Section: Ophthalmology

Original Research Article

PREVALENCE BETWEEN PTERYGIUM & DRY EYE & ITS CORRELATION

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Received *: 08/07/2025*
Received in revised form *: 23/08/2025*
Accepted *: 11/09/2025*

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DOI: 10.70034/ijmedph.2025.3.619

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2025; 15 (3); 3383-3387

ABSTRACT

Background: Pterygium is a common ocular surface condition linked to prolonged ultraviolet (UV) exposure and environmental stressors. It often coexists with dry eye disease (DED), yet the association between them remains underexplored in Indian populations. The objective is to determine the prevalence of DED in patients with pterygium and to assess its correlation with pterygium severity and tear film parameters.

Materials and Methods: A hospital-based cross-sectional study was conducted over 18 months at Dr. Sushila Tiwari Government Hospital, Haldwani. A total of 196 patients with clinically diagnosed pterygium were enrolled after applying strict inclusion and exclusion criteria. Each patient underwent a detailed ocular examination, including visual acuity, slit-lamp evaluation, and standardized dry eye testing. Tear Film Break-Up Time (TBUT), Schirmer's I test (without anesthesia), and Rose Bengal staining were used to assess tear film stability and ocular surface damage. TBUT <10 seconds, Schirmer's <10 mm in 5 minutes, and Rose Bengal score >3 were considered positive. Statistical analysis was done using appropriate tests, and $p < 0.05$ was considered significant.

Results: Out of 196 patients, 114 (58%) had dry eye disease. Significant associations were observed between DED and low socioeconomic status (OR=2.4; p=0.005), UV exposure >6 hours/day (OR=1.91; p=0.001), outdoor occupation (OR=1.5; p=0.02), and smoking (p=0.001). Tear film parameters (TBUT, Schirmer's, Rose Bengal score) showed marked deterioration in DED cases. No significant correlation was found between pterygium grade and DED presence (p=0.969).

Conclusion: Dry eye is highly prevalent in pterygium patients, especially those with environmental and occupational exposures. Early diagnosis and preventive care are essential.

Keywords: Pterygium; Dry Eye Syndrome; Tear Film; UV Radiation; Environmental Exposure".

INTRODUCTION

Pterygium is a chronic, degenerative ocular surface disorder characterized by a triangular fibrovascular proliferation of conjunctival tissue encroaching onto the cornea.[1] It is particularly prevalent in individuals with long-term exposure to ultraviolet (UV) radiation, dust, wind, and other environmental stressors, leading to progressive disruption of the corneal surface and tear film instability.[2] While often asymptomatic in early stages, advanced pterygium may result in symptoms such as ocular irritation, foreign body sensation, astigmatism, and visual axis involvement necessitating surgical excision.[3] Dry Eye Disease (DED), a multifactorial disorder of the ocular surface, is defined by tear film instability, increased osmolarity, ocular surface inflammation, and neurosensory abnormalities. It results in ocular discomfort, visual disturbance, and potential corneal damage.[4] DED prevalence globally varies between 5% and 50%, influenced by demographic, climatic, and diagnostic variations.[5] In the Indian subcontinent, environmental pollution, UV exposure, and increasing screen time have

contributed to a rising burden of DED, especially among vulnerable populations.[6,7] Anatomically and pathophysiologically, pterygium and DED frequently coexist. The presence of a pterygium mechanically disrupts the tear film, reduces blink efficiency, and induces local inflammation, which may promote or aggravate DED.[8] Conversely, chronic tear film instability in DED may create a microenvironment favoring fibrovascular proliferation and recurrence of pterygium.[9] Several clinical studies have demonstrated that patients with pterygium often exhibit significantly lower Schirmer's test values, shorter tear film breakup time (TBUT), and higher ocular surface staining scores compared to healthy individuals.[10,11] Despite these overlapping mechanisms and risk profiles—including UV exposure, smoking, outdoor occupation, and low socioeconomic status—the correlation between pterygium and DED remains insufficiently explored in clinical research, particularly in high-risk Indian populations.[12] Most existing literature is limited by small sample sizes or lacks standardized diagnostic methodology.[13] The purpose of the study was to determine the prevalence of DED in patients with pterygium and assess its correlation with pterygium severity and tear film parameters, along with identifying relevant demographic and environmental risk factors.

