

# **Serum Albumin Level as a Prognostic Indicator of Acute Ischemic Stroke: A Prospective Study**

1. BandaruAnusree 2. Sigilipelli Naveen 3. Prahallada Chandra Mishra  
4. MangalagiriYoganandini

**KEYWORDS:** Serum albumin, Ischemic stroke

-----  
Date of Submission: 01-01-2023

Date of Acceptance: 10-01-2023  
-----

## **I. INTRODUCTION**

Stroke is a serious global health issue. It accounts for over 70% of the illness burden worldwide and is a significant source of mortality and morbidity in low- and middle-income nations like India. In India, stroke is now the fifth greatest cause of long-term disability and the fourth major cause of death due to an increase in both ischemic and haemorrhagic stroke incidence over the past ten years.(1,2)The different stroke risk factors as well as the variables that affect mortality and act as predictors of mortality have been addressed in earlier studies. A few of these are hyperglycaemia, increased age, type of stroke, and enhanced severity of the stroke. These cannot be modified, making them of little use in clinical practise. It is essential to identify mortality predictors that can be modified so that quick therapeutic intervention can be initiated to enhance outcome.

The functional outcome of stroke patients may be influenced by a wide range of variables, including age, hemineglect, incontinence, admission functional status, and others.(3)Acute illnesses like stroke may cause a negative energy balance in undernourished patients and increase their need for nutrients. Patients with stroke may be unable to meet these higher demands. It has been recognized that the level of serum albumin serves as a measure of nutritional status.(4,5)It is well known that serum albumin plays a major role in the clinical outcome of vascular diseases like hypertension, carotid atherosclerosis and cardiovascular diseases.Because of its diverse properties, including anti-inflammatory and antioxidative actions, suppression of thrombosis in microcirculation, and other attributes, albumin, a multifactorial protein synthesized in liver, has been shown to have neuroprotective effects.(6,7)There is evidence from studies indicating the level of serum albumin at admission is an independent risk factor of the prognosis for ischemic stroke.(6,8)The ALIAS (Albumin in Acute Ischemic Stroke) part 1 and 2 trials, which assessed the efficacy and safety of human albumin therapy in acute ischemic stroke, revealed that albumin therapy is not advantageous in acute stroke patients even though low serum albumin is linked with a poor neurological outcome.(9)

The primary goal of our study is to comprehend the relationship between the serum albumin level at admission and the functional status of acute ischemic stroke patients at 90 days.

## **II. MATERIALS AND METHODS**

This is a hospital based prospective study carried out at MIMS, Vizianagaram for a period of one year i.e., from a 2021 January to 2022 January.

100 patients admitted to the hospital with acute ischemic stroke were taken into consideration.

### **Exclusion criteria:**

- Stroke due to any cerebral space-occupying lesion (ICSOL), acute haemorrhagic stroke, ischemic stroke with haemorrhagic transformation.
- Previous stroke history
- Individuals who present more than 72 hours after their stroke began
- Individuals having cancer, as determined
- Individuals with a history of chronic heart disease or chronic liver disease
- Dementia, chronic renal disease, or failure
- Those who have fevers or illnesses

### **Inclusion criteria:**

Patients admitted to medical wards having a clinical diagnosis of acute ischemic stroke with an initial onset that has been verified by a CT scan and who have given their informed agreement to participate in the study.

**Study design:**

All the patients admitted with acute ischemic stroke, after satisfying the inclusion and exclusion criteria were taken into consideration. National Institute of Health stroke scale (NIHSS) was used to rate the severity of the stroke. Simple investigations were carried out. Treatment was started and administered in accordance with the institution's policies. e. Blood samples for assessment of albumin were collected at admission within 24 hours after stroke onset. Bromocresol Green was used to assess the serum albumin level. After 90 days from the time of the stroke, patients were monitored and their functional level was assessed either in-person or over the phone using the modified Rankin scale (mRS). This scale ranges from 0 to 6, from perfect health without symptoms to death. A score of mRS: 0–3 was considered favourable, whereas mRS: 4–6 was considered unfavourable. Low serum albumin is viewed as less than 3.5 g%. The gathered information was placed into a Microsoft Excel spreadsheet and statistically analysed. Using the ANOVA and Kruskal-Wallis tests, the significance of the association was examined. The goal of the statistical study was to determine whether there was a statistically significant relationship between the blood albumin level at admission and the severity of the stroke as well as the functional outcome after 90 days.

