

**CT SCAN FINDINGS IN PATIENTS PRESENTING WITH HEADACHE AT  
THE RADIOLOGY DEPARTMENT, MUHIMBILI NATIONAL HOSPITAL.**

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**MMed (Radiology) Dissertation**

**Muhimbili University of Health and Allied Sciences**

**September 2012**

**CT SCAN FINDINGS IN PATIENTS PRESENTING WITH HEADACHE AT THE  
RADIOLOGY DEPARTMENT MUHIMBILI NATIONAL HOSPITAL,  
IN DAR ES SALAAM, TANZANIA**

**By**

**Margreth William Magambo**

**A dissertation Submitted in (partial) Fulfillment of the Requirements for the Degree  
of Master of Medicine (Radiology) of  
Muhimbili University of Health and Allied Sciences**

**Muhimbili University of Health and Allied Sciences**

**September 2012**

## **CERTIFICATION**

The undersigned certify that he has read and hereby recommend for examination of dissertation entitled “**CT scan Findings in Patients Presenting with Headache at the Radiology Department, Muhimbili National Hospital**” in fulfillment of the requirements for the degree of Master of Medicine (Radiology) of Muhimbili University of Health and Allied Sciences.

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**Dr R.R Kazema**

(Supervisor)

Date: \_\_\_\_\_

## **CERTIFICATION**

The undersigned certify that he has read and hereby recommend for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled “**CT scan Findings in Patients Presenting with Headache at the Radiology Department, Muhimbili National Hospital**” in (partial) fulfillment of the requirements for the degree of Master of Medicine (Radiology) of Muhimbili University of Health and Allied Sciences.

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**Dr R.R Kazema**

(Supervisor)

Date: \_\_\_\_\_

**DECLARATION**

**AND**

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I, **Margreth William Magambo**, declare that this **dissertation** entitled “**CT scan findings in patients with headache at the Radiology Department, Muhimbili National Hospital**” is my own original work and that it has not been presented and will not be presented to any other university for a similar or any other degree award.

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**Dar es Salaam, June 2012 Margreth Magambo**

**DEDICATION**

“If you want to achieve something, you are obligated to put in some effort”

**Mrs. Faith Magambo**

This dissertation work is dedicated to both my parents

**Mr. and Mrs. William Magambo**

## **ABSTRACT**

### **Background**

It is estimated that more than one hundred thousand people suffer from headache all over the world. Headache is one of the main sources of discomfort. The IHS classifies headache into primary (without any organic cause) or secondary (with an established cause an established cause). Primary headache includes migraine, cluster. With these types of headaches no imaging modality has proved to be necessary. With current literature, the migraine headache can be investigated with MRI and gives positive results. For secondary type of headache hemorrhage has been established as one of the factors. This is attributed to hypertension which is on the rise in Tanzania. Other factors include brain atrophy and tumors which can be primary or secondary.

### **Objectives**

To evaluate the causes of secondary headache by the use of CT scan at MNH in 2011. This will help to determine the most prevalent cause of headache in patients. Also to determine the most prevalent cause of headache in general and the pattern of presentation on the imaging modality.

### **Methodology**

This was an observational study whereby a sample of 85 subjects were taken. Characteristic of the type of headache was noted as documented in the request form.

The underlying conditions were outlined. Evaluation for the cause of headache was done using a helical PHILLIPS CT 8 planner scan machine (Phillips, Eindhelsen, Netherlands).



Collected data was analyzed using SPSS programme version 15. For the continuous data mean and standard deviation were considered while for the categorical was by proportion and percentage. The association between headache and the risk factors will be established using chi square and linear regression to establish the statistical significance.

## **Results**

The study included 85 patients, with more females than males. The study showed that the prevalence of positive findings among patients that presented with headache was 31.9%. The most prevalent pathology found was sinusitis which was located in the maxillary sinus. Among the CT scan findings and the suspected diagnosis, brain metastasis showed to have strong correlation. Both sinusitis, brain atrophy and brain infection had positive correlation and brain infarction had negative correlation between the clinical deduced diagnosis and the CT scan findings.

Some study subjects had pre existing morbidity and the most frequent one was hypertension. No significant difference was noted among patients who had hypertension and those who had not as far as the CT SCAN findings (P 4.254).

There were neurological complaints apart from headache and the commonest one documented was loss of consciousness. This however did not have an effect on the CT scan findings whether normal or abnormal (P 0.016).

## **Conclusion**

CT scan has a role in determining the cause of headache. Primary headache is more common than secondary headache. More emphasis should be put to women presenting with headache. The commonest cause of secondary headache is maxillary sinusitis.

### **Recommendations**

More emphasis should be given to female patients presenting with headache especially above the age of 40. Also cancer patients should undergo CT scan when presenting with first time headache due to high likelihood having brain metastasis.

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**LIST OF ABBREVIATIONS**

ASPN	Ambulatory Sentinel Practice Network.
Cc	Correlation Coefficient.
CT scan	Computed Tomography.
CI	Confidence Interval.
CECT	Contrast Enhanced Computed Tomography.
CTH	Chronic Tension Headache.
ECH	Extradural Cerebral Hemorrhage.
ED	Emergency Department.
ETH	Exaggerated Tension Headache.
HIV	Human Immunodeficiency Syndrome.
ICH	Intra Cerebral Hemorrhage.
IHS	International Headache Society.
LOC	Loss Of Consciousness.
MNH	Muhimbili National Hospital.
MRI	Magnetic Resonance Imaging.
MUHAS	Muhimbili University of Health and Allied Sciences.

NCCT Non Contrast Enhanced Computed Tomography.

NOMA Norwegian Medicines Agency.

WML White Matter Lesion.

PVALUE Pearson's value.

SIGN Significance

CRP C-Reactive Protein

SAH Subarachnoid Hemorrhage.

SDH Subdural Hemorrhage.



## **DEFINITION OF TERMS**

### **Extradural Cerebral Hemorrhage**

Bleeding outside the dural matter.

### **Episodic Tension Headache**

Type of tension headache whereby it has a certain frequency which is not systematically known.

### **Chronic Tension Headache**

Tension headache where there are 15 episodes in a month for more than three months in a year

## **1.0 INTRODUCTION**

Headache is one of the causes of discomfort to a human being. It accounts for about 1% of all ED in the United States of America (1, 2). Headache has many causes including tumors, brain atrophy, and intra-cerebral hemorrhage. Even diseases like Malaria and bacterial infections such as meningitis can all cause severe headache. It can also be acute or chronic. In the case of acute severe headache SAH or meningitis (3).

