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The Pattern of Computed Tomography Head Scan Findings among Patients with Chronic Headache at the Kenyatta National Hospital

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Abstract:
Background: The increasingly indiscriminate use of Computed Tomography (CT) scan in Kenya as an imaging modality in the evaluation of chronic headache, calls for a need to characterise and document the accruing results as to justify the radiological exposure to patients.
Method: This cross-sectional descriptive study at Kenyatta National Hospital between the period of January 2015 and April 2015 involved a total number of 90 patients that underwent CT scan of head following history of chronic headaches.
Results: Out of all the patients examined 66.3% (n=60) were of normal findings while 31.5% (n=28) were not normal (p = 0.034). Majority of the patients had not done CT scan previously despite having the chronic headaches 68.5% (n=62) while 30.3 % (n=27) had done the CT scan before. The majority (80.9%) of the respondents with chronic headache did not consume alcohol.
Conclusion: The yield of positive CT findings in patients with chronic headache is low at KNH and this is in agreement with a number of previous studies elsewhere. Correlation of the CT scan findings with the clinical diagnosis gave a poor yield of significant intracranial pathology in head CT scan among patients with chronic headache bereft of any lateralizing sequel (p=0.005).

1. Background Information

Headache is diffuse global pain in various parts of the head as opposed to pain along the area of distribution of a nerve. According to Stewart (1989), headaches are one of the most common neurological problems presented to General Practitioners (GPs) and neurologists. Headache varies from an infrequent and trivial nuisance to serious disease (Clarke, 2005). The primary headache disorders, which include migraine, cluster, and tension-type headaches, account for the majority of headaches, while secondary headaches, which are less common are attributable to underlying pathology like tumor, aneurysm, or giant cell arteritis (Rasmussen, et al., 1991). Most patients presenting with headache in the primary care setting do not have serious underlying conditions.(Sargent, et al., 1983)

According to Fausi et al., (2008) population based estimates suggest that about 4% of adults experience some degree of headache daily. Computed Tomography (CT) is one of the most widely used imaging modalities that is critical in determining the cause of headaches and recently, magnetic resonance imaging (MRI) is used to exclude other important abnormalities (Tshushima et al., 2005,Gupta et al., 2011).

1.1. Statement of the Problem

In a study by Mitchell et al., (1993), out of 27 headache patients evaluated, only one had pathology, hence raising concern on the wisdom of routine use of Computerized Tomography. In Kenya, many more patients with chronic headache without accompanying neurological sequel undergo CT scan. However, despite the usefulness of CT scan in the detection of significant and treatable lesions that affect quality of life in a patient with headache, there is associated with a deleterious heavy radiation exposure to a client. The purpose of this study therefore, was to evaluate the common pattern of findings in patients undergoing Computed Tomography (CT) scan for patients with complains of chronic headaches to see if the radiological exposure is justified.

1.2. Research Questions

1. What are the socio-demographic factors of patients with chronic headaches undergoing CT scans in Kenyatta National Hospital (KNH)?
2. What are the common CT patterns of findings for patients with chronic headaches at KNH?
3. What is the prevalence of positive findings in patients undergoing head CT scans at Kenyatta National Hospital?

1.3. Broad Objective

Determine the pattern of findings on Head CT scans for patients with chronic headaches at Kenyatta National Hospital.

1.4. Specific Objectives

1. Find out the socio-demographic characteristics of patients with chronic headache that undergo Head CT scan at KNH.
2. Evaluate the pattern of CT findings among patients with chronic headaches at KNH.
3. To determine the prevalence of positive CT scan findings among patients with chronic headaches at KNH.

1.5. Ethical Considerations

The Jomo Kenyatta University of Agriculture and Technology departmental institutional research review board approved the study and the radiology department granted permission to undertake the study at Kenyatta National Hospital. The respondents incurred no extra costs other than that for the examination. There was explanation on risks and benefits of the study to the participants in a language they could understand during the process of informed consent. No incentives were offered to participants for study.

