Original Article

Clinicoepidemiological Profile and Morphological Spectrum of Intracranial Tumors Seen in a Tertiary Health-Care Facility: A 6-year Retrospective Study

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Abstract

Introduction: Brain tumors are a diverse group of primary central nervous system (CNS) tumors and each tumor has a distinctive biology, treatment, and prognosis. The increase in the number of neurosurgeons and availability of newer diagnostic imaging techniques in our center, prompted this study, which was aimed at identifying the epidemiological pattern and the morphological spectrum of all intracranial tumors in this center and compare our findings with previous results from this institution and other centers. **Materials and Methods:** A retrospective study of cases of all intracranial tumors was conducted from January 2013 to December 2018. All slides were then reviewed by at least two pathologists. The age, sex, diagnosis using the World Health Organization grading, and the histological subtypes were recorded and then analyzed using the SPSS. **Results:** Altogether 113 intracranial tumors were identified out of 13,651 samples reported over a 6-year period representing 0.82% of all surgical biopsies. The mean age was 45 ± 23.6 years with ages ranging from 1 year to 85 years. Males accounted for 47.8%, whereas females represented 51.3% with a male-to-female ratio of 1–1.1. Intracranial tumors were most common in the 41–50 years of age group. Supratentorial tumors accounted for 75.2%. Headache, loss of vision, seizure, and paresis were the common presentations accounting for 39.8%, 31.9%, 27.4%, and 19.4%, respectively. Meningiomas were the most common tumors representing 47.8%. Grade I tumors were predominant. **Conclusion:** Supratentorial tumors were predominant and meningiomas accounted for the majority. Headache, loss of vision, and seizure were common presentations.

Keywords: Brain, morphology, spectrum, tumor, World Health Organization

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Introduction

Brain tumors comprise a large variety of primary central nervous system (CNS) tumors and secondary neoplasms arisen from spread to the brain or from hematogenous spread sequel to embolization from distant sites. Each tumor has a distinctive biology, treatment, and prognosis.[1] Advances in neuroimaging have improved their diagnoses. This has made the preoperative diagnosis of intracranial meningiomas almost certain.[2]

Brain tumors cause significant morbidity and fatality. It is associated with high economic and financial burden particularly to the next of kin or family members.[3] Geographical or ethnic considerations of the study of intracranial tumors are important. The discovery of Burkitt's lymphoma with a geographical bias gives credence to this fact.

Glioma which forms a major component of intracranial tumors results from multifactorial inheritance including environmental and genetic factors,[4] and some risk factors have been established.[5] Increased incidence of glioma has been noted in patients with monogenic Mendelian disorders

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such as neurofibromatosis 1 and 2, tuberous sclerosis, Lynch syndrome, Li-Fraumeni syndrome, and Ollier's disease.[6] It is more likely to develop in Caucasians than African and South Asians.[7,8] A descriptive epidemiological study of nervous system and intracranial tumors done in the UK showed that African had the highest incidence of meningioma and pituitary tumors; the rate was significantly higher than the rate for Caucasians and South Asians.[8]

The annual incidence rate of intracranial tumors is 7/100,000 in the UK. Males are more likely to develop brain tumors than females with a male-to-female ratio of 1.5:1, although meningioma occurs more in women.[9] The peculiar nature in this environment where data keeping is poor precludes us from giving a reasonable annual incidence in this country, although the GLOBACON estimated the incidence of brain and other CNS tumors in East African and Southern African countries to be 1.2/100,000 and 1.5/100,000, respectively.[10]

An earlier retrospective study on intracranial tumors had previously been conducted in this same center covering a period of 5 years (2008–2013). The total sample seen at that time was relatively small when compared to other studies. This was partly due to the fact that the neurosurgery department was relatively new and had only one neurosurgeon compared to the present time with three neurosurgeons. In addition to receiving many samples from its neurosurgery division, samples were also brought from some other peripheral hospitals within the state.

Against the background of increase in neurosurgeons and availability of newer diagnostic imaging techniques, a newer study is desirable. Our aim, therefore, was to look at the epidemiological pattern and the morphological spectrum of all intracranial tumors in this center and compare our findings with previous results from this institution and other centers.

Materials and Methods

A retrospective study of cases of all intracranial tumors seen in LASUTH was conducted over a period of 6 years (January 2013 to December 2018). These were patients who had surgery and their samples were sent to the Department of Pathology and Forensic Medicine for diagnosis. The teaching hospital is a tertiary health-care facility with four neuropathologists.

