Austin Journal of Clinical Ophthalmology

Austin Publishing Group

Open Access
Full Text Article

Research Article

The Correlation between Refractive Errors and Headache in the Young Adults

Fereshteh Abolbashari[1], Seyed Mahdi Ahmadi Hosseini[1]*, Abbas AliYekta[1,2] and Mahdi Khabazkhoob[3]

[1]Refractive Errors Research Center, School of Paramedical Sciences, Mashhad University of Medical Sciences, Iran
[2]Department of Optometry, School of Paramedical Sciences, Mashhad University of Medical Sciences, Iran
[3]Noor Ophthalmology Research Center, Iran

***Corresponding author:** Seyed Mahdi Ahmadi Hosseini, Refractive Errors Research Center, School of Paramedical Sciences, Mashhad University of Medical Sciences, Mashhad, Iran

Received: February 20, 2014; **Accepted:** February 24, 2014; **Published:** March 03, 2014

Abstract

Purpose: To compare the prevalence of refractive errors in the young adults with headache complaints and a control group.

Methods: In this prospective cross sectional study 74 patients with headache and 156 controls were evaluated. All participants underwent a comprehensive ophthalmic examination. Retinoscopy was performed for all subjects without application of cycloplegia. Subjects were classified in to 3 groups according to spherical (S) component of refraction: myopia (S ≤ -0.50D), emmetropia (-0.50 <S<+0.50 D), and hyperopia (S≥+0.50 D). Astigmatism was defined as the cylinder ≤ -0.50D. Headache complaints were measured using a questionnaire. The following parameters were noted for all participants: refractive errors, near point of accommodation (NPA) and near point of convergence (NPC). Multiple logistic regression analysis, Chi square test and independent Student t-test were used for statistical analysis.

Results: The prevalence of total refractive errors (p = 0.10), myopia (p = 0.89), hyperopia (p = 0.32) and astigmatism (p=0.09)were not significantly different between headache and control group. There were non-significant correlations between severity of refractive errors and headache (p>0.05) and also between subgroups of astigmatism and headache (p=0.39). The mean NPA and NPC were 9.7±1.53 cm and 9.2±3.3 cm in headache and 10.5±1.72 cm and 7.9±2.9 cm in normal, respectively. Statistical analysis demonstrated statistically significant difference for both NPA (p=0.01) and NPC (p=0.03) between 2 studied groups.

Conclusion: Based on our findings in this study, it is concluded that the prevalence of various types of refractive errors (myopia, hyperopia and astigmatism) in headache group is not significantly different from normal subjects. In addition, although the NPC in both studied groups was normal, orthoptic exercises that improve the convergence might be beneficial in patients with headache complaints.

Keywords: Refractive Error; Myopia; Hyperopia; Astigmatism; Headache.

Introduction

In general population, headache and refractive errors are common health problems. The prevalence of refractive errors (RE) in the general population was reported to be from 13 to 80% based on variety of geographic areas and age groups [1-3]. On the other hand, the incidence of sporadic headache and chronic primary headaches was 40% and 15% in developed countries [4]. Consequently headache could be considered as an important source of health complaints.

It is obvious that the young adult plays a vital role in economical and social aspects of the society. So any problem such as headache that influences their productivity and their quality of life may have serious impact on the society.

Some ocular disease such as acute glaucoma, optic neuritis has been reported to be associated with headache [5]. Although, some studies reported the higher prevalence of headache in subjects with binocular vision anomalies and uncorrected refractive errors, not all the studies consistent with this theory [6,7].

According to the International Headache Society (HIS), the criteria for the headache related to refractive errors include: (1) uncorrected refractive errors or miscorrection of refractive errors; (2) mild pain in frontal lobe as well as in eyes; (3) pain that is relieved by resting but get worse by doing visual tasks at the distance or angle for a long time when visual acuity is impaired. However, it should be noted that the attribution of headache in visual problem is usually overestimated [8].

High prevalence of the headache, its serious consequences and ambiguous role of refractive errors in headache occurrence led us to compare the prevalence of RE in the young adults with headache complaints and a control group.

Methodology

In this prospective cross-sectional study, 74 students with headache (age range from 18-27 years) and 156 normal students of Mashhad university of Medical sciences (MUMS) (age range from 18-38 years) were examined. This study got the approval from human

Citation: Abolbashari F, Hosseini SMA, AliYekta A, Khabazkhoob M. The Correlation between Refractive Errors and Headache in the Young Adults. Austin J Clin Ophthalmol. 2014;1(3): 1014.

ethics committee of MUMs. Informed consent was obtained from all participants after explanation of the study's procedures. All the investigations were conducted according to the tenets of Declaration of Helsinki.

