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MENINGIOMA IN YOUNG ADULTS; EVALUATING THE DEMOGRAPHIC PATTERN USING MAGNETIC RESONANCE IMAGING IN PORT HARCOURT METROPOLIS

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ABSTRACT
The use of Magnetic Resonance Imaging in diagnosis of brain tumour is inevitable. This study is aimed at determining the efficiency of magnetic resonance imaging in the diagnosis of brain tumour diseases among patients in Port Harcourt metropolis in Rivers State, Nigeria. It is a retrospective study where case files of 68 patients (male=26, female=42) were collected, evaluated and analysed using common MRI findings from January, 2009- December, 2019. From the result, meningioma was the common MRI finding (n=20, 29.41%), followed by pituitary macroadenoma (n=15, 22.06%), and the least MRI finding was cholesteatoma (n=1, 1.47%). The result also shows that mid-aged adults between the age range of 40-59 has the most common brain tumour pathologies (n=24, 35.29%) while children within the age range of 0-9 has the least common brain tumour pathologies (n=2, 2.94%). The various age group were analysed using one-way ANOVA at ($P < 0.05$) and there was significant difference across group. P value =0.0268 and R^2 =0.8510. Therefore, meningioma is the most common type of brain tumour cases in Port Harcourt metropolis in Rivers State, Nigeria and MRI is a useful tool in detection of brain tumour and as such, should be utilized more for patients with brain tumour.

KEYWORDS: Cholesteatoma, Macroadenoma, MRI finding, Meningioma, Brain Tumour and Port Harcourt.

INTRODUCTION
The advent of Magnetic Resonance Imaging (MRI) has provided a further powerful tool for the investigation of pathologies of the brain like brain tumour. Brain tumours comprise 2% of all cancers but are disproportionately responsible for all cancer-related deaths (Alfred *et. al.*, 2010). Patients diagnosed with brain tumours have an overall 5-year survival rate of approximately 34.4% but survival estimates depend on tumour histology (Wang *et al*, 2014). On the assumption that early detection can improve chances of survival, researchers are studying ways of identifying these neoplasms at a preclinical stage. Different imaging modalities can be used in the diagnosis of patients with brain tumour. Skull radiography, computed tomography and MRI are all important tools in the diagnosis of brain tumour in patients. Nevertheless, skull radiography and CT are less used due to the risk factors associated with them concerning the use of radiation. Therefore, MRI is currently the imaging modality of choice in the diagnosis of patients with brain tumour because of its higher resolution and field strength which can detect subtle brain abnormalities that may not be detected with other modalities (Provenzale, 2006). Hence, MRI is considered a better imaging technique than CT because MRI has a much higher contrast resolution when compared with CT for clear demonstration of anatomical structures and associated pathologies of the brain (Provenzale, 2006). Secondly, MRI does not involve radiation exposure unlike CT where x-ray source is used to produce image by exposing the patient to ionizing radiation (Edward and George, 2019).

However, magnetic resonance imaging (MRI) is a preferred method for the diagnostic evaluation of brain tumours and therefore, has also been considered a possible tool for the preclinical detection of brain tumours (Wang *et al*, 2014). But it is contraindicated in patients with pacemakers and other metallic devices.

MATERIALS AND METHOD
The study was a descriptive study from January 2009 to December 2019 using total of 68 patients dat retrieved from the MRI section of the department of Radiology, Rivers State University Teaching Hospital.

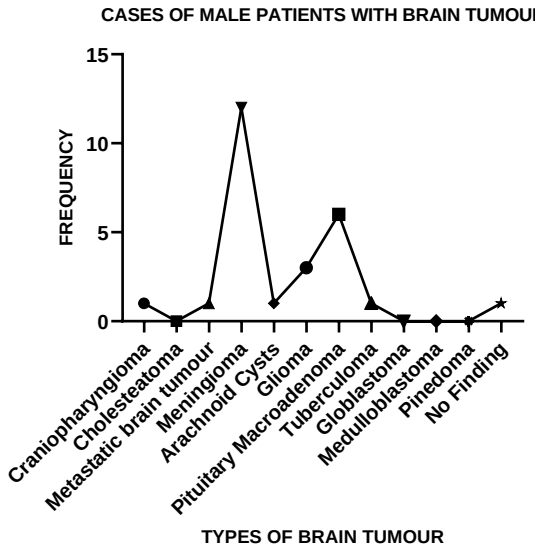
The data was collected retrospectively from the request cards, MRI scan reports and information that are stored in the MRI data storage unit. The information obtained from the request cards include: Patient's name, age, sex, clinical history and date of examination. Data collected from MRI scan report was the final diagnosis after the scan as reported by a radiologist. The researcher searched for records that met the inclusion criteria dating from January 2009 to December 2019. the MRI protocol was identical for all participants and included four high resolution axial sequences, three dimensional T1-weighted sequence of the slice thickness of 1.6mm, a two dimensional Proton-density weighted sequences with slice thickness of 0.8mm and a two dimensional FLAIR sequences with slice thickness of 2.5mm. All scans were obtained with a 1.5 Tesla scanner with an eight channel lead coil. The research was carried out in Rivers State University Teaching Hospital, Port Harcourt involving all patients who underwent MRI examination for space occupying lesions in the radiological department. Data collected was calculated using ANOVA and analysed in line with the objectives of the study. Accuracy was also calculated using appropriate formula.

