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Prevalence of hypoalbuminemia and clinical characteristics of patients in acute ischaemic stroke

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Abstract

Introduction: Stroke is a major and growing global health burden, with 11.9 million new cases annually, requiring urgent intervention. Common risk factors include hypertension, diabetes, dyslipidemia, metabolic syndrome, smoking, and alcohol use. Serum albumin, reflecting nutritional and inflammatory status, has been linked to stroke risk and outcomes. This study assessed the prevalence of hypoalbuminemia and its associated risk factors in acute ischemic stroke patients at a tertiary care hospital in Nepal.

Method: This hospital-based descriptive cross-sectional study was done among 65 patients diagnosed with stroke. Data collection was carried out with a detailed proforma of the participants, including demographic characteristics, and serum albumin level and analysed using SPSS version 28.0 (free).

Result: The study included 65 patients with acute ischemic stroke, with a mean age of 67 years. Stroke was most prevalent among individuals aged 60 years and above. A slight majority of the patients were female 34 (52.3%). Hypertension was the most common comorbidity, affecting 42 (64.6%) patients. Other major risk factors included smoking in 27 (41.5%), obesity in 16 (24.6%), and diabetes mellitus in 14 (21.5%) patients. Hypoalbuminemia was present in 35 (53.8%) patients. Of the total study population, 30 (46.2%) had normal serum albumin levels, 28 (43.1%) had mildly reduced serum albumin levels (2.5–3.49 g/dL), and 7 (10.8%) had severely reduced serum albumin levels (<2.5 g/dL).

Conclusion: Study identified the average age for stroke patients in this setting as 67, with hypertension, diabetes, and smoking being key risk factors and the prevalence of hypoalbuminemia was 53.84%.

Keywords: Hypoalbuminemia; Ischemic Stroke; Prevalence; Risk factors; Serum albumin

INTRODUCTION

World Health Organization (WHO) defines stroke as a rapidly developing clinical sign of focal and/ or global disturbance of cerebral function, with symptoms remaining for 24 hours or more or even leading to death, with no apparent cause other than of vascular origin.¹ The main cause of cerebral under perfusion is blockage of supplying vessels by any pathology which may be intrinsic to the blood vessels as atherosclerosis, lipohyalinosis, inflammation, amyloid deposition, developmental malformation, aneurysm and dissection, or venous thrombosis, embolus arising in the heart or large vessels and systemic hypoperfusion.²

According to the Global Burden of Diseases, Injuries, and Risk Factors, in 2021, there were 11.9 million incident cases of stroke, 93.8 million prevalent cases of stroke, 160.5 million disability-associated life years due to stroke, and 7.3 million deaths from stroke. It is the third most common cause of mortality worldwide accounting for 10.7% of deaths.^{3,4}

Albumin, the most abundant plasma protein, has been found to be involved in mediating systemic inflammation and oxidant activities, inhibiting platelet aggregation and neuroprotection besides other well-known functions.^{5,6,7,8,9} The role of albumin in predicting severity and outcomes of stroke has been demonstrated in many articles which stresses the need for monitoring albumin level in stroke patients.^{10,11}

Studies have shown the prevalence of hypoalbuminemia defined as serum albumin level <35 g/l up to 45.5% of acute ischemic stroke patients.¹² It is also associated with increased risk of stroke, severity and poor outcome.¹³

This study could find the prevalence of serum albumin on acute ischemic stroke patients and risk factors of stroke in our setup which may warrant screening for hypoalbuminemia and its correction strategy as an important step in stroke management. The main aim of the study is to find the prevalence hypoalbuminemia and clinicodemographic profiles of acute ischemic stroke in patients admitted in a tertiary care center.

METHOD

A descriptive cross-sectional study was conducted at Bir Hospital after obtaining ethical approval from the Institutional Review Committee (IRC No. IM210). Non-pregnant patients aged ≥18 years presenting with acute ischemic stroke were enrolled using a convenience sampling technique after obtaining written informed consent. Acute ischemic stroke was diagnosed based on the presence of acute neurological deficits with corresponding hypodense lesions on non-contrast computed tomography (CT) of the head. Patients with acute renal failure, chronic liver disease, heart failure, head injury, previous stroke, or other conditions known to affect serum albumin levels were excluded. Hypoalbuminemia was defined as a serum albumin level of <35 g/L (3.5 g/dL).

The sample size was calculated using the formula $n = Z^2P(1-P)/d^2$, assuming a prevalence of hypoalbuminemia among patients with ischemic stroke of 18.8%, as reported by Nair et al., a 95% confidence level ($Z = 1.96$), and a precision of 12%, yielding a minimum sample size of 59. After allowing for a 10% non-response rate, the final sample size was 65 participants.

