

Is there a misuse of computed tomography in the diagnostic workup of headache? A retrospective record-based study in secondary health-care facility in Saudi Arabia

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ABSTRACT

Introduction: Headache disorders are one of the most prevalent global public-health problems that require placing high demand on health-care Services. Since it is one of the most frequent complaints in clinical practice worldwide, it causes a considerable burden in terms of the social cost. The study aimed to give a guide for the decision on the utilization of computed tomography (CT) in the diagnostic workup and identify if patients require neurological imaging (CT) for proper diagnosis or not. **Material s and Methods:** The study was carried out in the Radiology Department in King Khalid Hospital, Al Kharj, Saudi Arabia from October 15, 2016, to February 15, 2017. A retrospective record-based study conducted using the documented CT reports in the files of patients whom were referred to the radiology department complaining of any type of a headache. **Results:** The data included 210 patients 51% were males and 49% were females. The patients were distributed into age groups; the mean age was 38.46 standard deviation \pm 13.56. Among Saudi population, the etiology of headache was varying; the most prevalent type of headache was tension headache 25.71% of the total headache patients followed by cluster 25.24% and the migraine with the lowest proportionality. The majority of the patients' headache pain was mild 60%. Moreover, the CT reports for most of the patients were normal. Spearman Correlation test was used to see if there is a significance in using the CT for any patient who comes with symptoms including headache, and the results have shown that there is no association and clinical significance in using the CT for patients with headache without suspecting other clinical condition ($P = 0.177$). **Conclusion:** Headache disorders must be on the public-health agenda. Tension, migraine, and cluster-type headaches represent the majority of primary headaches. Statistically no significance or need to obtain CT if there are no life-threatening conditions expected or trauma presented.

Keywords: Computed tomography, primary headache, secondary headache

Introduction

Headache clinically can be defined as a pain that occur in any region of the head. Headaches may occur on unilateral or

bilateral sides of the head. It has heterogeneous and complex set of causes.^[1]

Headache disorders are one of the most prevalent and burden global public-health problems. Health policy within countries depends on knowledge of health among the local populations.^[2]

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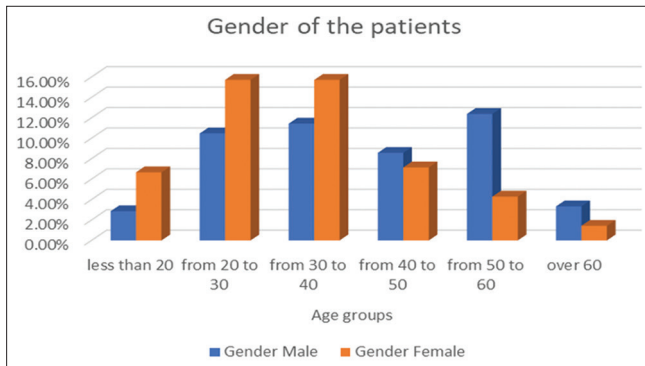


Figure 1: Percentage and age groups distribution among male and female patients

It requires placing high demand on health-care services. Good knowledge of their prevalence and distribution throughout the population are a very important prerequisite for planning interventions and organizing services.^[3] Since it is one of the most frequent complaints in clinical practice worldwide, it causes a considerable burden in terms of the social cost.^[4]

Migraine, tension-type, and cluster headaches (CHs) account for majority of primary headaches and improvise a substantial burden on the individual, family, or society at large.^[5] The burden is immense on workers, women, and children in terms of missing work and school days.^[6]

Headache disorders are considered to be classified as primary or secondary^[7] the classification is according to diagnostic and therapeutic factors.^[8]

According to the International Classification of Headache Disorders^[9] the primary headache mean it does not associated with any other disease or intracranial pathology^[10,11] and it has four sections migraine, tension-type headache (TTH) which considered as most prevalent type of primary headache,^[12] trigeminal autonomic cephalalgias TAC (which include the CH), and the group of other types of primary headaches.

Secondary headache is a term used to describe a type of headache that occur due to structural or metabolic abnormality also called symptomatic headache.^[13] It may occur due to set of reason such as trauma, infection, drug/substance using and its withdrawal, and low cerebrospinal fluid pressure.

