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Original Research Article

Clinico-Etiological Profile of Childhood Stroke in a Tertiary Care Hospital in Mumbai

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ABSTRACT

Background: Stroke is relatively rare in children, but can lead to significant morbidity and mortality. Understanding that children with stroke present differently than adults and often present with unique risk factors will optimize outcome in children. Despite an increased incidence of pediatric stroke, there is often a delay in diagnosis, and cases may still remain under- or misdiagnosed. Clinical presentation will vary based on the child's age, and children will have risk factors for stroke that are less common than in adults
Objective: To determine the clinical and etiological profile of childhood stroke.
Materials and Methods: This study was conducted in a tertiary Care Hospital of Mumbai. All children from 6 months to 12 years, diagnosed as childhood stroke by radio-imaging were included in our study. Etiologies were determined on the basis of clinical examination, related blood investigations and radio-imaging findings. Data gathered from the stroke patients were entered into a preformed proforma and appropriate statistical analyses were done.
Result: Most commonly found clinical presentation was hemiparesis (84.84%). Next in place were seizure (57.57%), altered sensorium (54,54%) , fever and cranial nerve involvement (45.45%) each. The most common etiology of childhood stroke in our hospital was found to be an intracranial infection (38.70%), followed by Idiopathic. Stroke was ischemic in nature in 93.93% of cases. Among the clinical features alteration of sensorium, and fever were significantly ($P < 0.01$) more in infectious cases of stroke, but hemiparesis was significant ($P < 0.05$) in noninfectious etiology.
Conclusion: Intracranial infection is the commonest etiology of stroke in pediatric patients presenting at our hospital. Commonest type was an ischemic stroke

Keywords: Hemiplegia, infections, stroke

INTRODUCTION

Stroke in pediatric age group is not as common as in adults. Common etiologies of stroke are also different in this age group. Pediatric stroke is now recognized as an important cause of morbidity and mortality in children. The incidence of the stroke exceeds 8/100,000/year. [1,2] In children, the presentation of stroke is often subtle and nonspecific that can also be attributed to other neurological disorders. The rarity of the condition and paucity of signs and symptoms can cause a delay in diagnosis and initiation of treatment. [1,3] However, diagnosing the cause of stroke helps in providing optimum treatment and appropriate preventive measures. Specific etiology and outcome of childhood stroke

are less commonly reported [4] from the Asian countries. Thus, we undertook this study to determine the clinical and etiological profile and associated risk factors of childhood stroke in a tertiary Care Center

MATERIALS AND METHODS

This retrospective study on the clinic-etiological profile of childhood stroke was carried out in the Department of Pediatric Medicine in a tertiary care hospital In Lokmanya Tilak Municipal Medical College& General Hospital, Sion, Mumbai, Records of All patients' between the age group of 6 months and 12 years admitted with signs and symptoms suggestive of stroke (hemiparesis, fever, seizure, altered consciousness, etc.,) and later diagnosed as stroke by radio-imaging were included in our study. Children are with history of birth asphyxia, spinal cord/brain traumas were excluded from this study. Detailed history, condition on admission was recorded from proforma & taken on a predesigned and pretested proforma. Clinical examination findings were noted and recorded accordingly, including routine measurement of blood pressure and detailed examination of the neurological system. Investigations were based on the findings on history and clinical examination and included complete blood count, prothrombin time, activated partial thromboplastin time, platelets count, electrocardiogram, echocardiography, lumbar puncture with cerebrospinal fluid analysis, blood protein C and protein S analysis, High Performance Liquid Chromatography, Computed Tomography scan brain, Magnetic Resonance Imaging brain, and Magnetic Resonance Angiography. Institutional Ethical Committee permission was taken

All data were collected, compiled and subjected to statistical analysis with the help of SPSS software (Version 17.0; IBM). Microsoft Word and Excel 2007 were used to generate the tables, graphs etc. Categorical variables were compared in two groups with the help of Chi-square test. All tests were two-tailed. A p <0.05 was considered as statistically significant.

RESULTS

During the study period, 33 patients were eventually diagnosed as having childhood stroke and were included in our study.

Stroke is common in age group of 1 year to 3 year in both male & female with M:F ratio of 1:1.2.The mean age of stroke patients is 3.16 ± 3.5 years and the median age is 2.75 years.

