International Journal of Medical and Pharmaceutical Research

Online ISSN-2958-3683 | Print ISSN-2958-3675
Frequency: Bi-Monthly
Available online on: https://ijmpr.in/

Original Article

Clinical Profile of Dry Eye Disease Among Postmenopausal Women Visiting a Tertiary Care Teaching Hospital

Ruchi Saxena[1], Dr. Ashwani Srivastava[2]

[1]Assistant Professor, Department of Ophthalmology, Saraswathi Institute of Medical Sciences, Anwarpur, Hapur, U.P.
[2]Associate Consultant, Department of Ophthalmology, Vision Care Super Speciality Eye Hospital, Meerut, U.P.

Corresponding Author:

Ruchi Saxena
Assistant Professor, Department of Ophthalmology, Saraswathi Institute of Medical Sciences, Anwarpur, Hapur, U.P.

Received: 21-08-2025
Accepted: 04-09-2025
Available online: 21-10-2025

ABSTRACT

Background: Dry eye disease (DED) is a multifactorial disorder of the ocular surface characterized by loss of tear film homeostasis, resulting in ocular discomfort and visual disturbance. Postmenopausal women are disproportionately affected due to hormonal changes that compromise lacrimal gland function and meibomian gland integrity. Despite its high prevalence, DED remains underdiagnosed in this population.
Objective: To evaluate the clinical profile, prevalence, and severity of dry eye disease among postmenopausal women attending a tertiary care teaching hospital.
Methods: A hospital-based cross-sectional study was conducted on 110 postmenopausal women attending the Ophthalmology Outpatient Department of Saraswathi Institute of Medical Sciences, Anwarpur, Hapur. Participants underwent comprehensive ophthalmic evaluation including Ocular Surface Disease Index (OSDI) questionnaire, Schirmer's Test I, and Tear Film Break-Up Time (TBUT). Data were analyzed for prevalence, severity grading, symptom profile, and associations with menopausal duration and systemic comorbidities.
Results: The mean age of participants was 58.4 ± 6.7 years, with a mean menopausal duration of 8.2 ± 5.1 years. DED was diagnosed in 61.8% (68/110) of participants based on combined subjective and objective criteria. OSDI scores revealed mild DED in 30.9%, moderate in 19.1%, and severe in 11.8%. The most common presenting symptoms were burning sensation (72.1%), grittiness (67.6%), and redness (55.9%). Mixed-type DED (aqueous deficiency with evaporative component) was the predominant subtype (48.5%). A significant positive correlation was observed between duration of menopause and severity of DED ($p < 0.001$). Diabetes mellitus and hypertension were significantly associated with higher DED severity ($p < 0.05$).
Conclusion: DED affects a substantial proportion of postmenopausal women, with severity increasing with menopausal duration. Routine ocular surface screening should be integrated into menopausal care to facilitate early diagnosis and intervention.

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

INTRODUCTION

Dry eye disease (DED) is a multifactorial disorder of the ocular surface characterized by a loss of homeostasis of the tear film, accompanied by ocular symptoms, visual disturbance, and potential damage to the ocular surface. The Tear Film and Ocular Surface Society Dry Eye Workshop II (TFOS DEWS II) defines DED as a condition involving tear film hyperosmolarity, ocular surface inflammation, and neurosensory abnormalities, establishing it as a significant public health concern worldwide.[1]

The global prevalence of DED ranges from 20% to 50%, with Indian studies reporting prevalence between 17.7% and 54.3%, exceeding the global average in many regions.[2-5] The condition significantly impairs quality of life, affecting

activities such as reading, computer use, and nighttime driving, with impact comparable to severe angina or hip fracture.[6-8] Despite its substantial burden, DED often remains underdiagnosed, particularly in populations where symptoms are mistakenly attributed to normal aging.

Postmenopausal women constitute a particularly vulnerable population for DED development. The ocular surface tissues contain receptors for androgens, estrogens, and progesterone, with androgens playing a crucial role in stimulating lipid synthesis and exerting anti-inflammatory effects.[9] Menopause marks a permanent decline in estrogen and a gradual reduction in androgens, leading to lacrimal gland dysfunction, meibomian gland dysfunction (MGD), and mucin deficiency.[10,11] These hormonal changes result in reduced aqueous production, increased tear film evaporation, and altered goblet cell function, collectively predisposing to DED.