Most types of headache can be diagnosed by taking careful history followed by general and neurologic examination. According to Evans 1996, most patients with headache only a few of patients actually suffered from serious disease that could be diagnosed with cerebral imaging, so no need to order cerebral imaging examination.^[14]

This study aims to give a guide for the decision on the utilization of computed tomography (CT) in the diagnostic workup. It also identifies if patients require neurological imaging (CT) for proper

diagnosis or not. The study mainly focuses on (CT) imaging, as these are the most commonly used methods in the clinical practice of headache.

Migraine is the most common type of primary headache disorder, and it is more common in female usually starts around the age of 20. Headache attacks extend between (4 and 72 h) and distinguish by unilateral location; also it characterize by moderate-to-severe pain intensity.^[15] Usually, neuroimaging examination is not required in patients that suffering from migraine.^[16]

TTH considered as most prevalent type of primary headache up to 78% of population. Usually, the duration of this type of a headache extend from (30 min to 7 days) and distinguish by bilateral location; also it characterize by mild-to-moderate pain intensity.^[10] In case of TTH, the patient could be request to make a radiological examination to exclude other pathology.^[15]

The CH considered as rare disease, but it the common type of trigeminal autonomic cephalalgias (TAC) group. CH is more common in male than female over the 40 years of age. Usually, the duration of this type of headache extend from (15 to 180 min) and distinguish by unilateral severe pain in orbital supraorbital and temporal regions. We must to keep in mind that there are some differential diagnoses such as arteriovenous malformation,^[16] cerebral infarctions,^[17] prolactinoma,^[18] and multiple sclerosis plaques.^[19]

Methodology

A retrospective record-based study was carried out in the Radiology Department in King Khalid Hospital, Al Kharij, Saudi Arabia from October 15, 2016, to February 15, 2017. The clinical records and CT scan results of all adults who presented with chronic and recurrent headaches and were referred for CT evaluation have been reviewed. Inclusion criteria were a complaint of chronic or recurrent headache of over 1-month duration and no other neurologic symptoms or focal findings on physical examination. The exclusion criteria include seizure disorders, previous head surgery or head trauma, vascular lesions, and intracranial neoplasm. Cases found to have brain abnormality suggesting an underlying cause of headache were considered positive and have been reported along with negative cases for data management and analysis.

Data collected about each patient included age, gender, and the following information about headache: onset, frequency, duration, severity, character of pain, location, also the patient asked about the presence of recent injury or concussion, and the blood pressure had been taken. A checklist collected the data from patient records.

All the brain CT examinations were performed on GE HiSpeed-NX/I Base-2002 Dual Slice Helical CT using the existing departmental protocol. Contrast medium enhancement, when not contraindicated, was usually performed in all the patients using a bolus of 40 mL of nonionic contrast medium,

Table 1: Demographic characteristics of patients

Parameter	n (%)
Gender	
Male	103 (49.0)
Female	107 (51.0)
Age (years)	
<20	20 (9.5)
21-30	55 (26.2)
31-40	57 (27.1)
41-50	33 (15.7)
51-60	35 (16.7)
>60	10 (4.8)
Frequency of headache	
<6 times/week	31 (14.8)
<4 times/day	31 (14.8)
From 4 to 6 times/day	12 (5.7)
Variable	86 (41.0)
Continuous	50 (23.8)
Type of headache	
Tension	53 (25.2)
Migraine	17 (8.1)
Cluster	54 (25.7)
Others	86 (41.0)
Severity of headache	
Mild	126 (60.0)
Moderate	47 (22.4)
Sever	37 (17.6)
CT report	
Normal CT	193 (91.9)
Pathological condition	17 (8.1)

CT: Computed tomography

iopamidol, with a concentration of 300 mg iodine per milliliter (Ultravist 300: Schering, Berlin, Germany).

The data were analyzed using SPSS (statistical packages for social science) version^[20] and the $P < 0.05$ was considered as statistically significant. The ethical approval was obtained from concerned authority.

