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Diagnosis and Management of Pediatric Brain Tumors in Togo

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Abstract

Background: Pediatric brain tumors (PBT) are among the most common childhood neoplasms worldwide, but their management in low- and middle-income countries (LMICs) remains under-documented. Limited access to specialized care, diagnostic tools, and adjuvant therapies poses significant challenges in sub-Saharan Africa, including Togo. **Objective:** This study reviews the management of pediatric brain tumors in Togo. **Methods:** We conducted a retrospective study in the neurosurgery department at Sylvanus Olympio Teaching Hospital between November 2017 and December 2022. Demographic, clinical, radiographic, operative, pathology, and outcome data were collected and analyzed. **Results:** Eighteen patients had histologically verified brain tumors. Ages ranged from 1 to 15 years (mean: 7.73 ± 4.28), with a sex ratio of 1. Symptoms of raised intracranial pressure were present in 83.4% of cases. The mean interval to presentation was 22 ± 5.32 months. Tumors were supratentorial in 66.7% of cases. Total tumor removal was achieved in 61.1%. Astrocytoma was the most common histological diagnosis, followed by ependymoma and medulloblastoma. Five patients (27.8%) died within the first month post-surgery. The estimated 5-year survival rate was 43% ± 5.4%. **Conclusion:** Delayed diagnosis, insufficient infrastructure, and limited access to radiotherapy and chemotherapy contribute to poor outcomes. Improving neurosurgical capacity, infrastructure, and financial support could enhance survival and outcomes for pediatric brain tumor patients in Togo.

Keywords

Pediatric Brain Tumors, Togo, Neurosurgery, Sub-Saharan Africa

1. Introduction

Intracranial tumors are the second most common neoplasms in children after leukemia [1]. The estimated age-standardized incidence rate of pediatric central nervous system (CNS) tumors in sub-Saharan Africa (SSA) was 6.3 per million person-years in 2017 [2] [3]. This is significantly lower than the incidence rates observed in high-income regions, which range between 12.4 and 38.9 per million person-years [2] [3].

Despite their clinical importance, brain tumors in SSA remain underdiagnosed and poorly documented due to economic constraints, lack of skilled neurosurgeons, limited access to diagnostic tools, and weak health information systems [2]-[5]. Globally, approximately 2 to 3 million people require neurosurgical intervention annually, with brain tumors accounting for 3.2% of these essential cases [2]. Addressing this burden in SSA necessitates a significant increase in neurosurgical capacity. By 2030, it is estimated that 1898 additional neurosurgeons will be needed in West Africa alone [2]-[4].

Togo, a low-income country in West Africa with a population of 8 million, has only eight neurosurgeons. The limited resources, lack of specialized infrastructure, and reliance on out-of-pocket healthcare financing make timely diagnosis and treatment of pediatric brain tumors particularly challenging. No studies have been conducted on pediatric brain tumors in Togo. Therefore, this study aimed to describe pediatric brain tumors' epidemiological, clinical, and pathological characteristics and their management outcomes in Togo.

2. Patients and Method

2.1. Study Design

We conducted a retrospective study in the neurosurgery department of Sylvanus Olympio Teaching Hospital from November 2017 to December 2022. We reviewed medical records and clinical databases to collect demographic, clinical, radiographic, surgical, pathology, and outcome data.

We needed to write this article before the neurosurgery department had a proper operating room. Significant technological advances, such as a functional operating microscope, pneumatically powered craniotome, endoscope, and Mayfield head holder, were not made. There was also no neuroreanimation in the hospital. Molecular markers are not available in Togo to date for the diagnosis.

2.2. Study Population

- **Target Population**: Children aged 0 to 15 years diagnosed with brain tumors.
- **Source Population**: Patients treated in the neurosurgery department of Sylvanus Olympio Teaching Hospital during the study period.

2.3. Inclusion Criteria

- Children aged ≤ 15 years with histologically confirmed intracranial tumors.

- Diagnosis was confirmed through histology, and immunohistochemistry was performed when parents could afford it.

