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Role of computed tomography for evaluation of headache without neurological deficit in tertiary care hospitals of Bangladesh

Abstract

Introduction: Headache is one of the most common complaints in patients pushing them for medical attention in the depart of emergency medicine and neurology clinic. Computed Tomography (CT) scan has a low yield value in patients with primary headaches without any neurological deficit. No national or international guidelines have been established yet for the clinical indication of neuroimaging. The main aim of our study is to determine the role of CT imaging in diagnosing a patient presented with a headache and evaluate the context of CT prescription in developing countries versus developed countries.

Methodology: This study was a multicentric Retrospective study carried out from the data collected from Bangabandhu Sheikh Mujib Medical University (BSMMU), Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (BIRDEM) from 2017-2019 AD. A total of 2184 patients were included in the study who were requested for CT scans by their primary care physician. Collected data was entered and analyzed through the SPSS version 21 and Microsoft Excel 2021.

Result: The total number of patients was 2184 with a predominance of females (63.02%) against males (36.98%) with a ratio of 1.7:1. CT scan findings were normal in 2060 cases which comprise 94.3 %, and positive in 124 cases accounting 5.7 % of the total study. The maximum number of cases was found in the age group between 21-30 years with 772 cases (35.3%) followed by the age group 31-40 years with 474 cases (21.7%), age group 11-20 years with 368 cases (16.8%), age group 41-50 years with 321 cases (14.67%), Age group 51-60 years with 131 cases (5.97%), age group 0-10 years with 83 cases (3.80%) and the least number of cases of 35 (1.67%) at the age group between 61-70 years.

Conclusion: Computed Tomography y has a low yield value in the diagnostic evaluation of patients with headaches who had no focal neurological signs. Its overuse can cause a socio-economic burden on the patients including radiation hazards. Thus, it is not justifiable for patients with low to middle-income resource countries.

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Introduction

A headache is a generalized or localized pain in several regions of the head and upper part of the neck that is not localized to a particular nerve distribution.[1] It is a typical complaint that prompts a patient to visit a Physician.[1] About 90% of people experience headaches at some point in their lives.[2] In September 2003, a preprinted version of the updated International Classification of Headache Disorders (ICHD-II) was revealed. It was formally published in January 2004. According to the ICHD-II, there are three different types of headache disorders: 1. primary headache, 2. secondary headache, and 3. cranial neuralgias, central and primary facial pain, and other headaches. More people experience primary headaches than secondary headaches.[2]

Primary headaches are those that are unrelated to other illnesses or intracranial pathologies. It is divided into four categories: migraine, tension-type headache (TTH), which is thought to be the most common primary headache type, trigeminal autonomic cephalalgias (TAC), which includes cluster headache (CH), and the group of another primary headache. A secondary headache, also known as a symptomatic headache, is one that develops because of a structural or metabolic problem. Several factors, including trauma, illness, drug use and withdrawal, low CSF fluid pressure, and infection may contribute to its occurrence.

Many types of headaches can be diagnosed by taking a thorough medical history and a physical and neurological examination.[3] According to Evans in 1996, few headache patients genuinely had a significant pathology that could be identified with cerebral imaging, hence there was no reason to request imaging. Although "red flags" have been highlighted in the SNNOOP10 list (systemic symptoms, neurologic symptoms or signs, sudden onset or onset after the age of 40 years, and change of headache pattern), there are currently no (inter)national guidelines that outline the clinical requirements for doing cranial CT imaging in patients with non-traumatic headaches. According to Dutch general practitioner guidelines, the following are the clinical manifestations in headache patients who require specialized neurological evaluation: a new type of headache in patients 50 years of age or older; acute onset of headache; neck stiffness; fever; headache combined with morning vomiting; patients who are immunocompromised or have a history of cancer; and progressive headache six weeks after a head injury.[4] A relatively low percentage of clinically significant positive results on neuroimaging are obtained with CT or MRI in individuals lacking red flags or clinical warning criteria signs.[5]

