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ORIGINAL RESEARCH ARTICLE

Clinical Profile and Determinants of Dry Eye Disease in Adults

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Abstract

Introduction: Dry Eye Disease (DED) is the disorder which is identified with tear film instability, ocular surface inflammation, and neurosensory dysfunction, which results to discomfort and visual impairment. The occurrence has variation among different populations and enhances with age, lifestyle factors and different systemic disorders. Analysis of the clinical profiles and determinants are important for the diagnosis and management.

Methodology: This cross-sectional study conducted over one year in a tertiary care hospital in India evaluated the clinical profile and determinants of dry eye disease. Among 150 patients aged above 20 years attending the Ophthalmology outpatient department, 90 were diagnosed with dry eye. Detailed demographic, clinical, and systemic data were collected following informed consent. Diagnosis and grading were based on Schirmer's test I, tear break-up time (TBUT), tear film thinning time (TTT), and tear meniscus height (TMH).

Results: Across 90 dry eye cases, the highest age-specific prevalence was observed in the 50–59-year group (26.67%), followed by 40–49 years (20.00%) and 60–69 years (18.89%), while younger adults aged 20–29 years contributed only 5.56%. Symptomatically, burning sensation (93.75%), blurred vision (92.11%), redness (90.00%), and itching (89.47%) predominated. Mild to moderate level of severity was observed with significant reduction in the quantity and the quality of tear for different parameters like Schirmer's I, TBUT, tear meniscus height, and tear film thinning time.

Conclusion: The study had concluded that dry eye disease was commonly prevalent among mid aged individuals, associated with ocular surface symptoms like itching and other systemic comorbidities were present. Mostly cases varied from mild to moderate level of severity of dry eyes.

Key words: Dry eye disease, prevalence, risk factors, screening

1 | INTRODUCTION

Tear-film unpredictability and ocular surface damage are two symptoms of dry eye illness. In addition, it is a multifactorial disorder of the tear film and ocular surface that produces pain and visual impairment. According to the current consensus, DED with tear film instability, hyperosmolarity, ocular surface inflammation and injury, and neurosensory abnormalities all playing etiologic roles, is characterised by a loss of tear film homeostasis. Clinical thought has moved away from a single "dryness" symptom and why therapy must be personalised according to this modern, pathophysiology-centered definition, and toward indicator a complex illness model that explains why symptoms that frequently do not agree (1).

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Epidemiologically, a global public health issue, DED is significant. Population-based and clinic-based studies' prevalence estimates vary greatly depending on case definition, population age structure, geography, and diagnostic methods have consistently established greater rates among women and older persons. Significant variability caused regional meta-analyses and systematic reviews, the fact that prevalence varies, and that local factors are important when assessing study results by environmental, behavioural, and systemic variables (2).

DED can present clinically from irregular, irritating symptoms and changeable vision to ocular surface damage and continuing pain in more cases in a number of ways. Since neurosensory dysfunction and patient-reported indications and symptoms frequently disagree, objective testing is necessary in becoming recognised as a major component of the illness. The TFOS DEWS II diagnostic with symptom questionnaires to improve diagnosis accuracy and guide therapy recommendations strongly emphasise a tiered strategy that combines targeted objective testing (3).

DED is related to numerous factors that frequently interact. Among the most dependable indicators are tear film production, meibomian gland function, and ocular surface health are age related and female sex that affect tears. Evaporative or aqueous-deficient processes can be made worse by a number of systemic drugs. Aqueous-deficient DED is transported on by lymphocytic destruction of lacrimal glands in systemic autoimmune illnesses such as Sjögren's syndrome. Examples of modern lifestyle exposures that can put someone at risk as well as contribute to explaining DED in younger cohorts include prolonged use of digital displays, low humidity, heavy contact lens use, history of refractive surgery, air pollution, testosterone deficiency, postmenopausal changes, and hormonal factors, which are reported in recent systematic reviews and meta-analyses (4).