2. Results

2.1. Socio-Demographic Data

The findings of this study showed that most of the respondents were of the age ranges between 20-29 and 30-39 years at 27.0% and 25.8% respectively. This were followed by 40-49 years at 18.0%, 10-19 years at 14.6% then 50-60 years at 11.2% and finally 70 years and above at 3.4% (Figure 1). The results further show that majority (62.0%) of the respondents were females while 38.0% were male as depicted in Figure 2.
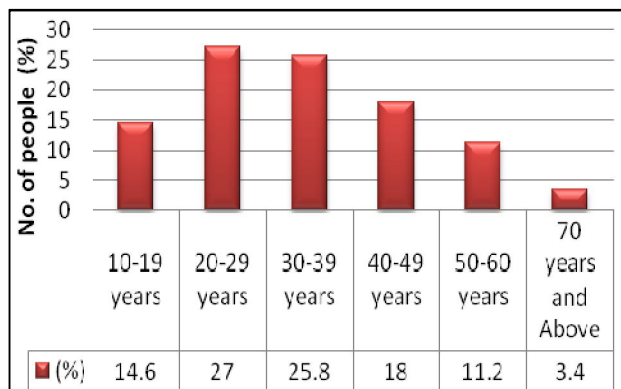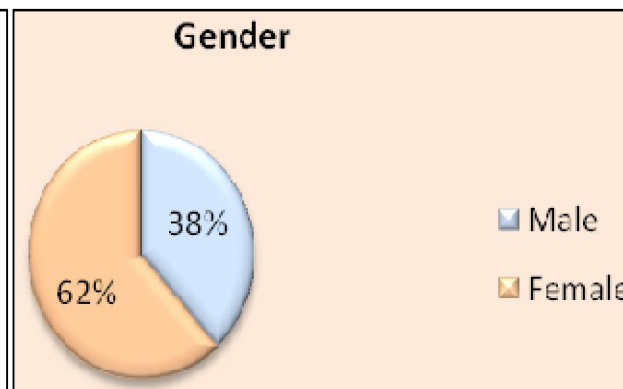

Figure 1: Respondents' Age in Years

Figure 2: Respondents' Gender

This study found out that more than half of the respondents had secondary level of education at 50.6% while those with college level of education were at 31.5% and primary level at 15.7% (Figure 3).
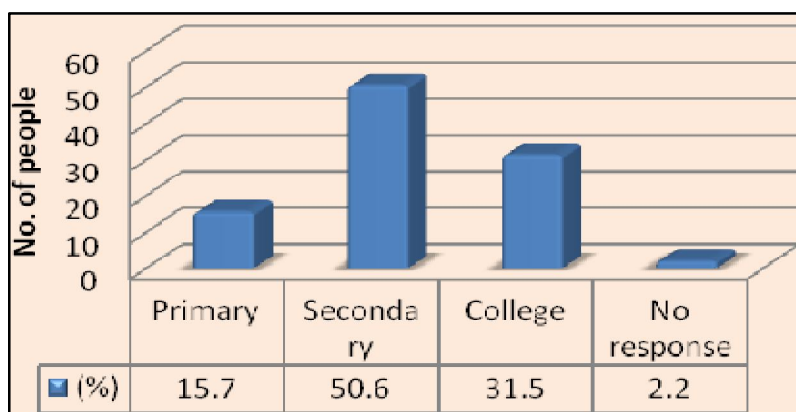

Figure 3: Respondent's Educational Level

In this study, most of the respondents (51.7%) were employed while 40.4% of them were unemployed and 5.6% self-employed while the remaining 2.2% were students (Figure 4).

Figure 4: Respondents' Occupation

The findings of the study further showed that a significant majority of the respondents (97%) were Christians while Muslims constituted 3.0% (Figure 5).
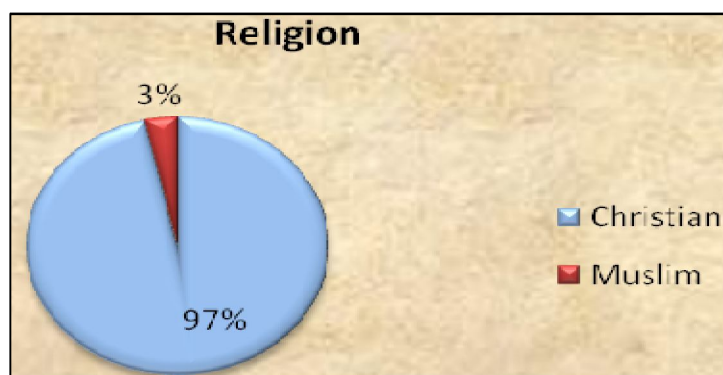