In Asia, Australia, Europe, and North America, the prevalence of headaches is nearly 50%, whereas it is far lower (20%) in Africa.[2] Globally, 52.0% of the population (men 44.4%, women 57.8%) had an active headache problem of any kind, while 14.0% (men 8.6%, women 17.0%) had migraine and 26.0% (men 23.4%, women 27.1%) had TTH (tension-type headache).[6]

According to studies, 3% of headache patients in developed nations have a CT scan, however, this number is likely considerably lower in developing nations. Although patients with acute or persistent severe headaches are not advised to undergo CT scans, the established criteria that are simple to apply in developed nations may be challenging in less developed nations.[7] All ages, races, socioeconomic classes, and geographic locations are affected by headaches, which place a heavy financial, personal burden, and decrease the quality of life. A headache can result in a substantial loss of working or school hours as well as decreased production, which places a tremendous socioeconomic burden on society.[1]

Since the invention of the CT scan in 1972, it has gained widespread acceptance as a first line and easily accessible imaging tool for structural brain abnormalities, particularly in developed nations.[2] To exclude serious secondary headache causes, further imaging, such as computed tomography (CT) and magnetic resonance imaging (MRI), is usually carried out. These tests are burdensome for patients (e.g., radiation exposure, allergies to contrast agents, and discomfort) as well as healthcare professionals (e.g., prolonged hospital stays and ED crowding), and they also raise the cost of healthcare significantly. Therefore, physicians must weigh the risk of misdiagnosing underlying pathology against the expenses of further investigations.[4] According to studies, neuroimaging was performed in up to 14% of all headache cases, with pathologic findings of any significance occurring in roughly 5.5% of the patients who had imaging. Up to 31% of patients with headaches received neuroimaging in other recent investigations.[1]

The "Evaluation of CT scan findings in patients presenting with headache" study by Nepal et al. was carried out in 2013 to determine the results of CT scans of patients who had headaches. Only 10.15 percent of patients had brain parenchymal disease, according to prospective observational research. Other abnormalities included sinusitis (11%), which was seen in the maxillary sinus, bone pathology (3.9%), and mastoiditis (2.3%). According to a study carried out in the United States of America, neuroimaging is recommended in as many as 12% of people presenting with headaches, with a total annual cost of roughly US$1 billion. Neuroimaging usage volume each visit shows significant overuse. Since headache neuroimaging is expensive, common, and probably significantly misused, it was recommended that interventions to decrease this are predicted to lower healthcare costs.[5]

The use of costly imaging technology to look for a rare lesion is not economical considering the terrible economic condition in developing nations, which has been made worse by unemployment and the global economic crisis.[2] Therefore, we decide to conduct a Multicentric Retrospective study from the CT scan data obtained from BSMMU (Bangabandhu Sheik Mujib Medical University) and BIRDEM (Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders). The main objective of this study is 1. to determine the role of CT imaging in diagnosing the patient presented with headache, 2. To evaluate the context of CT prescription in developing countries versus developed countries.

Methodology

A retrospective record-based study was conducted from the data obtained from Bangabandhu Sheikh Mujib Medical University (BSMMU), Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (BIRDEM) from 2017-2019 AD. The CT scan results of all the Age group patients who presented with complaints of headache either chronic or recurrent and were referred by their primary physician for non-contrast CT scan were performed and reported. Patients with suspicious masses were further evaluated with a contrast-enhanced CT scan after ensuring a normal renal function test with a creatinine level of less than 1.4 mg/dL.

Inclusion criteria: CT scan performed to diagnose headaches from 2017-2019 without and with contrast if necessary, depending upon the preliminary findings of CT report. Patients of all age groups with headaches of all kinds and no other neurological impairments or focal abnormalities on physical examination before referral for CT scan were included in the study.

Exclusion criteria: Patients who do not meet our inclusion criteria were excluded.