This work was performed as a collaboration among all of the authors. AHA participated in the study design and wrote the first draft of the manuscript. SAG and MHK collected and processed the samples. SAJ, OSA, AMA, SAR, and YMA participated in the study design. AYE performed the statistical analyses. All of the authors read and approved the final manuscript.

Results

The study was conducted over 210 patients 51% were males and 49% were females (with mean age 38.46 and standard deviation ± 13.56) [Figure 1]. The patients were distributed into five different age groups, and a randomly selected survey conducted to estimate the prevalence of the type, frequency, severity, side, and character of pain of the patient's primary types of headaches. [Table 1]

The data [Table 2] showed that there is no significance association between the gender and headache frequencies, it also showed that

the frequency was at highest in male and the lesser the frequency the greater the number of the patients.

The data showed the distribution of the primary headache types among male and female patients; it showed that the majority were suffering from tension-type and in males more than females, while in cluster, the females had the higher percentage. No significant association was found between them and the headache type as shown in Table 3.

The data [Table 4] revealed that the majority of the patients had a mild headache with considerate number had moderate and severe. The more the frequency of headache the lesser the severity.

According to the data showed in Table 5, the tension headache had the highest number of patients and the number decreases in patients as the frequency of the headache increases.

The data [Table 6] showed that the percentage of the patients increased in the second and third decades and the cluster type reported the highest percentage among all types.

The data [Table 7] showed that most of the CT reports for the headache patients came negative and there was no clinical significance has been found between the CT reports and the type of the primary headaches.

Discussion

This study of primary headaches follows many prior studies of headaches incidence. Population-based cross-sectional of a randomly selected survey conducted to estimate the prevalence of the type, frequency, severity, side, and character of pain of the patient's primary types of headaches. It was made by physicians in interviews in many Saudi's hospitals in Riyadh city; moreover, the results were compared to the CT reports and tested for significance in using head CT for patients with headache.

Many studies demonstrated a high prevalence of migraine and a very high prevalence of headache and showed unmet health-care needs of people with headache.^[21] In agreement with the literature, our data revealed that most of the affected patients were males with an exception of tension type of headache, which were more in females,^[22] these results supported by a recently published study, showed that the males have the dominance with an exception in migraine headache.^[23] However, the results disagree with a study conducted by El-Sherbiny *et al.*, in 2015, which indicated that the females except for the cluster type were more affected. They explained their results with the female lifestyle and concluded that marriage and high education could increase the risk of chronic headache.^[24] This without ignoring the fact that the Saudi's women have completely different lifestyles and habits that may explain our results.

The headache severity was mostly mild among the patients with considerate number of patients with moderate and severe pain;

Table 2: Frequency of headache in relation to participant's gender

Variable	Gender of patients		Total	χ^2	
	Male (n=103), n (%)	Female (n=107), n (%)		Value	P
Frequency of headache					
<6 times/week	15 (7.1)	16 (7.6)	31 (14.8)	3.614 ^a	0.461
<4 times/day	16 (7.6)	15 (7.1)	31 (14.8)		
From 4 to 6 times/day	6 (2.9)	6 (2.9)	12 (5.7)		
Variable	47 (22.4)	39 (18.6)	86 (41.0)		
Continuous	19 (9.0)	31 (14.8)	50 (23.8)		

^a0 cells (0.0%) have expected count <5. The minimum expected count is 5.89

Table 3: Type of headache in relation to participant's gender

Variable	Gender of patients		Total	χ^2	
	Male (n=103), n (%)	Female (n=107), n (%)		Value	P
Type of headache					
Tension	28 (13.3)	25 (11.9)	53 (25.2)	6.058	0.109
Migraine	8 (3.8)	9 (4.3)	17 (8.1)		
Cluster	19 (9.0)	35 (16.7)	54 (25.7)		
Others	48 (22.9)	38 (18.1)	86 (41.0)		