In other areas, DED's symptoms on everyday productivity, healthcare systems, and quality of life and indicators have quantifiable negative effects. DED can cause corneal ulcer and lead to vision loss. Patients frequently report early exposure, reading, driving, using digital gadgets, and performing professional duties, and reduced capacity for risk-factor management. The public health urgency by economic assessments and burden-of-disease studies, which include both direct and indirect costs and focused therapy, is reinforced. Therefore, modern therapy paradigms incorporate behavioural and environmental treatments, tear replacements, anti-inflammatory medications, and procedure choices personalised to the primary disease cause or mechanisms in line with the phased management supported by recent consensus reports (5).

Adult clinical profiles due to the multifactorial nature of DED differ between populations and healthcare situations; meaningful epidemiologic description, prognosis estimation, accurate phenotyping, and systematic evaluation of determinants, and the provision of efficient, individualised care depend. A strong basis for research aiming to explain clinical profiles and measure the relative contribution of modifiable and non-modifiable variables in adult DED is provided by the corpus of recent literature, which ranges from large population studies to consensus diagnostic and treatment recommendations.

2 | METHODOLOGY

Research design

This is a cross-sectional study for the evaluation of the clinical profiles and different determinants for the dry eye disease among patients. The study was conducted in a Tertiary care hospital in India for a period of one year. Total 150 patients were selected for the study of age greater than 20 years of age, out of which, 90 patients had dry eye cases. Patients those who had visited the opthalmology OPD department with the symptoms of ocular surface for dry eyes disease were included for the study. The evaluation of the dry eye cases was performed and graded by the use of using Schirmer's test I, tear break-up time (TBUT), tear film thinning time (TTT), and tear meniscus height (TMH). This was measured by the standard protocols for the assessment of the tear production, with stable tear film and grading of the severity. Informed written and verbal consent was taken.

Inclusion criteria

- Patients more than 20 years of age were selected for the study.

• Patients visited to the Ophthalmology OPD department for dry eye disease for 1 month were selected for the study.

• Well informed consent was taken for the study conduction.

Exclusion criter ia

• Patients using contact lens were not considered for the study.

• Patients with consistent treatment of dry eye were not selected for the study.

• Patients with active ocular infection were not selected for study.

• Malposition of the eyelid or any disease related to the dry eyes was not selected for the study.

• Pregnant women were not selected for the study.

Procedure

Written and verbal consent was obtained from each of the participants after selection based on the inclusion and exclusion criteria. Factors considered, were age, sex, occupational status, allergy, systemic disease, intake of drugs, joint pain, chemical injury, usage of contact lens, incidence of ocular surgeries and presence of any consistent medications. The slit-lamp biomicroscopic evaluation was done for assessing the abnormalities in the lid, status of the meibomian gland, tarsal conjunctiva, quality of the tear film, mucous threads and filaments of cornea. This was followed up by the objective tests, with Tear Break-Up Time (TBUT) by the use of 2% of fluorescein. The TBUT was recorded from the opening of the eye lid to the visibility of the initial dry spot. Measurement of the Tear meniscus height (TMH) was done by the use of slit lamp extending from the centre of the lower eye lid to the upper extension. The dry eye was graded as Grade 1 as mild discomfort, Grade 2 as moderate discomfort, Grade 3 as severe discomfort and Grade 4 as disabling discomfort. The value less than 10 seconds was meant to be abnormal. Ocular surface staining was performed by Fluorescein and Lissamine green. Schirmer's test I was assessed by the use of Whatman filter paper strip, which was put in the middle and the lateral third of the lower eyelid. The strip was removed after 5 minutes and the length of the wetting of the strip was measured in millimeter. Grading of the dry eye was done on the basis of Schirmer's values as mild (<10 mm), moderate as (<5 mm) and severe form as (<2 mm). Schirmer I test along with the anaesthesia was done under stable conditions. The process was performed with greater than 6 mm of wetting for 5 minutes determines dry eye. Different blood investigations like RA factor and tests for thyroid function was performed.