Table 1: Age and Sex wise distribution of patients with stroke (n=33)

Age	Gender		Total
	Male	Female	
< 1 Year	3 (20%)	1 (5.55%)	4 (12.12%)
1 years - 3 Years	7(46.66%)	9 (50%)	16 (48.48%)
4years - 7 Years	2(13.33%)	4 (22.22%)	6 (18.18%)
8 years – 12 yrs	3(20%)	4 (22.22%)	7 (21.21%)
Total	15 (100%)	18 (100%)	33 (100%)

Majority of patients 21 (63.63%) had subacute onset (24hr - 5 days). A small number of patients 7 (21.21%) had symptom duration of less than 24 hrs (acute onset). and 5 (15.15%) had symptoms present more week (chronic onset)

Among total 33 stroke patients in our study, 31 (93.93%) cases were diagnosed as ischemic stroke and 2 (6.06%) cases as a hemorrhagic stroke [Figure 1]

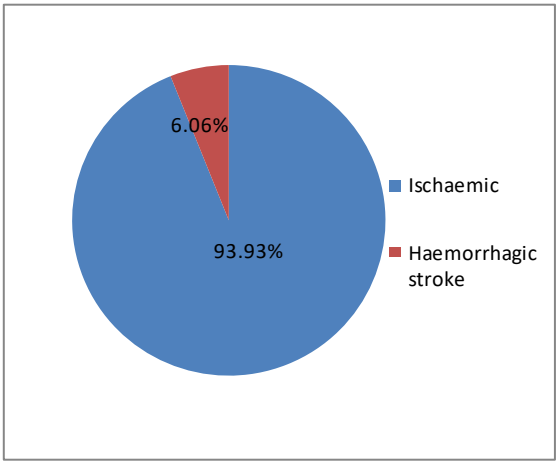

Figure 1: Distribution Of Stroke

The most common clinical presentation of childhood stroke that we found in this study [Figure 2], was

hemiparesis (28 cases [84.84%]), followed, respectively, by seizure (19 cases [54.54%]), altered consciousness (17 cases [51.51%]), both fever and cranial nerve palsy (15 cases [45.45%] each), and finally speech abnormality.

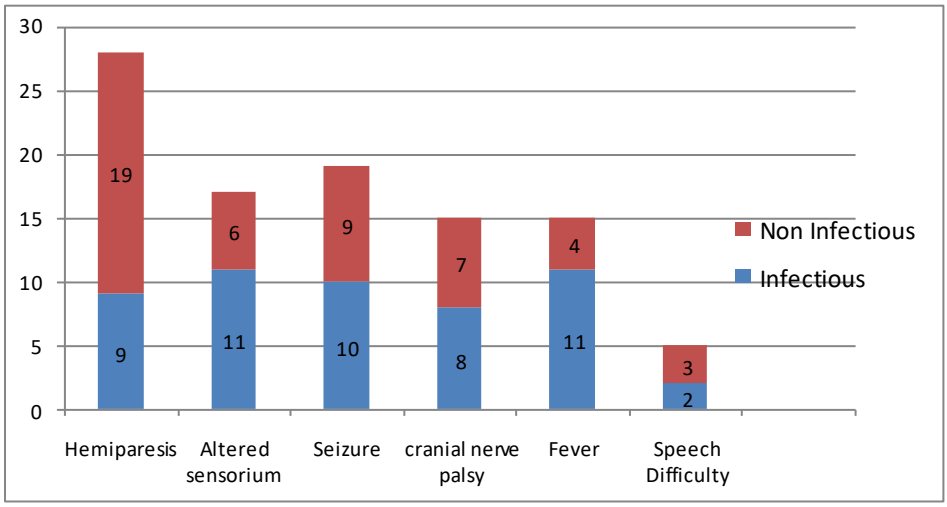

Figure 2: Comparison of Different Clinical Presentation Between Infectious and Non Infectious Cuases Of Stroke

Among all the clinical features, hemiparesis was found to be significantly more common in patients with noninfectious etiology of stroke (P = 0.009). Whereas, altered consciousness, and fever were found to be more commonly associated with infectious etiology, and the difference was statistically significant (P = 0.006, and 0.004, respectively) [Table 2]

