International Journal of Life Sciences, Biotechnology and Pharma Research Vol. 14, No. 2, February 2025 Online ISSN: 2250-3137
Print ISSN: 2977-0122

DOI: 10.69605/ijlbpr_14.2.2025.106

ORIGINAL RESEARCH

Association of serum 25-hydroxyvitamin-D levels and ischaemic stroke

[1]Dr. Ashutosh Kumar, [2]Dr. Rahul Ranjan, [3]Dr.(Prof) Ashok Kumar, [4]Dr. Swati Hazra, [5]Dr. Manilal Eslavath

[1,2]Senior Resident, [3]Professor, [4,5]Post graduate, Department of General Medicine, Patna Medical College and Hospital, Patna, Bihar, India

Corresponding Author
Dr. Rahul Ranjan
Senior Resident, Department of General Medicine, Patna Medical College and Hospital, Patna, Bihar, India
Email: drsss200584@gmail.com

Received: 15 January, 2025 Accepted: 31 January, 2025 Published: 17 February, 2025

ABSTRACT

Background: Strokes are the third leading cause of disability and the second leading cause of mortality worldwide.The present study was conducted to assess the association of ischaemic stroke and serum 25-hydroxyvitamin-D levels. **Materials & Methods:** 140 subjects of both genderswere divided into 2 groups based on stroke. Group I did while Group II did not have a stroke. A number of parameters were recorded, including 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). Additionally noted was the history of diabetes mellitus, hypertension, high cholesterol, emphysema, chronic bronchitis, and drinking, whether present or not. **Results:** Group I had 45 males and 25 females and group II had 35 males and 35 females. There were 32 married, 20 unmarried and 18 divorced in group I and 46 married, 22 unmarried and 2 divorced in group II. Education was more than high school in 32 and 30 and less than high school in 38 and 40 patients in group I and II respectively. Diabetes mellitus was positive in 52 and 10 patients in group I and II respectively. Emphysema was positive in 45 and 26 patients in group I and II respectively. Hypertension was positive in 57 and 21 patients in group I and II respectively. Chronic bronchitis was positive in 23 and 16 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 14 in group I and 5 in group II, insufficiency in 27 in group I and 16 in group II, normal in 21 in group I and 34 in group II, and adequate in 8 in group I and 15 in group II patients respectively. **Conclusion:** Serum 25(OH)D deficiency may be associated with an increased risk of stroke. Serum 25(OH)D at admission is useful prognostic marker of CVD and all-cause mortality in patients with ischemic stroke.

Keywords: stroke, vitamin D, Education

INTRODUCTION

Strokes are the third leading cause of disability and the second leading cause of mortality worldwide. According to estimates, there are 130,000 stroke-related deaths and 795,000 new or recurrent stroke cases in the US each year.[1] The prevalence increases with age in both males and females. By 2030, 3,400,000 more persons in the US are expected to have a stroke, a 20.5% rise from 2012.[2] Stroke is associated with both modifiable and behavioral risk factors, including sedentary lifestyle, tobacco use, poor food, hypertension, hyperglycemia, obesity, hyperlipidemia, and renal dysfunction.[3,4]

It's interesting to note that vitamin D (25-hydroxyvitamin D, or 25(OH)D), a hormone that primarily regulates calcium homeostasis, has been linked to the development of a number of chronic non-skeletal diseases, including stroke, cardiovascular disease, cancer, metabolic disorders, autoimmune diseases, and infectious diseases.[5] Low vitamin D status is increasingly recognized as a public health risk that impacts almost one in two people worldwide. Low vitamin D status has been linked to an increased risk of stroke in the future, according to a number of prospective population-based studies. Studies in India have repeatedly demonstrated that the population's 25(OH) D levels are low across all age groups and locales, despite the country's abundance of sunshine.[6] Comparing Indian epidemiology statistics to non-Asian groups also revealsthat Indians have higher age-standardized prevalence and yearly incidence rates of their first stroke.[7]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 140 subjects of both genders. All were informed regarding the study and their written consent was obtained.

