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RESEARCH ARTICLE

PROFILE OF ISCHEMIC STROKE IN CHILDREN: EXPERIENCE OF THE UNIVERSITY HOSPITAL CENTER OF OUJDA

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Abstract

Ischemic strokes (IS) in children are rare but critical, presenting unique challenges due to age-specific factors. Defined by the American Heart Association as episodes of neurological dysfunction caused by focal infarctions, IS can lead to severe outcomes if not promptly addressed. Despite their rarity, pediatric IS requires careful management, complicated by the lack of validated treatment data for children. This study from the University Hospital Center of Oujda examines the management of acute IS in children, analyzing epidemiological aspects, clinical presentations, and therapeutic approaches.

Results :

1. Population: 29 children, average age 3.5 years, slight male predominance (sex ratio: 1.2).
2. Consultation Delay: 14% were seen within 24 hours; 50% after 7 days.
3. Symptoms: Motor deficit was the most common (82.7%).
4. Diagnostics: CT confirmed IS in 85% of cases; MRI established etiological diagnosis in 51.8%, showing sylvian artery involvement in all patients.
5. Etiologies: Embolic cardiopathies (31.03%), vasculopathies (20.06%), and others such as hypertension and neurofibromatosis.
6. Treatments: Symptomatic management, motor physiotherapy, aspirin, and heparin.
7. Outcomes: 74% had complete regression of motor deficits, 20.6% had partial regression, and there were two deaths due to cardiogenic shock.

The study underscores the need for a multidisciplinary approach to effectively manage IS in children and improve clinical outcomes.

Introduction:-

Ischemic strokes in children are a rare yet critical condition that presents unique challenges due to age-specific risk factors, etiopathogenesis, clinical presentations, and therapeutic approaches. According to the American Heart Association - American Stroke Association, an ischemic stroke is defined as an episode of neurological dysfunction caused by a focal cerebral, spinal, or retinal infarction in a specific vascular territory. This condition manifests with symptoms lasting more than 24 hours or until death, supported by neuroimaging, pathological, or other objective evidence of focal ischemic injuries.[1]

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Despite their rarity, ischemic strokes in pediatrics demand particular attention to prevent potentially fatal or disabling outcomes. The absence of validated, evidence-based data on thrombolytic and endovascular treatments for children is a significant limitation in managing this condition effectively.

This article aims to share the experience of our University Hospital Center of Oujda in managing acute ischemic strokes in children. Drawing on data and clinical observations from our pediatric department, we will analyze the epidemiological aspects, clinical presentations, and therapeutic approaches adopted at our center.

Ultimately, this study aims to enhance understanding and improve the management of ischemic strokes in children by sharing data and clinical experiences from our center.

Materials and Methods:-

Type of Study

This retrospective study was conducted over 8 years and 4 months, from January 2016 to May 2024.

Study Population

The study included 29 children admitted for ischemic stroke and hospitalized in the pediatric department of the University Hospital Center of Oujda. The inclusion criteria were as follows:

- Patient age: 1 month to 15 years.
- Confirmed diagnosis of ischemic stroke by computed tomography (CT) and/or magnetic resonance imaging (MRI) of the brain.

The exclusion criteria included:

- Newborns.
- Children re-hospitalized during the same study period.

Data Collection

The patients' demographic, clinical, and paraclinical data were collected from hospital medical records. This information included age, gender, medical history, clinical findings at admission, imaging results, administered treatments, and clinical outcomes at discharge.

Data Analysis

The collected data were analyzed to identify risk factors, clinical presentations, and therapeutic approaches for ischemic strokes in children. Statistical analysis was performed using appropriate software to determine trends and significant associations.

This methodology provides a comprehensive overview of the pediatric department's experience at the University Hospital Center of Oujda managing ischemic strokes in children, highlighting the particularities and challenges associated with this rare but serious pathology.

Results:-

Demographic and Clinical Characteristics

Of the 29 children included in the study, the average age of the patients was 3.5 years (standard deviation: 2.1 years), with a slight male predominance (sex ratio: 1.2).

Consultation Delay

Only 14% of the children were seen within 24 hours of symptom onset, while 50% sought consultation after 7 days. This delay can be attributed to the non-specific nature of the symptoms and poor recognition of clinical signs by parents and primary healthcare professionals.