Table 2: Comparison Of Different Clinical Presentation Between Infectious and Non Infectious Cuases Of Stroke

Clinical feature	Infectious (n=12)	Non Infectious (n=21)	p Value
Seizure	10 (83.33%)	9 (42.85%)	0.332
Altered sensorium	11 (91.66%)	6 (28.57%)	0.006*
Fever	11 (91.66%)	4 (19.04%)	0.004*
Hemiparesis	9 (75%)	19 (90%)	0.009*
Speech Abnormalities	2 (16.16%)	3 (14.28)	0.945
Cranial nerve palsy	8 (75%)	7 (42.85)	0.448

Regarding the etiologies [Table 3], intracranial infection was found to be the most common (12 patients; 38.70%), cause of ischaemic stroke followed by idiopathic (7 patients; 22.58%), moyamoya (6 patients; 19.53%), haematological (4 patients; 12.90%), and cardiac (2 patients; 6.45%.)

Table 3: Etiology Of Ischaemic Stroke

S.No	Etiology	No Of Cases	Percentage
1	Infective	12	38.70
	Tuberculous meningitis	7	58.33
	Encephalitis	2	16.66
	Meningo encephalitis	2	16.66
	HIV	1	8.33
2	Idiopathic	7	22.58
3	Moya Moya	6	19.53
4	Haematological	4	12.90
	Sickle cell anemia	2	50
	Protein C & S deficiency	1	25
	Hyperhomocysteinemia	1	25
5	Cardiac	2	6.45

Among laboratory parameters Anaemia was associated with 5(16.12%) cases, 8(61.53%) cases on CSF analysis shows tuberculous meningitis of which 2 (28.57%) has positive CSF gene expert.2 (6.45%) cases has PS for sickle cell was positive and abnormal prothombotic workup each (1 case of Protein C & S deficiency &Hyperhomocysteinemia each)

Regarding the neuro imaging, clinical Presentation correlated well with neuro imaging. MCA is most commonly involved (21 cases {61.94}) followed by ACA (8 cases {23.52}), & PCA (5 cases {14.70})MCA involvement was common with infectious etiology (83.33%)& both cases cardiac etiology has MCA

involvement. One case of hyperhomocysteinemia shows AICA involvement.

DISCUSSION

Pediatric stroke is now recognized as an important cause of morbidity and mortality. Stroke is defined as a sudden-onset, focal, neurologic deficit resulting from irreversible, focal, ischemic or hemorrhagic damage to the brain parenchyma secondary to a cerebro-vascular disorder. [5] The present study is retrospective study conducted in the department of Pediatric medicine in a tertiary care hospital of Mumbai. Though ischemic stroke is rare in children, these are more common than the hemorrhagic strokes. [6-8]

Totally, 33 patients of childhood stroke were included in study. Male sex is more prevalent in our study and 18 (54.54 %) were female patients and 15 (45.45%) were male patients with male to female ratio of 1:1.2

Adequate identification and determination of etiology is absolutely necessary as stroke can be prevented in some children and treated in others. [6] In the present study, intracranial infection was the most common etiology, causing stroke in 12 (38.70%) patients, and tubercular meningitis was the commonest one among them. Other etiologies found in order of frequencies are idiopathic (7 patients; 22.58%), moyamoya (6 patients; 19.53%), haematological (4 patients; 12.90%), and cardiac (2 patients; 6.45%.) in contrast to our study, studies by Lee *et al*. [6] showed vasculopathy (35.5%) as the commonest cause, and intracranial infection was placed 4th in frequency in their study. Another Asian study by Lee *et al*. [7] also showed vascular etiology (33%) as commonest and Intracranial infection was found to be next most common. A study by Siddiqui *et al*. [10] from Abbottabad reported intracranial infection as the commonest etiology of stroke in their study, like ours.

Inflammatory mechanisms that accompany infections can stimulate coagulation by several pathways. These include expression of thromboplastin by monocytes and macrophages, [11] increased serum level of tumor necrosis factor which can affect pro-coagulant function of endothelium, inhibition of protein C and protein S anticoagulation systems [12] and increased levels of clotting factors like fibrinogen. [13,14] Thus, there can be a significant chance of overlap between infective and vascular etiologies, as the mechanism of stroke in intracranial infection is often some form of vascular catastrophe.

