ADDIS ABABA UNIVERSITY

Magnetic Resonance Imaging findings in patients referred for the evaluation of acute headache to Wudassie Diagnostic Center, Addis Ababa, Ethiopia

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THESIS REPORT DECLARATION

This thesis is a presentation of my original research work. Wherever contributions of others are involved, every effort is made to indicate this clearly, with due reference to the literature, and acknowledgement of collaborative research and discussions.

The work was done under the guidance of Dr. Abebe Mekonnen and Dr. Tesfaye Kebede, consultant radiologists at Addis Ababa University, College of Health Sciences, Department of Radiology.

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ACRONYMS AND ABBREVIATIONS

CT – Computed Tomography

CVT – Cerebral Venous Thrombosis

HIV – Human Immunodeficiency Virus

ICH – Intracerebral Hemorrhage

MRI – Magnetic Resonance Imaging

PRES – Posterior Reversible Encephalopathy Syndrome

RCVS – Reversible Cerebral Vasoconstriction Syndrome

SAH – Subarachnoid Hemorrhage

ACKNOWLEDGEMENTS

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ABSTRACT

Background: There is a lack of research done on imaging findings of acute headache in Ethiopia. Most studies available for cross-reference are done in developed countries and do not take into consideration clinical and epidemiologic factors unique to developing countries.

Objective: To determine the most frequent imaging findings in patients presenting with acute headache and understand the association with sociodemographic and clinical factors in Ethiopia.

Methodology: A retrospective cross-sectional analysis was adopted in this study. The brain MRI reports and files of 497 patients who were referred for the evaluation of acute headache (less than or equal to one month duration) to Wudassie Diagnostic Center in Addis Ababa, Ethiopia from January 2016 to September 2018 were analyzed. The demographic variables and the clinical data of the patients were correlated to the imaging findings. Data analysis was done using IBM SPSS Statistics for Windows, Version 20.0.

Results: An analysis of the neurological signs and symptoms showed 38.8% of the patients referred for the evaluation of acute headache had a neurological deficit. 60% of the patients had abnormal MRI findings. Non-specific white matter lesions,(which neither explain the reason for acute headache nor alter patient outcome and management) was the most frequently observed radiologic diagnosis (16%) followed by neoplasms (11%) and infections (8%). Tuberculoma was the most frequently diagnosed infectious cause. The majority of patients with Comorbid illnesses (hypertension and HIV) had abnormal imaging findings. Age had a weak but significant positive correlation with abnormal imaging findings.

Conclusions: The majority of patients who presented with acute headache had normal or minor MRI findings. The most frequent clinically significant brain MRI findings were neoplasms and infections. Older age is associated with an increased rate of abnormal imaging findings. The most common infectious cause of acute headache is found to be Tuberculoma.

Recommendations: A more detailed clinical history and physical examination should be implemented to properly identify patients who are candidates for neuroimaging. Future large scale studies should be done on the imaging of acute headache in Ethiopia.

Key Words: Magnetic Resonance Imaging, Acute, Headache, Ethiopia

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1. INTRODUCTION

1.1. Background

Headache is a common symptom among patients who present to the emergency department. It is estimated that 2.2%–4.5% of all neurologic evaluations in the emergency department are due to headache [1,2]. It is often challenging for the physician to decide which patients presenting with acute headache (less than or equal to one month duration) are candidates for neuroimaging. A thorough history and physical examination should be employed to distinguish between patients presenting with primary headache syndromes which usually do not require imaging and those presenting with secondary headaches which might have ominous underlying causes and therefore require special attention.

Certain red flag signs and symptoms identified during the history and physical examination as well as certain types of headaches are associated with serious intracranial pathology and therefore are indications for emergency neuroimaging. These include; sudden severe headache described by the patient as “worst headache of my life”, headache triggered by cough, exertion or sexual intercourse, headache accompanied by a change in mental status, loss of consciousness, and focal neurologic signs [1-4]. In patients diagnosed with cancer or HIV, new onset headache poses an increased association with an intracranial lesion or infection [4,6]. Of the types of headaches, thunderclap headache which is a severe headache for which the patient reports a pain score of 7 on a 0–10 pain scale and during which the pain peaks within 60 seconds of onset, has a documented strong association with neurovascular disorders such as subarachnoid hemorrhage, ruptured aneurysm and reversible cerebral vasoconstriction syndrome [6]. Up to 8% of patients who reported thunderclap headache were found to have subarachnoid hemorrhage [7,8].

The first line imaging modality usually ordered for patients presenting with acute headache is non-contrast CT, which can detect hemorrhage, ischemic changes or edema [8]. However, post-contrast or non-contrast MRI is appropriate as first-line imaging in many conditions, such as new onset headache with papilledema, cancer or in immunocompromised patients presenting with new headache, suspected encephalitis and sinonasal infection with feared intracranial complications [3,6].

