

Migraine and tension-type headache in children and adolescents a prospective cohort study

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Abstract

Objective: The present study aims to determine the frequency and characteristics of migraine and tension-type headache (TTH) in children and adolescents aged 10 to 18, and to evaluate the findings accompanying the headache and the factors increasing it.

Methods: Of 2576 students in total aged 10 to 18 from 17 schools in downtown Şemdinli and the villages of the county of Şemdinli 1614 students who filled out the questionnaire properly were included in the study and the characteristics of headaches were analyzed based on the International Classification of Headache Disorders (ICHD-3 beta) diagnostic criteria and the visual pain scale.

Results: One thousand four hundred and eighty three of the students expressed they had experienced headache at least once in their life, and 54.6% of these were female students. In the questionnaire, the headache was most frequently accompanied by sensitivity to sound, and the most frequent trigger was sound again. The most prevalent answer for the frequency of headache was '1 to 3 headache attacks a week' in all age groups. 94 students were diagnosed with migraine while 548 were diagnosed with TTH.

Conclusion: This questionnaire-based study found the prevalence of migraine as 6.3% and the prevalence of TTH as 40.1%, and revealed that headache was most prevalent in the age group of 10-12 and more common in females than in males. The present study aims to raise awareness among physicians and patients so that headaches will be diagnosed early which in turn will increase the quality of life and academic success of the patients.

Keywords: Childhood, headache, migraine, tension-type headache

INTRODUCTION

Headache is one of the most common reasons for visits to neurologists and comprises approximately 1% of all Emergency Room cases (1). Its prevalence varies from 37% to 51% in children aged 7 while it increases up to 57% to 82% in adolescents aged 15 (2). Being common among the pediatric population, migraine is a primary headache characterized by moderate-to-severe episodic headaches (1). At least one third of patients with migraine experience the onset of their headaches in childhood or adolescence (3). Its prevalence in pediatric population is approximately 7.7%, and while the prevalence is equal in both sexes in children below 10 years of age, migraine is more prevalent in females than in males after 11 years of age (3). Considering all age groups collectively, migraine is two or three times more prevalent in females than in males (4).

Transition from childhood to adulthood is a significant period for neurodevelopment, especially in terms of neurological disorders such as migraine. In this developmental period, the way migraine is manifested in the central nervous system may enable a better understanding of the migraine with the same pathophysiological mechanism in both children and adults (5). Nearly half of the pediatric patients with migraine suffer from headaches later in adulthood as well. Clinic-based baseline studies have shown that migraine can convert to tension-type headache (TTH), or vice versa, in children and adolescents, or headaches may disappear in one third of the patients (5).

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Characteristics of migraine in children and adolescents differ when compared to adults. Shorter attack durations and bilaterally or frontally located pain are characteristics independent of age and sex (5, 6). Migraine may be accompanied by additional findings such as depression, sleep disorders, allergy, asthma, and behavioral changes. Decreases in academic success and quality of life, reduced productivity, and suboptimal participation in various activities affect the physical and mental health of patients with migraine and cause severe disability (7, 8). Early diagnosis and effective treatment of headache may increase the quality of life and day-to-day activity of the patients. The present study aims to determine the frequency and characteristics of migraine and TTH in children and adolescents aged 10 to 18, and to evaluate the findings accompanying the headache and the factors increasing it.

METHODS

Planned by Şemdinli State Hospital's Neurology and Pediatrics Clinic, this study included a questionnaire investigating the demographics of the participants as well as the frequency and characteristics of the headaches. Required permissions were granted by Şemdinli National Education Directorate to distribute the questionnaire to the schools in downtown Şemdinli and its villages. Questionnaires were requested to be filled out under the supervision of teachers. Two thousand five hundred and seventy six students aged 10 to 18 from 17 schools took the questionnaire, and 962 questionnaires collected were excluded from the study because they were not filled out appropriately. Prevalence of headache and migraine in students taking the questionnaire was determined. The International Classification of Headache Disorders (ICHD-3 beta) diagnostic criteria were used for diagnosis of migraine

and TTH. The severity of pain was determined using the Visual Analogue Scale (VAS). Ethics committee approval received from Van Training and Research Hospital with decision number 2018/10 in 07.06.2018.

Statistical Analysis

Statistical analysis was performed with the help of Microsoft Office Excel program. For descriptive analysis, categorical data were expressed as frequency (n) and percentage (%), while continuous data were expressed as mean.

