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# Ocular pathology in patients referred to ophthalmology outpatient clinic at tertiary care hospital with headache

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## Abstract

**Introduction**: Headaches have multi-factorial causes, including ocular casues and a systematic ocular examination is beneficial. Physicians at the point of the first contact should therefore be familiar with common ocular pathologies associated with a headache for appropriate referral.

**Method**: This hospital-based cross-sectional study was conducted in the Ophthalmology Department of Patan Hospital, Nepal for 15 months till adequate sample size of 354 were reached. Patients with headache as primary symptom and who were referred to ophthalmology clinic for ocular evaluation by other departments were included. Occular findings were recorded and analyzed descriptively. Ethical approval was obtained.

**Result:** Among 354 patients 61% were in 14-40 y, homemaker 30.2% followed by students 25.4%. Ocular pathology was detected in 76% of patients. No refractive errors were seen in (67.8%). Refractive error was more common in the presbyopia age group but was no statistically significant difference observed between different age groups. Most patients were orthophoric, 11% had vergence insufficiency. Ocular pathology of dry eye, glaucoma suspects were more common.

**Conclusion:** The ocular morbidities was seen in 2/3$^{rd}$ of patients with headaches and may benefit from referral to a specialist.

**Keywords:** Headache, Nepal, ocular manifestations, ophthalmology, refractive error

## Introduction

Although uncorrected refractive errors are often believed by physicians and the general public alike to be commonly associated with frontal and/or occipital headache[1], these conditions are usually not the most common reported etiologies of headache in the general population. Nevertheless, many primary or secondary headache disorders have ocular manifestations and benefit from systematic ocular examination. Physicians at the point of the first contact should therefore be familiar with common ocular pathologies associated with headaches in the population to streamline patient management and referral to the ophthalmology department when required[2] andto avoid patients undergoing unnecessary investigations before a diagnosis is established in the ocular examination.

A clear guideline to evaluate the etiology of headache in people presenting with the headache to general practice is lacking in Nepal. Many patients visit subspecialty outpatient clinics and undergo extensive evaluation before an obvious ocular cause is identified. On the other hand, in some centers, all headaches are referred to ophthalmology clinics delaying the diagnosis of a patient's systemic disease. Lack of local epidemiological data on the etiology of headaches to guide patient evaluation in primary care may be a major reason for these approaches.[3]

This study was conducted to determine the common ocular causes of headache with emphasis on refractive errors, in patients presenting to the ophthalmology department of multispecialty referral general hospital. Results of this study can add to the literature to help formulate an ophthalmology referral protocol in a general hospital in Nepal.

## Method

This is a hospital-based descriptive cross-sectional study conducted in the Ophthalmology Department of Patan Hospital, Patan Academy of Health Sciences, Nepal for 15 months between December 2019 and February 2021. Patan Hospital located at Lalitpur, is one of the major general public hospitals in Kathmandu Valley and serves a large catchment inside Kathmandu valley as well as nearby villages in Lalitpur in addition to referral patients from all over the country.

We included all patients with headaches as primary symptoms and were referred to the ophthalmology clinic for ocular evaluation by other departments. Patients who primarily attended ophthalmology clinics or had another major ocular presenting symptom other than headache were excluded. Patients who underwent urgent consultation at bedside limiting complete examination or were referred for ocular examination with a diagnosed systemic disease were also excluded.

Informed consent was obtained from the adult patient and the patient ≤17 years had an assent taken in presence of the subject's parents or guardian. Using a proforma, detailed history of ocular diseases and facial pain was obtained by an ophthalmic assistant and an ophthalmologist. Visual acuity was taken for each eye and both eyes together at 6 m distance with internally illuminated Snellen's Chart. Near vision was recorded at a distance of 33 cm with a self-illuminated near vision Chart. Retinoscopy was done with a retinoscope at the working distance of 50 cm estimating the refractive status of patients objectively followed by subjective refraction to assess the patient's response to the corrective lenses. Patients with dissimilar objective and subjective findings, fluctuating refractive status, children under 15 years of age, and patients with binocular vision anomalies (BVA) underwent cycloplegic retinoscopy (1% cyclopentolate). In these patients, subjective refraction was done after three days, when the cycloplegia effect disappeared completely. Spherical and astigmatic deviations were measured to the nearest 0.50 D, astigmatic axes were measured to the nearest five degrees, negative cylinders being used for all

