

## Original Article

## EFFECT OF SERUM ALBUMIN ON OUTCOME OF STROKE IN CHILDREN AT TERTIARY CARE HOSPITAL

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**Objective:** The objectives of this study were to determine the frequency of favorable outcome of stroke in children presenting at tertiary care hospital and to compare the mean serum albumin levels in children with favorable and unfavorable outcome of stroke in tertiary care hospital.

**Methods:** Two hundred children in the age range of 1-14 years, meeting the inclusion and exclusion criteria were registered from pediatric and neurology department of Children Hospital & ICH Lahore. Informed consent was taken from their parents to include them in the study. Demographic information (name, age, sex, address) was collected. Serum albumin was sent to biochemistry lab of the hospital at the time of admission. Outcome of the stroke was determined by Modified Rankin Scale at the time of discharge and death in case and observed data was recorded on a specially designed proforma (attached).

**Results:** In our study, out of 200 cases, 40% (n=80) cases were between 1-7 years of age, 60% (n=120) cases were between 8-14 years of age, mean±sd was calculated as 7.75±3.49 years, 56% (n=112) cases were male, 44% (n=88) cases were females. Frequency of favorable outcome of stroke in children with stroke presenting in tertiary care hospital was calculated as 42.5% (n=85) while 57.5% (n=115) had unfavorable outcome. Comparison of mean serum albumin levels in children with favorable and unfavorable outcome of stroke in tertiary care hospital showed, 3.13±0.19g/dl in favorable outcome while 1.79±0.18g/dl in unfavorable outcome and p value was calculated as 0.0001 which shows a significant difference between mean serum albumin levels in favorable and unfavorable outcome of stroke.

**Conclusion:** We concluded that most of the pediatric stroke patients have unfavorable outcome and comparatively less patients have favorable outcome of stroke. Also, the mean serum albumin level in children with favorable outcome is higher and it is significantly lower in children with unfavorable outcome of stroke in tertiary care hospital. So higher the serum albumin in pediatric stroke patient one can expect good outcome of stroke.

**Keywords:** Stroke in children, favorable outcome, mean serum albumin levels.

### Introduction

An acute onset of focal neurological deficit persisting more than 24 hours is called stroke. Some pediatric neurologists include more transient deficit.<sup>1</sup> In neonates, about one of every 4,000 live births suffer from stroke and the risk of stroke from birth through age 18 is nearly 11 per 100,000 children per year.<sup>2</sup> Also, the top 10 causes of death for children includes stroke.<sup>3</sup> Two Asian studies reported incidences of pediatric stroke on population basis, first in Hong Kong and second study in an Iranian province, estimated an incidence of 2.1 per 100,000 children per year and an incidence of 1.8 per 100,000 children per year, respectively. Stroke resulting from vascular occlusion is ischemic stroke and from vascular rupture is haemorrhagic stroke.<sup>4</sup> Childhood stroke include death in 6-10%, seizure disorders in 15% and neurological deficit in 60-70% of patients.<sup>5</sup>

Albumin is produced in liver and it is the most abundant blood plasma protein constituting about 50% of human plasma proteins. It is a multifunctional protein. It maintains the oncotic pressure of the blood compartment which regulates blood volume. It also help in carrying the molecule including lipid soluble hormones, bile salts, unconjugated bilirubin, free fatty acids, calcium, transferrin, and some drugs.<sup>6</sup> This protein has been implicated in many neurological diseases because of its anti-oxidant property. Its ability to regulate the brain circulation and to modulate intracellular signalling of neuronal or glial cells are attributed as its direct neuroprotective actions.<sup>7</sup>

It has been found in various studies that the serum albumin is useful in predicting the functional outcome in stroke patients.<sup>8,9</sup> A study including 75 stroke patients determined mean serum albumin level in patients with good outcome of stroke and poor

outcome of stroke was  $3.03 \pm 0.61$  and  $2.08 \pm 0.61$ , respectively.<sup>10</sup> Patients that died had significantly lower serum albumin (1.66g/dl) than survivors ( $p=0.0001$ ). Favourable outcome of stroke was reported in 48% of patients while 30-day case fatality was in 17.3% of patients. In experimental models, administration of albumin to rats have proven the increased neuroprotection in both ischemic and hemorrhagic stroke.<sup>11</sup> The rationale of study is to compare the mean serum albumin levels in children with favorable and unfavorable outcome of stroke. To the best of our knowledge, the effect of serum albumin on stroke outcome in pediatric population is not known. All studies have been carried out in adult population. This will help us to determine the prognosis of stroke early in the course of disease in children and proper rehabilitation programs may be provided in time, limiting the morbidity and the cost of management.

## Methods

The study performed was descriptive case series study carried out at pediatric medicine and neurology department of The Children's Hospital and The Institute of Child Health, Lahore. Two hundred patients meeting inclusion and exclusion criteria, were enrolled in the study from 13 June to 13 December after taking informed consent from parents. Sampling technique was non purposive probability sampling. The inclusion criteria involved every patient with any acute neurological deficit persisting for more than 24 hours, confirmed on CT scan having age from 1 year to 14 years and patients with hemorrhagic or ischemic stroke. The exclusion criteria involved patients with transient neurological deficit less than 24 hours, head injury, any organic brain pathology and recurrent attack of stroke.

Serum albumin was sent to biochemistry lab of the hospital at the time of admission. Outcome of the stroke was determined by Modified Rankin Scale at the time of discharge and death in case. All data was collected into predesigned proforma (attached).