2.3. Non-Inclusion Criteria

- Medical records without histological diagnosis.
- Patients operated outside the study period.

2.4. Exclusion Criteria

- Incomplete or unusable medical records.

2.5. Data Collection

The study reviewed patient demographic data (age, sex), clinical presentation, imaging findings (CT/MRI), surgical procedures, histopathological diagnosis, and postoperative outcomes.

2.6. Statistical Analysis

Descriptive statistics were used. Categorical variables were expressed as frequencies and percentages, while continuous variables were presented as means ± standard deviations (SD).

2.7. Ethical Considerations

The study was approved by the Board of Sylvanus Olympio Teaching Hospital and the Ethics Committee at the Faculty of Medicine, University of Lomé.

We analyzed statistical data as frequency data and percentages for categorical variables or mean ± SD and median (range) for continuous variables.

2.8. Ethical Considerations

The Board of Sylvanus Olympio Teaching Hospital and the Ethics Committee at the Faculty of Medicine of the University of Lomé approved this study.

3. Results

Among 68 pediatric patients with radiological evidence of intracranial mass lesions, 18 had histologically confirmed brain tumors. Thirteen cases of infectious lesions and 37 cases without histological reports were excluded. The incidence for the period was 3.6 pediatric brain tumors per year.

Ages ranged from 1 to 15 years (mean: 7.73 ± 4.28). The sex ratio was 1.

Symptoms of raised intracranial pressure were observed in 83.4% of cases, hemiparesis in 38.9%, and visual disturbances in 38.9% (Table 1). The mean intervals to the presentation were 22 months ± 5.32.

A CT scan was performed in 77.7% of cases, and an MRI was done in 55.6%. Supratentorial tumors accounted for 66.7% of cases. Supratentorial was the standard location, with 66.7% of cases occurring in this area (Table 2).

Total tumor resection (Figure 1 and Figure 2) was achieved in 61.1% of pa-

tients, while biopsy was performed in one case (Table 3). Astrocytoma (40.7%) was the most common tumor, followed by ependymoma (22.2%) and medulloblastoma (16.7%) (Table 4).

Five patients (27.8%) died within the first month after surgery.

Two children had radiotherapy, while none had chemotherapy.

The estimated 5-year survival rate was 43% ± 5.4%.

4. Discussion

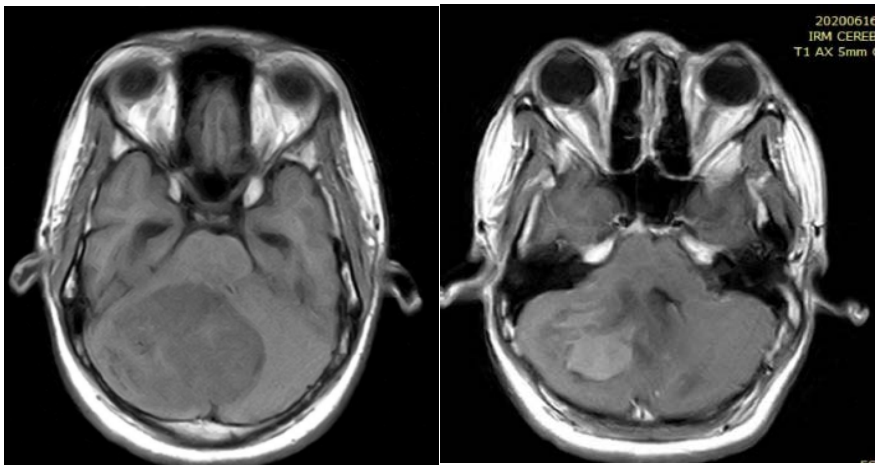
This study represents the first effort to describe the distribution and management

Table 1. Symptoms at presentation.

	Cases	%
Intracranial pressure	15	83.4
Hemiparesis	7	38.9
Altered vision	7	38.9
Seizures	3	16.7
Macrocephaly	1	5.6

Table 2. Tumor location.