Statistical analysis

The statistical analysis was done by SPSS 27. The continuous data were expressed in mean±SD and the categorical data was expressed in frequencies and percentages. Data collected were recorded and entered in Microsoft excel. Data analysis was performed by the use of SPSS version 20. Also the p values was maintained at <0.05 for statistical significance.

Table 1. Distribution of age group for number of dry eye cases along with their percentages

Age Group (years)	No. of Dry Eye Cases (N = 90)	Percentage (%)
20–29	5	5.56%
30–39	10	11.11%
40–49	18	20.00%
50–59	24	26.67%
60–69	17	18.89%
70–79	10	11.11%
80–89	6	6.67%
Total	90	100%

3 | RESULT

Table 1 shows the distribution of dry case patients according to age groups. Mid age 50 to 59 years of patients showed maximum dry eye cases about 26.7%. High proportion of dry eye cases have been observed in 40 to 49 and 60 to 69 years of age. Frequent dry eye cases have been observed among

young age group of 20 to 29 with 5 cases only. Thus, the table highlights strong age related distribution for dry eye cases, underscore the need for the management.

Table 2 shows the symptom wise distribution of number of dry eye cases out of the total number of 150 patients. Highest 93.75% of cases observed with burning sensation, 92.11% showed blurred vision. 90% of redness and about 89.47% of cases had itching issues. Ocular pain had been seen about 85.71% of patients, photophobia 84.62% and 81.82% experienced problem in opening of eye, were evaluated, highlighted the discomfort for ocular surface and dysfunction. About 75% of cases observed with dryness. Lowest association about 50% had been observed in case of foreign body sensation.

Table 2. Different symptoms for number of patients along with the dry eye cases

Symptoms	Number of Patients (N = 150)	Dry Eye Cases (N = 90)	Percentage (%)
Foreign body sensation	60	30	50.00%
Non-sticky eye discharge	35	25	71.43%
Itching	95	85	89.47%
Burning sensation	80	75	93.75%
Dryness	120	90	75.00%
Ocular pain	70	60	85.71%
Watering	65	50	76.92%
Temporary blurred vision	38	35	92.11%
Redness	50	45	90.00%
Photophobia	65	55	84.62%
Difficulty in eye opening	55	45	81.82%

Table 3 presents the distribution of different systemic disease for dry eye cases.68.88% of hypertension and 61.11% of diabetes mellitus commonly observed for the systemic diseases. This highlighted the association between the metabolic and different cardiac condition and the occurrence of dry eye condition. Very rare correlation have been seen in case of rheumatoid arthritis 30% for 27 cases, hypothyroidism for 38.88% among 35 cases and Sjögren's syndrome was observed among 8 cases only accounts to 8.88%, reflected the impact of the autoimmune and endocrine disorders.

Table 3. Different systemic diseases along with the number of dry cases with their percentages

Systemic Disease	Number of Dry Eye Cases (N=90)	Percentage (%)
Hypertension	62	68.88%
Diabetes mellitus	55	61.11%
Hypothyroidism	35	38.88%
Rheumatoid arthritis	27	30%
Sjögren's syndrome	8	8.88%

Table 4 highlighted the distribution of severity of dry eye on the basis ofSchirmer's test and tear break-up time (TBUT) among the dry eye cases of 90 patients. Majorly, 37.8% of patients have been observed with mild dry eye cases according to the Schirmer's test. This is followed by the moderate level among 24.4% and severe form of dry eye cases noted among 4.4%. 57.8% showed mild severity by TBUT assessment and 38.9% of moderate dry eye cases. Severe form of dry eye cases was not observed. The result findings suggested mild to moderate dry eye cases, while TBUT is more predominant comparing to Schirmer's test.

