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CLINICOPATHOLOGICAL PATTERN OF CHILDHOOD INTRACRANIAL TUMOURS IN THE NIGER DELTA

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ABSTRACT

Intracranial tumours are a mixed group of neoplasms originating from intracranial tissues with varying degrees of malignancy. In children, they are predominantly solid tumours and are second only to hematological malignancies. About two thirds are infratentorial, unlike in adults, gliomas constituting the majority. Though of great concern, literature is almost silent on the pattern of this disease from the Niger Delta regions of Nigeria.

Study Objective/Setting: To document the epidemiology, management and outcomes of childhood brain tumours in our teaching hospital setting in the Niger Delta region of Nigeria.

Methodology: Demographic, clinical, radiological and histopathological data of 57 patients aged ≤ 17 years treated for intracranial tumours from inception of our neurosurgical unit in 2006 June to 2019 April were documented. Outcomes were also documented. Data was statistically analysed using SPSS 21.0.

Results: Childhood intracranial tumours represented approximately 8.0% of paediatric neurosurgical admissions and 27% of all intracranial tumours. Of the 57 patients studied, 37 were male (60%) and 23 (40%) were female i.e. ratio 1.5: 1. The age at presentation was 2 to 17 years; mean age was 9.79 (median 9.0) years in boys and 9.91 (median 10.5) years in

girls. The duration of symptoms was 2 weeks to 48 months, forty-two percent presenting after 6 months of onset of symptoms. Headaches (65%), altered sensorium or frank coma (58%) and vomiting (44%) were the commonest symptoms. There were almost equal numbers of supra- and infratentorial tumours and 54% were gliomas. Cystic cerebellar astrocytoma (25%) followed by craniopharyngioma (14%), medulloblastomas (9%) and pineal region tumour (9%) were the most frequent histological types. Forty-eight patients underwent tumour resections. Mortality was 23%.

Conclusion: Intracranial tumours in children, though less common than congenital anomalies of the neuraxis, are associated with a very high mortality in paediatric neurosurgical patients. Besides the location and histological type, late presentation influences outcome significantly.

Keywords: *Intracranial Tumours; Childhood; Predominantly Solid; Cystic Cerebellar Astrocytomas; Paediatric Neurosurgical.*

INTRODUCTION

Childhood intracranial tumours are the most common paediatric solid tumours, second to leukemia as the most common childhood cancer and contributing significantly to mortality in children.[1-7] Though some literature and instituted teaching held that over sixty percent of paediatric intracranial tumours were infratentorial, this is subject to the age at presentation.[1, 2]

We present in this study the demographic, clinical and radiologic findings in childhood brain tumours as well as the outcomes of their management in our tertiary hospital setting, a major referral centre for paediatric neurosurgical

patients in Nigeria's Niger Delta region.

Patients and Methods

From June 2006 to April 2019, 57 patients who were 17 years old and under were recruited into the study.

The patients presented through our hospital's neurosurgical outpatient clinic, children's outpatient clinic, children's emergency room and general practice clinic, or from private health facilities. All these patients resided either in Edo, Delta, Ondo, Kogi and sometimes, Anambra, Imo Rivers and Bayelsa States.

They all had detailed neurosurgical examination as well as radiological and laboratory evaluation. Radiological evaluation included cranial computerised tomography (CT) scan with or without, for few patients, magnetic resonance imaging (MRI) of the brain. The diagnoses of intracranial tumour was made based on the presence of features of raised intracranial pressure (headaches, vomiting, papilloedema), deteriorating level of consciousness or coma, seizures, speech or visual disturbance, inability to walk, gait impairment or ataxia, etc. Diagnosis was confirmed by imaging after neurosurgical evaluation.

Laboratory investigation included full blood counts, electrolytes urea and creatinine, blood glucose estimation, cerebrospinal fluid (CSF) microbiology, biochemistry and cytology. CSF beta human chorionic gonadotropin (β HCG) and alpha fetoprotein (AFP) were evaluated in patients with pineal region tumours as an index of susceptibility of the tumour to radiotherapy.