Data collection procedure: A total of 2184 patients meeting inclusion criteria were enrolled in the study and referred for a CT scan. Demographic information including age, gender, and CT scan findings was noted. All this information was recorded through the attached proforma. All the CT scan was reported by the three different certified radiologist for each patient. The Ethics Committee of BSMMU does not require its approval or patient informed consent for a retrospective record-based study.

Data analysis: Collected data was entered and analyzed through the SPSS version 21 and Microsoft Excel 2021.

Result

A total of 2184 cases referred for CT scan was included in this study. Among them, 1376 cases were Female (63.02%) and 808 cases (36.98%) with a female: male ratio of 1.7:1. (Table 1)

Table 1 Distribution of patients according to Gender (Male: Female)

Gender	Total case	Percentage
Male	808	36.98%
Female	1376	63.02%

The distribution of patients who underwent CT scans for headaches was divided into 7 groups. The maximum number of cases was found in the age group between 21-30 years with 772 cases (35.3%) followed by the age group 31-40years with 474 cases (21.7%), Age group 11-20 years with 368 cases (16.8%), Age group 41-50 years with 321 cases (14.67%), Age group 51-60 years with 131 cases (5.97%), Age group 0-10 years with 83 cases (3.80%) and the least number of cases of 35 (1.67%) at the Age group between 61-70 years. (Figure 1)

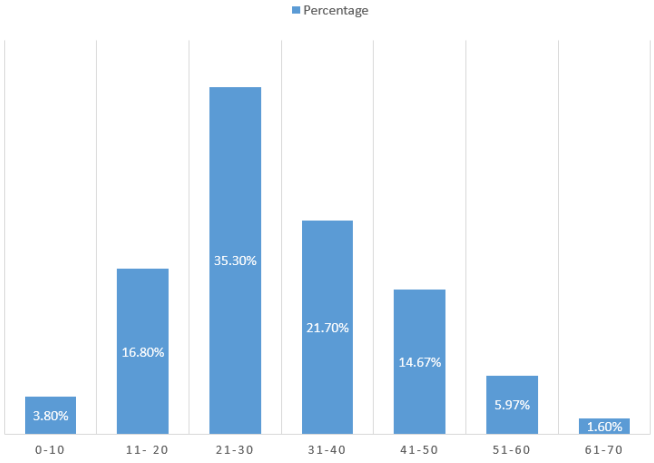

Figure 1 Distribution of patients according to Age group.

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CT scan findings were Normal in 2060 cases which comprise 94.3 %, and positive in 124 cases accounting for 5.7 % of the total study. Among the positive findings, there were 30 cases (1.4%) of brain tumors with 21 cases of benign and 9 cases of malignant brain tumors, 54 cases (2.5%) due to infection, 20 cases (0.9%) of Intracerebral hemorrhage (ICH) and 20 case (0.9%) was due to miscellaneous cause. (Figure 2)

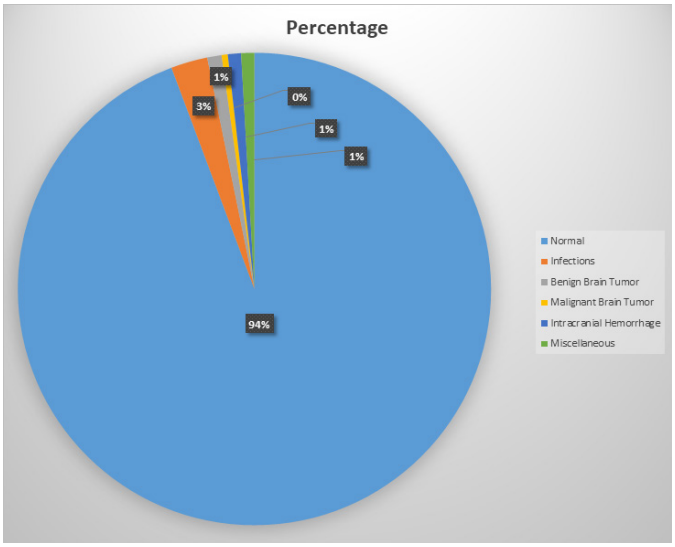

Figure 2 A Chart showing CT scan findings in patients with headaches.