Data were collected using a structured proforma and entered into Microsoft Excel before being analysed using IBM SPSS Statistics version 28. Continuous variables were summarized using mean ± standard deviation or median with interquartile range, as appropriate, whereas categorical variables were presented as frequencies and percentages. The prevalence of hypoalbuminemia was reported with a 95% confidence interval. The sample size was calculated based on the estimated prevalence of hypoalbuminemia among patients with acute ischemic stroke. Analyses examining the association between hypoalbuminemia and selected clinical characteristics were secondary exploratory analyses conducted using the same dataset and were not specifically powered to detect these associations.

RESULT

Out of 65 participants, the majority were aged 60 years and above, although patients aged 18–44 years were also represented. There were 34 (52.3%) female and 31 (47.7%) male participants. The prevalence of hypoalbuminemia was 35/65 (53.8%; 95% CI: 41.7%–66.0%). Male patients had a significantly higher prevalence of hypoalbuminemia than female patients (21/31, 67.7% vs. 14/34, 41.2%; Fisher's exact test, $p = 0.032$). Among participants aged 60 years and above, the proportions of patients with low and normal serum albumin levels were comparable, whereas hypoalbuminemia was more frequent than normal serum albumin levels among those younger than 60 years.

Table 1. Prevalence of hypoalbuminemia in patients with acute ischemic stroke according to different variables (n=65)

Characteristics		Serum Albumin		Value	p-value
		≤3.5	>3.5		
Age	low 60	13	9	0.368	0.544
	60 and above	22	21		
Gender	Male	21	10	4.605	0.032 (0.046)*
	Female	14	20		
Past Medical History of Stroke	Yes	4	2	0.054	0.817**
	No	31	28		
HTN	Yes	25	17	1.54	0.215
	No	10	13		
DM	Yes	6	8	0.867	0.352
	No	29	22		
Smoking	Yes	17	10	1.545	0.214
	No	18	20		
Alcohol	Yes	7	5	0.119	0.73
	No	28	25		
Obesity (BMI ≥27.5)	Yes	11	5	1.897	0.168
	No	24	25		

Significance level 5%; **1**= Calculated using a two-sided Fisher's exact test; **bold values** indicate statistical significance at $p < 0.05$; **2** = using continuity correction, Value= chi square value

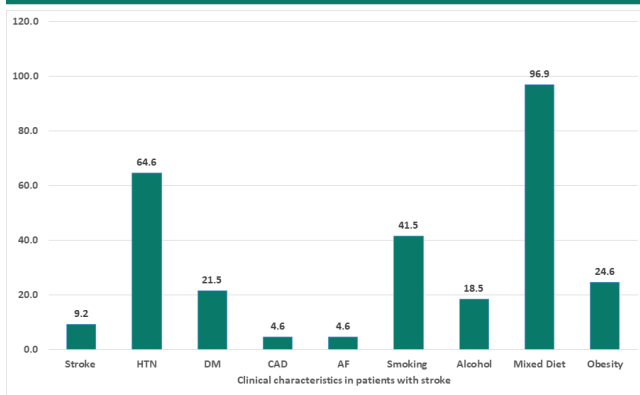


Figure 1. Clinical characteristics in patients with stroke

Hypertension was the most common comorbidity, followed by smoking, obesity, diabetes mellitus, alcohol consumption, and previous stroke. Most participants reported a mixed dietary pattern (Table 1).

DISCUSSION

A total of 65 patients were enrolled in the study, including 34 females and 31 males, resulting in a male-to-female ratio of 1:1.09. Stroke was more prevalent among participants aged 60 years and older. The mean age of patients presenting with stroke was 67 years, similar to other studies conducted in a tertiary hospital in Nepal. In a study conducted by Amit Thapa et al. at Kathmandu Medical College Teaching Hospital, the average age at presentation was 64.6 ± 16.3 years ($p = 0.000$), which was similar to our study.¹⁴ In the study by Munvar Miya Sheikh et al in 2012 in Nepal, the average age of stroke in Nepal was between 59 and 62 years of age 15. In a study by Shrestha S et al in Chitwan, the mean age of the patients was similar to ours, 67.5 years.¹⁵

