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Prevalence of dry eye disease among patients having migraine

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ABSTRACT

Aim: To study the prevalence of dry eye disease among patients having migraine.**Materials and Methods:** A retrospective study review of patients who were known case of migraine headache in a tertiary hospital in 1yr from December 2019 to December 2020. A total of 400 patients were reviewed. Age ranged from 15 to 35 years. The mean age was 32 years.**Results:** The study consisted of 400 patients, among which 200 patients were diagnosed to have migraine headache and 200 patients were taken as control. Total number of males included in the study were 180 and females were 220. Total of 34 and 22 patients had a dry eye disease among case study group and controls respectively. The prevalence among study group was 17% and 11% among the control study group. The prevalence among the case study group was found to be significantly higher compared to the control study group with p value < 0.05.**Conclusions:** From the study conducted we come to a conclusion of prevalence of dry eye disease among patients having migraine headache is significantly higher compared to control study group and all the patients suffering from migraine should undergo dry eye evaluation.This is an Open Access (OA) journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License](https://creativecommons.org/licenses/by-nc-sa/4.0/), which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.For reprints contact: reprint@ipinnovative.com

1. Introduction

Dry eye disease (DED) is a disorder affecting a significant proportion of the general population, with estimated prevalence rates ranging from 7.4% to 33.7%.^{1,2} The prevalence of migraine headaches among the general population is also quite high, with estimates as high as 14.2% in the United States alone.³

Dry eye is defined by the Tear Film and Ocular Surface Society Dry Eye Workshop II as a multifactorial disease of the ocular surface characterized by a loss of homeostasis of the tear film, and accompanied by ocular symptoms, in which tear film instability and hyperosmolarity, ocular surface inflammation and damage, and neurosensory abnormalities play etiological roles.⁴

Migraine is characterized by recurrent headaches widely variable in intensity, duration and frequency. The prevalence of migraine is higher in women (18%) than in men (6%). Migrainous headache is commonly unilateral, associated with nausea and vomiting and may be preceded by, or associated with, neurological and mood disturbances. However, all these characteristics are not necessarily present during each attack or in every patient.

The correlation between DED and migraine headaches, have been demonstrated by some studies. One theory suggested that dry eye symptoms and migraine involve abnormal peripheral trigeminal nerve activation with subsequent peripheral and central sensitization. Peripheral sensitization is defined as “increased responsiveness and reduced threshold of nociceptive neurons in the periphery to the stimulation of their receptive fields”⁵ and below corneal

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peripheral nerve abnormalities that have been described in dry eye and migraine. Central sensitization is defined as “increased responsiveness of nociceptive neurons in the central nervous system to their normal or sub threshold afferent input.”⁶

Studies have shown that the neural circuitry underlying photophobia, both in the context of dry eye⁷ and migraine.⁸ One pathway involves light-evoked signals in rod and cone cells that are transmitted to retinal ganglion cells (RGC) via amacrine and bipolar cells. Some signals in RGCs are transmitted to the olivary pretectal nucleus (OPN), then to the superior salivatory nucleus, and subsequently to the sphenopalatine ganglion, which stimulates parasympathetic-mediated vasodilation of ocular⁹ and dural¹⁰ vessels that are innervated by trigeminal afferents. Trigeminal signals subsequently travel to the trigeminal nucleus caudalis, posterior thalamus, and cortical structures.

A second neural pathway involves light-sensitive neurons in the posterior thalamus, specifically the posterior (LP) and posterior nuclei (PO),¹⁰ which receive input from both intrinsically photosensitive RGCs (ipRGC) and dural trigeminal afferents, and subsequently send signals to somatosensory and visual cortices.¹¹

The literature suggests that both dry eye symptoms and migraine pain are driven in part by peripheral sensitization.^{12,13} In dry eye, peripheral injury and activation may result from a number of sources including chronic epithelial disruptions, high tear osmolarity, ocular surface inflammation, and/or surgically induced nerve injury (eg refractive surgery).¹² On the other hand, initiators of peripheral nerve injury in migraine remain controversial.¹⁴

The literature suggests that both dry eye symptoms and migraine pain are caused in part by central sensitization. Given that corneal nerve fibers project to the trigeminal brainstem region, studies have used this region to investigate central nerve changes in dry eye.¹⁵

2. Materials and Methods

This is a retrospective study conducted from December 2019 to December 2020. 200 patients diagnosed with migrainous headache between the age group of 15 to 45 years on treatment were included in the study. 200 patients were taken in the control group study.