The commonest etiology associated with acute headache is intracranial hemorrhage (subarachnoid and intracerebral) [1,4,9]. SAH which commonly results from bleeding of a cerebral aneurysm into the subarachnoid space can be either spontaneous or post-traumatic [7]. Patients present with thunderclap headache which might be associated with loss of consciousness or nausea and vomiting. A non-contrast CT, ideally done within the first 24 hours of presentation, is the preferred imaging modality with a sensitivity of 92.9% and specificity of 100%. MRI might show an increased sensitivity a few days after bleeding [7]. Intracerebral hemorrhage presents with acute headache which is often accompanied by focal neurologic deficit which develops within minutes to hours [6]. Hypertension is the commonest cause of non-traumatic intracerebral hemorrhage (ICH) [6].

Vascular abnormalities are also frequent causes of acute headache. These include Reversible Cerebral Vasoconstriction Syndrome (RCVS), Posterior Reversible Encephalopathy Syndrome (PRES), Cerebral venous thrombosis, Carotid and vertebral artery dissection, and Giant cell arteritis (Temporal arteritis). RCVS is a group of disorders rather than a single entity that is characterized by prolonged but reversible vasoconstriction of the cerebral arteries. It is associated with sudden onset severe (thunderclap) headache which may or may not be accompanied by additional neurologic signs and symptoms. Conditions associated with RCVS include sympathomimetic and serotonergic drugs and tumors, uncontrolled hypertension, pregnancy and puerperium and head trauma [6,10]. The characteristic imaging finding is segmental arterial vasoconstriction known as “string of beads” sign found on CT or MR angiography [10]. PRES commonly occurs in association with preeclampsia or eclampsia, renal failure, hypertension, sepsis, alcohol withdrawal, cytotoxic or immunosuppressive drugs [11,12]. Non-enhanced CT is the initial imaging that should be done for these patients and the commonest finding is cortical and subcortical hypoattenuation with characteristic predilection to the parietoccipital lobes. MRI is more sensitive and shows cortical and subcortical white matter flair hyperintensity [11,12]. Cerebral venous thrombosis is another vascular pathology that frequently manifests with acute headache. The superior sagittal sinus is most commonly involved. Non-enhanced CT is the initial imaging modality, but MRI has greater sensitivity [6,13]. Carotid and vertebral artery dissections occur in patients who have underlying vasculopathies, and can have headache as a presenting symptom in about 57% of the cases. CT

angiography and MR angiography have comparable sensitivity and specificity for diagnosis [6,13].

Other common causes of acute headaches are intracranial infections (bacterial, viral, fungal or parasitic) [7,13]. Headache is usually the initial presenting symptom in these patients and is frequently associated with other symptoms such as fever, seizure and altered mental status [4,7]. Intracranial extension of paranasal infections and otitis also results in epidural empyema, meningitis, cerebritis and abscess [15]. Contrast-enhanced CT and MRI may show leptomeningeal enhancement and FLAIR hyperintensity of the cerebral sulci on MRI is specific [6]. In patients with HIV, opportunistic infections such as CMV encephalitis, cryptococcal meningitis and toxoplasmosis should be suspected [15].

Intracranial tumors both primary or metastatic are common causes of acute headache although there is a lack of data regarding specific types of tumors prone to acute presentation [7,13]. Other causes of acute headache include idiopathic intracranial hypertension, spontaneous intracranial hypotension and colloid cysts [4,6]. Furthermore, new onset of severe headache in pregnancy or postpartum period requires special attention since conditions such as PRES, sinus CVT and pituitary apoplexy have an increased incidence in this period [4,6].

1.2. Statement of the Problem

Most studies done on patients presenting with acute headache are from developed countries and therefore do not account for the sociodemographic variations of developing countries influencing imaging findings. There are only limited MRI-based studies on acute headache which means the pattern of MRI findings in patients presenting with acute headache is not yet adequately studied.

1.3. Rationale of the Study

This study is undertaken to identify the commonest radiologic findings in patients presenting with acute headache and examine the relationship with sociodemographic and clinical variables of the patients. Since most of the studies done on this topic are from developed countries, this study could be more representative of the epidemiological differences and clinical factors affecting imaging findings in the developing world. There are only limited MRI-based studies on acute headache which is another reason why this study could be valuable for evaluation of the

application of MRI, its specificity and sensitivity in relation to common causes of acute headache.

2. OBJECTIVE

The general objective of this study is to determine the most frequent MRI findings in patients presenting with acute headache and understand the association with demographic and clinical factors in Ethiopia.

The specific objectives are:

- To determine the most frequent MRI findings in patients presenting with acute headache.
- To determine the association between demographic factors and MRI findings of patients presenting with acute headache.
- To determine the association between comorbidities and MRI findings of patients presenting with acute headache.