measurements. The degree of ametropia was stated as follows: patients with Spherical Equivalent Refractive Error (SERE) of −0.25 and +0.25 Diopters (D) were considered as emmetropic, SERE > +0.50 D was considered as hyperopia and SERE > −0.50 D was considered as myopia. Astigmatism was defined as the cylindrical component of the refractive error of more than 0.50 D.[1] Cover test was performed at a distance of 6 m and 40 cm with an opaque occluder. A small non-accommodative target was used to control accommodation. The type and direction of heterophoria or heterotopia were recorded. Ocular motor functions (extraocular motility) were evaluated in six cardinal gazes. The Near Point of Convergence (NPC, defined as the nearest distance from the eyes to which eyes can converge without experiencing diplopia or subjective discomfort) was assessed with Binocular Vision Assessment (BVA) with exception of presbyopes where the cover test was not carried out due to expected vergence dysfunction due to loss of accommodative convergence.

An experienced ophthalmologist performed a thorough ocular examination including slit lamp biomicroscopy and detailed fundus examination to rule out posterior chamber ocular pathology. Intraocular pressure was measured with Goldman Applanation Tonometer on a patient with suspicious glaucoma on clinical evaluation. Intraocular pressure was classified as normal if Intraocular pressure (IOP) was between 12-22 mm of Hg. Ocular hypertension was defined by IOP as more than 22 mm of Hg without an abnormal visual field or optic disc. Glaucoma was identified as IOP more than 22 mm of Hg with defective visual field or optic disc changes.[4,5]

Patients were categorized into the following age groups: pediatric age group (children <14 y as followed in Patan hospital), non-presbyopic adults age group (<40 y), and presbyopic adults age group (>40 y) based on the assumption of onset of physiological presbyopia at 40 y of age.

An estimated sample size of 355 patients was calculated based on the estimated prevalence of ocular pathology of 36% in patients presenting primarily with headache[1] using $N=Z^2 pq/e^2$ where Z=1.96 for 95% Confidence Interval and Margin of error e=5%.

Data was collected in paper-based case report forms, entered into an excel database, and analyzed by SPSS Version 20. Frequencies and percentages of ocular abnormalities were calculated among patients who presented with headaches for an ocular examination along with other descriptive statistics. Proportions were compared with chi-square statistic and p-value ≤0.05 was considered significant.

## Result

During the study period of 15 months, 354 patients with headache were evaluated. Young people 216(61%) between 14-40 y of age were the most commonly referred patients for evaluation of headache. Patients who did not have additional ocular symptoms or signs in addition to headaches during the presentation were 85(24%). When present ocular pain and blurring of vision alone or in combination with other ocular symptoms were the most common presenting symptoms, Table 1.

Among 354 patients enrolled in the study, some form of ocular pathology was detected in 269(76%) patients.

Refraction was evaluated in detail in all the patients. Although presumed to be a very common cause of headache, the majority of patients had no refractive errors 240(67.8%),Table 2. Although any form of refractive error was more common in the presbyopia age group (>40 y: 39 vs. 14-40 y: 64 versus < 14 y: 11), there was no statistically significant difference between different age groups in proportions of patients with refractive error in different age groups (Pearson's $\chi^2$=2.6, value: 0.26).

Extra-ocular mobility was only detected to be impaired in a small number 2(0.6%) of the patients. Most patients were orthophoria and only 39(11%) of patients had vergence insufficiency, Table 2. The cover test was abnormal in similar proportions of patients in each age category ($\chi^2$=3.4, p=0.18). Vergence insufficiency was however significantly more common in the pediatric age group ($\chi^2$ =10.8, p=0.004).

