

# Brain Imaging Findings in Children with Headache

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## ABSTRACT

**Background:** Headache is a common problem in children, but a small percentage of them have positive findings on CT scan and MRI, and considering that CT scan and MRI is costly and risks of radiation is high for children. Therefore the aim of this study is evaluating CT scans and MRI finding in children with headache. **Materials and Methods:** This cross-sectional study was performed on 353 children with headaches that 217 patients underwent CT and 136 patients underwent MRI. The data collected through the report sheet of CT scan and MRI and analyzed using SPSS software and chi-square test. **Results:** According to the study, 88.9% of MRI and 75.7% of CT scan were normal. Abnormal findings on CT scan was significantly higher in boys (12.2% vs. 9.5%) ( $P=0.03$ ) and it was determined that MRI findings was also significantly higher in boys (26.3% vs. 21.5%) ( $P=0.04$ ). The most common abnormal findings on CT scan was mass (16.6%) and hematoma (16.6%) and the most common abnormal findings on MRI was cysts (26.3%). **Conclusion:** The results of our study showed that the majority of imaging results in patients with headache was normal or benign lesions. Therefore, imaging should be performed only in children with abnormal findings on physical examination.

**Keywords:** CT scan, headache, paediatrics.

## 1. INTRODUCTION

Headache is a result of disorders that affect pain-sensitive sites, such as meninges, blood vessels, para-nasal sinuses and muscles; it, also, is one of the most common causes of pain in children. The prevalence of severe and frequent headaches is 25.25 per thousand in children (1-3). A large number of physicians and parents of sick children are concerned that inter-carcinoma lesions may be due to headaches (4). The most important means to diagnose the cause of headaches is to take precise medical history and para-clinical measures. Brain imaging method, including CT scan and MRI, is one of the diagnostic methods in children with headaches (5-7). The main reason for performing MRI and CT scans in patients with headache is the diagnosis of curable lesions, which can increase the patient's longevity or improve her quality of life (8). Cases such as brain tumors, hydrocephalus vascular malformations and subdural hematoma are among this category (9). Another important cause for conducting MRI in headache patients is a way to alle-

viate their anxiety due to the presence of a brain tumor or intracranial disease (10). Cases in which imaging should be done include important changes in the type of headache, headache worsening, sudden development of headache or when it is stimulated by awakening of sleep, and when it is associated with a neurological symptom. It has been reported that there are abnormal findings in the imaging of patients who are suspected of having a headache based on the findings of the study. Secondary pathologic factors are more common than those in the general population of headache patients (11). Parents' anxiety and concern about headaches in children and the availability of imaging measures have caused most children to experience CT scan and radiation due to the importance of headaches in children and due to limited studies in Iran (12). Due to the lack of a similar study in this area, we have studied the prevalence of various CT scan and MRI findings in children with headaches in Zabol city in order to make important findings and outbreaks; it has, also, been

attempted to identify the factors affecting the emergence and development of headache in order to decrease the frequency of imaging measures conducted for children with headache.

## 2. MATERIALS AND METHODS

The present descriptive-analytic study is of cross-sectional type. The statistical population included all patients under the age of 12 years with headache who referred to Amiralmomenin Hospital in Zabol in 2015, who asked the physician for CT scan and MRI. According to the results of this study and the estimation of abnormal CT scan findings, which turned out to be 2.4%, and given a confidence level of 95% and test power of 80%, 353 subjects were selected as the final sample.