Majority of the patients underwent craniotomy or craniectomy for gross total

or subtotal tumour excision (sometimes following, or seldomly followed by, preliminary CSF diversion for secondary obstructive hydrocephalus) and, then, radiotherapy. Those with pineal region tumours had ventriculoperitoneal shunts followed by radiotherapy. Some patients with inoperable tumours underwent radiotherapy alone. Outcomes of treatment were documented as survival or death. The data were statistically analyzed using SPSS 21.0.

Results

Of 703 paediatric neurosurgical (and 213 total intracranial tumours) between June 2006 and April 2019, 57 had intracranial tumours.

General

The age of onset of symptoms ranged from 2 to 17 years with an even distribution in all the age groups. Intracranial tumours appeared commoner in boys aged 5 to 9 years and 15 to 17 years. This was slightly reversed from 10 to 14 years. Male to female ratio was 1.48: 1. (Table 1).

Duration of Symptoms

In patients aged ≤4 years, duration of symptoms before presentation ranged from 1 to 12 months (mean 5.54, median 5.0 months); in those aged 5 to 9 years, 0.5 to 48 months (mean 9.82, median 6.0); 10 to 14 years, 2 to 48 months (mean 12.1, median 7.0); 15 to17 years, 1.5 to 24 months (mean 8.03, median 6.0). (Figure 1). The earliest presentation was 2 weeks after the onset of symptoms and the most prolonged was 48 months. Most, 24 patients i.e. 42.1%, presented after 6 months of onset of symptoms, 19 (33.3%) presented at six months and 14 (24.6%) presented before 6 months

of onset. Generally, patients aged ≤ 4 years presented earlier. (Figure 1).

Presenting Symptoms

The common symptoms were headaches (37), altered sensorium and frank coma (33), vomiting (25), seizures (20), gait abnormalities (17), hemiparesis/inability to walk (7), visual impairment (8). The others were features of herniation (subfalcine, tentorial, foramen magnum) (6), head enlargement or cranial mass (5), decerebration (2) and progressive intellectual deterioration (1). (Figure 2)

Tumour Location and Histological Type

There were similar numbers of patients with supra- and infratentorial tumours in all the age strata, though the former predominated in children aged 15 - 17 years (ratio 2: 1). (Table 2).

The most frequent histological types were cystic cerebellar astrocytoma (14), craniopharyngioma (8), medulloblastomas (6), pineal region tumour (6), oligodendroglioma (5), ependymoblastoma (5), brain stem gliomas (3) and thalamic gliomas (2). There was one each of cerebellar lymphoma, fibrosarcoma, cerebellar metastatic tumour, neurofibroma, fibrous dysplasia, parietal cystic glioma and ependymoma. (Figure 3)

Treatment

Forty-eight patients underwent tumour resections (23 gross total and 25 subtotal), 9 were inoperable (6 pineal region tumours who had ventriculo-peritoneal shunt for cerebrospinal fluid diversion prior to radiotherapy). Three died after VP shunt before any definitive surgery. Of the 48 who had tumour resections, 17 had preliminary VP shunting.

Mortality

Thirteen (22.8%) patients died.

DISCUSSION

Cancer is a leading cause of death in children, brain and central nervous system tumours representing the most common solid tumour as well as a leading cause of cancer death in individuals 0 - 19 years of age in the U.S. and Canada.[3 - 6] Indeed, paediatric brain tumours have the highest cancer mortality rate among childhood cancers.[3 - 6]. In the U.S. alone, over two thousand diagnoses of paediatric brain tumours are made yearly.[6]

Though childhood intracranial tumours represented eight percent of paediatric neurosurgical admissions and twenty-seven percent of all intracranial tumours in our study, there was no patient under two years; this compares with other studies which hold that brain tumours are uncommon in infants.[2] While some report a small peak at the age of two years with a gradual decline in the first decade, our study showed no difference in incidence between the various age strata in childhood.[8] Furthermore, the primary health physicians may not recognize these patients when they present early especially in infants as observed in this study with the duration before presentation; only about thirty percent of diagnoses were made before six months of onset of illness in sharp contrast to up 92.7% in industrialized settings.[9] Headaches and vomiting remain the most common presenting symptoms, more so as our patients were older and had less elastic skulls; altered sensorium (extending into frank coma) was a significant presentation in our study

reflects the late presentation of patients to our facility.