Discussion

The development of imaging tools, which offer a non-invasive method for detecting structure-function correlations typical of pain and headache, is one of the most exciting advances in contemporary neuroscience.[8] In clinical practice, there is a well-established use for neuroimaging, primarily CT, in examining headaches, particularly in emergency situations.[1]

Although most headache-related reasons are benign, in recent years there has been an exponential rise in the number of routine neuroimaging.[9]

Numerous retrospective investigations have demonstrated that patients with isolated headaches without neurological symptoms may have low-yield imaging procedures.[5] Our study also resonates with these studies. The total number of patients was 2184 with females predominating 63.02% compared to Males 36.98%. CT Findings were Normal in 94.3 % of cases and pathological in 5.97% of cases. Among those Pathological cases, 2.5 % was due to infections, 1.4% were Brain tumor (0.98% Benign, 0.42% malignant), 0.9% were ICH and the remaining 0.9% were Miscellaneous. The most common age group for headaches was the age group between 21-30 years with 772 cases (35.3%) followed by the age group 31-40 years with 474 cases (21.7%), the age group 11-20 years with 368 cases (16.8%), Age group 41-50 years with 321 cases (14.67%), Age group 51-60 years with 131 cases (5.97%), age group 0-10 years with 83 cases (3.80%) and the least number of cases of 35 (1.67%) at Age group between 61-70 years. Mitchell et al., determined regardless of neurological abnormalities, a regular CT examination should be performed or not on patients who complain of headaches. 350 candidates participated in the trial, and 2% of those got favorable CT scan results.[5] Different studies by Carrera et al, Larson et al, and Akpek et al. demonstrated that the presence of clinically significant lesions at CT is uncommon in the absence of abnormal physical neurologic examination. Stein also highlighted that headache history is typically the most useful tool for distinguishing between functional headaches and the organic headaches. Direct CT scan use is justified when the organic illness if the organic cause is suspected.[2] One comparable trial was conducted in Samsun, Turkey that included 70 patients. Those patients got CT scans to check for intracranial pathology in adult candidates who met the clinical warning criteria for subordinate headaches and to determine the importance of the clinical warning criteria for predicting the likely lesion on the CT scan. The Clinical Warning Criteria include headaches that start suddenly, get worse more frequently and more intensely, fluctuate frequently, don't respond to analgesics, or are linked to specific neurological symptoms. The results showed that while 35.7% of head CT scans revealed positive findings that could be the cause of the headache, 64.3% of head CT scans were normal. Patients who met the Clinical Warning Criteria had a reasonably high incidence of recognizing positive findings.[5]

The strength of our study is that this Multicentric retrospective study was conducted in a tertiary hospital, the sample size was sufficient, and has included all the age group patients. The patients were referred by their primary care physician for a CT scan, thus, complete history, physical and neurological examinations could not be performed. This study may also have referral bias as the data were gathered from a patient who has been chosen for neuroimaging.

The use of neuroimaging for screening headaches is costly and places a financial burden on those who are looking for health care, especially in resource-constrained settings in developing nations. Patients' fear and anxiety, medical and legal considerations, and physicians concern about missing an intracranial abnormality are some of the factors that led to this unintentional neuroimaging use. Studies have demonstrated that raising awareness among patients of unnecessary testing and the radiation risks associated with it and the so-called low- yield test can help reduce use and improve neuroimaging procedures.[9]

Limitation: Only two tertiary care hospital were included for the study. There are many other tertiary care hospitals that were not included in this study. The duration of the study is only three years.

Conclusion

This study concludes that in most patients with headaches without neurological signs and symptoms referred for CT scan, most findings were normal. The use of CT scans for screening headaches can expose patients to ionizing radiation and increase the economic burden to the patient. The comprehensive history, physical and neurological examination will help to reduce the screening use of CT scans especially in low- and medium-income countries.

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None.

Conflicts of interest

Authors declare there are no conflicts of interest.

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