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RESEARCH ARTICLE

A Hospital-Based Study to Estimate the Prevalence of Dry Eye and Factors Attributed to IT

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ABSTRACT

Background: Dry eye disease (DED) is a multifactorial disorder affecting the ocular surface and tear film, leading to discomfort, visual disturbance, and reduced quality of life.

Aim: To estimate the prevalence of dry eye and identify associated risk factors among patients attending a tertiary care hospital.

Methods: A cross-sectional study was conducted in the Department of Ophthalmology, Government Medical College, Pali, over one year (2025). A total of 300 patients aged ≥18 years were included. Dry eye was diagnosed using a combination of McMonnies and HO dry eye questionnaire, Schirmer's test, and Tear Film Break-Up Time (TBUT). Statistical analysis included chi-square test and logistic regression.

Results: The prevalence of dry eye was 16.3% (49/300). Females had higher prevalence (22.5%) compared to males (11.1%) ($p=0.018$). Increasing age, outdoor occupation, and environmental exposure were significantly associated ($p<0.05$). Mean Schirmer's value in dry eye patients was 7.2 ± 2.1 mm, and mean TBUT was 7.8 ± 1.9 seconds.

Conclusion: Dry eye is a common yet under-recognized condition. Early detection and modification of risk factors can reduce disease burden.

Keywords: Dry eye, prevalence, Schirmer's test, TBUT, risk factors

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Introduction

Dry eye disease (DED) is a commonly encountered ocular condition characterized by instability of the tear film and associated ocular symptoms such as irritation, dryness, and visual disturbance [1]. It represents a significant public health concern due to its chronic nature and impact on quality of life .[2]

The tear film is a complex trilaminar structure composed of lipid, aqueous, and mucin layers, each playing a crucial role in maintaining ocular surface integrity [3]. Disruption in any of these components may lead to tear film instability and subsequent dry eye symptoms. [4]

DED has been broadly classified into aqueous-deficient and evaporative types, depending on the underlying pathophysiology [5]. Several systemic and environmental factors contribute to its development, including aging, hormonal imbalance, prolonged screen exposure, air pollution, and systemic diseases such as diabetes mellitus. [6–8]

Epidemiological studies report a wide variation in prevalence ranging from 10% to over 50%, largely due to differences in diagnostic criteria and population characteristics [9–11]. Hospital-based studies often report prevalence between 12% and 20% [12,13].

Women are more frequently affected than men, possibly due to hormonal influences, particularly estrogen deficiency in postmenopausal women [14,15]. Increasing

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age has also been consistently identified as a major risk factor .[16]

Environmental exposure such as wind, sunlight, and pollution plays a critical role in tear evaporation and ocular surface damage [17,18]. Occupational factors, especially outdoor work, further increase susceptibility [19].

Despite its high prevalence, dry eye remains underdiagnosed due to poor correlation between symptoms and clinical signs [20]. Diagnostic tools such as Schirmer's test and TBUT are widely used to objectively assess tear production and stability. [21]

Given the increasing burden of dry eye and limited regional data, this study was undertaken to estimate the prevalence and associated risk factors of dry eye in a tertiary care setting in Pali, Rajasthan.

MATERIALS AND METHODS

Study Design

- Cross-sectional observational study.
- Study Setting
- Department of Ophthalmology, Government Medical College, Pali.
- Study Duration
- 1 year (January 2025 – December 2025)
- Sample Size
- 300 patients

Inclusion Criteria

- Age ≥18 years
- Patients attending ophthalmology OPD
- Willing to participate

Exclusion Criteria

- Active ocular infection
- Recent ocular surgery (<6 months)
- Contact lens users

METHODOLOGY

Step 1

Subjects were asked to fill the McMonnies and Ho dry eye questionnaire as described by McMonnies CW and Ho A. [22]

Step 2

Clinical Tests

Schirmer's Test

≤10 mm in 5 minutes considered abnormal

TBUT

- <10 seconds considered abnormal
- Diagnostic Criteria

Dry eye diagnosed when

- McMonnies and Ho dry eye questionnaire score more than 20
- At least one positive objective test

Statistical Analysis

- Data analyzed using standard software
- Chi-square test for association
- Logistic regression for risk factors
- p-value <0.05 considered significant

RESULTS

A total of 300 participants were included in the present study. Among them, 49 individuals were diagnosed with dry eye disease, yielding an overall prevalence of 16.3%, as illustrated in Figure 1.

