



CORRELATION OF SERUM ALBUMIN LEVELS IN ACUTE ISCHEMIC STROKE PATIENTS.

Dr. Junaid Ahmed

Dr. Abhishek Jha

Dr. Ahmed Khan

Dr. Mitesh Thakkar

ABSTRACT

Background Westernization of lifestyle and the resulting demographic transition might increase the burden of stroke even in the developing countries. Stroke or cerebrovascular accident is a life threatening neurological disorder. It constitutes more than 50% of admissions in a hospital. Albumin is a multifunctional protein which has been proven to have neuroprotective effects in animal studies. Albumin is also an indicator of the nutritional status. **Methods** Total 75 patients admitted with the diagnosis of acute ischemic stroke and meeting the inclusion and exclusion criteria. A prospective, observational study is conducted under the Department of Medicine, MGM Medical College and Hospital, Navi Mumbai. A written signed informed consent was taken from all the patients prior to their enrolment in the study. **Results** It was observed that the mean age of the study population was 52.96 ± 13.11 years. Almost 58.66% of the cases belonged to the age group of 51 to 70 years. There was a male preponderance in the study population (86.67%). The age distribution was similar in both the genders; P value: 0.486. the results also showed that the mean serum albumin levels at the time of admission was 3.86 ± 0.49 g/dL and the mean serum albumin levels at discharge were 3.95 ± 0.47 g/dL. When assessed with age, there was no significant variation in the serum albumin levels at admission and discharge; P value: more than 0.50. **Conclusion** From the present study, it can be effectively concluded that acute ischemic stroke is prevalent in the older age groups with significant male preponderance. When the severity of the stroke was assessed by the NIHSS score, it was observed that moderate type of stroke was the most common. When assessed with the mean serum albumin levels, there was a significant strong negative correlation with NIHSS score. This indicates that low serum albumin levels are associated with increased severity of the stroke.

KEYWORDS : Albumin & Acute Stroke.

INTRODUCTION

Stroke or cerebrovascular accident is a life threatening neurological disorder. It constitutes more than 50% of admissions in a hospital.

The etiology of ischemic stroke is due to either a thrombotic or embolic event that causes a decrease in blood flow to the brain. The etiology of stroke affects both prognosis and outcomes.^{1,2}

Brain ischemia in its broad sense can be focal or multifocal, caused by a sudden closure or marked diameter reduction of the artery supplying an area of the brain, be it of previously stenotic or normal arteries (i.e. aorta, supra-aortic trunk or intracranial arteries). Brain ischemia can frequently be triggered through the lack of global brain blood supply, in more proximal causes of hemodynamic dysfunction causing sudden blood pressure fall.³

Early mortality from stroke is mostly directly related to stroke. Complications affect mortality only later in the course. Previous studies have thrown light on the various risk factors of stroke as well as the factors which influence mortality, some of which may serve as predictors of mortality.

Stroke severity, type of stroke, increased age, level of consciousness etc. are few of them. But most of these are non-modifiable and hence of limited value in clinical practice. Identification of predictors of mortality, especially, modifiable ones, is vital so that prompt therapeutic measures can be instituted to improve outcome.

Albumin is a multifunctional protein which has been proven to have neuroprotective effects in animal studies. Albumin is also an indicator of the nutritional status.

This fact holds importance, as, out of 15 million stroke events occurring annually all over the world, two third occurs in low

income and middle income developing countries, where malnutrition is rampant. There have been several studies in the western world including interventional studies trying to explore the scope of albumin as a neuroprotective agent.

Some of these have shown that albumin therapy is capable of minimizing infarction volume and cerebral edema. Albumin reduces hematocrit as well as erythrocyte sedimentation rate by its effects on erythrocyte aggregation.

Effect of albumin is mainly in the early reperfusion phase of acute ischemic stroke where it exerts an inhibitory effect on stagnation, thrombosis and leucocyte adhesion in microcirculation. Therefore, the present study is conducted to evaluate the role of serum albumin as a predictor of functional outcome of acute ischemic stroke.