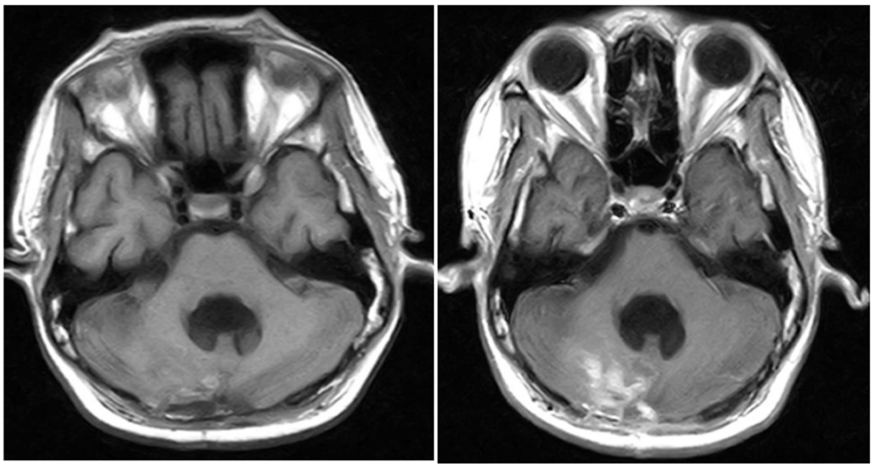
	Cases	%
Supratentorial	**12**	**66.7**
Hemispheric	8	44.5
Suprasellar	1	5.5
Ventricle	3	16.7
Infratentorial	**6**	**33.3**
Cerebellum	5	27.8
Brain stem	1	5.5



(a) (b)

Figure 1. Preoperative MRI showed a right cerebellar tumor compressing the fourth ventricle. (a) T1 without contrast; (b) T1 with contrast.

of pediatric brain tumors (PBT) in Togo. Like findings in other low—and middle-income countries (LMICs), our results highlight critical challenges, including delayed diagnosis, limited diagnostic tools, inadequate infrastructure, and poor access to adjuvant therapies, significantly contributing to suboptimal outcomes.



(a) (b)

Figure 2. Postoperative MRI showing a gross total resection of the tumor. (a) Without contrast; (b) With contrast.

Table 3. Surgical procedures.

	Cases	%
Craniotomy and total tumor removal	11	61.1
Biopsy	1	5.5
Ventriculoperitoneal shunt	3	16.7
Reservoir placement	3	16.7

Table 4. Tumors' histological diagnosis.

	Cases	%
Astrocytic tumors	5	27.8
Oligoastrocytoma	2	11.1
Ependymoma	4	22.2
Medulloblastoma	3	16.7
CNS primitive neuroectodermal tumor	1	5.5
Craniopharyngioma	3	16.7
Total	18	100

Togo has three neurosurgery departments: one north at 414 km from Lomé and two in Lomé (Department of Sylvanus Teaching Hospital and Department of Regional Hospital of Lomé Commune). The neurosurgery department of Sylvanus Olympio Teaching Hospital is the referral for pediatric neurosurgery. Due to its retrospective aspects and the lack of histopathological or alternate diagnoses, the

number of patients in our study is meager.

The annual incidence of 3.6 cases per year in our series is markedly lower compared to reports from Uganda (17.2 cases/year) by Stagno *et al.* [1] and Nigeria (12.6 cases/year) by Uche [6].

The mean age of 7.73 years and lack of sex predilection (sex ratio = 1) observed in this study are consistent with findings in Nigeria [6] [7]. Intracranial hypertension signs (headaches, vomiting, and altered vision) were the most common presenting symptoms at 83.4% in our series. Stagno [1] and Uche [6] described headaches and vomiting as common presenting symptoms. The mean delay of 22 months between symptom onset and diagnosis further emphasizes the systemic challenges of timely diagnosis in LMICs [6]. In comparison, delays in high-income countries average 7 - 8 months [8]. The similarity in age at diagnosis across SSA suggests a shared pattern of late presentation, exacerbated by a misdiagnosis of early symptoms, particularly headaches and vomiting, as common illnesses like malaria. Educational campaigns targeting primary care providers and caregivers are essential to improve symptom recognition. Significant contributors to late presentation are also parents' and caregivers' low levels of education and poverty. In this context, most pediatric brain tumors may never be diagnosed. The discrepancy underscores a widespread issue in SSA: many pediatric brain tumors remain undiagnosed due to poverty, low awareness, and limited access to neurosurgical services. Similar findings have been reported in Sudan, where limited diagnostic capacity was associated with the underdiagnosis of CNS tumors in children [9]. Factors such as poverty, long travel distances, and reliance on traditional healers contribute to prolonged intervals before hospital presentation. Strengthening health education and creating decentralized diagnostic centers could reduce diagnostic delays.

