

Ocular findings in children with headaches

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ABSTRACT

BACKGROUND: Children commonly suffer from headaches, and they often are presented to an ophthalmologist for a suspected underlying ocular problem. The purpose of the study was to identify ophthalmological disorders that could potentially cause headaches and determine the prevalence of ophthalmological disorders among children with headaches.

MATERIAL AND METHODS: All children included in the study were referred to the ophthalmologist by the pediatrician or pediatric neurologist due to the any sort of headache and every child underwent complete ophthalmological examination. A total of 155 patients were included in this study. The children were from 4 to 19 years old (mean 11.5 years; median 12 years).

RESULTS: A significant ophthalmologic disorder was found in 6.4% of children with headaches. The most common ophthalmologic disorder in the study was refractive error in 4.5 %. 1.3% of patients reported painful eye movements at the examination, and 0.6% had elevated optic discs nasally. Most children in our study who were referred to the ophthalmologist by their pediatrician due to the headache had a normal eye examination.

CONCLUSIONS: Pediatricians should probably first consider more prevalent underlying reasons for the headache as are migraine, tension-type headache and viral illness, and also more severe reasons as are intracranial processes. In addition to that, a full ophthalmologic examination should be available.

KEY WORDS: headache; children; refractive errors; migraine; ophthalmology

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INTRODUCTION

Headaches are widespread in children and young people and may cause significant dysfunction for the child and the entire family. Children experience it at one point in childhood in roughly 50% [1]. Chronic or recurrent headache is common in children, occurring in around 40% of children by 7 years of age and 75% of children by 15 years [2]. Headaches are slightly more common in young boys than girls under 7 years of age, but around the time of puberty, the ratio begins to change. The prevalence of headaches increases with age in both genders, but the prevalence of headaches increases much more sharply in girls until it reaches adult levels in late adolescence; then, the prevalence of headaches in women is significantly higher than in men [3].

Headache is a symptom of an underlying problem. Headaches in children may be due to primary or secondary etiologies. Common primary headache types include migraine or tension-type headache [4–6]. Migraine is the most common cause of intermittent headaches in children. However, it is often challenging to diagnose migraine in younger children, who have a limited ability to describe the unusual experiences of the pain and accompanying aura [2]. The prevalence of migraine over periods between 6 months and a lifetime is 7.7% [1].

The prevalence of non-migrainous headaches is 10–25% in childhood and adolescence. The distinction between tension-type headaches and migraine, which are one of the most common primary headaches, can be difficult [7]. Infrequent episodic ten-

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sion-type headache has minimal effects on individuals, and these individuals rarely use healthcare services, whereas chronic tension-type headache (CTTH) causes considerable disability and are often difficult to treat [5, 8]. One survey of 7900 children in Taiwan found the prevalence of CTTH to be 1.0% in adolescents aged 12–14 [4]. The prevalence of tension-type headaches increases with age [7, 9].

Secondary headache causes are broad and include infections, trauma, vascular disorders, intracranial masses, substance use/withdrawal, and psychiatric conditions [6]. Acute viral illness with fever is the most common cause of pediatric headache evaluated in the emergency department [3, 10]. Headaches are often associated with other physical and also emotional complaints [11].

Children with headaches often come for evaluation by an ophthalmologist. That is usually because pediatricians or parents suspect an ophthalmologic disorder as a reason for a headache. The most common ocular causes are refractive error, impairment of accommodation or convergence, ocular surface disease, acute glaucoma, optic neuritis, scleritis, uveitis, and orbital conditions [12–17]. Headache may also be a first sign of a severe disorder such as elevated intracranial pressure from an intracranial process or hydrocephalus. Ophthalmologic examination can be helpful in some of these cases [12–14, 18].

The purpose of the study was to analyse a group of children referred to the ophthalmologist primarily due to headaches. We were interested in ophthalmological disorders that could potentially cause or explain headaches in order to determine the prevalence of ophthalmological disorders among children with headaches.

MATERIAL AND METHODS

Children referred to the ophthalmologist by their pediatrician primarily due to the headache were included in this retrospective study. Children were examined by their pediatrician and some of them also by pediatric neurologist. In Slovenia, mostly due to the logistical reasons, children with headache were commonly first referred to the ophthalmologist by their pediatrician and then later to the neurologist if needed.

Children were referred between April 2022 and April 2023 to the ophthalmologist office in Community Health Centre Ljubljana. Children were examined by one ophthalmologist (A.K.).

Children included in the study were referred by the pediatrician and some of them by pediatric neurologist due to the any sort of headache. Patients aged 19 years and older were excluded from the study. Children in the active treatment process and regularly followed by the ophthalmologist due to other reasons were also excluded from the study.

