SERUM ALBUMIN LEVEL AND SHORT-TERM OUTCOME FOLLOWING STROKE IN HOSPITAL ADMITTED PATIENTS

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ABSTRACT

Albumin is a non-glycosylated plasma protein synthesized primarily in the liver. It is a protein involved in the transport of small molecules in the blood and plays a key role in restricting fluid leakage from the vasculature into the tissue. Elevated level of serum albumin is related to haemo-concentration and reduced level is associated with malnutrition and chronic inflammatory diseases representing a negative acute phase protein. This cross sectional study was done to determine the association between admission serum albumin levels and short-term outcome following acute stroke. Consecutive first-ever acute stroke patients were enrolled between January 2016 and December 2016 at DMCH. On admission serum albumin were measured. Patients were then followed up for 10 days and outcome measure at the end of the study were 10-day mortality. Relationship between serum albumin and stroke outcome was determined.

A total of 100 stroke cases were thus included in the study comprising 66 males and 34 females. The mean age of patients was 69.2 ± 12.2 years. Of total, 74% patients were of ischemic stroke and 26% were of hemorrhagic stroke. Among them 22 patients expired in the hospitalization period within 10 days and remaining 78 patients were discharged. The mean serum level of albumin was 2.90 ± 0.57 g/dl in the expired group and 3.79 ± 0.51 g/dl in the discharged group. It may be concluded that low admission serum albumin may be significantly associated with poor outcome.

Key Words: Serum albumin, Stroke, Acute phase protein

Introduction

Globally about 15 million new stroke events occur every year, two-third of which occur in people living in low income and middle income countries. Demographic transition resulting from adaptation of westernized lifestyle is also likely to increase the burden of stroke in developing economies[1]. In general early in-hospital mortality from stroke is usually directly related to the stroke itself, whereas factors related to hospitalization and complication of being hospitalized influence death later in the course of acute stroke. Previous studies have identified factors such as stroke severity, stroke type, older age, impairment of consciousness and hyperglycemia as predictors of mortality following acute stroke[2-5]. Serum albumin is a multifunctional protein which along with other properties also offers neuroprotective effects. Experimental animal studies have shown human albumin in moderate to high doses to be a promising neuro-protectant in focal and global cerebral ischemia and traumatic brain injury[6,7].

Serum albumin is regulated by factors influencing protein synthesis, breakdown, leakage to the extra-vascular space and food intake. In clinical practice serum albumin is often considered as a marker of nutritional status and a negative phase protein that decreases in concentration during injury and sepsis[8]. Serum albumin has neuroprotective effect that is mediated by its multitude of actions including anti-oxidant properties, modulation of endothelial functions and venular perfusion[9]. Albumin ameliorates brain swelling, enhancing blood flow to sub-occlusive micro-vascular lesion, maintaining vascular patency and preventing reocclusion after successful thrombolysis[10].

Serum albumin is a negative acute phase protein and its concentration falls between day 1 and day 7 after stroke onset. Alvarez-perez FJ *et al.*[11] looked at potential association between lower albumin level and cardio-embolic stroke and found that mean serum albumin of patients with acute ischemic stroke was significantly lower than controls and stroke patients that died or remained dependent at discharge (from hospital) was significantly lower than survivors.

To the best of our knowledge, the effect of serum albumin on stroke outcome in Bangladesh is not clearly known. The objective of the present study was to determine the association between admission serum albumin levels and short-term outcome following stroke in hospital admitted patients.

Methods

The study was carried out at Dhaka Medical College Hospital (DMCH), Dhaka in which presenting first-ever acute stroke (within 72 hours of onset of stroke symptoms) cases that fulfilled the predetermined inclusion criteria were enrolled. Patients with CT-Scan confirmed acute stroke not in keeping with hemorrhagic stroke or subarachnoid hemorrhage and those

with appropriate clinical scenario with normal brain CT-scan result were also considered as stroke and were enrolled after informed consent.

Patients' characteristics and basic data including age, sex, Glasgow coma scale score, smoking status and coexisting disease and including diabetes mellitus, hypertension, ischemic heart disease were recorded. Serum albumin level were estimated. Patients with evidence of smoking habit, hypertension, renal or liver disease as well as those with fever or infections were excluded. Hypertension was defined as systolic blood pressure > 140 and diastolic pressure > 90 mm of Hg or positive history of taking antihypertensive drugs.

