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ORIGINAL ARTICLE

Prevalence of Convergence Insufficiency in Patients Suffering from Headache.

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ABSTRACT… Objective: To find out the prevalence of convergence insufficiency (CI) in patients suffering from headache. **Study Design:** Cross Sectional, Observational study. **Setting:** Departments of Eye, The Children's Hospitals and The Institute of Child Health, Multan and Govt. Shahbaz Sharif Hospital, Multan. **Period:** August 2020 to January 2021. **Material & Methods:** A total of 95 patients between the ages of 08-62 years with a complaint of headache were examined. Both male and female patients having complaint of headache, patients more than 07 years of age and patients with complaint of discomfort and blur vision at near after focusing for few minutes were included. While uncooperative patients, patients less than 07 year of age and patients having systemic and neurological diseases that can cause headache were excluded. Patient's visual acuity (VA) was recorded with Snellen's chart and refraction was done with retinoscopy/ auto refractometer. Fundoscopy was carried out to find out any pathology i.e., papilledema. Convergence was checked by pencil push-up test and amplitude of accommodation was measured using RAF rule. Descriptive statistics including frequencies and percentages were extracted for categorical variables and mean ± standard deviation (SD) for quantitative variables. **Results:** In this study, we recruited 95 patients with a complaint of headache between the ages of 08-62 years and mean age was 27.80 years. 68 (71.60 %) were female and 27 (28.40 %) were male. These patients were examined to determine the prevalence of convergence inefficiency in patients suffering from a headache. Out of these 95 patients having headache 27 (28.4%) had poor convergence, 42 (44.2%) had weak convergence and 26 (27.4%) had normal convergence. This study suggested that 69 (72.6%) patients with headache had varying degree of CI. **Conclusion:** Our study suggested that headache is more common in females than males and CI is the most common cause of headache among these patients. These patients should be assessed and treated to relieve their symptoms and enable them to spend a better quality of life. We recommend ophthalmologists and optometrists to measure CI as a part of their routine ophthalmic examination.

Key words: Convergence Insufficiency, Discomfort, Eye Strain, Headache.

INTRODUCTION

Good near vision and comfortable reading are essential in the development of intelligence in children and young adults. This reading ability is dependent on convergence and accommodation mechanisms. If these mechanism fails, reading becomes difficult resulting in eyestrain, headache and diplopia. This eye strain and inability to concentrate while reading create frustration among individuals. If such symptoms persist despite the correction of refractive error, evaluation of the patient for convergence and accommodation is mandatory. Headache is one of the commonest health problem and almost half of the population is affected from it globally. It significantly affects quality of life and productivity at work.[1,2] Quick and precise diagnosis is an essential step for the management of headache[3,4] Previous studies show that the prevalence of headache is 58.4% and 46% among children and adults respectively.[3,4,5]

Pain in the head is commonly known as headache. It is defined as the pain which is present above the orbitometal line.[6] Headache is one of the most frequent reasons to consult with health care professionals.[7] Diagnosis and treatment of headache is usually difficult without knowing the exact cause.[8] Headache can be neurological or ocular in origin.

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Ophthalmic causes of headaches can be migraine, CI, accommodation insufficiency, squint, headaches associated with refractive error (HARE)[9], aniridia, nystagmus and albinism. Ocular diseases like acute glaucoma, optic neuritis, uveitis and acute iridocyclitis can also present with headache.[10] Another possible source of headache is ciliary muscle strain.[11] It is important to remember that small refractive errors can cause more eye strain and headache than large refractive errors.

CI is defined as exophoria at near with the poor recovery once fusion has been broken. It includes remoteness of near point of convergence (NPC) and decrease in the amplitude of accommodation.[12] CI is of unknown etiology but can be seen when there is head injury, illness along with fatigue such as anemia and Lyme disease. Headache caused by convergence and accommodation insufficiency usually occurs at school going age and not before the third or fourth grade when reading print becomes smaller. The child may have reading and learning problems. The problem may occur several times during his or her study. Double vision in a child is also a complaint.