RESULTS

Table 1- MRI Findings in Brain Tumour Patients.

S/N	Findings	Male	Female	Frequency	Percentage
1	Craniopharyngioma	1	1	2	2.94
2	Cholesteatoma	0	1	1	1.47
3	Metastatic brain tumour	1	2	3	4.41
4	Meningioma	12	8	20	29.41
5	Arachnoid Cyst	1	3	4	5.89
6	Glioma	3	8	11	16.18
7	Pituitary macroadenoma	6	9	15	22.06
8	Tuberculoma	1	2	3	4.41
9	Globlastoma	0	2	2	2.94
10	Medulloblastoma	0	2	2	2.94
11	Pinedoma	0	2	2	2.94
12	No findings	1	2	3	4.41
	TOTAL	**26(38.24)**	**42(61.76)**	**68**	**100.00**

Table 1 shows that among all the findings, meningioma has the highest frequency (n=20, 29.41%) while cholesteatoma has the least frequency (n=1, 1.47%).



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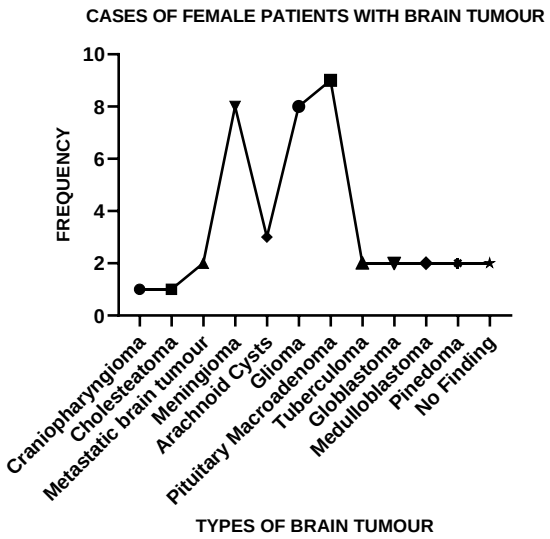

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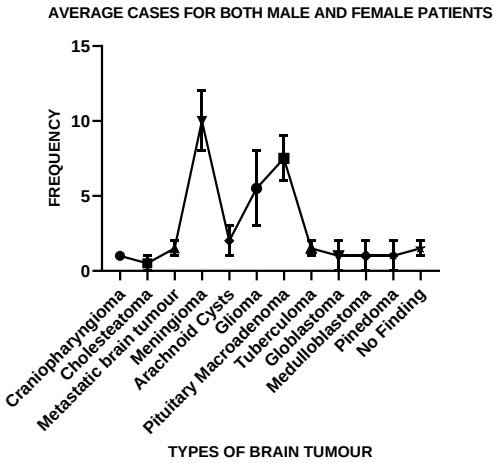

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Figure 1: (a) Shows different types of brain tomour in males (b) Shows different types of brain tomour in females (c) Shows different types of brain tomour in both males females.

Table 2- Relative Distribution of Sex and Age of Brain Tumour Cases.

Category (age group in years)	Male	Female	Frequency	Percentage (%)
Children (0-9)	1	1	2	2.94
Adolescent (10-18)	1	3	4	5.88
Young adult (19-39)	8	14	22	32.36
Mid adult (40-59)	10	14	24	35.29
Old adult (60>)	6	10	16	23.53
TOTAL	**26(38.24)**	**42(61.76)**	**68**	**100.00**

Table 2 shows the sex distribution of brain tumour cases. The number of males that are involved are (n=26, 38.24%) while those of the females are (n=42, 61.76%).

