



SERUM ALBUMIN LEVEL IN STROKE AND ITS CORRELATION WITH CLINICAL OUTCOME

General Medicine

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ABSTRACT

BACKGROUND: Serum albumin has been correlated with stroke outcome in previous studies and has shown that elevated levels of serum albumin has better outcome in stroke patients. But many of these studies has been done on acute ischemic stroke and evidence are scarce in hemorrhagic stroke. This study was done to assess albumin level in both ischemic and hemorrhagic stroke patients at tertiary care centered in north India.

MATERIALS & METHODS: One hundred and fifty patients with acute stroke were included in the study. All participants were evaluated by history, examination, laboratory and radiological modalities. Blood samples for assessment of albumin was collected at the time of admission. Stroke severity was assessed using NIHSS and GCS at the time of admission. Functional outcome was measured 1 week post admission and after 3 months using modified Rankin scale (mRs). Statistical analysis and interpretation of the data was done by using SPSS Software version 23.

RESULT: A total of 150 patients with 94 patients Ischemic stroke and 56 patients with Intracerebral hemorrhage (ICH) were included in this study. Mean (SD) age was 64.12 (10.85). Among the study population, 102 (68.0%) were male and 48 (32.0%) were female. Hypertension was present in 68.0% of the patients and 50.0% of the patients were diabetic. The mean S. Albumin (g/dL) was 3.63 (0.72). There was moderate negative correlation between serum albumin level and mRS score in both hemorrhagic and ischemic stroke at 1 week ($\rho = -0.48$, $p < 0.001$). At three months there was no correlation in both ischemic and hemorrhagic stroke patients ($\rho = -0.12$, $p = 0.287$).

CONCLUSION: Patients with low serum albumin level had poor outcome at one week but did not show significant impact on outcome at 3 month in both Ischemic and hemorrhagic stroke.

KEYWORDS

Stroke, Albumin, mRS

INTRODUCTION

Stroke is a major global health problem, and it is recognized as the second leading cause of death and the third leading cause of disability globally^{1, 2}. Perilesional edema and blood-brain barrier (BBB) disruption,³ oxidative injury and inflammation,^{4, 5} excitotoxicity⁶, and apoptosis⁷ are all common injury mechanisms in both ICH and ischemic stroke. Many of these mechanisms are known to be inhibited by albumin therapy, which directly protects both parenchymal and vascular elements of the brain, reduces brain edema, maintains microvascular integrity, inhibits endothelial cell apoptosis, and exerts antioxidant effects.^{8,9,10,11}

Serum albumin has been correlated with stroke outcome in previous studies and has shown that elevated levels of serum albumin has better outcome in stroke patients. But many of these studies has been done on acute ischemic stroke and evidence are scarce in hemorrhagic stroke. This study was done to assess albumin level in both ischemic and hemorrhagic stroke patients at tertiary care centered in north India.

AIMS AND OBJECTIVES

- To determine the serum albumin levels in stroke.
- To study its correlation with clinical outcome.

MATERIAL AND METHOD

The study was a prospective observational study conducted at Department of Medicine Moti Lal Nehru Medical College Prayagraj over a period of 18 months. After obtaining informed consent 150 patients with acute stroke were included in the study with 94 patients Ischemic stroke and 56 patients Intracerebral hemorrhage (ICH). Institutional Ethics Committee approved the study.

INCLUSION CRITERIA:

- All patients with clinical and radiological evidence of stroke admitted to the Department of Medicine.
- Age >18 years, both male and female patients.
- Patients who are willing to give informed consent.

EXCLUSION CRITERIA:

- Chronic Liver disease
- Nephrotic syndrome

- Diabetic nephropathy
- Malignancies
- Negative consent.

Diagnosis of stroke was based on clinical observation and radiological imaging. Blood samples for assessment of albumin was collected at admission within 36 hours after stroke onset. Stroke severity at presentation was determined by NIHSS score GCS. Functional outcome was measured 1 week post admission and after 3 months during follow up using modified Rankin scale. The data was entered in MS EXCEL spreadsheet and analysis was done using software SPSS Version 23.

RESULT

This study included a total of 150 patients with 94 patients Ischemic stroke and 56 patients with Intracerebral hemorrhage (ICH). Majority of the patients were in age group 61-70 years with mean (SD) age of 64.12 (10.85). Among the study population, 102 (68.0%) were male and 48 (32.0%) were female. Hypertension was present in 68.0% of the patients and 50.0% of the patients were diabetic. The mean (SD) Serum albumin (g/dL) was 3.35 (0.73). The median (IQR) S. albumin (g/dL) was 3.20 (2.8-4). The S. albumin (g/dL) ranged from 2 - 4.8. The mean (SD) S. albumin (g/dL) in the ICH patients was 3.27 (0.57). The mean (SD) of S. albumin (g/dL) in the infarct patients was 3.40 (0.81). There was no significant difference between ICH and infarct patients ($W = 2340.000$, $p = 0.256$). The mean (SD) of S. albumin (g/dL) in the survived patients was 3.90 (0.52) and in non-survived patients was 2.80 (0.45). There was a significant difference between survived and non-survived patients in terms of S. albumin (g/dL) ($W = 5269.000$, $p < 0.001$). There was a moderate negative correlation between NIHSS and S. albumin (g/dL), and this correlation was statistically significant ($\rho = -0.5$, $p < 0.001$). For every 1 unit increase in NIHSS, the S. albumin (g/dL) decreases by 0.06 units. Conversely, for every 1 unit increase in S. albumin (g/dL), the NIHSS decreases by 3.93 units. There was a moderate positive correlation between GCS and S. albumin (g/dL), and this correlation was statistically significant ($\rho = 0.5$, $p < 0.001$). For every 1 unit increase in GCS, the S. albumin (g/dL) increases by 0.17 units. Conversely, for every 1 unit increase in S. albumin (g/dL), the GCS increases by 1.36 units.

