



## A CLINICAL AND ANALYTICAL STUDY OF CORRELATION BETWEEN DRY EYE SYNDROME AND REFRACTIVE ERROR IN YOUNG ADULT PATIENTS ATTENDING OPHTHALMOLOGY DEPARTMENT, MBS HOSPITAL KOTA.

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### ABSTRACT

**Objectives:-** This study aims to add new information about the DES in young adult by examining the correlation between dry eye syndrome and refractive errors.

**Methods:** In this cross sectional study, a total of 200 participants in the age range of 18 to 35 years and who were free of ocular surface disease, were taken from the patients attending outpatient Department of Ophthalmology, MBS Hospital Kota. Refraction was defined by the spherical equivalent (SE) as the following: 74 emmetropic eyes ( $\pm 0.50$  SE), 76 myopic eyes ( $\leq -0.75$  SE), and 50 hyperopic eyes ( $\geq +0.75$ SE). All participants underwent full ophthalmic examinations assessing their refractive status and dryness level including tear film break up time, Rose Bengal staining and schirmer test.

**Results:** Prevalence of dry eye syndrome was 25.5% in this age group. In our study the prevalence of dry eye was 22.97%, 31.57%, and 20.00% in emmetropes, myopes, and hypermetropes, respectively (p value =0.28) and compared to emmetropes, prevalence of dry eye was higher in those with refractive errors (22.97% and 26.98% respectively). Mean Tear breakup time in seconds showed shorter time in eyes of myopic and hyperopic individuals compared to emmetropia. Mean Rose Bengal staining score showed less in emmetropic individuals compared to myopic and hyperopic.

**Conclusion:** The current results succeeded to demonstrate a correlation between refractive errors and dryness level.

### KEYWORDS :

#### INTRODUCTION

Dry eye syndrome (DES) is a common disorder that eye care providers encounter on a daily basis in which it accounts for 25% of patients' visits.<sup>1</sup> Recently, the Tear Film and Ocular Surface Society DEWS II has revised the definition as follows: "Dry eye is 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."<sup>2</sup> Several risk factors have been reported to increase the risk of DES such as the is the long-term wear of contact lens and refractive surgery such as laser-assisted in situ keratomileusis or photorefractive keratectomy (LASIK).<sup>3,4</sup> Questionnaire-based studies have shown that contact lens wearers have symptomatic DES than noncontact lens wearer.<sup>5-7</sup> A common finding between these studies is that approximately 50% of contact lens wearer reported dry eye.<sup>8-12</sup> Interestingly, spectacle lens and contact lens wearers were twice and 12 times, respectively, more likely than emmetropes to report DES.<sup>13</sup> Moreover, very few studies have shown evidence that refractive errors could contribute to the development of DES in young individuals.

#### MATERIAL AND METHODS:

**Methods:** In this cross sectional study, a total of 200 participants in the age range of 18-35 years and who were free of ocular surface disease. This study was conducted on 200 patients in the Department of Ophthalmology, MBS Hospital Kota.

Refraction was defined by the spherical equivalent (SE) as the following: 74 emmetropic eyes ( $\pm 0.50$  SE), 76 myopic eyes ( $\leq -0.75$  SE), and 50 hyperopic eyes ( $\geq +0.75$ SE). All participants underwent full ophthalmic examinations assessing their visual acuity by Snellen chart, refractive status (measurement of refractive error) using autorefractometer and subjective test, dryness level including (Fluorescein breakup time, Rose Bengal staining and schirmer test), slit-lamp examination, Goldmann applanation tonometry, and the biomicroscopic funduscopy (+90D lens) and assessment of meibomian gland, ocular surface disease index.

Diagnosis and confirmation of dry eyes will be done by series of tests performed in standard sequence as follows: Tear film breakup time (TBUT), ocular surface dye staining (Rose bengal stain), schirmer-1 test.

Diagnosis of dry eye in our study is made when two of the 3 tests are positive: TBUT, ocular surface dye staining and schirmer-1 test.

The study was approved by the Ethical Committee of govt medical college Kota and all patients recruited with informed consent.

