

# A Study On Serum Vitamin D Levels In Acute Ischemic Stroke At Government General Hospital, Vijayawada.

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## **Abstract**

**Background:** stroke has many well-established risk factors like diabetes mellitus, systemic hypertension, dyslipidemia, atrial fibrillation and smoking. Vitamin d is being looked upon as one of the latest risk factors. Our aim is to find out the association between vitamin d and acute ischemic stroke, and the effect of parameters like age, gender, obesity and dyslipidemia on vitamin d levels.

### **Materials and methodology:**

This is a observational study of 100 subjects – 50 patients with acute ischaemic stroke and 50 age and sex matches controls without stroke, studied consecutively at siddhartha medical college hospital, vijayawada during a period from january 2024 to june 2024. Serum 25 hydroxy vitamin d levels were measured along with body mass index, ldl cholesterol, hdl cholesterol, triglycerides and total cholesterol.

### **Results:**

Stroke patients had significant vitamin d deficiency (mean-13.48ng/ml, p value<0.01) when compared to controls (mean 23.03ng/ml). Gender variation and smoking did not affect the vitamin d levels and was found to be significantly lower in cases with age less than 40yrs (p-0.046). Vitamin d levels were not affected body mass index or lipid levels.

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## **I. Introduction**

One of the commonest causes of morbidity and mortality worldwide is cerebrovascular accident, commonly referred to as stroke. Stroke accounts for 1% of mortality among hospital deaths in India, with an incidence of 4% of admissions in medical wards and overall incidence of 20% of all patients admitted with neurologic disorder. The term 'stroke' is applied to a sudden focal neurologic syndrome, mainly the type caused by cerebrovascular disease. This term cerebrovascular disease points towards any abnormality of the brain resulting from a pathologic process of the blood vessels, occlusion of the lumen by embolus or thrombus, vessel rupture, altered permeability of the vessel wall, or hyperviscosity or other change in the quality of the blood flowing through the cerebral vessels.

The prevalence of stroke has rapidly increased in the past few years. Stroke has many well established risk factors like diabetes mellitus, systemic hypertension, dyslipidemia, atrial fibrillation and smoking. Yet, there are a lot of cases where the risk factors are not identified. Hence, a lot of epidemiological studies are being carried out to identify emerging novel risk factors and they continue to be an aspect of debate regarding their role in reducing incidence of stroke and their exact nature of association with stroke. Over the recent years, one such risk factor i.e. Vitamin D Deficiency has been given much emphasis. Vitamin D is a steroid molecule and one of the lipid soluble vitamins. It is mainly produced by the skin from cholesterol and also absorbed from the gut. As knowledge emerges of its biological functions, it is attracting importance from many nutritional and medical communities. In the last few years, its association with decreased risk of many chronic diseases as been the talk of the town.

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Vitamin D deficiency is a worldwide health problem. In addition to its well accepted role as a major regulator of calcium and bone metabolism, many studies have shown strong association of hypovitaminosis D with systemic hypertension, coronary artery disease, diabetes mellitus, heart failure, metabolic syndrome , cancer, peripheral artery disease and many autoimmune disorders.

Few worldwide studies have shown association between Vitamin D deficiency and an increased incidence of Cerebrovascular Accident ( Stroke). Vitamin D deficiency is postulated to cause endothelial dysfunction. This plays a vital role in the pathogenesis of stroke. Following the discovery of the expression of Vitamin D receptors and 1 $\alpha$  hydroxylase in the endothelium of blood vessels, several biological mechanisms that link Vitamin D with stroke and its risk factors have been identified. Vitamin D acts mainly through its role in maintaining gene transcription to prevent cerebrovascular disease and its risk factors.

In spite of the rising proportion of stroke in Asians, only limited data is available on the relationship between Vitamin D and stroke. Since Vitamin D levels are directly measurable and its deficiency can be treated, many trials are being done to assess its association with stroke and to prevent stroke if possible. A practical time to check 25-hydroxy vitamin D levels would be at the time of an acute ischaemic stroke. Hence this study is designed to assess the vitamin D levels in acute ischaemic stroke and to find out any significant correlation.

