Clinico-epidemiologic Study of Childhood Stroke in a Pediatric Neurology Clinic in Southeast Rajasthan.

[1]Dr. Amrita Mayanger, Professor & Head, Department of Paediatrics, GMC, Kota.

[2]Dr. Rohit Jain, Resident Doctor, Department of Paediatrics, GMC, Kota.

[3]Dr. Gopi Kishan Sharma, Associate Professor, Department of Paediatrics, GMC, Kota.

[4]Dr. Arif Ahmed, Resident Doctor, Department of Paediatrics, GMC, Kota.

Corresponding Author: Dr. Rohit Jain, Resident Doctor, Department of Paediatrics, GMC, Kota.

Abstract

Introduction

Stroke is the sudden occlusion or rupture of cerebral arteries or veins resulting in focal damage and clinical neurologic deficits. Clinical manifestations of stroke include weakness or paralysis of a limb or the sudden inability to speak and the onset of the deficit may be within seconds, minutes or hours. Stroke is one of the most common neurological causes of admission to a hospital and is the second commonest cause of death in the world.[1]

Stroke is an important cause of childhood morbidity and lifelong disability, including motor and sensory impairments, cognitive deficits, and epilepsy. Regarding outcome, neurological deficits are reported to be present in at least two-thirds of survivors, and the mortality rate in pediatric stroke is reported to be 6 to 30%.[2]

In India, there is a lack of population-based published data about the incidence or prevalence of pediatric stroke. In the hospital-based studies from India, pediatric strokes have constituted less than 1% of all pediatric admissions,[3-4] but some studies report that the annual average incidence in India is 13-33/100,000 per year.[5] No studies reporting the incidence and prevalence of stroke in children are available from Southeast Rajasthan. In this context, this study was undertaken to assess the clinical epidemiologic profile of childhood stroke cases in a pediatric neurology clinic in Southeast Rajasthan.

Methodology

Study setting: The present study was conducted at the Pediatric neurology clinic being run at the Department of Pediatric Medicine in J.K Lon hospital attached to Government Medical College, Kota.

Study design: The present study design is a case series that includes patients from both record-based surveys of patients already registered in the Paediatric neurology clinic as well as new patients registered during the study period. The database of the Paediatric neurology clinic was reviewed and all patients of stroke were included in the study.

Study Duration: The study was carried out from August 2021 to June 2022

Study Population: 60 children with stroke up to the age of 18 years were included in the study after taking

Page 164

consent from their primary caregiver. Among these, 33 cases were enrolled in the study from a review of the Paediatric neurology clinic, and 27 patients were enrolled during the study period. These stroke patients were categorized as AIS, CSVT, HS, and PPERI.

Method of Data Collection

The proforma of the International pediatric stroke study (IPSS) study was used after appropriate and necessary modifications for data collection in the present study. It was the major tool of the study. Thus a standardized data collection instrument was developed to record the history, and sociodemographic profile of patients i.e. gender, age at onset and preexisting risk factors, nature of the neurological event, physical examination findings including a detailed history, etc.

All patients were registered in the study after prior consent from their primary caregiver. All new patients were examined as per protocol by a trained Pediatric neurologist and appropriate, necessary, and affordable investigations were conducted and managed appropriately in the pediatric ward. Similarly, data for old patients were also collected from the database of the Pediatric neurology clinic, and history and other remaining information were taken when they came for follow-up visits.

Compilation and Analysis of Data

Data was entered and analyzed by using Micro soft excel version 2007 and Statistical Package for social science ver.16(SPSS.16) and chi-square and t-tests were applied and a p-value less than 0.05 was considered statistically significant.

Results

In the present study 71.1% of patients had AIS, 16.7% had CSVT, 10% had PPERI and 1.6% had HS. In the present study, 5% of patients were neonates. Overall, 76.67 % were under the age of five years. 23.33% of patients were of more than five years of age group. The distribution of patients according to age is depicted in Table 1.

Table 2 depicts the Distribution of Patients According to Gender. AIS, CSVT, and HS were commonly seen in males while PPERI was found equally in both males and females. The overall sex ratio was 1.9 in favor of males but this distribution of type of stroke and gender of patients was not found to be statistically significant (p value=0.576)

The distribution of patients according to the onset of stroke is illustrated in figure 1. Out of 60 patients with stroke, 23.3% were old stroke and 76.7% were acute stroke. All PPERI patients had an old stroke.