Every child underwent a complete ophthalmological examination that included visual acuity testing, both external and slit-lamp examination, ocular motility testing and pupil exam, fundus examination with dilated pupil, and retinoscopy under cycloplegia. Colour vision was tested by Ishihara plates. Visual field testing was performed where possible according to the child's cooperation and age.

We obtained patient's information from charts. This information included age of the patient and patient's gender, characteristics of the headache, family history of migraine and also patient's general medical and ocular history. Ophthalmologic examination findings and prescribed treatment data were collected. Primary outcome was prevalence of one or more findings that might indicate an ocular cause of headache, including glaucoma, uveitis, optic disc swelling, or possible asthenopia from strabismus or refractive issues or any other ophthalmological findings that could explain headache.

The study was approved by the Ethics Committee of the Community Health Centre Ljubljana (No. 852-1/2023-3).

RESULTS

We included 155 children in the study (62 male and 93 female). The children were from 4 to 19 years old (mean 11.5 years; median 12 years). The duration of the headache was, on average, 1.1 years (ranging from 4 days to 7 years).

A total of 26 patients (16.8%) had previously been prescribed glasses. Among those who had previously been prescribed glasses 2 had anisometropia, 4 had hypermetropia above 1 diopter (D), ranging from +1.00 D to +8.75 D in spherical equivalent (SE), and 4 had myopia above 1 D, ranging from –1.00 D to –3.00 D in SE. All other children with previously prescribed glasses had a refractive error under 1 D in SE. All children had corrected visual acuity logMAR 0.00 on both eyes, except in one child with anisometropia, where visual acuity on the better-seeing eye was logMAR 0.00 and on the other eye, it was logMAR 0.30.

New or altered spectacle correction for 1 or more D SE was prescribed in 7 patients (4.5%), and among these, 3 had blurred vision complaints. In two children, newly prescribed glasses had SE in one child, +5.25 D in the right eye and +6.25 D in the left eye, and in another child, +3.00 D in the right eye and +3.25 D in the left eye. All other children had lower prescribed SE, varying from -2.25 D to +2.25 D SE. Among them, only one child had myopia, and the other had hypermetropia. All children had corrected visual acuity logMAR 0.00. Refraction was either unremarkable or not significantly changed (under 1 D in SE) from previously prescribed glasses in 148 patients (95.5%).

Nine patients (6%) also had other ophthalmological complaints besides headaches. Among those, 2 reported diplopia, 3 noted visual field alterations, 2 had photophobia, one saw white dots in the visual field, and one saw everything brighter. Diplopia and visual field alterations were not confirmed during the examination. Headache was associated with visual work (e.g., reading, doing homework, or screen use) in 2 patients (1.3%). Nineteen (12.3%) reported a new onset of blurred vision.

Two patients (1.3%) reported painful eye movements at the examination, and one (0.6%) had elevated optic discs nasally. Otherwise, no other ophthalmologic disorders were identified on examination. Overall, significant ophthalmologic disorders were found at the ophthalmological examination in 6.4% of children with headaches, including refractive errors, painful eye movements, and elevated optic discs nasally.

In 9 children, the headache was related to coronavirus disease (COVID-19). Twelve pediatricians suspected or confirmed migraine. Four had tension-type headaches, four had headaches and vertigo, 11 had headaches and nausea/vomiting, four had night headaches, including awakening from sleep because of headaches, and three had headaches associated with physical strain. One child had DiGeorge syndrome. Fifteen patients (9.7%) had a positive family history of migraine.

DISCUSSION

Sixty percent of children and teenagers with headaches in the study were female, and the median age was 12 years, similarly as expected from the literature [2, 3]. In the study, a significant ophthalmologic disorder was found in 6.4% of children with headaches. The most common ophthalmologic

disorder in the study was refractive error, which was found in 4.5% of children. In other studies, refractive error among children with headaches was found in 1.7% to 27.2% [18–22].

The association between headache and refractive error in children is unclear. Some studies report that refractive error is usually not the reason for the headache [23]. Although headaches are associated with refractive errors, they are described in the International Headache Society's (IHS) classification system. It is described as a headache caused by ocular refractive error(s), generally symptomatic after prolonged visual tasks. Further it is stressed that uncorrected refractive errors may cause headaches but their importance is widely overestimated [16]. Temporal association of headaches with visual tasks was noted in only 2 patients in the presented study.