Figure 5: Respondents' Religion

On marital status, the majority of the respondents were married at 60.0% while the remaining 40.0% were of single status (Figure 6).
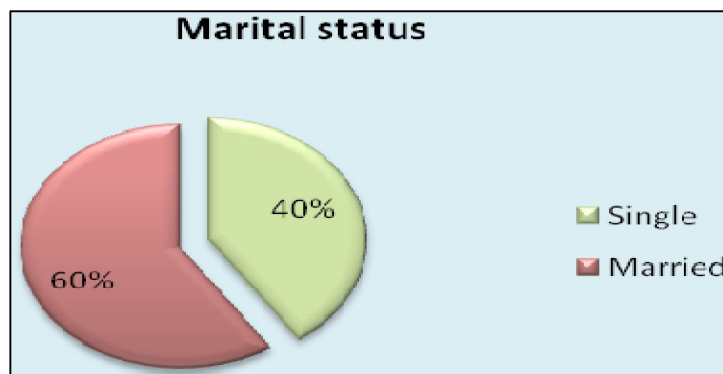

Figure 6: Respondents' Marital Status

2.2. Consumption of Alcohol and Smoking among the Respondents
The study findings showed that a significant majority of the respondents (80.9%) did not consume alcohol whereas 15.7% consume alcohol (Table 1).

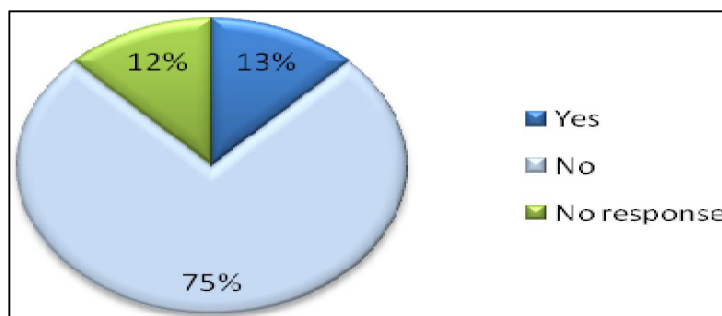| Whether respondent takes Alcohol	Frequency (N)	Percentage (%)
Yes	14	15.7
No	73	80.9
No response	3	3.4
Total	**90**	**100.0**

Table 1: Alcohol Consumption

Figure 7: Respondents' Smoking

2.3. Durations of Headaches
The study found out that 57.3% of the respondents experienced headaches for a period of more the two weeks while the remaining 41.6% experienced headaches for a period of less than two weeks (Table 2).

Period of Headaches	Frequency (N)	Percentage (%)
More than two weeks	52	57.3
Less than two weeks	37	41.6
No response	1	1.1
Total	**90**	**100.0**

Table 2: Period of Headaches

2.4. Localization of the Headaches as Per the Client
Most of the respondents (50.6%) experienced headache that affected the whole head followed by 18.0% the frontal region, then 16.9% the occipital region, and finally 13.5% the parietal regions (Figure 8).
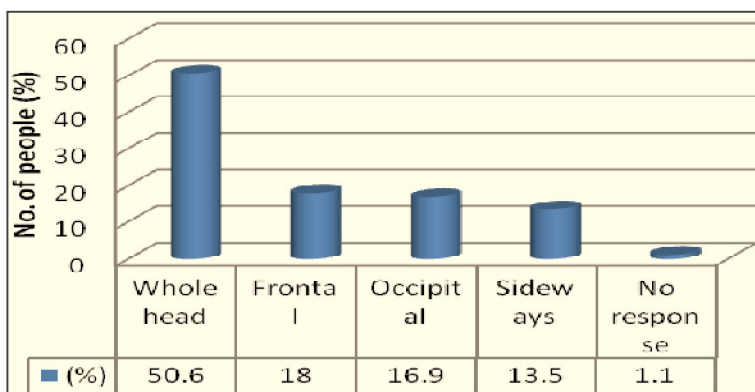