3. METHODOLOGY

3.1. Study Design

A retrospective cross-sectional analysis of the reports and files on consecutive brain MRI examinations performed during the time period from September 2016 to January 2018 of 506 patients referred for evaluation of acute headache to Wudassie Diagnostic Center, Addis Ababa, Ethiopia was done. The source population was 1029 Patients who were referred for the evaluation of headache to Wuddasie Diagnostic Center, Addis Ababa, Ethiopia during the same period. The study population were all patients who were referred for the evaluation of acute headache to Wuddasie Diagnostic Center, AddisAbaba,Ethiopia during the same period, a total of 497 patients.

The structured questionnaire included demographic information, duration of headache and other additional neurologic deficits or symptoms. The authors performed a retrospective review of MRI reports that were dictated by two licensed radiologists. Ethical clearance was obtained from the department of radiology; College of Health Sciences; Addis Ababa University ethical committee.

Inclusion criteria are as follows

a. Chief complaint of acute headache with a duration of less than one month.
b. Headache with no other neurologic symptoms.
c. Headache with other neurologic symptoms like paralysis, seizure, impaired vision and others.

Exclusion criteria:

a. Headache with a duration greater than 1 month.
b. History of brain surgery

3.2. Statistical Analysis

Statistical analysis was done using Statistical Package of Social Science (IBM SPSS Version 20.0). Data comparison was done by applying specific statistical tests, i.e. Pearson correlation analysis and Phi correlation analysis. Qualitative variables were compared using proportions. The significance level was fixed at $p < 0.05$.

3.3. Equipment: MR imaging

All subjects underwent MR scanning by the same Siemens Magnetom C 0.35T machine. The images include Axial TSE T2 (slice thickness/ slice gap of 5/1.5mm, TR/TE of 6210msec/114msec, Echo train length (ETL) 11, Matrix 256x163), Axial SE T1 (slice thickness/ slice gap of 5/1.5mm,TR/TE of 540msec/11msec, ETL-1, Matrix 256x138), Sag SE T1 (slice thickness/ slice gap of 5/1.5mm,TR/TE of 428msec/11msec, ETL-1, Matrix 256x166), Cor FLAIR (slice thickness/ slice gap of 5/1.5mm,TR/TE of 8574msec/79msec, ETL-7, Matrix 256x159), Axial epi DWI with ADC-map (slice thickness/ slice gap of 8/2mm, TR/TE of 6436msec/180msec, ETL-1, Matrix 96x96).

The MRI was done with and without contrast depending on the clinical indication and findings on pre-contrast study. We did not have a clear indication of intravenous contrast material administration. Contrast enhanced Axial, Sagittal and Coronal SE T1 images were obtained by using gadodiamide (GdDTPA-BMA) equiv.0.5mmol (Omniscan; of GE Healthcare) and dosage of 0.1mmol/kg of body weight (equivalent to 0.2ml/kg BW) if a more detailed examination was either recommended by the radiologist or the patient's physician or if the technologist doing the scanning suspects any pathology on precontrast images. The MR images

were interpreted by two radiologists with 15 years of experience and the images were not reinterpreted for the purpose of this study.

The reports of all head MRI of patients referred for the evaluation of acute headache were reviewed and the MR imaging results were categorized into normal and abnormal. The abnormal findings are further divided into:

a) Those with minor abnormality or insignificant abnormalities such as non-specific white matter changes like chronic ischemia, small arachnoid cyst, prominent perivascular CSF spaces which neither explained the reason for headache nor changed the clinical or therapeutic approach and

b) Those with clinically important intracranial abnormality or significant abnormality such as neoplastic lesion, hematoma, hydrocephalus, infection, vascular abnormalities (Dural venous thrombosis, arteriovenous malformation) which may result in acute headache or change the clinical or therapeutic approach or require further action.

MRI findings were evaluated for any intra and extra cranial pathology.

4. RESULTS

In this study, data were collected from MRI reports and files of 497 patients who were referred for the evaluation of acute headache to Wudassie Diagnostic center, Addis Ababa, Ethiopia, from September 2016 to January 2018. This section presents the findings of the data analysis.

4.1. Socio-demographic Characteristics and Clinical Presentation

The minimum age for patients with acute headache was 3 and the maximum age was 89. The majority of patients 56% were females. The mean age in years was 41.2 and 40.6 for females and males respectively. When assessed in categories, the majority of patients(61%) were 18-49years old. Table 1 presents a summary of the sociodemographic characteristics of the patients.

Table 1. Sociodemographic characteristics of patients presenting with acute headache to Wudassie Diagnostic Center, Addis Ababa, Ethiopia, Sep.2016-Jan.2018.

