To study the clinical correlation of headache and refractive error subtypes

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Abstract
Purpose: The prevalence of refractive errors is 13 to 80%. The uncorrected refractive errors are associated with headache. Examination & correction of defect will reduce headache. Minor refractive errors cause more headache & symptoms than major refractive errors.

Material & Methods: 150 patients with headache due to refractive error were included. A descriptive cross-sectional study. Subjects were evaluated like visual acuity, refraction, slit-lamp examination, retinoscopy were done. The type and amount of refractive error were estimated.

Results: Females (72%) suffer more than males from headache. Refractive errors are more commonly associated with frontal headache (67%). 82.7% of patients had a visual acuity 6/18 and better. 43.6% of astigmatics, 33% of hypermetropes presented with headache.

Conclusion: Most of the cases of astigmatism & hypermetropia presents with headache than blurring of vision. Ciliary muscle contraction & accommodation results in higher rate of headache in hypermetropes and astigmatics.

Keywords: Headache, Astigmatism, Hypermetropia.

Background
Headache and refractive errors are the common health problems in general population. 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 group. Studies on ocular headache have reported the role of different ocular diseases like glaucoma, uveitis, optic neuritis, visual anomalies like refractive errors, accommodative and vergence deficiencies as the cause of headache. The uncorrected refractive errors are often associated with frontal and /or occipital headache. A careful examination and possible correction of defect has been observed to reduce headache. Thomas.et.al noted that about 21% people with headache consult ophthalmologists for headache. Whittington reported that among 1400 consecutive patients attending for refraction, 45% complained headache as a chief complaint. Gordon.et.al claimed that minor refractive error often caused more headache and symptoms than major refractive error. Ciliary muscle strain has also been found to be the possible cause of headache.

According to the International Headache Society (HIS), the criteria for the headache related to refractive errors are:
(a) uncorrected refractive errors or
miscorrected refractive errors;
(b) mild frontal pain as well as eye pain;
(c) pain that is relieved by resting but getting
worse by doing visual tasks at the distance
for a long time when visual acuity is
impaired. ο

Though headache management is not easy always
but it is often rewarding. The contribution of an
ophthalmologist in the diagnosis and evaluation of
a patient with headache is outlined. When
asthenopia or an organic eye disease is the cause
of the headache, ophthalmologist can not only
diagnose the cause but also cure the patient by
adequate therapy.

Materials and Methods
150 patients attending ophthalmology OPD at
with headache due to refractive error were
included in the study. A descriptive cross-
sectional study, was conducted after obtaining
approval from Institutional Ethics Committee.
Patients were enrolled for the study after written
informed consent.

Such enrolled subjects underwent ophthalmic
examinations including best corrected visual
acuity with a Snellen chart at 6 m, slit-lamp
examination, cycloplegic refraction and
retinoscopy were done. Refractive errors of both
eyes were estimated using the retinoscopy and
then refined with subjective refraction. The type
of refractive error and amount of refractive error
were estimated.

The data collected was entered in excel spread
sheet. Descriptive statistical analysis was done by
mean and standard deviation for quantitative
variables and frequency and percentages for
categorical variables. The association between
categorical variables was analyzed by using Chi
square test. The data was analyzed by using SPSS
statistical software version 20.

Results
The maximum incidence of headache (43.3%) was
found in the age group of 16–30 years, followed
by in the age group of 31–45 years (31.3%). The
incidence was the lowest (10%) in the age group
of less than 15 years [Table 1]. The incidence was
higher in females (72%) than males (28%) [Table
2]. Students were found to be most commonly
affected (37.3%) followed by housewives (36%),
farmers (10.7%), clerks (3.3%), technical
personnel (4%), and others (10%) [Table 3].
Chronic headache is more common (64%) [Table
4]. Frontal headache (67.3%) is more common
in refractive errors [Table 5]. The most common
refractive error was astigmatism, which observed
in 43.6% cases followed by hypermetropia (33%)
and presbyopia (20.1%) [Table 6]. The most
common type of astigmatism was mixed
astigmatism (44.9%), simple myopic astigmatism
(37.2%), compound myopic astigmatism (11.5%),
simple hypermetropic astigmatism (6.4%) [Table
7]. Amount of refractive error less than 1 D was
detected in 69.3% cases, 23.3% cases between
1.25 and 2 D. Only 7.3% cases had more than 2 D
of refractive error [Table 8]. Astigmatism less
than 1D causes more headache and is significant in our
study [Table 9].

Table 1 Age distribution of Headache

| Age       | Frequency | Percent |
|-----------|-----------|---------|
| <=15 years| 15        | 10.0    |
| 16 - 30   | 65        | 43.3    |
| 31 - 45   | 47        | 31.3    |
| >45 years | 23        | 15.3    |
| Total     | 150       | 100.0   |

Table 2 Distribution of headache among two sexes

| Sex      | Frequency | Percent |
|----------|-----------|---------|
| Male     | 42        | 28.0    |
| Female   | 108       | 72.0    |
| Total    | 150       | 100.0   |