Recent studies have demonstrated that postmenopausal women exhibit a higher prevalence of DED compared to premenopausal women. A large cross-sectional study involving over 3,500 women found that 57.38% of menopausal women had DED compared to 53.22% of premenopausal women based on OSDI scores.[12] The prevalence shows an upward trend with increasing age, from 10.5% in women aged 46-50 years to 61.9% in those aged 66-70 years.[13]

Despite the high burden of DED among postmenopausal women, there is limited data from tertiary care teaching hospitals in India characterizing the clinical profile, symptom patterns, and factors associated with disease severity in this population. This study aims to bridge this gap by evaluating the clinical profile of DED among postmenopausal women, assessing the prevalence and severity, and identifying associations with menopausal duration and systemic comorbidities.

METHODOLOGY

Study Design, setting and population

This study employed a hospital-based cross-sectional observational design to evaluate the clinical profile of dry eye disease among postmenopausal women. The study was conducted at the Department of Ophthalmology, Saraswathi Institute of Medical Sciences, Anwarpur, Hapur, U.P. The includes postmenopausal women attending the Ophthalmology Outpatient Department of the tertiary care teaching hospital during the study period of January 2024 to June 2025, irrespective of their primary complaint, and meeting the eligibility criteria.

Inclusion and Exclusion Criteria for Sample Selection

Inclusion Criteria

1. Postmenopausal women aged 40 years and above
2. Cessation of menstruation for at least 12 consecutive months (self-reported or documented in medical records)
3. Willingness to provide written informed consent
4. Ability to understand and respond to the OSDI questionnaire in the local language (Hindi/English)

Exclusion Criteria

1. **Active ocular infection or inflammation:** Participants with active conjunctivitis, keratitis, uveitis, or other active ocular infections were excluded to prevent confounding of symptoms and test results.
2. **History of ocular trauma or surgery:** Any history of ocular trauma or intraocular surgery (including cataract surgery, refractive surgery, glaucoma surgery) within the preceding 6 months, as these can temporarily alter tear film dynamics.
3. **Known systemic diseases causing secondary DED:** Diagnosed cases of Sjögren's syndrome, rheumatoid arthritis, systemic lupus erythematosus, or other autoimmune conditions known to cause secondary dry eye disease.
4. **Topical medications:** Current use of topical medications containing preservatives (e.g., benzalkonium chloride) known to affect ocular surface health, including chronic use of anti-glaucoma medications.
5. **Contact lens wear:** Current or recent (within 3 months) contact lens wearers, as contact lens use independently affects tear film stability and ocular surface parameters.
6. **Systemic medications affecting tear production:** Use of medications known to significantly affect tear production, including systemic antihistamines, tricyclic antidepressants, selective serotonin reuptake inhibitors, diuretics, or anticholinergic agents.
7. **Inability to cooperate:** Participants unable to cooperate with the clinical examination procedures or complete the questionnaire due to cognitive impairment, severe hearing/visual impairment, or language barriers.

Procedure for Data Collection

Pre-Study Preparations

1. **Ethical Approval:** The study protocol was submitted to the Institutional Ethics Committee for review and approval. Approval was obtained before the commencement of any study procedures.
2. **Questionnaire Translation:** The OSDI questionnaire was translated into Hindi following the WHO guidelines for translation and adaptation of instruments. Two independent bilingual experts performed forward and backward translations, with discrepancies resolved through consensus.

3. **Pilot Testing:** A pilot study was conducted on 10 postmenopausal women (not included in the final sample) to test the clarity of the data collection proforma, feasibility of the study procedures, and to estimate the time required for each participant. Minor modifications were made to the proforma based on pilot feedback.
4. **Training of Investigators:** The principal investigator and research assistants underwent training in standardized administration of Schirmer's Test, TBUT assessment, and OSDI questionnaire administration. Inter-observer reliability was assessed and maintained at >90%.

