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Original Research

Retrospective Evaluation of Patients Admitted to the Pediatric Neurology Outpatient Clinic with Headache: Experience of a Tertiary Hospital

Ilhan Abidin,[1] Cuneyt Ugur,[2] Mirac Yildirim[3]

[1]Department of Pediatric Gastroenterology, Selcuk University Faculty of Medicine, Konya, Türkiye
[2]Department of Pediatrics, University of Health Sciences Türkiye, Konya City Health Application and Research Center, Konya, Türkiye
[3]Department of Pediatric Neurology, Ankara University Faculty of Medicine, Ankara, Türkiye

Abstract

Objectives: It was aimed to determine the etiological and clinical features of pediatric patients with headache complaints.

Methods: The files of patients who were admitted to the pediatric neurology outpatient clinic with headache were reviewed retrospectively. Patients' age, gender, features of headache, symptoms accompanying headache, available blood tests, brain magnetic resonance (MR) and electroencephalography (EEG) results were recorded.

Results: Of the total 470 patients, aged between 3 and 17 years, 291 (61.9%) were female and 179 (39.1%) were male. The mean age of the patients was 12.38±3.45 years. According to age groups, there were 16 (3.4%) patients under the age of 5, 159 (33.8%) between the ages of 6-11, and 295 (62.8%) patients aged 12-17 years. While 289 (61.5%) patients were diagnosed with primary headache, 122 (26.0%) patients were diagnosed with secondary headache, and headaches of 59 (12.5%) patients could not be classified. The most common primary headaches were tension-type headache (TTN) (n=177, 37.7%) and migraine (n=111, 23.6%). The 86 (70.5%) of the patients with secondary headache were diagnosed with sinusitis. Abnormal neurological examination finding was determined in 8 (1.7%) patients. Brain MR was performed in 439 (93.4%) of all patients and abnormal brain MR findings were detected in 52 (11.8%) patients. EEG was performed in 205 (43.6%) of all patients and abnormal EEG findings were detected in 24 (11.7%) patients.

Conclusion: According to age groups, headache was most common in the 12-17 age group. The most common causes of headache were TTN and migraine, respectively. The most common secondary headache cause was sinusitis. We think that physical and neurological examination still maintains its priority in determining the causes of headache.

Keywords: Headache, migraine, pediatric, tension type headache

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Headache, by definition, can be expressed as pain usually felt in an area above the orbitomeatal line.[1] In a study of the worldwide medical and neurological morbidity and financial burdens of 310 diseases, headache was one of the major contributors to this burden.[1] Headache is a common complaint in children and adolescents. It is one of the important reasons to apply to the hospital, as it affects the physical, mental state, school success of chil-

Address for correspondence: Cuneyt Ugur, MD. Department of Pediatrics, University of Health Sciences Türkiye, Konya City Health Application and Research Center, Konya, Türkiye
Phone: +90 532 771 22 47 **E-mail:** cugur70@gmail.com

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dren and is a worrying disorder for families. In a systematic review of 50 population-based studies, it was reported that 60% of children had headache complaints at any time. It is reported that by the age of 18, more than 90% of children experience a headache at least once.[2-4]

The cause of headaches in children rarely indicates a serious illness or disorder.[5] In the majority of patients who apply to pediatric emergency outpatient clinics with headache complaints, the cause of headache is upper respiratory tract diseases or viral diseases. Although rare, the cause of the headache may be trauma, serious conditions such as intracranial space-occupying lesions or meningitis, and primary headaches such as migraine status.[6,7] The most common headache causes in children are migraine and tension-type headache (TTH). Trigeminal autonomic headaches, including cluster headaches, are very rare in children younger than 10 years of age.[3,8]

In our study, it was aimed to retrospectively evaluate the demographic, etiological and clinical characteristics of the pediatric patients who applied with the complaint of headache.

