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Computed Tomography Imaging Features of Chronic Headaches in Abuja, Nigeria

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Authors' contributions

Both authors have made a significant contribution to the findings and methods in the paper. Both the authors have read and approved the final draft.

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ABSTRACT

Headache is one of the commonest presenting complaints among patients in the emergency room and in general outpatient clinics. Computed Tomography, CT is a veritable diagnosing tool in the evaluation of both intracranial and extracranial causes of headache.
Aim: To document the features of cranial CT in patients with chronic headache and determine the frequency of significant intracranial lesions.
Methodology: This is a retrospective study of the reports of cranial CT of 126 patients referred to the Radiology department of University of Abuja teaching hospital from January 2014 to February 2017with complaint of chronic headache. Data was statistically analyzed using SAS software version 9.3 and statistical level of significance set at 0.05.
Results: Age range of the studied patients was 5-75 years with a mean of 37.3±15.3 years and slight female preponderance (64% vs 54%) with majority of patients in the 45-55 age range. The CT findings show a near equal number of abnormal (n=62, 49.2%) and normal (n=64, 50.8%) findings with higher incidence of intracranial lesions (n=36, 58.1%).Intracranial tumors were seen in 11(17.7%) all occurring in patients <50 years. Sinusitis involving the maxillary and sphenoid

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sinuses were the commonest extracranial lesions.
Conclusion: There is a significant yield of remediable positive findings in Computed tomography scan of patients with chronic headaches in Abuja, Nigeria.

Keywords: Chronic headaches; computer tomography; tumor; sinusitis.

1. INTRODUCTION

Chronic headache is defined as "headache occurring for 15 or more days in a month for at least three months [1].

In a document on the global burden of headache, a prevalence of 50% has been reported in Asia, Australia, Europe, and North America [2].

In Africa, data on headache prevalence is sparse. A study done in rural Tanzania documented the 1-year prevalence of headache as 23.1% [3] while Osuntokun et al. in Nigeria documented the crude prevalence ratio of migraine headache to be 5.3 per 100 (5 per 100 in males and 5.6 per 100 in females) [4].

Headache is one of the commonest presenting complaints in general outpatient clinics and is ranked among the tenth most disabling conditions worldwide according to World Health Organization, (WHO) parameters [2].

It is generally classified as primary or secondary headache. Secondary headaches include those caused by an underlying medical condition while the Primary headaches are not caused by a disease or medical condition.

Some forms of headache like Ophthalmoplegic migraine have a typical clinical presentation and imaging may or may not be informative while in others like neoplasms imaging offers an early diagnosis and a chance for potential treatment [5].

The recent and increasing availability of CT scanners in Nigeria has made neuroimaging a viable option in the management of patients with chronic headaches.

Although CT allows rapid acquisition of high-resolution three-dimensional images, providing cross-sectional images of the brain, it poses risk of radiation exposure with effective doses of 2-4mSv for a typical head CT [6].

Multiple earlier studies have shown that in the vast majority of patients with chronic headache, CT scan may be normal since most of them do not have any serious or treatable underlying medical cause of the headache [7,8]. Routine investigation of all cases of headache is therefore not recommended.

In view of these challenges, The United State headache consortium has given recommendations for neuroimaging in chronic headache patient which includes non-acute headache associated with abnormal findings on neurological examination [9].

It is recommended that neuroimaging should be used in patients presenting with certain Clinical warning criteria, CWC of secondary headache which includes headache associated with focal neurological symptoms, change in the character of headache, headache of sudden onset, onset of headache after 50 years, no response to analgesics.

Studies have shown that the rate of detection of positive finding is higher among patients who meet this CWC criterion [10].

It has however been shown that significant intracranial pathology can cause nothing more than a mild headache [11] thus a potentially treatable abnormality can be missed if the physician relies solely on clinical presentation. This poses a dilemma to the attending physician in the management of chronic headaches.

