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ORIGINAL ARTICLE

Frequency of hypoalbuminemia in acute ischemic stroke patients presenting at Ayub teaching hospital Abbottabad

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ABSTRACT

Background: Stroke is a condition with several contributing variables. Variations in blood albumin levels can have a significant impact on the severity, course, and outcome of the disease. The study's objective is to determine the prevalence of hypoalbuminemia in patients who arrive at Ayub Teaching Hospital, Abbottabad with acute ischemic stroke.

Methods: This Descriptive, cross-sectional study was conducted by Department of Medicine, Ayub Teaching Hospital, Abbottabad from January 2024 to June 2024. All patients who experienced an ischemic stroke between the ages of 30 and 70 were included, regardless of gender. Patients with a history of nephrotic syndrome, transient ischemic stroke, decompensated liver disease, protein-losing enteropathy, or other chronic conditions including severe heart failure were excluded. 165 patients were selected via non-probability sequential sampling. The informed consent of each patient was sought. Serum albumin levels were determined. Hypoalbuminemia is regarded as positive if the serum albumin level is less than 35 g/l.

Results: Mean age was 56.85 ± 11.95 years. Of the 165 patients, 72 (43.64%) were female and 93 (56.36%) were male. The average BMI was 27.60 ± 3.02 kg/m2. 60.0% had hypertension, and 62.42% had diabetes. In this study 64 patients with acute ischemic stroke (38.79%) were found to have hypoalbuminemia.

Conclusion: In light of these results, serum albumin may be a useful biomarker for acute ischemic stroke patient's risk classification.

Keywords: Albumin levels, Hypoalbuminemia, Ischemic stroke

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Introduction

Stroke has been shown to be the third leading cause of death in developed nations. Large artery atherosclerosis, small vessel disease, cardioembolic stroke, other known causes, and unknown etiologies are among the causes of ischemic stroke that are categorized based on acute stroke treatment trials (1,2). Typically, paramedics, insurance representatives, and patient attendants seek doctors to forecast the patient's post-stroke prognosis (3). Age, stroke severity, stroke mechanism, infarction site, comorbid diseases, and

other associated sequelae are some of the factors that affect the prognosis of stroke (4).

Stroke is a condition with several contributing variables. Hypoalbuminemia is one of these characteristics (4). Variations in blood albumin levels can have a significant impact on the severity, course, and outcome of the disease (5). Numerous studies have reported a correlation between the severity of a stroke and hypoalbuminemia (6). A normal blood albumin level can lower the risk of in-hospital mortality in addition to being linked to favorable outcomes (7). Similarly, a low serum albumin level can predict hospital mortality, infections, and other complications in stroke patients, as well as recurrent stroke (5,7). Furthermore, a poor prognosis for intra-cerebral hemorrhage has also been linked to low blood albumin levels. Additionally, hypoalbuminemia in stroke patients exacerbates the severity of ischemic stroke (8). Serum albumin is a negative acute-phase protein that is associated with chronic inflammatory disorders and malnutrition. Its concentration falls during sepsis and tissue damage (9). Up to 19% of stroke patients are reported to have albumin insufficiency, which is frequently observed in hospitalized patients (8).

The study's objective is to determine the prevalence of hypoalbuminemia in patients who arrive at Ayub Teaching Hospital in Abbottabad with acute ischemic stroke. Thus, this study will give us the most recent and accurate measurement of hypoalbuminemia in our population's individuals who present with acute ischemic stroke. Additionally, the findings of this study may help with timely care of high-risk patients and early serum albumin level screening for stroke patients.

