



PREVALENCE OF DRY EYE IN PRE MENOPAUSAL AND POST MENOPAUSAL WOMEN.

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Abstract

Background: Dry eye disease is a multifactorial ocular-surface disorder characterized by tear-film instability, reduced tear production, ocular discomfort, and visual disturbance. Hormonal changes during menopause may affect lacrimal and meibomian gland function, potentially increasing the severity of dry eye manifestations. **Aim and Objectives:** To assess the prevalence and clinical pattern of dry eye disease among women according to menopausal status and to determine the association of menopausal status with tear-film breakup time (TBUT), Schirmer's test findings, and Ocular Surface Disease Index (OSDI) severity. **Results:** The study included 60 participants with a mean age of 41.27 ± 13.94 years and an age range of 21–68 years. Of these, 35 (58.33%) were premenopausal, 12 (20.00%) were menopausal, and 13 (21.67%) were postmenopausal; menopausal and postmenopausal women together constituted 41.67% of the participants. The mean Schirmer's test value was 8.05 ± 2.68 mm, the mean TBUT was 7.74 ± 1.94 seconds, and the mean OSDI score was 20.48 ± 5.66 . Abnormal TBUT was present in 47 (78.33%) participants. Schirmer's test showed mild reduction in 51 (85.00%), severe reduction in 2 (3.33%), and normal findings in 7 (11.67%) participants. Abnormal TBUT was observed in 77.14% of premenopausal, 75.00% of menopausal, and 84.62% of postmenopausal women, without a significant association with menopausal status ($p = 0.815$). Severe Schirmer's abnormality occurred exclusively among postmenopausal women (15.38%); however, the overall association was not statistically significant ($p = 0.075$). OSDI severity was also not significantly associated with menopausal status ($p = 0.912$). **Conclusion:** Tear-film instability and reduced tear secretion were highly prevalent among the participants. Although postmenopausal women showed the highest frequency of abnormal TBUT and were the only group with severe Schirmer's abnormality, menopausal status was not significantly associated with objective findings or symptom severity. Dry eye disease should therefore be evaluated as a multifactorial condition, with menopausal status considered alongside other clinical and environmental factors.

Keywords: Dry eye disease; menopause; postmenopausal women; tear-film breakup time; Schirmer's test; Ocular Surface Disease Index; tear-film instability; aqueous tear deficiency; ocular surface; hormonal changes.



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INTRODUCTION

Dry eye disease is a common, multifactorial disorder of the ocular surface characterized by loss of tear-film homeostasis and accompanied by ocular symptoms. Tear-film instability, hyperosmolarity, inflammation, ocular-surface damage, and neurosensory abnormalities contribute to its development (1). Patients commonly experience dryness, burning, irritation, foreign-body sensation, redness, excessive watering, photophobia, fluctuating vision, and ocular fatigue. These symptoms may interfere with reading, driving, computer use, occupational activities, and overall quality of life (2). The burden of dry eye disease has increased with population ageing, prolonged exposure to digital screens, environmental pollution, air-conditioned settings, contact-lens use, systemic illnesses, and the use of medications that alter tear secretion (3).

Hormonal status is an important consideration in dry eye disease, particularly among women. Menopause is associated with alterations in androgen and oestrogen levels that may influence the lacrimal glands, meibomian glands, conjunctival goblet cells, and ocular-surface inflammatory pathways. Postmenopausal women may consequently experience reduced

tear secretion, increased tear evaporation, meibomian gland dysfunction, and greater ocular discomfort (4,5). Determining the prevalence of menopause among female patients with dry eye disease and examining its association with clinical severity may help identify a subgroup requiring closer evaluation and individualized management (6,7).

The present prospective observational study was undertaken to determine the prevalence of dry eye among premenopausal and postmenopausal women and to evaluate the association between menopausal status and the clinical severity of dry eye disease using Schirmer's test, tear-film breakup time (TBUT), and the Ocular Surface Disease Index (OSDI). The findings may help improve understanding of the influence of menopausal status on dry eye disease and facilitate timely diagnosis and appropriate management.

AIMS AND OBJECTIVES

Aim:

To determine the prevalence of dry eye in premenopausal and postmenopausal women.

Objectives:

1. To determine the prevalence of dry eye among premenopausal and postmenopausal women.
2. To assess the association between menopausal status and the clinical severity of dry eye disease using Schirmer's test, TBUT, and OSDI.

