

# Prevalence and risk factors of dry eye disease in a hospital-based population

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## Abstract

**Aim:** The purpose of the study was to determine the prevalence and to evaluate the risk factors contributing to dry eye in a hospital-based population. **Methods:** This prospective cross-sectional analysis was conducted for a period of one year from September 2018 to August 2019. 1000 patients who attended Ophthalmology OPD, above 20 years of age were randomly screened for dry eye disease using an ocular surface index questionnaire. After obtaining a detailed history, the diagnosis of dry eye was confirmed based on the results of the Schirmer test, TBUT, and ocular surface stains. The results of tear parameters were taken as criteria to classify the dry eye disease into mild, moderate, and severe dry eye disease. **Results:** The prevalence of dry eye in our study was 39.2%. Male preponderance were seen with a male to female ratio of 1.2:1. A significant proportion 27.55% of the patients in the age group 51-60 years was prone to dry eye disease. 60.91% belonged to the rural background. Moderate dry eye was seen in 46.17% of patients followed by mild (32.90%) and severe (20.91%). Environmental factors like sunlight exposure (33.16%) and smoking (20.9%) were the most common risk factors affecting farmers (45.15%). **Conclusion:** Dry eye is one of the leading causes of ocular discomfort. Occupation and environmental factors are the common causes of dry eye leading to significant increase in the incidence of dry eye disease. Assessment and meticulous evaluation of patients with dry eye disease are necessary for early diagnosis and treatment. Modification of lifestyle, early detection and appropriate treatment can reduce the prevalence of dry eye.

**Key words:** Dry eye disease, ocular surface index, Schirmer's test, TBUT.

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## INTRODUCTION

Dry eye disease (DED) is a widespread condition that causes varying degrees of ocular discomfort and disability. It is a multifactorial disease associated with tears and ocular surface leading to discomfort, visual disturbance, and tear film stability with potential damage to the ocular surface.<sup>1</sup> Dry eye is accompanied by increased osmolarity of the tear film and inflammation of

the ocular surface. The prevalence of DED is greatly influenced by geographic location, climatic conditions and lifestyle of the people and ranges from 5% to 35%.<sup>2-4</sup> Dry eye syndrome becomes increasingly prevalent with age and affects 5% of population during 4th decade of life, increasing to 10-15% in adults over the age of 65%.<sup>5</sup> Asian studies on DED showed that the prevalence of dry eye is higher than that in western population and it is between 14.5% and 93.2%.<sup>6</sup> Factors that predispose to DED include socio-demographic characteristics like age, female gender, urban region, systemic autoimmune diseases, medications, environmental factors like sunlight, smoking, air pollution, occupational exposure to computers, and use of air conditioners. Increased television watching and reading time have also been reported to be associated with clinical signs of DED. Lacrimal glands, ocular surface (conjunctiva, meibomian glands and cornea), lids, sensory and motor nerves work as an integrated functional unit maintaining the balance between tear secretion and drainage.<sup>7</sup> Any disease or

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dysfunction of this system results in an unstable and poorly maintained tear film resulting in irritation and increased lacrimation. Dry eye is classified as aqueous tear deficient and evaporative dry eye. Aqueous tear deficient dry eye implies a failure of lacrimal tear secretion, while the evaporative dry eye is related to eyelids and ocular surface. In the early stages, the eye can adapt and compensate for the tear hyperosmolarity and tear film instability. However, if untreated, it can cause permanent damage to the tear film. The study of DED is essential because of the increasing frequency of its occurrence, various risk factors with which disease is associated, and difficulties in the treatment of disease.

## MATERIALS AND METHODS

This cross-sectional study was conducted in the Department of Ophthalmology, NRIIMS, Sangivalasa, Visakhapatnam from September 2018 to August 2019 for a period of 12 months. Ethical clearance was obtained. Informed consent was taken from all the patients. A total of 1000 cases above 20 years of age who presented to the out-patient department were included in the study.

**INCLUSION CRITERIA:** All the patients with dry eye symptoms like FB sensation, non-sticky eye discharge, itching, photophobia, redness, burning sensation, ocular pain, dryness, watering, and temporary blurred vision for the minimum 2-months duration were included in the study.

**EXCLUSION CRITERIA:** Contact lens wearers, post-operative patients, diagnosed cases of the dry eye under treatment were excluded from the study. OSDI questionnaire consisting of 12 questions were given to all the patients. Each question is given a score ranging from 0 (none of the time) to 9 (all of the time).

This was followed by objective tests like Tear film break up time (TBUT), Ocular surface staining with Fluorescein and Lissamine green, and finally Schirmer's test.