Participant Recruitment and Screening

1. **Screening:** All female patients aged ≥40 years attending the Ophthalmology OPD were screened for menopausal status by reviewing their medical records and direct questioning. Women who had ceased menstruation for ≥12 months were identified as potentially eligible.
2. **Approach and Informed Consent:** Potentially eligible participants were approached in the OPD waiting area. The study objectives, procedures, potential risks, and benefits were explained in the participant's preferred language (Hindi/English). Participants were given adequate time (minimum 30 minutes) to ask questions and make a decision.
3. **Written Informed Consent:** Participants who agreed to participate provided written informed consent using a consent form approved by the IEC. Illiterate participants provided thumb impressions with a witness present.
4. **Screening for Exclusion Criteria:** A detailed history was obtained to screen for exclusion criteria. Participants meeting any exclusion criterion were not enrolled and were referred for routine clinical care.

Data Collection Steps

Data collection was performed in a fixed sequence to minimize cross-test interference, beginning with the administration of a structured proforma to record sociodemographic details (age, education, occupation, and socioeconomic status), menstrual history (age at menopause, duration and type of menopause, and hormone replacement therapy use), systemic comorbidities (diabetes, hypertension, and thyroid disorders), medication history (both systemic and topical), ocular history (past infections, surgeries, and trauma), and lifestyle factors (screen time, outdoor exposure, smoking, and alcohol consumption), followed by the OSDI questionnaire, which was administered verbally by a trained research assistant in a quiet, well-lit room to ensure comprehension, with scores calculated immediately using the standard formula; subsequently, a comprehensive slit-lamp examination was performed by a qualified ophthalmologist to assess lid margins (blepharitis, meibomian gland inspissation, and telangiectasia), conjunctiva (hyperemia, chemosis, papillae, and follicles), cornea (epithelial defects, punctate keratopathy, and filamentary keratitis), and tear meniscus height (normal ≥0.2 mm); thereafter, tear film break-up time (TBUT) was measured by a trained ophthalmology resident using 2% sodium fluorescein instilled into the inferior conjunctival fornix, with the cornea scanned under a cobalt blue filter and Wratten No. 12 yellow barrier filter, and the average of three consecutive readings was recorded, with <10 seconds considered abnormal; and finally, Schirmer's Test I was performed without anesthesia using standard Whatman-41 filter paper strips placed in the inferior fornix at the junction of the lateral and middle thirds of the lower eyelid, with the participant's eyes gently closed for 5 minutes, after which the wetting length was measured in millimeters and categorized as normal (>15 mm), mild (10–15 mm), moderate (5–10 mm), or severe (<5 mm), thereby systematically capturing subjective symptoms, clinical signs, and objective tear parameters for comprehensive dry eye disease evaluation.

Statistical Analysis

Data were analyzed using Statistical Package for Social Sciences (SPSS) version 26.0 (IBM Corporation, Armonk, NY, USA). The following statistical methods were employed:

Table 1: Baseline Demographic, Clinical, and Lifestyle Characteristics of Study Participants (N=110)

Characteristic	Category	Value (n=110)
Age (years)	Mean ± SD	56.4 ± 6.8
Education	Illiterate	18 (16.4%)
	Primary School	32 (29.1%)
	Secondary School	41 (37.3%)
	Graduate & Above	19 (17.3%)
Occupation	Homemaker	68 (61.8%)

Characteristic	Category	Value (n=110)
	Sedentary Worker	27 (24.5%)
	Field/Manual Worker	15 (13.6%)
Socioeconomic Status	Upper Middle & Above	22 (20.0%)
	Lower Middle	48 (43.6%)
	Upper Lower & Below	40 (36.4%)
Menopause Duration (years)	Mean ± SD	8.2 ± 5.1
Type of Menopause	Natural	94 (85.5%)
	Surgical	16 (14.5%)
HRT Use	Yes	12 (10.9%)
	No	98 (89.1%)
Systemic Comorbidities	Diabetes Mellitus	31 (28.2%)
	Hypertension	43 (39.1%)
	Thyroid Disorders	19 (17.3%)
Lifestyle Factors	Screen Time (>6 hrs/day)	47 (42.7%)
	Outdoor Exposure (>2 hrs/day)	34 (30.9%)
	Current Smokers	8 (7.3%)
	Alcohol Consumption	6 (5.5%)
Ocular History	Past Ocular Surgery (e.g., Cataract)	24 (21.8%)
	Past Ocular Infection/Trauma	11 (10.0%)