MATERIALS AND METHODS

This prospective observational study was conducted over 18 months in the Department of Ophthalmology, Sri Siddhartha Medical College and Hospital, Tumkur, Karnataka. Women aged 30-80 years diagnosed with dry eye disease and attending the ophthalmology outpatient department were recruited using purposive sampling. Patients were enrolled after applying the predefined eligibility criteria and obtaining informed consent. Relevant demographic and clinical information, including age, presenting symptoms, medical history, ocular history, and menopausal status among female participants, was recorded using a structured study proforma.

All eligible women were assessed for dry-eye parameters using Schirmer's test, tear-film breakup time, and Ocular Surface Disease Index scoring. Participants were categorized according to menopausal status, and the association between menopausal status and the clinical severity of dry eye disease was examined. All clinical assessments were performed using standardized procedures under comparable examination conditions.

The collected data were entered into Microsoft Excel and analysed using appropriate statistical software. Continuous variables were expressed as mean $\pm$ standard deviation or median with interquartile range according to their distribution, whereas categorical variables were presented as frequencies and percentages. The association between menopausal status and dry eye assessment parameters, including Schirmer's test, tear-film breakup time (TBUT), and Ocular Surface Disease Index (OSDI), was analysed using appropriate statistical tests. A p-value of <0.05 was considered statistically significant.

RESULTS

Table 1: Descriptive analysis of age (years) in study population (N=60)

Parameter	Mean $\pm$ SD	Median	Minimum	Maximum	95% C.I	
					Lower	Upper
Age (Years)	41.27 $\pm$ 13.94	39	21	68	37.66	44.87

In the present study, the mean age of the participants was 41.27 ± 13.94 years, with a median age of 39 years. The age ranged from a minimum of 21 years to a maximum of 68 years. The 95% confidence interval for the mean age ranged from 37.66 to 44.87 years.

Table 2: Descriptive analysis of occupation in the study population (N=60)

Occupation	n	%
Homemaker	24	40.00%
Student	14	23.33%
Software	12	20.00%
Bank Employee	4	6.67%
Teacher	3	5.00%
Tailor	2	3.33%
Lawyer	1	1.67%

In the present study, homemakers constituted the largest occupational group, accounting for 24 (40.00%) participants, followed by students with 14 (23.33%) and software professionals with 12 (20.00%). Bank employees accounted for 4 (6.67%) participants, teachers for 3 (5.00%), tailors for 2 (3.33%), and lawyers for 1 (1.67%).

Table 3: Descriptive analysis of menopausal status in the study population (N=60)

Menopausal Status	n	%
Pre-menopausal	35	58.33%
Menopausal	12	20.00%
Post-menopausal	13	21.67%

In the present study, 35 (58.33%) participants were pre-menopausal, 12 (20.00%) were menopausal, and 13 (21.67%) were post-menopausal.

Table 4: Descriptive analysis of Dry Eye Assessment Parameters in study population (N=60)

Parameter	Mean $\pm$ SD	Median	Minimum	Maximum	95% C.I	
					Lower	Upper
Schirmers Test	8.05 $\pm$ 2.68	7.5	4	18	7.36	8.74
TUBT Test	7.74 $\pm$ 1.94	7.5	4	14	7.24	8.24
ODSI Test	20.48 $\pm$ 5.66	21	6	31.5	19.01	21.94

In the present study, the mean Schirmer's test value was 8.05 $\pm$ 2.68, with a median of 7.5 and a range of 4 to 18; its 95% confidence interval was 7.36 to 8.74. The mean tear-film breakup time (TBUT) was 7.74 $\pm$ 1.94, with a median of 7.5 and a range of 4 to 14; its 95% confidence interval was 7.24 to 8.24. The mean Ocular Surface Disease Index (OSDI) score was 20.48 $\pm$ 5.66, with a median of 21 and a range of 6 to 31.5; its 95% confidence interval was 19.01 to 21.94.