Among 45 cases of acute stroke of AIS and CSVT only 3(6.6%) patients presented to the emergency room within ≤4 hours, and all of them belonged to AIS. The interval from stroke symptom onset to arrival at the Emergency room and diagnosis of acute stroke is depicted in table 3. Overall, the mean Interval from stroke symptom onset to arrival at an emergency room in acute stroke was found to be 27.8 hours while the mean Interval from stroke symptom onset to Diagnosis of acute stroke was found to be 120.7 hours, thus causing the average delay from arrival to Diagnosis to be 92.8 hours. The difference was found to be significant (t = -3.483, p= 0.001). This was also true for individual AIS and CSVT cases of acute stroke. (For AIS, t = -2.760, p= 0.009 and for CSVT, t = -3.348, p= 0.010).

Table 4 depicts the distribution of patients according to the laterality of stroke lesions on neuroimaging. Overall, 40(70.1%) patients had unilateral lesions. Among these left-sided (60%), stroke lesions were more common than right-sided (40%) stroke lesions. Among patients of AIS, around 75% of patients had a unilateral lesion and around 25% of patients had bilateral stroke lesions. Among

unilateral cases, left sided stroke lesions were seen more commonly than right-sided stroke lesions. Overall Left stroke lesions {19 (44.18%)} were most commonly seen on neuro-imaging in patients with AIS and 11(25.6%) patients with AIS had a bilateral lesion. Among patients with CSVT 3(30%) patients had only CSVT but no stroke lesion, Among rest 7 patients 1(14.3%) patient had a unilateral right-sided stroke lesion 6(85.7%) patients had bilateral stroke lesions. In a patient with HS, only left-sided stroke lesions were seen on neuroimaging. All PPERI stroke patients had unilateral stroke lesions. 2/3rd of patients had left-sided stroke lesions while 1/3rd patients had right-sided stroke lesions. In AIS majority of the patients (83.3%) had non-hemorrhagic infarcts, while only 16.7% of cases had hemorrhagic infarcts. The distribution of patients according to the status of the outcome at the time of discharge is depicted in table 5. As only 49 patients were hospitalized in the present study, the status of the outcome at the time of discharge was available for only these patients. Overall Mortality among stroke patients during hospitalization was found to be 6.1%. Around 70% of patients had a neurological deficit at the time of discharge.

Discussion

Data about childhood stroke is lacking due to the non-uniformity of definitions and criteria across the world. In India, there is a lack of population-based published data about the incidence or prevalence of pediatric stroke. No studies on the epidemiology of stroke in children are available from Western Rajasthan. A total of 60 children with stroke up to the age of 18 years were included in the study and data were collected for each patient after taking consent from the caregiver and compiled to make observations and results. In the present study, AIS was the most common type of stroke seen in 43 (71.7%) patients, CSVT was present in 10(16.7 %) patients, and PPERI in 6 (10%) patients, and only 1 patient (1.6%) had HS. The result was similar to the results of the International pediatric stroke study (IPSS) published by Golomb M.R. et al[6] who reported, the majority (77.9%) of the cases had AIS while only 22.1% of the cases had CSVT and others. The data update report of IPSS 201220 too was almost similar, which stated that 73.66% had AIS while 26.34% suffered from CSVT and others. In the present study, the overall sex ratio was >1(1.9) in favor of males. In India, this may be because of male bias to bring them to a health facility in the community but this was also true for studies conducted by Obama et al[7]. They found a sex ratio of 1.5 in favor of males. Similarly study of AIS by C Barnes and F NE wallet al[8] too had a similar ratio; with a sex ratio of 1.7 in favor of males. Rasul CH et al[9] in their study also found that the overall sex ratio of patients showed a sex ratio of 2.8 in favor of males, although the proportion was slightly higher in comparison to other similar studies. In the present study 3 (5%) patients were neonates. The mean age of the remaining 57 patients was 4.0±4.1 years. The median value was 2 years which means that 50% patients were of less than 2 years of age. Adam L. Hartman et al[10] found concerning AIS that 24% of the patients were under the age of 2 years. The majority of the patients were less than 5 years of age (63%), remaining 37% of patients were of age more than 5 years. In the present study, the majority of the patients (76.67 %) were under the age of 5 years. The results were comparable to the study by Rasul CH et al[9] who also reported that the majority (52.4%) of the patients belonged to the early childhood (<5 years) period and the mean age of the children was 4.8±3.7 years.

In the present study out of 60 patients, 3 patients did not have stroke lesions; they had only CSVT. Overall, 40(70.1%) patients had unilateral lesions. Among these

left-sided (60%), stroke lesions were more common than right-sided (40%) stroke lesions. Results were comparable to the study by Tham H.E. et al[11] who found that strokes were unilateral in 58.7% and bilateral in 38.5% of cases.