Brain tumors account for a significant burden of disease, especially in children [2]. Between 2 and 3 million people each year require neurosurgical intervention and consultation. Brain tumors account for 3.2% of neurosurgical cases requiring neurosurgical intervention in that population [2] [10]. In Togo and Nigeria [11], pediatric neurosurgery is constrained by many factors, including poor government funding and weak health policies, such as insufficient health insurance schemes leading to out-of-pocket healthcare financing. That illustrates the challenges to care delivery, access to quality care, and health information systems [2]. Most children in SSA don't receive the neuro-oncology care they need because of the limited diagnostic capacity, which is related to a shortage of skilled neurosurgical workers, infrastructure, and diagnostic tools. In Togo, parents must pay for accessing care for their children in a low socioeconomic condition. Some regions in Togo do not have neurosurgeons. Addressing this gap requires improving primary healthcare systems to recognize symptoms early and refer patients promptly. 66.7% of tumors in our study occurred in the supra-tentorial compartment. Uche [11] in Nigeria found that 55.3% of tumors in his series were developed in the supra-tentorial compartment. Surgery provides a direct and effective treatment path for brain tumors, and the extent of resection correlates with the overall out-

come [12]-[14]. Intraoperative neuronavigation and brain function mapping facilitate tumor resection and help in preserving eloquent brain loci during surgery [11] [14]. In Togo, we don't have any neuronavigation and brain mapping. We rely on microneurosurgical techniques without a good microscope. In that condition, we realized 61.1% (n = 11) total resection of the tumor.

Only 18 patients had a histological diagnosis in our research. Parents had to pay for histopathological diagnosis. Immunohistochemistry is done in a private institution; it is unavailable in the hospital. That represents a cost for poor parents. Anatomopathological centers are only in Lomé. So, when a patient is operated on in Kara (the second neurosurgery unit at 414 km from Lomé), the piece for histopathological examination must be transported to Lomé, usually by the family. Those families don't have money for transportation, and the piece is thrown. According to that, there will be no histopathological diagnosis.

PBT distribution differs by region. Astrocytoma (40.7%) was the most common tumor, followed by ependymoma (22.2%) in our series. The third most common tumors were medulloblastoma (16.7%) and craniopharyngioma (16.7%). A recent meta-analysis demonstrates the same distribution of pediatric brain tumors in sub-Saharan Africa [2]. In the United States [15] and Finland [16], respectively, glioma accounts for 49.4% and 61.01%, medulloblastoma for 8.33% and 7.38%, and craniopharyngioma for 3.76% of pediatric brain tumors. The lack of advanced diagnostic tools in Togo, such as molecular markers, limits our ability to classify tumors more precisely, which could influence treatment decisions and outcomes.

The absence of adequate adjuvant therapies (radiotherapy and chemotherapy) in our setting mirrors the challenges faced across LMICs. In Togo, only two patients received radiotherapy, and none received chemotherapy due to financial constraints and the lack of public facilities offering these services. Similar reports from Nigeria [11] and Sudan [9] emphasize the urgent need for government-funded cancer treatment programs to reduce out-of-pocket expenses and improve access to essential therapies. In high-income countries, where radiotherapy and chemotherapy are integrated into treatment protocols, survival rates are significantly higher [17] [18].

In cases of glioblastoma, the standard radiotherapy protocol is combined with temozolomide. The dose is 60 Gy in 30 fractions of 2 Gy daily, 5 days a week.

