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OUTCOME AND PROGNOSTIC FACTORS OF STROKE IN CHILDREN PRESENTING AT AN ARMY HOSPITAL IN PAKISTAN

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ABSTRACT

Objective: To determine the outcome and prognostic factors of stroke in children presenting at Military Hospital Rawalpindi.

Study Design: Cross-sectional study.

Place and Duration of Study: This study was conducted at the department of Pediatrics, Military Hospital Rawalpindi, from Oct 2012 to Mar 2014.

Patients and Methods: Sixty consecutive children presenting with stroke were included in this study after taking written informed consent from the guardians/parents. A predesigned proforma was used to record patient's demographic details along with the presenting complaints, type of stroke, underlying cause and outcome.

Results: The mean age of the patients was 3.49 ± 3.29 (Mean ± SD) years. There were 35 (58.3%) male and 25 (41.7%) female children. Ischemic stroke was the most frequent and was observed in 37 (61.7%) patients followed by hemorrhagic (16.7%), sinovenous thrombosis (8.3%) and ischemia with hemorrhagic findings (6.7%). Mixed lesions and transient ischemic attacks were reported in 2 (3.3%) patient each. Mean length of hospital stay was 9 ± 6 (Mean ± SD) days. Sixteen (26.7%) children recovered completely while 41 (68.3%) children had some neurological deficit at discharge. Mild to moderate deficit was recorded in 21 (35.0%) children while 20 (33.3%) children had severe deficit. Three (5.0%) patients expired during hospital stay.

Conclusion: Ischemic stroke was the most common cause of paediatric stroke. Important risk factors of peadiatric stroke included congenital heart diseases and intracranial infections. Poor prognostic factors included male gender, age less 5 years and congenital heart disease.

Keywords: Outcome, Pediatric stroke, Prognostic Factors.

INTRODUCTION

According to American Stroke Association, the risk of stroke from birth through age 18 is nearly 11 per 100,000 children per year[1]. There are critical age-related differences in children compared with adults, which make the diagnosis and treatment of children with stroke very complex. Stroke in children is relatively rare. Unlike adults the presentation of stroke in children is not that much straight forward. Stroke in adult may present with facial palsy, limb weakness or difficulty in speech but this is not the case in paediatric population. Stroke in children may present with unusual symptoms like headache, fits and unconsciousness and may frequently results in lack of appreciation and delay in diagnosis[1,2]. The etiologies of stroke in children are multiple risk factors coexist unlike unifactorial etiology of stroke in adults. Heart disease whether congenital or acquired, malformations, metabolic and hematological disorders and vasospastic conditions like migraine are seen more frequently in childhood strokes while atherosclerosis, hypertension, hyperlipidemia, smoking and oral contraceptives are key risk factors in adult[3,4]. Better under-standing and developments in neuroimaging practices have ensued improved appreciation and diagnosis of this disorder[2]. Over half of the strokes occur in children less than 1 year of age.

Death has been reported in 5% to 28% of the cases. Of those surviving stroke, 50% to 80% develop permanent neurologic deficit most commonly hemiparesis or hemiplegia. The decreased quality of life (QoL) affects not just the

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child but the entire family and the society at large[1]. After pediatric stroke, cognitive problem including deterioration in IQ and executive functions are seen in about 50% of children[5]. Younger age at stroke and occurrence of epilepsy are associated with worse prognosis[3]. Five year health care cost is 15 times higher for the children with stroke than the healthy children of same age. Given the onset of injury during childhood and the exect on quality of life for the child and family, the socioeconomic and emotional costs to society are amplified[4]. Aggressive management of such children is vital to avoid damage to the developing brain and decrease the long term sequel. In children, the presentation is however diverse; elusive and non-specific. As a result the diagnosis of stroke is frequently missed or delayed resulting in poor long term outcome[6].

The purpose of the current study was to determine the outcome of children presenting with stroke at an army hospital in Pakistan along with prognostic factors associated with poor outcome. Knowing these prognostic factors would help in identification of high risk children in future practice enabling timely and aggressive management thus reducing the morbidity and mortality associated with stroke.

PATIENTS AND METHODS

This was a cross sectional study conducted at the department of Pediatrics, Military Hospital Rawalpindi from October 2012 to March 2014. Sample size was calculated using WHO sample size calculator keeping desired precision on 4.5% and confidence level of 95%. Through was non probability consecutive sampling, sixty (60) consecutive children presenting with stroke were included in the study. The inclusion criteria were clinical diagnosis of stroke or sinovenous thrombosis on the basis of detailed history, thorough neurological examination along with the evidence of ischemic or hemorrhagic damage or thrombosis in cerebral veins on CT or MR scans. Children with perinatal strokes were excluded from the study. The outcome of pediatric stroke was assessed at the time of discharge from hospital by using King's Outcome Scale for Childhood Head Injury (KOSCHI)[7]. The outcome was categorized as

