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Clinical, Laboratory and Neuroradiological Profile of Arterial Ischemic Stroke in Paediatric Patients

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Abstract **Original Research Article**

Background: Arterial ischemic stroke (AIS) is an increasingly recognized cause of significant morbidity in childhood and has personal, familial, economic and social consequences. Significant delays exist in the diagnosis of childhood stroke. Factors contributing to the delays include the low incidence, varying clinical presentations, limited access to urgent diagnostic neuroimaging, and poor awareness of childhood stroke among physicians and carers. An accurate diagnosis, with early differentiation between stroke and mimics, is crucial for early interventions that improve long-term outcomes. Neuroimaging is essential not only for diagnosis and decision-making for early intervention but also for later outcomes and the chance of recurrence, which can be predicted from a detailed neuroimaging profile. As a wide range of presumptive risk factors has been reported in association with childhood stroke, it is necessary to identify underlying associated abnormalities within a short period of time not only due to the early institution of treatment but also to prevent a recurrence. In Bangladesh, very few studies were done previously on pediatric stroke. Against this backdrop, this study was planned to observe the clinical, laboratory and neuroradiological profile of arterial ischemic stroke in paediatric patients. ***Aims of the study:*** To evaluate the clinical, laboratory and neuroradiological profile of arterial ischemic stroke in paediatric patients. ***Materials:*** This cross-sectional study was carried out at the Department of Pediatric Neurology, IPNA, BSMMU, Dhaka, Bangladesh without interrupting standard care practice in the department. The duration of the study was 18 months. Patients with sudden onset focal or global neurological disorders attending OPD and IPD of pediatric neurology were primarily enrolled for the study. Detailed history taking and clinical examination, including neurological examination, were done. Then, patients were assessed by brain MRI to confirm the diagnosis. After the exclusion of other conditions, twenty patients were selected as the study subjects. Study populations were further assessed with investigations including - MRA of the brain, CBC with PBF, CRP, Serum iron profile, Protein C, Protein S, Antithrombin III, Fasting lipid profile, ANA, Echocardiography to find out risk factors. Data were analyzed by using Statistical Packages for Social Sciences (SPSS-23). ***Results:*** A total of 20 children diagnosed with ischemic stroke were included in this study. Among them, 55% of the patients were in the 1-5 years age group. The mean (± SD) age was 3.84 (±1.64) years. Male to female ratio was (1:1). Only 5% of patients had a previous stroke, and 15% of patients had a family history of stroke. Hemiparesis was the most common localizing sign (85%), followed by facial nerve palsy (35%). Most of the patients presented with right-sided hemiparesis (65%). Protein C and Antithrombin III were deficient in 30% of patients. MRI showed the cerebral cortex was the most involved site (70%), followed by the capsuloganglionic region (30%). In the cerebral cortex, the parietal region (40%) was more affected. Single infarct (85%) and left-sided involvement (65%) were more common. MCA territory was the most involved site (60%), followed by ACA (20%) territory. Arteriopathy, including moyamoya and focal cerebral arteriopathy, was found in (30%) of patients. One patient (5%) with moyamoya arteriopathy had extensive collateral circulations on MRA. On the basis of laboratory parameters, the prothrombotic disorder was found in (30%), and iron Deficiency Anemia was present in (20%) of patients. Only one patient (5%) had a cardiac abnormality. Regarding association with stroke sub-classification, hemiparesis, visual field defect, dystonia and altered consciousness were significantly associated with stroke sub-

classification (p<0.05). Hemiparesis was significantly associated with TACI and PACI (p<0.05), and visual field defect was significantly associated with TACI (p<0.05). Moyamoya disease and cardiac abnormalities were significantly associated with stroke sub-classification. Two (2) of the three (3) patients of moyamoya disease had TACI (p<0.05). ***Conclusion:*** Hemiparesis was the most common localizing sign, followed by facial nerve palsy. Arteriopathy, including moyamoya and focal cerebral arteriopathy, and prothrombotic disorders are the commonly associated abnormalities, followed by iron deficiency anaemia and cardiac problems in this study group. The cerebral cortex was the most commonly involved site, followed by capsuloganglionic regions. Single infarct, left-sided infarct, and middle cerebral artery territory were most commonly involved. Hemiparesis was significantly associated with total and partial anterior circulation stroke.
Keywords: Arterial ischemic stroke, Neuroimage.