Medical History

MedicalHistory	N (%)
No particularhistory	8 (27,5%)
Cardiopathies	8 (27,5 %)
Trisomy 21	6 (20,6 %)

Recent infections	3 (10,3 %)
Others: - Neurofibromatosis -Autoimmunehistory - Ulcerativecolitis - Trauma	4 (13,8 %) 1 (3,4 %) 1 (3,4 %) 1 (3,4 %) 1 (3,4 %)

Reasons for Consultation

Reasons for Consultation	**N (%)**
Motor deficit	24 (82,7 %)
Seizures	4 (14,8 %)
consciousness disorders	8 (29,6 %)
Associated febrile syndrome	6 (22,2 %)
Language disorders	3 (11,1 %)

Diagnostic Imaging

All patients underwent a cerebral computed tomography (CT) scan, confirming the diagnosis of ischemic stroke in 85% of cases. Magnetic resonance imaging (MRI) was performed in 62% of patients, establishing the etiological diagnosis in 51.8% of examined cases. Cerebral ischemia affected the sylvian arterial territory in all patients (100%).

Etiological Assessment

The etiological assessment of children with ischemic stroke included the following examinations: electrocardiogram (ECG), electroencephalogram (EEG), echocardiography, ultrasound of the supra-aortic trunks, lumbar puncture, hemoglobin electrophoresis, and thrombophilia screening.

Identified Etiologies:

IdentifiedEtiologies	**Percentage (%)**	**Cases**
Embolic Cardiopathies	31.03%	
InfectiousEndocarditis		1
Mitral Stenosis		2
DilatedCardiomyopathy		2
Tetralogy of Fallot		1
MyocardialStunning (CO poisoning)		1
Restrictive Cardiomyopathy		1
- Atrioventricular communication complicated by PAH		1
Vasculopathies	20.06%	
Moya-Moya Syndrome		3
Post-varicellaAngiitis		2
TuberculousAngiitis		1
OtherEtiologies	24.13%	
Hypertension		2
Type 1 Neurofibromatosis		1
Pheochromocytoma		1
Scorpion Sting		1
Hyper-IgE Syndrome		1
Trauma withCarotid Dissection		1
UndeterminedEtiology	24.13%	

Identified Etiologies

This table summarizes the various identified etiologies among children with ischemic stroke in our study.

Administered Treatments

Treatments administered to children with ischemic stroke included symptomatic treatment, which consisted of stabilization for all patients. Motor physiotherapy was initiated for all patients with motor deficits. Regarding medications, aspirin was given to 13 patients (44.8%), heparin was used in 6 patients (20.6%), and one patient underwent decompressive surgery. Adequate etiological treatment was initiated for patients with a curable etiology.

Clinical Course

The clinical course of patients showed complete regression of motor deficits, including facial paralysis, in 74% of patients. Partial regression was observed in 20.6% of patients, who were subsequently referred to the rehabilitation service. One patient with neurofibromatosis developed epilepsy. Two cases of death (6.9%) were noted, attributed to cardiogenic shock.

Multivariate Analysis

The results of our multivariate analysis did not show a statistically significant association between age, sex, and complete regression of motor deficits. However, studies with larger samples are necessary to strengthen these observations and establish robust clinical recommendations. Further research is essential to identify modifiable factors that could improve clinical outcomes.

Figure 1:- CT scan of a 7-and-a-half-year-old child showing a right parietal hypodensity associated with an ischemic stroke (IS). MRI with angiographic slices shows hyperintense lesions associated with IS secondary to Moyamoya syndrome.