1. For patients with mild irritation symptoms: a reduced TBUT may indicate an unstable tear film with average aqueous tear production, and there may be minimal or no dye staining of the ocular surface.
2. For patients with moderate to severe symptoms: the diagnosis can be made by using one or more of the following tests:
3. TBUT – To evaluate tear film stability
4. Ocular surface dye staining (Fluorescein/Rose Bengal/Lissamine green) test: to evaluate ocular surface disease
5. Schirmer test: to evaluate aqueous tear production.

The results of the tear function tests were further subjected to the scoring system (Khurana 1993 scoring

system)<sup>8</sup> to assess the severity of dry eye. According to this score, the patients were graded.

**TABLE-1: DRY EYE SCORING SYSTEM**

NO DRY EYE	0 - 1
DRY EYE SUSPECT	2
MILD DRY EYE	3 – 8
MODERATE DRY EYE	9 – 13
SEVERE DRY EYE	14 – 18

## RESULTS

This study was carried out on 1000 patients attending Ophthalmology OPD between September 2018 to August 2019. Patients were randomly selected and were evaluated.

### DEMOGRAPHIC PROFILE:

The demographic profile of the 392 patients with dry eye is documented in Table – 2,3.

**TABLE 2: AGE AND GENDER DISTRIBUTION**

AGE (years)	MALE	FEMALE	TOTAL	%
21-30	24 (11%)	25 (14.36%)	49	12.50%
31-40	30 (13.76%)	29 (16.66%)	59	15.05%
41-50	41(18.80%)	33 (18.96%)	74	18.87%
51-60	66 (30.37%)	42 (24.13%)	108	27.55%
61-70	38 (17.43%)	32 (18.39%)	70	17.85%
>70	19 (8.71%)	13 (7.47%)	32	8.16%
<b>TOTAL</b>	<b>218(55.61%)</b>	<b>174(44.38%)</b>	<b>392</b>	

Out of 1000 patients, 392 were found to have dry eyes. Most of them (27.55%) presented in 6th decade followed by (18.87%) in 5th and (17.85%) in 7th decade. The mean age of presentation was 56 years, with an age range of 21 to 77 years. (Table- 2) Out of these, 218 (55.61%) were males, and 174 (44.38%) were females. Male: Female ratio is equal to 1.2:1 in our study. Males predominated in our study.(Chart-1) On comparing age and gender in our study, there was no statistical significance.

(P-Value > 0.05)

**TABLE 3: RESIDENCE**

RESIDENCE	MALE	FEMALE	TOTAL	%
RURAL	122 (55.96%)	106 (60.91%)	228	58.2%
URBAN	96 (44.03%)	68 (39.08%)	164	41.8%

The incidence of dry eye was more in the rural population (58.2%) compared to the urban population (41.8%) in our study, which was not statistically significant.(P-Value > 0.05).

**TABLE 4: DISTRIBUTION OF OCCUPATION**

OCCUPATION	TOTAL NO. OF PATIENTS	%
STUDENTS	47	11.9%
FARMERS	177	45.15%
FACTORY WORKERS	112	28.57%
OFFICE WORKERS	31	7.9%
OTHERS WITH LOW RISK	25	6.3%

The majority of patients who were affected with dry eye were farmers (45.15%) followed by factory workers

(28.57%), students (11.9%), office workers (7.9%). On comparing the distribution of occupation among the dry eye patients in our study, there was statistical significance. (P-Value < 0.00001)

**TABLE 5: SEVERITY OF DRY EYE**

SEVERITY	TOTAL NO. OF PATIENTS	%
MILD	129	32.90%
MODERATE	181	46.17%
SEVERE	82	20.91%

Out of 392 cases, most of the patients had moderate (46.17%) dry eye followed by mild (32.90%) and severe (20.91%). On comparing the severity of dry eye, there was statistical significance. (P-Value < 0.00001)

**TABLE 6: ENVIRONMENTAL RISK FACTORS**

ENVIRONMENTAL RISK FACTORS	NO. OF PATIENTS	%
SUNLIGHT EXPOSURE	130	33.16%
POLLUTION	65	16.5%
SMOKING	79	20.9%
DRUG USAGE	60	15.3%
OTHERS	58	14.7%

The risk factors are summarized in Table 7. Frequent exposure to sunlight (33.16%) was identified as a significant risk factor, followed by smoking (20.9%), pollution (16.5%), drug usage (15.3%).

