

# 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  $56.85 \pm 11.95$  years. Of the 165 patients, 72 (43.64%) were female and 93 (56.36%) were male. The average BMI was  $27.60 \pm 3.02$  kg/m<sup>2</sup>. 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

**This article may be cited as:** Haq ZU, Jahangiri AUR, Hamza M, Hussain N, Ullah A, Shah Q. Frequency of hypoalbuminemia in acute ischemic stroke patients presenting at Ayub teaching hospital Abbottabad. Int J Pathol 23(4):297-304. <https://doi.org/10.59736/IJP.23.04.997>

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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 hypoalbuminemia. 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  $\pm$  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  $56.85 \pm 11.95$  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  $27.60 \pm 3.02$  kg/m<sup>2</sup> 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.

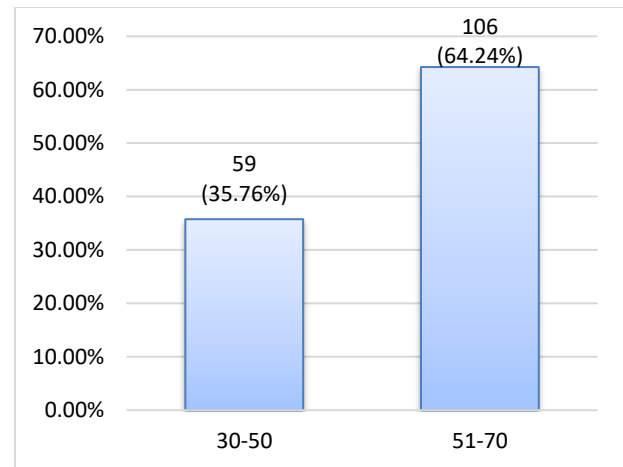


Figure I: Age distribution (n=165).

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

Variables		Frequency	%
Gender	Male	93	56.36
	Female	72	43.64
BMI (kg/m <sup>2</sup> )	$\leq 25$	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

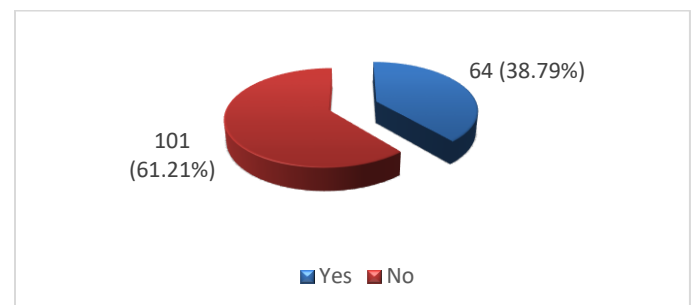


Figure II: Frequency of hypoalbuminemia in acute ischemic stroke patients (n=165).

**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/m <sup>2</sup> )	≤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 ( $56.85 \pm 11.95$  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.

**Funding Sources:** Nil

**Conflict of Interest:** Nil

### References

1. Li J, Imano H, Yamagishi K, Cui R, Muraki I, Umesawa M et al. Serum albumin and risks of stroke and its sub types the circulatory risk in communities' study (CIRCS). *Circulation J.* 2021 Mar; 85(4): 385-92. doi: 10.1253/circj. CJ-20-0384.
2. Bender M, Haferkorn K, Tajmiri-Gondai S, Stein M, Uhl E. Serum urea-to-albumin ratio is an independent predictor of Intra-hospital Mortality in Neurosurgical Intensive Care Unit patients with spontaneous intracerebral hemorrhage. *J Clin Med.* 2023 May 18; 12(10): 3538. doi: 10.3390/ jcm 12103538.
3. Bucci T, Pastori D, Pignatelli P, Ntaios G, Abdul-Rahim AH, Violi F et al. Albumin levels and risk of early cardiovascular complications after ischemic stroke: a propensity-matched analysis of a global federated health network. *Stroke.* 2024 Mar; 55(3):604-12. doi: 10.1161/STROKEAHA.123.044248.
4. Abraham A, Burrows S, Abraham NJ, Mandal B. Modified frailty index and hypoalbuminemia as predictors of adverse outcomes in older adults presenting to acute general surgical unit. *Revista espanola de geriatric y gerontologia.* 2020;55(2):70-5. doi: 10.1016/j.regg.2019.09.005.
5. Gao J, Zhao Y, Du M, Guo H, Wan T, Wu M, et al. Serum albumin levels and clinical outcomes among ischemic stroke patients treated with endovascular thrombectomy. *Neuropsychiatric Dise Treatment.* 2021; 17:401. doi: 10.2147/NDT.S293771.
6. Aman H, Zakir H, Naz B, Khokar A, Manzoor W, Haque NU. Frequency of hypoalbuminemia in acute ischemic stroke patients presenting at tertiary care Hospital, Karachi. *Pak J Health Sci.* 2025;6(6):154-8. <https://doi.org/10.54393/pjhs.v6i6.2967>
7. Aboud HN, Mohammed HA, Kamil MM, HassanB. TheSignificanceofhypoalbuminea mia and hypoproteinemia in patients with stroke. *Neuroscience and Medicine.* 2018;9(3):105-15.DOI: 10.4236/nm.2018.93011.