In this study, supratentorial and infratentorial tumours occurred in equal proportions, but in literature, over a quarter of tumors in children less than 6 months are infratentorial in location, this proportion rising up to three quarters by the age of 24 months.[2]

Childhood brain tumours include several histological subtypes, up to ninety percent being of neuroectodermal origin especially under two years.[1, 2, 10] The findings in our report were similar; over half were neuroectodermal especially gliomas. Cystic cerebellar astrocytomas, in over half, followed by craniopharyngioma, medulloblastomas and pineal region tumours were the most frequent histological types.

Although progress has been made in improving survival rates for some subtypes, understanding of risk factors for childhood brain tumours remains limited to a few genetic syndromes and ionizing radiation to the head and neck.[1] Established risk factors intracranial tumours in children include ionizing radiation and certain cancer syndromes; there are positive associations between advanced parental age, birth defects, foetal growth markers, CT scans, maternal dietary N-nitroso compounds, and residential pesticide exposure.[11 - 13]
Some of the patients who presented early could only afford the cost cranial computerised tomography and surgery several months later, requiring intervention as a matter of urgency due to rapid neurologic deterioration and brain stem compression.

Late presentation due to delayed diagnosis or poverty is the bane of treatment of childhood brain tumours. Lack of awareness in the population, low index of suspicion amongst first responders and the cost of cranial CT scans are significant contributory factors to this as the cost of this investigation is borne the patient's caregivers.

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Table 1. Age and Sex Distribution Childhood Intracranial Tumours

Age/Sex	Male	Female	Total
≤4 years	6	7	13
5 – 9 years	11	3	14
10 – 14 years	5	10	15
15 – 17 years	12	3	15
Total	34 (59.65%)	23 (40.35%)	57 (100%)

Table 2. Location of childhood tumours with respect to the tentorium cerebelli

Location of Tumour	Age Groups (years)				
	0-4	5-9	10-14	15-17	Total
Supratentorial	7	5	7	10	29
Infratentorial	6	8	9	5	28
Total	13	13	16	15	57

Figure 1. Duration of symptoms before presentation in all patients in various age categories.

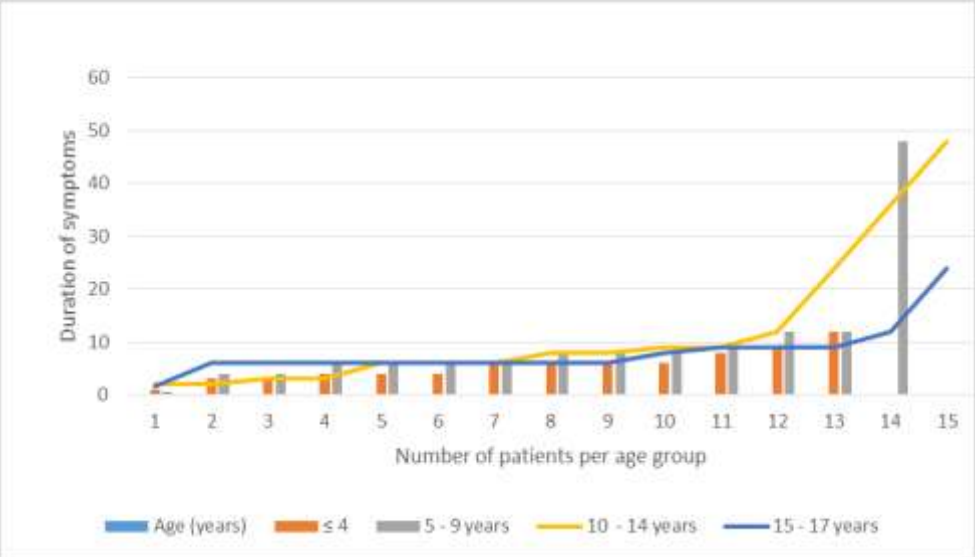


Figure 2. Major presenting symptoms of childhood intracranial tumours.