### **1.1 Classification of headache**

Headache can further be classified as primary or secondary headache(4). Primary headache is the headache that has no associated cause and secondary headache is the one that has an organic origin. Examples of primary headache include migraine, cluster and tension headache. Primary headache is more common than secondary.

#### **1.1.1 Tension headache**

Tension headaches are often related to stress, depression or anxiety. Approximately 90 percent of all headaches are classified as tension-type headache. The estimated prevalence is said to be 40% in males and 42% in females. The pain is typically generalized all over the head. There appears to be a slightly higher incidence of this type of headache among women, because more females than males seek treatment. This type of headache is not associated with nausea or aggravation by physical activity. This can be further classified into episodic or chronic tension headache. ETH is where by it has a certain frequency which is not systematically known and CTH is when there are 15 episodes in a month for more than three months in a year. CTH emphasize the possible role of central nociceptive pathway sensitization in addition to peripheral myogenic factors(5).

### **1.1.2 Cluster headache**

There are an estimated one million cluster headache sufferers in the United States, of whom 10 percent are afflicted with chronic cluster. Cluster headaches are sharp, extremely painful headaches that tend to occur several times per day for months and then go away for a similar period of time.

### **1.1.3 Hormonal headache**

Women suffer migraines three times more frequently than do men, and, menstrual migraines affect 70 percent of these women. The estimated prevalence is said to be 10% in males and 22% in females. They occur before, during or immediately after the period, or during ovulation. Menstrual migraines are primarily caused by estrogen, the female hormones that specifically regulates the menstrual cycle fluctuations throughout the cycle. When the levels of estrogen and progesterone change, women will be more vulnerable to headaches. Because oral contraceptives influence estrogen levels, women on birth control pills may experience more menstrual migraines(6). Although the exact cause is not known, many experts consider migraine to be an inherited condition where the brain and its serotonin-controlled blood vessels are involved. These headaches can often be triggered by many factors, including stress, certain foods, glaring lights, physical exercise and changes in hormone levels.

### **1.1.4 Migraine headache.**

Migraine headache is a form of primary headache. It also more common in females and the study by Bahou et al estimated a prevalence of 38.2% (7). It affects more females than males (8). It has been demonstrated that WMLs are more often found in migraineurs but most migraineurs will not have them and even when found the association with migraine is not understood .

### **1.1.5 Secondary Headache**

Secondary headache can result from a tumor and bleeding in the brain. Risk factors documented include age, about 40 years and the gender whereby more females are more affected than men (9). Among illnesses associated with headache hypertension is the most prevalent. This can result into cerebral hemorrhage. Cerebral hemorrhage can be classified as epidural, subdural or subarachnoid (4). In all these types of cerebral hemorrhage, headache may present as acute severe headache that is accompanied with abnormal neurological symptoms(10). Subarachnoid hemorrhage (SAH) presents with severe headache and is treated as an emergency. Imaging techniques are of use when done within the first 24 hours upon the acute onset of severe headache. This can be followed by a lumbar puncture within 72 hours to rule out meningitis. This was found in the study by Lledo et al (10). The headache presents differently depending on the site where the lesion is located. For cerebellar lesion, frontal headache is prominent, for the cases where there is papillo-edema full blown headache is observed.

The middle cranial fossa lesions are mostly associated with occipital headache.

### **1.2 Characteristics of headache by IHS**

The IHS have put the following warning signs and termed them as red flags for potential secondary headaches that need further investigation. New onset of headache in patients more than 50 years of age, focal neurological symptoms, non focal neurological symptoms. Others include new onset of headache in a cancer patient, new onset of headache in a patient with HIV infection, patients with risk of cerebral venous sinus thrombosis.

Also headache with abnormal neurological examination, headache with fever and neck stiffness, Headache that changes with posture and headache precipitated by physical activity.

### **1.3 Investigations for headache**

Headaches are investigated differently depending on the cause. For imaging investigations CT scan and MRI have proved to be useful when the neurological physical examination is abnormal. For the remaining types of headaches diagnosis can solely be based on the clinical conclusion. Other investigations include full blood count, hormonal assay, CRP, pregnancy tests and eye exams (FUNDOSCOPY) depending on presenting features. For the neuro-imaging investigations for headache, the CT scan has proved to be by far the easiest, quickest, cheap method for adult patients. CT scan is widely used to detect tumors, vascular function in cases of stroke. There are two types of CT studies, the non-enhanced and an enhanced CT study. The enhancement is done with the use contrast media which are made from water soluble compounds.

This imaging technique can be used in combination with other modalities. In cases of suspected embolism, CT angiography can be used. In the case of pediatric patients attending emergency rooms, a lumbar puncture is of more value than the CT scan. This is because the main illness documented is meningitis (11,12).

There is limited available data headache from developing countries such as Tanzania as to the estimated prevalence of both primary and secondary types of headache.

## 2.0 LITERATURE REVIEW

### 2.1 Prevalence of migraine headache with epilepsy

For primary type of headache, females have been identified to be more at risk, for migraine type of headache, the M: F ratio is 1:3 and for tension type of headache M: F ratio is 1:6. This decreases with age. Several factors have been associated with this, not sleeping for long hours, no relaxation after work, no vocational training. Migraine headache (90%) has been identified to be more common than the tension headache (10%) (12). Migraine headaches usually present with aura. Migraine can be found in patients with epilepsy and is usually without aura. In a study that was done by Yankosvky et al, that included 100 patients 25 (40%) patients had headache without aura (13). There was an association between headache and epilepsy. The headache was mostly located in the frontal-temporal lobe. Other patients had congenital malformation. The methodology for the study was satisfactory. The consideration for the location of the headache was also there. In a study that was done in Germany considered 110 epileptic patients. There was a prevalence of 47% epileptic related headache. This type of headache that is mostly in epileptic patients was post-ictal (14). The fact that the patients were recruited from epileptic centre gives a bias since the disease itself might not have been the cause of headache (15).

In another observational hospital based study in France by Valade et al headache patients presenting at the emergency department.

There were 22 hospitals involved and the duration was 7 days. A total of over 14.000 patients were included. Mostly were women 75%. 0.6% had migraine headache (16).

## **2.2 Prevalence of primary headache**

Different studies have shown primary headache to be more common than secondary headache. This is more evident in a study that was done by Gaini et al it showed that out of 350 patients, 7 (2%) had positive significant findings and 25 (7%) had positive findings that were not clinically significant(17). Patients were recruited from the emergency room and this might not be a representative sample since not all headaches are medical emergencies. This study also did not consider the location of the pathology found.