In the present study, the samples received from the Neurosurgery Division of the Department of Surgery, LASUTH, and other peripheral hospitals within the state were reviewed. Few histopathology slides were lost and some others had been broken. In all these cases, blocks were retrieved and new sections were cut and then stained with the usual hematoxylin and eosin. These were then reviewed by at least two pathologists. In rare instances, special stains such as phosphotungstic acid and reticulin stains were used. Only few cases had immunohistochemistry, and as such, immunohistochemistry profile could not be included in this study. The age, sex, diagnosis using the World Health Organization (WHO) grading, and the histological subtypes and location were recorded in a predesigned form, and the data were analyzed using the (SPSS) Software version 20 (IBM Corp., Armonk, NY).

Results

Altogether 113 intracranial tumors were identified out of 13,651 samples received over a 6-year period. This represented 0.82% of all surgical biopsies. The mean age was 45 ± 23.6 years with ages ranging from a minimum of 1 year to a maximum of 85 years. Males accounted for 47.8%, whereas females represented 51.3% with a male-to-female ratio of 1:1 [Table 1].

Intracranial tumors were most common in the 41–50 years of age group, and the least common in the 21–30 years' group [Table 1]. Tumors in the supratentorium accounted for 75.2%, while infratentorial ones constituted 24.8% [Figure 1].

Headache, loss of vision, seizure, and paresis were the common presentations accounting for 39.8%, 31.9%, 27.4%, and 19.4%, respectively [Table 2]. Meningioma was the most common (n = 54) representing 47.8%. Gliomas were the next most common (n = 26) and accounted for 23%, while pituitary adenoma constituted (n = 16) 14.2% [Table 3].

Sex distribution of meningioma revealed a female preponderance of 63%, while males account for 37%, giving a male-to-female ratio of 1:1.7. Furthermore, among females, meningiomas were predominant in the 31–40 years of age group, while in males, it was in 41–50 years' group [Table 4].

WHO Grade I tumors were the most common, while Grade IV was the least common, representing 61.9% and 6.2%, respectively [Figure 2].

Figure 3 shows anaplastic astrocytoma while figures 4 and 5 show gliobastoma multiforme with different magnification.

Discussion

The CNS is an extremely complex and specialized system known to harbor an array of approximately 130 primary neoplasms.[11] It is, therefore, essential to find out the distribution of these tumors in any society. In an earlier study from LASUTH, 56 intracranial tumors seen over a 5-year period showed a male:female ratio of approximately 1:1 with a mean age of the patients being 36 ± 20.35. Astrocytomas were the most common (30%), being closely followed by meningioma (29%).[12]

In the present study, 113 intracranial tumors were observed over a 6-year period with a mean age of 45 ± 23.6 and a male: female ratio of approximately 1:1. The number of intracranial tumors we observed in the present series is approximately double that of the previous study from the same center. This could be attributed to the increase in the number of neurosurgeons in this center and possibly more referrals.

Table 1: Age and sex distribution of intracranial tumors

Parameter	Frequency (%)
Gender	
Male	55 (48.7)
Female	58 (51.3)
Total	113 (100.0)
Age category	
1-10	15 (13.3)
11-20	19 (16.8)
21-30	2 (1.8)
31-40	15 (13.3)
41-50	21 (18.6)
51-60	15 (13.3)
61-70	12 (10.6)
71-80	11 (9.7)
Above 80	3 (2.7)
Total	113 (100.0)

Table 2: Distribution of the clinical presentations of intracranial tumors

Clinical presentation	Frequency (%)
Headache	45 (39.8)
Hemiparesis/quadriparesis/weakness	22 (19.5)
Convulsion/seizure	31 (27.4)
Loss of vision	36 (31.9)
Gait	3 (2.7)
Vomiting	5 (4.4)
Dizziness	2 (1.8)
Memory impairment	5 (4.4)
Hearing defect	1 (0.9)

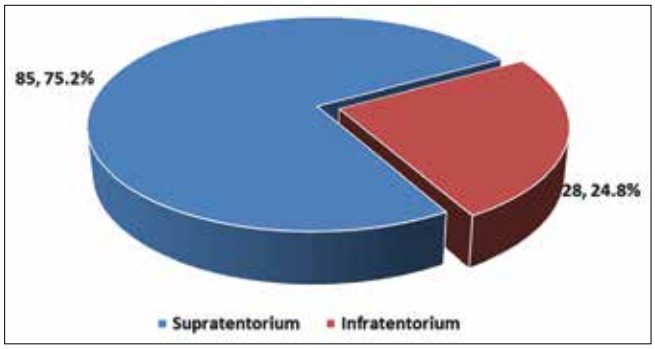

Figure 1: Anatomical distribution of the intracranial tumors

Tumors above the tentorium cerebelli (supratentorial tumors) accounted for 75.2% of all the tumors seen. The dominance of adults in this study would explain the predominance of supratentorial tumors in our study since most childhood tumors are infratentorial. Similarly, the results of other works in Ibadan (72.6%) and Ghana (77.5%) are consistent with our observation.[1,2] It shows that the ratio of supratentorial tumors to their infratentorial counterpart has not changed. These tumors usually present with features of space-occupying lesions. In this study, headache, paresis, and seizure were the common presenting features. These patterns were previously documented by past studies.[1]

