



Original Article

## Prevalence of Dry Eye Disease and Associated Risk Factors in the Elderly Population: An Observational Study

Dr Prabha<sup>1</sup>, Dr Sushma Kumari<sup>2</sup>, Dr. Saurabh Singh Jareda<sup>3</sup>

<sup>1</sup>Associate professor and Head, Department of Ophthalmology, SJPMC, Bharatpur Rajasthan.

<sup>2</sup>Associate professor, Department of Ophthalmology, GMC and Hospital, Dholpur, Rajasthan.

<sup>3</sup>Assistant professor, Department of Ophthalmology, GMC and Hospital, Dholpur, Rajasthan

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### Corresponding Author:

**Dr Prabha**

Associate professor and Head,  
Department of Ophthalmology,  
SJPMC, Bharatpur Rajasthan.

[Dr.prabhas22@gmail.com](mailto:Dr.prabhas22@gmail.com)

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### ABSTRACT

**Background:** Dry Eye Disease (DED) is a growing public health concern, particularly among the aging population. It significantly impacts visual function and quality of life. **Objective:** To determine the prevalence of DED and analyze associated systemic, ocular, and lifestyle risk factors in an elderly population. **Methods:** This cross-sectional observational study included 150 patients aged 60 years and older. Diagnosis of DED was based on the Ocular Surface Disease Index (OSDI) questionnaire and clinical tests (TBUT, Schirmer's test). Demographic data, systemic comorbidities, ocular history, and lifestyle factors were recorded and analyzed. **Results:** The overall prevalence of DED was 61.3% (n=92), with a female preponderance (54.7%). Among those with DED, 43.5% had mild, 38.0% moderate, and 18.5% severe disease. Statistically significant associations were found with Diabetes Mellitus (77.8% prevalence), Rheumatoid Arthritis (75.0%), and Thyroid Disorders (66.7%) ( $p < 0.05$ ). Ocular risk factors included Meibomian Gland Dysfunction (MGD) (80.0%) and topical anti-glaucoma medication use (80.0%). High screen exposure (>4 hours/day) and smoking were also correlated with increased DED frequency. **Conclusion:** DED is highly prevalent in the elderly, driven by a complex interplay of systemic diseases, ocular conditions like MGD, and lifestyle factors. Comprehensive screening in geriatric care is essential for early management.

**Keywords:** Elderly, Dry Eye Disease, Ocular Surface Disease Index, Tear Break-Up Time, Schirmer's Test.

### INTRODUCTION:

Dry Eye Disease (DED) is a multifactorial disease of the ocular surface characterized by a loss of homeostasis of the tear film, accompanied by ocular symptoms, in which tear film instability and hyperosmolarity, ocular surface inflammation and damage, and neurosensory abnormalities play etiological roles (1). As the global population ages, the burden of DED is expected to rise, posing a significant challenge to healthcare systems and the quality of life of the elderly.

The epidemiology of DED varies significantly depending on the population studied and the diagnostic criteria employed. The prevalence ranges from 5% to 50% in various global studies, with a marked increase observed with advancing age (2). The elderly are particularly susceptible due to the physiological senescence of lacrimal and meibomian glands, reduced blink reflex, and the cumulative effect of oxidative stress on the ocular surface (3). Furthermore, the geriatric population often suffers from multiple systemic comorbidities such as diabetes mellitus, rheumatoid arthritis, and thyroid dysfunction, all of which have been implicated in the pathogenesis of aqueous-deficient or evaporative dry eye (4).

In addition to systemic health, ocular history plays a pivotal role. The widespread prevalence of Meibomian Gland Dysfunction (MGD) in older adults contributes significantly to evaporative dry eye. Moreover, iatrogenic factors, including cataract surgery—the most common surgical procedure in the elderly—and the chronic use of topical preservatives in anti-glaucoma medications, exacerbate ocular surface disease (5, 6).

Despite the known associations, there is a need for comprehensive data that simultaneously evaluates demographic, systemic, ocular, and lifestyle variables within specific geriatric cohorts. The modern elderly population is also increasingly exposed to digital screens, adding a contemporary lifestyle risk factor to the traditional list. This study aims to estimate the prevalence of DED in patients aged 60 years and older and to dissect the contribution of various systemic and ocular risk factors to the disease burden.

## MATERIALS & METHODS:

### Study Design and Setting

This prospective, cross-sectional observational study was conducted at the Department of Ophthalmology in tertiary care teaching hospitals. The study duration was six months. The protocol adhered to the tenets of the Declaration of Helsinki and was approved by the Institutional Ethics Committee. Written informed consent was obtained from all participants.