Detailed demographic data about symptoms of feelings of dryness, grittiness and burning that characteristically worsen over the course of the day. Stringy discharge, transient blurring of vision, redness and crusting of the lids and the clinical details were noted down and entered into a standard clinical proforma. Uncooperative patients were excluded from the study.

Each patient was examined under slit lamp to look for Conjunctiva signs like, it becomes lustreless, mildly

congested, conjunctival xerosis and keratinization and corneal signs like punctate epithelial erosions, filaments and mucus plaques. Cornea may lose lustre.

The patients having dry eye disease caused by other causes like posterior blepharitis, steven Johnson’s disease, ocular pemphigoid, lagophthalmos were excluded from the study

Ophthalmic examination included, Best Corrected Visual Acuity was done by Snellen’s chart, slit lamp bio microscopy, tear film tests like tear film break-up time (BUT), Schirmer-I test, tear marginal strip.

Tear film break-up is the interval between a complete blink and appearance of first randomly distributed dry spot on the cornea. It is noted after instilling a drop of fluorescein and examining in a cobalt-blue light of a slit-lamp. BUT is an indicator of adequacy of mucin component of tears. Its normal values range from 15 to 35 seconds. Values less than 10 seconds imply an unstable tear film.

Schirmer-I test. It measures total tear secretions. It is performed with the help of a 5 x 35 mm strip of Whatman-41 filter paper which is folded 5 mm from one end and kept in the lower fornix at the junction of lateral one-third and medial two-thirds. The patient is asked to look up and not to blink or close their eyes. After 5 minutes wetting of the filter paper strip from the bent end is measured. Normal values of Schirmer-I test are more than 15 mm. Values of 5-10 mm are suggestive of moderate to mild dry eye and less than 5 mm of severe dry eye.

Tear marginal strip is a technique to quantify the height and thus the volume of the lower lid meniscus. Normally it is 1 to 2mm, in patients with dry eye has reduced or absent marginal strip.

2.1. Statistical analysis

Mean, median, standard deviation, ranges were evaluated for continuous variables and for categorical variables, frequency and percentages were recorded. Chi-square test and ANOVA test were also used whenever necessary independent t test was used to compare mean between the two group. P value of less than 0.05 within 95% CI was considered statistically significant.

3. Results

Total 400 patients were included in the study. Among these 180(45%) patients were males and 220 (55%) patients were females. Among the 200 patients of case control group 135 were females and 65 were males. Among the control study group 85 patients were females and 115 were males. The age group of the patients studied is between 15 to 45yrs. mean age being 28±17yrs. higher number of patients belong to age group between 22 to 30yrs.

34 patients in the case study group showed dry eye disease among which 24 were females and 10 males.

These patients showed shimmer values less than 10mm. 14 patients between 5 -10mm suggested mild dry eye disease and 21 showed less than 10mm indicating moderate to severe dry eye diseases. All 34 patients showed tear break time less than 10 seconds. 19 patients showed absent tear marginal strip and 10 patients showed between 0.1 to 0.5 mm. Other 166 patients having migraine showed normal Schirmer values, normal tear break up time and marginal strip ≥ 1 mm 22 patients among the control study group showed dry eye disease among which 13 were females and 8 males in this group, 12 patients between 5 -10mm suggesting mild dry eye disease and 10 showed less than 10mm indicating moderate to severe dry eye diseases. 20 patients showed tear break time less than 10 seconds other 2 patients had tear break up time more than 12sec. 9 patients showed absent tear marginal strip and 13 patients showed between 0.1 to 0.5 mm. Other 178 patients without migraine showed normal Schirmer values, normal tear break up time and marginal strip ≥ 1 mm.

The patients having the dry eye disease complained of having foreign body sensation, grittiness, irritation, and discomfort and eye strain. Some of the patients also showed conjunctival and corneal signs also as mentioned above.