In Africa, poverty, lack of experienced neurologists, sociocultural beliefs, late presentation and poor health seeking behavior make it difficult to apply the consensus guidelines applicable to developed countries [8,12].

The dearth of Neurophysicians is a major contributor to the increase in referrals without proper clinical evaluation. Patients are thus referred for various reasons ranging from suspicion of intracranial abnormality to reassurance of the worried patient or relatives. The practice of self-referral is also common in our locality especially with the educated patients who in most cases insist on having these investigations done against the better judgement of the physician. The rising cases of litigations is also a reason for ordering of neuroimaging even

without significant clinical indication. CT imaging ends up being used as a tool for classification of headache disorders in our environment.

We aim to report the radiologic features of all patients referred for cranial CT scan as part of investigation of chronic headaches and to determine the yield of significant intracranial lesions.

2. MATERIALS AND METHODS

This is a retrospective study of the reports of cranial CT of 126 patients referred from a variety of inpatient and outpatient settings to the Radiology department of University of Abuja teaching hospital with complaint of chronic headache. The study period was between January 2014 and February 2017. Patients with known secondary cause of headache was excluded from the study.

All studies were performed with a Toshiba 16 slice CT scanner. The study subjects were scanned supine from the skull base to the vertex with contiguous axial slices parallel to the inferior orbitomeatal line using 3- 5 mm slice thickness at interval of 3 mm. A few of the younger patients were sedated with 2.5 mg of diazepam as necessary. Intravenous contrast material was administered where necessary depending on the clinical picture as determined by the reporting Radiologist. Records of the images stored in the Picture archiving system (PACS) and written reports were reviewed and data entered into Microsoft Excel and subjected to analysis. Numerical and graphical descriptors were used to summarize the data. Numerical descriptors include mean, standard deviation, minimum, median and maximum values for continuous variables while frequency and percentage were used to describe categorical variables. Pearson's Chi-squared test was used to assess relationships and statistical relationship between categorical variables. In all statistical tests, significance level was set at an alpha level of 0.05.

3. RESULTS

3.1 Demographics

Analysis of the 126 reports showed an age range of 5-75 years with mean age of 37.3±15.5 SD. There is a slight female preponderance (64%vs 54%) with majority of all patients in the 45-54 age range as documented in Fig. 1.

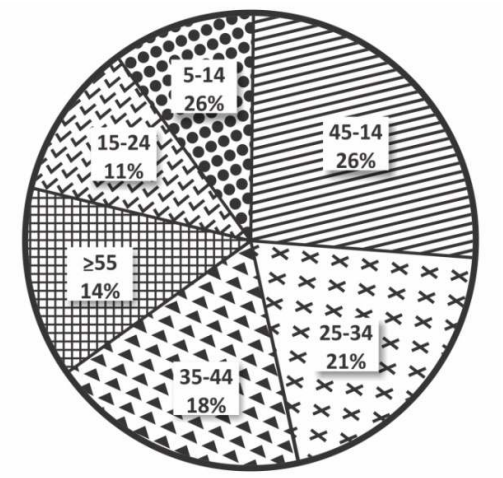

Fig. 1. Distribution of participants by age group

On the average, the female patients who visited the referral center were generally older (39.9 ± 13.7 years) than the male patients (34.3 ± 17.1 years).

3.2 Clinical Findings

The CT findings show a near equal number of abnormal (n=62, 49.2%) and normal (n=64, 50.8%) findings.

Although the number of female patients who had abnormal CT was higher (n=35, 51.5%) than that of the male counterpart (n=27, 46.6%), Chi-Square test conducted shows no association between lesion type and sex at 5% level of significance (p =0.4030) indicating that the proportion of male patients who had abnormal CT is about equal to the proportion of female patients who had abnormal CT. See Table 1.