Methods

In our study, patients who applied to Konya Training and Research Hospital, Pediatric Neurology Outpatient Clinic with headache complaints between March 2018 and March 2019 were evaluated retrospectively. Patients' age, gender, characteristics of headache, symptoms accompanying headache, abnormal neurological findings, effects of headache on daily life, diagnosis of headache, family history, available blood tests, brain Magnetic resonance (MR) and Electroencephalography (EEG) results were recorded.

Patients with missing demographic data, anamnesis, and physical examination findings in the hospital electronic archive were excluded from the study. Study data of a total of 470 patients were recorded. The patients were classified according to the International Classification of Headache Disorders 3rd edition (ICHD-3) diagnostic criteria.[8]

This study was conducted in accordance with the principles of the Declaration of Helsinki. Approval for the study was obtained from the Health Sciences University Hamidiye Scientific Research Ethics Committee (date: 26.06.2020, decision number: 9/24).

Statistical Analysis

Data analysis was performed in computer environment with IBM SPSS 23.0 (IBM SPSS Statics, Version 23.0 Armonk, NY: IBM Corp.). Descriptive statistical methods were used. Kolmogorov-Smirnov test of normality was used to determine the distribution of the data. Normally distributed data were given as mean±standard deviation. Categorical variables were stated as numbers (n) and percentages (%). Chi-square test was used to compare categorical variables. P value less than 0.05 was considered statistically significant.

Results

Of the total 470 patients, 291 were female and 179 were male. The mean age of the patients, whose ages ranged from 3 to 17 years, was 12.38±3.45 years. When we analyzed the patients according to age groups, there were 16 patients ≤ 5 years old, 159 between the ages of 6-11, and 295 patients aged 12-17 years old (Table 1).

Headache was frontal in 119 (25.3%) patients, frontotemporal in 132 (28.1%) patients, temporal in 90 (19.1%) patients, parietal in 6 (1.3%) patients, temporoparietal in 25 (5.3%) patients, and occipital in 65 (13.8%) patients. The headache region was variable in 33 (7.0%) patients. The shortest headache lasted 30 minutes, and the longest headache lasted 96 hours. The mean headache duration of the patients was calculated as 4.75±9.76 hours.

Among the complaints and findings accompanying headache, nausea and vomiting were present in 200 patients, photophobia in 243 patients, and phonophobia in 282 patients. While 72 patients had blurred vision during the headache, 27 patients had double vision, 18 had flashes of light, 353 patients had no visual symptoms. Additional complaints and findings were dizziness in 100 patients, vehicle sickness in 2 patients, abdominal pain in 3 patients, fever in 8 patients, and irritability observed in 15 patients. It was determined that 198 (42.1%) patients stated that their headaches increased with physical activity, and 192 (40.9%) patients stated that their headache negatively affected their daily lives (Table 2).

It was observed that the presence of additional complaints was more common in patients diagnosed with migraine. The presence of nausea and vomiting, photophobia, and phonophobia were observed more frequently in patients diagnosed with migraine than other etiological causes. A

Table 1. Distribution of patients by demographic characteristics

	n=470
Sex, n (%)	
Female	291 (61.9)
Male	179 (38.1)
Age, y	12.38±3.45
Age range, n (%)	
≤ 5 y	16 (3.4)
6-11 y	159 (33.8)
12-17 y	295 (62.8)

Parameters were expressed as n (%) and mean±standard deviation.

Table 2. Additional complaints, findings and effects of headache on daily life

	n	%
Nausea and Vomiting		
Present	200	42.6
Absent	270	57.4
Photophobia		
Present	243	51.7
Absent	227	48.3
Phonophobia		
Present	282	60.0
Absent	188	40.0
Visual Symptom		
Blurred Vision	72	15.3
Double vision	27	5.7
Flash of Light	18	3.8
Absent	353	75.1
Increase with Physical Activity		
Present	198	42.1
Absent	272	57.9
Negative Impact on Daily Life		
Present	192	40.9
Absent	278	59.1
Additional Complaints and Findings		
Dizziness	100	21.3
Vehicle Sickness	2	0.4
Abdominal pain	3	0.6
Fever	8	1.7
Irritability	15	3.2
Absent	342	72.8

statistically significant difference was detected in terms of these features ($p<0.01$ for all).