The prevalence of dry eye disease found in our study is 17% among the case study group and 11% among control study group. i.e., 34 patients had dry eye disease among case study group and 17 among the control study group had dry eye disease. The difference between the 2 groups is significant (p value< 0.05).

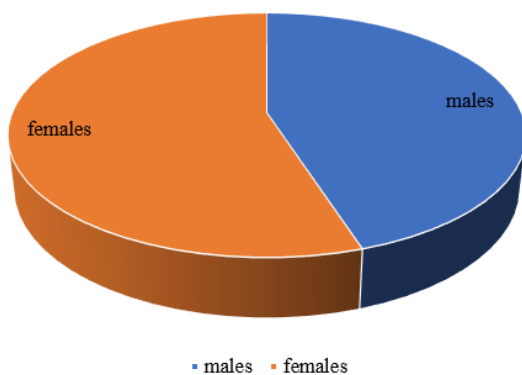


Fig. 1: Sex distribution among the patients studied

4. Discussion

This study was mainly conducted to compare the prevalence of dry eye disease among the patients having migraine with patients not having migraine. We studied total 400 patients among which 200 patients had migraine and 200 patients without migraine. Many studies have explained the link between dry eye disease and migraine. Exact etiology is unknown but some studies have shown the neural circuitry

Table 1: Showing the patients having dry eye disease among case and control group

Age group	Patients with migraine	Patients having dry eye		
		Percentage	Control group	Percentage
15-25	8	4%	12	6%
26-35	22	11%	10	5%
36-45	4	2%	0	0%
Total	34	17%	22	11%

Table 2: Prevalence of dry eye disease among case and control groups

	No of patients having DED	Prevalence
Case group	34	17%
Control group	22	11%
P value		0.02

Table 3: Schirmer values among the case and control groups

Schirmer values	Case group	Control group
>15mm	107	133
11-15mm	58	45
5-10	14	12
<5mm	21	10

Table 4: Tear break up time among the case and control groups

Tear break up time	Case group	Control group
0-5sec	13	9
5-10sec	21	13

underlying photophobia, both in the context of dry eye 43 and migraine. 44 On the contrary some studies also showed the reverse relationship.¹⁶ Our study showed a significant increase in prevalence among patients having migraine (17%) compared to the patients not having migraine (11%). Our study also showed that the symptoms and severity of dry eye disease were more in the case group compared to the control group.

Our study was comparable to the Korean population-based cross-sectional study of 14,329 participants which showed the frequency of dry eye diagnosis was found to be higher in those with migraine. Of those with migraine, 14.4% reported a dry eye diagnosis compared to 8.2% without migraine, with p<0.0001. Similarly, of those with migraine, 22% reported dry eye symptoms compared to 15.1% without migraine, p<0.0001.¹⁷

In a hospital-based case-control study of 72,969 individuals from University of North Carolina-affiliated hospitals found the prevalence of a migraine or dry eye diagnosis was 7.3% and 13.2%, respectively. Again, individuals with migraine had a higher frequency of a co-morbid dry eye diagnosis. Of those with migraine, 19.6% had a dry eye diagnosis compared to 12.7% without

migraine.

Omer et al,¹⁷ studied 72,969 patients, including 41,764 men (57.2%) and 31,205 women (42.8%) showed that diagnosis of migraine headaches was 1.72 (95% CI, 1.60–1.85) times higher than that of patients without migraine headaches.

5. Limitation

Since it is retrospective study interventional results cannot be commented upon. A small sample size can also affect the outcome of the study. Selection bias can also be present as it is a tertiary care centre. The lack of previous studies for comparison is also one of the limits for the study.

6. Conclusion

Dry eye disease is a common multifactorial problem with increasing worldwide prevalence. It is a disorder that affects all age groups thereby it is important to study about its comorbidities. Many studies have shown the link between dry eye and migraine but some studies have failed to show the association between the two. Studying its association with migraine helps to prevent the severe symptoms with which patient can suffer. As migraine is more prevalent in adult age group it's better for all the migraine patients to undergo dry eye evaluation. Our study showed the association between these two and the prevalence of dry eye is more in patients having migraine compared to patients without migraine.

7. Conflict of Interest

The authors declare that there are no conflicts of interest in this paper.

8. Source of Funding

None.

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