**TABLE 7: OCULAR SURFACE SYMPTOMS**

OCULAR SURFACE SYMPTOMS	TOTAL NO. OF PATIENTS	%
FB SENSATION	282	71.9%
BURNING SENSATION	250	63.7%
ITCHING	227	57.9%
EYE DISCHARGE	203	51.7%
WATERING	188	47.9%
PHOTOPHOBIA	168	42.8%
OCULAR PAIN	152	38.77%
REDNESS	140	35.7%
DRYNESS	79	20.1%
BLURRED VISION	82	20.9%

Foreign body sensation (71.9%), burning sensation (63.77%), itching (57.9%), eye discharge (51.7%) were the commonest symptoms encountered in our study followed by watering (47.9%), photophobia (42.8%), ocular pain (38.77%), redness (35.7%), dryness (20.1%) and blurred vision (20.9%). (TABLE-7) (CHART-3)

## DISCUSSION

DED is the most prevalent chronic ocular surface disorder having an adverse impact on the quality of life. In our study, the prevalence of dry eye was 39.2%. The prevalence of DED in India is higher than the global prevalence and ranges from 18.4% to 54.3%.<sup>9,10</sup> Studies have also shown that dry eye disease is more in the Asian population (93.2%) than in the Western population

(7.8%).<sup>2,11</sup> This vast disparity of DED prevalence can be attributed to geographic variations. The majority of the patients in our study were in the age group 51-60 yrs (27.55%) followed by 41-50 yrs (18.87%) and 61-70yrs (17.85%) (TABLE-2). This was similar to other studies done by Hikichi *et al*<sup>19</sup>, who reported a prevalence of 17%, Sahai and Malik<sup>17</sup> documented 36.1%. Albiets JN *et al*<sup>20</sup> and Moss SE *et al*<sup>21</sup> also found dry eye prevalence progressively increases with age. This age group being most active occupationally are exposed to environmental factors like sunlight, humidity, and windy climates, which causes increased evaporation of tears. Most of the studies revealed a higher prevalence of dry eye in women.<sup>2,3,9,12,13</sup> In contrast to other studies, male (60.9%) preponderance was observed in our study, which was comparable to studies done by Tseng *et al*<sup>14</sup>, Baisoya P *et al*<sup>15</sup>, Titiyal J S *et al*<sup>16</sup>. This could be explained by the fact that our hospital is rurally based, and our study group comprised patients in and around the hospital where males are farmers by occupation who spend most of their time outdoors and are exposed to hot, humid, windy climate. In our study, the prevalence of dry eye was high in rural dwellers (58.2%) compared to urban dwellers (41.8%) (TABLE-3). This was consistent with studies done by Sahai and Malik *et al*<sup>17</sup>, Choudhary P *et al*<sup>18</sup> and Khurana *et al*<sup>8</sup>. This was the consequence of excessive exposure of rural residents, mostly farmers to sunlight, high temperature, and excessive wind. DED was common among farmers and labourers (45.15%) in our study, followed by factory workers (28.57%) and office workers (7.9%). (TABLE-4). This correlates with other studies done by Sahai and Malik *et al*<sup>17</sup>, Choudhary P *et al*<sup>18</sup> and Khurana *et al*<sup>8</sup>. We have followed the scoring system of Khurana *et al*<sup>8</sup> to classify eyes into mild, moderate, and severe (TABLE-1). Most of our patients had a moderate dry eye (46.17%), followed by mild (32.90%) and severe dry eye (20.91%) (TABLE-5). This was following other studies done by Choudhary *et al*<sup>18</sup> and Baisoya *et al*<sup>15</sup>. Sunlight, smoking, air pollution, and drugs have been suggested as common risk factors. Sunlight and high temperature (33.16%) were identified as the significant risk factors followed by smoking (20.9%) and air pollution (16.5%) (TABLE-6). A study conducted by Galor A *et al*<sup>22</sup>, found out that air pollution and atmospheric pressure emerged to be most influential risk factor for dry eye. In other studies performed by Baisoya p *et al*<sup>15</sup> smoking was the most frequent risk factor (5.95%) and in a study conducted by Choudhary *et al*<sup>18</sup> air pollution (33.3%) was the most typical risk factor. Relative humidity, temperature, and sunlight affect the precorneal tear film and cause dry eye symptoms. Outdoor air quality and temperature also affect tear film stability. Majority of our patients presented with foreign

body sensation (71.9%), followed by burning sensation (63.7%), itching (57.9%), discharge (51.7%), watering (47.9%), photophobia (42.8%), ocular pain (38.77%), redness (35.7%), dryness (20.2%), and blurred vision (20.9%) (TABLE-7). This was consistent with a study done by Choudhary *et al.*<sup>18</sup> In a study done by KamalakshyJet *al*<sup>23</sup> itching was the commonest symptom. Symptoms were varying from study to study depending upon the risk factors. The prevalence of dry eye in our study is 39.2%, which was significantly high. It mandates the need for detecting and treating the disease at an early stage in asymptomatic patients, and modifying the attributing risk factors to reduce the ocular morbidity due to DED.

## CONCLUSION

Dry eye is a leading cause of ocular morbidity with a negative impact on patient's quality of life. With the increase in the prevalence of DED, it is essential to diagnose the disease at the early stage and treatment advocated appropriately so that the disease can be prevented from progressing to a severe stage. It is necessary to educate the public regarding the chronic nature of the disease and the importance of eye care. The ultimate goal is an early diagnosis, avoidance of risk factors, and appropriate treatment of the disease.

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