Identifiable ocular pathology other than refractive errors was detected in 128(36.15%) patients. Among them, dry eyes, 54(42.62%), was the commonest ocular pathology, followed by presbyopia, 37(28.9%) and glaucoma suspect, 12(9.3%), Table 3.

**Table 1. Age group, gender, occupation, address and additional ocular symptoms of patient with headache (n=354)**

| Clinical characteristics | N=354 | % |
|---|---|---|
| Age group | | |
| <14 years | 38 | 10.7 |
| 14-40 years | 216 | 61.0 |
| >40 years | 100 | 28.2 |
| Gender | | |
| Male | 127 | 35.9 |
| Female | 227 | 64.1 |
| Occupation | | |
| Home maker | 107 | 30.2 |
| Students | 90 | 25.4 |
| Services Business | 52 | 14.7 |
| Business | 33 | 9.3 |
| Agriculture | 30 | 8.5 |
| Others | 42 | 11.9 |
| Place of Residence | | |
| Urban | 227 | 64.1 |
| Rural | 127 | 35.9 |
| Additional ocular symptom/s | | |
| No ocular symptoms | 85 | 24.0 |
| Ocular pain | 98 | 27.7 |
| Blurring of vision (BoV) | 68 | 19.2 |
| BoV with ocular pain | 16 | 4.5 |
| Ocular pain with redness with photophobia | 15 | 4.2 |
| BoV with ocular pain, redness, photophobia | 14 | 4.0 |
| Redness | 14 | 4.0 |
| Diplopia | 11 | 3.1 |
| Ocular pain with photophobia | 10 | 2.8 |
| Aura with flashes of light | 7 | 2 |
| BoV with photophobia | 6 | 1.7 |
| BoV with ocular pain, diplopia, aura like symptoms | 5 | 1.4 |
| BoV with redness | 3 | 0.8 |
| BoV with redness and diplopia | 2 | 0.6 |

**Table 2. Eye pathology: refraction, ocular motility, cover test and convergence in participants (n=354)**

| Eye pathology | N=354 | | % | |
|---|---|---|---|---|
| Refraction | Right eye | Left eye | Right eye | Left eye |
| No Refractive error | 245 | 240 | 69.2 | 67.8 |
| Myopia | 52 | 53 | 14.7 | 15.0 |
| Hypermetropia | 38 | 40 | 10.7 | 11.3 |
| Astigmatism | 19 | 21 | 5.4 | 5.9 |
| Extra ocular motility | | | | |
| Full in all cardinal gaze | | 352 | | 99.4 |
| Restricted | | 2 | | 0.6 |
| Cover test | | | | |
| Orthophoria | | 337 | | 95.2 |
| Esophoria | | 7 | | 2.0 |
| Exophoria | | 5 | | 1.4 |
| Esotropia | | 1 | | 0.3 |
| Exotropia | | 4 | | 1.1 |
| Convergence | | | | |
| Good | | 315 | | 89.0 |
| Fair | | 21 | | 5.9 |
| Poor | | 18 | | 5.1 |

**Table 3. Ocular pathology: ocular surface disease, anterior segment disease and others (n=128)**

| Ocular pathology | N=128 | % |
|---|---|---|
| Ocular Surface Disease | | |
| Dry eye | 54 | 42.62 |
| Episcleritis | 6 | 4.68 |
| Scleritis | 2 | 1.56 |
| Ocular allergy | 2 | 1.56 |
| Anterior Segment Disease | | |
| Glaucoma suspect | 12 | 9.3 |
| Cataract | 5 | 0.7 |
| Acute angle-closure glaucoma | 1 | 0.7 |
| Glaucoma(open-angle) | 1 | |
| Others | | |
| Presbyopia | 37 | 28.9 |
| Bell's palsy | 2 | 1.56 |
| HZO | 2 | 1.56 |
| Papilloedema | 2 | 1.56 |
| LR Palsy | 1 | 0.7 |
| Amblyopia | 1 | 0.7 |