Less than 12 years of age patients who referred to the above-mentioned hospital and volunteered, or asked for, imaging actions, such as CT scan and MRI, were the main inclusion criteria. The exclusion criteria included being older than 12 years of age, lack of consent to enter the study, and defects in the medical records. Subsequently, the CT and MRI reports of these patients were reviewed and the findings were recorded. Abnormal findings in the CT scan include mass, cysts, infarcts, hydrocephalus, calcification, hematoma, ventricular dilation and edema. Abnormal findings in MRI include sinusitis, retinal cysts, masses, cysts, atrophy, ventricular dilatation, age variations, hydrocephalus, hematoma, demyelinating disease, mastoiditis, encephalomalacia, schizophyllum and hypoplasia of corpus colosum, the prevalence of which were measured after collecting reports. All patient information, including demographic factors and para-clinical symptoms, was recorded in a researcher-made check list and entered into SPSS. The statistical analyzes were presented in two sections of descriptive and analytical. In the descriptive part, abnormal CT scan and MRI findings are presented as the main variable in different groups. All of the demographic and clinical characteristics of patients were also reported based on descriptive criteria. In the analytical section, based on statistical assumptions, parametric and nonparametric proportional tests were used. CHI-SQUARE test was used to analyze the qualitative findings and independent T-test was used to compare quantitative data; non-parametric Man-Whitney was used if the initial assumptions were not as normal as they were supposed to. All tests were examined at a 5% error level.

## 3. FINDINGS

Total amount of 353 people were included in the study, of which 7 were excluded during the study. In the first group,

Group		Sex				P value
		Boy		Girl		
		Frequency	Percent	Frequency	Percent	
CT scan	Normal	77	90.5	116	87.8	0.03
	Abnormal	8	9.5	16	12.2	
MRI	Normal	44	87.5	59	73.7	0.04
	Abnormal	12	21.5	21	26.3	

**Table 1.** Frequency distribution in the CT scan and MRI group in terms of gender

CT scan was performed on 217 patients, of which 85(39.1%) subjects were girls and 132 (61%) were boys and 11.1% were abnormal. In the second group, 136 people were subjected to MRI, of which 56 (41.1%) were female and 80 (58.8%) were male, and 24.3% were abnormal. Also, according to gender segregation, abnormal findings in CT scan were significantly higher in boys (63% boys and 37% girls) ( $P = 0.03$ ), and it was also found that MRI findings were also significantly more common in boys in comparison to girls (66% vs. 34%) ( $P = 0.04$ ) (Table 1). The results of the study showed that the most common CT scan abnormal finding was mass (21%) and hematoma (21%). Then, cysts (14%) and Ventriculomegaly (14%) were the most frequent forms of abnormality (Table 2). The most commonly found abnormality was cysts in MRI (30%). Atrophy (12%) and Ventriculomegaly had the second and third frequencies (15%) ( $P > 0.05$ ).

Lesion	Sex						P Value
	Boy		Girl		Total		
	Frequency	Percent	Frequency	Percent	Frequency	Percent	
Mass	4	22	2	20	6	21	0.887
Cyst	4	22	0	0	4	14	0.269
Infarction	1	5	0	0	1	3	0.823
Hydrocephalus	1	5	2	20	3	9	0.698
Calcification	1	5	1	10	2	7	0.68
Hematoma	4	22	2	20	6	21	0.887
Shunt	0	0	1	10	1	3	0.823
Ventrikomgaly	2	11	2	20	4	14	1
Edema secondary to the mass	1	5	0	0	1	3	0.823

**Table 2.** Frequency distribution in the CT scan group in terms of sex

Lesion	Sex						P value
	Boy		Girl		Total		
	Frequency	Percent	Frequency	Percent	Frequency	Percent	
Mass	1	4.5	1	9	2	6	0.639
Cyst	7	31.8	3	27	10	30	0.68
Atrophy	1	4.5	3	27	4	12	0.38
Ventrikomgaly	4	18.1	1	9	5	15	0.603
Hydrocephalus	3	13.6	0	0	3	9	0.382
Hematoma	1	4.5	0	0	1	3	0.862
Demylinating disease	0	0	1	9	1	3	0.862
Mastoiditis	1	4.5	1	9	2	6	0.639
Encephalomalacia	1	4.5	0	0	1	3	0.862
Schizenphalic	1	4.5	0	0	1	3	0.862
Dysgenesis of corpus colosum	2	9	1	9	3	9	0.751