Data obtained were analysed using SPSS 17.0. All quantitative data like age and mean serum albumin levels were presented by mean and standard deviation. All qualitative data like gender and favorable outcome (i.e. score 0-3) was presented in the form of frequencies and percentages. Student t-test was used to compare the mean serum albumin levels in both groups (i.e. favorable and unfavorable). A  $p$  value  $\leq 0.05$  was considered as

significant.

## Results

A total of 200 cases fulfilling the inclusion/exclusion criteria were enrolled to determine the frequency of favorable outcome of stroke in children with stroke presenting in a tertiary care hospital and to compare the mean serum albumin levels in children with favorable and unfavorable outcome of stroke in tertiary care hospital. Age distribution of the patients was done which shows that 40% ( $n=80$ ) cases were between 1-7 years of age, 60% ( $n=120$ ) cases were between 8-14 years of age, mean  $\pm$  sd was calculated as  $7.75 \pm 3.49$  years. (Table No. 1)

**Table-1:** Age distribution ( $n=200$ ).

Age (in years)	No. Of Patients	Percentage
1-7	80	40%
8-14	120	60%
Total	200	100%
Mean $\pm$ SD	7.75 $\pm$ 3.49	

**Table-2:** Gender distribution ( $n=200$ ).

Age (in years)	No. Of Patients	Percentage
Male	112	56%
Female	88	44%
Total	200	100%

**Table-3:** Mean serum albumin levels in children with stroke in tertiary care hospital ( $n=200$ ).

Serum albumin	Mean	SD
	2.36	0.69

**Table-4:** Frequency of favorable outcome of stroke in children with stroke presenting in tertiary care hospital ( $n=200$ ).

Favourable Outcome	No. Of Patients	Percentage
Yes	85	42.5%
No	115	57.5%
Total	200	100%

**Table-5:** Comparison of mean serum albumin levels in children with favorable and unfavorable outcome of stroke in tertiary care hospital ( $n=200$ )

Serum albumin levels		Unfavourable outcome	
Favourable outcome		Mean	SD
Mean	SD		
3.13	0.19	1.79	0.18

$P$  value=0.0001

Gender distribution of the patients was done which shows that 56% (n=112) cases were male, 44% (n=88) cases were females. **(Table No. 2)**

Mean serum albumin levels in children with stroke in tertiary care hospital were calculated as  $2.36 \pm 0.69$  g/dl. **(Table No. 3)**

Frequency of favorable outcome of stroke in children with stroke presenting in tertiary care hospital was calculated as 42.5% (n=85) while 57.5% (n=115) had unfavourable outcome. **(Table No. 4)**

Comparison of mean serum albumin levels in children with favorable and unfavorable outcome of stroke in tertiary care hospital shows  $3.13 \pm 0.19$  g/dl in favourable outcome while  $1.79 \pm 0.18$  g/dl, p value was calculated as 0.0001 which shows a significant difference between favourable and unfavourable outcome. **(Table No. 5)**

## Discussion

Stroke is rare in pediatric age group but it has significant morbidity and mortality burden. To optimize the outcome of stroke in children it is required to understand that children with stroke present differently than adults and many of them present with unique risk factors. We know the neuroprotective role of albumin with all its pivotal role in hemodynamics of human body also serum albumin level is one of the biochemical markers of nutritional status, and malnutrition after acute stroke is a risk factor for poor outcome.

We planned this study to compare the mean serum albumin levels in children with favorable and unfavorable outcome of stroke as, the effect of serum albumin on stroke outcome in pediatric population is not known while all studies have been carried out in adult population.

In our study, out of 200 cases, 40% (n=80) cases were between 1-7 years of age, 60% (n=120) cases were between 8-14 years of age, mean  $\pm$ sd was calculated as  $7.75 \pm 3.49$  years, 56% (n=112) cases were male, 44% (n=88) cases were females. Frequency of favorable outcome of stroke in children with stroke presenting in tertiary care hospital was calculated as 42.5% (n=85) while 57.5% (n=115) had unfavourable outcome. We also

compared of mean serum albumin levels in children with favorable and unfavorable outcome of stroke in tertiary care hospital shows  $3.13 \pm 0.19$  g/dl in favourable outcome while  $1.79 \pm 0.18$  g/dl, p value was calculated as 0.0001 which shows a significant difference between mean serum albumin level of children with favourable and unfavourable outcome of stroke.

We correlated our study with a prospective study including 75 stroke patients which determined mean serum albumin level in patients with good outcome of stroke and poor outcome of stroke was  $3.03 \pm 0.61$  and  $2.08 \pm 0.61$ , respectively.<sup>10</sup> Favourable outcome of stroke was reported in 48% of patients while 30-day case fatality was in 17.3% of patients.

A few studies suggest that increased risk of stroke is associated with low serum albumin level. In one prospective study group with high serum albumin (>44 g/l) vs. low serum albumin (<42 g/l) had reduced stroke incidence. In the cross-sectional Norwegian Oslo Health Study, low albumin (less than or equal to 47 g/l) was associated with increased prevalence of self-reported stroke (OR: 1.83; 95% CI: 1.202-2.78) after adjusting for age and sex.<sup>14</sup>

We did not find much data to compare our results as no such study is available in children, however, our findings in our local population are primary, while some other trials are required so that our results may be authenticated and proper rehabilitation programs may be provided in time, limiting the morbidity and the cost of management as well. Also experimental models in children may be started regarding institution of albumin therapy in stroke patients so as to decrease the morbidity.

## Conclusion

We concluded relatively lower frequency of favorable outcome of stroke in children and higher mean serum albumin level in children with favorable outcome while significantly lower mean serum albumin level in children with unfavorable outcome of stroke in tertiary care hospital.

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## Picture Quiz

What can you interpret from following chest x-ray ?



See Answer on page# 207