## Discussion

This study shows that 128(36.5%) patients had an identifiable ocular pathology and 114(32.2%) had one or other form of refractive error that could contribute to the patient's headache. Similar study done in Dhulikhel hospital shows that 44 (44%) of the patients with headache had refractive error. All of them were corrected with appropriate prescription with glasses. Eye problem was significantly associated with refractive error and Binocular Single vision (BSV) anomalies.[1] However, a study from China shows that although vergence insufficiency was more common in pediatric age group patients, other refractive errors were noted in similar proportions in all age groups suggesting refractive error is not only the culprit for headache .[6]

Female, 227(64%), were affected more than male, among which homemakers, 107(30.2%), were the most common population group referred to ophthalmology clinics for evaluation of headache. A study from Italy has shown a higher prevalence of migraine, 59(13%), particularly in women, 78(17%), than in controls, 32(7%).[7] A higher population of female patients with headaches probably is a reflection of this spectrum of the problem. Students, service holders, and business holders, altogether 175 (49.4%) who use the screen for their daily work or for study formed the largest proportion of cases in our study.
A study also has reported that almost 71 out of 100 medical students spending 2 hours or more time on-screen use on daily had headaches as a manifestation of computer vision syndrome.[8] Most patients in this study were between 14-40 years of age. Although headache is a common complaint in all age groups, young adults who play a vital role in economic and social aspects of society were the common people affected leading to reduced productivity and quality of life.

In this study, 38(10.7%) were children <14 y of age. In children younger than 8 years, in whom the visual function is not fully developed, ocular pain could be a sign of an amblyogenic condition[10], and in rare cases, a sign of a visual and life-threatening condition
However, another study considered eye pain and headache to be functional in 73(91%) out of 80 children between ages 2 and 6 y who presented without a red-eye or a history of an obvious cause for the pain.[9] Thus, proper vision assessment with cyclorefraction and detail ocular evaluation including fundus evaluation is needed in these children to differentiate functional and organic cause for headache

Headaches with significant ocular symptoms constituted a significant proportion of the patients, 128(36.5%), in this study. Headache and blurring of vision 68(19.2%), headache with the blurring of vision associated with ocular pain 16(4.5%), and ocular pain associated with headache 98(27.7%) were common symptoms reported by patients in a detailed interview. The patients with one or the other refractive errors was 114(32.2%); myopia was the most common 53(14.7%) followed by hypermetropia 40(10.7%), and astigmatism 21(5.4%). The prevalence of refractive errors in our study was higher than that reported by different authors from other parts of the world. In one of the studies, a low prevalence of refractive error-related headache was estimated in a sample of 50 patients referred for ocular examination.[11]In an observational study conducted in India, the reported refractive errors is only 2(1.48%) among 202 patients evaluated for headache patients.[12]These discrepancies are probably related to patient enrolment in the study, other studies included all thepatients with headache presenting for an eye evaluation. In this study, however, we only evaluated patients who were referred from other specialty clinics and were most likely to have some other ocular symptom warranting referral. Nevertheless, the results of this study indicate that a more detailed evaluation of ocular symptoms in patients presenting with a headache at the point of the first contact may help identify ocular morbidities that cause headache before unnecessary investigations are conducted for the etiology of headache.