In this cross-sectional study, 100 patients from acute stroke were taken during a 12 month period of January 2016 to December 2016 in DMCH. Patients were then followed up for 10 days and outcome measures at the end of the study were 10-day mortality. Relationship between serum albumin and stroke outcome was determined.

Data were expressed as mean ± SD. The variables were compared between survivors and non-survivors. Statistical analysis was done by SPSS software version 15.0. Independent sample 't' test and chi square test were used for analysis where appropriate. P value < 0.05 considered as level of significance.

Results

A total of 100 stroke cases were included in the study comprising 66 males and 34 females. The age of the patients ranged from 58-84 years with a mean of 69.2 ± 12.2 years. 74% patients were of ischemic stroke and 26% were of hemorrhagic stroke. The mean Glasgow coma scale score was significantly lower in the expired group. Different variables are summarized and compared between survived

and non-survived cases in Table-1.

Among 100 patients about 22 patients expired in the hospitalization period within 10 days and remaining 78 patients were discharged. The mean serum level of albumin was 2.90 ± 0.57 g/dl in the expired group & 3.79 ± 0.51 g/dl in the discharged group. This difference was significant $P<0.001$) as shown in Table-2.

The mean serum level of creatinine was 0.90 ± 0.04 mg/dl in the expired group and 1.0 ± 0.06 mg/dl in the discharged group. The mean serum level of fasting glucose was 6.2 ± 0.02 mmol/l in the non-survived group & 5.6 ± 0.06 mmol/l in the survived group This difference was not significant $(P>0.05)$ as shown in Table-2.

Table-1: Comparison of different variables between survived and non-survived cases.

Variable	Non survived (n=22)	Survived (n=74)	P value
Age (year)	71.5 ± 12.1	66.9 ± 12.2	0.085
GCS score	7.2 ± 1.8	9.4 ± 0.5	0.003
Stroke type			0.708
Ischemic	20	55	
Hemorrhagic	6	19	

Level of significance was P<0.05

Table-2: Comparison of biochemical parameters between survived and non-survived cases.

Characteristic	Total (n=100)	Non survived (n=26)	Survived (n=74)	P value
Albumin g/dl: mean ($\pm$SD)	3.54 (0.79)	2.90 (0.57)	3.79 (0.51)	0.001
Serum creatinine mg/dl: mean ($\pm$SD)	0.96 (0.04)	0.90(0.04)	1.0(0.06)	0.30
Serum fasting glucose mmol/l: mean ($\pm$SD)	5.8 (0.02)	6.2 (0.02)	5.6(0.06)	0.24

Level of significance was P<0.05

Discussion

Albumin concentration have been used as a measure of health and disease for long time. Many conditions such as malnutrition, liver and kidney diseases may reduce serum albumin concentrations. The catabolic state and the associated neuro-endocrine response that is likely to follow an acute stroke may lead to altered serum albumin concentration and there is recent evidence linking the high stress reaction after stroke and under-nutrition[12].

In a recent study by Famakin et al (2010)[13], 1477 patient admitted cases with acute stroke were evaluated. In-patient hospital death were 10%. In the multivariate analysis the independent risk factors for mortality after stroke included older age, stroke type, Glasgow coma scale score (GCS) less than 9 and decreased serum albumin concentration. The serum level of albumin was <3.4 g/dl in the expired group. Hypoalbuminemia was found to be significantly associated with in-hospital mortality in our study.

The mean serum level of creatinine was 0.90 ± 0.04 mg/dl in the expired group and 1.0 ± 0.06 mg/dl in the discharged group. The mean serum level of fasting glucose was 6.2 ± 0.02 mmol/l in the non survived group and 5.6 ± 0.06 mmol/l in the survived group. This difference was not significant $(P>0.05)$.

On the other hand, the present study showed that the mean level of serum albumin was 2.90 ± 0.57 g/dl in the non-survived group and 3.79 ± 0.51 g/dl in the survived group. This showed that hypoalbuminemia was significantly associated with in-hospital mortality which is similar to the study by Famakin et al (2010)[13]. Likewise, low level of serum albumin and poor outcome patients of stroke is similar in two studies as well. Freiry *et al.*[14] showed that only severe admission hypo-albuminemia (serum albumin <2 mg/dl) is independently associated

with poor outcome in patients with acute stroke. The result of our current study is in line with the above mentioned study.

From our study it may be concluded that low level of serum albumin seems to be associated with in-hospital mortality after acute stroke.

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