ORIGINAL ARTICLE

Prevalence of Dry Eye Disease in Post-menopausal women at a tertiary care Hospital

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Abstract

Background: Dry Eye Disease (DED) is a widespread ocular disease, especially due to hormonal changes that influence the production and composition in women in postmenopause. Achieving this requires us to understand whether the disease is prevalent and what risk factors are associated with the disease.

Objective: The objective of this study is to find out the prevalence and magnitude of Dry Eye Disease (DED) and associated risk factors among post-menopausal women in tertiary care hospitals.

Material and Methods: The Department of Ophthalmology, Peoples University of Medical and Health Sciences for Women, Nawabshah-SBA, Pakistan, was observed in a cross-sectional manner over six months. Consecutive sampling was used to enroll 217 post-menopausal women, age ≥45 years. Based on symptoms and clinical assessments (Tear Film Break-Up Time (TBUT), Schirmer's test), Dry Eye Disease (DED) was diagnosed. 3-severity levels were considered mild, moderate, and severe. Structured interviews were used to collect demographic variables and lifestyle factors data. SPSS version 25 was used to perform the statistical analysis with chi-square tests, sig < 0.05.

Results: We found a 68.4% prevalence of Dry Eye Disease (DED) in participants. In those diagnosed, 30.5% had mild DED; 25.1% had moderate Dry Eye Disease (DED); and 12.8% had severe Dry Eye Disease (DED). Prolonged digital device use ($p < 0.001$), smoking ($p = 0.002$) and environmental factors including high air pollution ($p = 0.015$) were significant risk factors. Any degree of correlation existed between DED severity and age and duration of menopause.

Conclusion: Dry Eye Disease (DED) is very common in the post-menopausal women and is well associated with lifestyles and environmental factors. Dry Eye Disease (DEDS) impacts this population and early detection and targeted interventions to mitigate the impact are essential.

Keywords: Prevalence, risk factors, tear film break-up time, Schirmer's test, dry eye disease, post-menopausal women.

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Introduction:

Dry Eye Disease (DED) or keratoconjunctivitis sicca, is a multifactorial ocular disease involving decreased tear production or increased evaporation of tears from the ocular surface resulting in inflammation and damage to the surface of the eye.[1] It is an important public health problem, with millions affected, causing symptoms including burning, stinging, redness and visual disturbances.[2] Women who have gone through menopause are particularly at risk for getting Dry Eye Disease (DED) because of the drop in hormone levels in your body in particular estrogen, which is important for stabilizing your tear film and keeping your ocular surface healthy.[3]

Rates of Dry Eye Disease (DED) are scattered worldwide and are higher in Asia (5.9% to

Table 1: Demographic and lifestyle characteristics of participants

Variable	DED (n=149)	No DED (n=68)	p-value
Age:			
45-50yrs	40 (26.8%)	15 (22.1%)	0.076
51-60yrs	80 (53.7%)	35 (51.5%)	
>60yrs	29 (19.5%)	18 (26.5%)	
Duration of Menopause (years)			
1-5	50 (33.6%)	20 (29.4%)	0.042
6-10	60 (40.3%)	30 (44.1%)	
>10	39 (26.1%)	18 (26.5%)	
Smoking			
Yes	25 (16.8%)	10 (14.7%)	0.002
No	124 (83.2%)	58 (85.3%)	
Digital Device Use (hours/day)			
<2	30 (20.1%)	38 (55.9%)	<0.001
2-5	50 (33.6%)	15 (22.1%)	
>5	69 (46.3%)	15 (22.1%)	
Environmental Factors			
Yes	55 (36.9%)	20 (29.4%)	0.015
No	94 (63.1%)	48 (70.6%)	

33.7%) than in North America and Europe (5% to 22%).[4] This variability, as well as the contributing factors such as genetic predisposition, environmental conditions, lifestyle habits and access to healthcare services,[5] are not subject to control. Very few studies, however, have examined the prevalence of dry eye disease in post-menopausal women in Pakistan, where anecdotal evidence suggests there is a high burden.[6] Corrective and surgical measures to prevent and manage dry eye disease are best developed when based on a sound understanding of the epidemiology of dry eye disease in this demographic.[7]

In fact, previous studies, including Maurya and Majumdar et al. have documented a high prevalence of dry eye disease in post-menopausal women in India and hence revealed hormonal alterations influence ocular health.[8,9] Overall, though, there is little data available from Pakistan, which may experience greater impacts of dry eye disease symptoms from environmental factors such as air pollution and high temperatures.[10] The purpose of this study is to fill this gap by determining the prevalence and severity of dry eye disease in post-menopausal women attending a tertiary care hospital in Nawabshah, Pakistan, and risk factors.