It was reported that refractive errors can result in asthenopia (“eye strain”) symptoms after prolonged visual activities.[13] when refractive errors are large; the presenting symptom of pain is reduced. Large measurement errors do not usually present as pain because the refractive mechanism of the eye cannot accommodate the imaging. However, when the refractive errors are small, the eye makes an effort to accommodate the images, and symptoms can vary. After long periods of work, defined as the prolonged visual activity, the eyes may feel hot, tired, and uncomfortable (asthenopia symptoms). If the work continues, severe pain may develop in the eyes. Sustained excessive accommodation-convergence association can give rise to strain in the effort to maintain binocular single vision. Almost half of this study population was comprised of people with higher daily screen time that could

explain a high proportion of headaches with ocular pain and refractive errors.[13,14] According to the International Headache Society (IHS), the criteria for the headache related to refractive errors include: uncorrected refractive errors or mis correction of refractive errors; mild pain in the frontal lobe as well as in eyes; and 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.[15] Our patients with headaches also initially presented to another department for headache as they didn't have large refractive error and blurring of vision. As a system of routine periodic eye evaluation is almost nonexistent in Nepali population, examination of all patients with headache and eye pain for refractive error to ensure proper correction may be more rewarding for headache management than extensive investigations.

In our study, the majority, 352(99.4%) of patients had normal extra-ocular motility, 6th nerve palsy-related restriction was noted in 2(0.6%). Most patients were orthophoric and had adequate convergence. Gordon has cited poor binocular status as a potential source of headache. The literature also provides anecdotal support for the hypothesis that certain optometric anomalies, especially decompensated exophoria, may be prevalent in headaches.[1, 16]

This study constituted of 128(36.15%) patients who had different ocular pathology associated with headache. Among them, dry eye was the most common ocular surface disease, 54(42.62%). Anterior segment disease, importantly glaucoma suspects 12(9.3%), cranial nerve palsy 3(2.26%), and papilledema 2(1.56%) were also identified in patients referred for headache. Dry eye disease (DED) is a significant disorder in the general population, with estimated prevalence rates ranging from 7.4% to 33.7%.[17-19] This multifactorial disorder of the tear film and ocular surface results in symptoms of discomfort, visual disturbance, increased tear film osmolarity, and tear film instability, all of which can lead to inflammation of the ocular surface and a diminished quality of life. The disorder is more common in females, precipitates migraines and headaches.[20] A population-based case-control study of 72,969 patients demonstrated that the odds of having dry eye disease with a diagnosis of migraine headaches was at least 20% higher than that of individuals without a diagnosis of migraine headaches.[21] In our study, female preponderance, and more cases of dry eye disease suggests that dry eye can trigger symptoms of headache and proper lubrication of the eye with artificial tear can relieve headache and eye pain.

Among anterior surface diseases, glaucoma suspect was more common. A relationship between glaucoma, mainly in normal-tension glaucoma, and migraine has been hypothesized by some authors, but not confirmed by others. It is reported that a higher prevalence of migraine 59(13%), particularly in women 78(17%) than in controls 32(7%) in a case-control study involving 460 glaucoma suspects and a similar number of controls highlighting the importance of proper examination for this condition in a patient with headache.

The major limitation of this study is the generalizability of this study to the general population. Patients in this study were recruited from a hospital outpatient clinic population who were referred by other departments for evaluation of ocular pathology for headache. Identifiable ocular pathology or a suspicion of ocular pathology is likely to be the most common reason for the referral. Frequency of ocular pathology as an identifiable cause of headache in this population is therefore likely to be exaggerated and the etiology of headache and the patient profile is likely to be very different in the general population. Another major limitation was that this study was aimed to identify associated ocular pathology in patients with headaches and was not designed to identify if the ocular problem was the real culprit for headaches over an extended period of follow-up. The

establishment of a cause-and-effect relationship is challenging in patients with a headache due to a number of confounders. This was a single-center study in a general hospital; the profile of patients with headaches presenting to a general hospital may be very different from those directly presenting to an eye hospital.

## Conclusion

Ocular morbidities and headache symptoms are linked very frequently necessitating thorough refractive and binocularity evaluation in patients presenting with headaches in a general hospital in Nepal.

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## Conflict of Interest
None

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## Author Contribution
Concept, design, planning: RS,DA,MKJ; Literature review: RS; Data collection/analysis: RS, DA, MKJ; Draft manuscript: RS; Revision of draft: RS, DA; Final manuscript: all; Accountability of the work: all.

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