**III. RESULTS**

The mean age of the population was  $60.46 \pm 1.51$  years. 64 were males and 36 were females. 34 patients had diabetes. 41 patients had hypertension.

NIHSS SCORE	PATIENTS
Mild	22
Moderate	21
Moderate to Severe	33
Severe	25

The mean serum albumin for the population was  $4.34 \pm 0.12$  gm/dl. Mean serum albumin among various NIHSS score groups was as follows:

NIHSS SCORE	Mean Serum Albumin (gm/dl)
Mild	$5.18 \pm 0.13$
Moderate	$4.48 \pm 0.17$
Moderate to Severe	$4.27 \pm 0.11$
Severe	$3.63 \pm 0.16$

On ANOVA test, the *P* Value is significant at  $< 0.05$ .

NIHSS SCORE	Diabetics	Hypertensives
Mild	8	11
Moderate	7	10
Moderate to Severe	10	14
Severe	9	12

Diabetes and Hypertension did not have an effect on the outcome. *P* value  $> 0.05$  for both variables.

**IV. DISCUSSION**

Among the 100 acute ischemic stroke patients included in our study, 64% were males indicating male preponderance which correlated with other studies.(3,6,10)The mean age of the population was  $60.46 \pm 1.51$  years.

Severity of the ischemic stroke was mild in 22% of the patients where as it was severe in 25% as measured using NIH Stroke Scale. Male patients in the current study suffered strokes that were more severe than those in female patients.

The mean serum albumin levels recorded in the present study was  $4.34 \pm 0.12$  gm/dl. Patients who had ischemic strokes of milder severity had mean serum albumin levels that were higher, at  $5.18 \pm 0.13$  gm/dl, compared to patients who had ischemic strokes of greater severity, at  $3.63 \pm 0.16$  gm/dl. These findings were statistically significant ( $p < 0.05$ ) and correlated well with the studies done by Babu MS et al.(8)Serum albumin level was found by Ramesh et al. to be an independent predictor of survival in neurosurgical ICU patients.(11)

The correlation between mRS and serum albumin derived a *p* value  $< 0.05$  using the ANOVA test, which was significant. As a result, there was a negative association between the mRS score at 90 days and serum albumin upon admission. The MRS score decreases with increasing serum albumin levels, improving the

90-day prognosis. These results correlated well with the study conducted by Abubakar et al., who showed that serum albumin levels were substantially lower(1.66gm/dl) in patients who died than in survivors.(12)

In our study, systemic hypertension was the main comorbidity that contributed to ischemic stroke (41%), while diabetes comprised 34% of the total.

Patients with a low NIHSS score, a low mRS score, and a high albumin level had a good prognosis in this trial, and the authors discovered a statistically significant link between the severity of an ischemic stroke at presentation and serum albumin levels.

## V. CONCLUSION

The severity of the stroke at the time of onset is clearly related to the outcome. Serum albumin has an impact on both the severity and outcome of a stroke. Because serum albumin is a measure of nutritional status, nutritional treatment may improve the functional outcome of an acute ischemic stroke. Because blood albumin levels were shown to be inversely related to the severity of stroke at the time of onset and subsequent outcome on follow-up, investigations including a large number of patients will shed additional light in the future.