DOI: 10.69605/ijlbpr_14.2.2025.106

Data such as name, age, gender etc. was recorded. All were divided into 2 groups based on stroke. Group I did while Group II did not have a stroke. A number of parameters were recorded, including 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). Additionally noted was the history of diabetes mellitus, hypertension, high cholesterol, emphysema, chronic bronchitis, and drinking, whether present or not. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Baseline characteristics

Parameters	Variables	Group I (70)	Group II (70)	P value
Gender	Male	45	35	0.92
	Female	25	35	
Marital status	Married	32	46	0.01
	Unmarried	20	22	
	Divorced	18	2	
Education	More than high	32	30	0.05
	Less than high	38	40	
Diabetes mellitus	Yes	52	10	0.03
	No	18	60	
emphysema	Yes	45	26	0.04
	No	25	44	
hypertension	Yes	57	21	0.03
	No	13	49	
chronic bronchitis	Yes	23	16	0.05
	No	47	54	

Table I shows that group I had 45 males and 25 females and group II had 35 males and 35 females. There were 32 married, 20 unmarried and 18 divorced in group I and 46 married, 22 unmarried and 2 divorced in group II. Education was more than high school in 32 and 30 and less than high school in 38 and 40 patients in group I and II respectively. Diabetes mellitus was positive in 52 and 10 patients in group I and II respectively. Emphysema was positive in 45 and 26 patients in group I and II respectively. Hypertension was positive in 57 and 21 patients in group I and II respectively. Chronic bronchitis was positive in 23 and 16 patients in group I and II respectively. The difference was significant (P< 0.05).

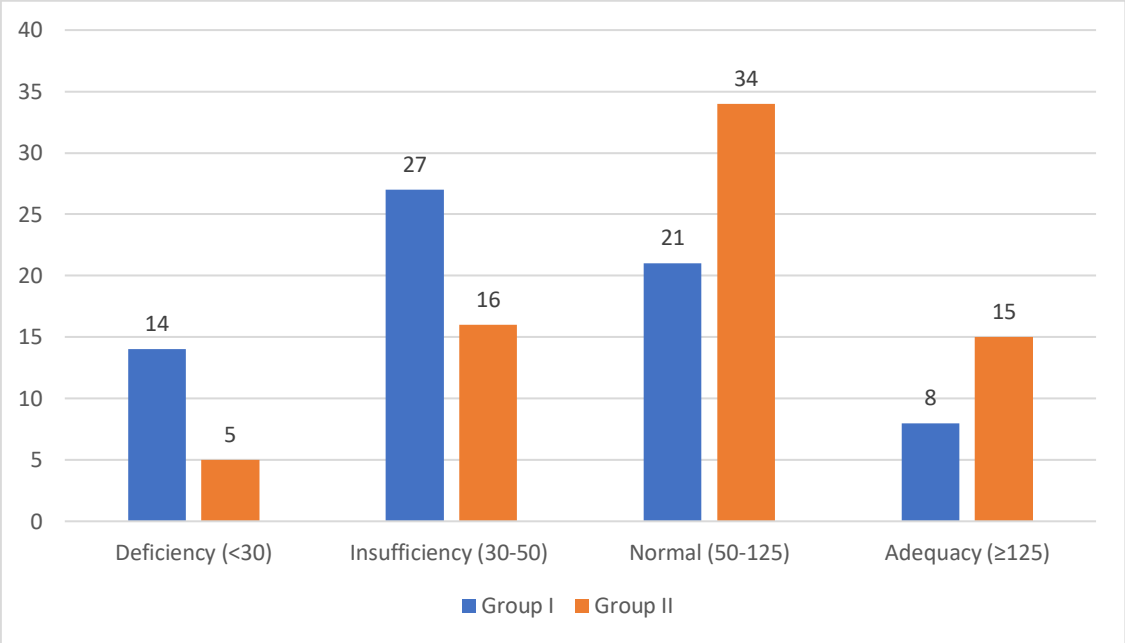
Table II Assessment of 25(OH)D level

25(OH)D level	Group I	Group II	P value
Deficiency (<30)	14	5	0.05
Insufficiency (30-50)	27	16	
Normal (50-125)	21	34	
Adequacy (≥125)	8	15	