### Study Population

A total of 150 elderly patients (aged >60 years) presenting to the ophthalmology outpatient department were recruited.

- **Inclusion Criteria:** Patients aged 60 years and above willing to participate.
- **Exclusion Criteria:** Patients with active ocular infections, history of ocular surgery within the last 3 months (to exclude acute post-operative inflammation), eyelid deformities (e.g., ectropion, entropion), or those unable to comprehend the questionnaire.

### Clinical Evaluation

All participants underwent a detailed history taking, focusing on:

1. **Demographics:** Age, gender, residence (urban/rural).
2. **Systemic History:** Presence of diabetes mellitus, hypertension, thyroid disorders, and rheumatoid arthritis.
3. **Ocular History:** History of cataract surgery, use of topical anti-glaucoma medications, and symptoms suggestive of MGD.
4. **Lifestyle:** Smoking status and daily screen time exposure (categorized as <4 hours or >4 hours).

### Diagnosis of Dry Eye Disease

The diagnosis was established using a combination of subjective symptoms and objective signs:

- **Subjective:** The Ocular Surface Disease Index (OSDI) questionnaire was administered. An OSDI score >12 was considered indicative of symptomatic DED.
- **Objective:**
  - **Tear Break-Up Time (TBUT):** < 10 seconds was considered abnormal.
  - **Schirmer's Test I:** < 10 mm wetting after 5 minutes (without anesthesia) was considered abnormal.
  - **Corneal Staining:** Assessed using fluorescein dye to evaluate surface damage.

Patients were diagnosed with DED if they had an OSDI score  $\geq 12$  plus at least one abnormal objective clinical test. Severity was graded as Mild, Moderate, or Severe based on the DEWS II management and severity grading guidelines (1). MGD was diagnosed based on lid margin changes and expressibility of meibomian glands.

## RESULTS:

A total of 150 elderly patients participated in the study, with a mean age distribution favoring the 60–69 year age group (43.3%) and a slight female preponderance (54.7%), as detailed in Table 1. The overall prevalence of Dry Eye Disease (DED) in the study population was found to be 61.3% (n=92), with the majority of these cases classified as mild (43.5%) to moderate (38.0%) in severity (Table 2).

Analysis of systemic risk factors revealed a statistically significant association between DED and Diabetes Mellitus (77.8% prevalence within the group) as well as Rheumatoid Arthritis (Table 3). Furthermore, ocular history played a critical role; patients with Meibomian Gland Dysfunction (MGD) and those using topical anti-glaucoma medications showed notably high rates of DED (80% for both groups), while 69.1% of patients with a history of cataract surgery were diagnosed with dry eye (Table 4). Lifestyle factors also contributed to the disease burden, with higher screen exposure (>4 hours) and a history of smoking correlating with a higher frequency of DED cases (Table 5).

**Table 1: Demographic Characteristics of the Study Population (N=150)**

Characteristic	Category	Frequency (n)	Percentage (%)
Age Group (Years)	60 – 69	65	43.3%
	70 – 79	55	36.7%
	$\geq 80$	30	20.0%
Gender	Male	68	45.3%
	Female	82	54.7%
Residence	Urban	95	63.3%
	Rural	55	36.7%

**Table 2: Prevalence and Severity of Dry Eye Disease (DED)**

DED Status	Category	Frequency (n)	Percentage (%)
Presence of DED	Present	92	61.3%
	Absent	58	38.7%
Severity of DED	Mild	40	43.5%

(among n=92)	Moderate	35	38.0%
	Severe	17	18.5%

**Table 3: Association of Systemic Comorbidities with Dry Eye Disease**

Comorbidity	Total Patients (n)	DED Present (n)	Prevalence within Group (%)	P-value*
Diabetes Mellitus	45	35	77.8%	< 0.05
Hypertension	50	28	56.0%	> 0.05
Thyroid Disorders	15	10	66.7%	< 0.05
Rheumatoid Arthritis	12	9	75.0%	< 0.05
No Comorbidities	28	10	35.7%	-

\*P-value calculated using Chi-square test; P < 0.05 considered significant.