In our study, among 45 cases of acute stroke of AIS and CSVT only 3(6.6%) patients presented to the emergency room within ≤4 hours and all of them belonged to AIS. In the present study, the mean interval from stroke symptom onset to arrival at an emergency room in acute stroke was found to be 27.8 hours. A study by L. V. Gabiset al[12] demonstrated up to a 28-hour delay in seeking medical attention from the onset of symptoms. The situation becomes worse in developing countries like India where patients have to wait in a long queue for neuroimaging which further causes a delay in making timely diagnoses which in turn causes a delay in the start of specific treatment for stroke. A study by L. V. Gabiset al[12] also demonstrated an average delay of 35.7 hours before any brain imaging was done after the onset of symptoms. In the present study the average delay from arrival to diagnosis was92.8 hours thus causing the average delay from stroke symptom onset to diagnosis to be 120.7 hours. The difference was found to be significant (t = -3.483, p= 0.001). This was also true for individual AIS and CSVT cases of acute stroke. (For AIS, t = -2.760, p= 0.009 and for CSVT, t = -3.348, p= 0.010) Gustavo Saposniket al[13] also reported that delays in the diagnosis of CSVT were common and significant and longer in comparison to delays in AIS. In the present study, only 49 patients were hospitalized. Overall Mortality among stroke patients during hospitalization was found to be 6.1 %. Around 70% of patients had a neurological deficit at the time of discharge. Many studies reported similar results. Julius Alexander Ogeng'oet al[14] also reported that 6.3% of patients died. Engle R. and Ellis C.[16] in their publication on pediatric stroke for three years also found that approximately 6% of children with stroke died in 2000, 7% in 2003, and 5% in 2006.

Conclusion

The present study was a case series of patients with childhood stroke in Southeast Rajasthan. In the present studies around 1/4th of patients had an old stroke and 1/10th of patients had PPERI indicating the existence of undiagnosed cases in the community. In the present study among patients with acute stroke, only 6.6% presented within 4 hours of the symptom onset which is considered a golden period for the disease debarring them from getting timely treatment. The average delay in diagnosis was 120.7 hours. The disease is found to be more common in less than five years of age and more common in males than females (M/F:1.9/1). Unilateral strokes were more common than bilateral strokes. Overall mortality among stroke patients during hospitalization was found to be 6.1/100.

References

1. R. Bonita, S. Mendis, T. True lsen, J. Bogousslav sky, J. Toole, and F. Yatsu, "The global stroke initiative," The Lancet Neurology, vol. 3, no. 7, pp. 391–393, 2004.

2. New J. Irazuzta and K. J. Sullivan, "Hyperacute therapies for childhood stroke: a case report and review of the literature, "Neurology Research International, vol. 2010, Article ID 497326,2010.

3. Nagaraja D, Verma A, Taly AB, Veerendra Kumar M, Jayakumar PN. Cerebrovascular disease in children. Acta Neurol Scand 1994; 90: 251-255.

4. Mehndiratta MM, Aggarwal P, Gupta M, Puri V, Aggarwal S, Stroke in 127 young people. Proceedings of the Lancet Stroke Conference, Montreal, 1998, p 12

5. Kalra V. Practical Pediatric Neurology, 1st ed. New Delhi. Arya Publication; 1999.

6. Meredith R. Golomb, Heather J. Fullerton, Ulrike Nowak-Gottl and Gabrielle de Veber. Male Predominance in Childhood Ischemic Stroke: Findings from the International Pediatric Stroke Study. Stroke: JAmer H Ass2009;40:52-57.

7. Marie-ThAbena Obama, Louis Dongmo, C. Nkemayim, J. Mbede, P. Hagbe. Stroke in children in Yaoundé, Cameroon. Ind.Pediatr1994; 31:791-795.

8. C Barnes, F Newall, J Furmedge, M Mackay and P Monagle. Arterial ischaemic stroke in children. J. Paediatr. Child Health(2004); 40:384–87

9. CH Rasul, AA Mahboob, SM Hossain, and KU Ahmed. Predisposing Factors and Outcome of Stroke in Childhood. Ind. Pediatr 2009; 46:419-21.

10. Adam L. Hartman, Kevin M. Lunney and Jacqueline E. Serena. Pediatric Stroke: Do Clinical Factors Predict Delays in Presentation? J Pediatr. 2009 May; 154(5): 727–32.

11. Elizabeth H Them, Stacey KH Tay, Poh Sim Low. Factors Predictive of Outcome in Childhood Stroke in an Asian Population. Ann Accad Med Singapore 2009;38:876-81

12. Gabis LV, Yan gala R and Lenn NJ. Time lag to the diagnosis of stroke in children. Pediatrics. 2002 Nov;110(5):924-8.