Material and Methods:

Study design: This was a cross-sectional study spanning over six months from April 2023 to September 2023 at the Department of Ophthalmology, Peoples University of Medical and Health Sciences for Women, Nawabshah SBA Pakistan.

Study population: Women aged ≥45 years of post-menopausal women visiting the ophthalmology department for routine eye examination or with complaints of ocular pain were included. Post-menopausal status was defined as no menses for at least 12 consecutive months, confirmed by medical record or as defined by self-report.

Sample size calculation: Using the WHO sample size calculator for prevalence studies with a 95% confidence level and a 5% margin of error, and assuming a prevalence (P) of 82.97% based on Majumdar et al.[9] a sample size of 217 post-menopausal women was determined.

Sampling technique: We used a non-probability consecutive sampling method that included every eligible post-menopausal woman attending in the Ophthalmology Department until the sample size was attained.

Inclusion criteria: Post-menopausal women aged ≥45 years. For routine eye examination or with ocular discomfort. Willingness to provide informed consent.

Exclusion criteria: History of ocular surgery (e.g., corneal refractive surgery) within the past six months. Ocular surface diseases other than dry eye disease (keratoconjunctivitis sicca, ocular cicatricial pemphigoid). Chronic systemic diseases of the tear film (Sjogren's syndrome, rheumatoid arthritis). Contact lens users. Associated with systemic diseases that are generalized dryness.

Ethical considerations: The Ethical Review Committee (ERC) of the hospital approved. Informed consent from each participant was

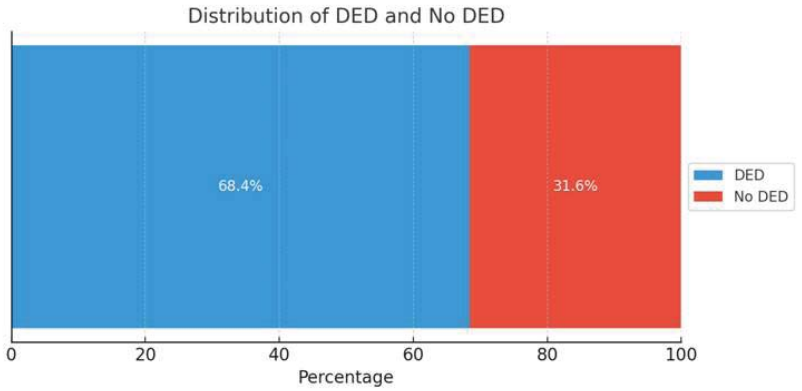

Figure 1: Prevalence of dry eye disease among post-menopausal women

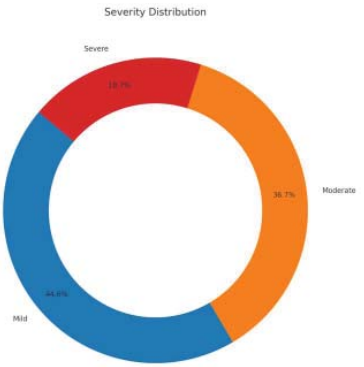

Figure 2: Severity Distribution of Dry Eye Disease

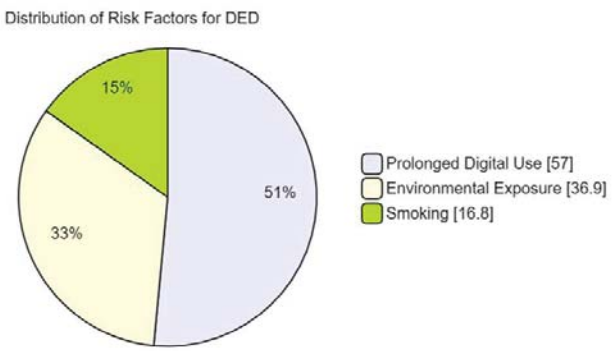

Figure 3: Risk Factors Associated with DED

obtained in written form. The study adhered to the Declaration of Helsinki principles and to the patient's secrecy that allows the patient to withdraw at any time.

Data collection: Participants underwent comprehensive ocular examinations, including:

Tear Film Break-Up Time (TBUT): Fluid testing was done using fluorescein dye to measure time until dry spots (cornea) appear after a blink.