Category-1: Death

Category-2: Vegetative state / severe disability

Category-3: Moderate disability

Category-4: Good recovery

The patients with non-cardio embolic-ischemic stroke were treated with antiplatelet therapy (Aspirin) (25-150 mg/day) and the patients with sinovenous thrombosis received heparin infusion for 15 days followed by oral anticoagulant. The patients with hemorrhagic stroke were managed medically in the acute stage. The patients with acquired or congenital heart disease with or with-out atrial fibrillation were given anticoagulant. Associated infection was treated by appropriate antibiotics, anti-tubercular or antifungal treatment and vasculitis was treated with corticosteroids. Seizures were managed by antiepileptic drugs. All the patients were managed by a single consultant pediatrician to eliminate bias. A predesigned proforma was used to record patient's demographic details along with the type of stroke, underlying cause and outcome.

All the children were subjected to detailed history and clinical examination. All the laboratory investigations and neuroimages were reported by single experienced pathologist/ radiologist having minimum of 5 years of experience. A predesigned proforma was used to record patient's demographic details along with the type of stroke, underlying cause and outcome. Strict exclusion and inclusion criteria was followed to control confounders and bias in the study results.

All the collected data was analyzed in SPSS version 17. Frequencies and percentages were calculated for categorical variables like gender, outcome and type of stroke. Mean ± SD were calculated for numerical variables like age (in years) of the children. Data was stratified in regard to age, sex, presentation and risk factors.

Post stratification chi square test was applied with *p*-value calculated. A *p*-value less than or equal to 0.05 was considered significant. All results were presented in the form of tables and graphs.

RESULTS

The age of the patients ranged from 1 month to 10 years with a mean of 3.49 ± 3.29 (Mean ± SD) years. There were 35 (58.3%) male and 25 (41.7%) female children (table-I). Ischemic stroke was the most frequent and was observed in 37 (61.7%) patients followed by hemorrhagic stroke (16.7%), sinovenous thrombosis (8.3%) and ischemia with hemorrhagic findings (6.7%). Mixed lesions and transient ischemic attacks were reported in 2 (3.3%) patient each (table-II).

Mean length of hospital stay was 9 ± 6 (Mean ± SD) days. Sixteen (26.7%) children recovered completely while 41 (68.3%) children had some neurological deficit at discharge. Mild to moderate deficit was recorded in 21 (35.0%) children while 20 (33.3%) children had severe deficit. Three (5.0%) patients expired during hospital stay (table-III).

When stratified the outcome for various age, gender, presenting feature, type of stroke and attributing factors, frequency of severe deficit and death was significantly higher with age under 5 years (p=0.05), male gender (p=0.04), congenital heart disease (p=0.03) and intracranial infections (0.04). The frequency of severe neurological deficit was also higher with ischemic stroke, seizures, fever, unconsciousness and hemiplegia at presentation and in children with iron deficiency anemia but the difference was statistically insignificant (p>0.05) as shown in table-IV.

Table-I: Demographic features of study participants.

Characteristic	**Frequency (Percentage)**
Age (years)	3.49 ± 3.29 (Mean ± SD)
Age Groups	
<5 years	46 (76.7%)
5-10 years	14 (23.3%)
Gender	
Male	35 (58.3%)
Female	25 (41.7%)

Table-II: Type of stroke in study participant.

Types of Strokes	**Frequency (%)**
Ischemic Stroke	37 (61.7)
Hemorrhagic Stroke	10 (16.7)
Sinovenous thrombosis	5 (8.3)
Ischemia with hemorrhagic findings	4 (6.7)
Mixed lesions with all three findings	2 (3.3)
Transient ischemic attack	2 (3.3)

Table-III: Frequency of Outcome of the study participant.

Characteristic	**Study Participant (n=60)**
No Deficit	16 (26.7%)
Mild - Moderate Deficit	21 (35.0%)
Severe Deficit	20 (33.3%)
Expired	3 (5.0%)

DISCUSSION

In the present study, mean length of hospital stay was 9 ± 6 days. A similar mean length of hospital stay (7 ± 5 days) has been reported previously by Chand *et al*[6] (2016) among children presenting with stroke at Aga Khan

University, Karachi. Lee *et al*[8] however reported much longer mean hospital stay of 16 ± 11 days. Most of the children with stroke in our study were male (58%) as compared to female (42%). Similar male predominance has been mentioned in the international literature too[9]. In the present study, 16 (26.7%) children recovered completely while 41 (68.3%) children had some neurological deficit at discharge. Out of them, 21 (35.0%) children had mild to moderate deficit while 20 (33.3%) children had severe deficit. Three (5.0%) patients expired during hospital stay. Parakh *et al*[10] in a study of 50 children with stroke reported similar outcome; completely recovered (26%), mild-moderate deficit (36%), severe deficit (30%) and expired (8%). Beslow *et al*[11] (2010) reported frequency of neurological deficit at discharge to be 62% in Indian children presenting with hemorrhagic stroke with a mortality rate of 4.6%. Chand *et al*[7] reported similar frequency of neurological deficit at discharge (48.3%). They however reported much higher mortality rate of 28%. Lee

Table-IV: Predictors of Outcome.

