



ROLE OF VITAMIN D AND PTH IN ISCHEMIC STROKE IN NORTH INDIAN POPULATION

Biochemistry

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ABSTRACT

Introduction: Vitamin D deficiency is highly prevalent in India due to lifestyle and environmental factors. This "pandemic" of vitamin D deficiency is of concern because of its association with cardiovascular, musculoskeletal, infectious, autoimmune diseases but the relationship between ischemic stroke and Vitamin D and PTH levels is still not conclusive.

Aims and objectives: We planned a cross sectional case control study to determine the association of vitamin D deficiency with ischemic stroke.

Materials and Methods: In the present study 50 patients were included who were diagnosed with ischemic stroke. The inclusion criteria were: i) Presentation within 7 days of onset of ischemic stroke ii) Prestroke Modified Rankin Score (MRS) < 2 iii) Age \geq 45 years. Patients on vitamin D and calcium supplementation, those with renal and hepatic impairment and those who underwent thrombolysis were excluded. All patients had a CT or MRI brain scan at baseline. A total of 50 age- and gender-matched healthy controls were included.

Results and conclusion: We found that there was no significant difference in levels of $p = 0.15$ and iPTH levels ($p = 0.10$) between cases and controls.

KEYWORDS

INTRODUCTION:

A poor vitamin D status is now considered as a health problem as it affects almost every organ.¹ Severe vitamin D deficiency results in rickets in children and osteomalacia in adults; these effects in the musculoskeletal system are well understood but now accumulating evidence suggests that vitamin D deficiency has pleiotropic effects and it is also associated with cardiovascular, renal, musculoskeletal, malignant, infectious and autoimmune diseases.²⁻⁶ Vitamin D receptor (VDR) is present in vascular smooth muscle cell as well as platelets, cells which play an important role in the development of stroke, that may be a possible mechanism that links vitamin D and stroke.^{7,8} Various studies have been done to show the association of carotid intima-media thickness and Vitamin D levels, however, they are inconsistent. Some studies have shown no association between Vit D and stroke whereas some have reported that low Vit D levels are independently associated with carotid intima-media thickness.⁹⁻¹²

Vit D deficiency generally increases Parathyroid hormone (PTH) levels but study by Anderson et al has shown that elevated PTH levels are common even in healthy people without vit D deficiency.¹³ PTH has well known effects on bone tissue. Elevated PTH levels have been demonstrated to be associated with various cardiovascular conditions such as endothelial dysfunction, vascular stiffness, and calcification coronary microvascular dysfunction, and hypertension.^{14,15}

Increased PTH levels and decreased Vit D levels may increase the risk for stroke but the studies have shown inconsistent results and data is not available for North India so the aim of this study was to investigate the correlation between PTH levels and vit D and stroke in North Indian population.

MATERIAL AND METHODS

This observational prospective study was conducted on 50 patients with first episode of ischemic stroke. The inclusion criteria were: i) Presentation within 7 days of onset of ischemic stroke ii) Prestroke Modified Rankin Score (MRS) < 2 iii) Age \geq 45 years. Patients on vitamin D and calcium supplementation, those with renal and hepatic impairment, endocrinal diseases, steroid therapy, malignancy and bone diseases, brain neoplasm and those who underwent thrombolysis were excluded. All patients had a CT or MRI brain scan at baseline. A total of 50 age- and gender-matched healthy controls were included in the study.

Methodology

Samples for Lipid profile, serum Vit D and PTH were collected taking

universal precautions and stored at -20°C . Samples were analyzed using commercially available ELISA kit.

RESULTS

Table 1: Baseline characteristics of the subjects

	Cases	Controls	p value
Age (years)	46.68 \pm 7.3	47.56 \pm 6.9	0.956
Total cholesterol (mg/dL)	260.04 \pm 11.07	179.133 \pm 6.697	0.000**
Triglyceride (mg/dL)	171.761 \pm 1.80*	115.667 \pm 8.022	0.041*
HDL-Cs (mg/dL)	49.059 \pm 3.49	41.50 \pm 3.126	0.125
LDL-C (mg/dL)	151.635 \pm 8.45**	113.840 \pm 8.467	0.001**
VLDL-C (mg/dL)	34.35 \pm 4.07*	23.133 \pm 2.483	0.041*
TC/HDL ratio	5.132 \pm 0.514	4.643 \pm 0.404	0.281
LDL/HDL ratio	3.439 \pm 0.38	3.035 \pm 0.344	0.232

** p value < 0.001; highly significant as compared to controls

* p value < 0.01; highly significant as compared to controls

Table 2: Vitamin D and PTH levels in cases and controls

	Cases	Controls	p value
Vitamin D level (nmol)	18.72 \pm 22.45	20.49 \pm 24.68	0.15*
Parathormone hormone (i PTH)(ng/l)	62.34 \pm 63.76	65.90 \pm 62.58	0.10*
Serum total Calcium level (mg/dl)	9.30 \pm 1.34	9.17 \pm 1.63	0.74*
Serum phosphorus level (mg/dl)	4.71 \pm 1.09	4.70 \pm 0.85	0.97*

*p value > 0.01; non significant

DISCUSSION

Role of Vitamin D in bone metabolism is well known but recently it has been suggested to have role in various diseases like hypertension, diabetes mellitus and immunological diseases as vitamin D receptor (VDR) is expressed in most human cells. Its role in stroke, one of the major causes of death worldwide is still non-conclusive.

Hyperlipidemia is an acknowledged, yet not fully understood risk factor in stroke patients.¹⁷ In our study we found significantly increased cholesterol, triglyceride, LDL-C levels. Dietary habits of the population under study may have contributory role in increased cholesterol profile. Abnormal cholesterol profile in individual's

especially increased LDL-C levels has been proposed to cause white matter abnormalities.¹⁸ In a study by Xing and colleagues it was demonstrated that increased LDL levels were associated with long-term mortality after stroke.¹⁹

Vitamin D and PTH levels were not significantly different in cases or controls. This is in contrary to study by Celik and colleagues.²⁰ The reduced Vitamin D in both cases and controls maybe the cause of no significant difference. Vitamin D deficiency is quite prevalent in India as per studies complied by Aparna and colleagues.²¹

This was a case control study, further prospective research is required to reach a final conclusion.

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