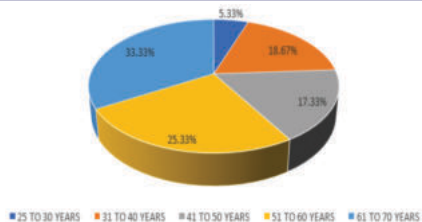
Objectives

1. To determine the correlation between serum albumin level and acute ischemic stroke.

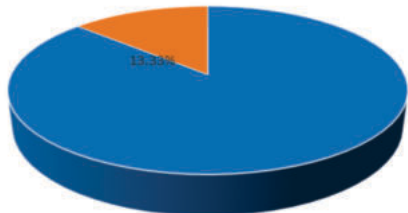
RESULTS

Table 1: Age (in years) and gender wise distribution of the study population

AGE GROUPS	FEMALES		MALES		TOTAL	
	N	%	N	%	N	%
25 TO 30	0	0%	4	5.33%	4	5.33%
31 TO 40	2	2.67%	12	16%	14	18.67%
41 TO 50	1	1.33%	12	16%	13	17.33%
51 TO 60	3	4%	16	21.33%	19	25.33%
61 TO 70	4	5.33%	21	28%	25	33.33%
TOTAL	10	13.33%	65	86.66%	75	100%
Mean \pm SD	55.6 ± 13.36		52.55 ± 13.13		52.96 ± 13.11	
Range	25 to 70 years					
P value	0.486					
Statistical Significance	Not Statistically Significant					



Graph 1: Age-wise distribution of the study population

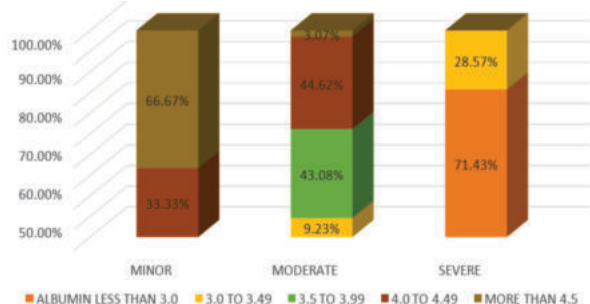


Graph 2: Gender wise distribution of the study population

Table 1 and Graph 1 and 2 shows the age and gender wise distribution of the study population. Most of the cases (58.66%) belonged to the age group of 51 to 70 years. There was a male preponderance. The age distribution was similar in both the genders; P value: 0.486.

Table 2: Distribution of the NIHSS score according to the serum albumin levels in the study population

PARAMETER	MINOR	MODERATE	MODERATE TO SEVERE	TOTAL
ALBUMIN LESS THAN 3.0	0 (0%)	0 (0%)	5 (6.66%)	5 (6.66%)
3.0 TO 3.49	0 (0%)	6 (8%)	2 (2.67%)	8 (10.67%)
3.5 TO 3.99	0 (0%)	28 (37.33%)	0 (0%)	28 (37.33%)
4.0 TO 4.49	1 (1.33%)	29 (38.67%)	0 (0%)	30 (40%)
MORE THAN 4.5	2 (2.67%)	2 (2.67%)	0 (0%)	4 (5.34%)
TOTAL	3 (4%)	65 (86.67%)	7 (9.33%)	75 (100%)
MEAN ± SD	4.54 ± 0.22	3.93 ± 0.35	2.87 ± 0.50	3.86 ± 0.49
P VALUE	<0.001*			
SIGNIFICANCE	Statistically Significant			