## **2.3 Prevalence and causes of secondary headache**

Another study that was done in ASPN by Becker et al, involved 394 CT scans that were ordered because clinicians suspected the patients with headache had either SAH or a tumor. The study duration was 19 months. Out of all the subjects, 14 out of the 293 reviewed showed SAH and SDH (18, 19). The methodology was satisfactory since patients were recruited from different hospitals. The CT scan algorithm used was not noted. There was no consideration of the location of pathology or duration of headache. No documentation of the pre existing disease such as hypertension. There was also no correlation between the clinical deduced diagnosis and the CT scan findings.

An observational hospital based study was done by Morgenstern, L.B., et al in Houston, Texas. For a certain period of time patients were recruited for CT scan when they complained of headache (20). Most patients were females with mean age of 37 years. More patients had migraine type of headache. The race complaining of this was non Hispanic whites. Results showed the leading cause of headache in patients is 3% subarachnoid hemorrhage followed by tumors and the last was subdural hematoma. This study had well

defined study population patients in the emergency room and this might not be a true representative of the community. The duration of headache was mostly acute and not mention of the chronic cases of headache. The location of the pathology was not included. .

### **2.3.1 Metastases to the brain as the cause of secondary headache.**

Metastases are also considered as the cause of headache in patients with cancer. And this is one of the red flag criteria documented by the IHS. A study that was done in Sweden revealed an incidence of 0.023 of colorectal cancer patients with metastasis to the brain by CT scan. This plays a role in staging and determining the prognosis of the patient. For these patients, headache was one of the major complaints. A survey was done involving 43 cancer patients, by Greenberg et al. Patients who had metastasis on skull base n presented with headache and several syndromes (21) depending on the specific anatomical location. The methodology was not clear for this study. A case of similar situation was reported in a patient who presented with headache and had metastasis to the pituitary gland (22).Two case reports by W. Kong et al in Hong Kong also revealed two male patients who had metastasis to the skull base who had similar presentation (23).

The presence of pre existing morbidity is made apparent in the study by Bahou et al in Singapore. A total of 1498 stroke patients presenting with headache were studied in a period of 6 years retrospectively. The prevalence of ICH was found to be 6.7% and hypertension was the common predisposing factor. The location and duration of headache in this study were not considered (24).

In a prospective hospital based study that was done in Nigeria by Arogundade RA et al recruited 160 cancer adult patients for a period of five years. Most patients were females 68% and the age mean age was 48 years. CT scan was done and revealed that about 60.6%



of the inter-cerebral primary tumor patients presented with chronic headache. And of these tumors encountered, majority (60.8%) were glioma (25). The location of the pathology was identified and the duration of headache. The methodology was of convenience since all patients were recruited. The investigation was thoroughly noted, CT scan of both with and without contrast in a multiplanar fashion. The CT scan diagnosis was compared with the post surgical diagnosis.

### **3.0 PROBLEM STATEMENT.**

As years go by and with the new development of technology, imaging modalities are considered to be more reliable in diagnosing diseases. The issue of radiation has been debated among scholars on whether it is crucial to subject the patients to radiations to determine the cause of headache. In a study by Mitchell CS et al, it was concluded that out of 27 headache patients evaluated, 1 had pathology. It has been documented that patients that are presenting with neurological symptoms have a higher chance of having a positive CT scan evaluation (26).

One of the causes of severe acute secondary headache that is the most prevalent is intra cerebral bleeding. This is mainly attributed to hypertension. Acute intra cerebral hemorrhage poses high mortality rate especially for subarachnoid hemorrhage. This is one of the documented cause of headache. It is easily identified by the CT scan. Studies that were done have shown hypertension to be on the rise in Tanzania (27) and there is no study done to associate this finding with the morbidity such as headache in Tanzania. Other causes of the secondary headache documented include tumors, masses and brain atrophy whose distribution in Tanzania has not been documented.

#### 4.0 RATIONALE

In developing countries such as Tanzania, imaging investigations are of high cost and remotely available. The study aims at demonstrating the ability and the key role of the CT scan to evaluate the causes of headache and assistance in decision making in clinical management. It should be mandatory for physicians' even graduate doctors to request for it as part of the investigations among others in the patients presenting with headache. This is because for proper management and proper course of action to be taken, one has to identify primary and secondary types of headache.

Hypertension as a risk factor for ICH has been documented to be on the rise in Tanzania. In a study that was done In a study that was done in Tanzania it showed Hypertension prevalence was 30% in men and 28.6% (24.3-32.9%) in women in Ilala, and 32.2% (27.7-36.7%) in men and 31.5% (27.8-35.2%) in women in Shari(21).

As of current, MNH is the only government hospital that offers CT scan imaging service. Keeping in mind that most of the Tanzanian population fall below the poverty line, emphasis should be put in reducing the cost of this technology hence make it accessible to those who need by making it available in more of the government hospital.

## **5.0 OBJECTIVES**

### **5.1 MAIN OBJECTIVE**

CT scan findings in patients presenting with headache at the Radiology Department, Muhimbili National Hospital from June to September 2011.

### **5.2 SPECIFIC OBJECTIVES**

- 1) To determine the demographic characteristics distribution of patients presenting with headache at MNH CT scan unit from June- September 2011.
- 2) To determine the prevalence of positive CT scans of patients presenting with headache at MNH CT unit from June- September 2011.
- 3) To determine the distribution of causes of headache by male and female patients presenting with headache attending MNH CT scan unit from June- September 2011.
- 4) To determine the correlation between the clinical diagnosis and the CT findings among patients with headache attending MNH CT scan unit from June to September 2011.

### **HYPOTHESIS:**

Null hypothesis: CT scan has no role in detecting causes of secondary headache.

Alternative hypothesis: CT scan has a role in detecting causes of headache

## **6.0 METHODOLOGY**

All the patients with the age above 18 years complaining of headache were recruited for the study. These patients had CT scan requested by their doctors.

### **6.1 TYPE OF STUDY**

This was a cross sectional descriptive study. This involved studying the causes of secondary headache in patients at MNH, CT scan unit. The study duration was from June-December 2011.

### **6.2 STUDY AREA/ STUDY POPULATION**

Muhimbili National Hospital, the radiology department which is located in Dar es Salaam. The study included 85 consented patients referred for CT scan at MNH from June-December 2011. Patients who did not consent were not included in the study.

