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Dr. Ravikumar Ughreja
Assistant Professor,
Department of Medicine,
Gujarat Adani Institute of
Medical Science, Bhuj, Kutch,
Gujarat, India

Prospective analysis of serum albumin level as prognostic indicator in acute ischemic stroke

Dr. Ravikumar Ughreja

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Abstract

Background and Aim: Effect of albumin is primarily in the early reperfusion phase of acute ischemic stroke where it has an inhibitory effect on thrombosis, stagnation and adhesion of leucocytes in microcirculation. Aim of the study is to understand the association between serum albumin on admission and the functional status at 90 days. It also aims to find the other indicators that influence the outcome after ischemic stroke.

Material and Methods: The study population consisted of total 200 patients who were admitted in the hospital wards with the instance of ischemic stroke within the first 2 hours of onset of symptoms. A detailed history was elicited from the attendees, followed by general examination. Serum albumin was measured using Bromocresol Green. Patients were followed up, and after 120 days following the onset of stroke, were evaluated either in person or over the phone using the Modified Ranking scale to assess their functional status.

Results: Maximum numbers of patients were in severe disability score group. The prevalence of systemic hypertension was present in 114 patients and absent in 86 patients. The association between GCS and albumin was found to be significant (p value < 0.05) using the ANOVA test. The mean albumin in those with $GCS > 13$ was 5.34 mg/dl while those for $GCS < 9$ was 4.26 mg/dl. There was a negative correlation between serum albumin at admission with the MRS score at 120 days. The higher the serum albumin levels, the lower the MRS score, hence better the outcome at 120 days.

Conclusion: Serum albumin has a significant association with the severity as well as the prognosis of stroke.

Keywords: Acute ischemic stroke, ANOVA, serum albumin level, systemic hypertension

Introduction

Acute ischemic stroke is a medical problem of vascular occlusion which results in non-functioning of a part of neuronal tissue. Stroke is one of the major causes of mortality and morbidity worldwide. After coronary artery disease and cancers of all types, stroke is the third commonest cause of death worldwide ^[1, 2]. The World Health Organisation (WHO) defines stroke as rapid development of clinical signs and symptoms of a focal neurological disturbance lasting more than 24 hours or leading to death with no apparent cause other than vascular origin ^[3].

In India, age adjusted prevalence rate of ischemic stroke is 250- 350/1,00,000 and stroke contributes 1.2% of total death in India. Over 80% of death due to stroke occurs in low-income and middleincome regions of the world. Identifying predictors of mortality is important so that prompt therapeutic measures could be initiated to improve outcome ^[4, 6].

Albumin is a multi-factorial protein which has been proven to have neuroprotective effect in animal studies. Albumin also is an indicator of nutritional status. Studies on prognostic factors of ischemic stroke in our population are limited. Serum albumin level at admission was found to be an independent prognostic factor for ischemic stroke outcome in studies done in western population ^[7, 8]. Some of the studies have shown that albumin transfusion is capable of minimising volume of infarction and cerebral edema. Albumin reduces the hematocrit as well as the erythrocyte sedimentation rate by its affect on erythrocyte aggregation ^[9, 10].

Effect of albumin is primarily in the early reperfusion phase of acute ischemic stroke where it has an inhibitory effect on thrombosis, stagnation and adhesion of leucocytes in microcirculation. There is scarcity of data regarding the usefulness of albumin as a prognostic indicator ^[7, 11].

Corresponding Author:
Dr. Ravikumar Ughreja
Assistant Professor,
Department of Medicine,
Gujarat Adani Institute of
Medical Science, Bhuj, Kutch,
Gujarat, India

Hence through this study, the goal is to understand the association between serum albumin on admission and the functional status at 90 days. It also aims to find the other indicators that influence the outcome after ischemic stroke.

Material and Methods

The present observation analysis was done in the department of medicine, medical college and associated hospital. The study population consisted of total 200 patients who were admitted in the hospital wards with the instance of ischemic stroke within the first 2 hours of onset of symptoms. The ethical committee was informed about the study and the clearance certificate was obtained prior to the start of the study. The patients were explained in detail about the study and the written informed consent was obtained prior to the start of the study.

Exclusion criteria

- Acute haemorrhagic stroke, ischemic stroke with hemorrhagic transformation or stroke related to intracranial space occupying lesion (ICSOL).
- Past history of stroke
- Patients presenting more than 72 hr after the onset of stroke
- Patients with diagnosed malignancy
- Patients with history of chronic liver disease, chronic heart failure, chronic kidney disease or dementia
- Patients with fever or infections

Inclusion criteria

- Patients admitted in medical wards with clinical diagnosis of first onset acute ischemic stroke
- Clinical diagnosis confirmed by CT scan
- Informed consent to participate in the study Cases where defined as per WHO definition of stroke.

