

## ORIGINAL ARTICLE

**Epidemiological Profile of Neurosurgical Tumours in Zaria, North-West Nigeria**

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## ABSTRACT

**Background:** The management of intracranial and spinal tumours remains a daunting task with the dearth of neurosurgeons in Nigeria. These tumours are believed to be rare and so, usually not suspected, and most often than not, go undiagnosed. With the increasing availability of modern radio-diagnostic facilities and great benefits of early diagnosis, the index of suspicion of medical practitioners for these tumours in the developing countries need to be raised.

**Objective:** The study is aimed at determining the demographic and pathologic profiles of neurosurgical tumours involving the cranium and spine in Zaria, North-West Zone of Nigeria.

**Methodology:** A 9-year retrospective study of patients managed for cranial and spinal tumours 2007-2015 was conducted at the Ahmadu Bello University Teaching Hospital, ABUTH, Zaria, Kaduna State, Nigeria. The hospital is a tertiary health institution and major referral centre in the northern part of Nigeria. The ward records, operation theatre logbooks, and Histopathology department records were used for data collection. The paediatric age group was taken as ≤16years, and only patients with histological confirmation had their data included and analyzed, using SPSS version 21.

**Results:** There were 125 histologically diagnosed tumour cases, and age range was 2-80years, with a mean of 31.5years (*SD* 16.5). Sixty-six patients (52.8%) were males, giving a M:F ratio of 1.1:1, while 26 (21.7%) were in the paediatric age group, ≤16years. Cranial tumours constituted 88%, giving a cranial to spinal tumour ratio of 7.3:1, and the most common tumour was meningioma (44%). There was a significant association between histological diagnosis and sex ( $p=0.011$ ). The most common neurosurgical tumour among the paediatric age group were gliomas (30.8%), and there was no metastatic tumour diagnosed in the paediatric group. Meningioma was the most common spinal tumour (46.6%), followed by metastatic spinal tumours (20%).

**Conclusion:** There appears to be an upsurge in the incidence of these tumours, in our study, with an overall slight male preponderance, and the most common tumours were meningioma, glioma and pituitary adenoma. In patients aged ≤16years, glioma, meningioma and medulloblastoma were the most common tumours. Gliomas are as common in males as meningiomas are in females.

**Keywords:** Glioma, histology, intracranial, meningioma, paediatric, spinal

## INTRODUCTION

Cancer has been recognized as an emerging public health problem in Africa which despite its growing burden continues to receive low public health priority. This situation is largely because of limited resources and, in part, due to a lack of awareness amongst the policy makers, general public and international private or public health agencies, on the magnitude of the current and future cancer burden.<sup>1</sup>

Primary CNS tumours are a significant cause of death in the African population where awareness and basic infrastructure to manage these tumours are essentially lacking.<sup>3</sup> This is further complicated by delayed presentation to appropriate health personnel, seen in up to 62% of cases.<sup>4</sup> Earlier reports from the Ahmadu Bello University Teaching Hospital (ABUTH), Zaria, Nigeria acknowledged the increasing burden of cancers but then, suggested that brain tumours are rare and occurred during childhood.<sup>5</sup>

Although MRI is the main diagnostic tool for most diseases of the central nervous system, CT is still a valuable modality in the imaging of brain tumours particularly in detecting calcification, hemorrhage, and in evaluating bone changes related to a tumor.<sup>6</sup> These findings were made one decade before the CT scan and MRI were introduced to Zaria, and with the observed global trend of increase in incidence of CNS tumours, there is an urgent need to re-evaluate the epidemiological profile of these conditions to provide information that reflects present day reality.

Recently, the 2016 WHO classification of CNS tumours was introduced with tumour markers forming an integral part of the system.<sup>7</sup> While this is commendable, these markers were not assessed in most of our patients because of unavailability, making it difficult to apply, hence the 2007 classification system will be the basis of this study.<sup>8</sup>

## METHODOLOGY

A 9-year retrospective study, of patients, managed for cranial and spinal tumours, in 2007-2015 was conducted at the Ahmadu Bello University Teaching Hospital. The hospital is a major referral centre in northern Nigeria situated in the ancient city of Zaria, Kaduna State, Nigeria. It is the only centre offering neurosurgical and histopathology services in Zaria. The ward records, operation theatre logbooks, and Histopathology department records were checked for patients who were managed for any cranial or spinal cord tumours with exception of scalp tumours. Initial diagnosis was arrived at by clinical assessment and imaging (magnetic resonance imaging (MRI) and/or Brain CT scan). Histology slides were stained with Haematoxylin and Eosin, and special and immunohistochemical stains, where necessary. Only patients with histological confirmation had their data included and analyzed using *SPSS version 21*.

## RESULTS

One hundred and fifty-seven cases were identified, out of which 125 (79.6%) were histologically confirmed, and only the histologically confirmed cases were analyzed. Several cases are diagnosed annually, ranging between 6 and 24, and giving an average of 13.9 cases per year, *see Figure 1*.