CI can be measured easily by pencil push-ups e.g., by asking the patient to look at the examiner`s fingertip. Examiner moves his finger slowly towards the patient`s eye from 30 cm distance in front. Normally eyes converge without any problem but in case of CI patient is unable to converge his eyes and complain headache and eye strain.[13] The amplitude of convergence is measured by RAF rule.[14]

Currently there is no established treatment for CI. Various treatments like home-based pencil push-up (HBPP) exercises, base in prism glasses, home-based vision therapy and office-based vision therapy are available options. HBPP is the most common prescribed treatment by ophthalmologist and optometrist.[15] Home-based computer orthoptic exercises combined with pencil push-up exercises improve NPC and fusional amplitudes and reduce CI symptoms. The computer orthoptic program is an emerging and effective treatment option for symptomatic CI.[16]

The Global Burden of Disease Study 2010 (GBD 2010) has placed a headache among the top ten causes of disability worldwide. Headache is often associated with a significant drop in quality of life, a major cause of absence from class among children.[17] Consider the high prevalence and negative impact on life, headache is currently considered a major public health problem. A careful eye examination and possible correction of the defect can cause a reduction in headache symptoms.

Usually patients come to an eye OPD with complaint of headache. Many of these have no refractive error hence remain untreated. They have to use some medication for their headache for quite a long time with no improvement. Our study will help such patients to get early diagnosis and treatment of CI to relieve their eye strain and headache symptoms effectively by prescribing CI exercises.

MATERIAL & METHODS

This cross sectional, observational study was carried out in the eye departments of The Children's Hospitals and The Institute of Child Health, Multan and Govt. Shahbaz Sharif Hospital, Multan from August 2020 to January 2021. The article was approved from the institutional ethical committee vide Ref. No. PMD/2020 CHC-645, dated 27-07-2020. A total of 95 patients between the ages of 08-62 years with a complaint of headache were examined. Sample size was calculated using formula (R & IP, 2002).

$$n = \frac{z^2_{1-\alpha/2} P(1-p)}{d^2}$$

Both male and female patients having complaint of headache, patients more than 07 years of age and patients with complaint of discomfort and blur vision at near after focusing for few minutes were included. While uncooperative patients, patients less than 07 year of age and patients having systemic and neurological diseases that can cause headache were excluded. A questionnaire comprising questions regarding demographic and clinical profile of patients was constructed to

collect the data.

After taking verbal consent from patients, VA was recorded with Snellen's chart. Auto refraction was done using Topcon KR 8800 and subjective refraction was carried out when needed. Fundoscopy was carried out to find out any pathology i.e., papilledema. Convergence was checked by pencil push-up test and amplitude of accommodation was measured using RAF rule. It is normal when NPC is 8-10 cm. If the NPC is 11cm it is classified as mild CI and if the NPC is more than 12cm it is severe CI also called weak and poor convergence respectively.[14]

Statistical package for social science (SPSS-23) was used to analyze data. Descriptive statistics including frequencies and percentages were extracted for categorical variables and Mean ± Standard Deviation (SD) for quantitative variables. Bar chart was used for representation of categorical variables and for quantitative variable histogram was drawn.

RESULTS

A total of 95 patients with a complaint of headache were recruited for this study between the ages of 08-62 years. The mean age was 27.80 years. 68 (71.60 %) were female and 27 (28.40 %) were male. Age and gender distribution is shown in Tables-I and II.

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Age	95	8	62	27.80	14.667

Table-I. Age distribution

	Frequency (%)
Male	27 (28.40%)
Female	68 (71.60%)
Total	95 (100.0%)

Table-II. Gender distribution

Table-III shows convergence status. 27 (28.40%) had poor convergence, 42 (44.20%) had weak convergence and 26 (27.40%) had normal convergence.