Variables	*Frequency*	*Percentage*
Age		
<18	40	8%
18-49	305	61%
≥50	151	30%
Sex		
Female	277	56%
	Average age	41.2 years
Male	220	44%
	Average age	40.6 years

4.2. Acute Headache Other Clinical Findings and Risk Factors

An analysis of the neurological symptoms of the patients showed that 5.4% had a history of seizure, 13% had vertigo, 1.6% had numbness and tingling, 8.7% had a loss of vision, 2.8% had fever, and 1.2% had neck stiffness. In addition, 38.8% had neurological deficit, where, 13.9% of those with neurological deficit had hemiplegia, 1% had monoplegia and 4% had paraplegia. A summary of the neurological signs and symptoms is presented in Table 2.

Table 2. A summary of neurological signs and symptoms of patients presenting with acute headache to Wudassie Diagnostic Center, Addis Ababa, Ethiopia, Sep.2016-Jan.2018.

Neurological signs and symptoms	*Present*	*Absent*
Seizure	27 (5.4%)	470 (94.6%)
Neurological deficit	193 (38.8%)	304 (61.2%)
Hemiplegia	69 (13.9%)	428 (86.1%)
Monoplegia	5 (1%)	492 (99%)
Paraplegia	19 (4%)	478 (96%)
Vertigo	65 (13%)	432 (87%)
Numbness and tingling	8 (1.6%)	489 (98.4%)
Decreased and loss of vision	43 (8.7%)	454 (91.3%)
Fever	14 (2.8%)	483 (97.2%)

Neck stiffness	6 (1.2%)	491 (98.8%)

Concerning comorbid illnesses, 17.1% had a history of hypertension and 0.4% had no hypertension. For the rest 410 (82.5%) cases, it is not known whether they are hypertensive or not. Similarly, 7.4% had a history of diabetes and 0.6% had no history of diabetes, but for 457(92%) of the cases, it is not known whether they are diabetic or not. 5.8% of the patients were HIV positive and 0.6% were HIV negative, but 465 (93.6%) of the cases had unknown HIV sero status. A summary of the comorbid findings is presented in Table 3.

Table 3. The incidence of comorbid illnesses in patients presenting with acute headache to Wudassie Diagnostic Center, Addis Ababa, Ethiopia, Sep.2016-Jan.2018.

Comorbid illness	***Present***	***Absent***	***Unknown***
Hypertension	85 (17.1%)	2 (0.4%)	410 (82.5%)
Diabetes	37 (7.4%)	3 (0.6%)	457 (92%)
HIV	29 (5.8%)	3 (0.6%)	465 (93.6%)

4.3. Imaging Findings in Patients with Acute Headache

The imaging findings show that 40% of patients had normal imaging findings while 60% of the patients had abnormal imaging findings. Non-specific white matter lesion was the most frequently observed diagnosis (16%) in those with abnormal imaging findings followed by neoplasms (11%) and infections (8%). Figure 1 presents the different radiological findings among the abnormal imaging findings.

Figure 1. Radiological diagnosis of patients presenting with acute headache to Wudassie Diagnostic Center, Addis Ababa, Ethiopia, Sep.2016-Jan.2018.

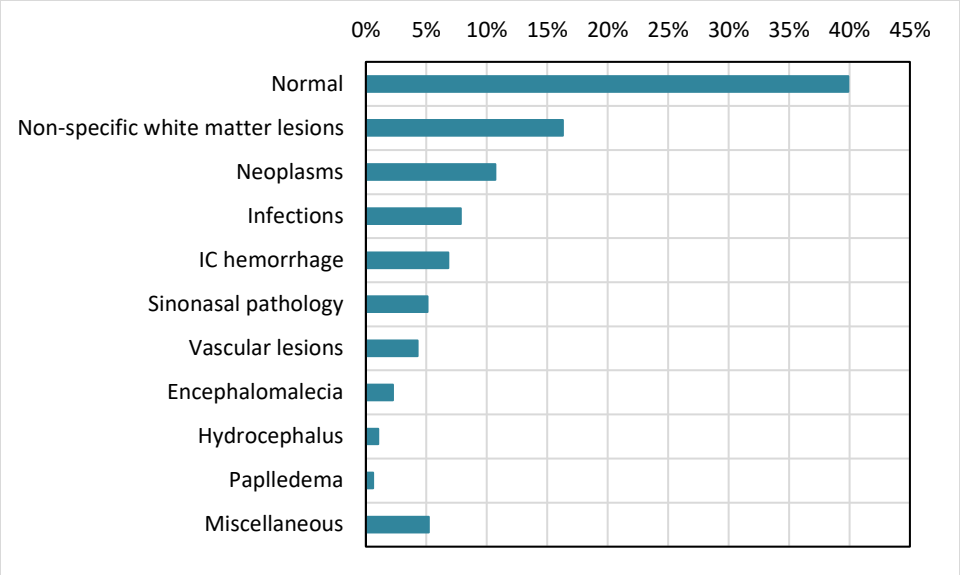

Table 4 shows a summary of imaging findings among patients who had tumors and infections. Among the 53 patients who had imaging findings of tumor, 22 had extraxial tumours,16 had intraxial tumors and 13 had pituitary adenoma. And among the 39 patients who had imaging findings of infection, 20 had tuberculoma.