Table 5: Descriptive analysis of Dry Eye Assessment Parameters in the study population (N=60)

Parameter	n	%
TBUT		
Normal	13	21.67%
Abnormal	47	78.33%
Schirmer		
Normal	7	11.67%
Mild	51	85.00%
Severe	2	3.33%
OSDI		
Normal	7	11.67%
Mild	27	45.00%
Moderate	26	43.33%

In the present study, tear-film breakup time (TBUT) was normal in 13 (21.67%) participants, whereas it was abnormal in 47 (78.33%) participants. According to Schirmer's test findings, 7 (11.67%) participants had normal values, 51 (85.00%) had mild findings, and 2 (3.33%) had severe findings. Based on the Ocular Surface Disease Index (OSDI) scores, 7 (11.67%) participants were classified as normal, 27 (45.00%) had mild dry-eye symptoms, and 26 (43.33%) had moderate dry-eye symptoms. Thus, among the assessed parameters, abnormal TBUT was observed in 47 (78.33%) participants, mild Schirmer's test findings in 51 (85.00%), and mild OSDI findings in 27 (45.00%) participants.

Table 6: Comparison of TBUT group across menopausal status (N=60)

TBUT Group	Menopausal Status			Chi square	P value
	Pre-Menopausal (N=35)	Natural Menopausal (N=12)	Post-Menopausal (N=13)		
Abnormal	27 (77.14%)	9 (75.00%)	11 (84.62%)	0.410	0.815
Normal	8 (22.86%)	3 (25.00%)	2 (15.38%)		

In the present study, among 35 pre-menopausal participants, TBUT was abnormal in 27 (77.14%) and normal in 8 (22.86%). Among 12 naturally menopausal participants, TBUT was abnormal in 9 (75.00%) and normal in 3 (25.00%).

Among 13 post-menopausal participants, TBUT was abnormal in 11 (84.62%) and normal in 2 (15.38%). The association between menopausal status and TBUT category was not statistically significant ($\chi^2 = 0.410$, $p = 0.815$).

Table 7: Comparison of SCHIRMER group across menopausal status (N=60)

Schirmer Group	Menopausal Status			Chi square	P value
	Pre-Menopausal (N=35)	Natural Menopausal (N=12)	Post-Menopausal (N=13)		
Normal	3 (8.57%)	2 (16.67%)	2 (15.38%)	8.48	0.075
Mild	32 (91.43%)	10 (83.33%)	9 (69.23%)		
Severe	0 (0.00%)	0 (0.00%)	2 (15.38%)		

Figure 1. Grading of Dry Eye Severity in Pre-menopausal Women (Schirmer's Test) (n = 35)

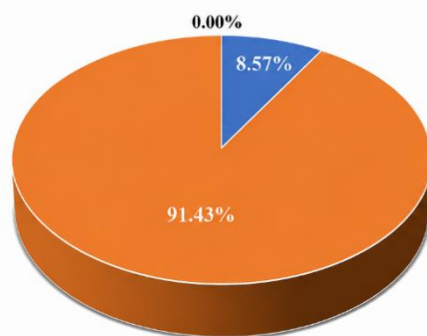
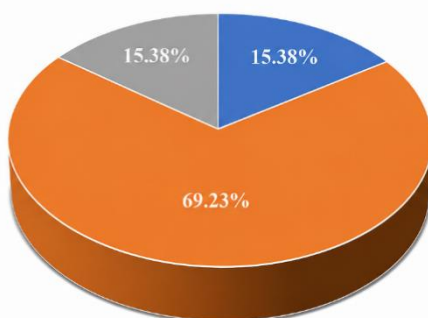


Figure 2. Grading of Dry Eye Severity in Post-menopausal Women (Schirmer's Test) (n = 13)



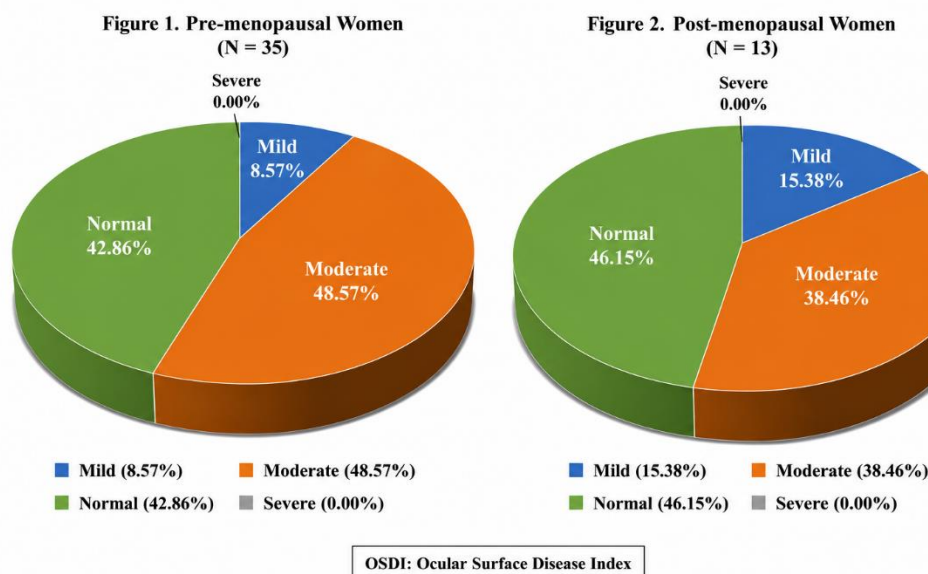
■ Normal (8.57%) ■ Mild (91.43%) ■ Severe (0.00%) ■ Normal (15.38%) ■ Mild (69.23%) ■ Severe (15.38%)