Our series' 5-year survival rate of 43% ± 5.4% reflects the harsh realities of limited resources. While this outcome is comparable to Uganda's survival rate of 60% [1], it is substantially lower than rates reported in Germany (64%) [17] and Italy (68%) [18]. In Sudan, the survival rate was as low as 13% due to similar constraints in surgical capacity and adjuvant care [9]. These comparisons underscore the need for systemic improvements, including surgical infrastructure, oncological services, and affordable therapies.

Limitations

The retrospective nature of our study, based on the analysis of medical records,

represents a limitation to consider. Furthermore, this study was conducted in a single institution and involved a relatively small patient sample, which could introduce selection and measurement biases. As a result, it is challenging to draw generalized conclusions about the status of pediatric brain tumors in children across Togo. However, the studied hospital is one of the leading specialized brain tumor treatment facilities in the country, making this data potentially representative of the prevalence and profile of pediatric brain tumors nationwide. Moreover, this study provides valuable insights for managing pediatric brain tumors in similarly resource-limited settings and lays the foundation for improving cancer care in Togo.

5. Conclusion

This study is the first to describe pediatric brain tumors in Togo, highlighting significant challenges in diagnosis, treatment, and follow-up. Astrocytoma was the most common tumor type, followed by medulloblastoma. The lack of surgical infrastructure, delayed diagnosis, and absence of adjuvant therapies are major contributors to poor outcomes. Increased investment in neurosurgical capacity, improved access to diagnostic tools, and financial support for families are essential to improving survival and quality of care for pediatric brain tumor patients in Togo.

Consent to publish

Consent was obtained from all the authors to publish the study results.

Conflicts of Interest

We have no competing interest to declare.

References

[1] Stagno, V., Mugamba, J., Ssenyonga, P., Kaaya, B.N. and Warf, B.C. (2013) Presentation, Pathology, and Treatment Outcome of Brain Tumors in 172 Consecutive Children at CURE Children's Hospital of Uganda. The Predominance of the Visible Diagnosis and the Uncertainties of Epidemiology in Sub-Saharan Africa. *Child's Nervous System*, **30**, 137-146. https://doi.org/10.1007/s00381-013-2297-z

[2] Nyalundja, A.D., Kanmounye, U.S., Karekezi, C., Laeke, T., Thango, N. and Balogun, J.A. (2024) Pediatric Brain Tumors in Sub-Saharan Africa: A Systematic Review and Meta-Analysis. *Journal of Neurosurgery: Pediatrics*, **33**, 524-535.

[3] Steliarova-Foucher, E., Colombet, M., Ries, L.A.G., Moreno, F., Dolya, A., Bray, F., *et al.* (2017) International Incidence of Childhood Cancer, 2001-10: A Population-Based Registry Study. *The Lancet Oncology*, **18**, 719-731.

[4] Mbi Feh, M.K., Lyon, K.A., Brahmaroutu, A.V., Tadipatri, R. and Fonkem, E. (2021) The Need for a Central Brain Tumor Registry in Africa: A Review of Central Nervous System Tumors in Africa from 1960 to 2017. *Neuro-Oncology Practice*, **8**, 337-344. https://doi.org/10.1093/nop/npaa086

[5] Ukachukwu, A.K., Still, M.E.H., Seas, A., von Isenburg, M., Fieggen, G., Malomo, A.O., *et al.* (2023) Fulfilling the Specialist Neurosurgical Workforce Needs in Africa: A Systematic Review and Projection toward 2030. *Journal of Neurosurgery*, **138**,

1102-1113. https://doi.org/10.3171/2022.2.jns211984

[6] Uche, E.O., Shokunbi, M.T., Malomo, A.O., Akang, E.E.U., Lagunju, I. and Amanor-Boadu, S.D. (2013) Pediatric Brain Tumors in Nigeria: Clinical Profile, Management Strategies, and Outcome. *Child's Nervous System*, **29**, 1131-1135. https://doi.org/10.1007/s00381-013-2105-9