## REFERENCES

- [1]. Jones SP, Baqai K, Clegg A, Georgiou R, Harris C, Holland EJ, et al. Jones SP, Baqai K, Clegg A, Georgiou R, Harris C, Holland EJ, Kalkonde Y, Lightbody CE, Maulik PK, Srivastava PM, Pandian JD, Kulsum P, Sylaja PN, Watkins CL, Hackett ML. Stroke in India: A systematic review of the incidence, prevalence, and case fatality. *Int J Stroke*. 2022 Feb;17(2):132-140. doi: 10.1177/17474930211027834. Epub 2021 Jul 2. PMID: 34114912; PMCID: PMC8821978. *Int J Stroke* [Internet]. 2022 Feb [cited 2022 Oct 13];17(2):132-40. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8821978/>
- [2]. Murphy SJ, Werring DJ. Stroke: causes and clinical features. *Medicine (Abingdon)*. 2020 Sep;48(9):561-566. doi: 10.1016/j.mpmed.2020.06.002. Epub 2020 Aug 6. PMID: 32837228; PMCID: PMC7409792. *Med Abingdon Engl UK Ed* [Internet]. 2020 Sep [cited 2022 Oct 13];48(9):561-6. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7409792/>
- [3]. Nair R, Radhakrishnan K, Chatterjee A, Gorthi SP, Prabhu VA. Serum Albumin as a Predictor of Functional Outcomes Following Acute Ischemic Stroke. *J Vasc Interv Neurol* [Internet]. 2018 Nov [cited 2022 Oct 21];10(2):65-8. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6350867/>
- [4]. Pandian JD, Jyotsna R, Singh R, Sylaja PN, Vijaya P, Padma MV, et al. Premorbid nutrition and short term outcome of stroke: a multicentre study from India. *J Neurol Neurosurg Psychiatry*. 2011 Oct;82(10):1087-92.
- [5]. Quinlan GJ, Martin GS, Evans TW. Albumin: biochemical properties and therapeutic potential. *Hepatology*. 2005 Jun;41(6):1211-9.
- [6]. Manickam S, Franklin J, Petchiappan V, Menon S. A Study of Serum Albumin Levels in Acute Ischemic Stroke and its Correlation with Clinical Outcome. *Int J Contemp Med Res IJCMR* [Internet]. 2019 Mar [cited 2022 Oct 21];6(3). Available from: [https://www.ijcmr.com/uploads/7/7/4/6/77464738/ijcmr\\_2398.pdf](https://www.ijcmr.com/uploads/7/7/4/6/77464738/ijcmr_2398.pdf)
- [7]. 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. *Neuropsychiatr Dis Treat* [Internet]. 2021 Feb 10 [cited 2022 Oct 21];17:401-11. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7882440/>
- [8]. Babu MS, Kaul S, Dadheech S, Rajeshwar K, Jyothy A, Munshi A. Serum albumin levels in ischemic stroke and its subtypes: correlation with clinical outcome. *Nutr Burbank Los Angel Cty Calif*. 2013 Jun;29(6):872-5.
- [9]. Ginsberg MD, Palesch YY, Martin RH, Hill MD, Moy CS, Waldman BD, et al. THE ALBUMIN IN ACUTE STROKE (ALIAS) MULTICENTER CLINICAL TRIAL: SAFETY ANALYSIS OF PART 1, AND RATIONALE AND DESIGN OF PART 2. *Stroke Cereb Circ* [Internet]. 2011 Jan [cited 2022 Oct 21];42(1):119-27. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3076742/>
- [10]. Dash PK, Behera S, Sahoo NC, Rattan R, Tripathy SK. Serum albumin level as prognostic indicator of acute ischemic stroke in tertiary care hospital admitted patients. *Int J Adv Med* [Internet]. 2020 May 22 [cited 2022 Oct 21];7(6):948-53. Available from: <https://www.ijmedicine.com/index.php/ijam/article/view/2290>
- [11]. Ramesh VG. Bedside computed tomography in traumatic brain injury. *Neurol India* [Internet]. 2016 Jan 1 [cited 2022 Oct 23];64(1):12. Available from: <https://www.neurologyindia.com/article.asp?issn=0028-3886;year=2016;volume=64;issue=1;spage=12;epage=13;aulast=Ramesh;type=0>
- [12]. 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* [Internet]. 2013 Feb 7 [cited 2022 Oct 23];14:53. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3617615/>

BandaruAnusree , et. al. "Serum Albumin Level as a Prognostic Indicator of Acute Ischemic Stroke: A Prospective Study." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 22(1), 2023, pp. 37-39.