Figure 8: Part of the Head with Headache

2.5. Whether CT Scan Examination Previously Done
The study findings showed that majority of the respondents at 69.0% have never had a previous head CT scan while 30.0% reported to have had a previous head CT scan with a pvalue of 0.047(Figure 9).
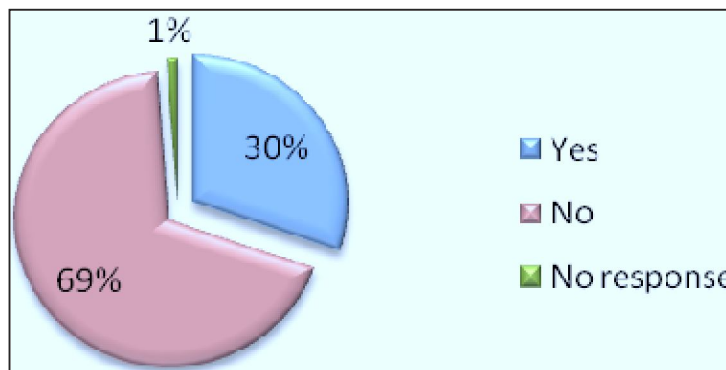

Figure 9: Previously did Head CT Scan

2.6. Whether Respondent Had Received Treatment for Headache Before
The study revealed that a significant majority of the respondents (71.9%) received treatment for headache before while 24.7% had never received any treatment (Table 3).

Treated for headache before	Frequency (N)	Percentage (%)
Yes	65	71.9
No	22	24.7
No response	3	3.4
Total	**90**	**100.0**

Table 3: Treated for Headache Before

2.7. Type of CT Examinations Performed for Headaches
The study found that 78.0% of the respondents had contrast enhanced CT exam while 21.0% had a non-contrast CT exam performed for their headaches with a p value of 0.047 (Figure 10).
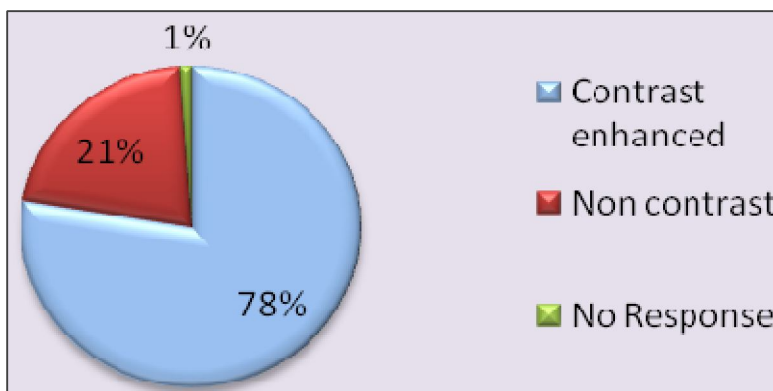

Figure10: Kind of Examination Performed

2.8. Findings of the Head CT Scan.
The CT scan radiological exams were normal in 66.3% of the respondents while in 31.5% it was abnormal (Table 4).

Findings of the examination	Frequency (N)	Percentage (%)
Normal	60	66.3
Not normal (Abnormal)	28	31.5
Inconclusive	2	2.2
Total	**90**	**100.0**