The study was conducted at CT scan unit, Radiology Department, Muhimbili National hospital (MNH), Dar-es-Salaam Tanzania . MNH is largest referral and teaching hospital in Tanzania. It receives referred patients from various referral hospitals in Tanzania, as well as patients from all three municipals of Dar Es Salaam and its surrounding regions. It is the only public/government hospital with MRI facility. The MNH radiology department offers the following services; General Radiology, Digital Mammography and Stereotactic Biopsies Neuro and Musculoskeletal Imaging (CT, MRI) Vascular Imaging (Ultrasound ) and Ultrasound Interventional Radiology (US guided aspiration of abscesses and renal cysts.

The department has total of forty three (43) staff. Among these seven (7) are Radiologists and eighteen (18) are Radiographer. Others are four (4) trained nurses, one secretary and thirteen (13) health attendants.

### **6.3 SAMPLE SIZE**

In the study that was done in the emergency medicine department, estimated a proportion of 0.0625 of patients with positive findings on CT presenting with headache (22)

From the formula

$$D = \frac{z^2 * p * (1 - P)}{E^2}$$

Where

D is the sample size.

Z = 1.96.

P is prevalence which is 6.25%.

E is error margin 0.05

An estimated sample size of 60 patients was reached. A rounded figure of 85 patients was taken so as to do away with failure of some patients to be retrieved.

#### **6.3.1 INCLUSION CRITERIA**

All the patients who were above 18 years, consented and presented with clinically suspected secondary headache.

### **6.3.2 EXCLUSION CRITERIA**

All those who were categorized as cases of head injury from trauma and presented with headache as part of the complaint.

The patients who refused to participate in the study.

### **6.4 SAMPLING TECHNIQUE**

A convenient sampling technique was used whereby; all the patients who presented with headache and had done a brain CT scan were included. These patients were the ones who had agreed to take part in the research.

### **6.5 DATA COLLECTION**

A pilot study was done to evaluate the validity and accuracy of the study.

Patients complaining of headache and have had their CT scans done were included in the study. An informed consent was obtained to allow the CT scan films to be used for the study. A short interview was conducted to obtain demographic data. This was conducted by the chief investigator.

A Phillips CT scan of 6 slices CT scanner was used for every patient. Two types of studies were done NCCT and CECT.

Mainly axial views were obtained and when the need arise, complimentary views were obtained. These views include saggital and coronal images. The images were printed and a copy stored in the computer. These were interpreted by a separate radiologist to avoid observer's bias.

## **6.6 DATA ANALYSIS**

The data analysis was done using the SPSS info program version 15, analyzing the data focusing on the findings of the source of headache but also evaluating whether or not CT scan should be included as a primary investigation on the causes of headache. The p-value is the index for the null hypothesis whereby if  $p < 0.05$  the observed outcome was considered to be statistically significant.

Correlation coefficient was used as the index for the correlation whereby  $Cc > 0.5$  was considered to significant. It was positive or negative.

## **6.7 LIMITATION OF THE STUDY**

The fact patients were recruited from the Radiology Department resulted to bias.

## **6.8 ETHICAL CLEARENCE**

Ethical clearance was obtained from the Ethics Committee of MUHAS and also from the Muhimbili National Hospital. Ethical clearance was obtained from the Muhimbili National Hospital to use the patients as study subjects. Clearance was obtained from the radiology department to use the equipment for the CT scanning and obtain the results. The informed consent was obtained from the study subjects.

### **6.8.1 DISPOSAL OF STUDY PATIENTS**

All positive results obtained from the study were immediately available to the Physicians looking after the patients to continue with the necessary intervention.



### **6.9 DISSEMINATION OF RESULTS**

The results obtained from this study are part of partial fulfillment of the Masters of Medicine in Radiology, and was presented to Muhimbili University of Health and allied Sciences. In addition the hospital authority was also be notified on the findings obtained. The results will also be presented in scientific meetings and published in local and international journals.

## 7.0 RESULTS

**Table 7.1. Socio and demographic distribution of patients presenting with headache.**

(N=85)

<b>Age group (years)</b>	<b>Sex</b>		<b>Total(%)</b>
	<b>Female(%)</b>	<b>Male(%)</b>	
18-25	4 (8.5)	7(18.4)	11(12.9)
26-33	7(14.9)	6(15.8)	13(15.3)%
34-41	16(34.0)	9(23.7)	25(29.4)
42-49	7(14.9)	4(10.5)	11(12.9)
50-57	6(12.8)	4(10.5)	10(11.8)
58-65	5(10.6)	2(5.3)	7(8.2)
66-73	2(4.3)	3(7.9)	5(5.9)
74-81	0(0.0)	3(7.9)	3(3.5)
<b>Total</b>	47(100)	38(100.0)	85(100)

Study population was a total of 85 patients. There were more female (47) than male patients (38). The most prevalent age group was between the age of 34 and 41 years. (Percentage in the parenthesis).

**Table 7.2 Prevalence of the positive CT scans of the patient presenting with headache.****(N=85)**

<b>CT scan Findings</b>	<b>Total(%) (N=85)</b>
<b>Normal</b>	58(68.2)
<b>Abnormal</b>	27 ( 31.8)
<b>Total</b>	85(100.0)

Total number of participants was 85. Out of 85 CT scans done, a total of 27 showed to have significant findings. The prevalence of positive scans is 31.8%. (Percentage in the parenthesis).

**Table 7.3 Percentage distribution of CT scan findings by sex. (N=85)**

CT scan findings	Sex		Total(N=85)	X <sup>2</sup> (P-value)
	Female(n=47)	Male(n=36)		
<b>Brain atrophy</b>				
<b>Yes</b>	3(6.4%)	1(2.6%)	4(4.7%)	0.621(0.663)
<b>No</b>	44(93.6%)	37(97.4%)	81(95.3%)	
<b>Brain tumor</b>	<b>Female(n=47)</b>	<b>Male (n=36)</b>	<b>Total(N=85)</b>	<b>X<sup>2</sup>(P-value)</b>
<b>Yes</b>	1(2.1%)	1(2.6%)	2(2.4%)	1.000(0.213)
<b>No</b>	46(97.9%)	37(97.4%)	83(97.6%)	
<b>Metastasis</b>	<b>Female(n=47)</b>	<b>Male(n=38)</b>	<b>Total(N=85)</b>	<b>X<sup>2</sup> (P-value)</b>
<b>Yes</b>	2(4.3%)	1(2.6%)	3(3.5%)	1.000(0.164)
<b>No</b>	45(95.7%)	37(97.4%)	82(96.5%)	
<b>Hemorrhage</b>	<b>Female(n=47)</b>	<b>Male (n=38)</b>	<b>Total(N=85)</b>	<b>X<sup>2</sup>(P-value)</b>
<b>Yes</b>	0(0.0%)	2(5.3%)	2(2.4%)	0.176(2.531)
<b>No</b>	47(100.0%)	36(94.7%)	3(97.6%)	
<b>Infarction</b>	<b>Female(n=47)</b>	<b>Male(n=38)</b>	<b>Total(N=85)</b>	<b>X<sup>2</sup> (P-value)</b>
<b>Yes</b>	1(2.1%)	2(5.3%)	3(3.5%)	0.584(0.612)
<b>No</b>	46(97.9%)	36(94.7%)	82(96.5%)	
<b>Normal</b>	<b>Female(n=47)</b>	<b>Male(n=38)</b>	<b>Total(N=85)</b>	<b>X<sup>2</sup>(P-value)</b>
<b>Yes</b>	31(66.0%)	28(73.7%)	58(68.2%)	0.493(0.601)
<b>No</b>	16(34.0%)	10(26.3%)	27(31.8%)	