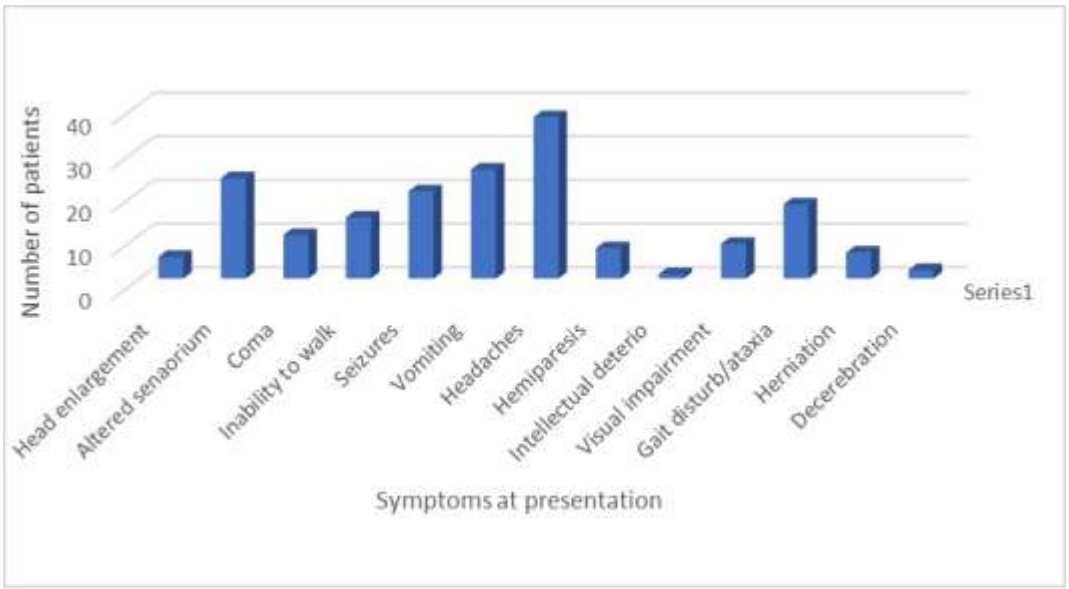
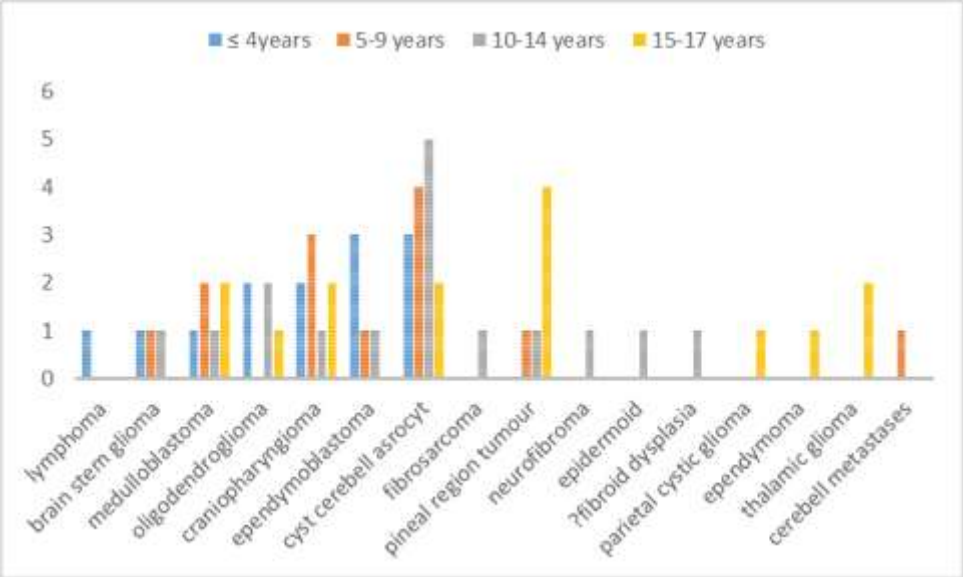


Figure 3. Histological types of childhood intracranial tumours



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