Schirmer's Test: Placing standardized strips in the lower eyelid for five minutes to measure tear production.

Ocular surface staining: Corneal and conjunctival staining identified using fluorescein is indicative of ocular surface damage.

Severity of dry eye disease was categorized based on TBUT and Schirmer's test results:

Mild: TBUT 5-9 seconds and/or Schirmer's test 5-10 mm.

Moderate: TBUT 3-4 seconds and/or Schirmer's test 1-4 mm.

Severe: TBUT <3 seconds and/or Schirmer's test <1 mm.

Structured interviews and medical records were used to obtain data on demographic variables (age, duration of menopause), lifestyle factors (smoking status, hours of digital device use, environmental exposures), as well as data on disease status (menopausal status and arthritis).

Data Analysis: Data were then entered into SPSS version 25. Numerical variables were calculated with descriptive statistics (mean±SD), and categorical variables resulted in frequency percentages. Dry eye disease prevalence and severity were determined. Associations of dry eye disease to risk factors were identified with chi-square tests, with $p \leq 0.05$ considered statistically significant.

Results:

Participant characteristics: A total of 217 post-menopausal subjects participated in the study. The mean age was 58.4±7.3 years; most (60%) were 50-60 years of age. A range from 1 to 25 years since menopause, mean 7.2±4.5 years. Table 1 summarizes demographic and lifestyle characteristics.

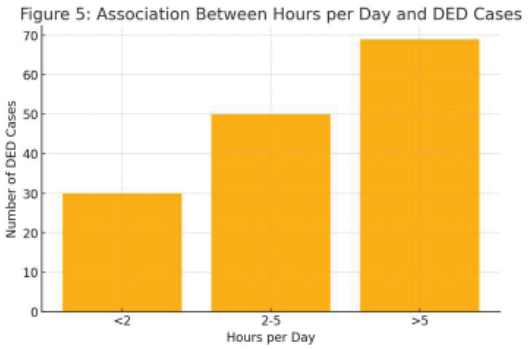

Figure 4: Distribution of digital device use among participants

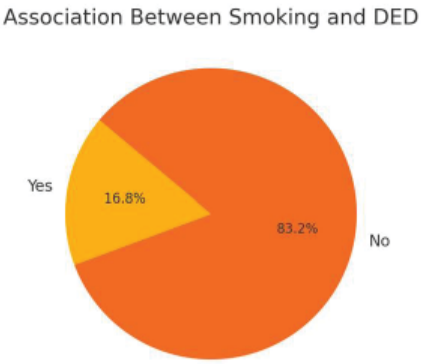

Figure 5: Association between smoking and DED

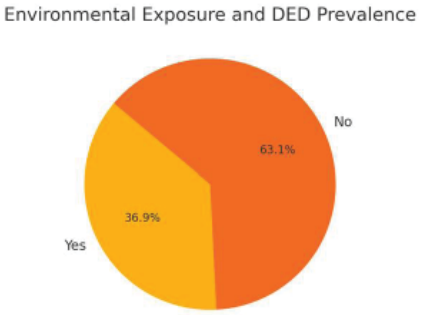

Figure 6: Environmental factors and DED prevalence

Prevalence of Dry Eye Disease: Dry eye disease was diagnosed in 149 out of 217 participants, yielding a prevalence rate of 68.4% (95% CI: 63.2-73.6%).

Severity of Dry Eye Disease:

- Mild: 66 participants (30.5%)
- Moderate: 54 participants (25.1%)
- Severe: 29 participants (12.8%)

Risk factors associated with dry eye disease:

Digital device use:

- ≥6 hours/day: 85 participants (57%) with DED vs. 30 participants (21%) without DED ($p < 0.001$).
- 2-5 hours/day: 50 participants (33.6%) with DED vs. 15 participants (22.1%) without DED.
- <2 hours/day: 30 participants (20.1%) with DED vs. 38 participants (55.9%) without DED.

Smoking:
Yes: 25 participants (16.8%) with dry eye disease vs. 10 participants (14.7%) without dry eye disease ($p = 0.002$).

No: 124 participants (83.2%) with dry eye disease vs. 58 participants (85.3%) without dry eye disease.

Environmental Factors (Air Pollution, Dry Climate):

Yes: 55 participants (36.9%) with dry eye disease vs. 20 participants (29.4%) without dry eye disease ($p = 0.015$).

No: 94 participants (63.1%) with dry eye disease vs. 48 participants (70.6%) without dry eye disease.