On the other hand, in a study by Christopher et al. [24], almost two-thirds of children had headaches associated with refractive errors. The authors believe their findings probably reflect the selection bias inherent to their patient population. Similarly, a high portion of the headaches related with refractive errors was found in a study by Das et al. [25]. In their study, children were recruited from the hospital ophthalmology outpatient department, and children with headaches of known etiology were excluded. So, selective recruitment could also impact the high prevalence of refractive errors among children with headache complaints.

In the study by Roth et al. [18] authors hypothesized that headaches improve no matter if the refractive error on their glasses is changed or not, their data also supported this hypothesis. They concluded that it may be more productive for primary care doctors to first look for more prevalent reasons for headache as are migraine or viral infection, and also more severe reasons as are intracranial processes [18]. Also the prevalence of common forms of headache such as migraine and tension-type headache in our study was higher than any significant ophthalmologic disorder, including refractive errors, probably indicates that neurological examination should be high on pediatrician investigation list. Additionally, Roth et al. concluded, that in children with any eye or vision problems, a full ophthalmologic assessment should be done [18].

Another study concluded that ophthalmic referral is likely to have a relatively low yield for the detection of treatable eye pathology in eyestrain symptoms. Also, most children with refractive error, amblyopia, or strabismus were eyestrain-free. In

their study, 78.7% of children with refractive errors and most children with amblyopia ($n = 17$, 68%) and strabismus ($n = 22$, 58%) were asymptomatic of eyestrain (23). Similarly, in our study, only 3 of 7 children (43%) with new or altered spectacle correction prescribed had blurred vision complaints.

On the contrary, although ophthalmologists should ensure that a child with a headache receives a thorough evaluation, including, but not limited to, a complete ophthalmologic evaluation, some studies emphasized the meaning of the ophthalmic evaluation, which includes proper refraction assessment as an essential step in identifying a treatable headache etiology [19, 24, 25]. Furthermore, they conclude that children without visual difficulty should be equally evaluated, as children with headaches and uncorrected ametropia do not always have vision complaints. In the study by Dotan et al., 10/16 of children with uncorrected refractive errors did not complain of any visual difficulty [19]. Similarly, the child with the highest newly prescribed refractive error in our study did not complain of any vision problems.

Other ophthalmological findings were painful eye movements in two children and one elevated optic disc nasally in one child. Those children were sent for further investigations, and the final findings were not available until the end of the study. Some patients reported awakening from sleep because of a headache or headache with vomiting and headache associated with straining, which are considered red flags [3, 9, 26]. These should probably be first evaluated by a pediatric neurologist who would consider neuroimaging to rule out an intracranial process [3].

In our clinical experience in Slovenia, mostly due to logistical reasons and probably faster access to the ophthalmologist, many children with headaches are first referred to the ophthalmologist by their pediatrician to exclude potential ophthalmological reasons for headaches and to search for signs of more severe reasons as are intracranial processes. The ophthalmologic examination may be helpful in some of these cases. However, as found in this study, ophthalmological examinations often do not find the reasons for headaches, which may give parents and pediatricians false relief and postpone other necessary exams and procedures. It is also essential to add that not all children with elevated intracranial pressure develop papilledema. Anatomic studies suggest that the subarachnoid space surrounding the optic nerves is a compartment different from

the rest of the intracranial subarachnoid space. These separate compartments may explain why not all children with elevated intracranial pressure develop papilledema and why papilledema may persist even in the setting of a functional ventriculoperitoneal shunt [27].

Common primary headache types, including migraine and tension-type headaches, were also prevalent in the presented study. Migraine or tension-type headaches were suspected or confirmed in 10% of cases. According to the literature, a family history of migraine is obtained in up to 80% of children who have migraine. A family history of motion and travel sickness is also common [2]. A family history of migraine was documented in almost 10% of children with headaches in the presented study.

The limitations of our study are that, based on its retrospective nature, we did not evaluate all psychosocial factors that may have contributed to presenting complaints. We did not formally collect data on the intensity and location of the headache in this relatively small clinical sample. Finally, we do not have long-term follow-up data to assess the progression or resolution of each child's headache.

CONCLUSION

Occasionally, a treatable ocular condition, which may be related to the headache, or a sign of intracranial pathology may be found, so an ophthalmologic examination, including cycloplegic refraction, is indicated in children with headaches. However, most children in our study were referred to the ophthalmologist by their pediatrician due to headaches and had normal eye examinations. Based on these findings, we can conclude that primary care pediatricians should probably first consider more prevalent underlying reasons for the headache, such as migraine, tension-type headache, and viral illness, and more severe reasons, such as intracranial processes. In addition to that, a complete ophthalmologic examination should be available.

Conflict of interests

The author report no competing interests.

Ethics statement

The study was approved by the Ethics Committee of the Community Health Centre Ljubljana (No. 852-1/2023-3).

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