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Frequency of Hypoalbuminemia in Acute Ischemic Stroke Patients Presenting at Tertiary Care Hospital, Karachi

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ABSTRACT

Stroke is regarded as the second most commonly reported death worldwide. The effect of albumin is mainly in the early reperfusion phase of acute ischemic stroke. **Objective:** To determine the frequency of hypoalbuminemia in patients with acute ischemic stroke. **Methods:** This cross-sectional observational study was carried out for six months (from April 2024 to October 2024) at the Department of Medicine, Al-Tibri Medical College, Karachi. 196 patients newly diagnosed with stroke patients presented within 24 hours were included, while patients with renal impairment, liver disease, etc., were excluded. SPSS version 24.0 was used for data analysis. Demographical data were reported with post-stratification chi-square applied, keeping p-value<0.05 as statistically significant. **Results:** A total of 196 patients with acute ischemic stroke were included in this study. The mean age in our study was 44.14 ± 4.49 years. 146(74.5%) were male and 50(25.5%) were female. Out of 196 acute ischemic stroke patients, 90 (45.9%) and 106(54.1%) had and did not have hypoalbuminemia. **Conclusions:** It was concluded that a significant frequency of hypoalbuminemia was observed among patients presenting with acute ischemic stroke. However, association with stroke severity could not be established. Therefore, patients presenting with ischemic stroke ought to be screened for serum albumin levels when presenting to the hospital. In addition, patients with low serum albumin levels must be considered high risk and should be managed accordingly.

INTRODUCTION

Stroke, the second most common cause of mortality, is regarded as a critical health problem, having high prevalence with worsening health outcomes [1]. Around 16.9 million people globally report experiencing a stroke at least once in their lives. The frequency of ischemic stroke is higher in underdeveloped and developing countries than in developed countries [2]. Over 85% of strokes are of the ischemic variety. The incidence of ischemic stroke is ever-increasing [3]. Severity and prevalence of stroke have become a burden to the already compromised healthcare system [4]. Stroke is a multi-factorial disease including biological, non-modifiable, genetic, modifiable, and environmental factors [5]. Low albumin in the blood, or hypoalbuminemia, is emerging as a serious stroke risk factor. Even a small change in albumin levels can worsen a patient's course, make symptoms stronger, and affect eventual recovery [6]. Several studies link low albumin directly with poorer stroke outcomes. When albumin stays within the normal range, patients tend to progress faster and face lower in-hospital death rates [7]. In contrast, weak albumin levels point to a higher chance of having another stroke, catching infections, dying during the hospital stay, and facing other related problems [8]. Furthermore, low albumin levels in blood tend to have poor prognostic value in intracerebral hemorrhages [9]. In stroke patients, hypoalbuminemia worsens the ischemic stroke [10]. In one of the studies, including 112 patients with ischemic stroke, the aim was to find an association between

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hypoalbuminemia and in-hospital outcome. It was reported that 87.7% of patients who died during hospital stay were found to have hypoalbuminemia. In addition, the association between ischemic stroke and hypoalbuminemia was substantially higher in non-survivors (p-0.001) [11]. With regards to local data, the frequency of hypoalbuminemia in ischemic stroke patients was reported to be around 42% and 41.6% in research done in KPK and Lahore [12, 13]. Nonetheless, no local research has quantitatively reported and assessed hypoalbuminemia and its association with stroke severity. In another study, the frequency of hypoalbuminemia was reported to be around 43.84 %. Survival was recorded in approximately 32.5% of patients, while 75.8% of patients who did not survive were found to have hypoalbuminemia [14]. The elevated serum albumin levels are related to haemoconcentration, and a reduction in its levels is associated with chronic inflammatory diseases, malnutrition, etc., that represent negative acute phase proteins [15]. Another study reported that around 19% of stroke patients who are hospitalized report hypoalbuminemia [16]. Although numerous studies have explored the clinical outcomes and risk factors associated with acute ischemic stroke, there is limited research specifically examining the frequency and implications of hypoalbuminemia in this patient population. Most existing literature focuses broadly on the prognostic role of serum albumin levels without offering targeted, region-specific data or addressing variations across different healthcare settings.