RESULTS

Of 2576 students taking the questionnaire, 1614 were included in the study. Seven hundred and sixty (47%) of the students included in the study were males while 854 (53%) were females. The age groups were 10-12, 13-14, 15-16 and 17-18 which had 676, 573, 228 and 137 students, respectively. One thousand four hundred and eighty three (91.8%) of the students expressed that they had suffered from headache at least once in their life, and 810 of these students were females while 673 were males. Majority of 131 patients who expressed that had never had headaches before were males from 10 to 14 years of age (Table 1, Figure 1).

Considering frequency of headache by age group, the most frequent answer for all age groups was 1 to 3 attacks a week (Table 2).

Considering the characteristics of headaches in students included in the study, 37.2% had bilateral headache, there was a slow onset of pain in 802 students, and 48.3% had compressive headache. Nine hundred and ninety students stated that

Figure 1. Percentage of headaches by age and gender

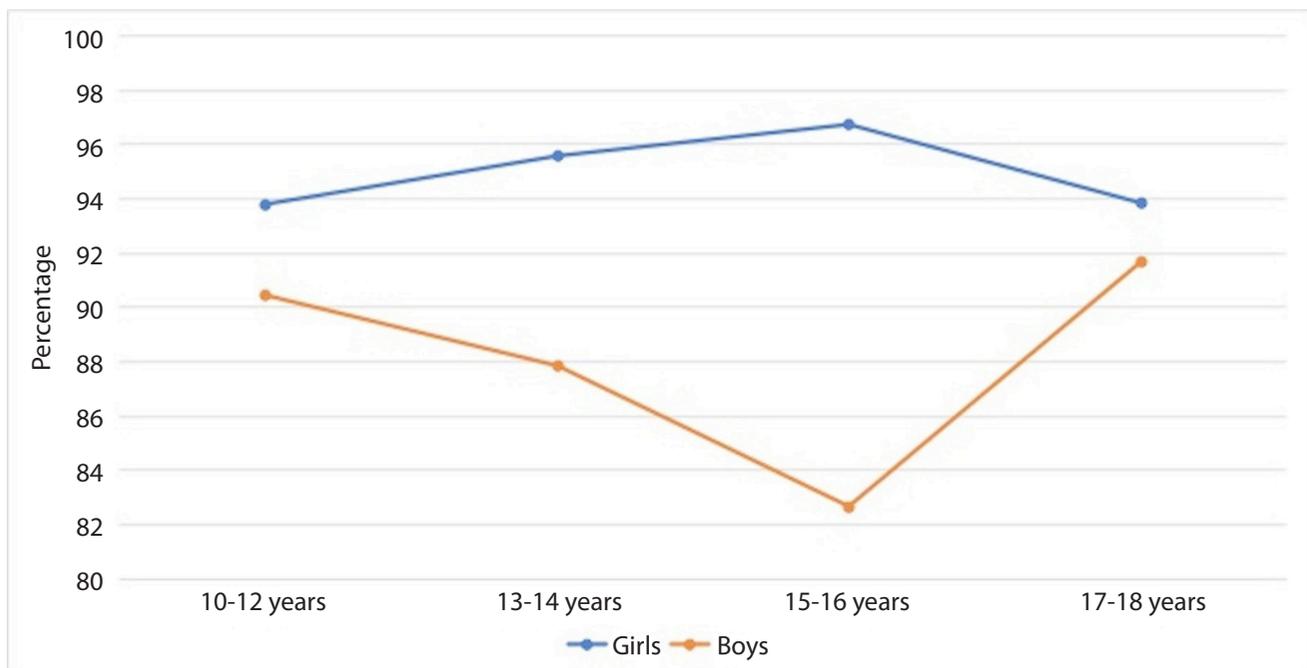


Table 1. Correlation between sex, age group and headache

Age	Headache				No headache			
	Female	%	Male	%	Female	%	Male	%
10-12	349	21.6	275	17	23	1.4	29	1.8
13-14	280	17.3	246	15.2	13	0.8	34	2.1
15-16	120	7.4	86	5.3	4	0.2	18	1.1
17-18	61	3.8	66	4.1	4	0.2	6	0.4
Total	810	50.2	673	41.7	44	2.7	87	5.4

Table 2. Frequency of headache by age group

Age	Headache		No headache	
	Female	Male	Female	Male
10-12	349	275	23	29
13-14	280	246	13	34
15-16	120	86	4	18
17-18	61	66	4	6
Total	810	673	44	87
%	50.2	41.7	2.7	5.4

the headache lasted less than 4 hours and the most common option chose for severity of pain was 6 in VAS (Table 3).