Table 4. Imaging findings of neoplasm and infection in patients presenting with acute headache to Wudassie Diagnostic Center, Addis Ababa, Ethiopia, Sep.2016-Jan.2018.

Radiological Diagnosis	***Frequency***	***Percentage***
Neoplasm	53	
Intraxialtumour	16	3.2%
Extraxialtumour	22	4.4%
Pitutary adenoma	13	2.6%
Infection	39	
Tuberculoma	20	4%

Table 5 presents the percentage of patients with comorbid illness who had abnormal imaging findings. Out of the 85 patients who had hypertension, 76.7% had abnormal imaging findings. Similarly, abnormal imagining results were found in 73% and 72.6% of patients with diabetes and HIV respectively.

Table 5. Percentage of patients with comorbid illness and abnormal findings in patients presenting with acute headache to Wudassie Diagnostic Center, Addis Ababa, Ethiopia, Sep.2016-Jan.2018.

Comorbidity	***Normal***	***Abnormal***	***Total***
Hypertension	20 (23.3%)	66 (76.7%)	86
Diabetes	10 (27%)	27 (73%)	37
HIV	8 (27.6%)	21 (72.6%)	29

Figures 2, 3 and 4 show the radiologic diagnosis observed for patients with hypertension, diabetes and HIV respectively. It can be seen that the most frequently found significant radiologic diagnosis for patients with hypertension and diabetes is intracranial hemorrhage. For patients with HIV, however, the most frequently found radiologic diagnosis is infections.

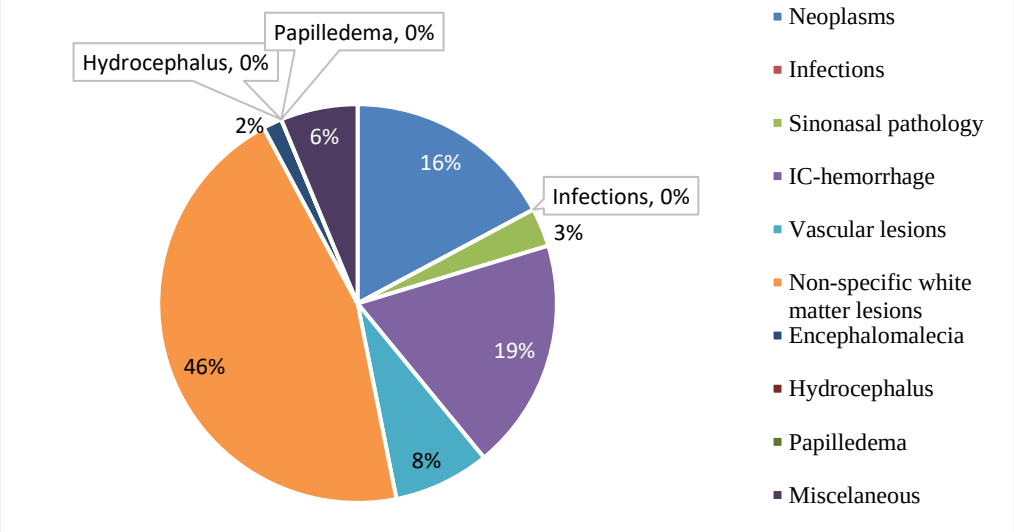

Figure 2. Imaging findings in patients with hypertension and abnormal imaging in patients presenting with acute headache to Wudassie Diagnostic Center, Addis Ababa, Ethiopia, Sep.2016-Jan.2018.