Age: Prevalence of dry eye disease was higher in older ages ($p = 0.076$, not significant).

Duration of menopause: Increasing dry eye disease severity was associated with longer duration since menopause ($p = 0.042$).

Discussion:
Results from the present study show that there was a high prevalence of dry eye disease (DED) in post-menopausal women at the tertiary care hospital, Nawabshah, Pakistan, where 68.4% had dry eye disease. This is consistent with what has been found in prior studies in similar populations, for example, that of Majumdar et al.

with an 82.97% prevalence in post-menopausal women in India.[9] Nevertheless, various factors of genetics, environmental and lifestyle stand as possible sources of different prevalence rates in different regions.[4]

In this study's severity distribution indicated that a high proportion of women had mild to moderate dry eye disease, suggesting the importance of early intervention to prevent progression to severe forms causing large amounts of discomfort and vision impairment.[11] It is also of particular note that in the current digital age, where screen time is ubiquitous, increased digital device use is particularly linked to dry eye disease due to chronic exposure to the ocular surface due to dryness.[12] This result is in line with recent reports in studies finding the effect of digital eye strain on tear film stability.[13]

This finding was consistent with the existing literature suggesting smoking, as a risk factor for ocular surface inflammation and tear film instability.[14] A strong association was also shown for dry eye disease with environmental factors, including high air pollution and dry climates, reflecting the exacerbating effects of external irritants on tear evaporation and the health of the ocular surface.[15] The findings also suggest that dry eye disease is a multifactorial process in which intrinsic and extrinsic factors interact to play a role in its pathogenesis.[16]

Similar to our finding, age and the duration of menopause were positively correlated with dry eye disease severity,[3] and hormonal changes are known to be maintained in the ocular surface integrity. Estrogen decline due to the menopause causes alterations in tear composition and increases susceptibility to dry eye disease.[17] Endocrine factors in dry eye disease should be seriously considered in the management and prevention of dry eye disease in post-menopausal women, because this hormonal influence makes this issue so important.[18]

Limitations: The validity of findings may be limited to this single tertiary care hospital. Yet, given that dry eye disease is a cross-sectional design, it cannot establish causality between risk factors and dry eye disease. Longitudinal designs joined with multiple centers would provide future studies a way to further the robustness and applicability of the results.

Implications for practice: Health practitioners should watch for dry eye disease in post-menopausal women, particularly those at high risk, including long-term digital device use, smokers and environmental risk factors. Preventive strategies can be implemented, including promoting digital hygiene as well as smoking cessation programs to prevent the burden of dry eye disease in this population.

Recommendations:
More research is needed into how targeted interventions to decrease prevalence and severity of dry eye disease achieve this goal. Studies investigating damages to the retina that may be made by hormonal replacement therapy could help develop therapeutic strategies.[19]

Conclusion:
Post-menopausal women have a high prevalence of dry eye disease, and it is dependent on lifestyle and environmental factors. Dry eye disease is a disease that is dramatically increased by prolonged digital device use, smoking and exposure to high air pollution levels. Delayed diagnosis and late intervention can lead to dismal outcomes in the forms of dry eye disease, affecting the quality of life of post-menopausal women. These risk factors should be addressed in addressing and preventing dry eye disease with healthcare policies.

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Role and contribution of authors:
Wajiha Murtaza, collected the data, references and did the initial writeup.

Muhammad Hisham, helped in collecting the data and also helped in introduction writing.

Arif Rabbani, helped in collecting the references and also helped in abstract writing.

Amjad Ali Sahito, critically review the article and made final changes.

Shahid Azeem Mirza, critically review the article and give useful suggestions.

Sikandar Azeem Mirza, collected the references and also helped in material and methods writing.

References:

