

## Dry Eye Syndrome and Associated Risk Factors among Computer Users in Karachi, Pakistan

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### Abstract

**Objective:** To assess the frequency of presence of dry eyes and its associated risk factors among employees working in call centres and software houses in Karachi.

**Methods:** A cross-sectional study was done during July to October 2014 at Hamdard College of Medicine and Dentistry, Karachi. By convenient sampling technique, data was collected from employees aged 20 to 40 years of call centres and software houses. Demographic information was recorded on pre-designed questionnaire and Schirmer's test strips were used to measure production of tears. Descriptive analysis was done for categorical variables using SPSS version 20. Cross-tabulation of different variables was done with dryness of eyes experienced. The frequency of various eye complaints was determined and Chi square test was used to observe the association with Schirmer's test. P-value < 0.05 was considered as significant.

**Results:** Out of 150 employees 42 (28%) were found to have dry eyes. Mean age was  $27 \pm 3.5$  years. The majority of employees 117 (78%) were males and 77 (51.3%) were using corrective spectacles for refractive errors. The most common eye complaints among the computer users were burning of eyes (44%), redness of eye (41.3%), dryness of nose (36%), dryness of mouth (34.7%), discharge from eye (10.7%) and foreign body sensation (10%). Statistically significant ( $p < 0.05$ ) relationship has been observed between presence of eye burning and positive Schirmer's test.

**Conclusion:** This study indicated that 28% of the individuals had dry eye, along with other symptoms of eyes among computer users in call centres and software houses.

**Keywords:** Dry eye syndrome, asthenopia, eyestrain, computer, call centers.

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### Introduction

Dry eye syndrome (DES) or keratoconjunctivitis sicca (KCS), is a multifactorial eye disease most common in females and old patients<sup>1</sup>. It is caused by either decreased tear production or in-

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creased tear film evaporation<sup>2</sup>. A normally functioning tear film is required to maintain clarity of vision and ocular health. The tear film consists of three layers from inside to outside; mucinous layer, aqueous layer, and sebaceous layer which serves to provide the ocular surface comfort, mechanical, environmental, and immune protection, maintain epithelial cellular health, and provide a smooth and very powerful refracting surface for clear vision<sup>3</sup>. Abnormality of any one of the three layers of tears produces an unstable tear film, resulting in symptoms of KCS<sup>4</sup>.

It has been reported in the past that older women suffer more from dry eye syndrome than males<sup>5,6</sup>. A research conducted among men in the United States concluded that the risk of dry eye in-

creases with age, presence of hypertension, benign prostatic hyperplasia and use of anti-depressants<sup>7</sup>. Another study conducted on elderly population in Australia reported the incidences of symptoms of dry eyes are more common in older females<sup>8</sup>. Another study in a developing country revealed a prevalence of 27.5% of dry eyes symptoms with pterygium; an independent risk factor<sup>9</sup>. A cross-sectional hospital-based study done in India reported prevalence of 18.4% with relative increase in symptoms due to excessive wind, sunlight exposure, smoking, air pollution and drug usage<sup>10</sup>.

In this advanced era of technology, throughout the world the use of computers has become a necessity in every working environment. This has significantly increased the impact on the health of a person. This is especially likely to be greater in the underdeveloped countries where most of the computer users are not aware of the principles and practice of safe computer use<sup>11</sup>.

Computer vision syndrome along with dry eye syndrome is also one of the major concerns among computer users<sup>12</sup>. It is a collection of ocular, extraocular and systemic symptoms related to prolonged sitting and focusing on computer screens<sup>13</sup>.

Karachi is a megacity of Pakistan and a large number of people are involved in call centres and software houses. These people work on computers for usually long hours and, thus, are likely to get affected from the computer screens. Literature review has revealed that a few studies have looked into this important computer-related issue<sup>11,14</sup>, therefore, the study aims to assess the frequency of presence of dry eye and its associated risk factors among employees working in call centres and software houses.

## Subjects and Methods

This cross-sectional study was done during July to October 2014 at Hamdard College of Medicine and Dentistry, Hamdard University, Karachi. The protocol was approved by the Ethical Review Committee of the institute. The data was collected

from employees of two call centres and two software houses using convenient sampling technique. All employees of both call centre and software houses working on computers were invited to participate in the study. Using the formula for estimating population proportion with an anticipated prevalence of 67%<sup>14</sup> and 95% confidence interval, the sample size was found to be 156<sup>15</sup>. Six respondents were excluded due to incomplete information hence, a total of 150 employees were included, of both sex and more than 19 years of age. Verbal consent was taken and anonymity of each participant was assured.