## **II. Materials And Methodology**

**Place of study:** Siddhartha Medical College Hospital ,Vijayawada.

**Study design:** Observational case - control study.

**Duration of the study:** 6 months.

**Period of study:** January 2024 to June 2024.

**Sample size:** 50 cases and 50 controls ( Age and Sex matched).

### ***Inclusion Criteria:***

1. Patients with new onset stroke with an acute infarct on CT Brain, admitted in Medical Wards in Siddhartha Medical College hospital, within 7days of onset of stroke were taken as cases.
2. Patients without stroke, who attended the Medical OPD were taken as Controls ( Age and sex matched).

### ***Exclusion Criteria:***

Patients with -

1. History of Transient Ischaemic Attacks, prior stroke.
2. Diabetes mellitus.
3. Systemic hypertension.
4. Coronary Artery diseases.
5. Chronic kidney diseases.
6. On drugs that affect Vitamin D metabolism (Anti epileptics, Steroids, Rifampin).
7. Calcium Provitamins supplements.

### ***Statistical Tools:***

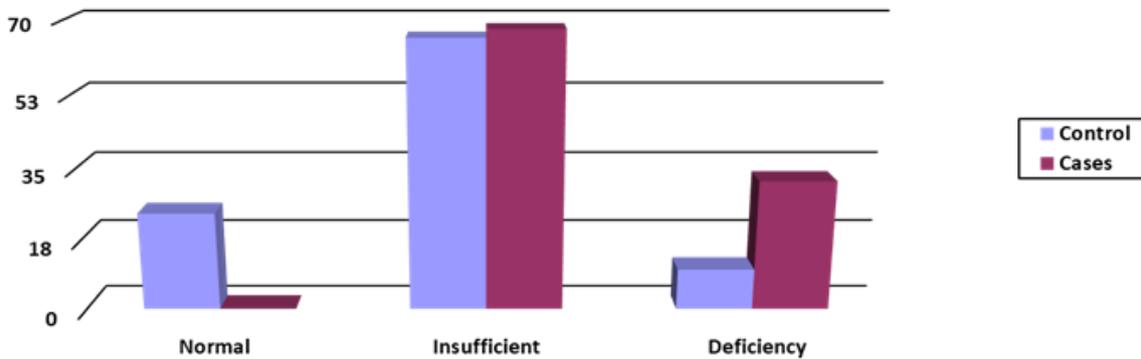
- Data analysis was done with the help of computer using standard SPSS software package ( Statistics Products Services Solutions).
- Using this software range, frequencies, percentages, means, standard deviations, 'T 'test, chi square and 'p' values were calculated.
- Kruskal Wallis chi-square test was used to test the significance of difference between quantitative variables and Yate's test for qualitative variables.
- 'p' value < 0.05 is taken to denote significant relationship.
- 'p 'value <0.01 is taken to denote highly significant relationship.

## **III. Discussion**

### ***Vitamin D Status In The Study Population:***

The difference between cases and controls with respect to Vitamin D is statistically highly significant. This means that significant hypovitaminosis D is seen among the cases. Out of the 89 males included in the study, 11 had normal Vitamin D levels and 78 had below normal levels of Vitamin D. Out of the 11 females included in the study, 1 had normal Vitamin D level and 10 had below normal levels of Vitamin D. No significant difference in Vitamin D levels between males and females.

All the patients who were admitted with acute ischaemic stroke had below normal Vitamin D levels. Vitamin D deficiency (<10ng/ml) was seen in 32% of the cases and 26% of the controls. Among the controls, 10% had Vitamin D deficiency, 66% had Vitamin D insufficiency and only 24% had normal Vitamin D levels. The mean Vitamin D levels among cases and controls was 13.48 and 23.03ng/ml respectively with a statistically significant difference.