Also, in patients diagnosed with migraine, it was observed that headaches increased with physical activity and negatively affected daily life more frequently than other etiological causes. A statistically significant difference was detected ($p<0.01$ for both).

The patients were classified according to the ICHD-3 diagnostic criteria (Table 3). The number of patients diagnosed with primary headache was 289 (61.5%), and the number of patients diagnosed with secondary headache was 122 (26.0%). Migraine (23.6%) and TTH (37.7%) were the most common primary headaches. The presence of aura was detected in only 4 patients diagnosed with migraine, and visual aura was described in these 4 patients, too. The patient in trigeminal autonomic cephalalgias group was diagnosed with cluster headache. Among 122 patients diagnosed with secondary headache, 4 had headaches related to head and neck trauma, 11 had headaches related to intracranial nonvascular diseases (5 patients with intracranial neoplasia and 6 patients with increased intracranial pressure), 6 patients had headaches related to homeostasis disorders (all diagnosed with arterial hypertension), and 101 patients had headache related to cranium, neck, eyes, ears, nose, sinuses, teeth, mouth, and other facial and neck structures (86 patients with sinusitis, 14 patients with ocular refractive error, and 1 patient with dental infection). In addition, 59 (12.5%) patients had headaches that could not be classified (Table 3).

Table 3. Distribution of patients according to international classification of headache disorders 3rd edition diagnostic criteria

	n	%
Primary Headaches		
Migraine	111	23.6
Tension-type headache	177	37.7
Trigeminal autonomic cephalalgias	1	0.2
Other primary headache disorders	0	0
Secondary Headaches		
Headache attributed to trauma or injury to the head and/or Neck	4	0.9
Headache attributed to cranial or cervical vascular disorder	0	0
Headache attributed to nonvascular intracranial disorder	11	2.3
Headache attributed to a substance or its withdrawal	0	0
Headache attributed to infection	0	0
Headache attributed to disorder of homoeostasis	6	1.3
Headache or facial pain attributed to disorder of the cranium, neck, eyes, ears, nose, sinuses, teeth, mouth or other facial or cervical structure	101	21.5
Headache attributed to psychiatric disorder	0	0
Unclassificated	59	12.5
Total	470	100

A detailed neurological examination was performed for each patient who presented with a headache. The neurological examination of 462 (98.3%) patients was normal, while only 8 (1.7%) patients had abnormal neurological examination findings. Papilledema was determined in 6 patients, and loss of muscle strength was determined in 2 patients.

When we examined the laboratory tests of the patients, we observed that all patients had their complete blood count, blood biochemistry (glucose, urea, creatinine, sodium, potassium, chloride, aspartate aminotransferase, alanine aminotransferase), thyroid stimulating hormone, free T4, vitamin D, vitamin B12, folic acid, iron, iron-binding capacity, and ferritin levels. It was determined that the blood tests of 422 (89.8%) patients were normal. Various abnormalities were found in 48 (10.2%) patients (Table 4).

Brain MR was performed on a total of 439 (93.4%) patients, and 333 (75.9%) of these patients had normal brain MR results. It was determined that non-diagnostic changes such as anatomical variations in brain MRI were reported in 54 (12.3%) patients and were not considered abnormal. It was determined that various abnormalities in brain MR were reported in 52 (11.8%) patients (Table 5). The additional complaints and findings of the patients were examined with the brain MR results; no statistically significant difference was detected between normal and abnormal brain MR results ($p>0.05$)