INTRODUCTION

Stroke constitutes a significant health problem in the paediatric population [1]. The prevalence of pediatric stroke is around 14.2/100 000 [2]. Stroke was defined by the World Health Organization (WHO) as "rapidly developing clinical signs of focal (or global) disturbance of cerebral function, lasting more than 24 hours or leading to death, with no apparent cause other than that of vascular origin" [3]. There are two primary types of strokes: an ischemic stroke- caused by blockage of an artery, and a haemorrhage stroke- caused by bleeding. Ischemic stroke includes Arterial Ischemic Stroke (AIS) and Cerebral Sinovenous Thrombosis (CSVT). AIS is defined as ischemia, infarction, or encephalomalacia in a vascular arterial distribution territory [5]. There are two different types of ischemic strokes: Thrombotic Strokes and Embolic strokes. Approximately 50–80% of children with AIS have at least one identifiable risk factor for stroke [6]. The more commonly reported risk factors include nonatherosclerotic arteriopathies, cardiac disorders, infections, inherited or acquired coagulation abnormalities, malignancies, head and neck trauma, and sickle cell disease [7,8]. The commonest etiologies in developed countries encompass cerebral arteriopathies, congenital or acquired cardiac disease, and serious systemic infections like meningitis and sepsis [9]. Clinical presentation of paediatric stroke varies depending on stroke type, vessels involved and the child's age [4,10,11]. Children with Ischemic stroke may present with sudden onset of neurological symptoms, particularly focal weakness, speech disturbance, sensory loss, limb incoordination, visual problems, ataxia, etc. Seizures, altered levels of consciousness and diffuse neurologic symptoms (headache, nausea, and vomiting) may also result. Neuroimaging is the first step in the evaluation of an acutely ill child. MRI, especially with the integration of diffusion-weighted image (DWI), is optimal for diagnosing stroke. DWI is the most sensitive tool in the diagnosis of cytotoxic edema, thus offering the unique possibility of diagnosing an acute ischemic stroke also in cases with apparently normal CT and MRI conventional sequences [12]. The gold standard for the definitive assessment of cerebral vasculature is Intra-arterial digital subtraction angiography (DSA), which should be considered in children when pathology of the small distal artery is suspected and with an unexplained infarct or hemorrhage not elucidated by MRI or MRA evaluation [13]. Other Investigations to see the underlying aetiology are as follows- complete blood count (CBC) with peripheral blood film (PBF), erythrocyte sedimentation rate (ESR), blood sugar, serum lipid profile, X-ray chest, electrocardiogram (ECG), Echocardiogram. Anti-nuclear antibody (ANA), cerebrospinal fluid (CSF) etc. Significant delays exist in the diagnosis of childhood stroke. Factors contributing to the delays include the low incidence, varying clinical presentations, limited access to urgent diagnostic neuroimaging, and poor awareness of childhood stroke among physicians and carers. There are a limited number of studies on stroke in Bangladesh, particularly in the pediatric population. Targeted treatment is needed to reduce morbidity as well as to prevent a further recurrence, so aetiology and clinical features should be known. Thus, this study aimed to identify the clinical manifestations and different laboratory and neuroradiological profiles of paediatric arterial ischemic stroke.