Table 3: Findings of the Examination

Among those found with abnormal examinations, the study found that 54.0% of them had intracranial lesion while 35.0% had extra cranial lesion (p=0.034) as shown in figure 11.
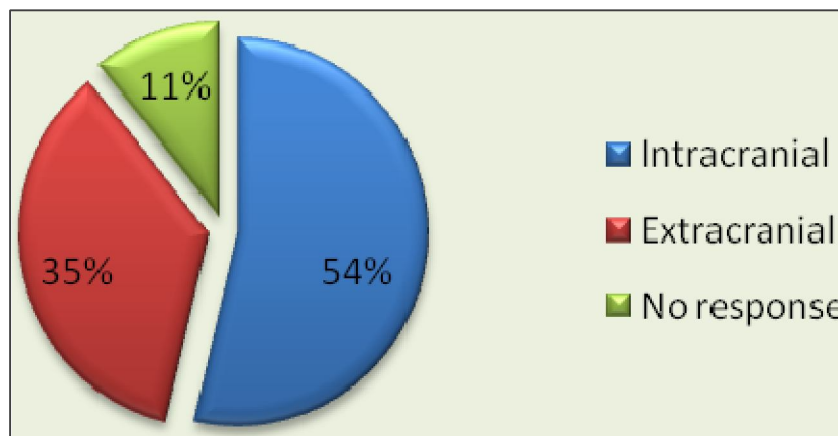

Figure11: Position of Lesion in those with Abnormal Exams

The results of the study showed that 46.0% of the respondents had solid lesions followed by 36.0% with cystic lesions and a smaller percentage (7.0%) with hemorrhagic lesions (Table 5).

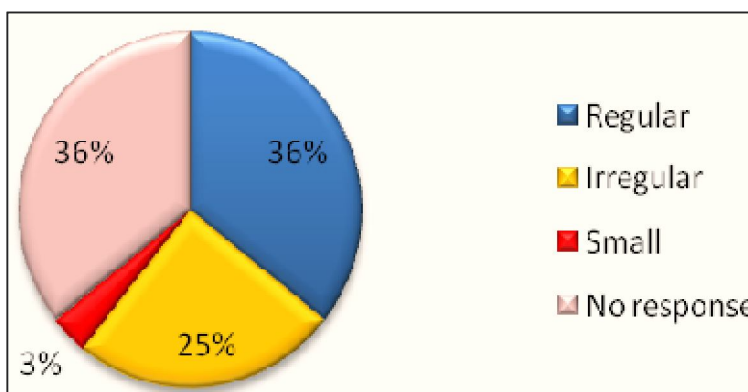| Nature of the lesion	Frequency (N)	Percentage (%)
Solid	13	46
Cystic	10	36
No response	3	11
Hemorrhagic	2	7
Total	**28**	**100.0**

Table 4: Nature of the Lesion

Figure12: Shape of the Lesion

2.9. Midline Shift in the Brain Caused by the Lesions
The study found that majority of the radiologists' reports (55.0%) showed that there was no midline shift whereas in 30.0% it was reported that there was a midline shift as a result of the tumors noted (Figure 12).
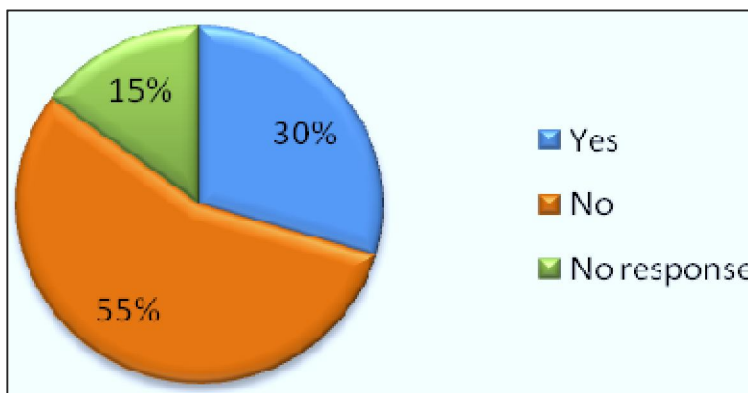

Figure 13: Tumor with Midline Shift

The majority (88.8%) of the respondents with abnormal examinations did not require further investigations while only 11.2% required further investigations based on the findings from the CT scan head done as shown in Table 6.