13. Gustavo Saposnik, Fernando Barinagar rementeria, Robert D. Brown, Jr, Cheryl D. Bushnell, Brett Cucchiara, Mary Cushman, Gabrielle de Veber, Jose M. Ferro and Fong Y. Tsai. Diagnosis and Management of Cerebral Venous Thrombosis: A Statement for Healthcare Professionals from the American Heart Association/American Stroke Association. Stroke 2011; 42: 11581192.

14. Julius Alexander Ogeng'o, Beda O. Olabu, Anne N. Mburu, Simeon R. Sinkeet. Pediatric stroke in an African country. J Pediatr Neurosci 2010; 5:23

Legend Tables

Table 1: Distribution of patients according to age (n=60)

Age of the Patients	No of Patients	Percentage (%)
Neonate	3	5
>28 days to ≤ 1 year	19	31.67
> 1 Year to ≤ 5 Years	24	40
>5 years to ≤ 18 years	14	23.33
Grand Total	60	100%
Mean: 45.86 months/ Median: 24 months		

Table 2: Distribution of Patients According to Gender (n=60)

Type of stroke	Male	Female	Total
AIS(n=43)	27(62.8%)	16(37.2%)	43(100%)
CSVT(n=10)	8(80%)	2(20%)	10(100%)
HS(n=1)	1(100%)	0(0%)	1(100%)
PPERI(n=6)	3(50%)	3(50%)	6(100%)
Total (60)	39(65%)	21(35%)	60(100%)
(Chi square=2.18, df=3, p value=0.576)			

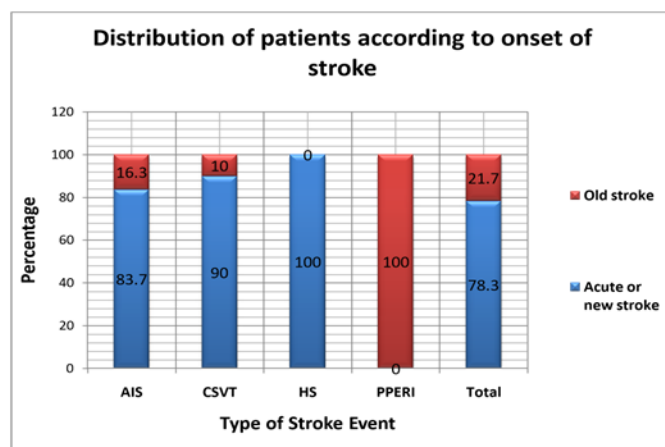Figure 1: Distribution of patients according to the onset of stroke

Table 3: Interval from stroke symptom onset to arrival at Emergency room and diagnosis in acute stroke

Type of stroke (Acute stroke only)	The interval from stroke symptom onset to arrival at The emergency room in acute stroke		The interval from stroke symptom onset to Diagnosis in acute stroke		Mean Delay from arrival to Diagnosis	
	Mean ±S.D.	Median ±S.D.	Mean±SD.	Median ±S.D.		
AIS*(n=36)	26.6±26.8	19±26.8	116.5±195.8	48±195.8	89.83±195.2	t = -2.760, p= 0.009
CSVT *(n=9)	32.6±22.2	24±22.2	137.5±98.2	96±98.2	104.8±93.9	t = -3.348, p= 0.010
Total (n=45)	27.8±25.8	24±25.8	120.7±179.7	72±179.7	92.8±178.8	t = -3.483, p= 0.001

*Information available only for specified n values.

Table 4: Distribution of patients according to laterality of stroke lesions on neuroimaging in (n=43)

Type of stroke	Unilateral (70.1%)		Bilateral (29.9%)	Total
	Left	Right		
AIS	19(44.2%)	13(30.2%)	11(25.6%)	43(100%)
CSVT	0(0%)	1(14.3%)	6(85.7%)	7(100)
HS	1(100%)	0(0%)	0(0%)	1(100%)
PPERI	4(66.7%)	2(33.3%)	0(0%)	6(100%)
Total	24(42.1%)	16(28.0%)	17(29.9%)	57(100%)

Table 5: Distribution of patients according to the status of the outcome at the time of discharge

At the time of discharge	AIS (n=38*)	CSVT (n=10)	HS (n=1)	Total
Neurological deficit present	31(81.6%)	3(30%)	0	34(69.4%)
Neurological deficit absent	5(13.1%)	6(60%)	1(100%)	12(24.5%)
Expired	2(5.3%)	1(10%)	0	3(6.1%)
Grand Total	38(100%)	10(100%)	1(100%)	49(100%)