

ORIGINAL RESEARCH

Assessment of association of ischaemic stroke and serum 25-hydroxyvitamin-D levels

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ABSTRACT

Background: Strokes continue to rank as the second most common cause of death globally and the third most prevalent cause of disability. The present study was conducted to assess the association of ischaemic stroke and serum 25-hydroxyvitamin-D levels. **Materials & Methods:** 128 subjects were divided into 2 groups based on stroke. Group I had stroke and group II had not stroke. Parameters such as body mass index (BMI), marital status, education, and 25(OH)D levels (deficiency: <30 nmol/L, insufficiency: 30–50 nmol/L, normal: 50–125 nmol/L, and adequacy: >125 nmol/L) etc. were recorded. History of presence or absence of drinking, emphysema, chronic bronchitis, hypertension, high cholesterol, and diabetes mellitus was also recorded. **Results:** Group I had 44 males and 20 females and group II had 34 males and 30 females. There were 32 married, 18 unmarried and 14 divorced in group I and 38 married, 20 unmarried and 6 divorced in group II. Education was more than high school in 46 and 48 and less than high school in 18 and 16 patients in group I and II respectively. Chronic bronchitis was positive in 11 and 3 patients in group I and II respectively. Emphysema was positive in 14 and 5 patients in group I and II respectively. Hypertension was positive in 52 and 7 patients in group I and II respectively. Diabetes mellitus was positive in 48 and 6 patients in group I and II respectively. The difference was significant ($P < 0.05$). The mean 25(OH)D nmol/L level was deficient in 10 in group I and 7 in group II, Insufficiency in 10 in group I and 7 in group II, normal in 10 in group I and 7 in group II, and adequate in 10 in group I and 7 in group II patients respectively. **Conclusion:** Serum 25(OH)D deficiency may be associated with an increased risk of stroke.

Keywords: Diabetes mellitus, stroke, vitamin D

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INTRODUCTION

Strokes continue to rank as the second most common cause of death globally and the third most prevalent cause of disability. An estimated 795,000 new or recurrent stroke cases and 130,000 stroke-related fatalities occur in the US annually.¹ In both males and females, the prevalence rises with age. It is projected that 3,400,000 more adults in the US will experience a stroke by 2030, a 20.5% increase from 2012.² Both behavioral and modifiable risk factors such as a sedentary lifestyle, tobacco use, and an unhealthy diet as well as hypertension, hyperglycemia, obesity, hyperlipidemia, and renal dysfunction are linked to stroke.³

Interestingly, it has been discovered that the development of several chronic non-skeletal diseases, such as stroke, cardiovascular disease, cancer, metabolic disorders, autoimmune diseases, and infectious diseases, is linked to vitamin D (25-

hydroxyvitamin D, or 25(OH)D), a hormone that primarily regulates calcium homeostasis.⁴ Nowadays, it is acknowledged that low vitamin D status affects nearly every second person on the planet and is a public health concern. Numerous prospective population-based studies have shown evidence that a low vitamin D status is associated with an increased risk of stroke in the future.⁵

Despite an abundance of sunshine, studies conducted in India have consistently shown that the population's 25(OH) D levels are low across all age groups and locations. When compared to non-Asian groups, Indian epidemiological data also shows that Indians have higher age-standardized prevalence and yearly incidence rates of their first stroke.⁶ The present study was conducted to assess the association of ischaemic stroke and serum 25-hydroxyvitamin-D levels.

MATERIALS & METHODS

The present study was conducted on 128 subjects of both genders. All were informed regarding the study and their written consent was obtained.

