VITAMIN D STATUS IN HYPERTENSION
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Abstract:
Background: The role of vitamin D in several diseases is becoming clearer and its role in hypertension and cardiovascular disease has been proven and studied in western populations. There are little data on Vitamin D status in hypertensive patients in the Indian context. Hypovitaminosis D is widely prevalent in the Indian populations despite good sunlight exposure, 1,2,6. Its role in other diseases apart from the classic deficiency states are emerging.
Aims and Objectives: a) to assess the vitamin D status in patients with essential hypertension and to compare the vitamin D status, dietary intake of vitamin D, physical activity and sunlight exposure among hypertensive and age and gender matched normotensive controls.
 b) To correlate vitamin D levels with dietary intake, physical activity, BMI and daily sunlight exposure.
Materials and Methods: 55 subjects and 32 controls were studied over a period of nine months from December 2011 to August 2012. Their 25 Hydroxy Vitamin D levels, daily sunlight exposure, dietary intake, physical activity were assessed and subjected to statistical analysis.
Results: The mean 25(OH)D levels for hypertensives were found to be 17.07 ± 9.72 ng/ml while in the normotensive controls were 22 ± 10 ng/ml (p=0.027). Only 20 % of the total population ie cases and controls had sufficient levels above 30 ng/ml. Higher dietary intake ie >200 IU/day were found to have lesser incidence of hypertension.
Conclusions: Vitamin D levels are significantly lower in hypertensive patients. Overall levels are low in the general population also. Adequate dietary intake, physical activity and sunlight exposure are protective.

I. INTRODUCTION
Vitamin D has well established role in calcium and bone metabolism. Laboratory studies demonstrate that physiologically active Vitamin D that is 1,25-dihydroxyvitamin D [1,25(OH)2D] inhibits renin expression in the juxtaglomerular apparatus and blocks proliferation of vascular smooth muscle cells which could influence systemic blood pressure. Vitamin D, called the antiricketic factor or sunshine vitamin was thought to be predominantly obtained from sunlight exposure. The dietary sources are probably quite less in comparison to other vitamins. There has been considerable volume of data regarding the establishment of hypovitaminosis D as an independent risk factor for a range of diseases 1,2,6. The role of hypovitaminosis D in lifestyle diseases has not been well studied in India. Hypovitaminosis D is a well proven risk factor for development of hypertension in western studies 7. There are no studies in this regard conducted on the Indian population. Hence the need for this study.

II. MATERIALS AND METHODS
This was a case control study conducted among 87 subjects from the time period of December 2011 to August 2012. Subjects were patients with essential hypertension alone or with both diabetes and hypertension. Hypertension was diagnosed when the average of 2 or more systolic BP was >140 mm Hg or diastolic BP > 90 mm Hg. Their BMI, Vitamin D in dietary intake and daily physical activity through the Framingham Activity Index were also assessed. 25 Hydroxy Vitamin D levels were assessed by means of electrochemiluminescence technique. Levels of insufficiency were graded by means of Lips classification4. Adequacy of sunlight exposure was assessed by the number of hours spent outdoors. These parameters were compared between these subjects and age and gender matched controls

III. RESULTS
A total of 87 individuals were studied, 44 males and 43 females, 55 were the study population and 32 were age and sex matched controls. 25 (OH) D levels were graded as per Lips classification and the mean levels were compared between the cases and controls and were found to be statistically significant. In addition when the overall levels of 25 (OH) D were assessed in the total population only 20% met the criteria for sufficient
vitamin D levels, that is more than 30 ng/ml. No age specific or gender wise difference in the levels of 25 (OH) D levels were noted.

Dietary vitamin D intake as ascertained from food frequency questionnaire showed low daily intake in all subjects - both cases and controls. With the arbitrary cutoff of 200 IU/day hypertensives had a statistically significant lower intake.

Serum 25 (OH) D levels were also compared with the surrogates of vitamin D namely sun exposure, physical activity and Body Mass Index (BMI). No significant correlation was found between individual dietary intake and corresponding serum 25 (OH) D levels. Physical activity was found to have a statistically significant correlation. Daily hours of sunlight exposure were not found to have significant correlation with the serum 25 (OH) D levels in this study.

On the other hand people with good physical activity measured by the Framingham Physical Activity Index were found to have better dietary vitamin D intake, more hours of sunlight exposure, lower BMI.

**IV. DISCUSSION**

As mentioned earlier the study population was restricted to 87 subjects due to financial constraints. However the cases and controls were carefully chosen so as to match in terms of age and gender distribution (Table 1). Vitamin D levels were graded as per the Lips classification which has to be ideally revised for the Indian population, but is nevertheless been used across other Indian studies as well.

Across the entire study sample only 20% had adequate levels above 30 ng/ml. This finding is keeping in line with other studies done in the Indian subcontinent. This is also quite in contrast to the fact that most Indians receive significant amounts of daily sunlight exposure. This in turn implies that more importance has to be given on the improvement of dietary intake.

<table>
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<th>Table 1: Showing particulars of cases and controls</th>
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<tbody>
<tr>
<td>Age, Range and Mean</td>
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<td>Sex (M:F)</td>
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<td>BMI</td>
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<td>25 (OH) D Levels</td>
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<td>Dietary Intake</td>
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<td>Sun Exposure</td>
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<td>Physical Activity Index</td>
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Levels of 25 (OH) D were significantly lower in hypertensives as compared to their normotensive controls. The mean 25(OH) D levels for hypertensives were found to be 17.07 ± 9.72ng/ml while in the normotensive controls was 22 ± 10 ng/ml. The difference was statistically significant (p value = 0.027). There are no Indian studies regarding the study of vitamin D in hypertension or other cardiovascular diseases. The relation has been proven in studies conducted in the West. The corollary of this is that supplementation with vitamin D may be necessary for the control or prevention of hypertension. Higher dietary intake of vitamin D was associated with better control of hypertension (p value < 0.001). Vitamin D analogs have experimentally proven role in suppression of renin angiotensin axis.

Vitamin D levels were studied across age groups and no significant variation in levels was found. In this study not many geriatric patients were included resulting in a relatively younger age group. The relation of serum vitamin D levels with dietary intake and sunlight exposure were inconclusive in this study but there is a suggestion that dietary intake is the important source for vitamin D and it is less than adequate in majority. The issues here being that vitamin D levels have not been standardized across Indian foods, the dietary intake was assessed by means of a recall questionnaire where recall bias is likely. Sunlight exposure was assessed only by means of a reported questionnaire and no means of cross checking these was available. The final interpretations of significant correlation between physical activity and BMI, physical activity and sun exposure, physical activity and dietary intake are more of a logical inference.

**V. CONCLUSIONS**

Overall the 25 hydroxy vitamin D levels are significantly low in both cases and controls. Vitamin D levels are significantly lower in the hypertensive population as compared to normotensives. Adequate dietary intake of Vitamin D has a lesser chance of developing hypertension. Adequate sunlight exposure and physical activity are protective against hypertension. Physical activity, BMI and hours of sunlight exposure were interrelated.

**References**