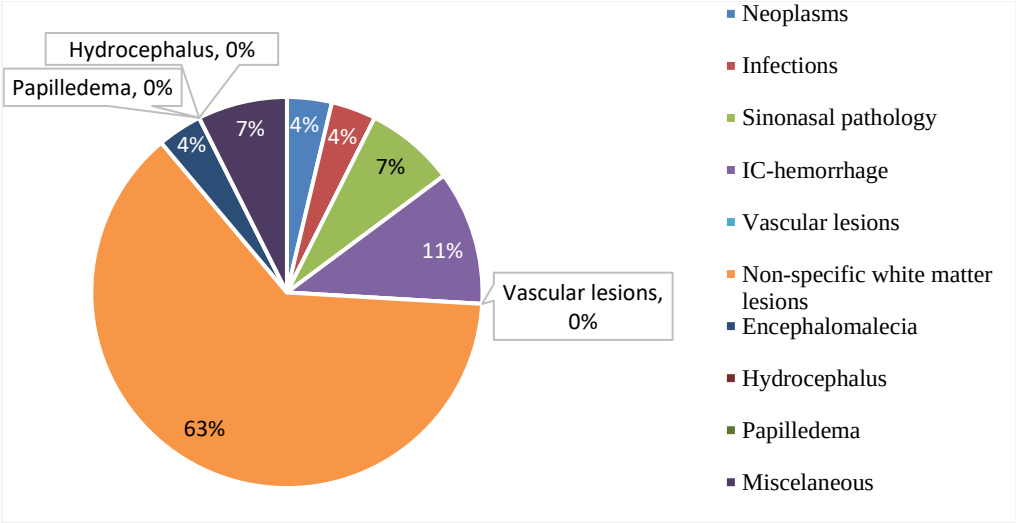

Figure 3. Imaging findings in patients with Diabetes and abnormal imaging in patients presenting with acute headache to Wudassie Diagnostic Center, Addis Ababa, Ethiopia, Sep.2016-Jan.2018.

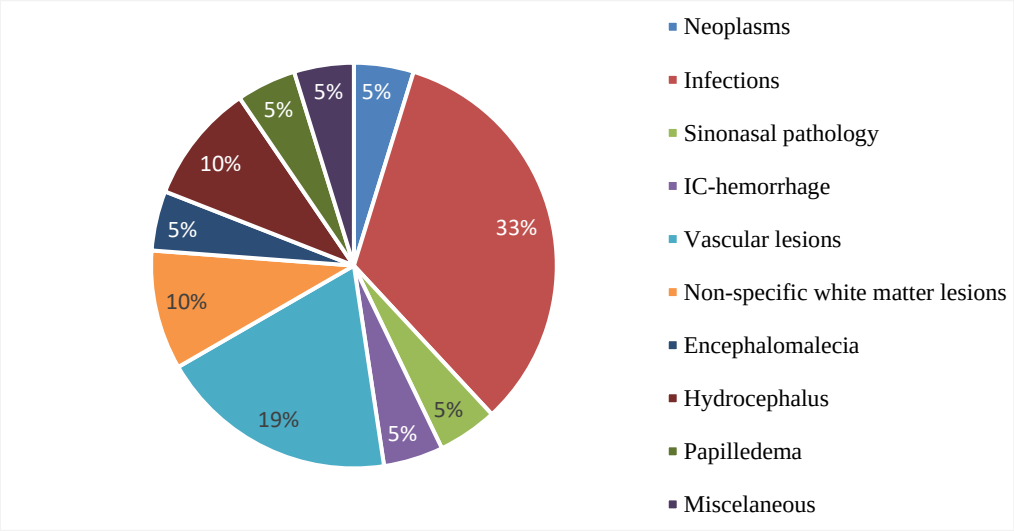

Figure 4. Imaging findings in patients with HIV and abnormal imaging in patients presenting with acute headache to Wudassie Diagnostic Center, Addis Ababa, Ethiopia, Sep.2016-Jan.2018.

The distribution of abnormal findings by age groups as well as the results of the Pearson correlation analysis are presented in Table 6. It can be seen that the majority of the imaging findings (68%) were normal for patients who are less than 18 years of age. For patients who are 18-49 years of age, the majority of the findings (60%) were abnormal. For patients above 50 years as well the majority (67%) had abnormal imaging findings. The correlation analysis showed a weak (Pearson correlation coefficient = 0.152) but significant ($p<0.001$) positive

correlation between age and abnormal imaging findings in general indicating that as the age of patients increases, the likelihood of an abnormal imaging result will increase.

Table 6. Correlation between age and abnormal imaging results in patients presenting with acute headache to Wudassie Diagnostic Center, Addis Ababa, Ethiopia, Sep.2016-Jan.2018.

Age	***Normal***	***Abnormal***
<18	27 (68%)	13 (33%)
18-49	121 (40%)	184 (60%)
≥50	50 (33%)	101 (67%)
Pearson correlation coefficient		0.152
P-value		<0.001

Table 7 shows the distribution of abnormal findings by gender as well as the results of the Phi correlation analysis. The analysis result shows that there is no significant correlation between gender and imaging findings.

Table 7. Correlation between gender and abnormal imaging results in patients presenting with acute headache to Wudassie Diagnostic Center, Addis Ababa, Ethiopia, Sep.2016-Jan.2018

Sex	***Normal***	***Abnormal***
Female	114 (41.1%)	163 (58.8%)
Male	84 (38.2%)	136 (61.8%)
Phi Correlation Coefficient		-0.03
P-value		0.501

A similar correlation analysis was performed to assess any associations between head trauma and imaging findings. As shown in Table 8, there are no significant correlations. Analysis of the radiological diagnosis in patients with head trauma (Figure 5) shows that IC hemorrhage is the most frequently observed diagnosis (26%).