MATERIALS AND METHODS

"This cross-sectional observational study was conducted over 18 months in the Department of Ophthalmology at Dr. Sushila Tiwari Government Hospital, Government Medical College, Haldwani, following approval from the Institutional Ethics Committee.

All patients presenting with pterygium during the study period and consenting to participate were enrolled. Patients with systemic conditions known to cause dry eye, such as Sjögren's syndrome, those on systemic medications affecting tear secretion (e.g., diuretics, psychotropics), contact lens users, individuals with adnexal or other ocular surface pathologies, patients who had undergone recent ocular surgery, those using topical anti-glaucoma medications, and individuals who refused consent were excluded.

After obtaining written informed consent, each patient underwent a comprehensive evaluation, including detailed history of symptoms, general physical examination, and full ophthalmic assessment. External examination of the eyelids, conjunctiva, cornea, iris, and lens was performed, followed by visual acuity testing for both near and distance vision. Slit-lamp biomicroscopy was used to assess pterygium and anterior segment structures. Dry eye was evaluated using standard clinical tests. Tear film break-up time (TBUT) was measured using fluorescein under cobalt blue illumination, with values less than 10 seconds considered abnormal. Schirmer's test I was conducted without anesthesia using Whatman filter paper placed in the lower fornix for five minutes; wetting of less than 10 mm indicated reduced tear production. Basal tear secretion was measured via Schirmer's test II after topical anesthesia. Rose Bengal staining was used to assess ocular surface integrity, with scoring based on the Van-Bijsterveld scale across three ocular zones; a total score exceeding three indicated a positive result. All collected data were entered into Microsoft Excel, and statistical analysis was conducted using appropriate methods. Quantitative data were expressed as mean ± standard deviation, and categorical variables as percentages. A p-value <0.05 was considered statistically significant."

RESULTS

Among all the participants, the majority of pterygium patients were males (63.3%) and in the 31–60 years age group (65.3%), indicating a mid-to-late adult population likely exposed to outdoor environmental risk factors [Table 1].

Table 1: Socio-Demographic Profile by Pterygium patient

Variable	Category	Total (n=196)
Age (years)	18–30	52 (26.5%)
	31–45	60 (30.6%)
	46–60	68 (34.7%)
	> 60	16 (8.2%)
Gender	Male	124 (63.3%)
	Female	72 (36.7%)

Out of all the participants, 58% of pterygium patients had Dry Eye Disease (DED), while 42% did not, indicating a high prevalence of DED in this population. This highlights a significant co-existence between pterygium and dry eye status [Figure 1].

There was no significant association between pterygium grade and dry eye status (p=0.969), suggesting severity of pterygium does not predict DED presence [Table 2].

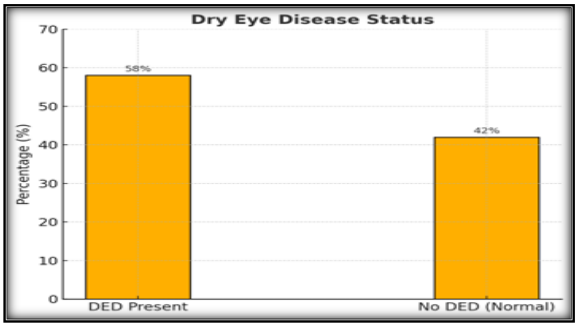

Figure 1: Dry eye disease Status

Table 2: Pterygium Grade by Dry Eye Disease Status

Grade	Dry Eye Disease Present (n=114)	No Dry Eye Disease (n=82)	Total (n=196)	p-value
I (0-2 mm)	48 (42.1%)	36 (43.9%)	84 (42.9%)	0.969
II (2-4 mm)	40 (35.1%)	28 (34.1%)	68 (34.7%)	
III (>4 mm)	26 (22.8%)	18 (22.0%)	44 (22.4%)	

Low SES, prolonged UV exposure, outdoor work, and long screen time were all significantly associated with increased odds of DED ($p<0.05$), confirming these as key risk factors [Table 3].