The minimum expected count is 8.34

Table 4: Frequency in relation to the severity of headache among patients

Variable	Severity of headache		
	Mild (n=126), n (%)	Moderate (n=47), n (%)	Severe (n=37), n (%)
Frequency of headache			
<6 times/week	12 (5.7)	11 (5.2)	8 (3.8)
<4 times/day	11 (5.2)	9 (4.3)	11 (5.2)
From 4 to 6 times/day	4 (1.9)	3 (1.4)	5 (2.4)
Variable	62 (29.5)	12 (5.7)	12 (5.7)
Continuous	37 (17.6)	12 (5.7)	1 (0.5)

the pain was mostly bilateral. This may relate to the onset and duration of the headache, these results to some extent agree with what^[20] have reported, but his results showed considerable percentage with severe pain. This variety of severity may have had a correlation with nature of work or some particular habits like spending long time on computers and mobile phones, which have been proven to cause a development in the headache severity.^[4] Our data also revealed headache among young ages which agree with Suzuki *et al.*, study proving that stress among school students could increase the headache severity even exceeded the severity of the pain caused by donating blood.^[25] Some of these results were related and explained by the drugs overuse.

The study was suburban and representative as regards age, gender, onset of the headache and the heart rate; CT examination reports for the patients have indicated no

Table 5: Frequency in relation to headache's type among patients

Variable	Type of headache			
	Tension (n=53), n (%)	Migraine (n=17), n (%)	Cluster (n=54), n (%)	Others (n=86), n (%)
Frequency of headache				
<6 times/week	20 (9.5)	6 (2.9)	3 (1.4)	2 (1.0)
<4 times/day	19 (9.0)	7 (3.3)	2 (1.0)	3 (1.4)
From 4 to 6 times/day	11 (5.2)	1 (0.5)	0	0
Variable	2 (1.0)	3 (1.4)	1 (0.5)	80 (38.1)
Continuous	1 (0.5)	0	48 (22.9)	1 (0.5)

Table 6: Headache types in relation to patients age

Age (years)	Type of headache			
	Tension (n=53), n (%)	Migraine (n=17), n (%)	Cluster (n=54), n (%)	Others (n=86), n (%)
<20	4 (1.9)	4 (1.9)	4 (1.9)	8 (3.8)
21-30	13 (6.2)	1 (0.5)	18 (8.6)	23 (11.0)
31-40	14 (6.7)	8 (3.8)	16 (7.6)	19 (9.0)
41-50	7 (3.3)	2 (1.0)	5 (2.4)	19 (9.0)
51-60	9 (4.3)	2 (1.0)	8 (3.8)	16 (7.6)
Over 60	6 (2.9)	0	3 (1.4)	1 (0.5)

Table 7: Type of headache in relation to the computed tomography report

Type of headache	CT report		Total	χ^2	
	Normal CT (n=193), n (%)	Pathological condition (n=17), n (%)		Value	P
Tension	46 (21.9)	7 (3.3)	53 (25.2)	4.927 ^a	0.177
Migraine	17 (8.1)	0	17 (8.1)		
Cluster	52 (24.8)	2 (1.0)	54 (25.7)		
Others	78 (37.1)	8 (3.8)	86 (41.0)		
Total	193 (91.9)	17 (8.1)	210 (100.0)		

^a3 cells (37.5%) have expected count <5. The minimum expected count is 1.38. CT: Computed tomography

abnormalities that have direct relation to the primary headache types. The results were statistically tested by Spearman Correlation to see if there is any significance in using the CT examinations for any patient how comes with symptoms including headache. With considering the presence of the headache, the results have shown that this is no association and therefore no clinical significant in using the CT for patients with headache without suspecting other clinical or life-threatening conditions ($P = 0.177$).

Conclusion

Headache disorders must be on the public-health agenda. Tension, migraine, and cluster-type headaches represent the majority of primary headaches. They affect families and societies and causes substantial burden at large. It increases among individual in terms of skipping work and school activities.

When patients present to the emergency department with symptoms of headache, it is important to run investigations to decide the type of headache whether this is a primary headache that only demands the appropriate therapy or whether it is a secondary headache that requires special and more attention and further diagnostic workup as this patient might be suffering from an underlying life-threatening condition. Statistically no significance or need to obtain CT if there are no life-threatening conditions expected or trauma presented.

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Conflicts of interest

There are no conflicts of interest.

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