 95% CI: 0.87–1.72). Pittas et al. established that the risk increased by 6.1 times in men and 2.6 times in women^[10].

Several studies have shown possible mechanisms that link vitamin D to hypertension; vitamin D negatively regulates the renin–angiotensin system and is associated with endothelial vasodilator dysfunction^[4]. Vitamin D has shown to mediate activation of the renin–angiotensin–aldosterone system and is linked to hypertension^[11].

This study also shows that among the hypertensives, SBP showed an inverse correlation with Vit D levels ($p < 0.0001$). Kota et al. demonstrated mean systolic blood pressure (SBP) of 162.4 ± 20.2 mm Hg and mean diastolic blood pressure (DBP) of 100.2 ± 11.2 mm Hg. All the three blood pressure parameters [SBP, DBP and mean arterial pressure (MAP)] were found to be significantly higher among individuals with lower 25(OH)D levels.^[12]

This study demonstrated that DBP also showed an inverse correlation with Vit D levels ($p < 0.0001$). Other studies have also demonstrated that vitamin D supplementation can reduce DBP^[6,7]. A study among an Indian population showed 4.5 times higher risk of MI among subjects with vitamin D deficiency^[13]. The need for prevention of hypertension is very relevant as it can potentially reduce the associated cardiac morbidity and mortality.

CONCLUSIONS

The hypertensive patients had lower levels of vitamin D as compared to controls with vitamin D deficiency seen in 62% of the cases and insufficiency in 26% of the cases and normal levels in 12% cases. Non

hypertensive controls showed a normal vitamin D status in 48% controls and insufficiency in 50% of the controls and 2% controls had Vitamin D deficiency.

Systolic blood pressure and diastolic pressure were found to be inversely correlated to vitamin D levels among cases.

In this study, Vitamin D was found to be an independent risk factor that is associated with primary essential hypertension.

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