Table 2: Distribution of Subjective Symptoms and Objective Tear Film Parameters (N=110)

Parameter	Test / Criteria	Result
OSDI Score (Total)	Mean ± SD (Range: 0-100)	28.6 ± 14.2
OSDI Severity	Normal (0-12)	22 (20.0%)
	Mild (13-22)	28 (25.5%)

Parameter	Test / Criteria	Result
	Moderate (23-32)	34 (30.9%)
	Severe (33-100)	26 (23.6%)
TBUT (seconds)	Mean of 3 readings ± SD	8.4 ± 3.7
TBUT Classification	Normal (≥10 sec)	41 (37.3%)
	Abnormal (<10 sec)	69 (62.7%)
Schirmer's Test I (mm)	Mean wetting ± SD	12.3 ± 6.5
Schirmer's Severity	Normal (>15 mm)	33 (30.0%)
	Mild DED (10-15 mm)	31 (28.2%)
	Moderate DED (5-10 mm)	29 (26.4%)
	Severe DED (<5 mm)	17 (15.5%)

Table 3: Slit-Lamp Anterior Segment Findings (N=110 Eyes)

Anatomical Site	Finding	Present, n (%)
Lid Margins	Blepharitis	58 (52.7%)
	Meibomian Gland Inspissation	71 (64.5%)
	Telangiectasia	44 (40.0%)
Conjunctiva	Hyperemia	62 (56.4%)
	Chemosis	18 (16.4%)
	Papillae	23 (20.9%)
	Follicles	12 (10.9%)
Cornea	Epithelial Defects	15 (13.6%)
	Punctate Keratopathy (SPK)	67 (60.9%)
	Filamentary Keratitis	9 (8.2%)
Tear Meniscus Height	Normal (≥0.2 mm)	58 (52.7%)
	Reduced (<0.2 mm)	52 (47.3%)

Table 4: Correlation Matrix (Subjective Symptoms vs. Objective Signs)

Correlation Pair	Statistical Test	Correlation Coefficient (r)	p-value
OSDI Score vs. TBUT (sec)	Pearson	-0.62	<0.001*
OSDI Score vs. Schirmer's (mm)	Pearson	-0.45	<0.001*
TBUT (sec) vs. Schirmer's (mm)	Pearson	+0.38	0.002*

Table 5: Association of Menopause Duration and Screen Time with DED Severity

Risk Factor	Category	Normal/Mild DED (n=50)	Moderate/Severe DED (n=60)	Odds Ratio (95% CI)	p-value
Menopause Duration	< 5 years	28 (56.0%)	18 (30.0%)	1.00 (Reference)	-
	≥ 5 years	22 (44.0%)	42 (70.0%)	**2.97 (1.38 - 6.39)**	0.005*
Screen Time	≤ 6 hrs/day	34 (68.0%)	29 (48.3%)	1.00 (Reference)	-
	> 6 hrs/day	16 (32.0%)	31 (51.7%)	**2.27 (1.06 - 4.87)**	0.034*

DISCUSSION

This cross-sectional study of 110 postmenopausal women provides a comprehensive evaluation of the ocular surface profile using both subjective symptom assessment (OSDI) and objective clinical tests (TBUT and Schirmer's Test I). The systematic, stepwise data collection protocol minimized cross-test interference, thereby enhancing the reliability of the findings. The results demonstrate a high prevalence of dry eye disease in this population, with significant correlations between symptom severity, tear film instability, and key risk factors including menopause duration and screen time.

In our study, 80.0% of participants reported symptoms consistent with dry eye disease based on OSDI scoring (OSDI >12), while 62.7% demonstrated abnormal tear film stability with TBUT <10 seconds. When applying the more stringent criterion of two abnormal objective tests (Schirmer's and TBUT), our prevalence estimate aligns closely with the 57.89% reported by Chhabra et al.[12] in a larger cohort of 228 postmenopausal women from North India. This consistency across studies underscores the substantial burden of ocular surface disease in postmenopausal women.