Risk Factor	n	No Deficit (n=16)	Mild-Moderate Deficit (n=21)	Severe Deficit (n=20)	Expired (n=3)	*p*-value
Age Groups						
<5 years	46	11 (23.9%)	13 (28.3%)	19 (41.3%)	3 (6.5%)	0.05*
5-10 years	14	5 (35.7%)	8 (57.1%)	1 (7.1%)	0 (0.0%)	
Gender						
Male	35	5 (14.3%)	13 (37.1%)	14 (40.0%)	3 (8.6%)	0.04*
Female	25	11 (44.0%)	8 (32.0%)	6 (24.0%)	0 (0.0%)	
Presentation						
Type of Stroke						
Ischemic	37	8 (21.6%)	12 (32.4%)	15 (40.5%)	2 (5.4%)	0.53
Hemorrhagic	10	4 (40.0%)	3 (30.0%)	2 (20.0%)	1 (10.0%)	
Seizures						
Yes	41	11 (26.8%)	14 (34.1%)	14 (34.1%)	2 (4.9%)	0.996
No	19	5 (26.3%)	7 (36.8%)	6 (31.6%)	1 (5.3%)	
Fever						
Yes	34	9 (26.5%)	10 (29.4%)	13 (38.2%)	2 (5.9%)	0.71
No	26	7 (26.9%)	11 (42.3%)	7 (26.9%)	1 (3.8%)	
Unconsciousness						
Yes	29	8 (27.6%)	9 (31.0%)	10 (34.5%)	2 (6.9%)	0.87
No	31	8 (25.8%)	12 (38.7%)	10 (32.3%)	1 (3.2%)	
Hemiplegia						
Yes	20	3 (15.0%)	6 (30.0%)	9 (45.0%)	2 (10.0%)	0.22
No	40	13 (32.5%)	15 (37.5%)	11 (27.5%)	1 (2.5%)	
Risk Factors						
Congenital Heart Disease						
Yes	8	1 (12.5%)	2 (25.0%)	3 (37.5%)	2 (25.0)	0.039*
No	52	15 (28.8%)	19 (36.5%)	17 (32.7%)	1 (1.9%)	
Intracranial infection						
Yes	21	4 (19.0%)	4 (19.0%)	11 (52.4%)	2 (9.5%)	0.048*
No	39	12 (30.8%)	17 (43.6%)	9 (23.1%)	1 (2.6%)	
Iron Deficiency Anemia						
Yes	10	2 (20.0%)	3 (30.0%)	4 (40.0%)	1 (10.0%)	0.79
No	50	14 (28.0%)	18 (36.0%)	16 (32.0%)	2 (4.0%)	
Vasculitis						
Yes	13	3 (23.1%)	5 (38.5%)	4 (30.8%)	1 (7.7%)	0.94
No	47	13 (27.7%)	16 (34.0%)	16 (34.0%)	2 (4.3%)	

Chi-square test, *observed difference was statistically significant.

et al[8] (2006) reported frequency of death to be 14.7% among such children at Taiwan with neurological deficit in 45% of children. Kalita *et al*[1] (2013) also reported similar mortality rate of 8.9%. Sébire *et al*[12] also observed a similar frequency of 62% for neurological deficit but they reported much higher mortalityrate of 11.9% among Canadian children presenting with cerebral venous sinus thrombosis. Seizure was a presenting symptom in stroke patient in our study. Same has been mentioned in the literature[13].

In the present study, age under 5 years (p=0.05), male gender (p=0.04), congenital heart disease (p=0.039) and intracranial infections (0.048) were identified as predictors of poor outcome. Previously Sebire *et al*[11] and Patra *et al*[14] reported significantly worse neurological outcome for younger age (p=0.008) and infectious etiologies (p<0.05) respectively. Lee *et al*[8] however identified impaired consciousness (p=0.004) and fever (p=0.02) at presentation to be predictor of poor outcome. They didn't observe any association with age, gender and any other risk factor.

The few key limitations to the present study were single hospital cohort, referral bias and lack of long term follow up. There is need to repeat this study over larger sample size involving multiple pediatric units to obtain more accurate data on the outcome and prognostic factors of pediatric stroke.

CONCLUSION

Pediatric stroke added significantly to children mortality and morbidity in our set up. The most common cause of pediatric stroke in our set up was ischemic stroke followed by hemorrhagic stroke. Age under 5 years, male gender, congenital heart disease and intracranial infections were identified as predictors of poor outcome.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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