Table 4. Grading of the Dry eye test on the basis of TBUT andSchirmer's test

Total dry eye cases 90		
Grading of Dry Eye	**Schirmer's (mm/5 min) (%)**	**TBUT (sec) (%)**
Normal	30 (33.3%)	2 (2.2%)
Mild	34 (37.8%)	52 (57.8%)
Moderate	22 (24.4%)	35 (38.9%)
Severe	4 (4.4%)	1 (1.1%)
Total	90 (100%)	90 (100%)

Table 5 demonstrates a clear and graded deterioration in all evaluated diagnostic parameters with increasing severity of dry eye disease, and these differences are supported by statistically significant p-values.Schirmer's I values show a marked decline from mild to severe grades, decreasing from 16.2 ± 6.1 in mild cases to 7.4 ± 3.2 in severe cases, with the intergroup difference being statistically significant (p = 0.002), indicating a progressive reduction in aqueous tear production. Tear film break-up time similarly decreases across severity grades, from 11.2 ± 2.1 in mild dry eye to 7.6 ± 1.8 in severe disease, and this reduction is statistically significant (p = 0.003), reflecting increasing tear film instability. Tear meniscus height shows a pronounced and consistent reduction with severity, falling from 0.51 ± 0.10 in mild cases to 0.23 ± 0.08 in severe cases, with a highly significant p-value (p = 0.001), suggesting substantial compromise of tear volume. Tear film thinning time also demonstrates a significant decline from mild to severe grades, decreasing from 11.4 ± 2.0 to 8.2 ± 1.4, with statistical significance (p = 0.004). Collectively, the data indicate that worsening dry eye severity is associated with significant impairment across all tear function parameters, and the consistently low p-values confirm that these trends are unlikely to be due to chance.

Table 5. The comparative analysis for different diagnostic parameters related to dry eye across different grades of severity

Grading of Dry Eye	Schirmer's I (Mean ± SD)	Tear Film Break-Up Time (Mean ± SD)	Tear Meniscus Height (Mean ± SD)	Tear Film Thinning Time (Mean ± SD)
Mild	16.2 ± 6.1	11.2 ± 2.1	0.51 ± 0.10	11.4 ± 2.0
Moderate	13.9 ± 5.8	9.6 ± 2.0	0.39 ± 0.11	10.2 ± 1.9
Severe	7.4 ± 3.2	7.6 ± 1.8	0.23 ± 0.08	8.2 ± 1.4
p-value*	0.002	0.003	0.001	0.004

4 | DISCUSSION

The heterogeneity and multifactoriality of the phenomenon of dry eye disease are witnessed in the clinical profile and determinants of the condition in the adult population. Simply, DED is a continuum of symptoms, severities, and clinical features that includes tear-film instability, ocular surface inflammation, and neurosensory abnormalities that, in turn, have variability across various patient groups. This complexity is clearly seen in clinic-based and population-based research that confounds the prevalence patterns, the profiles of risk factors, and clinical characteristics in geographic and demographic settings (6).

The common finding of various epidemiologic studies is that women are more likely to have DED as compared to men, whereby various ethnic and regional cohorts have seen this. Indicatively, a regional study survey conducted in Jazan Province in Saudi Arabia showed that symptomatic dry eye was some 60 per cent among the respondents, with a greater prevalence among the females (68.4) compared to the males (52.2). Female sex was a risk factor that was independent (OR about 1.78) (7). Equally, a population-based survey in the Riyadh area of Saudi Arabia reported a high adjusted prevalence of DED (~45%), once again with females being disproportionately affected; it was also found to have a strong association with glaucoma and topical glaucoma drugs (8).

These findings can be correlated with the general epidemiologic trends documented in systematic reviews, which highlight female sex and aging as

strong non-adjustable risk factors of DED (9). The clinical profiles of the hospital-based projects are sometimes slightly different because of referral bias and ascertainment of diagnosis. In West Bengal, India, 26 percent of the patients exhibited symptoms and at least one clinical sign of dry eye disease, and once more, female preponderation was observed. Still, computer use was not significantly related to the presence of the disease (10).