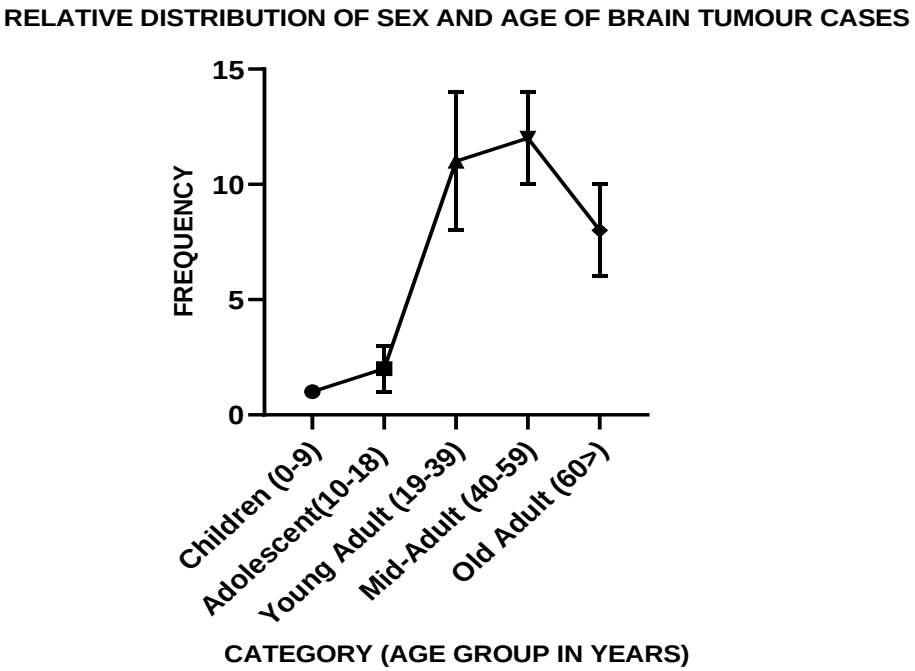

Figure 2: Shows different age groups and the occurance of brain tumours.

The various age group were analysed using one-way ANOVA at ($P < 0.05$) and there was significant difference across group. P value =0.0268 and R^2 =0.8510.

Table 3- An Estimated Diagnostic yield of MRI in Brain Tumour Cases and its Accuracy.

MRI results	Frequency	Percentage
Positive	65	95.59
No finding (negative)	3	4.41
TOTAL	**68**	**100.00**

This table shows that out of 68 patients, 65 showed positive giving MRI an estimated diagnostic yield of 95.59% for accuracy on brain tumour.

$$\text{ACCURACY} = \frac{\text{number of positives} \times 100}{\text{Total number of patients}}$$

$$= \frac{65 \times 100}{68} = 95.59\%$$

DISCUSSION

The results of this study emphasized on the MRI findings of brain tumour, relative distribution of sex and age of patients in the health institution studied and the estimated diagnostic yield of MRI in brain tumour cases and its accuracy.

This present study of MRI findings in patients with brain tumour, the most common findings are Meningioma (n=20; 29.41%), Pituitary Macroadenoma (n=15; 22.06%), Glioma (n=11; 16.18%). The least common findings are Craniopharyngioma, Globlastoma, Medulloblastoma, Pinedoma (n=2; 2.94%) and Cholesteatoma (n=1; 1.47%) respectively. With the aid of MRI, the clinicians were able to detect some insidious pathologies like Metastatic brain tumour (n=3; 4.41%), that arise due to deposits in the brain from tumour cells at distant body organ which skull radiograph and CT could not have revealed. These rare findings were probably because MRI is more precise than these other imaging modalities. The findings encountered were in line with Rotterdam *et al* (1997) study which highlighted the role of MRI in detection of brain lesions. This implies that with MRI, a better diagnosis could be made in brain tumour cases.

Lipsitz, *et al.,* (2003) in their research work, found that glioblastoma multiforme (GBM) is the most common and most aggressive malignant primary brain tumour in humans, involving glial cells and accounting for 52% of all functional tissue brain tumour cases and 20% of all intracranial tumours. Despite being the most prevalent form of primary brain tumour, GBMs occur in only 2-3 cases per 100,000 people in Europe and North America. Their study is not in line with this present study where meningioma is the the most prevalence ((29.41%).

In a research work by Radhakrishman *et al.,* (1995) on the incidence of primary brain tumour, they discovered that primary brain tumour represent only 2% of all cancers, with 35,000 new cases diagnosed each year in the United States. Meningiomas occur at the rate of 7.8 per 100,000 per year, but only 25% are believed to be symptomatic, with others being found incidentally. The male to female ratio is 1:1.8, and the incidence increases with age, peaking at age 85 years. However, in this study, the total number of females (n=42; 61.76%) and males (n=26; 38.24%) were found and the peak age was between 40-59). However, the number of males relative to females is higher only in the case of Meningioma. This finding disagree with that of Radhakrishman *et al* (1995) which generally concluded that female to male ratio of brain tumour cases is always on the increase.