METHODOLOGY & MATERIALS

This was a cross-sectional study conducted to evaluate the clinical, laboratory, and neuroradiological profile of arterial ischemic stroke (AIS) in pediatric patients. The study focused on pediatric patients diagnosed with AIS based on clinical presentations and neuroimaging confirmation. It was conducted from October 2019 to March 2021 at the Department of Pediatric Neurology, Institute of Pediatric Neurodisorders and Autism (IPNA), Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh. The study included 20 patients diagnosed with arterial ischemic stroke. All patients were diagnosed with AIS based on clinical presentations and confirmed by neuroimaging (CT or MRI). Ethical approval for the study was obtained from the Institutional Review Committee of BSMMU. Written informed consent was taken from all participants or their legal guardians before enrollment.

Inclusion Criteria

- Patients aged one month to 18 years with sudden onset focal or global neurological signs.

- Neuroimaging (CT/MRI) confirmed the diagnosis of ischemic stroke.

Exclusion Criteria

1. Patients with hemorrhagic stroke or cerebral sinovenous thrombosis (CSVT).
2. Patients with cerebral palsy (CP).

Data Collection

Convenience sampling was employed to enrol study participants. After a detailed clinical history and examination, neuroimaging (MRI of the brain) was conducted to confirm the diagnosis of arterial ischemic stroke. Clinical evaluations included motor weakness, seizures, headache, fever, past medical history, and family history of neurological disorders.

Patients underwent a series of diagnostic tests to evaluate potential risk factors, including complete blood count (CBC), peripheral blood film (PBF), serum iron profile, C-reactive protein (CRP), fasting lipid profile, antinuclear antibody (ANA), and echocardiography. Specialized tests, such as Protein C, Protein S, and Antithrombin III assays, were conducted to assess prothrombotic conditions.

Neuroimaging results, particularly MRI, were reviewed by qualified radiologists and cross-checked by pediatric neurologists. The classification of stroke was based on Bamford sub-classifications (TACI, PACI, LACI, POCI), and correlations between clinical presentation, neuroimaging findings, and laboratory profiles were analyzed. Patients were treated as per the standard protocol, admitted for further management, and discharged after clinical improvement.

Data Analysis

Data were collected using a pre-designed structured questionnaire. The data were processed using Statistical Package for Social Science (SPSS) version 23 for Windows. Descriptive statistics, including means and standard deviations (SD), were used to present continuous variables, while categorical variables were expressed as frequencies and percentages. Associations between clinical and neuroimaging profiles were analyzed using Chi-square and Fisher's exact tests. A p-value <0.05 was considered statistically significant.

RESULT

Most of the participants (55%) were aged 1-5 years. The gender distribution was equal. Additionally, 5% had a history of previous stroke, and 15% had a family history of stroke (Table 1). The most common neurological presentation was hemiparesis (85%), followed by facial nerve palsy (35%), dysphasia (25%), visual field defects (10%), irritability (20%), seizures, headache, ataxia (each 10%), and behavioral changes, altered consciousness, and dystonia (each 5%) (Table 2). Figure 1 shows that 65% presented with right-sided hemiparesis, 20% with left-sided hemiparesis, and 15% had no hemiparesis. Among all, 35% presented with pallor, while cyanosis, tachycardia, hypertension, tachypnea, raised temperature, and precordial murmur were each observed in 5% of the patients (Table 3). 40% of pediatric patients had low hemoglobin levels, 35% had low iron, and 30% showed raised TIBC as well as deficiencies in Anti-thrombin III or Protein C. Additionally, 25% had low T-SAT, 20% had low ferritin, and 15% were found to have MHA or Protein S deficiency. Elevated CRP was present in 10% of cases, while thrombocytosis, abnormal echocardiography, hypercholesterolemia, and hypertriglyceridemia were each seen in 5% of the patients (Table 4). Regarding laboratory, cardiac and vascular abnormalities, arteriopathy, including moyamoya and focal cerebral arteriopathy, was found in 6(30%) and prothrombotic disorders were also found in 6(30%) patients. Iron Deficiency Anemia was present in 4(20%) (Table 5). Neuroimaging of pediatric patients reveals 70% involvement of the cerebral cortex, primarily in the parietal lobe (40%). Capsuloganglionic and corona radiata regions were affected in 30% and 20% of cases, respectively. Most patients (85%) had a single infarct, with 65% on the left side and Collateral circulation was seen in 5% (Table 6). MCA territory was the most involved site (60%), followed by ACA (20%) and PCA (10%) territory (Figure 2). The number of infarcts and laterality had no association with the sub-classification of AIS and were not statistically significant ($p>0.05$). In terms of neurological presentation, hemiparesis, visual field defect, dystonia and altered consciousness were associated with the classification of AIS. Hemiparesis was significantly associated with TACI and PACI ($p<0.05$), and homonymous hemianopia was significantly associated with TACI ($p<0.05$). Moyamoya disease and the presence of cardiac abnormalities were associated with the sub-classification of AIS. Two of the three patients of moyamoya disease had TACI, and it was statistically significant ($p<0.05$) (Table 7).

