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Research Article

Study of Clinical Profile and Risk Factors in Dry Eye Disease in a Tertiary Care Setting: A Cross Sectional Study

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ABSTRACT
Introduction: Dry eye disease (DED) is a multifactorial disorder of the tear film and ocular surface, increasingly recognized as a public health concern due to its rising prevalence and impact on quality of life.
Aim: To evaluate the demographic profile, clinical features, severity, and associated risk factors of patients presenting with DED in a tertiary care setting.
Methods: A cross-sectional observational study was conducted on 130 patients clinically diagnosed with DED. Demographic data, occupational exposure, and symptom profiles were documented. Tear film parameters were assessed using Tear Film Break-Up Time (TBUT) and Schirmer I test. Meibomian gland dysfunction (MGD) was graded, and severity was classified according to DEWS II criteria. Statistical analysis was performed using chi-square test to determine associations between risk factors and disease severity.
Results: The majority of patients were aged 40–49 years (24.6%), with a female predominance (58.5%) and urban residency (67.7%). Office/computer-based workers formed the largest occupational group (35.4%). Dryness (69.2%), burning (63.1%), and foreign body sensation (56.9%) were the most common symptoms. Bilateral involvement was seen in 80% of cases. TBUT was <10 seconds in 80% of patients, while Schirmer I values were <10 mm in 70.8%. Based on DEWS II criteria, moderate severity was most common (41.5%), followed by mild (35.4%) and severe (23.1%). High screen time (>4 h/day), prolonged air-conditioned exposure (≥6 h/day), and MGD grade ≥2 were significantly associated with disease severity ($p < 0.05$).
Conclusion: DED is prevalent among middle-aged females and urban populations, with lifestyle factors such as screen time and air-conditioned environments contributing to disease progression. MGD is a key determinant of severe disease. Early recognition of risk factors and preventive strategies are essential to reduce disease burden and improve patient outcomes.

Keywords: Dry Eye Disease, Tear Film Break-Up Time, Schirmer Test.

INTRODUCTION

Dry eye disease (DED) is a multifactorial disorder of the tears and ocular surface that results in symptoms of discomfort, visual disturbance, and tear film instability, often accompanied by increased osmolarity and inflammation of the ocular surface[1]. It is broadly categorized into aqueous-deficient and evaporative types, though most patients exhibit overlapping mechanisms[2]. The condition has gained increasing recognition as a major public health issue, with global prevalence estimates ranging from 5% to 50%, depending on diagnostic criteria and population studied[3].DED significantly impacts quality of life, productivity, and visual function. Patients often report difficulty with reading, computer use, driving, and performing daily tasks, leading to both personal and socioeconomic burden[4]. In recent years, lifestyle changes such as prolonged digital screen exposure, extensive use of air-conditioned environments, and urbanization have contributed to rising incidence rates, particularly among younger and middle-aged populations[5].In India, epidemiological studies have highlighted a growing burden of DED, especially in urban regions where occupational exposure to digital devices and environmental stressors is high[6]. Female predominance has been consistently reported, possibly due to hormonal influences on tear film stability and meibomian gland function[7]. Meibomian gland dysfunction (MGD) has emerged as a leading cause of evaporative dry eye, with strong associations between glandular changes and disease severity[8].Given these trends, it is essential to evaluate demographic patterns,

clinical features, severity grading, and risk factors in local populations to better understand disease mechanisms and guide preventive strategies. The present study was designed to assess these parameters in a tertiary care setting, with particular emphasis on lifestyle-related exposures and MGD as determinants of severity.

Aims and Objectives

Aim: To evaluate the demographic profile, clinical features, severity, and associated risk factors of patients presenting with dry eye disease (DED) in a tertiary care setting.

