Original Article

Etiology and Presentation of Stroke in Hospitalized Children

Stroke in Hospitalized Children

Farrukh Saeed, Amna Iqtidar, Farhan Zahoor and Muhammad Asif Siddiqui

ABSTRACT

Objective: This study was aimed to note the main underlying causes and presentation of stroke amongst hospitalized children.

Study Design: A retrospective study.

Place and Duration of Study: This study was conducted at the Department of Pediatrics, Services Hospital, Lahore from March 2016 to March 2018.

Materials and Methods: A total of 62 children admitted with stroke during the study period, aged one to 15 years, having focal acuteneural impairment established by brain imaging, were analyzed. Demographic characteristics including age and gender along with clinical presentation and neuroimaging findings of all the study participants were noted. Etiologies like prenatal diseases, CHD, hematological disorders, trauma as well as infections of CNS were also recorded.

Results: Out of a total of 62 children with stroke, 36 (58.1%) were male and 26 (41.9%) female. There were 9 (14.5%) children below the age of 1 years, 36 (58.1%) between 1 to 5 years, 8 (12.9%) from 5 to 10 years and 9 14.5%) above 10 years of age. Mean age was noted to 4.5 years with standard deviation of 2.4 years. There were 28 (45.2%) children who belonged to urban areas while 34 (44.8%) to rural area. There were 52 (83.9%) children who presented with weakness, 41 (66.1%) with raised intracranial pressure while seizures were seen to be a presenting feature 37 (59.7%). Commonest cause of stroke was noted to be hemorrhagic stroke due to trauma in 22 (35.5%) and vascular disease in 17 (27.4%).

Conclusion: Hemorrhagic stroke due to trauma, coagulopathy and vasculopathy were found to be the most common etiologies in children with stroke. Preventive strategies involving measures to address the causes of stroke in children along with early diagnosis and treatment will certainly reduce its burden amongst children.

Key Words: Stroke, hemorrhagic stroke, vascular disease, coagulopathy

Citation of articles: Saeed F, Iqtidar A, Zahoor F, Siddiqui MA. Etiology and Presentation of Stroke in Hospitalized Children. Med Forum 2019;30(5):23-26.

INTRODUCTION

Stroke is described as rapid decline of cerebral blood flow that goes on to result in impairment of functions related to brain.[1] In the past few decades, a rise has been noted in the prevalence of stroke around the world. Global incidence of stroke in pediatric population is calculated to be 13 to 16 cases per 100000.[2]In North America, stroke's incidence is estimated to be 2.5-2.7 per 100000 in pediatric population while France represents an incidence of 13 per 100000 cases in children.[3,4]

In the United States, it is estimated to be one of the top ten diseases to be blamed for childhood mortality. Pakistan holds noteworthy share of stroke that is contributing significantly to economic burden as well as occupancy at healthcare facilities.[5]Mortality rate in children with stroke ranges between 2 to 11% while persistent neurological deficit is recorded in about 70% of pediatric population with stroke.[6]

Diagnosis of stroke in children is not always prompt and in a country like Pakistan, timely access to acute MRI and pediatric anesthesia is not always available all the time. There are no stroke centers of any type of standardized care for strokes in children in our settings. Moreover, it has been observed widely around the world that causes of stroke in children differ clearly as it is different in terms of etiology, physiology as well as natural history when compared to adults.[7] Thrombophilia, sickle cell anemia, infections,acquired or congenital emboligenic heart diseasesare noted as most common causes of stroke in children. In children, Stroke may go on to cause death while cognitive-motor disabilities as well as seizure spanning long durations (1 day or more) are other important factors to consider while dealing stroke. Congenital heart disease is known to be the commonest risk factor associated with ischemic and hemorrhagic stroke in children.[8] Coagulopathy and thrombophilia are also recorded to be an important riskfactor associated with arterial ischemic stroke. In children, metabolic disorders as

Department of Pediatrics Med, Services Hospital, Lahore.