While headache was most frequently accompanied by sensitivity to sound (57.8%), 83 students reported no accompanying findings (Table 4, Figure 2).

Students taking the questionnaire expressed their headache was triggered by sound the most followed by stress (Table 5).

The number of students who had seen a doctor for headache was found to be 571. They chose 'sleeping' the most (60.5%) to relieve headache. Medication was the second most preferred relief method (56.3%) followed by massage (19%), and other options were preferred less but close to each other (Table 6).

One thousand three hundred and twenty three of the students included in the study stated that there was one other member of family suffering from headache. Five hundred and one of these students reported only their mothers had headaches, 120 reported only their fathers had headaches, and 121 only one of their siblings had headaches, while 185 students chose all of the three options.

There were 94 students, 50 of whom were females, diagnosed with migraine based on the ICHD-3 beta diagnostic criteria. Prevalence of migraine was estimated to be 6.3%. The most common duration of headache in 94 students was 4-12 hours, and 84 of them had a positive family history. Forty two of them had felt the need to see a doctor for headache, and chose sleeping as the first remedy for headache followed by medication.

There were 648 students diagnosed with TTH based on the ICHD-3 beta diagnostic criteria. For this type of headache with

Table 3. Headache characteristics

Headache characteristics	Number	%
Location		
Unilateral	269	18.1
Bilateral	552	37.2
Forehead	494	33.3
Back of neck	202	13.6
Temples	236	15.9
Eye area	507	34.2
Onset		
Slow	802	54.1
Rapid	681	45.9
Characteristics		
Sharp	382	25.7
Compressive	717	48.3
Throbbing	384	25.9
Duration		
Less than 4 hours	990	66.7
4-12 hours	316	21.3
12-24 hours	86	5.8
More than 24 hours	91	6.1
Severity		
2	110	7.4
4	275	18.5
6	454	30.6
8	374	25.2
10	270	18.2

a prevalence of 40.1%, sex distribution was 349 females and 299 males. Five hundred and seventy four students expressed at least one other member of their families had a complaint of headache.

DISCUSSION

Headache reduces the quality of life for both patients and their families by causing stress and disabilities in children and adolescents. Affecting all ethnic and socioeconomic groups, headache is seen in 60% of individuals from 2 to 18 years of age (2). The most common type of primary headaches is the TTH which usually causes much less disability. It is followed by migraine which is the most common cause of recurring headaches causing disability in childhood (9). Other primary

headaches are rarer about which there is only limited data (10). A 2009 study in Korea with school children found headache prevalence 8.7% for migraine, 13.7% for TTH, and 6.7% for other headaches (11). In the study by Jeong et al. where they evaluated the data from 2005 to 2016 about Korean children aged 3 to 18, the prevalence was 43% for migraine, 35% for TTH, and 22% other primary headaches (2). The said study found that the number of patients with headache in 2016 was 3 times the number in 2005 (2). A Swedish study examining 1371 patients reported that the prevalence of TTH in 2003 increased by 2.3 and the prevalence of migraine went up from 11% to 17% when compared to 1995. The study by Ozge et al. observed migraine the most in children aged 11, and the prevalence was 51.6% in females and 48.4% in males (12). Similarly, our study found that in the age group 10-18 children aged 10 to 12 constituted the subgroup with the

Table 4. Accompanying findings

Finding	Number	%
Nausea	368	24.8
Vomiting	217	14.6
Sensitivity to light	434	29.3
Sensitivity to sound	858	57.8
Sensitivity to physical activity	92	6.2
Sensitivity to smell	288	19.4
Loss of appetite	285	19.2
Weakness	479	32.3
Problems relating to eyesight	248	16.7
Numbness	151	10.2
No accompanying findings	83	5.6