From the result obtained, patients in their mid adult age range 40-59 (n=24; 35.29%) were found to be more affected by brain tumour. This finding is in agreement with the study by O'neil and Widigicks (2004) who found that 50% of brain tumour cases occur in adults between 40 and 60 years of age. However, the total number of males (10) and females (14) in the age range (41-50) mostly affected by brain tumour agrees with the study by Radhakrishman et al (1995) whose study on the incidence of primary brain tumour, found a male to female ratio of 1:1.8. This finding also agrees with studies carried out by Goyal (2003) which states that brain tumour is one of the leading causes of death among adults and middle aged groups. The greater ratio of females in the mostly affected age range is possibly due to the role that pregnancy plays in the development of tumour cells. Aside other factors, primary tumour cells have hormone receptors for progesterone and oestrogen and these hormones increase in pregnancy thereby making the growth of tumour cells likely favourable as shown in the study by Atlas *et al* (1996).

It was also found in this study that children in age group 0-9 years has the least numbers of brain tumour cases (n=2; 2.94%).

Another study on meningiomas and small brain aneurysms among people of age 45 year or above, it was found out that the growth of meningiomas is typically slow and most meningiomas remain asymptomatic throughout life which explains why 50% of all meningiomas found at autopsy in persons over 60 years of age is 3% and the majority of lesions are less than 1cm in diameter (Staneszek and Janisch, 1992).

According to Cancer Brain Tumour Registry of the United States (CBTRUS), the incidence of oligodendrogliomas, including anaplastic oligodendrogliomas, is approximately 0.3 per 100, 000

persons and these tumours account for 4% to 15% of intracranial gliomas.

Primary brain tumour accounts for 3% of all neoplasm but is the most common solid tumour in children, accounting for 35% of all paediatrics malignancies. They also concluded that 2120 new brain tumour occur in Canada yearly and 50% of the brain tumour occur in adult between 40 – 60 years as stated by O'neil and Widigicks (2004).

In a study by Cairncross *et al.*, (1998) on MRI characterization of primary malignant brain tumors (PMBTs), they posited that PMBTs are typically hypo-intense on T1-weighted images and hyper-intense on T2-weighted and fluid-attenuated inversion recovery (FLAIR) images. They also found that the higher-grade lesions (WHO III and IV) are more likely to demonstrate enhancement (anaplastic oligodendrogliomas, anaplastic astrocytomas, glioblastoma multiforme), although ring enhancement is less common in anaplastic oligodendrogliomas and usually is associated with a worse prognosis. However, glioblastoma multiforme often has ring enhancement around a central area of necrosis whereas tumour associated cysts are more common with astrocytomas.

Goldman *et. al.*, (2008) in their research observed that in children under the age of 2 years, about 70% of the brain tumour are medulloblastoma, ependymoma and low grade glioma whereas teratoma and a typical teratoid rhabdoid tumour are less commonly seen in children. They also noted that germ cells tumours including teratoma make up just 3% of paediatric primary brain tumours but its incidence varies significantly in different part of the world. Although this study was not focused on the type of tumor among children, the prevalence rate among children in Port Harcourt was low (table 1).

The Rotterdam and Katzman (1997) study aimed at investigating the causes and consequences of age-related brain changes among persons of 55 years of age or above who were living in suburbs of Rotterdam, in Netherland. They found out that aneurysm (1.8%) were the most frequent. Benign tumors were also frequent (1.6%) with meningioma being recorded most often (0.4%). The meningioma ranged from 5-60mm in diameter and their prevalence was 1.1% in women and 0.7% in men. Pituitary macroadenoma was present in six persons (0.3%), vestibular schwannomas has 0.2% prevalence.

Meningioma on T1-weighted axial MR image of a patient with crohn's disease has been reported despite the absence of neurological symptoms and electromyography abnormalities (Gatopoulou, 2009).

On the diagnostic yield of MRI in brain tumour cases, this study shows that out of 68 cases presented for MRI investigation, 65 cases (95.59%) yielded positive report while only 3 cases (4.41%) had no finding/report. This result concurs with the study by Jekins *et al* (2003) which opined that MRI has been considered to have a high diagnostic yield in the diagnosis of patients with brain tumour.

On accuracy of MRI in detection of brain tumour, this study shows that MRI is 95.59% accurate in detection of brain tumour showing that MRI is in no doubt the modality of choice in the investigation of brain tumour cases.

CONCLUSION

Meningioma is therefore the most common type of brain tumour cases in Port Harcourt metropolis in Rivers State, Nigeria and MRI is a useful tool in detection of brain tumour and as such, should be utilized more for patients with brain tumour.

Brain tumor is gradually becoming common among people living in Port Harcourt and it affects all ages but the age range at which brain tumour manifests most has not been fully categorized in Port Harcourt. This work seeks to find the patterns of MRI findings in patients with brain tumour and the particular age group mostly affected in Port Harcourt Metropolis. This study shows that age range of 40-59 are mostly affected by brain tumour in Port Harcourt.

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