Figure 1. Number of Cases per Year

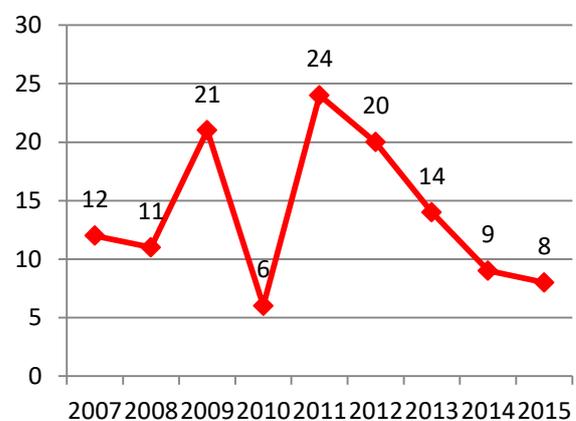


Table 1. Age distribution of patients

Age (yrs)	Frequency	Percent	Cumulative Percent
1-10	13	10.4	10.4
11-20	21	16.8	27.2
21-30	33	26.4	53.6
31-40	24	19.2	72.8
41-50	19	15.2	88.0
51-60	9	7.2	95.2
>60	6	4.8	100.0
Total	125	100.0	

The age varied between 2 and 80 years with a mean of 31.5 years (*SD* 16.5). Sixty-six patients (52.8%) were males, giving a M:F of 1.1:1, see Tables 1 & 2. A hundred and ten tumours (88%) were located in the cranial region while 15 (12%) were spinal in location, giving a cranial to spinal cord tumour ratio of 7.3:1.

Table 2. Distribution of histological diagnosis and sex of patients

HISTOLOGY	Frequency	Percent	Cumulative Percent	MALE		FEMALES	
				Number	%	Number	%
MENINGEAL TUMOURS	57	45.6	45.6	20 (35.1)	30.3	37(62.9)	62.7
<i>Meningioma</i>	55	44.0		20(36.4)	30.3	35 (63.6)	59.3
<i>Haemangioblastoma</i>	2	1.6		0 (0)	0.0	2 (100)	3.4
GLIAL CELL TUMOURS	23	18.4	64.0	15 (65.2)	22.7	8 (34.8)	13.6
<i>Astrocytoma</i>	14	11.2	-	-	-	-	-
<i>Glioblastoma</i>	6	4.8	-	-	-	-	-
<i>Oligodendroglioma</i>	1	0.8	-	-	-	-	-
<i>Oligoastrocytoma</i>	1	0.8	-	-	-	-	-
<i>Ependymoma</i>	1	0.8	-	-	-	-	-
SELLAR REGION TUMOURS	18	14.4	78.4	13 (72.2)	19.7	5 (27.8)	8.5
<i>Pituitary Adenoma</i>	14	11.2		10 (71.4)	15.2	4 (28.6)	6.8
<i>Craniopharyngioma</i>	4	3.2		3 (75.0)	4.5	1 (25.0)	1.7
METASTASIS	5	4.0	82.4	2 (40.0)	3.0	3 (60.0)	5.1
SKULL OSTEOMA	2	1.6	84.0	1 (50.0)	1.5	1 (50.0)	1.7
FIBROUS DYSPLASIA	5	4.0	88.0	4 (80.0)	6.1	1 (20.0)	1.7
MEDULLOBLASTOMA	5	4.0	92.0	3 (60.0)	4.5	2 (40.0)	3.4
SCHWANNOMA	1	0.8	92.8	1 (100)	1.5	0 (0)	0.0
PLASMACYTOMA	2	1.6	94.4	1 (50.0)	1.5	1 (50.0)	1.7
OTHERS	7	5.6	100.0	6 (85.7)	9.1	1 (14.3)	1.7
TOTAL	125	100.0		66		59	

Meningiomas were the most common tumours irrespective of sex (44%) with a female predilection (M:F of 1:1.75), followed by gliomas (18.4%) and pituitary adenomas (11.2%), and both are more common amongst males. The ratio of cranial to spinal meningioma was 6.9:1. Most meningiomas are intra-cranial (87.3%), whereas 12.7% were located in the spinal region. Pituitary adenoma is 2.5 times more common among the males, see Table 2. Significant association was found between sex and histological diagnosis in the above tumours ( $p = 0.011$ ,  $\chi^2$  11.1,  $df$  3).

The most common neurosurgical tumours among the paediatric age group were gliomas (30.8%), meningiomas (23.1%), medulloblastoma (15.4%) and fibrous dysplasia (11.5%). No metastatic tumours were diagnosed in the paediatric group. These translate to 90% of medulloblastomas, 60% of fibrous dysplasia, 36.4% of gliomas, and 10.9% of meningiomas; see Figure 2.