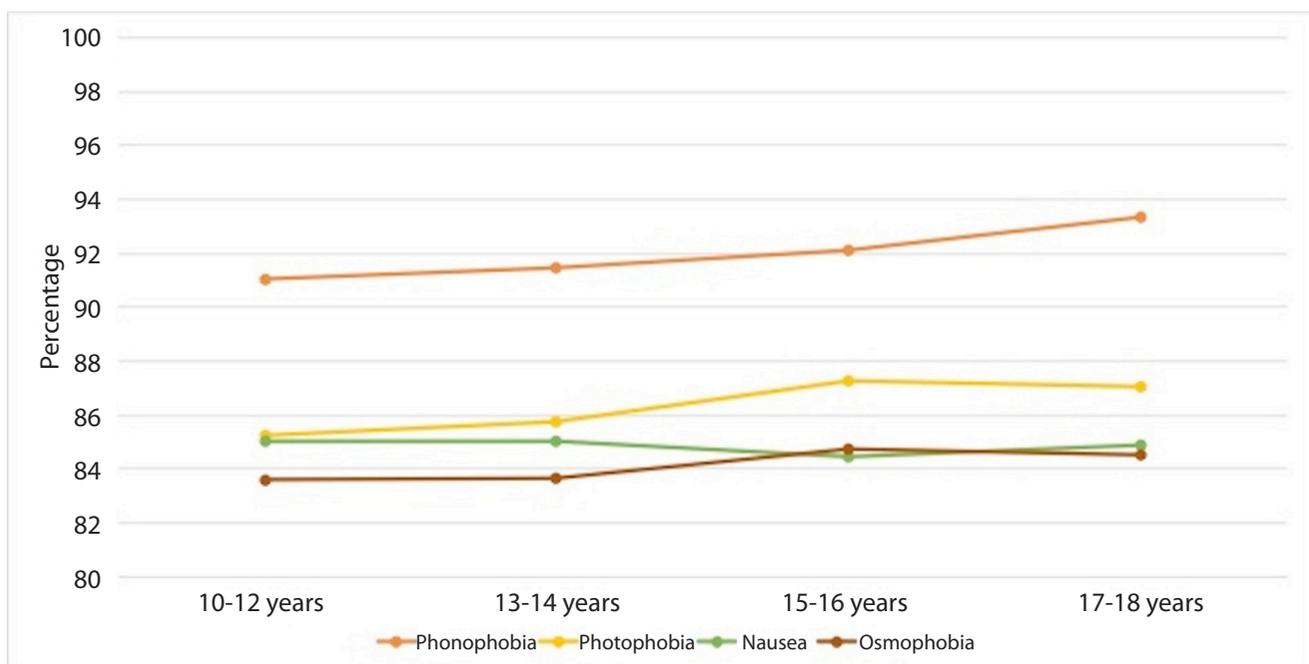
most complaints about headache, and the headache was more prevalent in females than in males. Due to the effects of ethnological, cultural and geographical features on headache and the methodological differences, prevalencies in studies on headache differ from study to study (2). The present study found the prevalence of migraine to be 6.3% and the prevalence of TTH to be 40.1% in our study group.

Table 5. Triggers of headache

Trigger	Number	%
No trigger	115	7.7
Hunger	264	17.8
Lack of sleep	512	34.5
Stress	621	41.9
Physical activity	105	7
Light	327	22
Sound	776	52.3
Food / drinks	115	7.7
Menstruation	38	2.6

Table 6. Methods to relieve headache

	Number	%
Medication	835	56.3
Sleeping	892	60.5
Doing sports	125	8.4
Watching TV	125	8.4
Reading a book	164	11
Massage	282	19
Listening to music	166	11.2

Figure 2. Rates of symptoms associated with headache by age

While the prevalence of headache is equal in both sexes before puberty, it is higher in females after menarche than in males. A study with pediatric patients aged 9 to 14 performed logistic regression analyses which showed that the risk of headache increased for females in the last two years before menarche compared to the general female population in the study who had not experienced menarche yet. On the contrary, intraindividual longitudinal analyses showed that the prevalence of headache increased after menarche. In their study, Aegidius et al. reported an inverse proportion between prevalence of TTH and migraine and the onset age of menarche, which they concluded could be associated with estrogen sensitivity (13).

Since brain development and myelination are ongoing active processes in children and adolescents, characteristics of headache differ in children and adults (14). Characteristics of migraine in children include lower prevalence of typical migraine characteristics and accompanying findings, shorter attack durations (2 hours vs. 4 hours minimum), and headache resembling TTH (often localized bilaterally, frontally or temporally). Tension-type headache, on the other hand, displays a more generalized localization and lasts for 30 minutes to 7 days (15). Our results are compatible with clinic-based data. In the present study, headache lasted less than 4 hours in 66.7% of the participants. The most common complaint was slow-onset and compressive pain. The pain was localized bilaterally by 37.2% and the focal points were eye and frontal areas. In the VAS, the most common severity of pain was 6 followed by 8.