Data such as name, age, gender etc. was recorded. All were divided into 2 groups based on stroke. Group I had stroke and group II had not stroke. Parameters such as body mass index (BMI), marital status, education, dietary intake, total cholesterol (TC), glycated hemoglobin (GHb), high-density lipoprotein

(HDL), C-reactive protein (CRP), and 25(OH)D levels (deficiency: <30 nmol/L, insufficiency: 30–50 nmol/L, normal: 50–125 nmol/L, and adequacy: >125 nmol/L) etc. were recorded. History of presence or absence of drinking, emphysema, chronic bronchitis, hypertension, high cholesterol, and diabetes mellitus was also recorded. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Baseline characteristics

Parameters	Variables	Group I	Group II	P value
Gender	Male	44	34	0.82
	Female	20	30	
Marital status	Married	32	38	0.71
	Unmarried	18	20	
	Divorced	14	6	
Education	More than high	46	48	0.01
	Less than high	18	16	
chronic bronchitis	Yes	11	3	0.02
	No	53	61	
emphysema	Yes	14	5	0.04
	No	50	59	
hypertension	Yes	52	7	0.01
	No	12	57	
Diabetes mellitus	Yes	48	6	0.05
	No	16	58	

Table I, graph I shows that group I had 44 males and 20 females and group II had 34 males and 30 females. There were 32 married, 18 unmarried and 14 divorced in group I and 38 married, 20 unmarried and 6 divorced in group II. Education was more than high school in 46 and 48 and less than high school in 18 and 16 patients in group I and II respectively. Chronic

bronchitis was positive in 11 and 3 patients in group I and II respectively. Emphysemawas positive in 14 and 5 patients in group I and II respectively. Hypertensionwas positive in 52 and 7 patients in group I and II respectively. Diabetes mellituswas positive in 48 and 6 patients in group I and II respectively. The difference was significant (P< 0.05).

Graph I Baseline characteristics

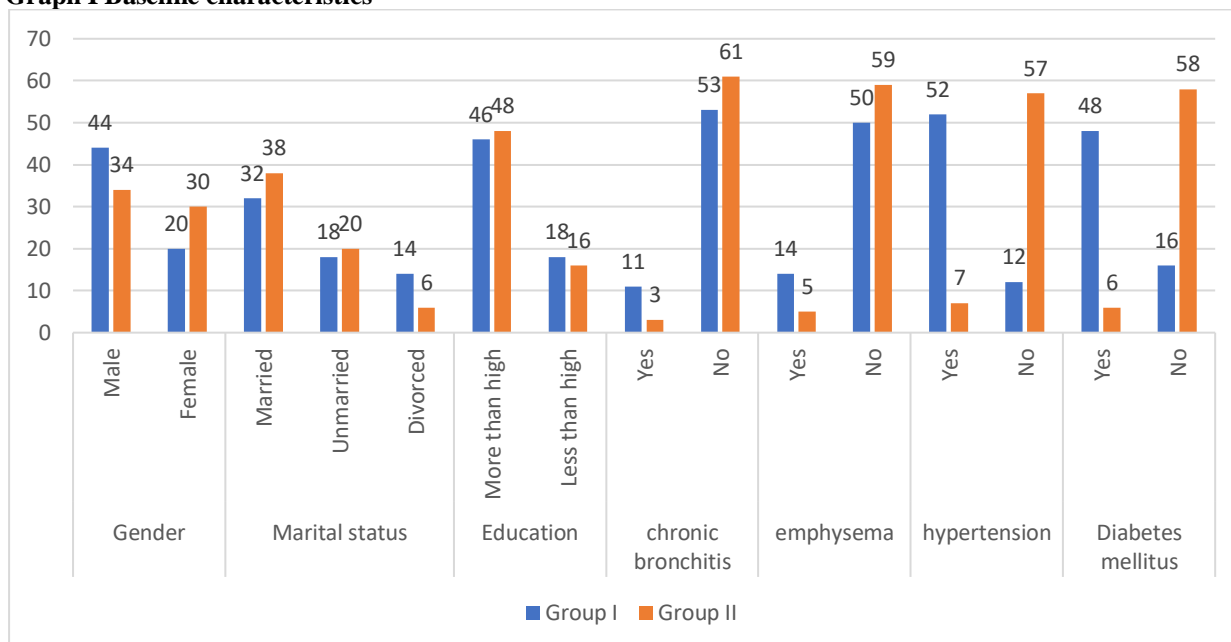


Table II Assessment of 25(OH)D level

25(OH)D level	Group I	Group II	P value
Deficiency (<30)	10	7	0.05
Insufficiency (30-50)	22	21	
Normal (50-125)	25	30	
Adequacy (\geq 125)	7	6	

Table II shows that mean 25(OH)D nmol/L level was deficient in 10 in group I and 7 in group II, Insufficiency in 10 in group I and 7 in group II, normal in 10 in group I and 7 in group II, and adequate in 10 in group I and 7 in group II patients respectively.