Table 3: Adjusted Risk Factors for Dry Eye by Dry Eye Disease Status

Risk Factor	Dry Eye Disease Present (n=114)	No Dry Eye Disease (n=82)	Adjusted OR (95% CI)	p-value
Low SES (Class IV–V)	45 (39.5%)	33 (40.2%)	2.4 (1.6–3.5)	0.005
UV exposure > 6 h/day	70 (61.4%)	45 (54.9%)	1.91 (1.3–2.8)	0.001
Outdoor occupation	63 (55.3%)	45 (54.9%)	1.5 (1.1–2.1)	0.02
Screen time > 4 h/day	45 (39.5%)	27 (32.9%)	1.4 (1.0–1.9)	0.04

Patients with Dry Eye Disease (DED) had significantly lower Schirmer's I (5.2 ± 1.8 mm) and TBUT (4.5 ± 1.4 s) values, along with higher Rose Bengal staining scores (5.6 ± 2.2), compared to those without DED. These findings indicate reduced tear production, increased tear film instability, and greater ocular surface damage in the DED group [Figure 2]. Tear film function declined progressively with lower socioeconomic status, with Class IV–V showing the worst Schirmer's, TBUT, and staining scores ($p=0.01$) [Table 4].

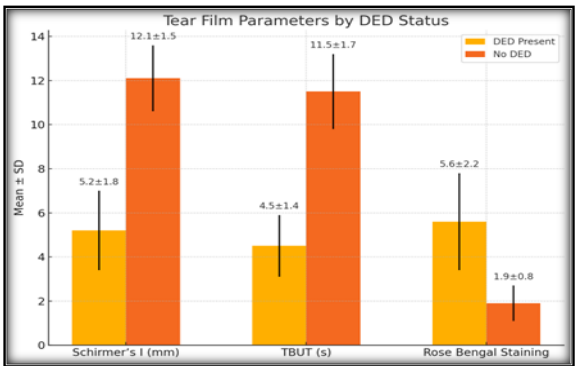

Figure 2: Tear Film Parameters by Dry Eye Disease Status (Mean ± SD)

Table 4: Socio-Economic Impact on Tear Parameters (Mean ± SD)

SES Class	Schirmer's I (mm)	TBUT (s)	Rose Bengal Staining	p-value
Class II (40)	7.8 ± 2.2	7.3 ± 2.0	2.1 ± 0.9	0.01
Class III (78)	6.8 ± 1.9	6.4 ± 1.6	3.4 ± 1.3	
Class IV–V (78)	5.3 ± 1.5	5.5 ± 1.3	4.6 ± 1.5	

Age, gender, and comorbidities showed no significant association with DED ($p>0.05$), suggesting they are not independent predictors in this cohort. A strong correlation was found between smoking and DED ($p=0.001$), identifying it as a major modifiable risk factor.No significant difference in lubricant compliance was found between DED and non-DED groups ($p=0.039$), indicating uniform adherence across the cohort [Table 5].

Table 5: Age Distribution by Dry Eye Disease Status

Variable	Category	Dry Eye Disease Present (n=114)	No Dry Eye Disease (n=82)	Total (n=196)	p-value
Age Group	18–30	30 (26.3%)	22 (26.8%)	52 (26.5%)	0.988
	31–45	36 (31.6%)	24 (29.3%)	60 (30.6%)	
	46–60	39 (34.2%)	29 (35.4%)	68 (34.7%)	
	> 60	9 (7.9%)	7 (8.5%)	16 (8.2%)	
Gender	Male	67 (58.8%)	57 (69.5%)	124 (63.3%)	0.165
	Female	47 (41.2%)	25 (30.5%)	72 (36.7%)	
Comorbidity	None (140)	82 (71.9%)	58 (70.7%)	140 (71.4%)	0.971
	Diabetes (32)	18 (15.8%)	14 (17.1%)	32 (16.3%)	
	Hypertension (24)	14 (12.3%)	10 (12.2%)	24 (12.2%)	
Smoking Status	Smoker (44)	66 (57.8%)	18 (22.0%)	84(42.8%)	0.001
	Non-Smoker (152)	48 (42.2%)	64 (78.0%)	112(57.2%)	
Compliance Level	Low (<2×/day)	28 (24.6%)	20 (24.4%)	48 (24.5%)	0.039
	Medium (2–4×/day)	51 (44.7%)	37 (45.1%)	88 (44.9%)	
	High (>4×/day)	35 (30.7%)	25 (30.5%)	60 (30.6%)	