In regard to clinical symptoms of stroke, we have found in our study that hemiparesis (84.84%) is the commonest presenting feature with next most common being seizure (54.54%), which was similar to the finding from study by Lee *et al*. [6] altered consciousness, and fever were found to be significantly associated with stroke patients with infectious etiologies, focal neurological deficit (hemiparesis) was mostly associated with noninfectious etiology, while other clinical presentations (e.g., speech abnormality, Cranial nerve palsy, Headache) had no significant association with etiology. This type of data, relating the association of stroke symptoms with etiology is lacking in most of the Asian literature.

Table 3 : Clinical presentation of pediatric stroke

	Earle et al. [15]	DeVeber et al [2]	Meyer-Heim, Boltshauser et al. [16]	Our study
Hemiparesis or focal CNS deficit	94%	51 %	21%	100%
Altered Sensorium	28%	48%	88%	51.51%
Seizure	16%	-	29%	54.54%
Speech disorder, incl. aphasia	-	17%		15.12%
Fever	35-40%	-	35-40%	45.45%

Seizures were present in 54.54% of cases in this study which is lesser than Taiwan University hospital study [17] (21.1%) & Fritsch et al [16] (31.6%) Most common age group presented with seizures was 1-3 yrs (45%) followed by 4-7yrs age group (25%). Infective vasculitis was the most common cause of seizure (45%) which was also the most common cause of stroke in this study.

Three other important observations in this study are,
(i)About 81.1% Patients of infective vasculitis presented with seizure.
(ii) About 57.1% Patients of Idiopathic group presented with seizure
(iii) All the cases of Moya Moya (100%) presented with seizure

Fever was present in 45.45% of patients in this study. The most common etiology was infective vasculitis (54.1%) and rests of the etiologies were also infection related except the idiopathic group (10.5%). The most common age group presented with fever was 1-3yrs. In Taiwan university hospital study [17] fever was present in 21.1% of cases of acute hemiplegia.

About 50% of patients with presented with altered sensorium and the most common etiology was infective vasculitis (56.25%). Here also 81.8% of infective vasculitis cases and all the cases of 100% moyamoya presented with altered sensorium. Altered sensorium was the second most common presentation in both Taiwan University hospital study [17] (42.1%) and study by Fritsch et al [18] (57.9%)

About 15.15 % of Patients with presented with speech difficulty and the most common etiology was Idiopathic (77.8%). The most common age group involved was 1-3 yrs (66.7%) All the Idiopathic cases (100%) presented with dysphasia. Dysphasia was present in 31.6% patients of acute hemiplegia in the study by Fritsch.G et al.

Cranial nerve palsy was present in 45.45 % of cases in this study which is comparable to other studies like Taiwan University hospital study [17] (47.4%) In this study facial palsy was more common than other cranial Nerve Palsy which is comparable to the above mentioned studies. Infective vasculitis was the most common etiology for facial palsy & 1-3 yrs age group was the most common age group involved in this study

Regarding the neuro imaging, clinical Presentation correlated well with neuro imaging. Middle cerebral artery involved most commonly as compare to anterior cerebral and posterior cerebral which is constituent with Hong Kong University study [19]

Speech disturbances and altered consciousness were independent variables associated with ACA infarctions as compared with MCA stroke. The lower frequency of dysarthria or aphasia is explained because both Broca's motor speech area and sensory speech area of Wernicke are located in the vascular territory of the MCA . The lower frequency of decreased consciousness may be related to the small diameter of the lesion in ACA in comparison with MCA infarctions.

Our study had a few limitations. First of all, as it is a tertiary care hospital or referral center, prevalence may be higher than the general population in this hospital-based study. Hence, the data cannot be projected to the general population, for which population-based studies are necessary. Second, a number of hemorrhagic stroke patients were less and it may be that they were referred to the neurosurgery department without admitting in our department.

CONCLUSION

To conclude, intracranial infection was the commonest cause of stroke in pediatric age group found in this study. Commonest clinical presentation was hemiparesis. Commonest type was an ischemic stroke. With the help of newer diagnostic facilities, probability of finding an etiology of pediatric stroke is increased

in cases of both noninfectious and infectious etiologies, which can greatly facilitate to adopt early and appropriate measures to decrease the chances of recurrences of stroke and also provide immediate cure for better neurological outcome.

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