Table 3 Occupation of patients having headache
due to ocular causes

| Occupation         | Frequency | Percent |
|--------------------|-----------|---------|
| Students           | 56        | 37.3    |
| Housewife          | 54        | 36      |
| Farmer             | 16        | 10.7    |
| Clerk, Tailor      | 5         | 3.3     |
| Technical Personnel| 4         | 2.7     |
| Others             | 15        | 10.0    |
| Total              | 150       | 100.0   |
### Table 4: Headache distribution based on duration

| Headache Duration | Frequency | Percent |
|-------------------|-----------|---------|
| Acute             | 13        | 8.7     |
| Subacute          | 41        | 27.3    |
| Chronic           | 96        | 64.0    |
| Total             | 150       | 100.0   |

### Table 5: Headache distribution based on region

| Headache Region | Frequency | Percent |
|-----------------|-----------|---------|
| Frontal         | 101       | 67.3    |
| Occipital       | 20        | 13.3    |
| Combined        | 29        | 19.3    |
| Total           | 150       | 100.0   |

### Table 6: Final diopteric correction of headache

| Diagnosis         | Frequency | Percent |
|-------------------|-----------|---------|
| Myopia            | 2         | 1.1%    |
| Mixed             | 4         | 2.2%    |
| Presbyopia        | 36        | 20.1%   |
| Hypermetropia     | 59        | 33.0%   |
| Astigmatism       | 78        | 43.6%   |
|                   | 100.0%    | 100.0%  |

**Table 6 Note:** a. Dichotomy group tabulated at value 1.

### Table 7: Types of refractive errors causing headache

| Diagnosis          | Frequency | Percent |
|--------------------|-----------|---------|
| Simple Myopic      | 29        | 37.2%   |
| Compound Myopic    | 9         | 11.5%   |
| Simple Hypermetropia | 5     | 6.4%    |
| Mixed              | 35        | 44.9%   |
| Total              | 78        | 100.0%  |

### Table 8: Final diopteric correction of the refractive error

| Final Correction | Frequency | Percent |
|------------------|-----------|---------|
| < 1 D            | 104       | 69.3%   |
| 1.25 - 2 D       | 35        | 23.3%   |
| > 2 D            | 11        | 7.3%    |
| Total            | 150       | 100.0%  |

### Table 9: Amount of diopteric power in various type of astigmatism in headache

| FINAL CORRECTION | Simple Myopic | Compound Myopic | Simple Hypermetropia | Mixed | Total |
|------------------|---------------|-----------------|----------------------|-------|-------|
| < 1 D            | 24 (51.1%)    | 3 (6.4%)        | 5 (10.6%)            | 15    | 47    |
| 1.25 - 2 D       | 4 (16.7%)     | 2 (8.3%)        | 0 (0.0%)             | 18    | 24    |
| > 2 D            | 1 (4.3%)      | 4 (57.1%)       | 0 (0.0%)             | 2     | 7     |
| Total            | 29 (37.2%)    | 9 (11.5%)       | 5 (6.4%)             | 35    | 78    |

**Chi-Square value:** 30.379; **P-Value:** <0.001

### Discussion

In our study, headache was found to be common in the age group of 16 – 30 years (43.3%). Shashi jain in their study also reported that maximum incidence in the age group of 15 – 30 years (46.8%). Headache in this particular age group can be due to stress caused by educational pressures, work stress, emotional factors and family conflicts.

In our study, headache was found to be higher in females (72%) than in males. Similar findings are seen in other studies done by Shashi jain, Lanchner who reported incidence of headache in females to be 56.5%, 58.3%, 56%, and 57% in their respective studies. It can be due to the higher emotional instability, hormonal variation and psychological stress in females.

In our study headache due to ocular causes was mostly seen in students (37.2%) followed by housewives (35%). Shashi jain and Brown and Kronfeld also reported the similar results with 52% and 60% of student group having headache in their study.

In our study chronic headache was more common and was seen in about 67.3% of the cases. Frontal headache was more common, seen in about 67.3% of the cases. Shashi jain in their study also reported that 67.7% of patients had anterior headache. Ciliary pain is primarily frontal in origin as the ophthalmic division of trigeminal nerve is represented most caudally.

In our study, the most common refractive error was astigmatism, which occurred in 43.6% cases followed by hypermetropia (33%). Shashi jain also reported that astigmatism (42.37%) is the most...
common refractive error followed by hypermetropia (21.46%) in causing headache. Marasini also found that astigmatism was seen in 63.63%, hypermetropia in 27.27%, and myopia in 9.09% cases. Patwardhan and Sharma also claimed the same trend of refractive error prevalence in headache patients. Mechanism of headache in hypermetropia is from ciliary muscles contraction, where patients accommodate to see clearly and in astigmatism, especially in lower degree, where muscles contract irregularly which causes more severe headache. In our study, there were 69.3% of patients with refractive error <1 D, 23.3% patients within 1.25 to 2 D. Similar observations were reported by Shashi jain, Griffith, who stressed that small astigmatism errors were responsible for more severe ocular asthenopia. Cogan also reported that small refractive errors, especially hypermetropia and astigmatism, causes headache. In our study, it is significant with p value < 0.001. The reason for the higher incidence of headache in hypermetropic astigmatism and mixed astigmatism may be that involuntary, sustained excessive accommodative efforts put the eyes under strain.

**Conclusion**

Patients with astigmatism & hypermetropia presents more commonly with headache than blurring of vision. Ciliary muscle contraction & accommodation results in higher rate of headache in hypermetropes and astigmatics. A detailed clinical history, examination and proper correction of refractive error can help in relieving the headache and thereby improves the quality of life.

**Acknowledgement:** Nil

**Financial support:** Nil

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