Table II, graph I shows that mean 25(OH)D nmol/L level was deficient in 14 in group I and 5 in group II, insufficiency in 27 in group I and 16 in group II, normal in 21 in group I and 34 in group II, and adequate in 8 in group I and 15 in group II patients respectively.

DOI: 10.69605/ijlbpr_14.2.2025.106

Graph I Assessment of 25(OH)D level



DISCUSSION

Research interest in the relationship between blood 25-hydroxyvitamin D (25(OH)D) levels and stroke risk has grown. A fat-soluble vitamin that is acquired from diet, supplements, and sun exposure, vitamin D is essential for bone health and calcium metabolism.[8] According to new research, it may potentially have wider health effects, such as an increased risk of stroke and cardiovascular disease.[9] Vitamin D affects cardiovascular health in a number of ways. The renin-angiotensin-aldosterone system (RAAS), which aids in blood pressure regulation, is impacted by vitamin D. A vitamin D deficiency can raise RAAS activity, which raises the risk of hypertension, a major risk factor for stroke.[10] Because of its anti-inflammatory qualities, vitamin D lowers the risk of atherosclerosis and the stroke that follows. Maintaining vascular health depends on proper endothelium function, which is promoted by adequate vitamin D levels.[11]The present study was conducted to assess the association of ischaemic stroke and serum 25-hydroxyvitamin-D levels.

We found thatgroup I had 45 males and 25 females and group II had 35 males and 35 females. There were 32 married, 20 unmarried and 18 divorced in group I and 46 married, 22 unmarried and 2 divorced in group II. Education was more than high school in 32 and 30 and less than high school in 38 and 40 patients in group I and II respectively. Diabetes mellitus was positive in 52 and 10 patients in group I and II respectively. Emphysema was positive in 45 and 26 patients in group I and II respectively. Hypertension was positive in 57 and 21 patients in group I and II respectively. Chronic bronchitis was positive in 23 and 16 patients in group I and II respectively. Akhtar et al[12]examined the association of serum 25-hydroxyvitamin D deficiency with ischemic stroke. The present study comprised 41 consecutive ischemic stroke patients and 45 age and sex matched controls. Out of forty- one stroke patients, 57.7% were men and mean age was 61.0±10.0 years. 25-hydroxy Vitamin D deficiency was observed in 65% stroke patients and 31% controls (P=0.0026). As NIHSS score increases, mean vitamin D levels decrease. Trend shows that negative association between levels of vitamin D severity of stroke. Statistically significant association was found in type of Infract and vitamin D deficiency status.

We found that mean 25(OH)D nmol/L level was deficient in 14 in group I and 5 in group II, insufficiency in 27 in group I and 16 in group II, normal in 21 in group I and 34 in group II, and adequate in 8 in group I and 15 in group II patients respectively. Nie et al[13] in their study 387 consecutive patients with ischemic stroke were identified. Serum 25(OH) D levels were measured at admission. Infarct volume was measured using diffusion-weighted imaging (DWI). The primary end point was CVD mortality among 1 year. The secondary end point was all-cause mortality.In this study, 387 patients were included. A statistically significant negative correlation between serum 25(OH) D level and infarct volume was found ($r = -0.442$; $P < 0.001$). There were 74 patients (19.1%, 95%CI: 15.2%–23.0%) died, including 36 CVD mortality (9.3%, 95CI%: 6.4%–12.2%). The mortality distribution across the 25(OH) D quartiles ranged between 39.2% (first quartile) to 5.2% (fourth quartile) for all-cause mortality and between 18.6% (first quartile) to 2.1% (fourth quartile) for CVD mortality. In a multivariate model using the first quartiles of 25(OH) D *vs.* quartiles 2 through 4 together with the clinical variables, the marker displayed prognostic information CVD mortality: OR for first quartile, 3.06 [95% CI, 2.16–

DOI: 10.69605/ijlbpr_14.2.2025.106

4.95]; all-cause mortality: OR for first quartile, 2.76 [95% CI, 2.01–4.32].