[7] Igun, G.O. (2001) Diagnosis and Management of Brain Tumors at Jos University Teaching Hospital, Nigeria. *East African Medical Journal*, **78**, 148-151. https://doi.org/10.4314/eamj.v78i3.9082

[8] Mehta, V., Chapman, A., McNeely, P.D., Walling, S. and Howes, W.J. (2002) Latency between Symptom Onset and Diagnosis of Pediatric Brain Tumors: An Eastern Canadian Geographic Study. *Neurosurgery*, **51**, 365-373. https://doi.org/10.1097/00006123-200208000-00012

[9] Elhassan, M.M.A., Mohamedani, A.A., Osman, H.H.M., Yousif, N.O., Elhaj, N.M. and Qaddoumi, I. (2019) Patterns, Treatments, and Outcomes of Pediatric Central Nervous System Tumors in Sudan: A Single Institution Experience. *Child's Nervous System*, **35**, 437-444. https://doi.org/10.1007/s00381-018-04032-9

[10] Dewan, M.C., Rattani, A., Fieggen, G., Arraez, M.A., Servadei, F., Boop, F.A., *et al.* (2019) Global Neurosurgery: The Current Capacity and Deficit in the Provision of Essential Neurosurgical Care. Executive Summary of the Global Neurosurgery Initiative at the Program in Global Surgery and Social Change. *Journal of Neurosurgery*, **130**, 1055-1064. https://doi.org/10.3171/2017.11.jns171500

[11] Uche, E.O., Eke, C.B., Okafor, O.C., Uche, N.J., Ajuzieogu, O.V., Amuta, D.S., *et al.* (2020) Pediatric Brain Tumor Care in a Sub-Saharan Setting: Current Poise of a Precariously Loaded Dice. *British Journal of Neurosurgery*, **35**, 174-180. https://doi.org/10.1080/02688697.2020.1777259

[12] McGirt, M.J., Chaichana, K.L., Attenello, F.J., Weingart, J.D., Than, K., Burger, P.C., *et al.* (2008) Extent of Surgical Resection Is Independently Associated with Survival in Patients with Hemispheric Infiltrating Low-Grade Gliomas. *Neurosurgery*, **63**, 700-708. https://doi.org/10.1227/01.neu.0000325729.41085.73

[13] Vabulas, M., Kumar, V.A., Hamilton, J.D., Martinez, J.J., Rao, G., Sawaya, R., *et al.* (2014) Real-Time Atlas-Based Stereotactic Neuronavigation. *Neurosurgery*, **74**, 128-134. https://doi.org/10.1227/neu.0000000000000199

[14] Khalil, E.M. (2008) Treatment Results of Adults and Children with Medulloblastoma NCI, Cairo University Experience. *Journal of the Egyptian National Cancer Institute*, **20**, 175-186.

[15] Ostrom, Q.T., Francis, S.S. and Barnholtz-Sloan, J.S. (2021) Epidemiology of Brain and Other CNS Tumors. *Current Neurology and Neuroscience Reports*, **21**, Article No. 68. https://doi.org/10.1007/s11910-021-01152-9

[16] Abuhamed, J., Nikkilä, A., Raitanen, J., Alimam, W., Lohi, O., Pitkäniemi, J., *et al.* (2022) Incidence Trends of Childhood Central Nervous System Tumors in Finland 1990-2017. *BMC Cancer*, **22**, Article No. 784. https://doi.org/10.1186/s12885-022-09862-0

[17] Kaatsch, P., Rickert, C.H., Kühl, J., Schüz, J. and Michaelis, J. (2001) Population-based Epidemiologic Data on Brain Tumors in German Children. *Cancer*, **92**, 3155-3164. https://doi.org/10.1002/1097-0142(20011215)92:12<3155::aid-cncr10158>3.0.co;2-c

[18] Bellil, S., Limaiem, F., Mahfoudhi, H., Bellil, K., Chelly, I., Mekni, A., *et al.* (2008) Descriptive Epidemiology of Childhood Central Nervous System Tumours in Tunisia. *Pediatric Neurosurgery*, **44**, 382-387. https://doi.org/10.1159/000149905