Objectives

1. To analyze the age, gender, residence, and occupational distribution among patients with DED.
2. To document the spectrum of presenting symptoms, their duration, and laterality.
3. To assess tear film parameters using Tear Film Break-Up Time (TBUT) and Schirmer I test.
4. To classify disease severity according to DEWS II criteria.
5. To identify and correlate risk factors such as high screen time, prolonged air-conditioned environment exposure, and Meibomian Gland Dysfunction (MGD) with disease severity.

MATERIAL AND METHODS

Study Design and Setting

A cross-sectional observational study was conducted in the Department of Ophthalmology at a tertiary care hospital.

Study Population

A total of 130 patients clinically diagnosed with dry eye disease were included in the study.

Inclusion Criteria

1. Patients aged ≥18 years presenting with symptoms suggestive of dry eye (e.g., dryness, burning, foreign body sensation, redness, watering, itching, blurred vision, photophobia).
2. Willingness to participate and provide informed consent.

Exclusion Criteria

1. Patients with active ocular infection, trauma, or recent ocular surgery.
2. Individuals with systemic autoimmune diseases known to cause secondary dry eye (e.g., Sjögren's syndrome, rheumatoid arthritis).
3. Patients on medications known to affect tear film stability (antihistamines, antidepressants, isotretinoin).

Procedure

Institutional ethics committee permission was taken prior to commencement of present study. 130Participants fulfilling inclusion and exclusion criteria were enrolled. Study was explained to all participants and written informed consent was obtained from all.Detailed history was taken regarding demographic variables, occupation, symptom duration, and risk factor exposure (screen time, air-conditioned environment).Ocular examination included slit-lamp evaluation and assessment of tear film parameters.

- Tear Film Break-Up Time (TBUT)[1]: Measured using fluorescein dye; values <10 seconds considered abnormal.
- Schirmer I Test[9,10]: Performed without anesthesia for 5 minutes; values <10 mm considered reduced tear secretion.
- Meibomian Gland Dysfunction (MGD)[8]: Graded based on gland expression and lid margin changes.
- Severity was classified according to DEWS II criteria into mild, moderate, and severe categories[2].

Statistical Analysis

Data were tabulated and analyzed using descriptive statistics. Chi-square test was applied to assess associations between risk factors and disease severity. A p-value <0.05 was considered statistically significant.

Observation and Result

Table 1. Demographic Data

Sr No	Variables	Number Of Cases N=130	Percentage 100 %
1	Age (Years)	22	16.9 %
	a. <30	28	21.5 %
	b. 30–39	32	24.6 %
	c. 40–49	26	20.0 %

	d. 50–59 e. ≥60	22	16.9 %
2	Gender n (%) a. Male b. Female	54 76	41.5 % 58.5 %
3	Residence a. Urban b. Rural	88 42	67.7 % 32.3 %
4	Occupation a. Office/computer-based b. Outdoor/manual c. Homemaker d. Student e. Retired	46 28 34 12 10	35.4 % 21.5 % 26.2 % 9.2 % 7.7 %

The study population comprised 130 individuals, with the majority falling in the 40–49 year age group (24.6%), followed by 30–39 years (21.5%) and 50–59 years (20%). Participants younger than 30 years and those aged 60 years or above each accounted for 16.9%. Females (58.5%) outnumbered males (41.5%), indicating a slight female predominance. Urban residents formed two-thirds of the cohort (67.7%), while 32.3% were from rural areas. Occupational distribution revealed that office or computer-based workers (35.4%) were the largest group, followed by homemakers (26.2%) and outdoor/manual workers (21.5%). Students (9.2%) and retired individuals (7.7%) represented smaller proportions.