Correspondence: Dr. Farrukh Saeed, Senior Registrar of Pediatrics Medicine, Services Hospital, Lahore.
Contact No: 03457131588
Email: dr.farrukhsaeed@yahoo.com

Received: December, 2018
Accepted: March, 2019
Printed: May, 2019

well as injuries progressing to infarction are not seen frequently but these conditions cannot be overlooked.[9]
In the recent years in Pakistan, not much work has been done to find out the underlying causes as well as presentation of stroke in Pediatric population. So, we did this study to note the main underlying causes and clinical features of stroke amongst hospitalized children.

MATERIALS AND METHODS

This study was a retrospective analysis from March 2016 to March 2018, from Department of Pediatrics, Services Hospital, Lahore. Approval from institutional ethical and research committee was taken for this study. A total of 62 children admitted with stroke during the study period, aged one to 15 years, having focal acuteneural impairment established by brain imaging, were analyzed.
Detailed general physical as well as systemic examination was done. Investigations like peripheral smear, serumelectrolytes, CSF examination and neuro-imaging like cranial ultrasound and CT scan were done. Demographic characteristics including age and gender along with clinical presentation and neuroimaging findings of all the study participants were noted. Etiologies like prenatal diseases, CHD, hematological disorders, trauma as well as infections of CNS were also recorded.

RESULTS

Out of a total of 62 children with stroke, 36 (58.1%) were male and 26 (41.9%) female. Male to female ratio was noted as 1.4/1. There were 9 (14.5%) children below the age of 1 years, 36 (58.1%) between 1 to 5 years, 8 (12.9%) from 5 to 10 years and 9 14.5%) above 10 years of age. Mean age was noted to 4.5 years with standard deviation of 2.4 years. There were 28 (45.2%) children who belonged to urban areas while 34 (44.8%) to rural area.

Table No.1: Signs and Symptoms at Presentation Amongst Children with Stroke

Signs and Symptoms	Cases (%)
Weakness	52 (83.9%)
Hemiplegia / hemiparesis	45 (72.6%)
Monoplegia	7 (11.3%)
Raised Intracranial Pressure	41 (66.1%)
Irritability	30 (48.4%)
Nausea & Vomiting	6 (9.7%)
Headache	5 (8.1%)
Seizures	37 (59.7%)
Fever	38 (61.3%)
Cranial Nerve Palsies	16 (25.8%)
Aphasia	4 (6.5%)
Comatose	15 (25.0%)

There were 52 (83.9%) children who presented with weakness, 41 (66.1%) with raised intracranial pressure while seizures were seen to be a presenting feature 37 (59.7%). Fever was noted to be present in 38 (61.3%) whereas 15 (25.0%) reported in a state of coma.
Commonest cause of stroke was noted to be hemorrhagic stroke due to trauma in 22 (35.5%). Vascular disease, coagulopathy, congenital cardiovascular disease, and premature rupture of the membranes (PROM) were noted in 17 (27.4%), 12 (19.3%), 3 (4.8%), 3 (4.8%) cases respectively whereas 5 (8.1%) cases had idiopathic causes.