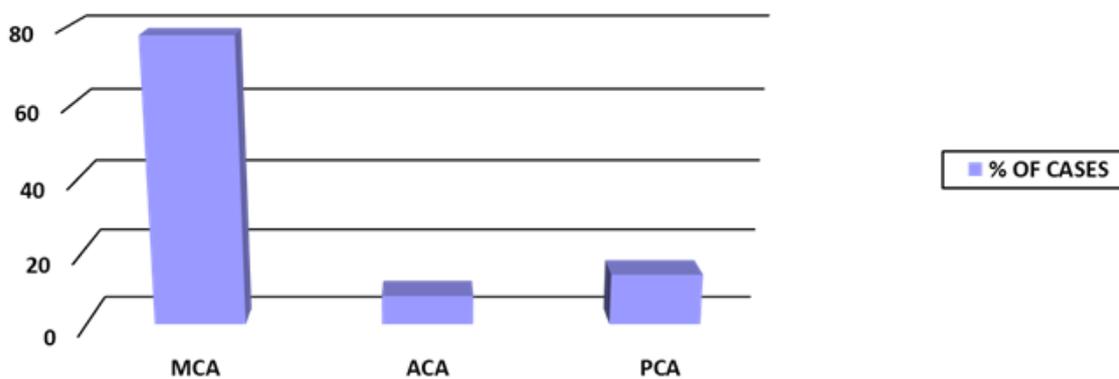
**Correlation Between Vitamin D Status And Territory (Area) Of Infarct:**

Among all the cases, 78% has MCA infarct, 8% has ACA infarct and 14% has PCA infarct. p value – 0.049, therefore there is significant correlation between Vitamin D levels and territory (area) of infarct. Cases with below normal Vitamin D levels have infarcts involving the MCA territory mainly.

On assessing the overall study population of 100 subjects, we found only 12% of the subjects with normal Vitamin D levels. The remaining 88% with below normal Vitamin D levels with 21% ha Vitamin D deficiency and 67% Vitamin D insufficiency. This high rate of Vitamin D deficiency in our study group reflects the high prevalence of Vitamin D deficiency in Indian population.

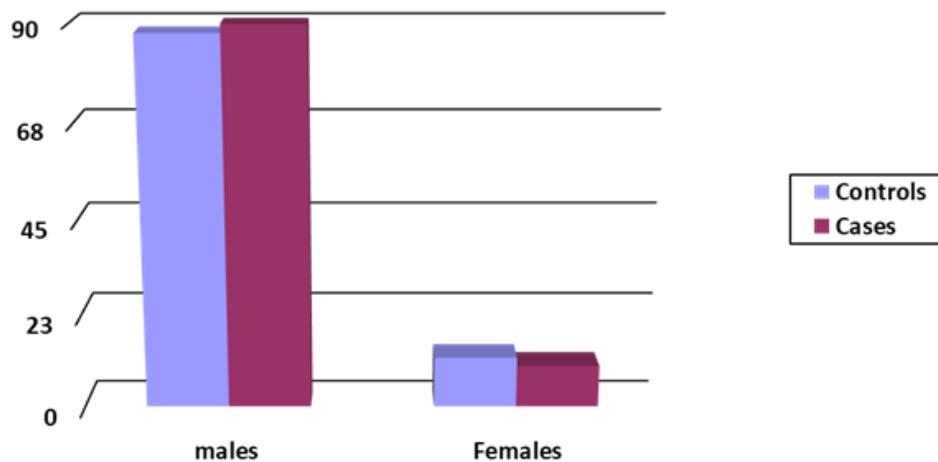
In our study, the association between ischaemic stroke and parameters like Gender, Age, Body Mass Index, Smoking, LDL cholestrol, HDL cholestrol, Total cholestrol, Triglycerides and Area of infarct was also analysed. Apart from Body Mass Index, statistical significance is not found with any other parameter. Hence we can safely exclude most of these confounding factors, which are themselves independent risk factors of stroke.