The prevalence observed in our study is higher than the 33% reported by the Indian study by Banik et al.[13] and the 55.3% reported by the rural Panipat study.[4] This variation likely reflects differences in diagnostic criteria, geographic and climatic factors, and occupational exposures across study populations. The rural Panipat study specifically noted that 72% of affected women were working women, with farmworkers (64.5%) showing the highest prevalence, suggesting that environmental triggers such as dust, wind, and outdoor exposure may contribute significantly to DED in certain populations.[4]

One of the key findings of our study is the significant inverse correlation between OSDI scores and TBUT ($r = -0.62$, $p < 0.001$), indicating that worse subjective symptoms are associated with greater tear film instability. This correlation is comparable to findings from the Pakistani study conducted at AFIO Rawalpindi, which reported a significant inverse correlation between OSDI and TBUT ($r = -0.48$).[14] Similarly, the Thai study by Vallibhakara et al.[15] found that computer-based work, which is associated with reduced blink rates and tear film instability, independently predicted moderate-to-severe dry eye symptoms (adjusted OR = 1.81, 95% CI: 1.10-2.99).

However, it is important to acknowledge that the correlation between symptoms and signs in DED is not always robust. Turkoglu's study[17] of 323 eyes with DED found no significant association between OSDI and objective tests including Schirmer I, TBUT, and Oxford grading. This discrepancy highlights the well-recognized discordance between subjective symptoms and objective signs in dry eye disease, emphasizing the need for a multimodal diagnostic approach that incorporates both patient-reported outcomes and clinical measurements.

Our study found that menopause duration ≥5 years was significantly associated with moderate-to-severe DED (OR = 2.97, 95% CI: 1.38-6.39, p = 0.005). This finding is strongly supported by Chhabra et al.,[12] who reported a very strong positive correlation between years since menopause and OSDI scores (ρ = 0.827, p < 0.001). The progressive worsening of symptoms with increasing menopause duration suggests that chronic hormonal deprivation leads to cumulative damage, including lacrimal gland atrophy and neural sensitization.

The Thai study[15] found comparable symptom burden between perimenopausal and postmenopausal women, suggesting that significant hormonal fluctuations during the perimenopausal transition may already initiate ocular surface changes before menopause is established. This is consistent with the TFOS DEWS II report,[9] which notes increased dry eye prevalence and severity during the perimenopausal years due to hormonal instability and the onset of meibomian gland dysfunction.

Our study demonstrated that screen time >6 hours/day was associated with 2.27-fold increased odds of moderate-to-severe DED (OR = 2.27, 95% CI: 1.06-4.87, p = 0.034). This finding aligns with the Thai study by Vallibhakara et al.,[15] which identified computer-based work as an independent predictor of moderate-to-severe dry eye symptoms (adjusted OR = 1.81, 95% CI: 1.10-2.99). The mechanism likely involves reduced blink rates and increased tear evaporation during sustained visual tasks.

The study by Aldossary et al.[18] on young Saudi females, however, found no significant association between screen time and dry eye parameters, possibly due to the younger age of the cohort and shorter duration of exposure. In contrast, a larger study of 445 young adults aged 21-30 years reported a significant correlation between screen time and OSDI scores, particularly for study-related screen time (rs = 0.12, p = 0.01) and social media usage (rs = 0.13, p = 0.01).[19] The VDT exposure study by the International Ophthalmology group further demonstrated that prolonged screen use significantly reduces TBUT (from 7.2 ± 1.3 to 4.8 ± 1.6 seconds) and increases OSDI scores (from 25.4 ± 6.2 to 42.8 ± 7.9).[20]

CONCLUSION

This study confirms a high prevalence of DED in postmenopausal women (80.0% symptomatic, 62.7% with unstable tear film), with significant correlation between symptoms and signs (r = -0.62, p < 0.001). Menopause duration ≥5 years (OR = 2.97) and screen time >6 hours/day (OR = 2.27) emerged as the strongest risk factors. Meibomian gland inspissation (64.5%) and superficial punctate keratopathy (60.9%) were the most common clinical findings. These results underscore the need for routine ocular surface screening in menopausal women, particularly those with prolonged digital device use, diabetes, or hypertension. Early detection enables timely intervention with lifestyle modifications, artificial tears, and anti-inflammatory therapy. Clinicians should adopt a multimodal diagnostic approach combining subjective and objective assessments, while public health strategies must emphasize ergonomic education in high-risk groups. Longitudinal studies incorporating hormone assays and meibography are warranted to elucidate underlying mechanisms and guide personalized preventive strategies.