The total number of participants was 85. The most prevalent pathology found in both females and males with positive CT scans was sinusitis. In males it was 7.9% and in females 10.6%. The least pathology found was brain tumor (2.1%), degenerative changes of the cervical spine (2.1%) and brain infarction (2.1%) for females. Brain tumor (2.6%)

metastasis (2.6%), brain atrophy (2.6%) for males. Females had no CT scan findings of hemorrhage and males had no CT scan findings of degenerative diseases of the spine. (Percentage in the parenthesis).

**Figure1. Pie chart representing distribution of pathology among patients with headache.**

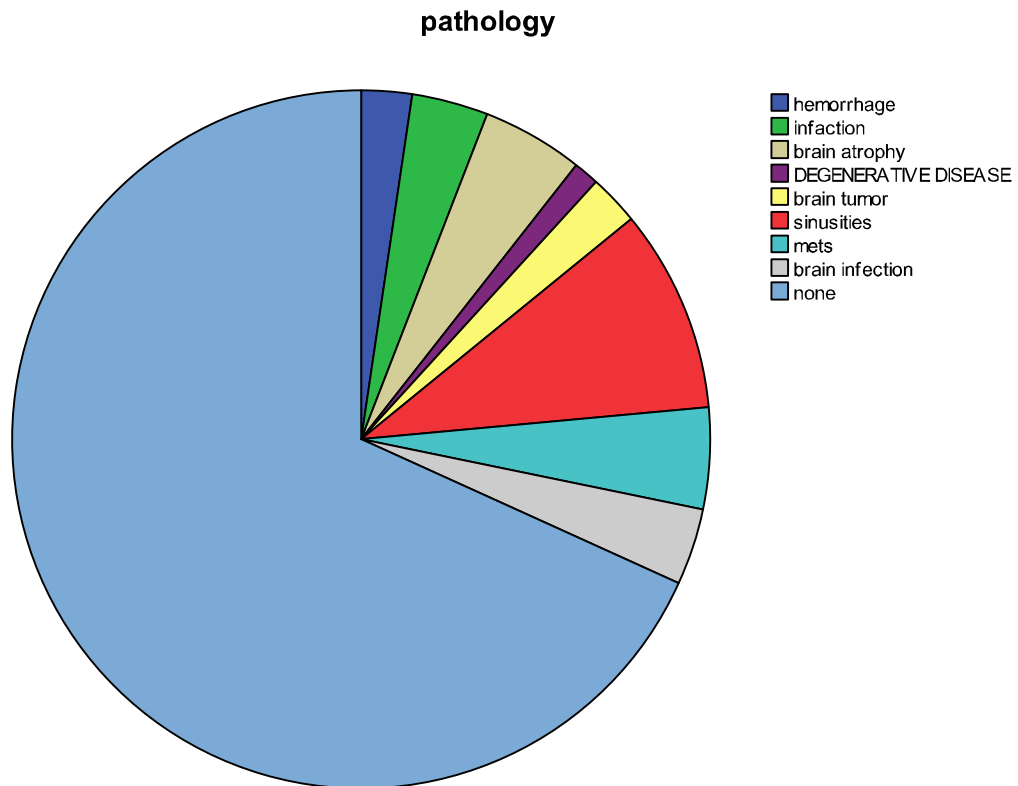


Figure 1 shows that majority of the patients had normal CT scan findings. The least finding was degenerative changes of the cervical spine.

**Table 7.4. Correlation between deduced diagnosis and the CT scan findings among patients presenting with headache. (N=85)**

Written Diagnosis	Ct scan findings (n=85)		Pearson's correlation Coefficient	P value
	Yes (%) (N=16)	No ( %) (N=69)		
Sinusitis	7 (43.8)	20(2.9)	0.929	0.000
Tumor	2(12.5)	17 (50.8)	0.040	0.692
Hemorrhage	0 (0)	3(4.3)	0.200	0.470
Infection	2(12.5)	2(2.9)	0.861	0.000
Brain atrophy	0(0)	2(2.9)	-0.001	0.540
Degenerative changes	1(6.3)	1(0)	1.000	0.000
Metastasis	2(12.5)	2(2.9)	1.000	0.000
None	1(6.3)	14(20.3)	0.400	0.652
Infarction	1(6.3)	8(4.3)	-0.030	0.787

There was a strong correlation in the diagnosis of metastasis (Cc 1). Negative correlation was found in the cases of brain infarction (Cc-0.030) and brain atrophy (Cc -0.001). (Percentage in the parenthesis).

**Table 7.5 Distribution of CT scan findings by duration of headache. (N=85)**

Pathology(%)	Duration		Total(%)
	Acute(%)	Chronic(%)	
<b>Hemorrhage</b>	1(2.9)	1(2.0)	2(2.4)
<b>Infarction</b>	3(8.6)	0(0.0)	3(3.5)
<b>Brain atrophy</b>	1(2.9)	3(6.0)	4(4.7)
<b>Degenerative disease</b>	0(0.0)	1(2.0)	1(1.2)
<b>Brain tumor</b>	0(0.0)	2(4.0)	2(2.4)
<b>Sinusitis</b>	2(5.7)	6(12.0)	8(9.4)
<b>Metastasis</b>	3(8.6)	0(0.0)	3(3.5)
<b>Brain infection</b>	1(2.9)	2(4.0)	3(3.5)
<b>No pathology</b>	23(68.6)	35(70.0)	58(68.2)
<b>Total</b>	35(100.0)	50(100.0)	85(100.0)

For both acute and chronic types of headache, there was no actual pathology detected by CT scans. For the acute headache 68.6% had no pathology and for chronic headache most of them had no pathology 70.0%. (N is 85). (Percentage in the parenthesis).