#### ELIGIBLE CRITERIA

- Participants with best-corrected visual acuity of 6/9
- Age range of 18-35 years
- Free of known ocular surface disease (Herpes simplex virus, varicella zoster virus, Steven Johnson Syndrome, aniridia, blepharitis etc.) are eligible for this study.
- Volunteer

#### EXCLUSION CRITERIA

Included those participants with

- ocular allergic disease
- keratitis
- contact lens wear
- glaucoma
- Ocular infection
- previous ocular surgery, eye lid surgery or injury
- Bell's palsy
- Systemic or ocular treatment.
- Unilateral Symptom
- Any Lid Pathology
- Meibomian gland dysfunction
- Smoker

#### RESULTS:

The age group was between 18 to 35 years, with the mean age of the patients being  $25.54 \pm 5.89$  years. Among the entire group, 51 patients (87 eyes) were diagnosed to have dry eye based on the test, i.e. prevalence of 25.5%.

#### Dry eye in relation to residence

Out of 200 parents, 94 (47%) were resident of urban area and 106 (53%) were resident of rural areas. In our study prevalence of dry eye from rural areas were slightly higher than urban areas 26.41% and 24.46% respectively, Chi-square test was applied, (p value =0.75).

**Dry eye in relation to sex**

Out of 200 parents, 96 were male and 104 were female. In our study prevalence of dry eye is slightly higher in female (26.92%) than male (22.91%), Chi-square test was applied, (p value = 0.51).

**Dry eye prevalence in relation to refractive status**

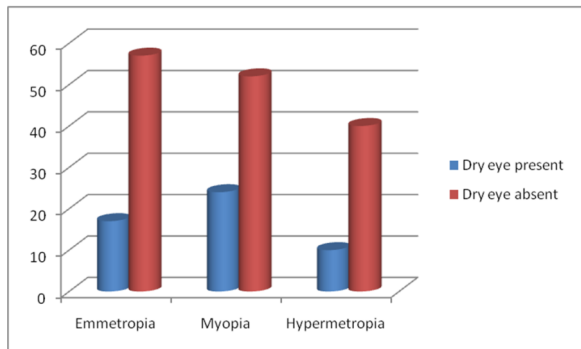
Prevalence of dry eye syndrome was 25.5% in this age group. In our study the prevalence of dry eye was 22.97%, 31.57%, and 20.00% in emmetropes, myopes, and hypermetropes, respectively (p value =0.28) and compared to emmetropes , prevalence of dry eye was higher in those with refractive errors (22.97% and 26.98% respectively).

**Table no. 1 : Dry eye prevalence in relation to refractive status**

Refractive status	Dry eye present	Dry eye absent	Total
Emmetropia	17	57	74
Myopia	24	52	76
Hypermetropia	10	40	50
Total	51	149	200

Chi-square test was applied, p value =0.28

**Graph no. 1 : Dry eye prevalence in relation to refractive status**

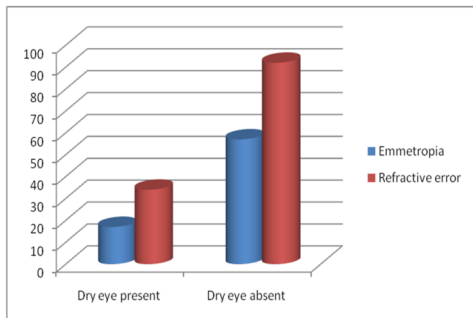


**Table no.2: Dry eye prevalence in relation to emmetropia versus refractive error**

Refractive status	Dry eye present	Dry eye absent	Total
Emmetropia	17	57	74
Refractive error	34	92	126

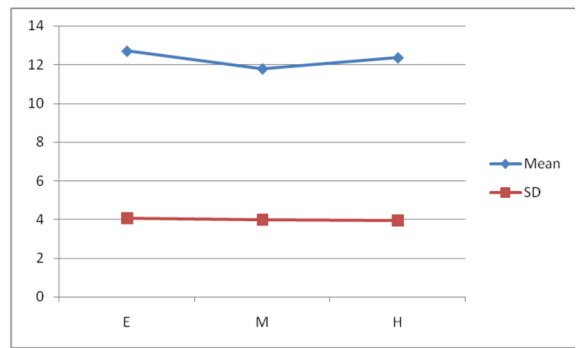
Chi-square test was applied, p value =0.52

**Graph no. 2 : Dry eye prevalence in relation to emmetropia versus refractive error**



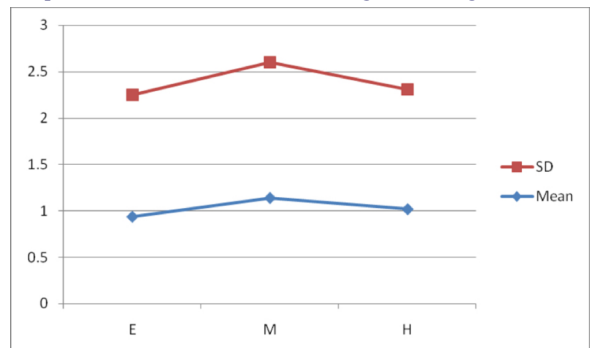
Mean value of TBUT in emmetropia, myopia and hypermetropia is 12.70, 11.79 and 12.36 Respectively. Mean Tear breakup time in seconds showed shorter time in eyes of myopic and hyperopic individuals compared to emmetropia.