In the first step, an expert examiner interviewed subjects for the demographic data (age and gender), incidence and characteristics of the headache. Based on the current HIS diagnostic criteria, questions were organized in order to identify the headache associated with refractive errors (HARE). Subjects with other types of headache were excluded. The Cohen's kappa in 30 subjects was 77% [9] that verified inter-observer reliability.

Each subject was first asked if he/she usually suffered from headaches. If the response was negative, the subject was considered as control group. On the other hand, if the reply was positive, that participant was considered as headache group. The subjects in headache group were then asked about the quality of headache (steady, pulsating, sharp, dull, deep or shallow), intensity of the headache (severe, moderate, mild), location (generalized , localized, frontal, brow, around eyes, temporal, unilateral , bilateral), origin and onset of the headache (days, weeks, months, sudden, gradual, on waking, end of the day), headache association (reading, TV, work, sewing, stress, movement), periodicity (frequent, regular, daily, occasional, irregular), duration of the headache (transient, persistent, short, prolonged), the way of preventing the headache (refraining from activity, medication, sleep, rest), effect of the headache on activity (cessation, impairment, annoyance).

All subjects were asked about the medical history, any previous ocular diseases or surgeries and use of medications.

Then, all participants were underwent ophthalmic examinations including best corrected visual acuity with a Snellen chart at 6 m, retinoscopy (without application of cycloplegia) and slit-lamp biomicroscopy by an examiner unaware of the interview results. To evaluate binocular visual anomalies following tests were also carried out: alternating cover test (distance and near), near point of accommodation, near point of convergence and TNO test.

Refractive errors of both eyes were estimated using theretinoscopy and then refined with subjective refraction. All measurements were performed by an expert optometrist with use of negative cylinders. The right eye was always measured first.

Although low degree of ammetropia is rather insignificant for optical purposes, this was integrated in this study as it may play an important role in incidence of headache [10].

Subjects were classified in to 3 groups according to the spherical (S) component of refraction: myopia (S ≤ -0.50D), emmetropia (-0.50 <S<+0.50 D), and hyperopia (S≥+0.50 D). Astigmatism was defined as the cylinder ≤ -0.50D.It should be mentioned that we included participants who were uncorrected or did not often use their corrections (by this we meant subjects who did not use their spectacles regularly).

Myopia was classified into mild (−0.50 to −3.0 D), moderate (−3.0 to −6.0 D), and severe (>−6.0 D) subgroups. Patients with bilateral myopia were classified according to the more myopic eye. Hyperopia was classified into mild (+0.50 to +3.0 D), moderate (+3.0 to +6.0 D), and severe (>+6.0 D) subgroups. Patients with bilateral hyperopia were classified according to the more hyperopic eye.

Subjects with astigmatism were classified in to 3 groups based on the axis of corneal astigmatism: with the rule (corneal meridian of the least refractive power lies between 160 and 20 degrees), against the rule (corneal meridian of the least refractive power lies between 70 and 110 degrees), and oblique astigmatism (corneal meridian of the least refractive power lies between 20 and 70 degrees or between 110 and 160 degrees).

The exclusion criteria for all participants were suppression, neurological or internal diseases that cause headache, migraine headache, binocular visual anomalies and ocular diseases identified by the HIS as a cause of ocular pain or headache. The following parameters were noted for all participants: refractive errors, NPA and NPC.

SPSS version 18.0 was used for the statistical analysis. In order to compare the relative risk of the groups for categorical variables, estimated odds ratio and 95% confidence intervals were calculated. To investigate the association between headache complaints and severity of refractive errors, the Chi square test was used. Independent Student t-test was employed to compare the refractive errors between headache group and subjects without headache. A p value of <0.05 was considered statistically significant.

Results

Of the total participants, 74 subjects were in headache and 156 subjects recruited as control normal group. This study included 18 male and 56 female in headache group and 36 male and 120 female in group without headache. Mean age of participants was 21.02±1.86 years in headache group and 21.33±2.91 years in group without headache .Two studied groups were age matched (p=0.56).