Table 1. Distribution of subjects by sex and CT findings

Variable	N	%	P-value
Sex			
Male	58	46.0	0.3730
Female	68	54.0	
CT finding			
Normal	64	50.8	0.8586
Abnormal	62	49.2	
Abnormal CT			
Male	27	46.6	0.5820
Female	35	51.5	

P-value is Pearson`s Chi-Square test for differences of proportions

Out of the patients who had abnormal findings, the most prevalent lesion overall was Sinusitis in

10 (16.1%) cases involving the maxillary and sphenoid sinuses. Intracranial abnormalities were more common than extracranial lesions with intracranial tumors seen in 11(%) patients. Haemorrhagic/vascular events occurred in 8(%), degenerative lesions in 5(%) and inflammatory processes in 4(%). See Figs. 2, 3 and Table 2.

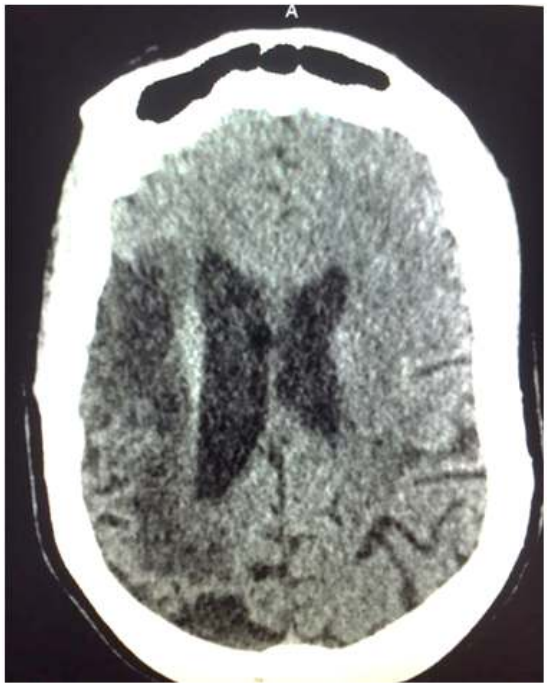

Fig. 2. Axial CT of the brain showing chronic right sided infarct

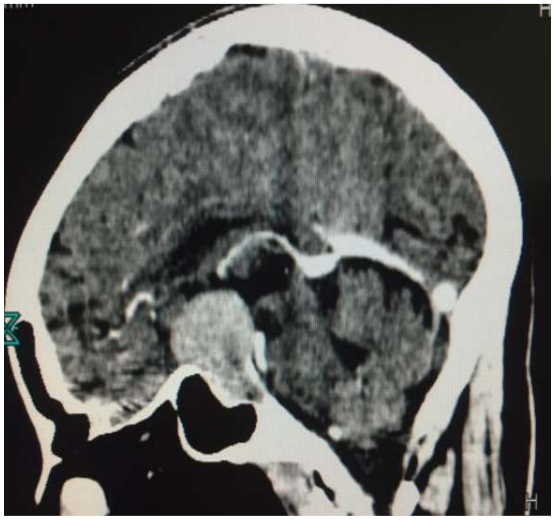

Fig. 3. Sagittal contrast enhanced CT of the brain showing intrasellar mass

Table 2. Abnormal findings in CT scan of the head

Findings	No.	%
Intracranial lesions		
Tumors		
Pituitary Macroadenoma	5	8.1
Craniopharyngioma	2	3.2
Glioma	2	3.2
Arachnoid cyst	1	1.6
Pinealoma	1	1.6
Inflammatory		
meningoencephalitis	2	3.2
Tuberculous granuloma	1	1.6
neurocysticercosis	1	1.6
Haemorrhagic/vascular		
Intraparenchymal heamatoma	2	3.2
Subdural heamatoma	2	3.2
Subarachnoid haemorrhage	1	1.6
infarct	3	7.8
Degenerative		
Bifrontal atrophy	2	3.2
Generalized cerebral atrophy	3	7.8
Others		
Exuberant physiologic calcifications	6	9.7
Cerebrospinal fluid Hygroma	1	1.6
Normal pressure hydrocephalus	1	1.6
Extracranial		
Sinusitis	10	16.
Polyps	3	1
Mastoiditis	3	7.8
Hyperostosis frontalis interna	6	7.8
Internal jugular vein stenosis	2	9.7
Hyperpneumatization	1	3.2
Nasopharyngeal tumor with intracranial extension	1	1.6
Total	62	100