Table 4. Abnormal laboratory test results of patients

	n	%
Anemia	26	54.1
Polycythemia	3	6.3
Leukocytosis	4	8.3
Leukopenia	3	6.3
Vitamin D deficiency	6	12.5
Elevated thyroid stimulating hormone	2	4.2
Vitamin B12 deficiency	3	6.3
Hypocalcemia	1	2.1

Table 5. Abnormal brain magnetic resonance results of patients

	n	%
Arachnoid cyst	11	21.2
Pineal cyst	12	23.1
Gliosis	7	13.5
Glioma	5	9.6
Demyelinating plaque	6	11.5
Dermoid cyst	2	3.8
Partial empty sella	2	3.8
Choroidal fissure cyst	2	3.8
Rathke kleft cyst	1	1.9
Focal infarct	1	1.9
Lacuner infarct	2	3.8
Hemosiderin residue	1	1.9

It was determined that EEG was performed on 205 (43.6%) patients who applied with the complaint of headache. Epileptic changes were determined in 7 (3.4%) patients, paroxysmal disorders were determined in 17 (8.3%) patients, and EEG was found to be normal in 181 (88.3%) patients.

Discussion

Headache is a frequent reason for admission to emergency and pediatric outpatient clinics in recent years.[9] The prevalence of headache increases with age, starting from the pre-school period, and is most common at 11-13 years of age.[10] It has also been reported in various studies conducted in our country that the incidence of headaches increases with age.[11,12] In our study, consistent with the literature, the mean age of the patients was 12.38±3.45 years, and it was observed that the incidence of headaches increased as the age increased.

Headache in children is usually frontal, bitemporal, or diffuse. It has been reported that occipital headache is described in 7-16% of pediatric patients admitted to the hospital due to headache.[13] Similarly, in our study, patients with headaches in the frontal, frontotemporal, and temporal regions were considerably higher.

In our study, the most common additional findings and complaints were phonophobia, photophobia, nausea and vomiting, and dizziness. In various studies in the literature, it has been reported that headache was accompanied by complaints such as phonophobia (30-86%), photophobia (68-75%), nausea and vomiting (39-45%), and dizziness (18-32%).[14-16] Also, additional complaints and findings were observed statistically significantly more in patients diagnosed with migraine than in other etiological causes. This may be because these findings are also used to diagnose migraine.

Primary headaches in children are mainly migraine and TTH. In a study by Zwart et al.[3], the frequency of migraine in children aged 13-15 years was 7%, the frequency of TTH was 18%, and in a study conducted by Kilic[11], the frequency of migraine was 51.1%, the frequency of TTH was found to be 32.3%. In a study conducted by Ozge et al.[17] the frequency of migraine was 10.4%, and the frequency of TTH was found to be 24.7%. Cluster headaches are very rare in childhood. In a multicenter study conducted in Italy, the frequency of cluster headaches was found to be 0.03% in patients under the age of 18.[18] Primary headache rates were found in our study consistent with the literature.

Sinusitis was the most common cause of secondary headache. In a study conducted by Kilic, it was reported that the most common causes of secondary headache were viral upper respiratory tract infection (n=17), sinusitis (n=10) and benign intracranial hypertension (n=8).[11] In one study, when patients who were previously diagnosed with sinusitis by any physician were re-evaluated, 42% were diagnosed with migraine.[19] In the study of Senbil et al.[20] conducted on pediatric patients, it was reported that 40% of migraine patients and 60% of TTH patients were diagnosed with sinusitis-related headaches. Nasal congestion and nasal discharge can be seen as a result of congestion in the nasal mucosa-related trigeminal autonomic reflex in migraine, and as a result, migraine patients may be misdiagnosed as having sinusitis.[19]

The prevalence of hypertension in children is between 1 and 5%. Hypertension is also one of the causes of headache.[21] Bigal et al.[22] reported a relationship between hypertension and migraine in their study. In another study, it was stated that there was no relationship between hypertension and any type of headache.[23] In our study, hypertension was determined in 6 patients. Headache from refractive error often becomes symptomatic after prolonged visual function.[8] In our study, it was observed that refractive error was detected in 14 patients after an ophthalmology outpatient examination, and headaches decreased after these patients wore glasses.