Further investigation needed	Frequency (N)	Percentage (%)
Yes	10	11.2
No	80	88.8
Total	**90**	**100.0**

Table 5: Further Investigation Needed

2.10. Correlation of Clinical Diagnosis and CT Findings
The findings of the study revealed that in 39.0% of the abnormal findings there was a correlation between clinical diagnosis and CT scan findings while in majority of the cases (61.0%) there was no correlation ($p = 0.005$)as depicted in figure 14.
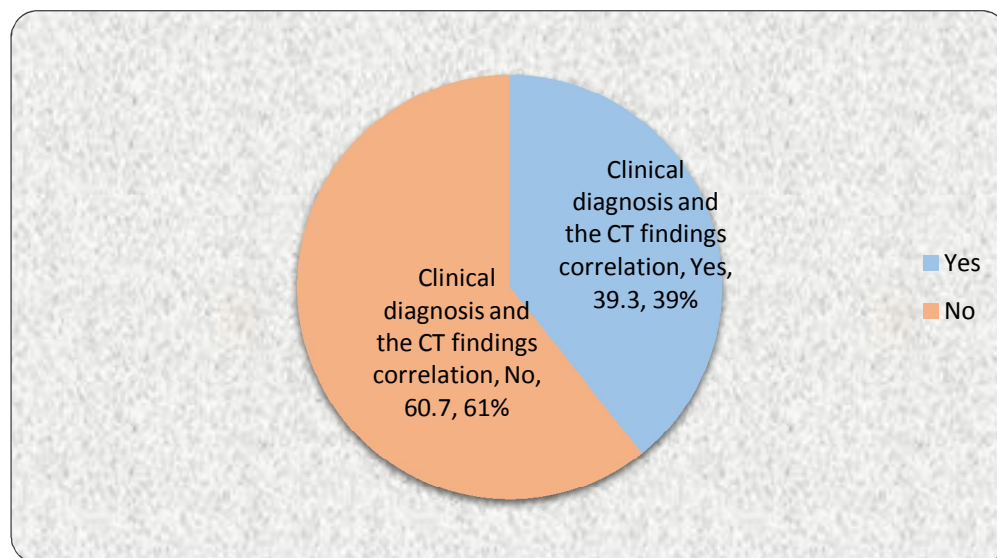
Figure 14: Correlation between Clinical Diagnosis and CT Findings

3. Discussion

3.1. Socio-Demographic Data

From the data of 90 respondents, most were of the age ranges between 20-29 and 30-39 years at 27.0% and 25.8% respectively. The age bracket of 40-49 years at 18.0%, 10-19 years at 14.6% then 50-60 years at 11.2% and finally above 70 years at 3.4%.The mean age range among the respondents was 30-39 years. The findings of this study are similar to the study in France by Valade et al., (2007) that had the mean age 36 years. However, prevalence studies in other parts of the world contradict our findings since they showed that headache prevalence affected all age groups though in one of the study affected adults up to 71.0% (Abu- Arefeh, *et al*., 1994; Gobel, et *al*.,1994). The results further showed that majority (62.0%) of the respondents were females while 38.0% were male. This finding is supported by a study by Rusell et al., (1995) on prevalence of migraine that showed women being most affected than men (about 15%–18% of women and 6% of men). Rusell *et al*. (1995) further found that severe headache-related disability was more common among females with chronic headaches. Other studies by Scharfman, et al (2008) and Macgrepor et al, (2011) showed an association between headaches and female sexual hormones and thereby explain why headaches are more prevalent in women than in men.This is also similar to the study that was done by Morgenstern, L.B., et al (2001) in Houston, Texas 66% of the patients were females. Another study conducted in France by Valade et al., (2007) had 75% of female patients among those complaining of headache.

This study found out that more than half of the respondents had secondary level of education at 50.6% while those with college level of education were at 31.5% and primary level at 15.7%, which statistically was not significant in leading to development of headaches. Evidence from a study by Jain *et al*., (2007) supports this finding since he found that education did not play any significant role in the development of headaches.

On marital status, the study found that majority of the respondents were married at 60.0% while the remaining 40.0% were of single status thus the headaches could be attributable to the fact that married couples have more responsibilities as pertains the family compared to those who are not married. A study on social demographic characteristics and chronic headaches found that primary type headaches were common among, housewives (40.1%), married persons (69.3%), those belonging to Socioeconomic class II (47%), and in nuclear families (75.25%) (Jain *et al*., 2007) and which clearly support the findings of the current study.