Chi-Square test conducted to examine whether there is an association between lesion type and age indicates that there is an association ($p = 0.0425$). The largest difference between percentages in patients with normal and abnormal lesion occurs in the 25 – 34 year and 5-14 age groups. Patients with normal CT scan were more likely to be younger than patients with abnormal CT scan. Abnormal lesion was found to be associated with older age as shown in Fig. 4.

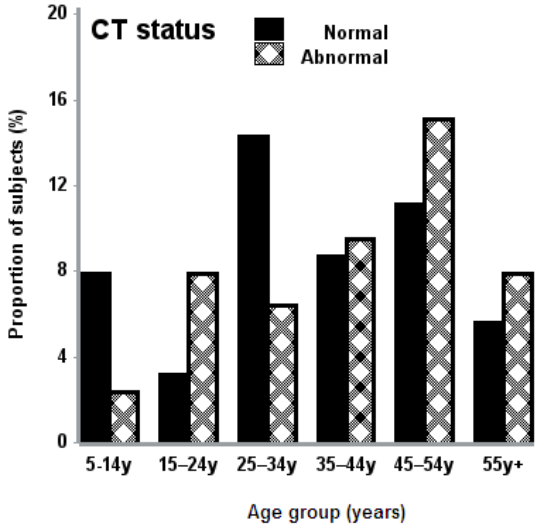

Fig. 4. Comparison of age distribution among subjects with normal and abnormal findings

4. DISCUSSION

In view of the disabling nature of headache, various studies have been conducted at different parts of the world at different times to assess the utility of Neuroimaging techniques in patients with chronic headache [13,14, and 15]. Majority were done with CT most likely because of its availability and speed of image acquisition.

Headache affects all age group and sex but in general headache is said to be twice to thrice more common in females than males [16]. Our study shows as light female preponderance in a ratio of 1.2:1. The higher incidence in females could be due to hormonal factors. The link between migraine and female sex hormone is well established with Migraine having a strong correlation with menstrual cycle, pregnancy, oral contraceptive pills, and menopause and Hormonal replacement therapy [16].

The mean age of 37.3±15.3 coincides with the period of active life and stress which is widely demonstrated as a contributing factor in tension-type headache [17].

Estimation of the frequency of headache in children varies among authors in different localities with studies showing that up to 51% of children aged 7 years and 57-82% of adolescents aged 15 years report recurrent headaches [18,19].

This is not our experience since children aged <15 years accounted for only 10% of all cases. Other studies done in Nigeria showed similar findings [20,21]. This could be as a result of the smaller sample sizes used or the fact that typical African culture places less value on children, thus a child's symptom might not be taken as serious as the adult counterpart especially if there are no other coexisting clinically significant symptoms.

The United States headache consortium- a group of acknowledged expert Neurologists and the European Federation of Neurological Societies' (EFNS) Task Force on use of instrumentation in the diagnosis of headaches recommend neuroimaging in ambulatory (non-emergency) patients with migraine only in the presence of persistent focal neurological findings or a history of seizure [22].

Most (92%) of the records however show no associated clinical history beyond chronic, recurrent headaches. Only three patients had associated seizures while two patients had coexisting history of loss of consciousness. None was recorded with any associated neurologic abnormality.

Five patients were referred on the suspicion of space occupying lesion highlighting the possible dilemma of the clinician in making diagnosis. None had any significant correctable intracranial lesion.

A high rate of abnormality (49.2%) was noted in this study similar to others done in Nigeria [20,21], but contrasting greatly with a similar but older study involving all categories of patients. Mitchell et al in their study of 350 patients with chronic headache irrespective of presence or absence of neurological findings noted that only 2% had CT findings which were clinically significant with an additional 7% of the patients with positive CT findings that were clinically insignificant. More importantly, all of the patients in their study who had significant CT findings had some neurological finding or abnormal symptom [23] unlike this study.