In our study, the neurological examinations of 8 patients were abnormal. Papilledema was found in six patients, and two patients had muscle strength loss. In all patients with papilledema in advanced examinations, increased intracranial pressure due to pseudotumor cerebri was detected, and medical treatment was started. One patient with muscle strength loss was diagnosed with familial hemiplegic migraine. The other patient was followed up in the pediatric metabolism department, previously had complaints of unilateral muscle weakness, was awaiting diagnosis, and was diagnosed with TTH as the cause of headache. In a study, it was reported that abnormal physical and neurological findings were detected in 17 patients, and the most common finding was papilledema (n=8).[11] We believe that an abnormal neurological examination definitely indicates an underlying pathology and that a detailed neurologic examination, including a fundoscopic examination, should be performed in every patient presenting with headache.

In our study, it was determined that all patients underwent routine blood analysis. Abnormal results were found in only 48 patients. Abnormal results were anemia, vitamin D deficiency, leukopenia, leukocytosis, polycythemia, vitamin B12 deficiency, and hypocalcemia. There are many studies in the literature showing the relationship between iron deficiency anemia, polycythemia, vitamin D deficiency, vitamin B12 deficiency, and headache.[24-26] It was determined that the patients were referred to the relevant units according to their abnormal results, but most of the patients did not come for control. It was not found whether they received any treatment for their abnormal test results, and if they did, whether there was an improvement in their headaches after the treatment. Therefore, prospective case-control studies are needed to have more information about the relationship between these disorders and headaches.

In the imaging guidelines for children with headaches published by the American Academy of Neurology, neuroimaging is not recommended in patients with a normal neurological examination.[27] In a meta-analysis of 3260 neuroimaging children presenting with headaches, 14.6% of neuroimaging was found to be abnormal. Of patients with abnormal neuroimaging, only 2.5% had a change in treatment plan.[28] In our study, brain MR was abnormal in 11.8% of patients, and most of these abnormalities were cystic lesions, which we thought were incidental. Our abnormal brain MR rate was consistent with the literature.

Routine use of EEG is not recommended in patients with suspected primary headache or without a history of seizures or confusion.[27] In the study of Ozek et al.[29] in which they examined recurrent headaches, it was reported that the EEG was found to be normal in 39.4% of the patients whose EEG was taken, while nonspecific findings were found in 32% of them. The frequency of EEG abnormalities in children presenting with headaches varies between 12% and 13.4% in some studies.[30,31] Abnormal EEG findings in children may not always indicate a pathological finding. However, it has been reported in patients who present with headaches and are diagnosed with epilepsy.[30,31] Benign occipital epilepsies from childhood may also present with migraine-like symptoms.[32] For these reasons, EEG can be considered a test that can be used according to the clinician's experience and preference. In our study, among the patients who underwent EEG, patients with paroxysmal disorders were not given treatment, while antiepileptic treatment was started in patients with epileptic changes, and headache complaints were decreased in all patients in the control examination.

The limitations of our study are that it is a single-center retrospective study. In addition, data on the treatment process and headache course of patients with abnormal laboratory test results were not available. Prospective and multicenter studies on this topic can provide more valuable results.

Conclusion

According to age groups, headache was most common in the 12-17 age group. The most common causes of headache were TTN and migraine, respectively. The most common secondary headache cause was sinusitis. We think that a good neurological examination, including a general physical examination and fundus examination, still has priority in detecting the causes of headaches. Routine blood tests, neuroimaging, and EEG are not necessary for every patient with a headache but can be used in patients who are deemed necessary by the clinician.

Disclosures

Ethics Committee Approval: Approval for the study was obtained from the Health Sciences University Hamidiye Scientific Research Ethics Committee (date: 26.06.2020, decision number: 9/24).

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