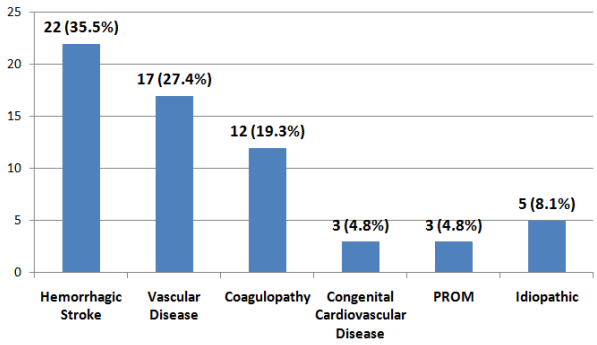

Figure No.1: Causes of Stroke Amongst Children with Stroke

DISCUSSION

Stroke contributes significantly towards morbidity and mortality along with causing major restraints to quality of life. Stroke has long been thought to be uncommon amongst children but figures in the last few decades are indicating that its presence is being recognized more around the world.[10,11] We noted 62 cases of stroke amongst children in a study period of 3 years. A study from Ayub Medical College[12] spanning 2 years and 10 months recorded 46 cases whereas if we note the stats 1985 to 1993 from Stroke Registry of France,[13] they documented 28 stroke cases amongst children.
In the present retrospective study, we noted that stroke was more common in males (58.1%) as compared to females. Our results were quite consistent with a recent study from Iran[14] where they found 53% of children having stroke as male. A study from China[15] in 2015 evaluating children with stroke, also noted 60% male in their findings. Pretty similar male to female ration in comparison to our study has also been noted previously where the researchers noted this to be 1.4:1.[16]
In the current work, it was noted that 45 (72.6%) children were below the age of 5 years. Keihani DZ et al from Iran[16] also found that 86% of the children with stroke were less than 6 years of age.Tavassoli A et al[17] in their clinical survey regarding cerebrovascular disease in children found 2 to 5 year old to be the most common age amongst children with stroke. Our results were also comparable to another local study[12] found meanage of onset related to stroke in children was

found to be 3 years while a study from Saudi Arabia[18] having a duration of more than 10 years evaluating 104 children with stroke also found similar findings regarding age of children with stroke.

In this study, we noted 52 (83.9%) children having weakness, 41 (66.1%) raised intracranial pressure, seizures in 37 (59.7%) while 15 (25.0%) reported as comatose.Our results are quite consistent with those of Saima B et al where in a local study[14] analyzing 46 children with stroke, they found limb weakness as presenting feature in 80% while seizuresin 61% and coma in 22%. Pediatric Ischemic Stroke Registry of Canada[19] documented hemiparesis in 51% of cases while they also noted seizures to be in 48% children with stroke. Tham EH et al[20]also reported seizures in58% cases while hemiparesis and altered level of consciousness were found to be 39% each in children with stroke.

Hemorrhagic stroke due to trauma was the most frequent cause of stroke in our study affecting 35.5% children, followed by vascular disease (27.4%) and coagulopathy19.3% being the other most frequent causes. Hemorrhagic stroke due to trauma has also been noted as the commonest cause affecting 27% cases of stroke in children in a study done in the neighboring Iran.[14]A study done by Gulati et al from India[21] noted head trauma and arterial dissectionin 26% cases of children with brain infarction. A study done by Cicconi S and coworkers[22] recordedspontaneous intraparen-chymal hemorrhage and nontraumatic subarachnoid hemorrhages as the most common causes of stroke. Vascular disease was found to be another common cause observed in our study, found in 27.4% cases. Keihani DZ et al[14] also found vascular disease in 20% cases with stroke while the same study also noted vasculopathy to be in 24% of cases.

We found coagulopathy in 19.3% of children which is very near to the findings from Iran[14] while our results were different from another study conducted in Iran[17] where they found prothrombotic disorders to be in only 8% of children with stroke. Higher contribution of prothrombotic disorders ranging around 50% have also been noted in the past in children with stroke.[23]

Past few years have seen a rapid advancement regarding stroke in children in the shape of research as well as trials assessing clinical care.Lot of efforts are being put to better understand the underlying pathology to devise appropriate strategies for the right management. Likewise, it has also been advocated that more detailed in to cerebral arteriopathies will surely give us more insight to form better treatments. Early identification of risk factors and underlying pathologies regarding stroke in pediatric population is the best way to handle this problem.[24]

CONCLUSION

Hemorrhagic stroke due to trauma, coagulopathy and vasculopathy were found to be the most common etiologies in children with stroke. Preventive strategies involving measures to address the causes of stroke in children along with early diagnosis and treatment will certainly reduce its burden amongst children.

Author's Contribution:

Concept & Design of Study:	Farrukh Saeed
Drafting:	Amna Iqtidar
Data Analysis:	Farhan Zahoor, Muhammad Asif Siddiqui
Revisiting Critically:	Farrukh Saeed, Amna Iqtidar
Final Approval of version:	Farrukh Saeed

Conflict of Interest: The study has no conflict of interest to declare by any author.