**Table 4: Ocular Risk Factors and Medication History**

Ocular Risk Factor	Total Patients (n)	DED Present (n)	Prevalence within Group (%)
Meibomian Gland Dysfunction (MGD)	60	48	80.0%
History of Cataract Surgery	55	38	69.1%
Topical Anti-Glaucoma Meds	20	16	80.0%
No Ocular History	15	5	33.3%

**Table 5: Lifestyle and Environmental Risk Factors**

Risk Factor	Category	DED Present (n)	DED Absent (n)	Total (n)
Smoking Status	Smoker (Current/Past)	25	10	35
	Non-Smoker	67	48	115
Daily Screen Time	> 4 Hours	30	10	40
	< 4 Hours	62	48	110

## DISCUSSION:

This study highlights the substantial burden of Dry Eye Disease (DED) in the elderly population, revealing an overall prevalence of 61.3% among 150 participants. This finding aligns with the higher end of the prevalence spectrum reported in global literature, which typically ranges from 5% to 50% but escalates sharply in geriatric cohorts (2). The high prevalence observed here emphasizes that DED is not merely a nuisance but a pervasive condition in older adults that requires active clinical attention.

### Demographic Influences

Our study observed a slight female preponderance (54.7% of the study population), which is consistent with the well-established understanding that women are at higher risk for DED. This gender disparity is often attributed to the effects of sex hormones on the ocular surface, particularly the decrease in androgens and estrogens during menopause, which can alter tear secretion and meibomian gland function (7). The age distribution in our study also reflects the natural progression of ocular senescence, with the majority of participants falling in the 60–69 age bracket. As age advances, the lacrimal functional unit undergoes involutonal changes, including decreased tear volume and stability, making the elderly population universally susceptible (8).

### Systemic Associations

A significant finding in our study was the strong association between Diabetes Mellitus and DED, with a 77.8% prevalence rate within the diabetic group (Table 3). This supports the concept of "diabetic dry eye," where hyperglycemia can lead to corneal neuropathy, reducing corneal sensation and reflex tearing. Furthermore, diabetes can damage the microvasculature of the lacrimal gland (9). Our results showing a significant association with Rheumatoid Arthritis (75.0%) and Thyroid Disorders (66.7%) further corroborate the link between autoimmune dysregulation and ocular surface inflammation. In autoimmune conditions like RA, lymphocytic infiltration of the lacrimal glands (secondary Sjögren's syndrome) leads to aqueous deficiency. Therefore, ophthalmologists treating elderly patients with these systemic comorbidities should maintain a high index of suspicion for DED (10). Interestingly, hypertension did not show a statistically significant correlation ( $P > 0.05$ ) in our cohort, a finding that remains debated in the literature, with some studies suggesting antihypertensive medications rather than the disease itself may precipitate dry eye (11).

### Ocular Risk Factors

Meibomian Gland Dysfunction (MGD) was identified as a major risk factor, present in a large portion of our cohort, with 80% of MGD patients suffering from DED (Table 4). This underscores the dominance of the evaporative subtype of dry eye in the elderly. MGD leads to a lipid-deficient tear film, causing rapid tear evaporation (12).

Additionally, our study highlights the iatrogenic burden of DED. A high prevalence (69.1%) was noted in patients with a history of cataract surgery. Surgical incisions can disrupt the subbasal nerve plexus of the cornea, reducing corneal sensitivity and interrupting the neural loop of tear secretion. This "neurotrophic" element of post-surgical dry eye is often

transient but can become chronic in elderly eyes with limited regenerative capacity (13). Furthermore, the 80% DED prevalence among patients on topical anti-glaucoma medications is a critical finding. Chronic exposure to preservatives like Benzalkonium Chloride (BAK) is known to cause goblet cell loss and epithelial toxicity (14). This suggests a need for preservative-free formulations in elderly glaucoma patients who are already predisposed to DED.

### Lifestyle Factors

In the modern context, even the elderly are not immune to "Computer Vision Syndrome." Our data shows a higher frequency of DED in those with >4 hours of daily screen time (Table 5). Reduced blink rate during screen use leads to increased evaporative stress (15). Smoking was also associated with DED, likely due to direct irritative effects of smoke and systemic oxidative stress (16).

### Limitations

The limitations of this study include its cross-sectional design, which prevents the establishment of temporal causality between risk factors and DED. The sample size of 150, while sufficient for a prevalence estimate, may limit the power of subgroup analyses for less common comorbidities. Additionally, we did not strictly differentiate between aqueous-deficient and evaporative subtypes in the final analysis, although MGD presence suggests a high burden of the latter.

### CONCLUSION:

DED is highly prevalent (61.3%) in the elderly population, driven by a complex interplay of physiological aging, systemic diseases (Diabetes, RA), ocular conditions (MGD), and iatrogenic factors (medications, surgery). The strong association with modifiable and manageable risk factors suggests that a multidisciplinary approach—involving endocrinologists, rheumatologists, and ophthalmologists—is essential. Routine screening for DED should be mandatory in elderly patients, particularly those with diabetes or those undergoing cataract surgery, to improve visual outcomes and quality of life.

### Declaration:

Conflicts of interests: The authors declare no conflicts of interest.

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