In our study, hypertension was the most common risk factor present in 64% of patients, followed by Diabetes in 21.5% of cases, history of stroke present in 9.2%, CAD in 4.6 % of cases and AF in 4.6% of cases. Among other risk factors, smoking was most commonly seen in 41.5% of cases. 24.6% of patients had BMI $>30 \text{ kg/m}^2$ which makes obesity an important risk factor of stroke. Alcohol intake was another very important risk factor for stroke, seen in 18.5% of stroke patients. The risk factors present in our study population were similar as shown by several other studies in our setup. In a retrospective cross-sectional study by Rijal S. et al from 1st August 2018 to 30th July 2019, among 170 stroke patients, the most frequent risk factor, hypertension, was observed in 64 (37.1%) individuals, followed by no known risk factors in 25.3%. Smoking accounted for 11.2%, diabetes mellitus for 12.4%, and prior stroke for 4.1% of the risk factors.¹⁶ In a study by Amit Thapa et al, 39.2% of patients reported drinking alcohol. 34.1% had dyslipidemia. 35.6% were current smokers and 4.9% were ex-smokers.¹⁴ In a study by Yang Si et al in 2020 with the patient of age group 18-50, among 343 patients, the prevalence of risk factors like smoking, diabetes and hypertension were 49.0, 24.8 and 36.2% respectively.¹⁷ In a cross-sectional study conducted by Sumnima A. et al in Lumbini Medical College,

Palpa, in 2016, 59% of cases had hypertension.¹⁸ In a study by Acharya RR et al conducted in Nepal, among 50 patients, the most common risk factor was HTN accounting for 50% of cases.¹⁹ In a study by Shrestha S. et al 62.5% of the patients had hypertension, and 59% of them smoked cigarettes.²⁰ All of these findings were similar to our study.

The Prevalence of hypoalbuminemia in our study population was 53.84% (95%CI 41.74% to 65.96%). The prevalence varies across the studies. In a study by R Nair et al in India among acute ischemic stroke cases patients was 18.8%, the threshold for hypoalbuminemia in their study was 4g/dl.¹⁰ However, in a study conducted in India among 196 patients by Aman H et al, the prevalence of hypoalbuminemia was 45.9% and in a Polish study by Dziedic T. et al it was 45.5%, similar to our study.^{12,21} Serum albumin level has also been linked to outcome of stroke in several studies. In a study by Shaikh F et al, among the cases expired within 7 days of stroke, 81.8% had hypoalbuminemia.²² In a study done in Egypt, though the prevalence of hypoalbuminemia was 26.7%, among the patient who expired 100% had hypoalbuminemia.²³ In a study by Abubakar et al among 75 acute ischemic stroke patients, average serum albumin (3.03 g/dL) in patients with favorable outcome was 3.03 g/dl, that of the patients with poor outcome was 2.08 g/dL and that of the patients who died was (1.66 g/dl ($p=0.0001$)).²⁴ The reason of high prevalence of hypoalbuminemia could be socio nutritional factors; preexisting protein energy malnutrition and dietary pattern comprising of predominantly carbohydrate meal; other chronic comorbidities causing hypoalbuminemia, and the abrupt onset of stroke causing acute stress to the body.^{10,12,21}

This study has several limitations. First, the sample size was calculated to estimate the prevalence of hypoalbuminemia rather than to detect associations between hypoalbuminemia and clinical characteristics. Consequently, the analyses examining these associations were secondary post hoc exploratory analyses using the same dataset and may have been underpowered to detect statistically significant relationships. It was conducted at a single tertiary care hospital using a hospital-based sample, which may limit the generalizability of the findings and may have resulted in a higher proportion of patients with hypoalbuminemia and established vascular risk factors than would be expected in the general population. Second, the relatively small sample size may have limited the statistical power to detect significant associations between serum albumin levels and some clinical characteristics. Third, critically ill patients with severe ischemic stroke were excluded, which may have underestimated the prevalence and severity of hypoalbuminemia among the overall stroke population. Finally, the cross-sectional design precludes establishing a temporal or causal relationship between hypoalbuminemia and acute ischemic stroke, and multicenter prospective studies with larger sample sizes are needed to validate these findings and further explore the

prognostic role of serum albumin in acute ischemic stroke.

CONCLUSION

The prevalence of hypoalbuminemia was 53.84% among the stroke patients. A higher proportion of male patients had hypoalbuminemia than female patients. Hypertension was the most common comorbidity, followed by smoking, obesity, diabetes mellitus, alcohol consumption, and previous stroke. Further studies with a larger sample size and prospective descriptive studies are advised to strengthen and clarify whether routine albumin screening may prevent and/or improve the outcome of acute ischemic stroke.

DECLARATIONS

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Conflict of Interests

None

Funding

Self

Ethical clearance

Ethical clearance was obtained from Institutional Review committee of National Academy of Health Sciences, BIR hospital on 24th November 2021(Ref: IM210).

Consent

Written informed consent was taken from the participants

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