REFERENCES

1. Rosa M, De Lucia S, Rinaldi VE, Le Gal J, Desmarest M, Veropalumbo C, et al, Titomanlio. Pediatric arterial ischemic stroke: acute management, recent advances and remaining is ues. Ital J Pediatr 2015;41:95.
2. Mallick AA, O'Callaghan FJ. The epidemiology of childhood stroke. Eur J Paediatr Neurol 2010; 14(3):197-205.
3. Schoenberg BS, Mellinger JF, Schoenberg DG. Cerebrovascular disease in infants and children: a study of incidence, clinical features, and survival. Neurol 1978;28:763–8.
4. Broderick J, Talbot GT, Prenger E, Leach A, Brott T. Stroke in children within a major metropolitan area: the surprising importance of intracerebral hemorrhage. J Child Neurol 1993;8:250–5.
5. Chung B, Wong V. Pediatric stroke among Hong Kong Chinese subjects. Pediatrics 2004;114(2): e206-12.
6. Bernard TJ, Goldenberg NA, Armstrong-Wells J, Amlie-Lefond C, Fullerton HJ. Treatment of childhood arterial ischemic stroke. Ann Neurol. 2008;63(6):679-96.
7. The Epidemiology of Stroke in a Developing Country (Pakistan). J Neurol Stroke 2018;8(1): 00275.
8. DeVeber G. Arterial ischemic strokes in infants and children: an overview of current approaches. Semin Thromb Hemost 2003;29:567-573.
9. Mandalenakis Z, Rosengren A, Lappas G, Eriksson P, Hansson P, Dellborg M. Ischemic stroke in children and young adults with congenital heart disease. J Am Heart Assoc 2016; 5:e003071.

10. Stroke Association. The nation Stroke statistics January 2017.Together we can conquer stroke. Zh Nevrol Psikhiatr Im S SKorsakova 2003;(Suppl 8): 4-9.
11. Wang W, Jiang B, Sun H, Ru X, Sun D, et al. Prevalence, Incidence and Mortality of Stroke in China: Results from a Nationwide Population-Based Survey of 480, 687 Adults. Circulation 2017;35(8): 759-771.
12. Saima B, Syed YH, Syed RA, Sadia B, Tahir S. Siddiqui. Childhood strokes: epidemiology, clinical features And risk factors Ayub Med Coll Abbottabad 2011;23(2):69-71.
13. Giroud M, Lemesle M, Gouyon KB, Nivelon JL, Milan C, Dumas R. Cerebrovascular disease in children under 16 years of age in the city of Dijon, France: a study of incidence and clinical features from 1985 to 1993. J Clin Epidemiol 1995;48: 1343– 8.
14. Keihani DZ, Noori SF, Akbari AP, Farahani Z, Tehrani F, Shariat M. Incidence and Etiology of Stroke among Hospitalized Children: A Case-Series Study. Iran J Child Neurol. Winter 2019; 13(1): 65-70.
15. Gao YB. Risk factors and imaging characteristics of childhood stroke in China. J Child Neurol 2015;30(3):339-43.
16. Shi KL, Wang JJ, Li JW, Jiang LQ, Mix E, Fang F, et al. Arterial ischemic stroke: experience in Chinese children. Pediatr Neurol 2008;38(3): 186-90.
17. Tavassoli A, Ghofrani M. Clinical Survey of Cerebrovascular Disease in Children. Iran J Pediatr 2008; 18(Suppl 1):53-58.
18. Salih MA, Abdel-Gader AM, Al-Jarallah AA, Kentab AY, Alorainy IA, Hassan HH, et al. Stroke in Saudi children: Epidemiology, clinical features and risk factors. Saudi Med J 2006;27 Suppl 1:S12-20.
19. de V eber G. The Canadian Pediatric ischemic stroke study group. Canadian pediatric ischemic stroke registry: analysis of children with arterial ischemic stroke. Ann Neurol 2000;48:526.
20. Tham EH, Tay SK, Low PS. Factors predictive of outcome in childhood stroke in an Asian population. Ann Acad Med Singapore 2009;38 (10):876-81.
21. Gulati S, Karla V. Stroke in children. Indian J Pediatr 2003; 70:639-648.
22. Ciccone S, Cappella M, Borgna-Pignatti C. Ischemic Stroke in infants and children: practical management in emergency. Stroke Res Treat 2011; 2011:736965.
23. Simma B, Martin G, Müller T, Huemer M.Risk factors for pediatric stroke: consequences for therapy and quality of life. Pediatr Neurol 2007; 37(2):121-6.
24. Kirton A, deVeber G. Paediatric stroke: pressing issues and promising directions. The Lancet Neurol 2015;14(1):92-102.