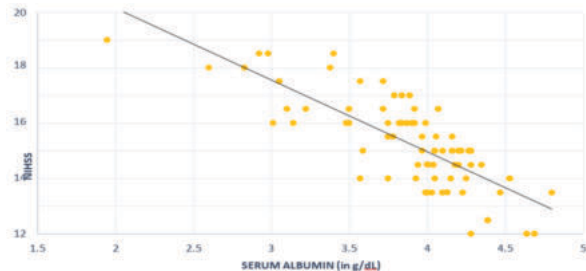
Graph 3: Distribution of the NIHSS score according to the serum albumin levels

Table 2 and Graph 3 show that majority of the cases of minor stroke had serum albumin level of more than 4.5 g/dL, those with moderate stroke had serum albumin of 4.0 to 4.49 g/dL while cases of severe stroke had serum albumin levels of less than 3.0 g/dL; P value: less than 0.001.

Table 3: Correlation of the NIHSS score with serum albumin at the time of admission

SCORE	CORRELATION COEFFICIENT (R)	P VALUE	INTERPRETATION
NIHSS	-0.78	<0.001*	Strongly Negative

Serum albumin levels showed significant strongly negative correlation with NIHSS score; P value: less than 0.001.



Graph 4: Correlation of the NIHSS score with serum albumin at the time of admission

RESULT AND DISCUSSION

Strokes are of particular importance because ischemic brain tissue suffers necrosis almost immediately and stops working in seconds, giving a very short window for treatment. While prompt reperfusion after ischemia/infarction is essential for preserving neurological function, it can precipitate tissue dysfunction and cell necrosis from the destruction of reversibly damaged cells. Cerebral ischemia- reperfusion injury can occur after thrombolysis or mechanical thrombectomy. While this restores brain flow and salvages reversibly damaged tissue, reperfusion after a longer ischemic period can cause a larger infarct than the initial occlusion.⁴

The ensuing complications are often permanent and severely debilitating. Therefore, there has been a search for neuroprotective agents which can prolong the window of treatment while also decreasing the risk of severe complications. There has been recent interest in the neuroprotective function of albumin and its role as a prognostic indicator. However, studies in this regard are scarce. Therefore, the present study was conducted to assess the same.

In the present study, it was observed that the mean age of the study population was 52.96 ± 13.11 years. Almost 58.66% of the cases belonged to the age group of 51 to 70 years. There was a male preponderance in the study population (86.67%). The age distribution was similar in both the genders; P value: 0.486.

Ranjan A. et al.⁵ conducted a prospective observational study on 100 patients of acute ischemic stroke to assess the role of serum albumin as a prognostic indicator of functional recovery. They observed that the mean age of the study population was 57.95 ± 13.75 years. They also found a slight male preponderance (54%). These findings were similar to the present study.

In another study by Sandeep F. et al.⁶, they observed that the mean age of males was 55.71 ± 5.76 years and females was 59.31 ± 7.81 years. They also observed male preponderance with 77.7% of the cases being males. These findings were similar to the present study.

In the present study, the mean serum albumin levels at the time of admission was 3.86 ± 0.49 g/dL and the mean serum albumin levels at discharge were 3.95 ± 0.47 g/dL. When assessed with age, there was no significant variation in the serum albumin levels at admission and discharge; P value: more than 0.50.

In the study by Manickam S. et al.⁷, the mean serum albumin levels were 3.85 g/dL. This was similar to the present study.

When assessed according to the serum albumin levels on admission, it was observed that majority of the cases of minor stroke (66.67%) had serum albumin level of more than 4.5 g/dL. In moderate stroke, majority (44.62%) had serum albumin of 4.0 to 4.49 g/dL while in cases of severe stroke 71.43% cases had serum albumin levels of less than 3.0 g/dL. Thus, there was a decrease in the mean serum albumin levels along with the increase in the severity of the stroke as per the NIHSS score; P value: less than 0.001. The NIHSS score and the serum albumin levels showed a strongly negative significant correlation ($R = -0.78$, P value: less than 0.001).

In the study by Sandeep F. et al.⁸, they observed that NIHSS score showed strongly negative significant correlation with serum albumin levels ($R = -0.724$; P value: 0.0001). This was similar to the present study.