Methods

The Department of Medicine of Ayub Teaching Hospital Abbottabad, conducted this descriptive cross-sectional study between January 2024 to June 2024. After being approved by the institutional ethical review committee via letter no RC-EA-2023/135, 165 patients were selected via non-probability sequential sampling. The informed consent of each patient was sought. Sample size is calculated on the WHO sample size calculator by keeping 30% (10) frequency of hypoalbuminemia in acute ischemic stroke, 95% confidence interval and absolute precision 7%. The total sample size was 165 patients. All patients, male or female, between the ages of 30 and 70 who had an ischemic stroke (a focal or global neurological deficit of cerebrovascular origin) and who had sudden onset weakness, aphasia, ataxia, nystagmus, dysphagia, vertigo, or any of these symptoms that lasted longer than 24 hours and were confirmed by a brain CT scan that revealed an ischemic area of hypodensity within the brain parenchyma were included. Excluded were patients with a history of transient ischemic attack, hemorrhagic stroke, decompensated liver disease, nephrotic syndrome, protein-losing enteropathy and other chronic illnesses such as advanced heart failure.

Every patient who was included underwent a thorough history, clinical examination, and radiological evaluation. A proforma was used to collect demographic information such as age, gender, BMI, residence, occupation, socioeconomic status, smoking status, diabetes, hypertension, and obesity. All included patients received tourniquets

above the chosen puncture site after the blood sample technique was explained. After sterilizing the chosen area with an alcohol pad or another antiseptic, three to five centiliters of blood were extracted using a sterile, disposable syringe and placed in blood collection tubes to be forwarded to the hospital lab for measurement of serum albumin levels. Serum albumin level less than 35 g/l,was considered positive for hypoalbunemia. Strict adherence to the exclusion criteria prevented bias in the study's findings.

SPSS 27 was used to analyze all of the data. The mean ± SD was used to express continuous data, such as age and BMI. Frequencies and percentages were used for gender, DM, HTN, smoking, obesity, and hypoalbuminemia. To observe the impact of modifiers, hypoalbuminemia was stratified by age, gender, diabetes, hypertension, smoking status, and obesity. The post-stratification chi square test was used, and a P value of less than 0.05 was deemed significant.

Results

Mean age was 56.85 ± 11.95 years. According to figure I, the majority of the 165 patients (64.24%) were between the ages of 51 and 70 years. Out of 165 patients, 93 (56.36%) were men and 72 (43.64%) were women. A mean BMI of 27.60 ± 3.02 kg/m2 was recorded. Table I displays the patient distribution based on confounding variables. Diabetes was found in 62.42% and 60.0% were hypertensive.

In our study, frequency of hypoalbuminemia was found in 64 (38.79%) acute ischemic stroke patients (Figure II). Stratification of hypoalbuminemia with respect to confounding variables showed no significant difference.

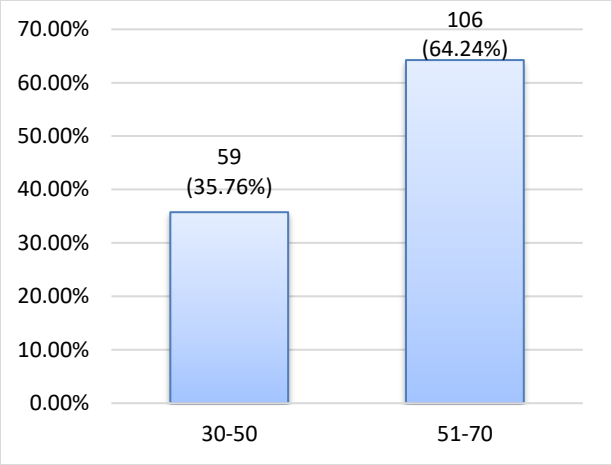

Figure I: Age distribution (n=165).