In the present study, among 35 pre-menopausal participants, Schirmer's test findings were normal in 3 (8.57%), mild-to-moderate in 32 (91.43%), and severe in none (0.00%). Among 12 naturally menopausal participants, the findings were normal in 2 (16.67%), mild-to-moderate in 10 (83.33%), and severe in none (0.00%). Among 13 post-menopausal participants, Schirmer's test findings were normal in 2 (15.38%), mild-to-moderate in 9 (69.23%), and severe in 2 (15.38%). Thus, mild-to-moderate dry eye was present in the majority of the study population, while severe dry eye was present in two participants. The association between menopausal status and Schirmer's test severity was not statistically significant ($\chi^2 = 8.48$, $p = 0.075$).

Table 8: Comparison of OSDI group across menopausal status (N=60)

OSDI Group	Menopausal Status			Chi square	P value
	Pre-Menopausal (N=35)	Natural Menopausal (N=12)	Post-Menopausal (N=13)		
Mild	3 (8.57%)	2 (16.67%)	2 (15.38%)	0.984	0.912
Moderate	17 (48.57%)	5 (41.67%)	5 (38.46%)		
Severe	0 (0.00%)	0 (0.00%)	0 (0.00%)		
Normal	15 (42.86%)	5 (41.67%)	6 (46.15%)		

Grading of Dry Eye Severity by OSDI in Pre-menopausal and Post-menopausal Women



In the present study, among 35 pre-menopausal participants, OSDI findings were mild in 3 (8.57%), moderate in 17 (48.57%), and normal in 15 (42.86%). Among 12 naturally menopausal participants, OSDI findings were mild in 2 (16.67%), moderate in 5 (41.67%), and normal in 5 (41.67%). Among 13 post-menopausal participants, OSDI findings were mild in 2 (15.38%), moderate in 5 (38.46%), and normal in 6 (46.15%). The association between menopausal status and OSDI severity was not statistically significant ($\chi^2 = 0.984$, $p = 0.912$).

DISCUSSION

Previous studies have reported an association between hormonal changes, menopausal status, and dry eye disease. Gorimanipalli et al. (2023) explained that alterations in sex hormones may affect tear production, meibomian gland function, and ocular-surface homeostasis. Suzuki et al. (2017) also reported physiological differences in meibomian gland function between premenopausal and postmenopausal women. Maurya et al. (2019) reported a substantial burden of severe dry eye among postmenopausal women in North India, while Joshi et al. (2025) documented dry eye among postmenopausal women attending a community eye centre. These findings support the evaluation of menopausal status in women presenting with dry-eye manifestations. The present study evaluated dry-eye parameters and their relationship with menopausal status among 60 women. The mean age was 41.27 ± 13.94 years, with an age range of 21–68 years. Among the participants, 35 (58.33%) were premenopausal, 12 (20.00%) were menopausal, and 13 (21.67%) were postmenopausal. Thus, menopausal and postmenopausal women together constituted 41.67% of the study population.

Among the 35 premenopausal women, abnormal TBUT was observed in 27 (77.14%), while Schirmer's test showed mild-to-moderate dry eye in 32 (91.43%). Dry eye among premenopausal women may be influenced by environmental and occupational factors. Homemakers constituted the largest occupational group, accounting for 40.00% of participants, followed by students at 23.33% and software professionals at 20.00%. Environmental exposure, prolonged visual activity, computer use, and reduced blinking may contribute to ocular-surface discomfort and tear-film instability. Patel et al. (2023) similarly described environmental conditions and visually demanding activities as important contributors to tear-film instability and ocular-surface stress. Gorimanipalli et al. (2023) reported that changes in sex hormones may influence tear secretion, meibomian gland function, and ocular-surface homeostasis. Hormonal changes during menopause may therefore affect both tear-film stability and aqueous tear production. Suzuki et al. (2017) also described differences in meibomian gland physiology between premenopausal and postmenopausal women, supporting a biological relationship between menopause and ocular-surface alterations.