1. Mandal A, Gote V, Pal D, Ogundele A, Mitra AK. Ocular pharmacokinetics of a topical ophthalmic nanomicellar solution of cyclosporine (Cequa) for dry eye disease. Pharma Res. 2019;36:1-21.
2. Mohamed HB, Abd El-Hamid BN, Fathalla D, Fouad EA. Current trends in pharmaceutical treatment of dry eye disease: A review. Eur J Pharma Sci. 2022;106206:31-62.
3. Zhao M, Yu Y, Roy NS, Ying GS, Asbell P, Bunya VY, et al. Sex-related differences and hormonal effects in the Dry Eye Assessment and Management (DREAM) study. Brit J Ophthalmol. 2022;31(5):111-34.
4. McCann P, Abraham AG, Mukhopadhyay A, Panagiotopoulou K, Chen H, Rittiphairoj T, et al. Prevalence and incidence of dry eye and meibomian gland dysfunction in the United States: A systematic review and meta-analysis. J Am Med Assoc. 2022;51(3):233-54.
5. Sheppard J, Shen Lee B, Periman LM. Dry eye disease: identification and therapeutic strategies for primary care clinicians and clinical specialists. Ann Med. 2023;55(1):241-52.
6. Veernala I, Jaffet J, Fried J, Mertsch S, Schrader S, Basu S, et al. Lacrimal gland regeneration: The unmet challenges and promise for dry eye therapy. Ocular Surface. 2022;22(3):64-69.
7. Lee Y, Kim M, Galor A. Beyond dry eye: how co-morbidities influence disease phenotype in dry eye disease. Clin Exper Optomet. 2022;105(2):177-85.
8. Maurya RP, Singh VP, Chaudhary S, Roy M, Srivastav T, Rajan M. Prevalence of severe dry eye disease in postmenopausal women in North India: A teaching hospital study. Indian J Obstet Gynecol Res. 2019;6(1):94-6.
9. Majumdar M, Khandelwal R, Gangwani T. Comparison of dry eyes in post-menopausal women with and without symptoms of dry eyes. J Evol Med Dent Sci. 2014 Oct 30;3(57):12933-8.
10. Tiwari G, Sharma AV, Samar R, Samar AK. Dry eye disease symptoms in menopausal and postmenopausal women. Eur Chem Bull. 2023;12(Special Issue 01):5596–5600.
11. Chen D, Zhang S, Bian A, Hong J, Deng Y, Zhang M, et al. Efficacy and safety of 0.05% cyclosporine ophthalmic emulsion in treatment of Chinese patients with moderate to severe dry eye disease: A 12-week, multicenter, randomized, double-masked, placebo-controlled phase III clinical study. Medicine. 2019;98(31):202-246.
12. Song Y, Yu S, He X, Yang L, Wu Y, Qin G, et al. Tear film interferometry assessment after intense pulsed light in dry eye disease: A randomized, single masked, sham-controlled study. Contact Lens Anterior Eye. 2022;45(4):101499:554-45.
13. Khanal S, Ngo W, Nichols KK, Wilson L, Barnes S, Nichols JJ, et al. Human meibum and tear film derived (O-acyl)-omega-hydroxy fatty acids in meibomian gland dysfunction. Ocular Surface. 2021;21(1):118-28.
14. Prabakaran S, Schwartz A, Lundberg G. Cardiovascular risk in menopausal women and our evolving understanding of menopausal hormone therapy: risks, benefits, and current guidelines for use. Therapeutic Adv Endocrinol Metab. 2021;12:20420188211013917.
15. Kopacz D, Niezgoda Ł, Fudalej E, Nowak A, Maciejewicz P. Tear film–physiology and disturbances in various diseases and disorders. Ocular Surface Dis. 2020;15(3):137-44.
16. Baudouin C, Rolando M, Del Castillo JMB, Messmer EM, Figueiredo FC, Irkec M, et al. Reconsidering the central role of mucins in dry eye and ocular surface diseases. Prog Retin Eye Res. 2019;71:68-87.
17. Samuel CGJ, Vimala KS, Balaji R, Sathish KM, Swamyraj SV. Study of dry eye in post-menopausal women. Trop J Ophthalmol Otolaryngol. 2019;4(5):328-333.
18. Jeena G, Saurav P, Anadi K. Prevalence of Dry Eye in Postmenopausal Women: A Study from Nepal. Ophthalmology J. 2019;1-5.
19. Maurya RP, Gupta A, Verma S, Singh VP, Singh A, Singh V, et al. Sex hormones and dry eye disease: current update. IP Int J Ocul Oncol Oculoplasty. 2021;7(2):139-50.
20. Majumdar M, Khandelwal R, Gangwani T. Comparison of dry eyes in postmenopausal women with and without symptoms of dry eyes. J Evol Med Dent Sci. 2014;3(57):12933-8.
21. Chen D, Zhang S, Bian A, Hong J, Deng Y, Zhang M, et al. Efficacy and safety of 0.05% cyclosporine ophthalmic emulsion in treatment of Chinese patients with moderate to severe dry eye disease: A 12-week, multicenter, randomized, double-masked, placebo-controlled phase III clinical study. Medicine. 2019;98(31):202-246.