## DISCUSSION

Our findings showed that neurosurgical tumours affect a wide range of age groups from 2nd year of life to the ninth decade, and peak in the third and fourth decades of life (accounting for 45.6%). With a mean age of

31.5 years, the brunt of this disease is borne by the active, productive population. Similar age distribution was reported by Soyemi and Oyewale in Lagos, South-West Nigeria where the age ranged between 2 to 85 years.<sup>9</sup> The mean age at diagnosis was also reported to be 31.5 from a retrospective study in Uganda, East Africa.<sup>10</sup> This is one decade younger than the peak incidence of 41-50 years reported from South Korea.<sup>11</sup> In terms of distribution, cranial tumours were 7.3 times more common than spinal tumours.

We found no significant sex predilection on general note, but on specific analysis, a significant association was found between sex and histological diagnosis ( $p, 0.011$ ). The most common tumours were meningioma, glioma and pituitary adenoma seen in 44%, 18.4% and 11.2% of cases, respectively. While meningioma was more common among females, gliomas were more common among males with a M:F of 1.75:1 Hence gliomas are as common in males as meningiomas are in females. Female predominance in meningiomas has been well established in the literatures.<sup>12</sup>

Our finding compares with reports from Iran where the most common tumours were meningiomas, astrocytoma and pituitary adenoma. The authors, also, reported meningiomas as the only tumour with a female preponderance.<sup>13</sup> Similar reports from South Africa had reported meningioma as the most common intra-cranial neoplasm in their series with a female preponderance.<sup>14</sup>

In a review of 10,009 patients, Kim, *et al*, reported glial tumor (25.2%), meningioma (17.5%), and pituitary adenoma (17.1%), in a single centre in South Korea.<sup>11</sup> Glial cell tumours are generally reported as the most common CNS tumours worldwide and in other parts of Nigeria.<sup>9-11,15</sup> However, a lack of the equipment for stereotactic biopsies completely rules out the chances of having histological diagnosis for most brain stem gliomas.

Though the definition of paediatric age varies, we considered patients aged 16years

and less to fall within this category.<sup>18</sup> Tumours in this group of patients accounted for 27.1% of all cases. The figures vary from 30.1% (Uganda) to 38% (Korea).<sup>10,11</sup> Both studies defined paediatric age as 0-19years. Gliomas, meningiomas, and medulloblastoma were the most common tumours in paediatric age groups accounting for 30.8%, 23.1%, and 15.4%, respectively. This agrees with a retrospective single centre study from Morocco where astrocytoma was the most common histological diagnosis, however, medulloblastoma and craniopharyngioma make up the first three unlike our findings.<sup>16</sup> Uche *et al* also found low grade astrocytoma (a glial cell tumour) and medulloblastoma to be the most common paediatric tumours in Ibadan, South-West Nigeria.<sup>17</sup>

Ninety-percent of medulloblastoma occurred in patients under 17 years of age asserting its place as a common paediatric brain tumour.<sup>18</sup> In a 5-year review of solid paediatric cancers among patients attending the oncology and radiotherapy centres in our hospital, brain cancer accounted for 4.4% of the 136 patients evaluated.<sup>19</sup> While this demonstrates the need for further care, it may not give a true reflection of the brain tumour burden as not all patients end up with such therapy.

Cranial-based CNS tumours were by far more common than spinal tumours. Spinal tumours accounted for 12% of all CNS tumours in our patients. This is higher than 5.4% reported by Hatef, *et al*, from Uganda, and 5% among children in Morocco.<sup>10,16</sup> Metastasis, which is the second most common tumour of the spine in our series was not mentioned in any of the two studies. We are of the opinion that metastatic spine tumours could be far more than this because most patients with metastasis to the spine may be managed without neurosurgical intervention.

Of the 71 patients who had specific diagnosis made based on clinical and radiological parameters, 63 correlated with the final histological diagnosis giving an accuracy of 88.7%; *see Table 3*. Tumours with highest degree of wrong diagnosis were medulloblastoma and glioma.

Table 3. Accuracy of pre-histologic diagnosis among selected specified tumours

HISTOLOGY	PRE-OPERATIVE DIAGNOSIS		TOTAL
	CORRECT	WRONG	
Meningioma	36	2	38
Glioma	7	2	9
Pituitary Adenoma	14	3	17
Craniopharyngioma	3	0	3
Medulloblastoma	3	1	4
TOTAL	63	8	71

In an evaluation of diagnostic value of CT and MRI in comparison with biopsy, the authors reported accuracy of 78% and 87% for CT and MRI respectively.<sup>20</sup> Elrahim, *et al*, from Saudi Arabia also concluded that the sensitivity of CT for diagnosis of brain astrocytoma was 79%.<sup>21</sup> It is, therefore, logical to initiate appropriate intervention on the basis of clinical and radiologic parameters.

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Other pre-operative diagnosis could not be assessed as they were identified in generic terms such as brain tumour, posterior fossa tumour, sellar region tumour, etc.

## CONCLUSION

Tumours of the CNS appear to no longer be uncommon among our population. They affect mainly the young age group, with meningiomas, glial cell tumours and pituitary adenoma being the most common histological types. Clinical and radiological aids are important in diagnosing these conditions. Population based study, and further characterization of the specific tumours and their outcomes need to be studied.

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