Table 1: Demographic characteristics of the study group (n=20)

Variable	Frequency (n)	Percentage (%)
Age		
<1	4	20
1-5	11	55
>5	5	25
Gender		
Male	10	50
Female	10	50
Past medical history		
Previous stroke	1	5
Family H/O stroke	3	15

Table 2: Clinical presentation (Neurological) of the study subjects (n=20)

Neurological	Frequency (n)	Percentage (%)
Localizing		
Hemiparesis	17	85
Facial nerve palsy	7	35
Dysphasia	5	25
Visual field defect	2	10
Non localizing		
Irritability	4	20
Seizure	2	10
Headache	2	10
Ataxia	2	10
Behavioral change	1	5
Altered consciousness	1	5
Dystonia	1	5

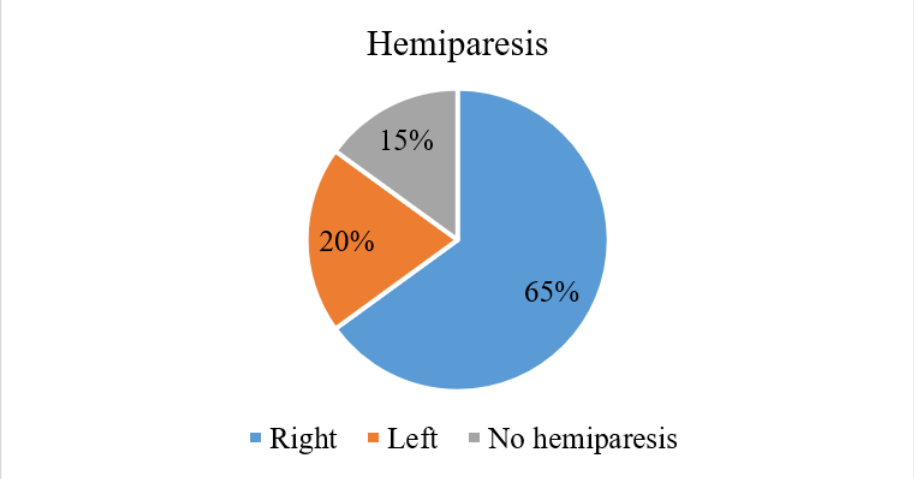

Figure 1: Distribution of study population according to hemiparesis (n=20)

Table 3: Clinical presentation (non-neurological) of the study subjects (n=20)

Non-neurological	Frequency (n)	Percentage (%)
Pallor	7	35
Cyanosis	1	5
Tachycardia	1	5
Hypertension	1	5
Tachypnea	1	5
Raised temperature	1	5
Precordial murmur	1	5

Table 4: Laboratory findings of the study population (n=20)