Table I: Distribution of different variables (n=165)

Variables		Frequency	%
Gender	Male	93	56.36
	Female	72	43.64
BMI (kg/m²)	≤25	42	25.45
	25.1-30	86	52.12
	>30	37	22.42
DM	Yes	103	62.42
	No	62	37.58
HTN	Yes	99	60.0
	No	66	40.0
Smoking	Yes	46	27.88
	No	119	72.12
Occupation	Office	66	40.0
	Field	55	33.33
	Others	44	26.67
Place of living	Rural	62	37.58
	Urban	103	62.42
Socioeconomic status	Poor	39	23.64
	Middle	60	36.36
	Upper	66	40.0

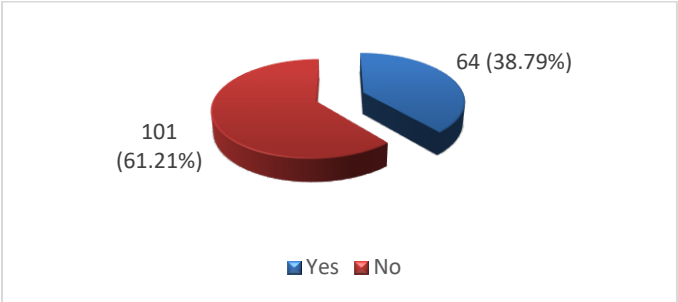

Figure II: Frequency of hypoalbuminemia in acute ischemic stroke patients (n=165).

Table II: Stratification of hypoalbuminemia with respect to confounding variables.

Variables		Yes (n=64)	No (n=101)	Chi square	P-value
Age (years)	30-50	18 (30.51%)	41 (69.49%)	**2.65**	**0.103**
	51-70	46 (43.40%)	60 (56.60%)		
Gender	Male	35 (37.63%)	58 (62.37%)	**0.119**	**0.729**
	Female	29 (40.28%)	43 (59.72%)		
BMI (kg/m²)	≤25	12 (28.57%)	30 (71.43%)	**3.61**	**0.164**
	25.1-30	39 (35.35%)	47 (64.65%)		
	>30	13 (35.14%)	24 (64.86%)		
DM	Yes	39 (37.86%)	64 (62.14%)	**0.098**	**0.753**
	No	25 (40.32%)	37 (59.68%)		
HTN	Yes	42 (42.42%)	57 (57.58%)	**1.38**	**0.240**
	No	22 (33.33%)	44 (66.67%)		
Smoking	Yes	11 (23.91%)	35 (76.09%)	**5.94**	**0.015**
	No	53 (44.54%)	66 (55.46%)		
Occupation	Office	27 (40.91%)	39 (59.09%)	**0.568**	**0.753**
	Field	22 (40.0%)	33 (60.0%)		
	Others	15 (34.09%)	29 (65.91%)		
Place of living	Rural	28 (45.16%)	34 (54.84%)	**1.69**	**0.192**
	Urban	36 (34.95%)	67 (65.05%)		
Socioeconomic status	Poor	13 (33.33%)	26 (66.67%)	**3.62**	**0.164**
	Middle	29 (48.33%)	31 (51.67%)		
	Upper	22 (33.33%)	44 (66.67%)		

Discussion

Millions of people are still killed and crippled by strokes every year, despite all the innovative diagnostics and therapies that doctors can now do. In low- and middle-income nations, where resources are frequently limited, the issue is most severe.

Our study showed that the mean age of stroke patients was significantly higher (56.85 ± 11.95 years). This result is in line with earlier research showing a correlation between greater stroke severity and advanced age (11). Compared to younger people, people over 60 had a greater prevalence of moderate to severe stroke (54.9%), which may indicate that aging-related vascular alterations, increased arterial stiffness, and a larger load of comorbidities all contribute to worse stroke severity (12). Similar trends have been noted in earlier studies. For example, a meta-analysis by Thuemmler et al (13) found that age-related endothelial dysfunction and decreased neuroplasticity increased the probability of poor outcomes for older stroke patients. Higher levels of systemic inflammation and compromised cerebrovascular autoregulation may also contribute to the relationship between older age and increased stroke severity, resulting in larger infarct expansion

and neurological damage (14). Almost 38.79% of the stroke patients in our cohort had low albumin levels, which is consistent with previous research by Haq and colleagues that found hypoalbuminemia to occur in 30% of stroke cases (10). According to a different study, stroke patients who recovered well had values of 3.08 0.61 gm/dl, whereas those who performed badly had somewhat higher readings of 2.02 0.67 gm/dl (15). Low serum levels may alert physicians to the possibility of a new stroke or the difficulty of treating an existing one because albumin levels decrease during stress (16). Hypoalbuminemia patients experience more infections and greater symptoms. People who have an ischemic stroke frequently have hypoalbuminemia, or low albumin in the blood, which physicians frequently associate with worse outcomes over time (17).