DISCUSSION

The association between serum 25-hydroxyvitamin D (25(OH)D) levels and stroke risk has been a subject of growing research interest. Vitamin D, a fat-soluble vitamin obtained from sun exposure, food, and supplements, plays a critical role in calcium metabolism and bone health. Emerging evidence suggests it also has broader health implications, including cardiovascular health and stroke risk.⁷

Vitamin D influences cardiovascular health through several mechanisms. Vitamin D affects the renin-angiotensin-aldosterone system (RAAS), which helps regulate blood pressure.⁸ Deficiency in vitamin D can lead to increased activity of RAAS, contributing to hypertension, a significant risk factor for stroke.⁹ Vitamin D has anti-inflammatory properties, reducing the risk of atherosclerosis and subsequent stroke. Adequate levels of vitamin D promote healthy endothelial function, which is crucial for maintaining vascular health and preventing conditions that can lead to stroke.¹⁰ The present study was conducted to assess the association of ischaemic stroke and serum 25-hydroxyvitamin-D levels.

We found that group I had 44 males and 20 females and group II had 34 males and 30 females. There were 32 married, 18 unmarried and 14 divorced in group I and 38 married, 20 unmarried and 6 divorced in group II. Education was more than high school in 46 and 48 and less than high school in 18 and 16 patients in group I and II respectively. Chronic bronchitis was positive in 11 and 3 patients in group I and II respectively. Emphysema was positive in 14 and 5 patients in group I and II respectively. Hypertension was positive in 52 and 7 patients in group I and II respectively. Diabetes mellitus was positive in 48 and 6 patients in group I and II respectively. Gupta et al¹¹ determined the association of vitamin D deficiency with ischemic stroke and its risk factors. They measured serum 25-hydroxyvitamin D [25(OH) D] and intact parathyroid hormone (iPTH) levels in 73 patients of ischemic stroke, presenting within 7 days of onset of stroke and compared with 70 age and gender matched controls. The mean age of patients and controls was 59.9 ± 11.2 years and 57.9 ± 9.7 years, respectively ($P = 0.26$). Of 67.1% patients were men as compared to 65.7% controls ($P = 0.86$). There was no significant difference in the prevalence of vitamin D deficiency/insufficiency ($P = 0.25$), mean 25(OH) D levels ($P = 0.75$), and iPTH levels ($P = 0.10$) between cases and controls. No association of vitamin

D deficiency/insufficiency was found with the prevalent risk factors in cases of ischemic stroke.

We observed that mean 25(OH)D nmol/L level was deficient in 10 in group I and 7 in group II, Insufficiency in 10 in group I and 7 in group II, normal in 10 in group I and 7 in group II, and adequate in 10 in group I and 7 in group II patients respectively. Wang et al¹² analyzed the association between serum 25-hydroxyvitamin D level (25(OH)D) and stroke risk. Of the 8,523 participants, there were 310 participants with stroke and 8,213 participants without stroke. The multivariate logistic analysis showed that serum 25(OH)D deficiency (odds ratio (OR): 1.993, 95% confidence intervals (CI): 1.141-3.481, and $P = 0.012$) was the significant risk factors for stroke. Subgroup analysis showed that non-Hispanic whites with serum 25(OH)D deficiency (OR: 2.501, 95% CI: 1.094-5.720, and $P = 0.001$) and insufficiency (OR: 1.853, 95% CI: 1.170-2.934, and $P = 0.006$) were associated with a higher risk of stroke than those with normal 25(OH)D levels.

The shortcoming of the study is small sample size.

CONCLUSION

Authors found that Serum 25(OH)D deficiency may be associated with an increased risk of stroke.

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