Degrees of significance of the abnormalities however defer depending on the prognostic value of the lesion.Ssignificant abnormalities (defined as abnormalities related to headache that may require further or urgent action) in this study include tumors, vascular/heamorrhagic lesion and infective processes.

Ezeala-Adekaibe et al. in Enugu, Nigeria recorded 47% and Imariagbe recorded 47.3% abnormality rates. While the former attributed the higher findings to improper patient selection, Imariagbe suggests that the relatively high yield of cases with identifiable cranial lesions may have been influenced by the method of selection, in which all the cases reviewed were referred for CT after assessment by a specialist neurologist. It is however of note that both studies were done in patients without associated neurologic symptoms. We suggest that the higher abnormality rate could be as a result of better resolution scanners which acquire volumetric data compared to the older generation CT scanners. CT imaging is very expensive for the average Nigerian and most patients would not ordinarily pay for such an investigation unless they are quite distressed putting to question the clinical assessment by the referring physicians. This could be contributory to the reported higher abnormality rates recorded by the different studies in our country when compared to other previously mentioned studies done in more industrialized nations. The method of classification which included "incidental" findings like infarct, atrophy and sinusitis also contributes to the higher abnormality rate. A study done in France by Kurth et al to evaluate the association of overall and specific headaches with volume of white matter hyperintensities, brain infarcts and cognition support an association between migraine with aura and brain infarcts [24]. Another study done to assess neurological-radiological correlations in 200 cases of primary atrophy showed that a majority of the patients (54.5%) presented with headaches [25].

76.9% of children <15 years had normal reports while 56.2% of adults >35years had abnormal findings on the cranial CT. This is similar to findings by Prpic et al. [26] and Gupta [27] who had a normalcy rate of 71.3 and 78.8% respectively in children and young adults. In view of this finding, it is recommended that Clinicians should be cautious in advising CT scan in young children to avoid the hazardous radiation exposure in such a young age and to consider MRI as a better alternative in paediatric patients if neuroimaging is essential to reach a diagnosis or to exclude some serious intracranial pathology [27].

Intracranial lesions formed the majority of the abnormality (n=36, 58.1%) with a significant number of intracranial tumors (n=11, 17.7% patients) with predominance of Pituitary Macroadenoma. Levy et al. [28] reported 70% of headache incidence in patients with pituitary lesions, suggesting participation of pituitary tumors in origin of headache.

All the patients with intracranial tumors were <50 years with a male to female ratio of 1.8:1. In other studies age and sex have not been shown to correlate with the presence of headache in brain tumors [28].

Other surgically remediable or potentially treatable lesions seen included infections and intracranial heamorrhages.

Extracranial pathologies were seen in 26(41.9%) with maxillary and sphenoid sinusitis predominating. Although sinusitis is referred to as an incidental finding, within the medical literature, there are texts that report that sphenoid sinusitis can cause headaches and present with progressive or thunderclap headache in adults [29].

Hyperostosis Frontalis Interna seen as thickening in frontal bone is associated with headaches and seizures in middle aged females mimicking intracranial space occupying lesions [30]. Our study shows an incidence of 7.8% with all occurring in females. This condition was not commonly reported among the reviewed studies but appears to be a relatively significant etiology of headache in our environment. A solitary case of excessive pnuematization of all the paranasal sinuses was seen and has been reported in literature as a possible cause of chronic headache [31].

5. CONCLUSION

This study shows a significant yield of remediable intracranial lesions in Computed tomography scan of all patients with chronic headaches. There is however need for proper clinical history and examination especially in children who recorded a rather low rate of clinically significant abnormalities.

CONSENT

It is not applicable.

ETHICAL APPROVAL

The investigation and research work received ethical approval.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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