One of the most distinctive characteristic of migraine distinguishing it from TTH and other primary headaches is sensitivity to external stimuli such as light and sound. Although there are many findings accompanying migraine such as osmophobia and allodynia, ICHD-3 beta criteria include only nausea and/or vomiting, photophobia, and phonophobia. Phonophobia is more prevalent in young females than in males, and the prevalence of photophobia was reported to be 7.8% among adolescents (5). In our subjects, headache was accompanied by photophobia by 57.8% and phonophobia by 29.3%. For an unclear reason, nausea and vomiting are more prevalent in children, and unlike adults, in adolescent males than in adolescent females (16). Neck stiffness, allodynia, vertigo, non-pulsatile tinnitus and sensitivity to motion are other common accompanying findings (15). The prevalence of osmophobia, one of the possible findings accompanying headache, is 33.4% among patients with pediatric migraine and 18.1% among patients with TTH (17). In our study, headache was accompanied by osmophobia in 19.4% of participants as well.

When evaluating headaches, headache and general medical history of the patient, and especially the family observation for young children who cannot express the findings clearly,

should be examined carefully. Since the age group of our subjects was 10-18, they were able to express their complaints clearly. Our study investigated the characteristics of headache in detail. The subjects had no history of conditions that may cause secondary headaches such as intracranial tumors, inflammatory diseases or other systemic diseases.

Headache is a multifactorial condition with genetic and neuropsychological features. According to family and twin studies, average genetic inheritance ratio of migraine with genetic components is 42% (18). The study by Seng et al. showed that children aged 11–17 living with a parent with migraine reported the greatest impact of migraine on children's global well-being, parent/child relationships, burden of daily help, and emotional impact (19). Of 1614 students included in our study, 742 expressed that at least one other family member, i.e. the mother, the father or a sibling, complained about headaches while 185 students stated that their mothers, fathers and siblings had the complaint of headache. Since headache is associated with behavioral and mood comorbidities such as depression, attention deficit, eating disorders, and obsessive compulsive disorder, the multimodal approach should be adopted to evaluate the patients (2).

Reflection of high expectations of the parents, stressors in school and social life or at home, increased consumption of coffee, alcohol and smoking in adolescents may cause or worsen headaches (20). Previous studies have shown that the frequency of headaches decreased in summer, whereas its incidence tended to increase in winter and fall due to school-related stress and the changes in the sleep pattern (21). Identifying the factors causing or increasing the headache and making necessary adjustments in one's daily life accordingly may play an important role in reducing the frequency and severity of headaches, increasing the quality of life and the academic success, and improving the adaptation to social life. Similarly, 41.9% of our study group expressed that stress increased their headache while 34.5% said that lack of sleep increased their headache. While sleeping was the most preferred remedy for headache with 60.5% followed by medication, non-pharmacological methods such as doing sports, watching TV, reading a book, massage, and listening to music were close to each other.

The present study has one limitation which is the data are based on the questionnaire results conducted in a single region. Thus, they may not represent the general population. Migraine and TTH were diagnosed based on the questionnaires filled out under the supervision of teachers. The study did not investigate other primary headaches. Since it is a prospective study, a neurologist explained the parts of the questionnaire the participants had difficulty understanding fully. Unlike many other studies, the data are not restricted to selected patients diagnosed in specialized centers, and they represent the pediatric patients aged 10 to 18 who are not treated regularly for headache, which can explain

why the present study found an extremely high frequency of headache attacks (1 to 3 attacks a week maximum) and severity of headache (VAS 6 maximum). Since our subjects were aged 10 to 18, they were able to express their complaints clearly, thus we did not refer to parents' observations.

This questionnaire-based study found the prevalence of migraine as 6.3% and the prevalence of TTH as 40.1%, and revealed, in accordance with the literature, that headache was most prevalent in the age group of 10-12 and more common in females than in males. Only 38.5% of the students suffering from headache had seen a doctor. Commonly seen pediatric migraine and TTHs may cause disabilities or reduced academic success. Further studies may contribute to the understanding of the effects of migraine's fundamental mechanism and the sociocultural factors on headache, and lead to the development of diagnostic criteria and symptomatic treatment options in the pediatric population. The present study aims to raise awareness among physicians and patients so that headaches will be diagnosed early which in turn will increase the quality of life and academic success of the patients. Early diagnosis, changing the lifestyles, and administering the effective treatment in children and adolescents with headache may both mitigate the risk of chronic migraine and increase their quality of life and academic success.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Van Training and Research Hospital (decision number: 2018/10, date: 07.06.2018.).