Lab findings	Frequency (n)	Percentage (%)
Low Hemoglobin	8	40
Low Iron	7	35
Raised TIBC	6	30
Low T-SAT	5	25
Low Ferritin	4	20
MHA	3	15
Anti-thrombin- III (Deficient)	6	30
Protein C (Deficient)	6	30
Protein S (Deficient)	3	15
CRP (Raised)	2	10
Thrombocytosis	1	5
Echocardiography (Abnormal)	1	5
Hypercholesterolemia	1	5
Hypertriglyceridemia	1	5

Table 5: Distribution of Laboratory, Cardiac and Vascular abnormalities in study population (N=20)

Associated abnormalities	Frequency (n)	Percentage (%)
Arteriopathy	6	30
Moyamoya	3	15
FCA	3	15
Prothrombotic disorder	6	30
Iron deficiency anemia	4	20
Cardiac disorders	1	5
Multiple abnormalities	3	15
Undetermined	1	5

Table 6: Neuroimaging of the study subjects- Pattern of involvement (n=20)

Imaging findings	Frequency (n)	Percentage (%)
Location		
Cerebral cortex	14	70
Capsuloganglionic	6	30
Corona Radiata	4	20
Thalamus	1	5
Cerebral cortex location		
Frontal	3	15
Parietal	8	40
Temporal	2	10
Occipital	1	5
Number of infarcts		
Single	17	85
Multiple	3	15
Laterality		
Left	13	65
Right	7	35
Collateral circulation	1	5

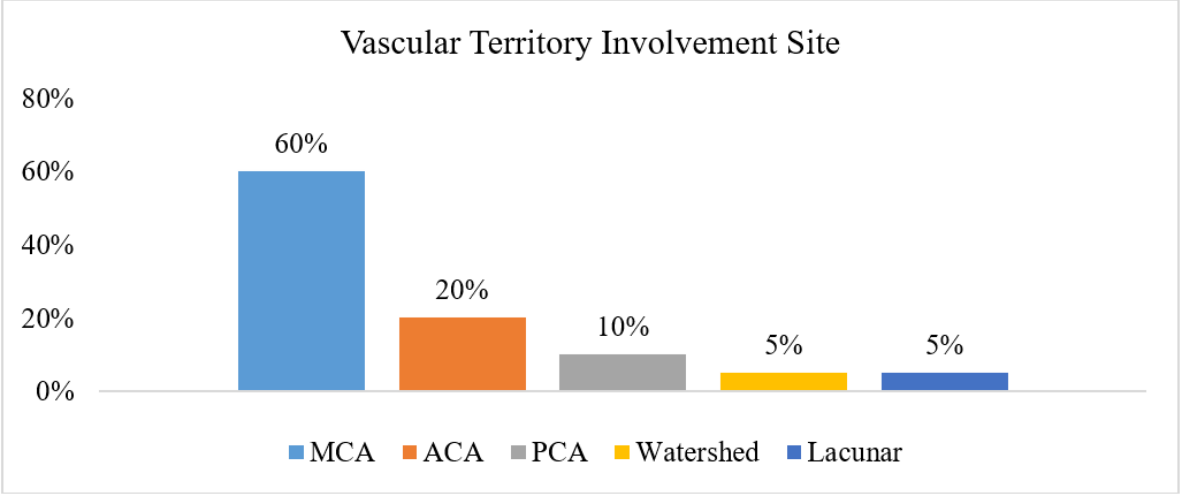

Figure 2: Distribution of the study population according to vascular territory involvement site

Table 7: Association of number of Infarct, laterality, neurological presentation and associated abnormalities with sub classification of AIS (n=20)