Prevalence of Dry Eye

The proportion of participants identified with dry eye in the study population is depicted in Figure 1, demonstrating that approximately one-sixth of the study group was affected.

Age-wise Distribution

An increasing trend in the occurrence of dry eye was observed with advancing age. The lowest prevalence was noted in the 18–30 years group (8.3%), while the highest was seen in individuals above 60 years (22.7%).

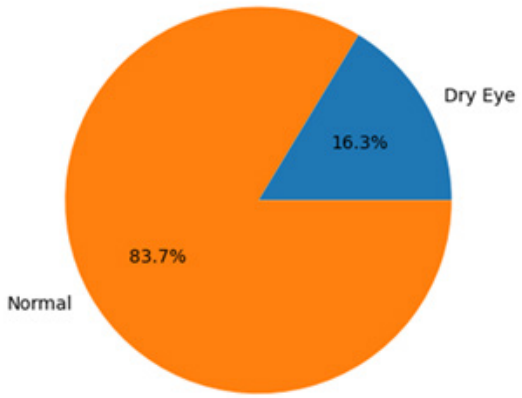

Figure 1: Prevalence of Dry Eye

Table 1: Age-wise Distribution of Dry Eye

Age Group (years)	*Total (n)*	*Dry Eye Cases (n)*	*Prevalence (%)*
18–30	72	6	8.3%
31–40	68	10	14.7%
41–50	64	12	18.7%
51–60	52	11	21.1%
>60	44	10	22.7%

This association between age and dry eye was found to be statistically significant (χ^2 test, p = 0.012), as shown in Table 1.

Gender Distribution

Dry eye was more frequently observed among females (22.5%) compared to males (11.1%). This difference was statistically significant (χ^2 test, p = 0.018). The distribution across gender is detailed in Table 2 and visually represented in Figure 2.

This figure demonstrates a higher proportion of dry eye cases among female participants compared to males.

Association with Risk Factors

Multivariate analysis revealed that several factors were significantly associated with dry eye. Outdoor exposure (OR = 2.12, p = 0.006), prolonged screen time (>4 hours/day) (OR = 1.89, p = 0.021), air pollution (OR = 1.72, p = 0.041), and presence of systemic illness (OR = 2.05, p = 0.009) showed statistically significant associations. Smoking showed a positive trend but did not reach statistical significance (p = 0.083). These findings are summarized in Table 3.

Clinical Test Findings

Objective assessment of tear function showed significantly reduced values among dry eye patients. The mean Schirmer's test value was 7.2 ± 2.1 mm, while the mean TBUT was 7.8 ± 1.9 seconds, both below normal thresholds. These findings are presented in Table 4.

Symptom Profile

Among the diagnosed cases, dryness (81.6%) was the most commonly reported symptom, followed by grittiness (75.5%) and burning sensation (61.2%). Other symptoms included foreign body sensation (55.1%) and redness (48.9%). The distribution of symptoms is shown in Table 5.

Table 2: Gender Distribution

Gender	*Total (n)*	*Dry Eye Cases (n)*	*Prevalence (%)*
Male	162	18	11.1%
Female	138	31	22.5%

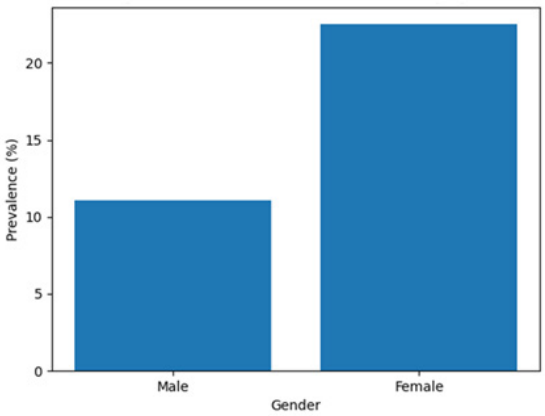

Figure 2: Gender-wise Distribution of Dry Eye

DISCUSSION

The present study demonstrated a prevalence of dry eye disease (DED) of 16.3%, which is consistent with findings from similar hospital-based studies. Variability in prevalence across studies is often attributed to differences in diagnostic criteria, study populations, and environmental conditions. [23]