Table 2. Clinical Symptoms and Tests

Sr No		**Number Of Cases N=130**	**Percentage 100 %**
1	Symptom a. dryness b. burning c. foreign body sensation d. redness e. watering f. itching g. blurred vision h. photophobia	 90 82 74 68 52 40 58 36	 69.2 % 63.1 % 56.9 % 52.3 % 40.0 % 30.8 % 44.6 % 27.7 %
2	Symptom duration a. <3 months b. 3–12 months c. >12 months	 34 52 44	 26.2 % 40.0 % 33.8 %
3	Laterality a. Bilateral b. Unilateral	 104 26	 80.0 % 20.0 %
4	TBUT (seconds) a. <5 b. 5–10 c. >10	 48 56 26	 36.9 % 43.1 % 20.0 %
5	Schirmer I (mm, 5 min) a. <5 b. 5–10 c. >10	 42 50 38	 32.3 % 38.5 % 29.2 %

Dryness was the most frequently reported symptom (69.2%), followed closely by burning sensation (63.1%) and foreign body sensation (56.9%). Redness (52.3%) and watering (40%) were also common, while itching (30.8%), blurred vision (44.6%), and

photophobia (27.7%) were less prevalent. Symptom duration varied, with 40% experiencing complaints for 3–12 months, 33.8% for more than a year, and 26.2% for less than 3 months. Bilateral involvement was predominant (80%), compared to unilateral cases (20%). Tear film breakup time (TBUT) was reduced in most patients, with 36.9% showing values <5 seconds and 43.1% between 5–10 seconds. Schirmer's test revealed reduced tear secretion in 32.3% (<5 mm), while 38.5% had borderline values (5–10 mm) and 29.2% had normal secretion (>10 mm).

Table 3. Severity

Sr No	Dews Ii Overall Severity	Number Of Cases N=130	Percentage 100 %
1	Mild	46	35.4 %
2	Moderate	54	41.5 %
3	Severe	30	23.1 %
Total		130	100 %

Based on DEWS II criteria, moderate severity was most common (41.5%), followed by mild cases (35.4%). Severe disease was observed in nearly one-fourth of patients (23.1%). This distribution highlights that while a significant proportion of patients present with moderate disease, a considerable number already have severe involvement, underscoring the burden of advanced dry eye in the studied population.