Variable	Total	TACI	PACI	LACI	POCI	P-value
Number of infarcts						
Single	17(85%)	1(5%)	13(65%)	1(5%)	2(10%)	0.478
Multiple	3(15%)	1(5%)	2(10%)	0	0	
Laterality						
Left	13(65%)	2(10%)	9(45%)	1(5%)	1(5%)	0.576
Right	7(35%)	0	6(30%)	0	1(5%)	
Neurological presentation						
Hemiparesis	17(85%)	2(10%)	15(75%)	0	0	0.002*
Facial nerve palsy	7(35%)	2(10%)	5(25%)	0	0	0.147
Dysphasia	5(25%)	2(10%)	3(15%)	0	0	0.065
Visual field defect	2(10%)	2(10%)	0	0	0	0.001*
Dystonia	1(5%)	0	0	1(5%)	0	0.023*
Seizure	2(10%)	1(5%)	1(5%)	0	0	0.254
Irritability	4(20%)	1(5%)	3(15%)	0	0	0.597
Headache	2(10%)	1(5%)	1(5%)	0	0	0.254
Ataxia	2(10%)	0	0	0	2(10%)	0.221
Behavioral Change	1(5%)	0	1(5%)	0	0	0.95
Altered consciousness	1(5%)	1(5%)	0	0	0	0.023*
Associated abnormalities						
Moyamoya	3(15%)	2(10%)	1(5%)	0	0	0.005*
FCA	3(15%)	0	3(15%)	0	0	0.757
IDA	4(20%)	0	3(15%)	0	1(5%)	0.59
Cardiac Disorder	1(5%)	1(5%)	0	0	0	0.023*
Prothrombotic disorder	6(30%)	0	4(20%)	1(5%)	1(5%)	0.301
Undetermined	3(15%)	0	3(15%)	0	0	0.757

DISCUSSION

According to our study, most of the patients (55%) were in the 1-5 years age range. This is almost similar to Ghofrani *et al.*, [14]. Male and female patient ratios were equal in our study. Ghofrani *et al.*, found male patients to be predominantly male [14]. There might be some genetic determinants of AIS development dependent on gender, as the 677C>T polymorphism within the MTHFR gene was suggested to significantly increase the risk of AIS in boys [15]. In this study, only 5% of patients had a history of previous stroke, and 15% of patients had a family history of stroke. Documented parental stroke by age 65 years was associated with a three-fold increase in risk of offspring stroke [16]. This could be due to environmental, behavioral, and lifestyle-related factors, or there may be a substantial genetic contribution to the risk of stroke [17]. Clinical presentation of stroke depends on the location of vascular pathology and the site of ischemic focus. Hemiparesis was the most common presentation (85%) in this study. The finding of this study is almost similar to the study