Table 8. Correlation between head trauma and abnormal imaging results in patients presenting with acute headache to Wudassie Diagnostic Center, Addis Ababa, Ethiopia, Sep.2016-Jan.2018

Head Trauma	***Normal***	***Abnormal***
No	177 (39%)	272 (61%)
Yes	22 (39%)	35 (61%)
Phi Correlation Coefficient		0.005
P-value		0.90

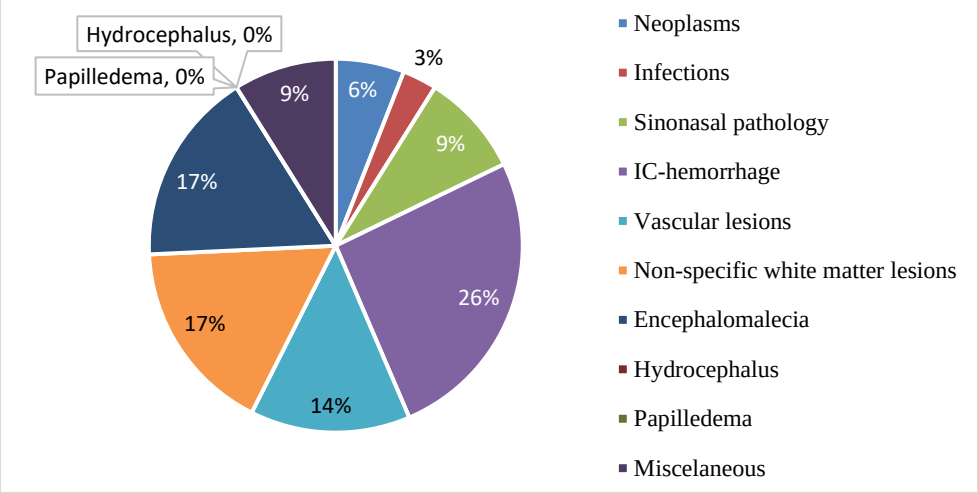

Figure 5. Imaging findings in patients with head trauma and abnormal imaging in patients presenting with acute headache to Wudassie Diagnostic Center, Addis Ababa, Ethiopia, Sep.2016-Jan.2018.

When the presence of neurological symptoms is assessed in relation to imaging findings, there was no strong association identified except for fever which showed a significant correlation with abnormal imaging finding. Results of the Phi correlation analysis are presented in Table 9.

Table 9. Relationship between neurological symptoms and imaging findings in patients presenting with acute headache to Wudassie Diagnostic Center, Addis Ababa, Ethiopia, Sep.2016-Jan.2018.

Symptoms	***Imaging findings***		***Total***	***Phi correlation coefficient***	***P-value***
	Normal	Abnormal			
Seizure	12	15	27	-0.023	0.615
Neurological deficit	68	125	193	0.075	0.095
Numbness and tingling	2	6	8	0.039	0.387
Decrease or loss of vision	24	19	43	-0.100	0.025
Vertigo	31	34	65	-0.062	0.165
Neck stiffness	2	4	6	0.015	0.743
Fever	2	12	14	0.089	0.048

5. DISCUSSION

Analysis of the correlation between demographic variables and abnormal imaging findings showed age has a weak but significant correlation with abnormal imaging findings. Neurologic deficits (hemiplegia, monoplegia, and paraplegia) were the most frequent clinical signs in patients presenting with acute headache followed by vertigo and decrease or loss of vision. In patients with comorbid diseases, the majority had abnormal imaging findings. The most frequently encountered radiologic diagnosis in HIV patients presenting with acute headache was infection, although the type of infection was not specified. Non-specific white matter lesions (which are minor or clinically insignificant abnormalities) accounted for the highest proportion of abnormal imaging findings. From the clinically significant abnormal imaging findings, neoplasms and infections were the most frequent. From the neoplastic findings, the majority are extraxial tumors. The history of head trauma did not show a significant association with abnormal imaging findings.

From the sociodemographic variables, patient age was significantly associated with abnormal imaging findings. Several studies have shown that in patients presenting with acute headache, age over 50 years is significantly associated with intracranial pathology [9,16]. Another study

also showed a higher frequency of secondary headache in patients aged more than 65 years compared with a younger population (11.2% vs. 8.0%) [17]. Sex does not show association with abnormal imaging findings in this study which is also supported by previous studies [16].

From among the patient presentations, neurologic deficits (hemiplegia, monoplegia, and paraplegia) were the most frequent signs followed by vertigo and decrease or loss of vision. When it comes to association with abnormal imaging findings fever had a significant correlation with abnormal imaging findings while the rest of the neurologic findings did not show any significant positive correlation. This contradicts with previous studies which have shown that the presence of neurologic findings on physical examination in patients presenting with acute headache is strongly associated with intracranial pathology [9,16]. One study reported 44.4% of patients with neurologic findings had intracranial pathologies as compared to 2.2% of patients who did not have neurologic findings [1]. In our study duration of symptoms was only included for headache while the duration of the rest of the neurologic symptoms was not recorded which could lead to a significant proportion of chronic symptoms unrelated to the acute presentation being included in the data. This is the most probable explanation for the contradicting result in addition to possible false subjective reporting of neurologic symptoms.