Table 3: Distribution of histological types of intracranial tumors

Histological type	Frequency (%)
Meningioma	54 (47.8)
Astrocytoma	26 (23.0)
Pituitary adenoma	16 (14.2)
Craniopharyngioma	8 (7.1)
Ependymoma	4 (3.5)
Medulloblastoma	3 (2.7)
Schwannoma	1 (0.9)
Metastatic carcinoma	1 (0.9)

Table 4: Age and sex distribution of meningioma

Age category	Gender (%)		*P*
	Male	Female	
1-10	2 (100.0)	0	0.415
11-20	2 (40.0)	3 (60.0)	
31-40	2 (18.2)	9 (81.8)	
41-50	5 (45.5)	6 (54.5)	
51-60	2 (28.6)	5 (71.4)	
61-70	3 (42.9)	4 (57.1)	
71-80	4 (44.4)	5 (55.6)	
Above 80	0	2 (100.0)	
Total	20 (37.0)	34 (63.0)	

An interesting twist, however, is the prevalence of meningioma which was hitherto the second most common tumor in the previous study; it is now observed to be the most common. This observation would explain the tilt in the male-to-female ratio (1–1.7) since the preponderance of females in meningiomas in many studies has been well documented.[13,14] The higher incidence of meningiomas among women, their behavior during pregnancy, and the reported epidemiological link between meningiomas and breast carcinomas have led to the assumption that sex steroid has a causal relationship with meningioma.[15-17]

In comparing our observations with other studies, the mean age of intracranial tumor in this study was 45 ± 23.6 with a male: female ratio of 1:1. This finding is consistent with other documented works by Idowu *et al*. in Ibadan.[1] and Ndubuisi *et al*. in Enugu,[18] both studies in Nigeria, and Ekpene *et al*. in Ghana[19] and Ibebuike *et al*. in South Africa.[2]

In the present study, meningiomas were the most common tumor and they accounted for 47.8% of all intracranial tumors over the study period. This is consistent with other previous works in Nigeria,[1,18,20,21] South Africa,[22] Singapore,[23] Japan,[24,25] and the US.[14] All these authors documented the predominance of meningioma among intracranial tumors. Although the authors are not unaware of the predomination of gliomas in other documented reports,[18] we strongly believe that environmental

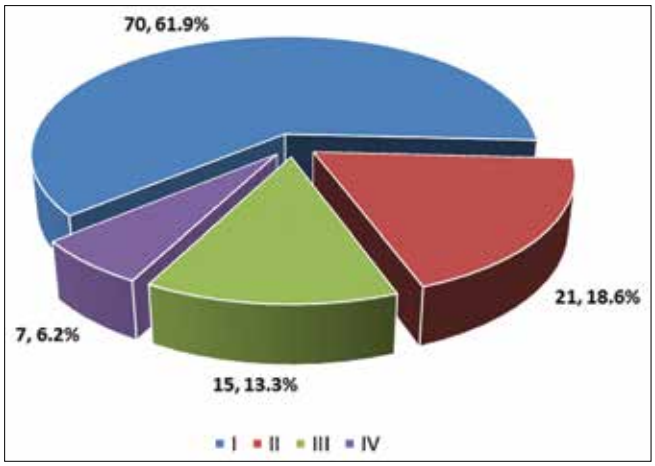

Figure 2: Distribution of the different World Health Organization Grades of intracranial tumors

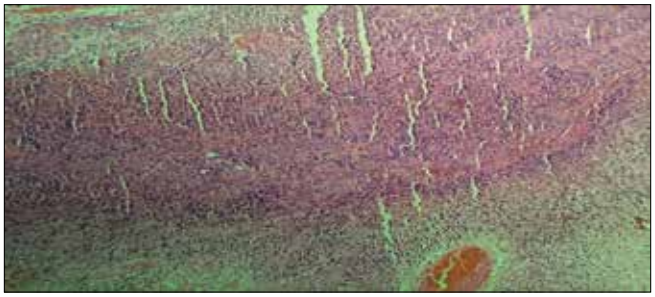

Figure 4: Glioblastoma multiforme ×40 MAG. H and E (World Health Organization Grade IV)

