

Research Article

Frequency of Vitamin D Deficiency in Patients with Stroke

Qamar Rafiq¹, Abdul Moiz Bhatti², M Adnan Iqbal³, Rao Hashim Idrees⁴,
Khalil-ur-Rehman⁵, Sadia Rashid⁶

¹MBBS, FCPS (General Medicine), Assistant Professor Medicine, Gujranwala Medical College, Gujranwala, Pakistan

²MBBS, FCPS (Medicine), Gujranwala Teaching Hospital, Gujranwala, Pakistan

³MBBS, FCPS (Medicine), Assistant Professor General Medicine, KMSMC, Sialkot, Pakistan

⁴MBBS, MRCP (Medicine), Senior Registrar Medicine, Gujranwala Medical College, Gujranwala, Pakistan

⁵MBBS, MCPS (Medicine), MD (Internal Medicine), MPH, Senior Registrar Medicine, Gujranwala Medical College Teaching Hospital, Gujranwala, Pakistan

⁶BDS, MPhil (Physiology), Professor of Physiology, Frontier Medical and Dental College, Abbottabad, Pakistan

Corresponding Author: Dr. Sadia Rashid, BDS, MPhil (Physiology), Professor of Physiology, Frontier Medical and Dental College, Abbottabad, Pakistan. Email: drsadiarizwan@gmail.com

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ABSTRACT

Objective: Vitamin D is an important hormone involved in mineral ion homeostasis regulation. Vitamin D inadequacy has been highlighted in Stroke cases in several previous studies. The aim of present study was to determine the frequency of vitamin D deficiency in the patients with stroke admitted in the Medical and Neurology Departments of Frontier Medical and Dental College, Abbottabad.

Materials and Methods: This was a cross sectional study, conducted at Gujranwala Medical College Teaching Hospital Gujranwala, from July 2025 to December 2025. A total of 200 patients (aged 18-60 years) with stroke were included. Patients' blood serum collected to measure the vitamin D Levels. Data were analyzed using SPSS version 26. Mean and standard deviation were calculated for age. Frequency, percentage and proportion were calculated for qualitative variables like sex and low vitamin D levels.

Results: Out of 200 patients, with mean age of 52.4 ± 10.2 years, 152 (76.0%) patients showed ischemic stroke and 48 (24%) were found with hemorrhagic stroke. Out of these, 106 (53%) were found with Vitamin D deficiency. Deficiency was more common in females (59.1%) than males (48.2%) and prevalence increased with age from 41.7% in 18-40 years to 48.4% in 41-50 years and 62.2% in 51-60 years ($p=0.04$).

Conclusion: Fifty three percent of stroke patients showed features of vitamin D deficiency in our study. Vitamin D deficiency was seen increased with age and higher in patients from 51-60 years of age. Routine screening for vitamin D deficit is recommended in stroke patients.

Keywords: Vitamin D Deficiency; Stroke; Ischemic Stroke; Hemorrhagic Stroke; Pakistan.

INTRODUCTION

Vitamin D is a vital hormone for ion hemostasis in the human body occurs in two forms, Ergocalciferol (D2—plant source) and cholecalciferol (D3—animal source). It is produced by the liver as 25-(OH) vitamin D or calcidiol, the intermediate precursor to the metabolically active 1, 25(OH) vitamin D, also known as calcitriol [1,2]. Apart from calcium hemostasis and bone health, it also have role in immune modulation, insulin secretion, cell proliferation and cell differentiation through inhibition of matrix metallo-proteinases [2,3]. Its deficiency is prevalent globally and recent data from Pakistan confirms a similarly high burden [10]. Its insufficiency in addition to causing rickets, also contributes in the etiology of several chronic diseases like cardiovascular,

stroke, cancer, obesity, asthma, type 1 diabetes and multiple sclerosis [4].

Stroke, a syndrome of rapid onset of focal cerebral deficit of vascular origin lasting for more than 24 hrs, is a leading cause of disability and death worldwide after ischemic heart disease [5]. It has high prevalence in underdeveloped countries compared to developed ones. There is no sizeable community based epidemiological studies in Pakistan to substantiate this assertion, but stroke is considered to be the third most common cause of death and the first leading cause of disability in the developing countries [6]. There are many studies in the world showing the relationship of vitamin D deficiency and stroke. The studies conducted by Rufin et al and Kim et al. determined vitamin D

deficiency in 52.94% and 43% of stroke patients respectively [7,8]. In Pakistan, no study has been conducted so far showing specifically the relationship between vitamin D deficiency and stroke. The purpose of this study was to find out the frequency of Vitamin D deficiency in stroke patients and if established statistically significant, then recommend effective measures to treat vitamin D deficiency in our people and thus contain and lessen the spiralling incidence of stroke.

MATERIAL AND METHODS

This was a cross sectional study, conducted in the Medical Department of Gujranwala Medical College Teaching hospital Gujranwala, over a period of six months from July 2025 to December 2025. It consisted of 200 patients. The sample size was estimated using 95% confidence level with 7% margin of error with an expected deficiency in 52.94% cases to be two hundred cases. Non-probability purposive sampling technique was used.