done by Fatema and Rahman (2021) and Sarecka-Hujar *et al.,* where also the predominant manifestation was hemiplegia (82.7% and 85.33%, respectively) [18,19]. In this study, Seizure was found in 10% of patients. Chiang and Cheng (2018) also found that Seizure (25.4%) more predominately compared to hemiplegia (9.9%) [2]. The finding is in disagreement with the study conducted by Fatema and Rahman (2021) (36.5%) [18]. SeizureSeizure is considered to be a more common manifestation of hemorrhagic stroke compared to ischemic stroke [20]. So, varied results may be due to the inclusion of both ischemic and hemorrhagic stroke in their study in contrast to the present study. Other clinical manifestations included facial nerve palsy (35%), dysphasia (25%), visual field defect (10%), dystonia (5%), irritability (20%), headache (10%) and altered consciousness (5%). These findings are similar to the study done by Fatema and Rahman (2021) and Earley *et al.,* [18,20]. However, this is different from Chiang and Cheng (2018) and De Veber *et al.,* [2, 21]. Varied results may be due to the inclusion of fewer numbers of patients and the observation of only arterial ischemic stroke in this study. According to our observation, moyamoya vasculopathy was found in 15% of patients, which is consistent with the findings found by Ghofrani *et al.,* (11.5%) [14]. Conversely, Nagaraja *et al.,* found moyamoya vasculopathy in 5.3% of cases, and Soriano *et al.,* found 6% of cases [22, 23]. This may explain the more widespread recognition of moyamoya vasculopathy in recent years due to advancements in diagnostic facilities. Another cause behind it may be due to the high prevalence of vascular disease, including moyamoya disease, as a main risk factor of pediatric AIS in Asian children [24]. Focal cerebral arteriopathy was found in 15% of cases in our observation. This result is dissimilar from the study conducted by Sarecka-Hujar *et al.,* and Steinlin *et al.,* (62.34% and 35%, respectively) [19,25]. The results of these previous observations are higher than those of the current study, probably due to the lack of advanced diagnostic facilities here. Our study found prothrombotic disorders in 30% of patients, as evidenced by deficient protein C, protein S, and antithrombin III. These findings are similar to those of Boundel *et al.,* (30%) [26]. Cyanotic congenital heart disease was found in only 5% of patients, which is lower than the study done by Ghorfani *et al.,* who revealed 21.31% of cases [14]. From our study, 20% of patients had iron deficiency anaemia, as evidenced by low Hb with microcytic hypochromic blood picture or low serum ferritin level. These findings are lower than the study accomplished by Ganesan *et al.,* and Azab *et al.,* [27,28]. The inclusion of more patients could demolish this disparity. In 15% of cases, no specific abnormalities were identified in the present study. The finding is different from the study of Ghofrani *et al.,* and Fatema and Rahman (2021) [14,18]. Multiple abnormalities were found in 5% of patients in this study. Lanthier *et al.,* (2000) and Fatema and Rahman (2021) reported multiple abnormalities in 24% and 19.2 % of cases. MRI of the brain was used to evaluate all the patients in this study. The cerebral cortex was the most commonly involved site (70%), followed by the capsuloganglionic region (30%), corona radiata (20%) and thalamus (5%). In the cerebral cortex, parietal region was (40%) more affected than the frontal (15%), temporal (10%) and occipital region (5%). Steinlin *et al.,* also concluded similar findings [25]. Single infarcts (85%) were more common than multiple infarcts (15%), which is consistent with another observation [19]. In this current study, left-sided involvement was more (65%) compared to right-side (35%); it is comparable with the findings of Hedna *et al.,* (54% vs 46%) and Foerch *et al.,* (56% vs 44%) [29,30]. MCA (60%) territory was most commonly involved in this study, followed by ACA (20%) and PCA (10%), which is also in agreement with the study done by Steinlin *et al.,* [25]. Hedna *et al.,* explained the velocity difference in the carotid circulation and direct branching of the left common carotid artery from the aorta might be the cause of involvement of left MCA territory more frequently in large vessel ischemia [29]. The association of a number of infarcts and laterality with the classification of AIS was observed in this study, but no statistically significant associations were found ($p>0.05$). Regarding the neurological presentations, hemiparesis, visual field defect, dystonia and altered consciousness were significantly associated with the classification of AIS ($p<0.05$). The findings of the study are more or less similar to Sarecka-Hujar *et al.,* [19], where hemiplegia was found to be significantly associated with TACI and PACI ($p<0.05$), while none of the children with POCI had hemiplegia because of the topographic localization of infarcts. Our study observed two patients with moyamoya vasculopathy and one with cardiac abnormalities in the TACI group and had a statistically significant association ($p<0.05$). On the other hand, Sarecka-Hujar *et al.,* demonstrated that only FCA showed a statistically significant association, which was more frequently (80%) found in the TACI group ($p<0.05$) [19]. According to our study, most of the patients (55%) were in the 1-5 years age range. This is almost similar to Ghofrani *et al.,* [14]. Male and female patient ratios were equal in our study. Ghofrani *et al.,* found male patients to be predominantly male [14]. 