**Graph.no.3 : Mean value of TBUT**



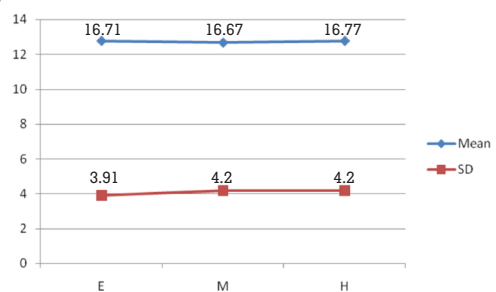
Mean value of Rose Bengal staining test in emmetropia, myopia and hypermetropia is 0.94, 1.14 and 1.02 Respectively. Mean Rose Bengal staining score showed less in emmetropic individuals compared to myopic and hyperopic.

**Graph no.4 : Mean value of Rose Bengal staining**



Mean value of Schirmer I test in emmetropia, myopia and hypermetropia is 16.71mm, 16.67mm and 16.77mm Respectively.

**Graph no.5 : Mean value of schirmer test**



E- emmetropia, M- myopia, H- hyperopic

**DISCUSSION**

Dry eye is a distressing problem for both subjects and treating Ophthalmologist. The actual prevalence of this condition in the community is unknown because patients present for assessment and treatment when the condition is moderate to severe and the symptoms have become intolerable. Even at this stage, the diagnosis may not be made if the ophthalmologist does not perform the diagnostic tests required to detect dry eye. The condition of dry eye is therefore often overlooked and hence under diagnosed in the population. Dry eye is known to increase with age in both men and women, especially in post-menopausal females.<sup>14</sup>

The rate of dry eye in young adults is not well known although the visual tasks that younger adults are taking nowadays make them more vulnerable to DES. Video games, computers, and different digital devices as well as contact lenses are all contributing to the development of DES in younger patients.<sup>15-</sup>

<sup>18</sup> Studies have revealed that the overuse of smartphones is associated with increased risk of DES in children.<sup>19-21</sup> Moreover, very few studies have shown evidence that refractive errors could contribute to the development of DES in young individuals.<sup>22,23</sup>

The aim of this study was to examine the prevalence of DES among young adults in relation to the refraction error.

This study was designed to find correlation between dry eye and refractive error in young adults in clinic setting, so the tests used were simple yet established in many studies to detect dry eye, namely the Schirmer's test, tear film break-up time and rose bengal dye staining. In our study, every patient had an ocular Examination for dry eye by the same investigator and this reduced bias and Standardised our diagnosis of dry eye.

The mean age of the group was  $25.54 \pm 5.89$  years

#### Prevalence of dry eye:

In our study, out of 200, we found 51 patients to have evidence for dry eye either in one or both eyes based on the positive results of at least two out of three objective tests. The prevalence of dry eye in this study was found to be 25.5%.

In a population based study in Indonesia, conducted by **Lee AJ et al**<sup>24</sup> the prevalence of dry eye was 27.5%.

The **Salisbury**<sup>25</sup> eye study showed a prevalence of 14.6% based on subjects reporting symptoms.

The prevalence of dry eye varies from 10.8% to 57.1%, there by showing wide disparity.<sup>26-30</sup> The vast disparity in dry eye prevalence stems mainly from the different dry eye diagnostic criteria employed and different cut-off values for the objective dry eye tests. The high prevalence in some studies is also because objective dry eye tests have been performed in patients with positive symptom score ( thereby introducing a selection bias) or in patients in rheumatoid arthritis and Sjogren's syndrome , which have proven dry eye components. Our dry eye prevalence of 25.5% falls within this range.

#### Sex wise distribution of dry eye:

We found a slightly higher prevalence of dry eye 26.91% in women compared to 22.92% in men, which corresponded to the findings of other studies.