Male and female patients, 18-60 years of age, presenting with stroke confirmed through CT or MRI Brain were included in the study and Patients with vitamin D malabsorption problems i.e., undergone resection of the small intestine are at risk for this condition; diseases associated with vitamin D malabsorption include celiac sprue, short bowel syndrome, cholestatic liver disease, cystic fibrosis, those with history of taking medication for vitamin D deficiency, having stroke due to space occupying lesions confirmed by CT/MRI Brain, and infections or bleeding diathesis with

confirmation through specific blood tests were excluded.

Two hundred patients with stroke admitted in Medical Department conforming to the inclusion and exclusion criteria were included in the study. The purpose of the study was explained and informed consent of the patients was obtained. Then detailed history, clinical examination, necessary laboratory investigations and CT or MRI Brain and serum sample were taken. The sample was analyzed using Siemens Advia Centaur Immunoassay System IRL 46350440 by the Advanced Diagnostic Centre, Frontier Medical and Dental College Hospital, Abbottabad. All the collected information was entered in a predesigned proforma. Confidentiality and anonymity of patients' records was maintained for the purpose of ethical consideration and secrecy requirements.

Data were analyzed using SPSS version 26. Mean and standard deviation was calculated for quantitative variables like age, sex of patient and vit D deficiency. Frequency, percentage and proportion was calculated for qualitative variables like sex and low vitamin D levels. Effect modifiers like age and type of stroke were addressed through stratification. Chi-square test was applied and $p < 0.05$ was considered significant.

RESULTS

A total of 200 patients were enrolled with mean age of 52.4 ± 10.2 years. Table 1 shows the baseline demographic and clinical characteristics of the study population.

Table 1: Baseline characteristics of stroke patients (N=200)

Variable	Category	Frequency n (%)
Sex	Male	112 (56.0)
	Female	88 (44.0)
Age group (years)	18-40	48 (24.0)
	41-50	62 (31.0)
	51-60	90 (45.0)
Stroke type	Ischemic	152 (76.0)
	Hemorrhagic	48 (24.0)

Vitamin D deficiency ($<20\text{ng/ml}$) was found in 106(53.0%) patients. The mean serum vitamin D level was 18.6 ± 6.4 ng/ml among deficient patients and 31.2 ± 8.1 ng/ml among non-

deficient patients. Table 2 shows the association of vitamin D deficiency with patient characteristics.

Table 2: Association of vitamin D deficiency with patient characteristics (N=200)

Variable	Category	Vitamin D Deficient n (%)	p-value
Sex	Male	54 (48.2)	0.12
	Female	52 (59.1)	
Age group	18-40 years	20 (41.7)	0.04
	41-50 years	30 (48.4)	
	51-60 years	56 (62.2)	
Stroke type	Ischemic	84 (55.3)	0.26
	Hemorrhagic	22 (45.8)	

Vitamin D deficiency was indicated in 53% of stroke patients, more in females (59.1%) than males (48.2%) but the difference not statistically significant at $p=0.12$. An increase in deficiency with age: 41.7% in 18-40 years, 48.4% in 41-50 years, and 62.2% in 51-60 years was seen. The $p=0.04$ for age was statistically significant, whereas Ischemic stroke patients had higher deficiency (55.3%) compared to hemorrhagic stroke (45.8%), but this difference was not statistically significant ($p=0.26$).

DISCUSSION

Vitamin D is a vital hormone for maintaining homeostasis in the human body and its deficiency contributes in the etiology of several chronic diseases like cardiovascular and stroke etc. In this study, we found that 53% of stroke patients had vitamin D deficiency. A study conducted by Rufin S D et al, also determined the frequency of vitamin D deficiency with the cut off value of $<20\text{ng/ml}$ in stroke patients and its results also indicated that 52.94% of stroke patients had vitamin D deficiency [7]. Another study carried out by Kim et al. showed that 43% of stroke patients were vitamin D deficient [8]. Our findings are consistent with the literature of above studies. Also a recent meta-analysis from Pakistan reported a high prevalence of vitamin D deficiency, further supporting the need for routine screening in this population [10].

In our study, deficiency was more common in females (59.1%) compared to males (48.2%) but $p=0.12$ (not statistically significant). This is similar to other studies from Pakistan [10]. The significant increase in deficiency with older age (62.2% in 51-60 years) is consistent with global literature and may reflect reduced skin synthesis, decreased dietary intake, or impaired renal conversion. Ischemic stroke was more common than hemorrhagic stroke (76% vs. 24%), which matches the typical distribution in South Asian populations as reported by Chand et al [6]. Vitamin D may influence stroke risk through several mechanisms including regulation of blood pressure, anti-inflammatory

effects, and suppression of the renin-angiotensin system [2,3,9].

This study had a few limitations. This was a single center study. Causality could not be inferred from a cross sectional design and dietary vitamin D intake or sunlight exposure was not measured.

CONCLUSION

Vitamin D deficiency was found in 53% of stroke patients with significantly higher association with patients of 51-60 years ($p=0.04$). Female patients showed higher deficiency rate (59.1%) compared to males, though this difference was not statistically significant ($p=0.12$). Routine screening for vitamin D deficiency is recommended in stroke patients. Further multicenter studies are recommended.

Ethical approval: The study was conducted in accordance with the Declaration of Helsinki. And ethical approval was obtained from the Institutional Review Board (IRB) (Ref No.: FMDC/IRB/2025/042).

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