Age was found to be a significant risk factor, with prevalence increasing in older individuals. This can be explained by age-related decline in lacrimal gland secretion, reduced corneal sensitivity, and structural changes in the ocular surface. Previous studies have also emphasized that advancing age leads to deterioration of tear film stability and increased susceptibility to dry eye. [24]

A higher prevalence among females was observed in this study, which was statistically significant. Hormonal influences, particularly androgen deficiency and postmenopausal estrogen imbalance, are known to impair

Table 3: Association of Risk Factors with Dry Eye

Risk Factor	*Odds Ratio (OR)*	*p-value*
Outdoor exposure	2.12	0.006
Screen time >4 hrs	1.89	0.021
Smoking	1.54	0.083
Air pollution	1.72	0.041
Systemic illness	2.05	0.009

Table 4: Clinical Test Values

Parameter	*Dry Eye (Mean ± SD)*	*Normal Value*
Schirmer's test	7.2 ± 2.1 mm	>10 mm
TBUT	7.8 ± 1.9 sec	>10 sec

Table 5: Distribution of Symptoms in Dry Eye Patients

Symptom	*Frequency (%)*
Dryness	81.6%
Grittiness	75.5%
Burning sensation	61.2%
Foreign body sensation	55.1%
Redness	48.9%

lacrimal gland function and meibomian gland activity. This gender-based predisposition has been widely reported and is considered a key biological factor in dry eye pathogenesis [25]

Environmental exposure, including sunlight, wind, and air pollution, showed a strong association with dry eye in the present study. These factors accelerate tear evaporation and disrupt tear film integrity. Similar observations have been reported in epidemiological studies, where environmental stressors were identified as major contributors to ocular surface disorders. [26,27]

Prolonged screen time also emerged as an important risk factor. Reduced blink rate during digital device usage leads to increased tear evaporation and ocular discomfort. This condition is increasingly recognized as part of digital eye strain, especially in younger populations and office workers. [28]

Occupational exposure plays a significant role, particularly among outdoor workers who are continuously exposed to harsh environmental conditions. Studies have shown that individuals engaged in outdoor occupations have a higher risk of developing dry eye compared to those in controlled indoor environments. [29]

In the present study, objective clinical tests such as Schirmer's test and TBUT were significantly reduced in dry eye patients, confirming both aqueous tear deficiency and tear film instability. These diagnostic methods remain the cornerstone of dry eye evaluation and have been validated in multiple clinical studies. [30]

Symptom analysis revealed dryness and grittiness as the most common complaints, followed by burning sensation and foreign body sensation. These findings are consistent with previous reports describing similar symptom profiles in dry eye patients [31]. However, the discrepancy between subjective symptoms and objective findings remains a known challenge in clinical practice. [32]

The prevalence observed in this study is comparable to other regional studies conducted in similar climatic conditions. Hot and dry environments, such as those found in Rajasthan, contribute significantly to increased tear evaporation and ocular surface stress. [33]

Additionally, systemic conditions and medication use were found to influence the occurrence of dry eye. Certain systemic drugs can interfere with tear production and alter tear film composition, thereby increasing the risk of dry eye. [34]

Overall, the findings of this study highlight the multifactorial nature of dry eye disease and emphasize the importance of early diagnosis and management. Preventive strategies focusing on lifestyle modification, environmental protection, and awareness can significantly reduce disease burden and improve patient outcomes. [35]

CONCLUSION

Dry eye is a prevalent ocular condition with significant association with age, gender, and environmental exposure. Early detection using simple clinical tests and addressing modifiable risk factors can help reduce morbidity and improve quality of life.

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