8. Zhou H, Wang A, Meng X, Lin J, Jiang Y, Jing J, et al. Low serum albumin levels predict poor outcome in patients with acute ischaemic stroke or transient ischaemic attack. *Stroke Vasc Neurol*. 2021 Feb 25;6(3):458–66. doi: 10.1136/svn-2020-000676.
9. Ronit A, Kirkegaard-Klitbo DM, Dohlmann TL, Lundgren J, Sabin CA, Phillips AN et al. Plasma albumin and incident cardiovascular disease: results from the CGPS and an updated meta-analysis. *Arteriosclerosis, Thrombosis, Vascular Biol*. 2020;40(2): 473-82.doi:10.1161/ATVBAHA.119.313681.
10. Haq EH, Qayyum A, Qayyum HA, Anam M, Khan AR, Ahmed K et al. Frequency of hypoalbuminemia in acute ischemic stroke patients based on stroke severity. *Pak J Med Health Sci*. 2021;15(6):1335-39. DOI: <https://doi.org/10.53350/pjmhs211561335>
11. Simmons CA, Poupore N, Nathaniel TI. Age Stratification and Stroke Severity in the Telestroke Network. *J Clin Med*. 2023;12(4):1519. doi: 10.3390/jcm12041519.
12. Fantin F, Giani A, Trentin M, Rossi AP, Zoico E, Mazzali G, et al. the correlation of arterial stiffness parameters with aging and comorbidity burden. *J Clin Med*. 2022;11(19):5761. doi: 10.3390/jcm11195761.
13. Thuemmler RJ, Pana TA, Carter B, Mahmood R, Bettencourt-Silva JH, Metcalf AK, et al. Serum Albumin and Post-Stroke Outcomes: Analysis of UK Regional Registry Data, Systematic Review, and Meta-Analysis. *Nutrients*. 2024;16(10):1486. doi: 10.3390/nu16101486.
14. Yousufuddin M, Young N. Aging and ischemic stroke. *Aging (Albany NY)*. 2019;11(9):2542-4. doi: 10.18632/aging.101931
15. Abubakar S, Sabir A, Ndakotsu M, Imam M, Tasiu M. Low admission serum albumin as prognostic determinant of 30-day case fatality and adverse functional outcome following acute ischemic stroke. *Pan Afr Med J*. 2013May;14(1). doi: 10.11604/pamj.2013.14.53.1941.
16. Zhang Q, Lei YX, Wang Q, Jin YP, Fu RL, Geng HH et al. Serum albumin level is associated with the recurrence of acute ischemic stroke. *Am J Emergency Med*. 2016;34(9):1812-6. doi:10.1016/j.ajem.2016.06.049.
17. James R, Antony J, Sreedhar S, Mathew R, Surendran A. Study of serum albumin as a predictor of short-term functional outcome in acute ischaemic stroke. *J Evo Med Dental Sci*. 2017;6(36):2957-62.doi:10.14260/Jemds/2017/637.
18. Elbaih AH, Elshaboury IM, Ahmed RM, Abd Allah MA. Validity and prognostic value of serum albumin level in emergency acute ischemic stroke egyptian patients. *Med*. 2018;7(4): 736-44.doi:10.5455/medscience.2018.07.8844.
19. Shaikh F, Shaikh FH, Chandio SA. Frequency of hypoalbuminemia and in-hospital mortality in acute ischemic stroke patients presenting at a tertiary care hospital, hyderabad. *Cureus*. 2021;13(4): e14256. doi: 10.7759/cureus.14256.
20. Violi F, Novella A, Pignatelli P, Castellani V, Tettamanti M, Mannucci PM, et al. Low serum albumin is associated with mortality and arterial and venous ischemic events in acutely ill medical patients. Results of a retrospective observational study. *Thrombosis Research*. 2023; 225:1-10. doi: 10.1016/j.thromres.2023.02.013.
21. Wang Y, Zhuang Y, Huang H, Ke J, Lin S, Chen F. Association of serum albumin levels and stroke risk in adults over 40 years: Apopulationbasedstudy. *Medicine(B*

- altimore).2023;102(36):e34848.doi:10.1097/MD.00000000000034848
22. Yoon CW, Bushnell CD. Stroke in Women: A Review Focused on Epidemiology, Risk Factors, and Outcomes. *J Stroke*. 2023;25(1):2-15. doi: 10.5853/jos.2022.03468
  23. Alharbi AS, Alhayan MS, Alnami SK, Traad RS, Aldawsari MA, Alharbi SA et al. Epidemiology and risk factors of stroke. *Archiv Pharma Prac*. 2019; 10(4): 60-6. doi: 10.51847/pMfN3Q005M.
  24. Mendelson SJ and Prabhakaran S. Diagnosis and management of transient ischemic attack and acute ischemic stroke: a review. *J Am Med Assoc*. 2021;325(11): 1088-98.doi: 10.1001/jama.2020.26867.
  25. Powers WJ. Acute Ischemic Stroke. *New England J Med*. 2020;383(3): 252-60.doi: 10.1056/NEJMc1917030.
  26. EkkertA, Šliachtenko A, Grigaitė J, Burnytė B, Utkus A, Jatužis D. Ischemic stroke genetics: what is new and how to apply it in clinical practice? *Genes*. 2021;13(1):48. doi: 10.3390/genes13010048.

#### HISTORY

Date received:	10-09-2025
Date sent for review:	16.09.2025
Date received reviewer's comments:	30-09-2025
Date received revised manuscript:	04-10-2025
Date accepted:	20-10-2025

#### CONTRIBUTION OF AUTHORS

AUTHOR	CONTRIBUTION
Conception/Design	AUH, AUR
Data acquisition, analysis and interpretation	AUH, MH, NH, AU
Manuscript writing and approval	AUR, MH, AU, QS
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.	