Graph1: Severity

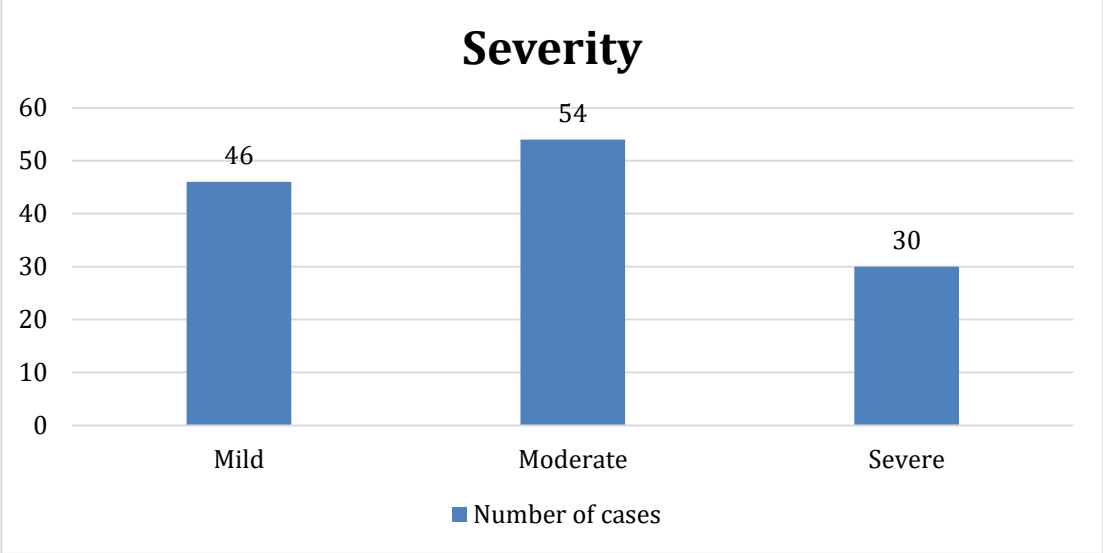

Table 4: Risk Factors vs Severity

Sr No	Risk Factor	Mild (N=46)	Moderate (N=54)	Severe (N=30)	Total (N=130)	Chi Square	P Value
1	High screen time (>4 h/day) a. Yes b. No	10 (21.7%) 36 (78.3%)	22 (40.7%) 32 (59.3%)	16 (53.3%) 14 (46.7%)	48 (36.9%) 82 (63.1%)	χ^2 = 12.14	p =0.002 (S)
2	Air-conditioned environment ≥6 h/day a. Yes b. No	18 (39.1%) 28 (60.9%)	34 (63.0%) 20 (37.0%)	20 (66.7%) 10 (33.3%)	72 (55.4%) 58 (44.6%)	χ^2 = 9.87	p = 0.007 (S)

3	MGD grade ≥2 a. Yes b. No	12 (26.1%) 34 (73.9%)	28 (51.9%) 26 (48.1%)	30 (100%) 0 (0%)	70 (53.8%) 60 (46.2%)	χ^2 = 27.64	p < 0.001 (S)

High screen time (>4 hours/day) was significantly associated with disease severity (p = 0.002). While only 21.7% of mild cases reported prolonged screen exposure, this proportion increased to 40.7% in moderate and 53.3% in severe cases. Similarly, prolonged exposure to air-conditioned environments (≥6 hours/day) showed a strong correlation (p = 0.007), with 39.1% of mild, 63% of moderate, and 66.7% of severe cases affected. Meibomian gland dysfunction (MGD) grade ≥2 was the most striking risk factor (p < 0.001), present in 26.1% of mild, 51.9% of moderate, and 100% of severe cases. This suggests that MGD plays a pivotal role in progression to severe dry eye disease.

DISCUSSION

In the present study, the majority of patients belonged to the 40–49 year age group, with a female predominance and urban residency. These findings are consistent with reports from Rao et al., who observed higher prevalence of DED among middle-aged females in urban populations in Telangana[11]. The occupational distribution in our cohort, with office/computer-based workers forming the largest group, highlights the role of digital screen exposure as a major risk factor. Similar associations have been documented in other Indian studies, where prolonged screen time was significantly linked to increased severity of DED[12].

Symptomatically, dryness, burning, and foreign body sensation were the most common complaints, aligning with the DEWS II global report, which emphasizes these as hallmark symptoms of tear film instability[4]. Bilateral involvement was predominant, and objective tests revealed reduced TBUT and Schirmer values in a substantial proportion, corroborating earlier findings by Gupta et al., who reported comparable tear film abnormalities in Indian patients[13].

Severity analysis revealed that moderate disease was most common, followed by mild and severe cases. This distribution is comparable to the study by Ramapathi Rao et al., where moderate severity predominated, but severe cases were not uncommon[11]. Importantly, our risk factor analysis demonstrated strong associations between high screen time, prolonged air-conditioned exposure, and MGD with disease severity. MGD grade ≥2 was present in all severe cases, underscoring its pivotal role in disease progression. Similar results were reported by the DEWS II report, which identified MGD as the leading cause of evaporative dry eye worldwide[14].

The possible mechanism underlying these associations can be explained by increased tear film evaporation due to reduced blink rate during screen use, coupled with environmental desiccation in air-conditioned settings. Chronic exposure leads to hyperosmolarity, ocular surface inflammation, and destabilization of the lipid layer of the tear film. MGD further exacerbates evaporative loss by impairing lipid secretion, resulting in severe and persistent disease[2]. Thus, lifestyle factors and glandular dysfunction act synergistically to accelerate disease severity.

CONCLUSION

Dry eye disease is prevalent among middle-aged females and urban populations, with moderate severity being most common. Lifestyle factors such as prolonged screen use and air-conditioned environments, along with meibomian gland dysfunction, are strongly associated with disease progression. Early recognition and targeted interventions are essential to reduce severity and improve patient outcomes.

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