**Percentage Of Cases**



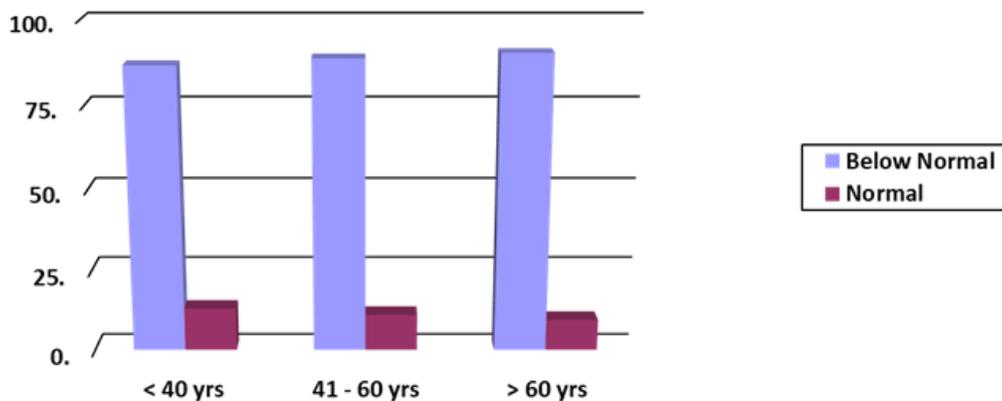
**Vitamin D And Gender Variation:**

We did not find any significant association between Vitamin D levels and gender distribution. Normal Vitamin D levels were found in 12% of males and 9% of females. 88% of males and 91% of females with below normal Vitamin D levels.



**Vitamin D And Age Distribution:**

The study population is divided into 3 age groups (<40yrs, 41-60yrs, >60yrs). Below normal Vitamin D levels are found in the three age groups were 89%, 87% and 90% respectively. There is significant hypovitaminosis D in the young stroke patients (<40yrs of age). This shows Vitamin D deficiency as an independent risk factor for young stroke in the absence of other conventional risk factors.



**Vitamin D And Smoking:**

There is no significant association between Vitamin D and smoking in our study.

**Vitamin D And Obesity:**

Body Mass Index is found to be higher in subjects with below normal Vitamin D levels. Body mass index >25kg/m<sup>2</sup> is seen in approximately 70% of the subjects with Vitamin D deficiency. But high BMI values are not statistically significant. This is not in concurrence with many studies that link high BMI (obesity) to Vitamin D deficiency. Obesity can itself lead to atherosclerosis and cause stroke. Thus, our study shows association between Vitamin D deficiency and stroke, without significant effect of Vitamin D on Body Mass Index.

**Vitamin D And Dyslipidemia:**

We did not find any association between Vitamin D and dyslipidemia (LDL cholesterol, HDL cholesterol, Total cholesterol, Triglycerides).

**IV. Conclusion**

A wide variety of diseases are associated with Vitamin D deficiency. This poses a great burden on the community. Hence, the discovery of the causal association of Vitamin D deficiency in stroke is indeed an important breakthrough.

1. In our study, ischaemic stroke patients had significantly low levels of Vitamin D.
2. There is growing body of evidence suggesting low Vitamin D levels may be a potentially modifiable cerebrovascular risk factor. Our results provide additional evidence to this.
3. These results may have broad public health implications due to the high prevalence of Vitamin D deficiency in our country.
4. Vitamin D deficiency is an easily measurable and correctable risk factor. The treatment is cost effective and safe. Therefore, general awareness needs to be created about this risk factor and guidelines need to be implemented regarding its diagnosis and treatment.
5. Adequate sun exposure and food fortification are simple preventive measures which can bring about a significant reduction in cerebrovascular events and other diseases associated with Vitamin D deficiency.

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