Original Article

Effect of Refractive Error Correction on Dry Eye Disease among Computer Operators of Hayatabad Medical Complex Peshawar

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ABSTRACT

Purpose: To determine the frequency of dry eye disease and association of refractive error correction on dry eye disease among computer operators.

Study Design: Cross-sectional.

Place and Duration of Study: Hayatabad Medical complex, Peshawar from June 2022 till December 2022.

Methods: This study recruited ninety-three computer operators from Hayatabad Medical Complex. Data collection began after approval from hospital ethical and research committee. Symptoms of dry eye were recorded in a pre-designed proforma after obtaining written informed consent. The Schirmer test was used to measure tears volume. Data was analyzed using SPSS version 23. Quantitative variables were described as mean + standard deviation and categorical values in frequency and percentages. Post stratification chi square test was utilized. A p value of less than 0.05 was considered statistically significant.

Results: The mean age of the subjects was 38.7 + 8.5 years. There were 75.3% males. The mean duration of the job was 8.1 + 3.5 years and mean daily computer use was 8 + 2.2 hours. Use of spectacles was reported by 30.1% participants and contact lenses by 17.2%. Dry eye disease (on Shirmer's test) was recorded in 24.7%. Refractive errors correction had no statistically significant effect on dry eye disease (for glasses p=0.313 and contact lens p=0.193).

Conclusion: Dry eye disease is significantly high in our population among avid screen users, but the refractive error correction has no effect on dry eye disease.

Key words: Dry Eye, Pain, Schirmer test, Refractive error, Contact lenses.

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INTRODUCTION

Dry eye disease is a common eye condition which affects millions of people globally. The worldwide prevalence has varied from 10% to 50% depending on the geographic region.[1] It is common in the Asia where 1 in 5 individual above 18 years of age is inflicted with the disease.[2] In Pakistan, studies have found the prevalence even higher at 40% while targeted studies aimed at information technology personnel have recorded rate of 47%.[3,4]

Dry eye disease (DED) is a multi-factorial disease in which the quantity or quality of the tear film covering the cornea and conjunctiva is affected.[5] This instability can cause damage to the ocular surface and hence caused is comfort, tearing, itching, burning, redness, photophobia, decreased/blurring of vision and foreign body sensation.[6]

The incidence of this disease is greater in

individuals with more screen time. The main documented reason being that screen time reduces the normal blinking rate of 10-12 times a minute to 5-7 times a minute.[7] This decreases the time the cornea is protected by tears and the efficiency with which they are spread on the eye. DED is a part of a combination of ocular and musculoskeletal symptoms that occur from screen use called "Computer Vision Syndrome".[8] This is common in individuals who have more than 3 hours of screentime daily or 30 hours weekly.[9]

The purpose of this study is to determine the frequency of DED in our population by looking at an at-risk population of computer operators and to determine the association of refractive error correction on dry eye disease among computer operators. This information will be beneficial for the patients as well as healthcare professionals because it will make it more convenient to diagnose the disease. The results can also be compared to the normal population especially how screen time is now high for most individuals and not just those working in IT fields.

METHODS

This cross-sectional study was conducted at Hayatabad Medical complex, Peshawar from June 2022 till December 2022. Sampling was done by convenience sampling. Taking the population size as ninety-three computer operators, with an anticipated proportion of 28%, absolute precision of 5% and a confidence level of 95%, the sample size was 72. Those subjects who had any other eye morbidity (trauma or severe ocular disease), ocular surgery or use of medication were excluded from the study.

Data collection began after approval from hospital ethical and research committee (740/HEC/B&PSC/2022). This study followed the tenets of Declaration of Helsinki for research on human subjects. Symptoms of dry eye were recorded in a pre-designed proforma after obtaining written informed consent. The Schirmer test was used to measure the production of tears. The strip was carefully placed within the lower eyelid (conjunctival sac), and participants were instructed to close their eyes for five minutes. After this period, the strip was removed, and the measurement in millimeters was recorded from the scale marked on the strip. Local anesthesia was used to prevent irritation and ensure that only basal tear secretion was measured.