**Table 7.6 Percentage distribution of pathology by age among patients presenting with headache. (N=85)**

The most affected age group with multiple pathologies was between the ages of 51 and 60 years (25.9%). For hemorrhage, it was the age group 58-65. The least affected age group was 18-25 years (3.7%). (N is 85).

**Table 7.7. Percentage distribution of CT scan findings by location among patients presenting with headache. (N=85).**

The most affected area of the brain was the maxillary sinus (29.6%) by sinusitis. The least affected areas were cervical spine and the temporal lobe by 7.4% each.



**Table 7.8 Percentage distribution of pre-existing morbidity by CT scan findings. (N=85)**

Morbidity	CT scan findings		Total (N=85)	P value
	Normal (n =58)	Abnormal (n=27)		
<b>Hypertension</b>	7(12.1%)	8(29.6%)	15(17.6%)	0.119(0.004)
<b>HIV</b>	1(1.7%)	2(7.4%)	3(3.5%)	0.421(1.700)
<b>Ear problem</b>	1(1.7%)	0	1(1.2%)	1.000(0.471)
<b>Cancer</b>	0	4(14.8%)	4(4.7%)	0.009(9.459)

The table shows that the most morbidity that was shown by the patients presenting with headache was hypertension 15 subjects and 29.6% of their scans had abnormality. The least morbidity was ear problem 1 subject and the scan showed no abnormality.

**Table 7.9 Percentage distribution of neurological symptoms by CT scan findings. (N=85)**

Symptoms	CT scan findings		Total (N=85)
	Normal(n=58)	Abnormal (n=27)	
<b>Loss of Balance</b>	4 (6.9%)	2(7.4%)	6(7.1%)
<b>Loss of consciousness</b>	7(12.1%)	3(11.1%)	10(11.8%)
<b>Seizures</b>	4(6.9%)	2(7.4%)	6(7.1%)
<b>Neck stiffness</b>	1(1.7%)	1(3.7)	2(2.3%)
<b>Paralysis</b>	1(1.7%)	0	1(1.2%)
<b>Blurred vision</b>	4(6.9%)	2(7.4%)	6(7.1%)
<b>Loss of memory</b>	3(5.2%)	0	3(3.5%)

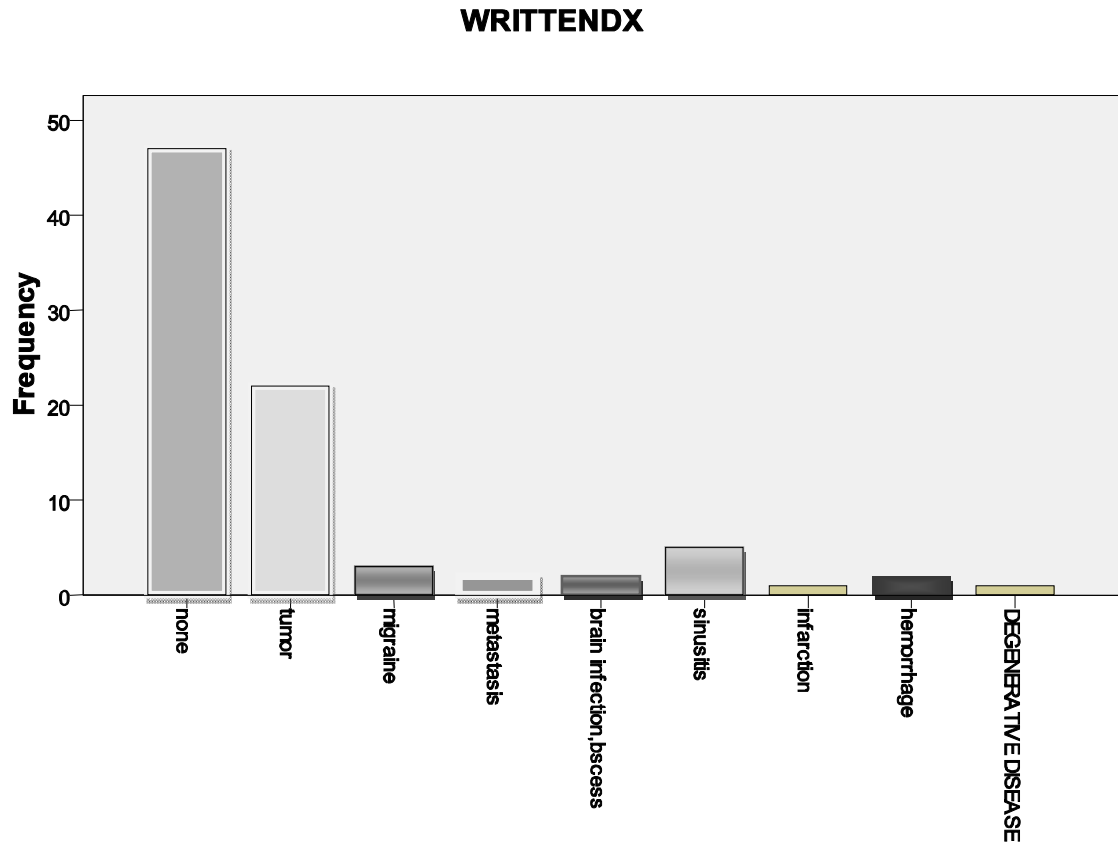
The commonest neurological symptom reported was loss of consciousness, 10(11.8%). The least finding was paralysis, 1 patient.

**Table 7.10. Distribution of CT scan findings by duration of headache. (N=85)**

Pathology	Duration		Total(%)
	Acute(%)	Chronic(%)	
<b>Hemorrhage</b>	1(2.9)	1(2.0)	2(2.4)
<b>Infarction</b>	3(8.6)	0(0.0)	3(3.5)
<b>Brain atrophy</b>	1(2.9)	3(6.0)	4(4.7)
<b>Degenerative disease</b>	0(0.0)	1(2.0)	1(1.2)
<b>Brain tumor</b>	0(0.0)	2(4.0)	2(2.4)
<b>Sinusitis</b>	2(5.7)	6(12.0)	8(9.4)
<b>Metastasis</b>	3(8.6)%	0(0.0)	3(3.5)
<b>Brain infection</b>	1(2.9)	2(4.0)	3(3.5)
<b>No pathology</b>	23(68.6)	35(70.0)	58(68.2)
<b>Total</b>	35(100.0)	50(100.0)	85(100.0)

For both acute and chronic types of headache, there was no actual pathology detected by CT scans. For the acute headache 68.6% had no pathology and for chronic headache most of them had no pathology 70.0%. (N is 85). (Percentage in the parenthesis).