**Table 3.** Frequency distribution in the MRI group in terms of sex

## 4. DISCUSSION

The purpose of this study was to determine the positive results of CT scan and MRI, and their relationship with gender, among pediatric patients in Amiralmomenin Hospital in

Zabol in 2015. In the present study, most patients with CT scan and MRI did not have any lesions. This study was performed at Amir Al-Momenin Hospital's Imaging Center. Out of 217 cases, 88.9% (193 patients) of the CT scan were normal. Of the 136 MRI cases, 75.7% (103) were normal. In this study, the prevalence of headache in boys was lower than that of girls and the most common abnormal findings were headaches, cysts in MRI, and mass in CT scans. In this study, 88.9% of CT scans and 75.7% of MRIs were normal. However, the results of Talebian et al study (1996), which as conducted in Kashan, indicated that 98% of CT scans were normal (13). Additionally, the results of Maytal et al study, which was conducted on 133 children with chronic headache under CT and MRI in California in 1994, indicated that there were only 3% abnormal findings, a result which is not consistent with the findings of the present study (11), because, based on the results of the present study, over 10% of the CT scan and about 25% of the MRI had abnormal findings; this difference may be due to the sample size of the study (our study has a sample size twice that of the above studies) and It's harder for doctors to conduct imaging when the headache patient is a child. Some of the causes of headache in children is migraine, tension, migraine-stress, post-traumatic stress, hydrocephalus, and mass (14). Based on the findings of the present study, the most common causes of headaches were mass, with 21% in CT scan and 6% in MRI, and hydrocephalus, with 9% in CT scan and 9% in MRI. Another study by Fallah et al showed that brain CT scan of 40 girls and 60 boys was found to be 61% normal. The most common abnormalities were brain atrophy (21%) and intracranial hemorrhage (5%). All patients with focal seizure and 61% of developmental delays had abnormal reports. Cerebral CT scan was reported in 29.4% of cases of meningitis, 17.2% of patients with epilepsy, and in 42% of all patients with abnormal diagnosis of brain structural impairment (18). However, in our study, 87.8% of the CTs and 73.7% of the tests were normal. The most common CT scan findings included mass (21%) and hematoma (21%) and the most common MRI findings were mild cysts (30%) and ventriculomegaly (15%). Based on the results of another study, conducted by Gandhi R et al, thirty-four children (34%, 95% CI 25-45) were subjected to CT scan, none of whom had any specific and significant outcome (0%, 95% CI 0-10) and no one was diagnosed with a headache so intense that necessitates intervention. Given that few children with chronic CT scan headaches are abnormal and often have an abnormal examination (13), and given the high cost of conducting brain CT scans, they are not usually required in all children with chronic headaches; therefore, it is recommended to use this diagnostic methods in cases of abnormal examination findings. Considering the results obtained and comparing them with the cases, it can be said that in spite of the high efficiency and precision of this method in diagnosis of brain lesions, following the potential dangers of radiation, this method cannot be used as the first diagnostic method. However, this method is sometimes used at the beginning of the diagnosis process because of its usefulness in preventing frequent visits to the office and efficiency in alleviating intolerance and anxiety of the subject (14, 15), and CT scan is recommended in cases where there is clear clinical finding (16). The main indications required for the implementation

of CT scan include durable, extreme, permanent, abnormal headaches, dependent on abnormal neurological symptoms (17-19). Therefore, based on the results of the present study, performing MRI and CT scans in children with headache is unnecessary and that these methods must merely be used in cases of chronic emergency in which clinical examination fails to obtain any certain findings.

## 5. CONCLUSION

Based on the results of our study, it was found that most of the imaging results are normal in headache patients and the most visible lesions seen in the findings of imaging are benign lesions. On the other hand, abnormal lesions in CT scan and MRI were higher in boys; thus, CT scan and MRI and necessary only when headache is accompanied with a finding of clinical examination which suggests something abnormal in both boys and girl, especially in boys; otherwise, the parents must be reassured and they must be asked to refer back to the hospital only if they witness any dangerous symptoms.

• Conflict of interest: none declared.

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