Figure 1 indicated the percentage of different types of refractive errors in headache and control groups. The prevalence of total refractive errors was higher in participants with headache than in controls, but the difference was insignificant (p = 0.10). The prevalence of the myopia in headache group was approximately the same as

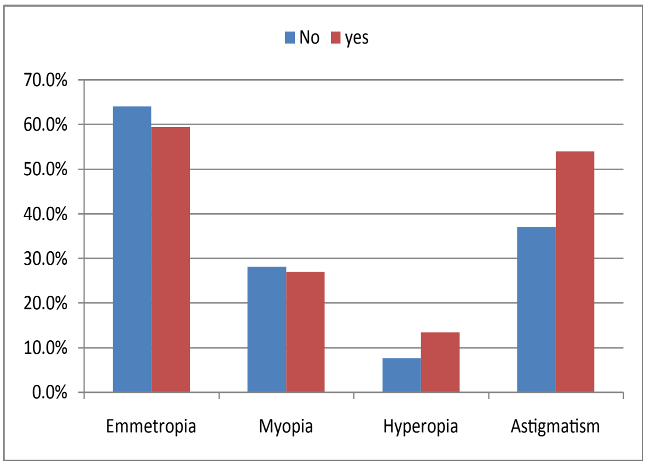

Figure 1: The percentage of different types of refractive errors in headache and control groups.
No: control group, Yes: headache group.

Table 1: Comparison of the prevalence of refractive errors between the headache and the control groups.

Parameters	Number of patients		p-value	Odds ratio	95% Confidence interval
	Headache group (n = 74)	Normal group (n = 156)			
Myopia	20	44	0.89	0.94	0.39-2.27
Hyperopia	10	12	0.32	1.875	0.533-6.59
Astigmatism	40	58	0.07	1.98	0.899-4.4
Total refractive error	25	40	0.10	1.97	0.87-4.49

Table 2: Classification of different types of refractive errors in headache and control groups according to the severity.

	Number of patients (%)								
	Myopia			Hyperopia			Astigmatism		
	Mild	Mod	Sev	Mild	Mod	Sev	With	Against	Oblique
Headache group	10 (20.8%)	10 (62.5%)	0	10 (45.4%)	0	0	16 (40%)	14 (33.34%)	10 (62.5%)
Normal group	38 (79.2%)	6 (37.5%)	0	12 (54.6%)	0	0	24 (60%)	28 (66.66%)	6 (37.5%)

Mod: moderate, Sev: sever, With: with the rule, Against: against the rule

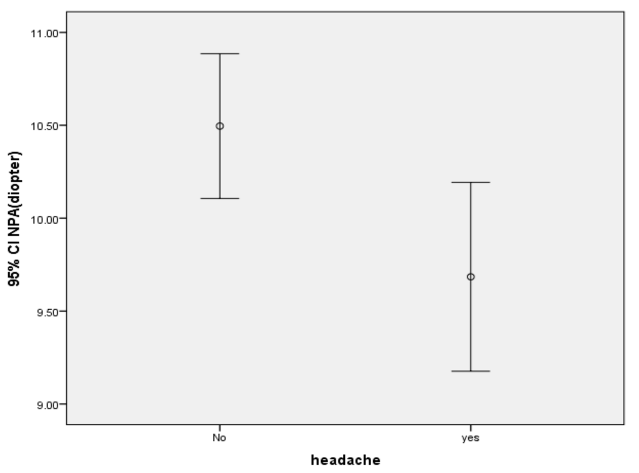

Figure 2: The value of near point of accommodation (NPA) in headache and control groups.

normal group (p = 0.89).However, hyperopia was more prevalent in headache group compared to normal controls (p = 0.32). But the relative risk of these 2 types of refractive error were not significantly different between headache and normal control group. Astigmatism was insignificantly more prevalent in headache group compared to the control group (p=0.09).Prevalence of different types of refractive errors (myopia, hypropia and astigmatism) for headache and normal control groups are summarized in Table 1.

Table 2 represents the classification of refractive errors in both groups according to the severity. Chi square test showed non-significant correlation between severity of refractive errors and headache (p>0.05) and also between subgroups of astigmatism and headache (p=0.39).