For comorbid illnesses (hypertension, diabetes and HIV) correlation analysis could not be done because the majority of patients have unknown status. But it can be inferred that the majority of patients with comorbid diseases (73% of hypertensive patients,and 62% of HIV-seropositive patients) had abnormal imaging findings. Previous studies have shown that patients with HIV presenting with new headache are at increased risk of having serious intracranial pathology [15,18,19]. Hypertension at presentation has been linked to an increased association with intracranial pathology in a previous study, although it was not clarified if the hypertension was diagnosed at the ED or if patients had a long-standing history [16].

A separate analysis of abnormal imaging findings in patients with HIV showed that the most frequently encountered radiologic diagnosis was infection, although the type of infection was not specified. Previous clinical and imaging-based researches have produced similar results in which infectious causes such as cryptococcal meningitis and CNS toxoplasmosis were found to be the commonest causes of acute headache in HIV-seropositive patients especially in those with low CD4 counts and living in developing countries [15,18,19].

When it comes to the radiologic findings 40% of the patients had a normal brain MRI, while the remaining (60%) had abnormal findings. From among the abnormal findings, non-specific white matter lesions (which neither explained the reason for acute headache nor changed the clinical outcome of the patient and management approach) accounted for the highest proportion. From clinically significant findings (findings that were assumed to explain the reason for the acute headache and change patient outcome and management approach) neoplasm (11%), infection (8%) and ICH (7%)accounted for the most prevalent diagnosis. A previous long-term study done in the United States on patients who presented with headache to the adult ED and imaged with CT and MRI showed a positive imaging yield of 4.5% [16]. Another study found a 5.5% rate of positive CT scan findings in patients presenting with acute headache to ED [2]. The higher yield of abnormal imaging findings in our study might be a result of a more appropriate selection criterion for imaging or the higher sensitivity of MRI for certain pathologies as compared to CT. In other studies, the commonest pathologies diagnosed on imaging in patients presenting with acute headache were intracranial hemorrhage, vascular diseases and infections [1,2,4], where as in this study the commonest clinically significant findings were neoplasms and infection.

From the neoplastic findings, the majority are extraxial tumors. A previous study has shown that glial tumors (46.3%), meningioma (22%) and metastatic tumors (17.1%) to be the most frequent diagnosis in patients with brain neoplasms presenting with acute headache and other neurologic symptoms [20]. From the infectious causes, most cases were found to be tuberculomas which is unique from other studies that showed bacterial meningitis and viral encephalitis to be the commonest infectious cause of acute headache [1,2,4]. However, epidemiologic differences in the prevalence of TB might contribute to the higher frequency of tuberculoma in this study.

The history of head trauma did not show a significant association with abnormal imaging findings in this study, but the time the head trauma was sustained and variables for assessing the degree of traumatic brain injury are not included in the data which might explain the discrepant correlation with MRI finding.

6. STRENGTHS AND LIMITATIONS OF THE STUDY

The study has a fairly large sample size which makes the results more reliable. It is also the first MRI-based study done on acute headache in Ethiopia.

The majority of the patients have an unknown status for comorbid illnesses (hypertension, diabetes mellitus and HIV). These gaps in the data could be attributed to the underdeveloped trend of screening patients for comorbid illnesses. To make up for these omissions, while doing correlation statistics, patients with unknown statuses were excluded. The other shortcoming in this study would be the limited clarification of radiologic findings. For example, for patients diagnosed with intracranial tumors, whether or not the tumor is primary or secondary was not indicated.

CONCLUSIONS

The majority of patients had normal or minor brain MRI findings indicating inappropriate selection criteria for imaging in patients presenting with acute headache. The most frequent clinically important brain MRI finding in patients presenting with acute headache are neoplasms which is a distinct finding as compared to previous studies. Older age is associated with an increased rate of abnormal imaging findings. The most common infectious cause of acute headache is found to be Tuberculoma which shows variation from findings of previous studies which is most likely due to epidemiologic differences. In HIV seropositive patients the commonest causes of acute headache were found to be intracranial infections which is in agreement with findings from previous studies.

7. RECOMMENDATIONS

A more comprehensive and detailed patient history taking and physical examination should be practiced by treating and referring physicians to correctly identify patients with acute secondary headache who are candidates for neuroimaging and to avoid unnecessary imaging of those patients with primary headache syndromes who will not benefit from neuroimaging. The trend of patient history taking and record keeping at diagnostic centers should also be improved to avoid gaps in future research. Finally it is recommended that future large scale studies be conducted on imaging of acute headache in Ethiopia as it a very important area of research.

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