3.2. Alcohol Use as a Cause of Chronic Headache

The study findings showed that a significant majority of the respondents (80.9%) did not consume alcohol whereas 15.7% consume alcohol (p = 0.059). This finding is contrary to a study by Green (2012) who found that some primary headaches result from lifestyle factors, including alcohol use, particularly red wine, and certain foods such as processed meats that contain nitrates, changes in sleep patterns, poor posture, skipped meals, and stress.

3.3. Duration of the Headaches

The study found out that 57.3% of the respondents experienced headaches for a period of more the two weeks continuously while the remaining 41.6% experienced headaches for a period of less than two weeks that would recur after a short period of time (Table 2). Most of the respondents (50.6%) experienced headache that affected the whole head followed by 18.0% the frontal region, then 16.9% the occipital region, and finally 13.5% the parietal regions (Figure 11).

3.4. Previous CT Scan on the Patients

The study findings showed that majority of the respondents at 69.0% have never had a previous head CT scan while 30.0% reported to have had a previous head CT scan (Figure 12).

A significant majority of the respondents (71.9%) had received treatment for headache before while 24.7% had never (Table 3).

3.5. CT Head Findings of the Patients with Chronic Headache
The CT scan exams were normal in 66.3% of the respondents while in 31.5% it was reported to be abnormal (p = 0.034). This finding somewhat contradicts the study by Tsushima (2005) where out of 897 studies of migraine patients, only 4 were positive of which 3 were tumours and 1 AVM; a 0.4% yield of potentially treatable lesions. In addition, the findings also contradict another study in which, out of 1999 CT scans, only 21 (1%) disclosed treatable lesions (Michell, 1994).

About 88.8% of the respondents with abnormal findings in our study at KNH did not require further investigations while only 11.2% required further investigations. Aurora (2003) who concluded that the indications for imaging a common disorder such as headache result in low-yield of false-positives that may warrant further investigations supports this. In our KNH study, 78.0% of the respondents underwent contrast enhanced CT exam while 21.0% underwent non-contrast scan (Figure 13). This is similar to a study done by Anish Subedee, (2009) at Chitwn Medical College and Teaching Hospital, whereby, from among the 56 patients 38 patients underwent both plain and contrast enhanced CT scans without any additional diagnostic value.

The most common causes of the chronic headaches noted in the case of normal brain parenchyma in this study were sinusitis (7.9 %). This finding agrees with the study done at Muhimbili National Hospital in Tanzania in which the prevalence of positive findings among patients with headache was 31.9% whereby the most prevalent pathology was maxillary antral sinusitis (Magambo W, 2012).

3.6. Incidence of Midline Shift in the CT Scan.
The study found that in the majority of the abnormal CT scan cases (55.0%), there was no midline shift whereas in 30.0% had midline shift.

3.7. Correlation of Clinical Diagnosis and CT Findings
The findings of the study revealed that in 39.0% of the abnormal findings there was a correlation between clinical diagnosis and CT scan findings while in majority of the cases (61.0%) there was no correlation (p = 0.005) . Evidence supporting this finding can be seen from a study by Gaini *et al* (2004) which showed that out of 350 patients, 7 (2%) had positive significant findings on CT scan and 25 (7%) had positive findings that were not clinically significant.

4. Conclusion
In line with previous findings of most scholars, the routine use of head CT is of less diagnostic yield in patients with chronic headaches since most of the examinations performed at KNH had normal findings compared to the studies that yielded pathology. Further to this, the additional use of contrast media on the clients with normal CT findings did not improve the diagnostic yield, which was in keeping with the findings of other scholars like Magambo (2012).

5. Recommendations
It is incumbent upon the KNH clinical team to review the management of clients with chronic headaches and come up with diagnostic and management protocols to avoid unnecessary CT radiological exposures and the adverse effects that could emanate from the excessive use of the seemingly superfluous intravenous contrast media whenever the non-contrast examinations are negative. There is need for a more comprehensive study that should involve more radiological facilities on the subject in order to be able to generalize the results.

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