	Frequency (%)
Poor	27 (28.40%)
Weak	42 (44.20%)
Normal	26 (27.40%)
Total	95 (100.0%)

Table-III Convergence status

DISCUSSION

Presentation of patients with headache in an ophthalmic clinic is something usual and might be challenging to assess. Most of the people with headache consult eye care practitioners for advice. These kind of patients mostly attribute their headache to the visual disorders. However, findings of our study indicated significant prevalence of convergence inefficiency in patients suffering from headache.

In our study, we took 95 patients with a complaint of headache. The mean age of the patients was 27.80 years and female were affected more than males. We concluded that 27 (28.40%) had poor convergence, 42 (44.20%) had weak convergence and 26 (27.40%) had normal convergence. This study suggested that 69 (72.60%) patients with headache had varying degree of CI.

R.S. Mahto has seen 310 patients aged under 40 years in a period of two years. Thirty four (11%) had CI of varying degrees and 14 of them had eye strain (headache). They were 15-28 years of age when their symptoms appeared. Twenty four (70.5%) were women and 10 (29.4%) were men out of these 34 patients. The patients were wearing glasses of + 0.75 or - 0.5 diopter sphere (DS) with or without a cylindrical number of ± 0.5 diopter. Among these patients, one patient with a complaint of headache and eye strain had no difference in her ocular symptoms after using refractive glasses for 15 years but after a course of orthoptic exercise, she was finally symptom free.[13]

S Aziz, M Cleary, HK Stewart, CR Weir conducted a study on patients with phorias and convergence deficiencies. Patients age range was 05 to 73 years (mean age 11.9 years). Females were more than males (46:32). The diagnoses were CI (n=28: primary 27; secondary 01) and

decompensating hetrophoria (n=50). Exophoria was more common (n=65) followed by esophoria (n=11) and orthophoria (n = 1). Treatments were aimed at improving NPC and/or reduced fusional reserves. After 8.2 months of treatment, reduced NPC normalized in 47/55 cases and mean NPC improved from 16.6cm to 8.4cm. Fusional reserves normalised in 29/50 cases. Asthenopic symptoms like eye strain, headache and blurring during near focusing improved in 65 patients.[18]

Kyung Min Kim, Bo Young Chun conducted a study in 16 patients with a mean age of 19.3 years. Mean angle of deviation of exophoria at distance and near was 03 prism diopter (PD) and 11.2 PD respectively. The mean value of NPC before HBPP therapy was 36.3 cm, however the near point of accommodation was normal. After 03 months of HBPP therapy the angle of deviation of exophoria decreased to orthophoric at distance and 04 PD at near. The mean value of NPC decreased to 14.4 cm and asthenopic symptoms also reduced.[19]

Saif Hassan Al-Rasheed conducted a study at Al-Neelain eye hospital Khartoum, Sudan. One hundred and fifty patients complaining of headache with a mean age of 25.0 ± 3.5 years were included. One hundred and seventeen (78%) patients were females. Leading cause of headache was convergence weakness exophoria in (39.3%) patients followed by CI in (24%) patients[1]. Our study gave almost similar results as published in above studies.[1,13,18,19]

Studies conducted in India and china showed that CI is present in 27.5% of the population and in 9.6% of the patients respectively.[20,21] Our CI percentage was quite higher than these studies. This discrepancy may be due to the sample population. The studies mentioned were general population studies and our study was a clinical study. In clinical settings most patients are symptomatic, hence clinical studies have higher rates as compared to population based studies. Furthermore, above studies used cluster sampling but we used convenient sampling in our study.

CONCLUSION

Our study suggested that headache is more common in females than males and CI is the most common cause of headache among these patients. These patients should be assessed and treated to relieve their symptoms and enable them to spend a better quality of life. We recommend ophthalmologists and optometrists to measure CI as a part of their routine ophthalmic examination.

LIMITATIONS

Limitation of our study is that it was a clinical study rather than a population based study. So our results are not a true picture of general population. We included older patients and our sample size was relatively smaller.

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