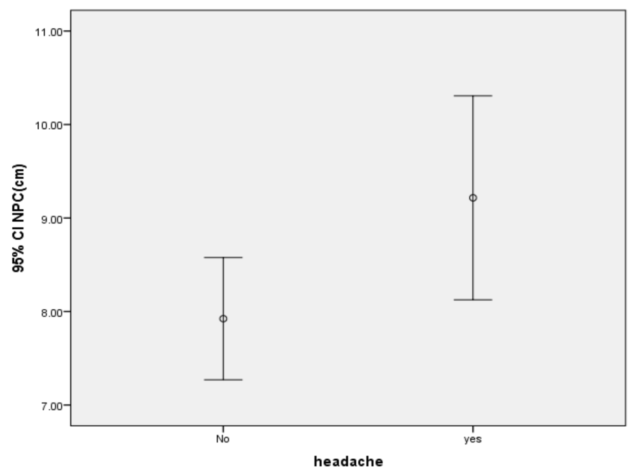

Figure 3: The value of near point of convergence (NPC) in headache and control groups.

The mean NPA in headache and normal group was 9.7±1.53 cm and 10.5±1.72 cm, respectively (Figure 2). Statistical analysis demonstrated a statistically significant difference in NPA between 2 groups (p=0.01). A statistical significant difference in NPC was also found between normal and headache group (p=0.03). The mean NPC was 9.2±3.3 cm in headache and 7.9±2.9 cm in normal group (Figure 3).

Discussion

Presentation of patients with headache in optometry clinic is something usual and might be challenging to assess [11]. It causes about 21% of people with headache having consulted an eye care practitioner for advice [12]. These kind of patients mostly attribute their headache to the visual disorders. However, findings of the current study indicated no significant difference in prevalence of various types of refractive errors between headache group and normal subjects.

In the present study, the prevalence of total refractive errors was higher in headache group compared to normal subjects, however, the difference between 2 groups was insignificant that was in contrary with previous reports. Akinciet al. [13] evaluated 310 subjects with headache (mean age 13.4 ± 2.6 years) and 843 control subjects (mean age13.9 ± 3.1 years). These researchers used the autorefractometer in combination with cycloplegia (cycloplegiafor the subjects under 10 years old). Although the amount of their myopia and hypropia did not reach the significant level between groups, their headache group presented with higher rate of astigmatism.

Changes in astigmatism of the eye from the infants to adolescents have been documented in previous studies [14]. From the infancy to young adulthood there is a gradual change in astigmatism from against the rule toward with the rule. It is believed that with-the-rule astigmatism is less symptomatic [15] in comparison with against-the-role astigmatism. In a previous [13] study the higher risk of headache in subjects with astigmatism was explained to be confined to this fact that in school ages, astigmatism presented in against-the-rule form, while in young adults (our study) with-the-rule astigmatism reported to be more prevalent.

In our study 27.02% of the subjects in headache group and 28.20% in normal group presented with myopia. This range of refractive errors in both our groups was fairly typical of the age group [16]. Of our total myopic participants, only 31% were in headache group that was a lower percentage in comparison with subjects with hyperopia (45%) and astigmatism (40%). So this could be concluded that myopia patients might encounter with lower headache complaints in comparison with other types of refractive errors. Furthermore, eye practitioners should more carefully consider other factors (that cause headache problems) in history taking, examinations and referral process of patients with myopia.

The prevalence of hyperopia was twice in the headache comparedto normal group but the difference did not reach the statistical level. This might indicate the role of ciliary muscle contraction and accommodation effort in hyperopic subjects that results in higher rate of headache complaints [17]. Eyebrow furrowing, prolonged contraction in muscles of the brow, neck and scalp for maintenance of a clear image is another possible mechanism that leads to headache [18]. In contrary, although the aforementioned' study population were children [13], they showed lower incidence of hyperopia in their headache group compared to our study. One explanation could be the use of autorefractometer for determination of refractive error in their study that resulted in underestimation of the hyperopia. Although they used cycloplegia for participants under 10 years of age, it could influence the refraction of children older than 10 years and therefore the total results.

Regarding the severity of refractive errors, it should be noted that our subjects were mild and moderate myopia, mild hypropia and astigmatism. The mean myopia, hypropia and cylindrical power were -2.65±1.70 D, 0.56±0.07D and 0.45±0.53 D in headache group and -1.61±1.36 D,0.45±0.74D and 0.39±0.27 D in without headache group ; Nevertheless, the differences were not statistically significant ($p>0.05$).Therefore, there were no subjects with moderate and severe hyperopia and severe myopia. So further investigation of the correlation in subjects with different severity of refractive errors is warranted.

The value of NPC was in normal range for both groups [19]. On the other hand, the significantly higher value of NPC in headache group compared to control group demonstrated the feasible role of this parameter in occurrence of the headache complaints. It could be proposed that even if the subject with headache has normal NPC, orthoptic exercises designed to improve the convergence could be helpful and may alleviate the pain. Considering the prevalence of headache, only if a few number of patients require these kind of exercises, the number of those who might benefit from optometric intervention is significant.