**Moss et al**<sup>31</sup> found a prevalence of 16.7% in women compared to 11.4% in men. These were the prevalence rates obtained after adjusting for age.

**Sahai et al**<sup>32</sup> found prevalence of 22.8% in women compared to 14.9% in men in his study on hospital based population.

#### Residence wise distribution

In our study prevalence of dry among patients from rural areas were slight higher than urban areas (26.41% and 24.46% respectively). Though it was not statistically significant ( $p= 0.75$ ). This incoherence with the study of **Schuamberg et al**<sup>33</sup> surveyed 39876 US women's health study, who reported there were no significant difference with respect to region of residence on the probability of having dry eye syndrome. In the study conducted by **Sahai et al**<sup>32</sup> Dry eye appeared to be more common in rural (19.6%) than urban patients (17.5%)( $P=0.553$ ; 95% CI 0.55-1.37); however this was not statistically significant.

#### Refractive errors and dry eye:

There are very few studies have shown evidence that refractive errors could contribute to the development of DES in young individuals.

In our study the prevalence of dry eye was 22.97%, 31.57%, and 20.00% in emmetropes, myopes, and hypermetropes, respectively ( $p$  value =0.28) and compared to emmetropes , prevalence of dry eye was higher in those with refractive errors (22.97% and 26.98% respectively). Mean Tear breakup time in seconds showed shorter time in eyes of myopic and hyperopic individuals compared to emmetropia. Mean Rose Bengal staining score showed less in emmetropic individuals compared to myopic and hyperopic.

Our findings are consistent with other studies, **Fahmy RM, Aldarwesh A.**<sup>34</sup> Correlation between dry eye and refractive error in Saudi young adults using noninvasive Keratograph 4. The prevalence of dry eye was 24.6%, 36.5%, and 17.4% in emmetropes, myopes, and hypermetropes, respectively. NIBUT has a negative correlation with hyperopia and a positive correlation with myopia with a significant reduction in the average NIBUT in myopes and hypermetropes in comparison to emmetropes.

**Wang et al.**<sup>35</sup> who reported high prevalence of DES among myopic teenagers using Keratograph 5M and they demonstrated low tear volume in teenagers with myopia.

Unfortunately, the mechanism of refractive error inducing eye dryness is unknown. The cross sectional design of this study allowed screening of dryness among people with refractive error, but it would have been interesting to find the relation in terms of causality.

**Nichols JJ et al.**<sup>36</sup> As stated earlier, individuals with refractive error are among those with a higher rate of contact lens and spectacle use as well as the reported rate of dryness.

Clinically, the changes in the anterior corneal surface as the eyeball elongates in myopia may contribute to increase the likelihood of developing dryness.<sup>37-39</sup> In conclusion, noninvasive ocular surface examinations using Keratograph 4 showed a low NIBUT in healthy participants with refractive error which could be indicative of DES.

**Sahai et al**<sup>32</sup> and **Moss and colleagues.**<sup>31</sup> which have shown that compared to emmetropes, prevalence of dry eye was higher in those with corrected and uncorrected refractive errors.

It has been postulated that persons with refractive errors have an increased tendency to rub their eyes which apart from introduction of infective material , sebum and sweat could cause the lodgement of particulate foreign substances into the eye that predispose to tear film instability. Also, people with uncorrected refractive errors have more tendency to squeeze the eye, causing instability of tear film, predisposing to dry eye.<sup>40</sup>

#### CONCLUSION :

**Our conclusions from this study were as following:**

1. Prevalence of dry eye syndrome was 25.5% in this age group.
2. There was no significant difference with respect to region of residence (urban vs rural) on the probability of having dry eye syndrome.
3. We found a slightly higher prevalence of dry eye in women (26.92%) compared to men (22.91%).
4. The prevalence of dry eye was 22.97%, 31.57%, and 20.00% in emmetropes, myopes, and hypermetropes, respectively ( $p$  value =0.28). Prevalence of dry eye was higher in myopic as compared to other refractive status. Compared to emmetropes, prevalence of dry eye was higher in those with refractive errors (22.97% and 26.98% respectively).

The cross sectional design of this study allowed screening of dryness in relation to refractive error, but it would have been interesting to find the relation in term of causality. Hence more studies are required to understand the patho-physiology and prevalence of dry eye in relation to refractive status and should be treated effectively.

This study has shown evidence that refractive errors could contribute to the development of DES in young adults individuals.

#### Financial support and sponsorship

Nil.

#### Conflicts of interest

There are no conflicts of interest.

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