**Figure 2. Bar chart showing written diagnosis for the patients presenting with headache**



Most patients had the forms without any written diagnosis. The least written diagnosis was degenerative disease of the spine. (N is 85).

KEY

WRITTENDX = Written Diagnosis

## 8.0 DISCUSSION

This cross sectional study included a total of 85 participants. There were more female candidates (47) than male candidates (38). This is similar to the study that was done by Morgenstern, L.B., et al in Houston, Texas 66% of the patients were females. Another study that was conducted in France by Valade et al had 75% of female patients among those complaining of headache. The most prevalent age group was between 26 to 33 years (15.3) which also correlates with the study that was done in France by Valade et al that had the mean age 36 years.

The prevalence of positive CT scans was 31.8% that showed more significant findings. In total, among 85 study subjects, 58 (69.4%) did not show any significant findings in the CT scan done. This finding correlates with the studies there were done whereby most of the CT scans of headache patients were actually normal. The commonest cause of secondary headache sinusitis which was located in the maxillary sinus 7.9% in males and 10.6% in females. There was no statistical significant difference of this finding among male and females (P 0.186). The least finding for males was brain tumor and for females was brain atrophy. No female had brain hemorrhage and no male had degenerative changes of the spine for this study. This finding was already suspected in most patients that were from the ENT clinic. This is different from the studies that were done that documented tumors and hemorrhage to be the major causes of secondary type of headache.

In a study that was done by Morgesteen et al demonstrated subarachnoid hemorrhage to be the cause of headache. The same was concluded from the study that was done by Lledo et

al. The socio demographic distribution of diseases pattern of African countries favors infections more than malignancies. However in Korea where hypertension is the most prevalent existing morbidity, intra cerebral hemorrhage was the reported cause of secondary headache. The CT scan becomes necessary only when the issue of time is in question. Also it can be used to evaluate any other co existing malignancy. The evaluation should start with plain skull x rays in appropriate views. As long as the cons outweigh the pros then there is a need to have the plain x rays and later on assess the need for further investigation which will include the CT scan.

There was a strong correlation between the clinically diagnosed metastasis and CT scan findings of metastasis (Cc 1). There was a positive correlation between the clinical and CT finding for sinusitis (Cc 0.989). A negative correlation was noted for brain infarction (Cc-0.30). Sinusitis can be diagnosed in the primary settings by the use of plain x ray with appropriate views. For the patients who had primary tumors 4(12.8%) when they presented with headache the most likely cause was found to metastasis to the brain although other studies indicated other conditions to be associated with other symptoms. In a study by Fridley, J, et al revealed the presence of pituitary gland metastasis from small lung cell carcinoma. The main complaint was headache and seizure. This study did not consider the location of metastasis.

A study that was done in Hong Kong by W. Kong et al documented a case of hepatocellular carcinoma with metastasis in the pituitary gland presenting with supra-orbital headache and vomiting (23).

The headaches were classified as being acute less than 4 weeks or chronic more than 4 weeks. Many had presented with chronic type of headache (58.8%). Among both the

patients had no pathologies detected by CT scan, 68.6% acute and 70.0% for the chronic cases. Metastasis had presented as acute cases (8.6%) with no reported chronic case. The degenerative changes of the spine and brain tumors both presented as chronic cases and not acute. The age that presented with highest number of pathologies was above 50 years. The highest age group with pathologies was 58-65 years. (25.9%) although there was no statistical significance difference with other age groups in all pathologies. The socio demographic distribution of Tanzania shows that there are more young people than older group.

Among the participants presented with a pre existing morbidity reached 16 and the most common was hypertension 15 subjects (17.65%). There was significant difference in the CT scan findings among subjects who had hypertension and those who had no hypertension (P 0.005). The data is congruent with the study that was done by W. Kong et al that had identified hypertension as a pre existing morbidity. This variable was taken from the participant's medical history. There might have been new diagnosed cases that were missed.

The least pre existing morbidity was an ear problem. There was no significant difference in findings for those who had and who had no ear problem. Three patients admitted being sero-converted. Some subjects chose not to disclose their status hence this might have also contributed to the lower number. Others might have not known of any other disease they had at that time and others may have chosen not to volunteer that information.

For the 85 subjects that were included for the study, 47 (55.3%) investigation forms had no written diagnosis. This can be from the fact that a doctor might be having many patients and not time to write the diagnosis but also the diagnosis might have not been known due

to the symptoms being vague. There were 3 participants that were at a suspicion of having migraine (1.2%). Migraine is principally investigated by MRI as the imaging modality of choice. Their CT scans were bound to be normal. In a study that was done in New England Centre of Headache in USA showed that keeping a longitudinal diary can also assist in the diagnosis of migraine.

Studies sighted earlier on showed the presence of neurological symptoms apart from headache increased the probability of having positive CT scan findings (21). In this study patients were asked about other symptoms. For the ones that could not volunteer this information the investigation form was used. More females reported to have symptoms than males. The most frequent presenting neurological symptoms for the positive CT scans was loss of consciousness (11.8%). For both males and females. For the patients who had this complaint 11.1% had abnormal CT scan. Although this finding was not of statistical significance when compared with those who had no this complaint ( $P > 0.05$ ). Loss of consciousness can be attributed to many conditions and one of them includes seizure disorders. In a study done by Poch et al, the patients with seizure disorders reported to present with headache as well (15). However this study did not put into consideration whether the EEG was done and the result known. Also the patients were not identified as being epileptic from the beginning. The consideration for the time the headache was experienced was also not put into consideration in this study. The prevalence of epileptic disorders for Tanzania is not documented. From the literature, the ideal imaging modality used for such disorders is MRI. The study only looked at CT scans results.

## **9.0 STUDY LIMITATIONS**

The fact that this was done in the referral hospital, might not be a true representative of the population.

The subjects taken were the ones who could afford to do the investigation and they were picked directly from the Radiology Department.



## 10.0 CONCLUSION

From the study it is well established that CT imaging plays a major role in detecting the cause of secondary headache. When used properly it does confirm and give an alternate diagnosis. Most cases had primary type of headache. The commonest cause that was found among patients with suspected secondary headache was sinusitis located in the maxillary sinus. Majority (68.2%) had no any significant findings. Many patients presented with hypertension as an existing morbidity and the frequent encountered neurological manifestation as loss of consciousness.