In the study by Nair R. et al.⁹, they observed that moderate stroke was the most common (68.3%), followed by severe stroke (24.8%), very severe stroke (5.9%) and mild stroke (1.0%). These findings were similar to the present study.

Thus, most cases of acute ischemic stroke are moderate stroke according to the NIHSS score. It can be also concluded that low serum albumin levels are associated with increased severity of stroke.

CONCLUSION

Though stroke has been recognized from 460 BC, however, it still remains one of the major cause of concern. This is because of limited therapeutic options to be promptly instituted in the narrow window for treatment because brain tissue suffers irreversible damage almost instantly, resulting in permanent disability. This becomes challenging, particularly in a limited-resource country like ours, where the reach of healthcare is limited, and the affordability of advance treatment is scarce. This results in long-term disability and also has an adverse impact on the economy.

Therefore, there has been a search for neuroprotective agents. One such agent is albumin with recent discovery of its role as therapeutic and prognostic indicator for stroke. However, studies in this regard are scarce. Therefore, the present study was conducted to evaluate its role as a prognostic indicator after acute ischemic stroke. From the present study, it can be effectively concluded that acute ischemic stroke is prevalent in the older age groups with significant male preponderance. When the severity of the stroke was assessed by the NIHSS score, it was observed that moderate type of stroke was the most common. When assessed with the mean serum albumin levels, there was a significant strong negative correlation with NIHSS score. This indicates that low serum albumin levels are associated with increased severity of the stroke.

REFERENCES

1. Ntaios G. Embolic Stroke of Undetermined Source: JACC Review Topic of the Week. *J Am Coll Cardiol*. 2020;75(3):333-340.
2. Pierik R, Algra A, van Dijk E, Erasmus ME, van Gelder IC, Koudstaal PJ, et al on behalf of the Parelsnoer Institute-Cerebrovascular Accident Study Group. Distribution of Cardioembolic Stroke: A Cohort Study. *Cerebrovasc Dis*. 2020;49(1):97-104.
3. Formisano L, Guida N, Mascolo L, Serani A, Laudati G, Pizzorusso V, et al. Transcriptional and epigenetic regulation of *ncx1* and *ncx3* in the brain. *Cell calcium*. 2020;87:102194.
4. Pan J, Konstas AA, Bateman B, Ortolano GA, Pile-Spellman J. Reperfusion injury following cerebral ischemia: pathophysiology, MR imaging, and potential therapies. *Neuroradiology*. 2007;49(2):93-102.
5. Ranjan A, Singh H, Lahkar R, Kumar R. A prospective Study of Serum albumin level as a prognostic indicator of functional recovery following acute ischemic stroke in patients managed at narayan medical college and hospital, Sasaram. *International Journal of Health and Clinical Research*. 2020;3(9):129-134.
6. Sandeep F, Bai P, Kumari R, Shiwani S, Kumar S, Poonam F. Prognostic significance of serum albumin in acute ischemic stroke. *European Journal of Pharmaceutical and Medical Research*. 2017;4(8):138-142.
7. Manickam S, Franklin J, Petchiappan V, Menon S. A Study of Serum Albumin Levels in Acute Ischemic Stroke and its Correlation with Clinical Outcome. *International Journal of Contemporary Medical Research*. 2019;6(3):8-12.

8. Sandeep F, Bai P, Kumari R, Shiwani S, Kumar S, Poonam F. Prognostic significance of serum albumin in acute ischemic stroke. *European Journal of Pharmaceutical and Medical Research*. 2017;4(8):138-142.
9. Nair R, Radhakrishnan K, Chatterjee A, Gorthi S, Prabhu V. Serum Albumin as a Predictor of Functional Outcomes Following Acute Ischemic Stroke. *Journal of Vascular and Interventional Neurology*. 2018;10(2):65-68.