The data were analyzed using SPSS version 23. Quantitative variables such as job duration, age, and time spent working on a computer were presented as mean ± standard deviation. Categorical variables, including gender, use of spectacles/contact lenses, and symptoms, were summarized as frequencies and percentages. Symptoms were further stratified by age, gender, job duration, hours spent on a computer, and use of spectacles/contact lenses. Post-stratification, the chi-square test was applied, with a p-value of less than 0.05 considered statistically significant.

RESULTS

A total of 93 computer operators were recruited with 70(75.3%) males and 23(24.7%) females. The mean age of the subjects was 38.7 + 8.5 years (range 25 to 55 years). This is further elaborated in Table 1. Out of total, 28 individuals (30.1%) wore glasses while 16 individuals (17.2%) wore contact lens, and 23 individuals (24.7%) claimed that they had symptoms related to dryness. The specific symptoms are stratified and presented in Table 1.

The participants were categorized into different groups for both the number of years on the job and the hours spent on the computer per day. The mean duration of the job was 8.1 + 3.5 years (range 3-15 years). The mean daily computer use was 8 + 2.2 hours (range 5 to 12 hours). The results are given in Table 2 below.

Table 1: *Stratification by Gender & Age group of different symptoms. The number in brackets is percentage of total N=93. The lowest columns are totals of each age group.*

Symptoms (in any eye)	Gender, n (%)		Age groups (in years), n (%)			
	Female	Male	0-35Count	36-45Count	46-55Count	Total
Burning	4(4.3)	22(23.66)	8(8.6)	13(13.9)	5(5.3)	26(28)
Irritation	2(2.1)	9(9.6)	5(5.5)	2(2.1)	4(4.3)	11(11.8)
Watering	4(4.3)	22(23.66)	8(8.6)	13(13.9)	5(5.3)	26(28)
Foreign body sensation	3(3.2)	7(7.5)	6(6.4)	2(2.1)	2(2.1)	10(10.8)

n=frequency, %=percentage

Table 2: *Dry eye diagnosed by Schirmer in different categories.*

Schirmer Test	Symptoms, n (%)		Hours Spent on Computer, n (%)			Number of Years of Job, n (%)			Total, n (%)
	Yes	No	0-5	6-10	>11	0-5	6-10	>11	
Positive	12 (12.9)	11(11.8)	5 (5.4)	11(11.8)	7(7.5)	10(10.8)	7(7.5)	6(6.5)	23 (24.7)
Negative	24 (25.8)	46 (49.5)	10(10.8)	51 (54.8)	9 (9.7)	21(22.6)	29(31.2)	20 (21.5)	70(75.3)
Schirmer Test	**Symptoms, n (%)**		**Hours Spent on Computer, n (%)**			**Number of Years of Job, n (%)**			**Total, n (%)**
	Yes	**No**	**0-5**	**6-10**	**>11**	**0-5**	**6-10**	**>11**	
Positive	12 (12.9)	11(11.8)	5 (5.4)	11(11.8)	7(7.5)	10(10.8)	7(7.5)	6 (6.5)	23 (24.7)
Negative	24 (25.8)	46 (49.5)	10(10.8)	51 (54.8)	9 (9.7)	21(22.6)	29(31.2)	20 (21.5)	70(75.3)

n=frequency, %=percentage

Dry eye diagnosed via Schirmer test was positive in a total of 23 individuals (24.7%) in which 12(12.9%) had any sort of symptoms of dry eye while 11(11.8%) did not. Out of the 70 individuals (75.3%) who tested negative; 24(25.8%) had symptoms while 46(49.5%) did not. The results of hours spent in front of computer daily, number of years at job and presence of symptoms against dry eye diagnosed by Shirmer are given in Table 2.

To analyze the effect of refractive corrections on the Schirmer test, the Chi Square test was applied. None of these resulted in statistically significant results as shown in Table 3.