Informed Consent: Verbal informed consent was obtained from patients and the parents of the patients who participated in this study.

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REFERENCES

- Orr SL, Kabbouche MA, O'Brien HL, Kacperski J, Powers SW, Hershey AD. Paediatric migraine: evidence-based management and future directions. *Nat Rev Neurol* 2018; 14: 515-527. [\[CrossRef\]](#)
- Jeong YJ, Lee YT, Lee IG, Han JY. Primary headaches in children and adolescents -experiences at a single headache center in Korea. *BMC Neurology* 2018; 18: 70. [\[CrossRef\]](#)
- Abu-Arafeh I, Razak S, Sivaraman B, Graham C. Prevalence of headache and migraine in children and adolescents: a systematic review of population-based studies. *Dev Med Child Neurol* 2010; 52: 1088-1097.
- Merikangas KR. Contributions of epidemiology to our understanding of migraine. *Headache* 2013; 53: 230-246. [\[CrossRef\]](#)
- Wilcox SL, Ludwick AM, Lebel A, Borsook D. Age- and sex-related differences in the presentation of paediatric migraine: A retrospective cohort study. *Cephalalgia* 2018; 38: 1107-1118. [\[CrossRef\]](#)
- Headache Classification Committee of the International Headache Society (IHS). The International Classification of Headache Disorders, 3rd edition (beta version). *Cephalalgia* 2013; 33: 629-808. [\[CrossRef\]](#)
- Wöber-Bingöl C. Epidemiology of migraine and headache in children and adolescents. *Curr Pain Headache Rep* 2013; 17: 341.
- Adikaibe BE, Onyekonwu C, Ijoma U, et al. Primary headache among secondary school children: Prevalence, pattern and other characteristics in Enugu, South East Nigeria. *Neurol Sci Neurophysiol* 2017; 34: 86-95. [\[CrossRef\]](#)
- Blume HK. Childhood headache: a brief review. *Pediatr Ann* 2017; 46: 155-165.
- Hershey AD. Pediatric headache: update on recent research. *Headache* 2012; 52: 327-332. [\[CrossRef\]](#)
- Rho YI, Chung HJ, Lee KH, et al. Prevalence and clinical characteristics of primary headaches among school children in South Korea: a nationwide survey. *Headache* 2012; 52: 592-599. [\[CrossRef\]](#)
- Ozge A, Buğdaycı R, Saşmaz T, et al. The linear trend of headache prevalence and some headache features in school children. *Agri* 2007; 19: 20-32.
- Aegidius KL, Zwart JA, Hagen K, Dyb G, Holmen TL, Stovner LJ. Increased headache prevalence in female adolescents and adult women with early menarche. The Head-HUNT Studies. *Eur J Neurol* 2011; 18: 321-328. [\[CrossRef\]](#)
- Guidetti V, Faedda N. From 0° to 18°: how headache changes over time. *Neurol Sci* 2017; 38: 103-106. [\[CrossRef\]](#)
- Dao JM, Qubty W. Headache diagnosis in children and adolescents. *Curr Pain Headache Rep* 2018; 22: 17. [\[CrossRef\]](#)
- Eidlitz-Markus T, Haimi-Cohen Y, Zeharia A. Vomiting and migraine-related clinical parameters in pediatric migraine. *Headache* 2017; 57: 899-907.
- Zanchin G, Fuccaro M, Battistella P, Ermani M, Mainardi F, Maggioni F. A lost track in ICHD 3 beta: A comprehensive review on osmophobia. *Cephalalgia* 2016; 38: 340-352. [\[CrossRef\]](#)
- Polderman TJ, Benyamin B, de Leeuw CA, et al. Meta-analysis of the heritability of human traits based on fifty years of twin studies. *Nat Genet* 2015; 47: 702-709. [\[CrossRef\]](#)
- Seng EK, Mauser ED, Marzouk M, Patel ZS, Rosen N, Buse DC. When mom has migraine: an observational study of the impact of parental migraine on adolescent children. *Headache* 2019; 59: 224-234.
- Albers L, Kries VR, Heinen F, Straube A. Headache in school children: is the prevalence increasing? *Curr Pain Headache Rep* 2015; 19: 4.
- Kedia S, Ginde AA, Grubenhoff JA, Kempe A, Hershey AD, Powers SW. Monthly variation of United States pediatric headache emergency department visits. *Cephalalgia* 2014; 34: 473-478. [\[CrossRef\]](#)