The mean TBUT in the present study was 7.74 ± 1.94 seconds, and abnormal TBUT was observed in 47 (78.33%) women. Abnormal TBUT was recorded in 77.14% of premenopausal, 75.00% of menopausal, and 84.62% of postmenopausal women. The highest proportion was observed among postmenopausal women. In menopausal and postmenopausal women, decreased androgen levels may reduce tear-film stability and increase tear-film evaporation, resulting in evaporative dry eye. In premenopausal women, tear-film instability may be influenced more by environmental exposure, prolonged screen

use, visual activity, and reduced blinking. However, the association between TBUT category and menopausal status was not statistically significant ($p = 0.815$). The mean Schirmer's test value was 8.05 ± 2.68 mm. Mild-to-moderate dry eye was present in 51 (85.00%) women, severe dry eye was present in 2 (3.33%), and normal findings were observed in 7 (11.67%). Reduced tear production may result in aqueous-deficient dry eye. Hormonal alterations during menopause may influence lacrimal-gland function and reduce aqueous tear secretion. Severe Schirmer's test abnormality was observed exclusively among postmenopausal women, affecting 2 of 13 women (15.38%). Nevertheless, the association between menopausal status and Schirmer's test severity was not statistically significant ($p = 0.075$).

Among the 13 postmenopausal women, abnormal TBUT was observed in 11 (84.62%), mild-to-moderate Schirmer's test abnormality in 9 (69.23%), and severe abnormality in 2 (15.38%). Thus, abnormal TBUT was most frequent among postmenopausal women, and severe reduction in tear secretion occurred only in this group. These findings were comparable with the observations of Maurya et al. (2019) and Joshi et al. (2025), who reported a considerable burden of dry eye among postmenopausal women. The mean OSDI score was 20.48 ± 5.66 . OSDI severity was not significantly associated with menopausal status ($p = 0.912$). Aragona et al. (2025) described dry eye disease as a multifactorial condition influenced by ocular, systemic, hormonal, occupational, and environmental factors. Overall, tear-film instability and reduced tear secretion were common in the present study. Although postmenopausal women showed the highest frequency of abnormal TBUT and were the only group with severe Schirmer's test abnormality, menopausal status was not significantly associated with objective dry-eye findings or symptom severity.

CONCLUSION

Dry eye disease was more common among postmenopausal women. Abnormal TBUT and Schirmer's test abnormalities were noted more frequently among postmenopausal women, which may be attributed to hormonal changes associated with menopause. The higher frequency of abnormal TBUT among postmenopausal women may be explained by hormonal changes after menopause. Reduced androgen levels can impair meibomian gland function, resulting in reduced lipid secretion, increased tear-film evaporation, and tear-film instability. However, the association between menopausal status and TBUT was not statistically significant ($p = 0.815$). Similarly, the association between menopausal status and Schirmer's test severity was not statistically significant ($p = 0.075$), and OSDI severity was also not significantly associated with menopausal status ($p = 0.912$). Thus, menopause and menopausal status were not significantly associated with the severity of dry eye disease in the present study.

Women aged approximately 30–80 years should be evaluated for dry eye disease so that appropriate treatment can be provided according to the severity of the condition. Severe reduction in Schirmer's test values occurred exclusively among postmenopausal women; however, the overall association remained statistically insignificant. Symptom severity assessed using the Ocular Surface Disease Index was comparable across menopausal-status groups. These findings indicate that dry eye disease is multifactorial and cannot be attributed solely to menopause. Nevertheless, the tendency toward greater tear-film evaporation and impairment of tear secretion after menopause highlights the importance of assessing menopausal status during clinical evaluation and providing individualized ocular-surface management. Mild to moderate dry eye can generally be managed with topical lubricants and lubricating gels. Severe dry eye may require topical cyclosporine therapy, and in selected postmenopausal women, hormone replacement therapy may be considered when clinically indicated after appropriate evaluation.

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