Gupta et al[14] 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.

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. Serum 25(OH)D at admission is useful prognostic marker of CVD and all-cause mortality in patients with ischemic stroke.

REFERENCES

1. Anderson JL, May HT, Horne BD, Bair TL, Hall NL, Carlquist JF, et al. Intermountain Heart Collaborative (IHC) Study Group. Relation of vitamin D deficiency to cardiovascular risk factors, disease status, and incident events in a general healthcare population. Am J Cardiol2010;106:963-8.
2. Kilkkinen A, Knekt P, Aro A, Rissanen H, Marniemi J, Heliövaara M, et al. Vitamin D status and the risk of cardiovascular disease death. Am J Epidemiol2009;170:1032-9.
3. Buell JS, Dawson-Hughes B, Scott TM, Weiner DE, Dallal GE, Qui WQ, et al. 25-Hydroxyvitamin D, dementia, and cerebrovascular pathology in elders receiving home services. Neurology 2010;74:18-26.
4. Kendrick J, Targher G, Smits G, Chonchol M. 25-Hydroxyvitamin D deficiency is independently associated with cardiovascular disease in the Third National Health and Nutrition Examination Survey. Atherosclerosis 2009;205:255-60.
5. Das SK, Banerjee TK. Stroke: Indian scenario. Circulation 2008;118:2719-24.
6. Alberti KG, Zimmet P, Shaw J. IDF Epidemiology Task Force Consensus Group. The metabolic syndrome: A new worldwide definition. Lancet 2005;366:1059-62.
7. Ramakrishnan S, Bhansali A, Bhadada SK, Sharma R, Walia R, Ravikiran M, et al. Vitamin D status and its seasonal variability in healthy young adults in an Asian Indian urban population. EndocrPract2011;17:185-91.
8. Kojima G, Bell C, Abbott RD, Launer L, Chen R, Motonaga H, et al. Low dietary vitamin D predicts 34-year incident stroke: The Honolulu Heart Program. Stroke 2012;43:2163-7.
9. Sun Q, Pan A, Hu FB, Manson JE, Rexrode KM. 25-Hydroxyvitamin D levels and the risk of stroke: A prospective study and meta-analysis. Stroke 2012;43:1470-7.
10. Drechsler C, Pilz S, Obermayer-Pietsch B, Verduijn M, Tomaschitz A, Krane V, et al. Vitamin D deficiency is associated with sudden cardiac death, combined cardiovascular events, and mortality in haemodialysis patients. Eur Heart J 2010;31:2253-61.
11. Wang L, Li S, Sanika GH, Zhao J, Zhang H, Zhao L, Wang W. Association between serum 25-hydroxyvitamin D level and stroke risk: an analysis based on the National Health and Nutrition Examination Survey. Behavioural neurology. 2021 Oct 29;2021.
12. Asif Akhtar, Mukesh Rana, Sanjeev Kumar Pandey. Study of association of Ischaemic Stroke and serum 25-hydroxyvitamin-D Levels. International Journal of Health and Clinical Research, 2021;4(1):82-86.
13. Nie Z, Ji XC, Wang J, Zhang HX. Serum levels of 25-hydroxyvitamin D predicts infarct volume and mortality in ischemic stroke patients. Journal of Neuroimmunology. 2017 Dec 15;313:41-5.
14. Gupta A, Prabhakar S, Modi M, Bhadada SK, Lal V, Khurana D. Vitamin D status and risk of ischemic stroke in North Indian patients. Indian journal of endocrinology and metabolism. 2014 Sep 1;18(5):721-5.