A pre-designed questionnaire was given to each participant for demographic information and assessment of various eye-related problems. Schirmer's test strips was used to measure production of tears. The strip was placed inside the lower eyelid (conjunctival sac) and the subject was asked to close their eyes for 5 minutes. Both eyes were tested at the same time. The test strip has a printed ruler on one side, with a scale divided into millimetres. The strip was removed after 5 minutes and the quantity of tears absorbed was measured and compared with the other eye. To prevent eyes from producing excess tears due to irritation from the paper strips local anaesthetic eye drops were given before the start of test. The use of the anaesthesia ensures that only basal tear secretion is being measured. The results of Schirmer's test was interpreted as; (i) positive- less than 10 millimetres wetting of the paper strip after 5 minutes, (ii) negative- more than 10 millimetres wetting of the paper strip after 5 minutes.

Employees between more than 19 years of age using computer at least for 3 hours daily are included in the study. All participants with any eye morbidities (eye injury, ocular disease), history of ocular surgery, and use of ocular medication or computers less than 3 hours were excluded.

The data was entered into SPSS version 20. It was cleaned for data discrepancies and checked for double entries before statistical analysis. Descriptive analysis was done for all categorical vari-

**Table 1.** Cross-tabulation of demographic characteristics, measures for refractive error correction, type of computer screens used and time spent on computers with presence of eye dryness

Variables	Eye dryness		Total N= 150 (%)	p-value
	Present n= 61 (%)	Absent n= 89 (%)		
<b>Sex</b>				
Male	47 (77.0)	70 (78.7)	117 (78.0)	0.843
Female	14 (23.0)	19 (21.3)	33 (22.0)	
<b>Age in years</b>				
< 25	19 (31.1)	35 (39.3)	54 (36.0)	0.387
> 25	42 (68.9)	54 (60.7)	96 (64.0)	
Mean ± SD (Range) 26.9 ± 3.58 (19 to 40)				
<b>Wearing spectacles for refractive error correction</b>				
Yes	42 (68.9)	35 (39.3)	77 (51.3)	<0.0001
No	19 (31.1)	54 (60.7)	73 (48.7)	
<b>Wearing contact lens for refractive error correction</b>				
Yes	6 (9.8)	6 (6.7)	12 (8.0)	0.549
No	55 (90.2)	83 (93.3)	138 (92.0)	
<b>Type of computer screen</b>				
LCD	52 (85.2)	81 (91.0)	133 (88.7)	0.303
Monitor	9 (14.8)	8 (9.0)	17 (11.3)	
<b>Time spent on computers (in hours)</b>				
< 6	26 (42.6)	37(41.6)	63 (42.0)	0.999
> 6	35 (57.4)	52 (58.4)	87 (58.0)	

**Table 2.** Association of ocular and extraocular symptoms with Schirmer's test

Variable	Schirmer's test		Total N= 150 (%)	p-value
	Positive n= 42 (%)	Negative n= 108 (%)		
<b>Burning of eyes</b>				
Yes	40 (95.2)	26 (24.1)	66 (44.0)	<0.0001
No	2 (4.8)	82 (75.9)	84 (56.0)	
<b>Redness of eyes</b>				
Yes	22 (52.4)	40 (37.0)	62 (41.3)	0.099
No	20 (47.6)	68 (63.0)	88 (58.7)	
<b>Watery discharge from eyes</b>				
Yes	4 (9.5)	12 (11.1)	16 (10.7)	0.999
No	38 (90.5)	96 (88.9)	134 (89.3)	
<b>Foreign body sensation in eye</b>				
Yes	1 (2.4)	14 (13.0)	15 (10.0)	0.068
No	41 (97.6)	94 (87.0)	135 (90.0)	
<b>Dryness of nose</b>				
Yes	17 (40.5)	37 (34.3)	54 (36.0)	0.570
No	25 (59.5)	71 (65.7)	96 (64.0)	
<b>Dryness of mouth</b>				
Yes	16 (38.1)	36 (33.3)	52 (34.7)	0.574
No	26 (61.9)	72 (66.7)	98 (65.3)	

ables. Demographic variables were tabulated as frequencies and percentages. Cross-tabulation between different variables and dryness of eyes was done. The frequency of various eye complaints was determined and Chi square test was used to observe the association with Schirmer's test. P-value <0.05 was considered significant.