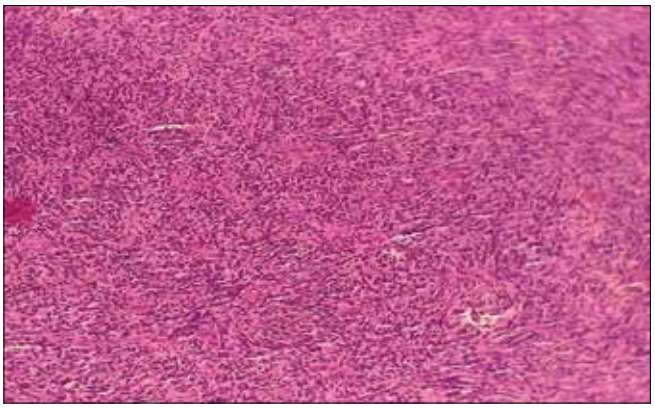

Figure 3: Anasplatic astrocytoma ×100 MAG H and E (World Health Organization Grade III)

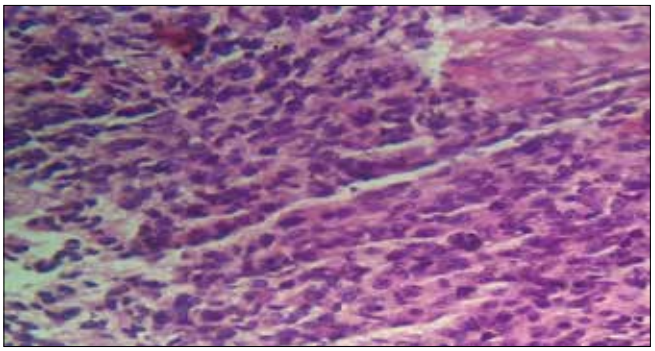

Figure 5: Glioblastoma multiforme ×400 MAG. H and E (World Health Organization Grade IV)

and lifestyle factors including occupation, environmental carcinogens, and diet might play significant roles in this trend.[1]

Astrocytomas are second to meningiomas in the present study. The authors observed a change in the incidence of these two tumors over time in this center.[5] We do not know whether the incidence of this tumor is falling or that of meningioma is rising. However, what we can ascertain is that this newer study had more sample population (n = 113) when compared with an earlier study done in this same center (n = 56).

Pituitary adenomas are common, and they are usually benign and, expectedly, slow growing. While some lead to hormone hypersecretion, hypopituitarism, and neurologic dysfunction, many are asymptomatic and could remain undetected.[26] Headache and visual problems were the common presentation in this study.

Indeed, autopsy, surgical biopsies, and radiographic data indicate that these tumors are actually relatively common with overall prevalence rates varying from 10 to 22%.[27] It accounted for 14.2% of all intracranial tumors in our study. It is worth mentioning that Jibrin *et al*.[20] documented the incidence (22%) in their study. Similar observations were also reported by Olasode *et al*.[28] and Idowu *et al*.,[1] with frequencies of 17.1% and 16% in their studies, respectively.

One of the most common tumors of the posterior cranial fossa are the medulloblastomas, which is highly invasive. This tumor also has a high tendency to recur and spread through the cerebrospinal fluid space, subsequently making radical cure of the tumor a problem.[1] The authors observed a striking reduction in the incidence of medulloblastoma in the current study (2.7%) in contrast to the figure of 18% reported in our earlier study. In the latter, it appears that younger age groups predominate as exemplified by the observed mean age of (36 ± 20.35) whereas older age were the predominant groups in the current study (mean age of 45 ± 23.6). Since medulloblastoma is seen more in children, this would ordinarily explain why very few cases of the tumors were seen in this study.

The classification of CNS tumors by the WHO has provided a common nosologic system for clinicians, researchers, and patients when discussing primary CNS tumor. It is for this reason we attempted to look at the different grades of tumors in our study. The WHO Grades I and II were the most common with Grade I constituting 80.5%. This is also consistent with previous works.[1]

The limitation observed in this study was that only few cases had immunohistochemistry, and as such, immunohistochemistry profile could not be included in this study. Therefore, a

future study will attempt to determine the progesterone and estrogen receptor status of meningioma. This would be an interesting study considering the findings in many research works (including this present study) revealing the predominance of this tumor in females.

Conclusion

Intracranial tumour was most common in the 5th decade with almost same sex distribution. About three-quarters of the tumours were supratentorial. Headache, loss of vision and seizure were the common presentations. Of all intracranial tumours, meningioma was the predominant and this occurred more in females in the 3rd decade.

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Conflicts of interest

There are no conflicts of interest.

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