According to one study, 45.9% of acute ischemic stroke patients had hypoalbuminemia (9). Every stroke victim who passed away in Egyptian research had hypoalbuminemia. However, only 7.5% of patients who were discharged from the hospital still had low albumin levels, whereas 92.5% had normal albumin levels (18). This demonstrates a direct correlation between serum albumin and the short-term outcomes of stroke patients. Abubakar et al. examined 75 patients with ischemic strokes and discovered that those with a better prognosis had an average albumin level of 3.03 g/dL, but those with a worse prognosis only had an average of 2.08 g/dL ($p<0.001$) (15).

According to a study by Shaikh et al (19), stroke patients frequently had hypoalbuminemia, which was substantially associated with higher NIHSS scores. Similarly, stroke patients with low albumin levels had severe neurological sequelae, according to Thuemmler et al. (13) Low-normal albumin levels (<37 g/dl) 37 g/L) increased the risk of both in-hospital and long-term death. Because hypoalbuminemia is linked to inflammation, endothelial dysfunction, and poor cerebral perfusion, it is thought to increase the severity of stroke (20). Furthermore, it was shown by Wang et al (21) that low serum albumin levels were substantially linked to a higher risk of ischemic stroke, especially in patients who were neither diabetic or hypertensive. Hypoalbuminemic people have reduced albumin's neuroprotective qualities, including as its anti-inflammatory and antioxidant actions, which can enhance the severity of stroke and ischemic injury (8). The distribution of stroke in men and women differed significantly, according to our research. This result is consistent with a Framingham Heart Study report by Yon CW et al (22), which indicated that gender had no discernible impact on the prognosis or severity of stroke. But according to some research, women typically experience worse functional results after a stroke because of things like being older when the stroke occurs and having different pre-existing comorbidities (22) Interestingly, our study found no significant correlation between stroke and typical vascular risk factors, such as smoking, alcohol use, hypertension, and diabetes mellitus (all p-values > 0.05). This stands in contrast to a number of earlier research that found these parameters to be significant determinants of stroke outcome (23,24). The small sample size (n = 165) and the potential influence of other unmeasured characteristics, like medication use and stroke subtype, may be the reasons for our study's lack of significant relationships. Prior studies have demonstrated that, even in the absence of conventional vascular risk factors, low albumin levels are linked to a worse

prognosis and a more severe stroke (25,26). Therefore, although if risk factors like diabetes and hypertension are known to increase the incidence of stroke, other factors like inflammation and nutritional status may also have a mediating effect on the severity and prognosis of stroke.

Study Limitations

It is important to recognize the various limitations of the current study. First, because this was a single-center study, the results might not apply to larger groups with different socioeconomic and demographic backgrounds. Furthermore, dynamic variations in albumin throughout time were not evaluated, despite the fact that blood albumin levels were recorded at admission. This could have yielded more profound insights into the role of albumin in the course and recovery of stroke. Additionally, the study did not take into consideration possible confounders that can affect albumin levels and stroke outcomes, such as dietary status, inflammatory indicators, and chronic comorbidities.

Conclusion

In light of these results, serum albumin may be a useful biomarker for acute ischemic stroke patients' risk classification. Targeted treatments, including albumin supplementation, nutritional assistance, and inflammation management, may enhance patient outcomes.

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Conflict of Interest: Nil

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Data acquisition, analysis and interpretation	AUH, MH, NH, AU
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All the authors agree to take responsibility for every facet of the work, making sure that any concerns about its integrity or veracity are thoroughly examined and addressed.	