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This result is dissimilar from the study conducted by Sarecka-Hujar *et al.*, and Steinlin *et al.*, (62.34% and 35%, respectively) [19,25]. The results of these previous observations are higher than those of the current study, probably due to the lack of advanced diagnostic facilities here. Our study found prothrombotic disorders in 30% of patients, as evidenced by deficient protein C, protein S, and antithrombin III. These findings are similar to those of Boundel *et al.*, (30%) [26]. Cyanotic congenital heart disease was found in only 5% of patients, which is lower than the study done by Ghorfani *et al.*, who revealed 21.31% of cases [14]. From our study, 20% of patients had iron deficiency anaemia, as evidenced by low Hb with microcytic hypochromic blood picture or low serum ferritin level. These findings are lower than the study accomplished by Ganesan *et al.*, and Azab *et al.*, [27,28]. The inclusion of more patients could demolish this disparity. In 15% of cases, no specific abnormalities were identified in the present study. The finding is different from the study of Ghofrani *et al.*, and Fatema and Rahman (2021) [14,18]. Multiple abnormalities were found in 5% of patients in this study. Lanthier *et al.*, (2000) and Fatema and Rahman (2021) reported multiple abnormalities in 24% and 19.2 % of cases. MRI of the brain was used to evaluate all the patients in this study. The cerebral cortex was the most commonly involved site (70%), followed by the capsuloganglionic region (30%), corona radiata (20%) and thalamus (5%). In the cerebral cortex, parietal region was (40%) more affected than the frontal (15%), temporal (10%) and occipital region (5%). Steinlin *et al.*, also concluded similar findings [25]. Single infarcts (85%) were more common than multiple infarcts (15%), which is consistent with another observation [19]. In this current study, left-sided involvement was more (65%) compared to right-side (35%); it is comparable with the findings of Hedna *et al.*, (54% vs 46%) and Foerch *et al.*, (56% vs 44%) [29,30]. MCA (60%) territory was most commonly involved in this study, followed by ACA (20%) and PCA (10%), which is also in agreement with the study done by Steinlin *et al.*, [25]. Hedna *et al.*, explained that the velocity difference in the carotid circulation and direct branching of the left common carotid artery from the aorta might be the cause of involvement of left MCA territory more frequently in large vessel ischemia [29]. The association of a number of infarcts and laterality with the classification of AIS was observed in this study, but no statistically significant associations were found ($p>0.05$). Regarding the neurological presentations, hemiparesis, visual field defect, dystonia and altered consciousness were significantly associated with the classification of AIS ($p<0.05$). The findings of the study are more or less similar to Sarecka-Hujar *et al.*, [19], where hemiplegia was found to be significantly associated with TACI and PACI ($p<0.05$), while none of the children with POCI had hemiplegia because of the topographic localization of infarcts. Our study observed two patients with moyamoya vasculopathy and one with cardiac abnormalities in the TACI group and had a statistically significant association ($p<0.05$). On the other hand, Sarecka-Hujar *et al.*, demonstrated that only FCA showed a statistically significant association, which was more frequently (80%) found in the TACI group ($p<0.05$) [19].

Limitations of the study: The present study faced several limitations, including a small sample size and a study population restricted to one tertiary care hospital in Dhaka, potentially limiting the generalizability of the results to the broader community. The cross-sectional observational design lacked a control group, which could affect the robustness of the findings. Additionally, financial constraints and the unavailability of certain investigations hindered the ability to identify all potential risk factors.

CONCLUSION AND RECOMMENDATIONS

The study results showed that Hemiparesis was the most common localizing sign, followed by facial nerve palsy**.** Arteriopathy, including moyamoya and focal cerebral arteriopathy, and prothrombotic disorders are the commonly associated abnormalities, followed by iron deficiency anaemia and cardiac problems in this

study group. The cerebral cortex was the most commonly involved site, followed by capsuloganglionic regions. Single infarct, left-sided infarct, and middle cerebral artery territory were most commonly involved. Hemiparesis was significantly associated with total and partial anterior circulation stroke. Extensive investigations should be done, including serum homocysteine level, anticardiolipin antibody, lupus anticoagulant, and another metabolic and vasculitic workup to find out some other associated abnormalities. Further large-scale multicenter study is recommended.

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