Table 3: *Effect of refractive error correction on Schirmer test.*

Characteristics		Dry eye on Schirmer (any eye) Yes, n (%)	No, n (%)	Total	p-value[1]
Glasses wearer	Yes	5(17.86)	23(82.14)	28	0.313
	No	18(27.69)	47(72.31)	65	
Lenses wearer	Yes	6(37.50)	10(62.50)	16	0.193
	No	17(22.08)	60(77.92)	77	

n=frequency, %=percentage
[1]chi-square test was applied.

To check the association of age with presence of dry eye disease. Shapiro Wilk test was applied for normality. Since the data was not normally distributed; Mann Whitney U test showed a p value of 0.762 identifying no statistical significance.

DISCUSSION

In addition to the strong biological plausibility, the detrimental effect of Dry eye disease (DED) on ocular health has long been postulated and studied. The earliest work was done in the 1980s in which video display operators were screened for visual effects.[10] The phenomenon only popularized after the term "Computer Vision Syndrome" was coined and the subjective symptoms were given a more concrete definition.[11]

The key risk factors include prolonged screen time, improper posture and ergonomics as well as decreased humidity.[12] Common symptoms include headaches, eyestrain, burning of eyes and tearing.[13]In our study we found that 38.7% of the computer operators had at least one symptom of DED. They are included in a high-risk group with a recent study by Chaitra et al, in a Tertiary care center in India reporting a prevalence rate of 51%.[14] Another study showed a positive correlation between hours of screen time and the prevalence of Dry Eye Disease.[15]Studies done in Pakistan showed a prevalence of 47.7% of DED among IT students who had extensive eight plus hours of screentime.[4] A study which reported on the increased screen hours among children during COVID-19 lockdown also found an increased symptoms of DED in children.[16] One study in randomized computer users yielded a shocking prevalence of 75% in a tertiary care hospital in Karachi.[17]

Previous studies have demonstrated a gender disparity in the prevalence of DED. Stang et al, showed a significant prevalence of 2.1 times higher in females compared to men.[18] This difference has been attributed to an increase in symptoms during menopausal age in women, as well as their greater likelihood of reporting higher symptom severity scores compared to men.[19] A study done in 2024 by Li and Gavin showed odds ratios of 1.49 and 1.54 in individuals aged 75-84 and 85+ respectively.[20] The incidence was higher in females compared to males in this study as well. Our study found no association between increased dry eye disease (DED) and age or gender in individuals up to 55 years, likely due to the targeted nature of our population, which primarily

consisted of male computer operators.

Diagnosed DED does not necessarily mean the presence of symptoms with highly variable ranges. A population-based study showed only 15% of diagnosed patients had symptoms.[21] Sometimes the symptoms are exacerbated by other conditions. A study in Nepal showed 72% of glaucoma patients experienced dry eye symptoms.[22]Our study showed that symptoms were present in 24.7% patients regardless of DED.

The strength of our study is that it is real-world data on specific population. The limitations of our study include a small sample size, the cross-sectional design and lack of control for confounding variables. The presence of subjective data like symptoms of burning, irritation etc. is prone to recall bias and underreporting. The use of a single test (Schirmer) for diagnosis also limits the ability to fully capture the severity of the condition. We recommend further multi-institutional work on this topic and feel the best results would come from a longitudinal study with long follow-up to understand the temporal relationship between DED and risk factors.

CONCLUSION

About a quarter of those who have screen related work have dry eyes. We recommend raising awareness regarding the symptoms of the disease and advocating for less screen time in those with severe symptoms.

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Patient's Consent: Researchers followed the guidelines set forth in the Declaration of Helsinki.

Conflict of Interest: Authors declared no conflict of interest.

Ethical Approval: The study was approved by the Institutional review board/Ethical review board **(740/HEC/B&PSC/2022)**.

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Authors Designation and Contribution

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Bakht Danyal Khan; Trainee Medical Officer: *Literature search, Data analysis, Manuscript preparation, Manuscript editing, Manuscript review.*

Yousaf Jamal Mahsood; Associate Professor: *Concepts, Design, Literature search, Statistical analysis, Manuscript preparation, Manuscript editing, Manuscript review.*