Some of the written diagnoses were best investigated by other imaging modalities. Some patients when asked about any other imaging investigation done were not aware of the results and also knowledge as for the reason for being asked to do the CT scan. CT scans have been shown to have a role in evaluating the causes of headache. Most of the subjects recruited had no significant findings (68.2). This demonstrates that CT scan alone may not be the way for patients with headache; other investigations should be undertaken before reaching for the CT scan such cases the clinical findings and other laboratory findings can play a better role than the imaging modalities.

For the cases of migraine history is mandatory as well as hormonal assay and MRI can play a better role than CT scan.

## 11.0 RECOMMENDATIONS

- Other broader studies that will include more subjects and not be based in the hospital to be done. This will help give the true picture of situation in the society as a whole.
- More emphasis should be given to female patients presenting with headache especially above the age of 40 since they are most likely to be having secondary headache.
- Cancer patients should undergo CT scan when presenting with first time headache due to high likelihood having brain metastasis.

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## APPENDICES

## APPENDIX I; QUESTIONNAIRE

**THE ROLE OF IMAGING IN PATIENTS PRESENTING WITH HEADACHE AT MUHIMBILI NATIONAL HOSPITAL.***PART I: Demographic data*

1. Registration no: \_\_\_\_\_
2. Date of interview: \_\_\_\_/\_\_\_\_/\_\_\_\_\_ (dd /mm/yyyy)
3. Date of birth \_\_\_\_/\_\_\_\_/\_\_\_\_\_ (dd /mm/yyyy)\_\_\_
4. District \_\_\_\_\_
5. Region \_\_\_\_\_
6. Religion \_\_\_\_\_
7. Marital status:
  - 1) Single
  - 2) Cohabiting
  - 3) Married
  - 4) Divorced
  - 5) Widowed
8. Level of education attained
  - 1) None
  - 2) Primary school
  - 3) Secondary school
  - 4) Post Secondary
9. For how long have u been having a headache
  - 1) Less than a month
  - 2) More than a month

10. Which part of the head is the headache present?

1) Frontal

2) Occipital

3) Sideways

4) Whole head

11. Are there any worsening/relieving factors?

Yes /No

12. If yes mention them.....

13. Apart from CT scan are there any other investigations that have been ordered?

Yes/ No

14. If yes mention them.....

15. Conclusion of the investigations ordered.....

**CT scan data part III**

16. Is the CT scan examination normal?

Yes /No. (If yes go to question number 17).

17. Position of the lesion

1).Intracranial

2). Extra cranial

18. Nature of the lesion

1). Cystic

2). Solid

3). Hemorrhagic

19. Shape of the lesion

1) Small

2) Large

3) Regular

4) Irregular

20. Attenuation

1) Hyper

2) Hypo

21. Size of the gyros and sulci

1) Normal

2) Larger than usual

3) Smaller than usual

22. Enhancement on contrast

Yes/ No

23. Conclusive diagnosis.....

24. Further investigations needed.....

25. Is there a correlation between the clinical diagnosis and the CT findings

Yes/ No



**APPENDIX II; INFORMED CONSENT**

I am Dr Margreth Magambo, a postgraduate student at Muhimbili University of Health and Allied Sciences (MUHAS). I am doing investigations on patients presenting with headache. The aim of this study is evaluate the role of brain CT studies in detection of causes of headache.

If you agree to participate in this study, you will be asked questions then CT scan will be done, both non and contrast enhanced studies.

No information from this study will be available to unauthorized individuals. All information collected plus results of the brain CT scan will be entered in a computer system and only registration numbers will be used for identification. We don't expect any harm from this study to happen to you.

Taking part in this study is completely voluntary. You can withdraw any time without giving reasons, even if you have already given consent.

If you agree to participate you will benefit by having thorough check for any lesions that may be present in the brain. You will be told of the results with total honesty.

If you have any other questions regarding this study, feel free to contact me, the investigator, Dr. Margreth Magambo through telephone number 0713477652 or email address magambomeg@yahoo.com. If you have any questions or concerns about your rights as a participant in this study you could discuss them with the current chairman of the Research Ethical Committee Prof E Lyamuya, MUHAS P.O.Box 65001, Phone 2152489 or 0754 495933.

Do you agree to participate? (*Tick the response*) .....YES .....NO.

I, .....have read the  
consent form and my questions have been answered and I agree to participate in this study.

Signature of Participant.....

Signature of Investigator.....

Date of signed consent.....

**APPENDIX III; CONSENT FORM SWAHILI VERSION****FOMU YA RIDHAA YA KUSHIRIKI UTAFITI**

Mimi ninaitwa Dk Margreth Magambo ni mwanafunzi wa uzamili chuo kikuu cha tiba Muhimbili. Nina fanya uchunguzi kwa wagonjwa wenye kusumbuliwa na kuumwa kichwa. Dhumuni la utafiti huu ni kuona uwezo wa picha ya CT katika kuonyesha vitu vinavyosababisha kuumwa na kichwa kusiko kwa kawaida.

Ukikubali kushiriki katika utafiti huu utaulizwa maswali halafu utapigwa picha ya kichwa.

Taarifa zote kuhusiana na utafiti huu ni siri na mtu yeyote asiyehusika hataruhusiwi kuziona. Taarifa pamoja na majibu yote yataingizwa kwenye computer kwa kutumia namba yako ya utambulisho. Hatutegemei madhara yoyote yakupate kutokana na utafiti huu.

Ni hiari yako kukubali kushiriki kwenye utafiti huu. Unaweza kujitoa wakati wowote bila kutakiwa kutoa maelezo hata kama ulishathibitisha kushiriki. Hautaadhibiwa au kunyimwa haki yako ya matibabu. .

Kama ukikubali kushiriki katika utafiti huu utafaidika kwa kuchunguzwa kwa kina kama una ugonjwa wowote utaonekana utaarifiwa.

Kama una maswali kuhusu utafiti huu wasiliana nami Dk Margreth Magambo SLP 65007 Dar es Salaam, nambari ya simu 0713477652 au kwa barua pepe selly35@hotmail.com.

Kama una maswali yoyote juu ya haki zako katika kushiriki utafiti huu, unaweza kuzungumza na mwenyekiti, Kamati ya utafiti kuruhusu udhamini wa utafiti- Chairman of

Ethical Committee MUHAS Prof. E. Lyamuya, S.L.P 65001, Simu: +255 22 2152489,  
+255 754 495933.

Je, umekubali kushiriki? .....NDIYO..... HAPANA.....

Mimi.....nimesoma maelezo na maswali  
yangu yamejibiwa na nimekubali kushiriki kwenye utafiti huu.

Sahihi ya Mshiriki.....

Sahihi ya Mtafiti.....