Based on our findings in this study, it is concluded that the prevalence of various types of refractive errors (myopia, hyperopia and astigmatism) in headache group is not significantly different from normal subjects. In addition, although the NPC in both studied groups was normal, orthoptic exercises that improve the convergence might be beneficial in patients with headache complaints.

References

1. Pan CW, Klein BE, Cotch MF, Shrager S, Klein R. Racial variations in the prevalence of refractive errors in the United States: the multi-ethnic study of atherosclerosis. Am J Ophthalmol. 2013; 155: 1129-1138.
2. Kempen JH, Mitchell P, Lee KE, Tielsch JM, Broman AT. The prevalence of refractive errors among adults in the United States, Western Europe, and Australia. Arch Ophthalmol. 2004; 122: 495-505.
3. Dandona R, Dandona L, Naduvilath TJ, Srinivas M, McCarty CA. Refractive errors in an urban population in southern India: the Andhra Pradesh Eye Disease Study. Invest Ophthalmol Vis Sci. 1999; 40: 2810-2818.
4. Lipton RB, Hamelsky SW, Stewart WF (2001) Epidemiology and Impact. In: Wolff's headache and other head pain (Harold George Wolff, Richard B Lipton, Donald J Dalessio, eds), pp 85. Oxford: Oxford University Press.
5. Friedman DI, Gordon LK, Quiros PA. Headache attributable to disorders of the eye. Curr Pain Headache Rep. 2010; 14: 62-72.
6. Gil-Gouveia R, Martins IP. Headaches associated with refractive errors: myth or reality? Headache. 2002; 42: 256-262.
7. Gordon GE, Chronicle EP, Rolan P. Why do we still not know whether refractive error causes headaches? Towards a framework for evidence based practice. Ophthalmic Physiol Opt. 2001; 21: 45-50.
8. Classification and diagnostic criteria for headache disorders, cranial neuralgias and facial pain. Headache Classification Committee of the International Headache Society. Cephalalgia. 1988; 8: 1-96.
9. Cohen J. A coefficient of agreement for nominal scales. Educational and psychological measurement. 1960; 20: 37-46.
10. Gordon DM. Some headaches in an ophthalmologist's office. Headache. 1966; 6: 141-146.
11. Hendricks TJ, de Brabander J, Vankan-Hendricks MH, van der Horst FG, Hendrikse F. Prevalence of habitual refractive errors and anisometropia among Dutch schoolchildren and hospital employees. Acta Ophthalmol. 2009; 87: 538-543.
12. Thomas E, Boardman HF, Ogden H, Millson DS, Croft PR. Advice and care for headaches: who seeks it, who gives it? Cephalalgia. 2004; 24: 740-752.
13. Akinci A, Güven A, Degerliyurt A, Kibar E, Mutlu M. The correlation between headache and refractive errors. J AAPOS. 2008; 12: 290-293.
14. Anstice J. Astigmatism--its components and their changes with age. Am J Optom Arch Am Acad Optom. 1971; 48: 1001-1006.
15. Hirsch MJ. Changes in astigmatism during the first eight years of school—an interim report from the Ojai longitudinal study. Am J Optom Arch Am AcadOptom. 1963; 40: 127-132.
16. Bar Dayan Y, Levin A, Morad Y, Grotto I, Ben-David R. The changing prevalence of myopia in young adults: a 13-year series of population-based prevalence surveys. Invest Ophthalmol Vis Sci. 2005; 46: 2760-2765.
17. Eckhardt B, McClean J, Goodell H (1943) Experimental studies on headache: the genesis of pain from the eye. Paper presented at: ProcAssoc Res NervMent Dis (pp 209-227).
18. Tanner J. Growth at adolescence, with a general consideration of the effects of hereditary and environmental factors upon growth and maturation from birth to maturity. Oxford: Blackwell Scientific Publications; 1962.
19. von Noorden GK. Treatment of amblyopia. Fortschr Ophthalmol. 1990; 87: 149-154.

Austin J Clin Ophthalmol - Volume 1 Issue 3 - 2014
ISSN : 2381-9162 | www.austinpublishinggroup.org

Citation: Abolbashari F, Hosseini SMA, AliYekta A, Khabazkhoob M. The Correlation between Refractive Errors and Headache in the Young Adults. Austin J Clin Ophthalmol. 2014;1(3): 1014.