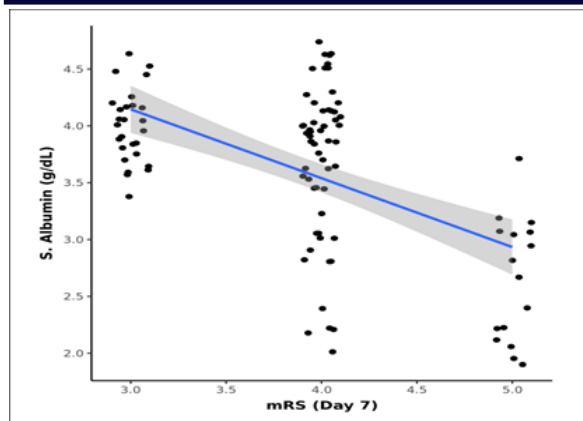


Fig.1: The above scatterplot depicts the correlation between mRS and S. albumin (g/dL) on day 7. There was a moderate negative correlation between mRS and S. albumin (g/dL), and this correlation was statistically significant ($\rho = -0.48$, $p = <0.001$). For every 1 unit increase in mRS, the S. albumin (g/dL) decreases by 0.61 units. Conversely, for every 1 unit increase in S. albumin (g/dL), the mRS decreases by 0.49 units.

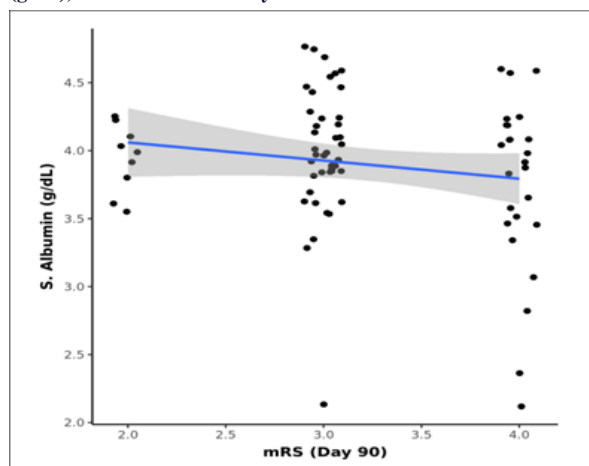


Fig.2: The above scatterplot depicts the correlation between mRS and S. albumin (g/dL) on day 90. There was a weak negative correlation between mRS and S. albumin (g/dL), and this correlation was not statistically significant ($\rho = -0.12$, $p = 0.287$).

DISCUSSION

Albumin has traditionally known to be a marker of nutritional status. Hypoalbuminaemia appears to be a predictor of poor prognosis in different clinical settings. Protein-energy malnutrition has shown to be a risk factor for poor outcome and could worsen the prognosis by decreasing cellular immunity in stroke patients¹². Albumin has shown to be neuroprotective in preclinical studies by variety of mechanisms including decrease volume of infarction, brain swelling primarily by reducing hematocrit level, direct vascular endothelial effect, antioxidant effect, blood-brain barrier protectant¹³ inhibit stagnation, thrombosis, and leukocyte adhesion in postcapillary microcirculation¹⁴.

In our study there was moderate negative correlation between serum albumin level and NIHSS score in both ischemic and hemorrhagic stroke. Idicula TT et al.¹⁵ study showed that the median NIHSS score on admission (interquartile range) was 4 (1–8) and reported that lower NIHSS score on admission were independently associated with a better outcome. Cho YM et al.¹⁶ demonstrated that initial NIHSS score correlated with the functional outcome. Manickam S et al.¹⁷ study showed that the median NIHSS score (interquartile range) on admission was 4 (1–8) and showed that patients with lower NIHSS score had better outcome. Kasundra G et al.¹⁸ reported that patients with higher NIHSS score had a lower serum albumin level and had a poor outcome. Findings in our study were consistent with the above studies.

In our study there was moderate negative correlation between serum

albumin level and GCS level in both hemorrhagic and ischemic stroke. Similar findings were reported in previous studies also. Morotti A et al.¹⁹ study reported that hypoalbuminaemia patients had a lower GCS at presentation and a higher frequency of IVH and correlated with poor outcome in ICH patients. Ranjan AK et al.²⁰ demonstrated that serum albumin had a weak correlation with GCS score in patients with ischemic stroke with R square 0.360.

In our study there was moderate negative correlation between serum albumin level and mRS score in both hemorrhagic and ischemic stroke at 1 week. At 1 month there was weak correlation in ischemic stroke patients but there was no significant correlation in hemorrhagic stroke patients. At three months there was no correlation in both ischemic and hemorrhagic stroke patients. Dask PK et al.²¹ showed that patients with low mRS and high albumin had better outcome and follow up serum albumin level (g/dL) at 1 week (3.8 ± 0.25) and at 3 months (3.7 ± 0.23) was associated with poor outcome. Idicula TT et al.¹⁵ study showed that the median mRS score on day 7 was 2 (1–3) and was significantly associated with good outcome and lower mortality. Our observation is in line with the above studies that low mRS score associated with higher serum albumin level and better outcome at 1 week but unlike the study done by Dask PK et al.²¹, our study did not show significant correlation at 1 month in ICH patients and at 3 months it did not show significant correlation in both ischemic and hemorrhagic stroke patients.

Limitation of the study was that the sample size was small and study was carried out over a limited period of time in a single tertiary care centre.

CONCLUSION

Patients with low serum albumin level had poor outcome at one week but did not show significant impact on outcome at 3 month in both Ischemic and hemorrhagic stroke.

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