## Results

Out of the total subjects, the majority 117 (78%) were males and 33 (22%) were female participants. The mean age was  $26.90 \pm 3.58$  years (range 19 to 40 years). There were 54 (36%) participants equal to or less than 25 years of age and 96 (64%) participants above 25 years of age. Slightly more than half, 77 (51.3%) of the participants were using spectacles and 12 (8.0%) wore contact lenses for correction of refractive errors. Most of the participants, 87 (58.0%), spent more than 6 hours on computers with the majority, 133 (88.7%), having liquid crystal display (LCD) as their computer screens. Statistically significant ( $p < 0.05$ ) association was observed between participants using corrective spectacles with complaint of eye dryness (Table 1).

Forty-two (28.0%) participants had positive Schirmer's test (less than 10 millimetres of moisture) while 108 (72%) participants showed normal tearing (more than 10 millimetres of moisture).

Burning of eyes, 66 (44%), was the most frequently reported eye complaint among the computer users. This was followed by redness of eye 62 (41.3%), watery discharge from eye 16 (10.7%) and 15 (10%) foreign body sensation in eye. Extraocular symptoms include dryness of nose 54 (36%) and dryness of mouth 52 (34.7%) and showed no association with Schirmer's test, whereas burning of eyes was strongly associated ( $p < 0.05$ ) (Table 2).

## Discussion

The present study is probably the first study in Karachi conducted on employees of call centres and software houses using computers in their job description exclusively. The presence of dry eye was found to be 28% among participants. A study conducted in Pakistan among medical students reported a much higher frequency (67%) of dry eye syndrome compared to our study<sup>14</sup>. Another local study conducted on different students found a frequency of 72%<sup>16</sup>. However, a recent study on computer users in Lahore reported 30% frequency of dry eyes<sup>17</sup>. A study conducted in our neighbouring country reported frequency of 78.6% for dry eye syndrome<sup>18</sup>. Higher frequency of dry eye syndrome was reported from Malaysia<sup>19</sup>, 89.9%, and 74% in Nigeria<sup>20</sup>.

The mean age of subjects in our study was  $27 \pm 3.5$  years. Studies from Malaysia and India reported similar mean age of 31 and 30 years respectively<sup>21,22</sup>. However, Khalaj et al. conducted a study in which the mean age was 15.83 years<sup>23</sup>. The presence of dry eye among participants more than 25 years of age was (68.9%) and more among male participants (77%) in our study suggesting that this prevalence increases with computer exposure time. Study conducted in India reported that the prevalence of dry eye is (25%) among both male and female<sup>24</sup>.

The present study found 57.4% of the participants using computers for more than 6 hours a day. Akinbinu et al. reported that participants who spend 6 to 8 hours average daily on the computer experienced more symptoms of dry eye syndrome<sup>20</sup> from those spending lesser time. Another study also reported of developing DES among those using computer for more than 5 hours per day<sup>21</sup>. Nevertheless, Reddy et al. reported more than 2 hours continuous use of computer significantly associated with occurrence of DES<sup>19</sup>.

In our study, the ocular symptoms experienced by the participants were burning sensation 44%, followed by redness of eyes 41.3%, discharge from

eyes 10.7% and foreign body sensation 10%. While among extraocular symptoms, dryness of nose 36% was the most common symptom. Burning sensation of eye was also reported among 33% and 32% in study conducted in Karachi<sup>14</sup> and India respectively<sup>25</sup>. Another study conducted in India reported relatively less prevalence of burning sensation as it was experienced by 28.9% of the participants<sup>26</sup>. This is in contrast to a study among call centre workers reporting a higher prevalence (54.6%) of burning sensation<sup>27</sup>. Logaraj et al. conducted a study in Chennai reported symptoms of redness, burning sensation, headache, and dry eye, and neck and shoulder pain among computer users<sup>18</sup>. In another study, the most common visual problem reported was burning sensation and dry/tired/sore eyes<sup>28</sup>. Mahalingam et al. also reported headache, fatigue and tiredness, burning of eyes, dry eyes, and neck and shoulder pain as the most common symptoms<sup>29</sup>. Prolonged time spent on computer could probably be one of its causes.

One of the limitations of this study is that detailed examination of those who had eye complaints was not done due to time restraint and unavailability of specific machines. More studies should be done among students and professionals involving logistics and experts to identify the burden of this problem that can further avoid complications and limit disability.

## Conclusion

The present study showed a sizable frequency of dryness of eyes and other ocular and extraocular symptoms among computer users of call centres and software houses. There is a definite need to provide them a better understanding of sign and symptoms of dry eye syndrome. Periodic eye examination would help early recognition of computer related eye problems hence, preventing loss of work productivity and vision-related quality of life among its users.

## Conflict of Interest

Authors have no conflict of interests and no grant/funding from any organisation for this study.

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