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Serum Albumin Level as a Prognostic Indicator of Acute Ischemic Stroke

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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. Hence the aim was to study whether serum albumin is a good prognostic indicator of acute ischemic stroke using modified ranking scale at 3 months follow up of patients admitted in general medicine ward.

Material and Method: The study population consisted of 200 patients who got admitted in medical wards of our hospital with first instance of ischemic stroke within the first 72 hours of onset of symptoms. These patients were included in the study after getting informed consent either from the patient or from the legal guardian.

Results: The mean albumin level in subjects with mild disability was 5.74 mg/dl, as opposed to 4.21 mg/dl in patients with severe disability, and 3.34 mg/dl in patients who died. The higher the serum albumin levels, the lower the MRS score, hence better the outcome at 90 days.

Conclusion: Albumin is a multi-factorial protein which has been proven to have neuroprotective effect in animal studies. There was a positive correlation between the SSS score at admission and the serum albumin. The association between GCS and albumin was found to be significant (p value<0.05) using the anova test. Serum albumin has a significant association with the severity as well as the prognosis of stroke.

Key Words: Acute Ischemic Stroke, Disability, Mortality, Serum Albumin

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Introduction

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]

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.[2, 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. As late as 2000, India was ranked among countries lacking sufficient data on stroke. Over 80% of death due to stroke occurs in low-income and middle income regions of the world. Identifying predictors of mortality is important so that prompt therapeutic measures could be initiated to improve outcome.[4, 5]

Early mortality due to stroke is directly related to stroke. Complications affect the mortality only later in the course .Previous studies have elucidated the various risk factors of stroke as well as the factors which influence mortality, which serve as predictors of mortality. Stroke severity, type of stroke, increased age, level of consciousness and hyperglycaemias are a few of them. These are non-modifiable, hence of limited interest in clinical practise. Identification of predictors of mortality which are modifiable are vital so that prompt therapeutic measures can be started to improve outcome.[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.[7] Serum albumin level at admission was found to be an independent prognostic factor for ischemic stroke outcome in studies done in western population. 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 rythrocyte aggregation.[8, 9]

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. Hence the aim was to study whether serum albumin is a good prognostic indicator of acute ischemic stroke using modified rankin scale at 3 months follow up of patients admitted in general medicine ward.

Material and Methods

This observational study was conducted in Tertiary Hospital of India over a period of one year. Approval was obtained from the Ethics Committee, medical college. The study population consisted of 200 patients who got admitted in medical wards of our hospital with first instance of ischemic stroke within the first 72 hours of onset of symptoms. These patients were included in the study after getting informed consent either from the patient or from the legal guardian.

Study design- longitudinal 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

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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.

A detailed history was elicited from the attenders, followed by general examination, an elaborate CNS examination and relevant examination of other systems. Vitals were stabilised, 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). 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 90 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 Microsoft Excel spreadsheet and analysed statistically. The significance of association was tested using Anova and Kruskal wallis test. Statistical analysis was carried out to establish whether a statistically significant association exist between serum albumin level on admission and the stroke severity, as well as the functional outcome at the end of 90 days. The secondary outcomes that were aimed to be tested included the association with risk factors and the viability of the stroke scales.

Results

A total of 200 patients who satisfied the inclusion and exclusion criteria were included in the study. The age range o the included patients were from 30 to 80 years. The maximum numbers of patients were in the age group of 51 – 60 years. There were 108 males and 92 females in the study.

As per the scores for disability on the MRS range the patients were divided into mild moderate and severe disability. There were 46 patients with mild score, 46 with moderate disability and severe disability were present in 58 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 5.92 mg/dl while those for GCS< 9 was 4.30 mg/dl.

The association between SSS and albumin had a significant association with a p value<0.05. Hence it proves that there was a positive correlation between the SSS score at admission and the serum albumin. The mean albumin in patients with mild impairment was 5.76 mg/dl, while in those with severe impairment was 4.94 mg/dl.

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Using ANOVA 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 90 days. The mean albumin level in subjects with mild diability was 5.74 mg/dl, as opposed to 4.21 mg/dl in patients with severe disability, and 3.34 mg/dl in patients who died. The higher the serum albumin levels, the lower the MRS score, hence better the outcome at 90 days.

There was a strong negative correlation between the SSS score at admission and the MRS score at 90 days. This entails that higher the SSS score, lower the MRS score hence more the disability at 90 days.

Table 1: Disability based on MRS score

MRS score	No. of patients
Mild	46
Moderate	46
Severe	58
Death	50

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.[10]

Serum albumin acts as an independent predictor of mortality in various clinical settings. Serum levels of albumin may also serve as a marker of subclinical disease in elderly patients. Studies in hospitalised patients have revealed that low serum concentration of albumin is associated with prolonged hospital stay, more complications and higher mortality.[11] It also correlates with the prolongation of stay in intensive care unit, increased ventilator requirements and escalating rate of infections. Albumin slows the onset and enhances the vasodilatory response to nitric oxide. Nitric oxide by binding to the sulfhydryl groups of albumin, forms the S-nitrosothiol group which is not rapidly degraded. Thus albumin plays a role in the regulation of vasodilatory tone of vessels.[12]

Albumin therapy is also beneficial in cirrhotic patients with ascites who require paracentesis. Post-paracentesis circulatory dysfunction which is the increased plasma rennin activity 6 days after paracentesis is prevented by albumin therapy.[13]

In our study, 56% were male, and the ramainder female, in keeping with the other studies on stroke undertaken in our population Majority of patients were 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 corelation between the age and serum albumin.

The major co morbidity that contributed to ishemic 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

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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.

Conclusion

Albumin is a multi-factorial protein which has been proven to have neuroprotective effect in animal studies. There was a positive correlation between the SSS score at admission and the serum albumin. The association between GCS and albumin was found to be significant (p value<0.05) using the anova test. Serum albumin has a significant association with the severity as well as the prognosis of stroke.

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