Furthermore, while hypoalbuminemia is known to influence recovery and mortality rates, its exact prevalence and contributory mechanisms in acute ischemic stroke patients remain under-reported and poorly understood. This gap highlights the need for focused investigations to better define the frequency of hypoalbuminemia in stroke patients and its potential impact on clinical outcomes, enabling more effective management strategies.This study aims to determine the frequency of hypoalbuminemia in patients with acute ischemic stroke.

METHODS

This cross-sectional observational study using non-probability consecutive sampling was carried out at the Department of Medicine, Al-Tibri Medical College (IRB No. ATMC/IERC/13th/01-2023/11) for a period of six months (from April 2024 to October 2024). The sample size for the study was calculated using the WHO software for sample size calculation. Keeping prevalence of hypoalbuminemia at 43.84 % as reported in a study, with 95 % confidence level and margin of error = 7%, the sample size came out to be 196 [14]. Therefore, after ethical approval from the Institutional Review Committee, 196 ischemic stroke patients were included in the study. Newly diagnosed stroke patients of either gender and between 30-60 years of age, presenting within 24 hours, confirmed through CT-scan showing hypodense area were included in the research while patients with malnutrition, SLE, psychological condition, post-traumatic stress, significant hyponatremia (Na <130 meq), central nervous system disease (multiple sclerosis or head trauma), impaired renal function, chronic liver disease and chronic obstructive pulmonary disease as well as patients that did not consent for the study were excluded. Patients above 60 years were excluded to minimize confounding factors that are more prevalent in older populations, such as multiple comorbidities (e.g., chronic kidney disease, malignancies, chronic infections) and age-related physiological changes that independently affect serum albumin levels. Including these patients could obscure the relationship between hypoalbuminemia and acute ischemic stroke by introducing additional variables that influence albumin metabolism. The focus on a relatively younger cohort allows for a clearer assessment of hypoalbuminemia's frequency and its direct association with stroke, without the complexities associated with advanced age-related systemic conditions. After ethical approval, data collection was initiated. Before data collection, informed consent was sought from each patient. A self-designed questionnaire was used for collecting baseline demographical data, patients' history, and examination and laboratory findings. A CT scan was done by a minimum of five years of experience. Scans showing a hypodense area were labeled as ischemic stroke and included in the study. For the blood sample, 5 ml of blood was drawn from the peripheral vein using aseptic technique and a 10 cc disposable syringe. Serum albumin was measured using the blood sample. Patients having serum albumin <3.5 mg/dl were labeled as hypoalbuminemic [17]. Demographics included age, gender, BMI, hypertension, diabetic status, anemia, dyslipidemia, smoking status, socio-economic status, and history of ischemic heart disease. Data were analyzed using SPSS version 24.0. For numbers, the study reported averages and standard deviations; for categories, we simply showed counts and percentages. To see if low albumin levels and ischemic stroke were linked, research ran a chi-square test was run, and p-values under 0.05 were considered meaningful.

RESULTS

196 patients with ischemic stroke were included in the study from the Department of Medicine of the hospital. The minimum age of included patients was 38, while the maximum was 58, with a mean of 44.14 ± 4.49 years. 146 (74.5%) patients were male, while 50 (25.5%) were female. Other variables and their values have been recorded (Table 1).

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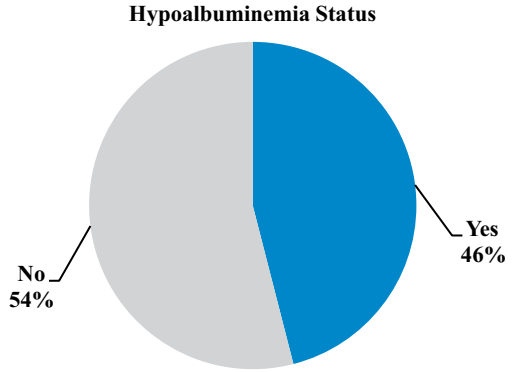
Table 1: Baseline Demographics of Patients Included in the Study (n=196)

Variables	Mean ± SD
Age (Years)	44.14 ± 4.49
Duration of Disease (Years)	1.72 ± 0.24
Albumin	1.89 ± 0.33
GCS	09 ± 2.35
Height (cm)	158 ± 7.28
Weight (kg)	78.7 ± 9.87
BMI (kg/m2)	26.72 ± 1.56
SBP (mmHg)	141 ± 9.81
DBP (mmHg)	92 ± 7.22
Cholesterol (mg/dl)	196.7 ± 12.88
Triglycerides (mg/dl)	144.7 ± 10.43
LDL (mg/dl)	123.8 ± 9.06
HDL (mg/dl)	41.61 ± 4.03

Amongst ischemic stroke patients, 70 (35.7%) patients were found to have ischemic heart disease while 126 (64.3%) did not. 90 (45.9%) of patients were reported to have hypoalbuminemia, while 106 (54.1%) did not (Figure 1).