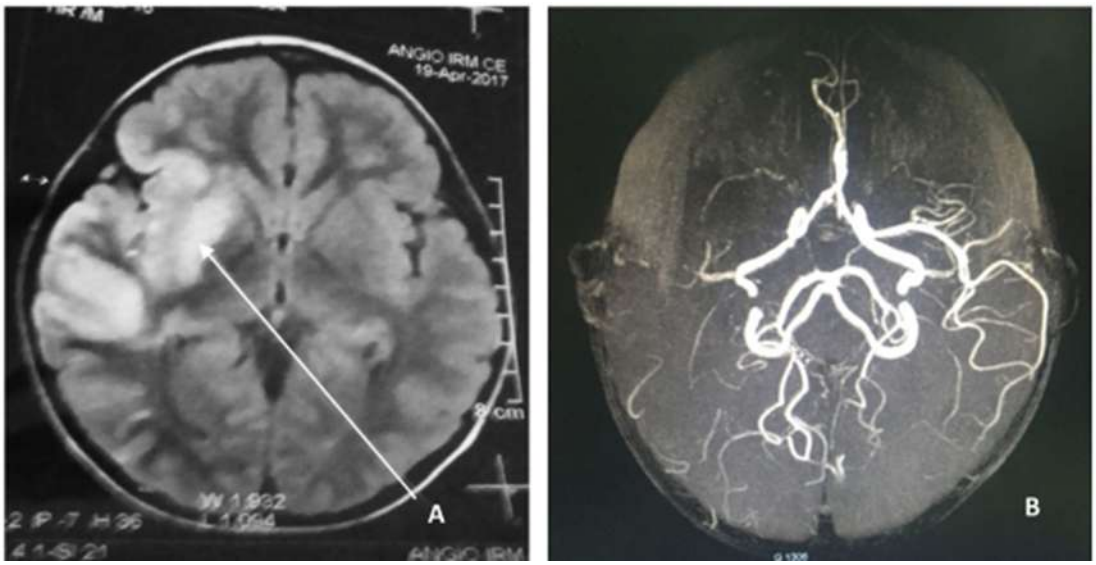

Figure 2:- MRI of a 5-year-old child showing: A. An ischemic stroke (IS) in the superficial and deep right sylvian territory. B. Amputation of the right middle cerebral artery secondary to post-varicella angiitis.

Discussion:-

Our study provides an analysis of the various characteristics of ischemic strokes in children admitted to our university hospital center. This analysis offers insights into the clinical presentation, underlying etiologies, and clinical outcomes of this specific population. Comparing our results with the available literature, several key points merit discussion.

Ischemic strokes in children are rare, with varying incidence rates based on age groups and geographical origins. In newborns, the incidence is 1 per 3,500 live births, while during childhood, it ranges from 1 to 2 per 100,000 per year.[2]

Our study included 29 children with an average age of 3.5 years, showing a slight male predominance (sex ratio: 1.2). A study by SoungaBandzouzi et al. in Congo reported a mean age of 11 years and a male predominance[3], which corroborates our findings. Previous studies have also reported increased risk in boys[4][5]. However, a study in southern England on 96 cases of childhood ischemic stroke did not find statistically significant differences between the sexes.[6]

Regarding time to presentation, half of our patients sought medical care after 7 days. Perez et al. reported an average consultation delay of over 24 hours[7], and Sandougou et al. found it to be 24.5 hours[3]. This delay may be due to the nonspecific nature of symptoms in children and a lack of awareness. Recently, several diagnostic scores have been developed to enhance diagnostic sensitivity.[8][9]

The most common presenting symptom in our study was motor deficit (82.7%), followed by altered consciousness (29.6%), seizures (14.8%), and language disorders in three patients. Overall, hemiplegia remains the major presenting symptom according to several series[3][6][10]. Clinical manifestations vary with age, making initial clinical diagnosis challenging and often delaying appropriate management.

All our patients underwent cerebral CT scanning, and 62% underwent MRI, revealing the involvement of the sylvian artery. MRI remains the preferred diagnostic tool, providing not only diagnostic but also prognostic and etiological value[2][10][11].

Identified risk factors in our series mainly included heart disease and Down syndrome. Key risk factors in children include prothrombotic conditions, heart diseases, and non-atherosclerotic arteriopathies, with varying distribution based on geographical regions and age groups.[10]

Management of ischemic strokes is multidisciplinary. None of the children in our center received thrombolytic therapy. However, the majority of our patients achieved full recovery, consistent with other studies. Ischemic strokes have long-term implications on neurological functions[12], underscoring the need for prolonged follow-up and tailored rehabilitation programs.

Our study has limitations, including its retrospective nature and the limited number of included patients. Prospective studies with larger cohorts are needed to confirm our findings and further explore prognostic factors of ischemic strokes in children. Additionally, long-term evaluation of clinical outcomes could provide additional insights into medium- and long-term management outcomes in this population.

Conclusion:-

In conclusion, our study provides a comprehensive overview of the management of ischemic strokes in children and underscores the importance of a multidisciplinary and individualized approach to optimize clinical outcomes. Further research is needed to better understand prognostic factors and to develop more effective treatment strategies for this vulnerable population.

Conflicts of Interest:

The authors declare no conflicts of interest related to this study.

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