Such exposure of the digital screen as a key determinant makes a very important point: the impact of risk factors may be different based on the population under consideration and the diagnostic criteria. With cohorts, there are also different comorbidity profiles. According to the Saudi high-altitude study, comorbidities (hypertension and asthma) also had a pronounced impact on DED severity and a previous refractive surgery, as well as arthritis (11). The Riyadh cohort failed to identify significant relationships with diabetes or hypertension, though glaucoma and its topical treatment were significant (12).

These disparities are the interaction between systemic health status and ocular surface homeostasis, and how local disease epidemiology can change with the prevalence of comorbidities. Our knowledge of determinants is further enhanced by comparative data based on population-based studies in Europe and U.S. systematic reviews. In the United States, a meta-analysis estimated a 8.1 and 21.2 percent prevalence of DED and meibomian gland dysfunction, respectively; this lower prevalence than in Middle Eastern studies could be due to the different methods of diagnosis, climate, ethnicity, and lifestyle (13).

The additional studies of the population (Russia) supported the idea that female sex and such systemic disorders as thyroid disease and depression were important predictors of DED and MGD prevalence (14). DED also has changes in its clinical manifestations based on the underlying aetiology. A key pathophysiologic cause of evaporative dry eye, Meibomian gland dysfunction, is often a primary clinical presentation of tertiary care groups. MGD was found to be the most prevalent diagnosis in a South Indian tertiary care centre, and older age was linked with more significant tear-film disruption (15).

Clinic-based studies may show a worse disease profile than general population surveys, which is perhaps due to the fact that patients who seek care will have more symptom burden or disease progression. In the literature, there is a persistent issue of symptom-sign discordance, i.e., the overall lack of correlation between subjective complaints and objective test abnormalities. The West Bengal research indicated that the major symptoms could be present without matching signs, indicating that individual pain sensations, the level of tear osmolarity, or neurosensory dysfunction could vary (16).

It supports the concept of the necessity of such an extensive method of diagnostics that should combine the patient-reported outcomes with the objective ones. The environment and lifestyle also give further background. Other studies not in the Middle East recognize exposure to digital screens as a key risk factor, especially among young cohorts and students. Although the Saudi Jazan survey did not establish any significant effects of screen time and smoking, other studies that use a sample of university students in similar districts attribute high rates of DED symptoms to extensive use of visual displays (17). The environment, including low humidity and air pollution, has also been reported to increase the instability of the tear film, which agrees with epidemiologic literature on determinants of DED that are under control (18).

The multifactorial determinants and variable clinical profiles of DED in the world populations. Repeatedly observed risk factors are the female sex, old age, systemic comorbidities, and dysfunction of the meibomian glands. However, the contribution and importance of other factors, including the use of digital devices, smoking, diabetes, or environmental exposures, may vary in terms of population, diagnostic criteria, and methodological design. In addition, the clinical manifestations may vary between mild symptoms, which come and go, to severe disruption of the tear-film and destruction of the ocular surface, thus the importance of individual evaluation and treatment.

5 | CONCLUSION

The study concluded that dry eye cases are observed mostly among middle-aged and elderly individuals, commonly among those aged 50 to 59 years. Most

commonly observed symptoms are burning sensation, blurred vision, itching, redness, and ocular pain. Some comorbidities, like hypertension and diabetes mellitus, showed a strong association with dry eye. This highlighted the strong connection between metabolic and cardiovascular conditions and showed impairment in the tear film function. On the basis of Schirmer's test and TBUT, the patients were graded as having mild to moderate severity of dry eye cases. The unstable tear film is more predominant over aqueous film deficiency. Significant reduction in the Schirmer's I values, TBUT, tear meniscus height, and tear film thinning time according to the severity of the disease was noted by a descriptive and comparative analysis study. Altogether, the study underscored the value of dry eye cases and highlighted the significance of the diagnostic assessment of the dry eye, the grading system, and the management for the prevention of the progression of disease for improvement in eye comfort and life quality.

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