Figure 1: Graphical Representation of Distribution of Hypoalbuminemia Status (n=196)



Among ischemic heart disease patients with hypoalbuminemia, 45 (64.3%) of patients were reported to have hypoalbuminemia, while 25 (35.7%) did not. Among patients without a history of ischemic heart disease, 45 (35.7%) were found to have hypoalbuminemia, whilst 81 (64.3%) did not. A significant p-value of <0.001 was observed between the two groups (Table 2).

Table 2: Relation of Hypoalbuminemia with history of Ischemic Heart Disease (IHD) (n=196)

History of IHD	Hypoalbuminemia		p-Value
	Yes	No	
Yes (n=70)	45 (64.3%)	25 (35.7%)	<0.001
No (n=126)	45 (35.7%)	81 (64.3%)	

DISCUSSION

Despite all the new tests and treatments doctors now have, strokes still kill and cripple millions of people each year. The problem hits hardest in low-income and middle-income countries, where resources are often scarce. In our group of heart patients, nearly 50% had low albumin levels, a finding that echoes earlier work by Haq and others, who saw hypoalbuminemia show up in 30 percent of stroke cases [18]. Dziedzic's team reported a similar figure of 45.5% [16]. Every study, including ours, found a strong link between low albumin and ischemic strokes, with p-values below 0.05. On average, we measured albumin at only 1.89 0.33 gm/dl. Another report shows that stroke patients who did poorly had slightly higher readings, 2.02 0.67 gm/dl, while those who recovered well had 3.08 0.61 gm/dl [19]. Because albumin levels drop during stress, low serum values may warn doctors that a new stroke is coming or that a current one will be harder to treat [20]. Patients with hypoalbuminemia end up facing worse symptoms and more infections. Hypoalbuminemia, or low albumin in the blood, commonly shows up in people who have an ischemic stroke, and doctors often link it to worse outcomes over time [21]. In a study done in Egypt, every stroke patient who died was found to have hypoalbuminemia. Yet among those who left the hospital, 92.5% had normal albumin levels and only 7.5% still showed low albumin [22]. This shows that serum albumin directly links to how well stroke patients do in the short term. In a study by Abubakar and colleagues, doctors looked at 75 people who had ischemic strokes and found that those with a better outlook had an average albumin level of 3.03 g/dL, while patients with a poor prognosis averaged only 2.08 g/dL ($p<0.001$) [19]. Because of the many tests done, scientists now believe low albumin levels, or hypoalbuminemia, really do link to a higher chance of having an ischemic stroke. For these reasons, doctors say every stroke patient should get a simple albumin blood test as soon as they arrive at the hospital. When the test shows low albumin, the care team should treat that person as high-risk and adjust the stroke plan right away.

This study was limited by a relatively small sample size and single-center design, which may affect the generalizability of the findings. Additionally, the observational nature of the study and lack of control for confounding factors such as nutritional status, comorbidities, and acute inflammatory response may have influenced serum albumin levels. Future studies should include larger, multi-center cohorts with adjustment for confounders to better evaluate the prognostic role of serum albumin in ischemic stroke.

CONCLUSIONS

It was concluded that many people who arrive at the hospital with an acute ischemic stroke also have low albumin levels in their blood. Yet, the researchers could not link those low levels to how severe the stroke turned out to be. Because of this, every patient with ischemic stroke should have their serum albumin tested as part of the initial work-up. If the test shows the albumin is low, the patient

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deserves extra attention and care that matches this possible high-risk sign.

Authors' Contribution

Conceptualization: HA
Methodology: HA, BN
Formal analysis: HA
Writing and Drafting: HZ, AK, AM, NUH
Review and Editing: HA, HZ, BN, AK, AM, NUH

All authors approved the final manuscript and take responsibility for the integrity of the work

Conflicts of Interest

All the authors declare no conflict of interest.

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