The seasonal distribution of Dry Eye Disease (DED) cases in pterygium patients shows minimal variation, with slightly higher counts in summer (42) and winter (40) compared to monsoon (32). This indicates no

significant seasonal influence on DED prevalence across the observed cohort [Figure 3].

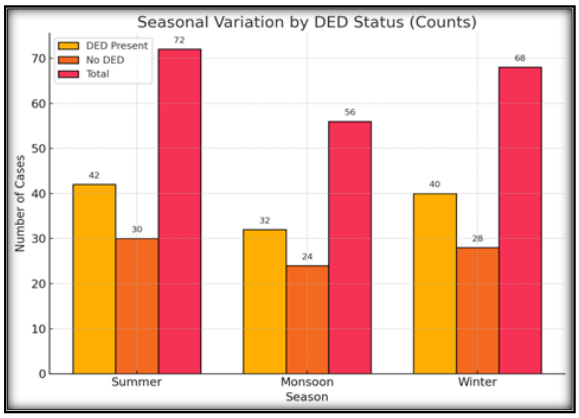

Figure 3: Seasonal Variation by Dry Eye Disease Status

DISCUSSION

Among 196 patients with pterygium, 58% were diagnosed with DED, consistent with the findings of Manhas et al (2017),[14] who reported a similar prevalence of 58.89%.

The majority of the study population were males (63.3%), aged between 46–60 years (34.7%), with outdoor occupations (55.1%) and lower socioeconomic status, notably Class III (39.8%). These demographics closely align with Kotecha et al. (2021),[15] who associated pterygium and DED with prolonged UV exposure, outdoor labor, and lower SES. Sabarwal et al (2025),[16] further emphasized occupational and environmental risk factors, including extended screen time and UV exposure, corroborated by the present study's findings (ORs: UV exposure = 1.91, outdoor work = 1.5, $p < 0.05$).

Tear function tests—Schirmer's I (5.2 ± 1.8 mm), TBUT (4.5 ± 1.4 s), and Rose Bengal staining (5.6 ± 2.2)—were significantly abnormal in DED patients, supporting the tear film instability demonstrated by Hashemi et al. (2014),[17] and Cornejo & Levano (2022).[18] Lower SES patients showed progressively worse tear parameters ($p = 0.01$), suggesting socioeconomic conditions affect ocular surface health, as also noted by Sabarwal et al.[16]

There was no significant correlation between DED and age ($p = 0.988$), gender ($p = 0.165$), comorbidities ($p = 0.971$), or season ($p = 0.982$), partially diverging from Manhas et al,[14] and Hashemi et al,[17] who found higher DED in older females and during colder seasons. However, a strong association was observed with smoking ($p = 0.001$), in agreement with findings by Manhas et al,[14] and Cornejo & Levano.[18]

Interestingly, lubricant compliance did not differ significantly between groups ($p = 0.039$), contrary to Sabarwal et al,[16] who reported poor compliance in DED patients. The absence of correlation between pterygium grade and DED ($p = 0.969$) contrasts with Winai Chaidaroon et al. (2023),[19] who linked larger pterygia with worse tear film parameters.

In conclusion, this study reinforces the interrelation between pterygium and DED, particularly among outdoor workers and smokers, highlighting the need for targeted screening and preventive strategies in at-risk populations.

CONCLUSION

In conclusion, dry eye disease was commonly seen in patients with pterygium, especially those with greater sun exposure and from lower-income groups. The link between poor tear film quality and the presence of pterygium suggests the need for routine screening in such individuals. Addressing modifiable risks early on can help prevent worsening symptoms and improve overall eye comfort and quality of life.

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