Hypertension was documented if there were records proving it or when at least 2 readings of blood pressure - systolic blood pressure was ≥ 140 mm Hg and diastolic blood pressure was ≥ 90 mmHg after the acute phase of stroke. Coronary artery disease was diagnosed with either ECG changes or previous records.

Patient was considered a smoker if he had a history of smoking in the past 5 years. About 453 consecutive patients who were admitted in the medical wards with first ever attack of stroke were screened to get the study population of 200.

A detailed history was elicited from the attendees, followed by general examination, an elaborate CNS examination and relevant examination of other systems. Vitals were stabilized, and patients underwent a CT scan of the brain in order to rule out hemorrhagic stroke or any mass lesion. Severity of stroke was graded using the Scandinavian Stroke Scale (SSS).

Basic investigations like complete hemogram-including ESR, blood sugar, renal function test, liver function test and serum proteins-albumin and globulin, lipid profile and urine routine examination. ECG was taken to establish any coronary artery disease. Those that fell under exclusion criteria were excluded.

Treatment was initiated and carried out according to the institution guidelines. Serum albumin was measured using Bromocresol Green. Patients were followed up, and after 120 days following the onset of stroke, were evaluated

either in person or over the phone using the Modified Ranking scale to assess their functional status.

The collected data was entered into Excel spreadsheet and was analyzed statistically. The significance of association was tested using Anova and Kruskal Wallis test. Statistical analysis was carried out to establish whether statistically significant associations exist between serum albumin level on admission and the stroke severity, as well as the functional outcome at the end of 90 days.

Results

Distribution of study subjects as per the age shows that 25% study subjects were in the age group of 41-50, 24% were in the age group 51-60 yrs, 21% were above 70 yrs, 20% were in the age group 61-70 yrs whereas 10% study subjects were in the age group less than 40 years. The mean age of the study subjects were 59.65 ± 19.14 yrs. Distribution of study subjects as per sex shows that 54% of study subjects were male whereas others rest 46% were female.

The disability was based on the MRS score. Maximum numbers of patients were in severe disability score group. The prevalence of systemic hypertension was present in 114 patients and absent in 86 patients. On basis of MRS score the systemic hypertension was seen maximum in severe MRS score and least in mild MRS score group. MCA infarct was seen in 104 patients, multi infarct was seen in 38 patients, lacunars infarct was seen in 50 patients and post circulation stroke was seen in 8 patients.

The association between GCS and albumin was found to be significant (p value < 0.05) using the anova test. The mean albumin in those with $GCS > 13$ was 5.34 mg/dl while those for $GCS < 9$ was 4.26 mg/dl. Using annova test, the association between MRS and serum albumin had a p value < 0.05 which was significant. Hence there was a negative correlation between serum albumin at admission with the MRS score at 120 days. The mean albumin level in subjects with mild disability was 5.30 mg/dl, as opposed to 4.42 mg/dl in patients with severe disability, and 3.10 mg/dl in patients who died. The higher the serum albumin levels, the lower the MRS score, hence better the outcome at 120 days.

Table 1: Glasgow Coma Scale Vs Serum Albumin

Glasgow Coma Scale	Serum Albumin level
Mild	5.34
Moderate	4.94
Severe	4.26

Discussion

Albumin is a molecule with multifaceted action on various systems in the body. Neuroprotective effects of albumin have been well documented in animal studies. Studies have been conducted in the western population regarding the usefulness of serum albumin as an indicator of prognosis in ischemic stroke. There are few Indian studies in this regard [7, 12].

In our study, 56% were male, and the remainder female, in keeping with the other studies on stroke undertaken in our population Majority of patients was in the 51-60 year age group, constituting 24% of the total patients. The mean age of 57.66 ± 12.4 , the oldest being 85 years old the youngest 27 years. There was no correlation between the age and serum albumin [7].

The major comorbidity that contributed to ischemic stroke in our study was systemic hypertension (57%), while diabetes constituted 27% of the total, while 18% had both. There was no significant association between serum albumin and comorbidities. The other risk factors were coronary artery disease, dyslipidemia and rheumatic heart disease (RHD). RHD contributed to the majority of stroke less than 35 years.

Smoking and alcohol intake was found in 32% of the subjects. Majority of subjects had lesion in the MCA territory (52%) in keeping with the national and international studies.

The mean albumin level in subjects with mild disability was 5.3 mg/dl, as opposed to 4.42 mg/dl in patients with severe disability, and 3.10 mg/dl in patients who died. The higher the serum albumin levels, the lower the MRS score, hence better the outcome at 120 days.

Conclusion

Serum albumin has a significant association with the severity as well as the prognosis of stroke.

Conflict of Interest

Not available

Financial Support

Not available

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