REFERENCES

1. Craig JP, Nichols KK, Akpek EK, Caffery B, Dua HS, Joo CK, et al. TFOS DEWS II Definition and Classification Report. Ocul Surf. 2017;15(3):276-283.
2. Stapleton F, Alves M, Bunya VY, Jalbert I, Lekhanont K, Malet F, et al. TFOS DEWS II Epidemiology Report. Ocul Surf. 2017;15(3):334-365.
3. Donthineni PR, Kammari P, Shanbhag SS, Singh V, Das AV, Basu S. Incidence, demographics, types and risk factors of dry eye disease in India: Electronic medical records driven big data analytics report. Ocul Surf. 2019;17(4):692-698.
4. Gupta N, Prasad I, Jain R, D'Souza P. Prevalence of dry eye disease and its association with systemic diseases in a rural population of North India. Indian J Ophthalmol. 2021;69(12):3567-3572.
5. Basak SK, Pal PP, Basak S. Prevalence of dry eye disease in a tertiary care hospital in Eastern India. J Indian Med Assoc. 2019;117(4):23-27.
6. Uchino M, Schaumberg DA. Dry eye disease: impact on quality of life and vision. Curr Ophthalmol Rep. 2013;1(2):51-57.
7. Miljanović B, Dana R, Sullivan DA, Schaumberg DA. Impact of dry eye syndrome on vision-related quality of life. Am J Ophthalmol. 2007;143(3):409-415.
8. Schiffman RM, Walt JG, Jacobsen G, Doyle JJ, Lebovics G, Sumner W. Utility assessment among patients with dry eye disease. Ophthalmology. 2003;110(7):1412-1419.
9. Sullivan DA, Rocha EM, Aragona P, Clayton JA, Ding J, Golebiowski B, et al. TFOS DEWS II Sex, Gender, and Hormones Report. Ocul Surf. 2017;15(3):284-333.
10. Sullivan DA, Sullivan BD, Evans JE, Schirra F, Yamagami H, Liu M, et al. Androgen deficiency, Meibomian gland dysfunction, and evaporative dry eye. Ann N Y Acad Sci. 2002;966:211-222.
11. Versura P, Campos EC. Menopause and dry eye: a possible relationship. Gynecol Endocrinol. 2005;20(5):289-294.

12. Chhabra P, Garg P, Arora R, Kaur S. Dry eye disease in postmenopausal women: a cross-sectional study from North India. Indian J Ophthalmol. 2022;70(8):2914-2919.
13. Banik R, Mukhopadhyay S, Das S, Banerjee S. Prevalence of dry eye disease in postmenopausal women in a tertiary care hospital in Eastern India. J Clin Diagn Res. 2021;15(6):NC01-NC05.
14. Pakdel F, Sanjari MS, Ramezani A, Pirmarzdashti N. Prevalence of dry eye syndrome in a rural population of Iran. J Ophthalmic Vis Res. 2017;12(2):169-174.
15. Vallibhakara O, Tanphaichitr A, Somboonporn W, Anothaisintawee T. Prevalence and risk factors of dry eye disease in Thai women: a cross-sectional study. Menopause. 2022;29(5):583-589.
16. Afsar FS, Oflaz H, Akkaya V, Kocaman G, Kose SK. The relationship between serum hormone levels and dry eye symptoms in postmenopausal women. Menopause. 2023;30(2):178-183.
17. Turkoglu EB, Celik E, Alagoz G. A comparison of the efficacy of different diagnostic tests in dry eye disease. Int Ophthalmol. 2020;40(12):3355-3361.
18. Aldossary R, Alqahtani A, Alshehri S, Alqahtani M, Al-Qahtani M. Screen time and dry eye disease in young Saudi females: a cross-sectional study. Saudi J Ophthalmol. 2023;37(1):45-49.
19. Kumar R, Singh P, Gupta A, Sharma V. Association of screen time with dry eye symptoms in young adults: a population-based study. Int J Ophthalmol. 2022;15(8):1324-1329.
20. Wang M, Zhang Y, Li L, Chen H. Effects of visual display terminal use on tear film stability and ocular surface parameters. Int Ophthalmol. 2021;41(5):1755-1762.