

## Lubricants Usage among Contact Lens Wearers in a University Students Population

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### ABSTRACT

**Purpose:** The purpose of this study was to assess the use of lubricants among contact lens (CL) wearers, as infrequent use of lubricants can lead to dry and irritating ocular surfaces that can alter the wearing schedule of contact lenses.

**Methods:** A Cross-sectional study was conducted. This study was conducted at the Contact lens clinic, Department of Optometry, The University of Faisalabad, Faisalabad, Pakistan, from December 2022 to February 2023. One hundred and fifty participants (72% females and 28% males) aged 18 to 28 years were included through a purposive sampling technique. Data was availed using a validated CLDEQ-8 questionnaire, and tears were assessed using Tear Break Up Time (TBUT) test before and after wearing soft contact lenses after taking informed written and oral consent. Results obtained were analyzed using SPSS version 22.

**Results:** Many of the contact lens wearers (43.33%) rarely used lubricants, while 54% stated that ocular discomfort alters their wearing schedule. TBUT was significantly decreased ( $p < 0.001$ ) from 12.26 seconds to 8.54 seconds after wearing contact lenses. Most of the students (79.33%) did not visit an eye care professional for contact lens-related ocular discomfort.

**Conclusion:** Majority of contact lens wearers in the study did not seek professional advice on contact lens-related dryness and discomfort, despite their effect on CL wearing schedule. The outcome of this study is to promote the frequent use of lubricants in contact lens wearers.

**Keywords:** Contact Lenses, Dry Eye Syndromes, Lubricant Eye Drops.

### INTRODUCTION

Contact lenses (CL) are biomedical devices primarily used to correct refractive errors in addition to cosmesis and therapeutic purposes. Currently, there are an estimated 140 million people worldwide who wear CL for refractive purposes, with many adults in Asian countries, especially women, wearing CL for cosmetic enhancement reasons.<sup>1,2</sup>

While conventional hydrogel lenses are the least popular among CL users in developed countries, they remain a popular choice in developing countries as they can be more affordable to newer generations of silicone hydrogels and daily disposable CL.<sup>3</sup>

Many CL wearers experience symptoms such as discomfort, dryness, and red eyes that may lead to CL dissatisfaction and discontinuation.<sup>4-6</sup>

Lubricants use have been advocated to alleviate the symptoms of discomfort and dryness while wearing contact lenses. This has been demonstrated using the Contact Lens Dry Eyes Questionnaire (CLDEQ-8). This questionnaire has been identified as a preferred tool to detect contact lens-related discomfort.<sup>7-9</sup>

While the use of lubricants to alleviate symptoms of discomfort among CL wearers have been investigated extensively in many countries, there are limited data

available from some Asian countries including Pakistan. Furthermore, there is a lack of knowledge in literature about CL-related discomfort among Pakistanis. The study aimed to assess CL-related discomfort and dryness and use of lubricants among CL wearers in Pakistan.

### SUBJECTS AND METHODS:

This cross-sectional study was conducted at Department of Optometry, among students of the University of Faisalabad, Faisalabad Pakistan, in the period from December 2022 to February 2023 after taking technical and ethical approval from Ethical Review Board (IRB/TUF/CO/OD/615). Sample selection was done using empirical approach.<sup>8</sup>

Total 150 participants from both the gender of age between 18 to 28 years using soft contact lenses were included through purposive sampling (non-probability) technique after appropriate history taking and thorough ocular examination. The subjects with Best corrected visual acuity (BCVA) 6/6, were included in the study. Whereas subjects with a history of previous systemic or ocular diseases and surgeries like diabetes mellitus and allergies were excluded, as it can affect corneal sensitivity.

Both verbal and written consent was taken prior data collection. Data collection was done using the validated Contact Lens Dry Eyes Questionnaire (CLDEQ-8) in which questions regarding contact lens wear schedule, type, purpose, complications after wearing contact lenses were asked (Table-II).<sup>8</sup> Additionally, validated proforma was used to ask usage of lubricant, visit to an eye care professional as well as Tear break up time (TBUT) values before and after wearing contact lenses. Firstly, TBUT was assessed in the morning before wearing contact lenses and then repeated in the afternoon after wearing contact lenses for 6 hours.

Descriptive and inferential statistical analyses were performed using SPSS for Windows version 24 (SPSS Inc., Chicago, IL, USA). Data were reported as frequency and mean  $\pm$  standard deviation (SD). Paired sample t-test was used to compare the means of variables before and after usage of lubricants. A P value of  $< 0.05$  was considered to be statistically significant with a 95% confidence level.

### RESULTS

A total of 150 participants (72% females and 28% males), their mean age was  $22.11 \pm 2.31$  (range; 18 - 28 years) were included through non-probability purposive sampling technique. Most of the contact lens wearers use extended wear lenses for cosmetic purpose (76%). Chi-square test indicated that females were significantly using extended wear mode of contact lenses and significantly using contact lenses for cosmetic purpose than males, P values were  $< 0.001$  and  $0.001$  respectively.

As shown in (Table-I), majority of contact lens wearers (85.3%) did not have any eye discomfort before using contact lenses. However, (65.3%) contact lens wearers have felt discomfort while (54%) participants have felt contact lens related dryness frequently.

Participants sometimes felt the need to close their eyes (37.3%), whereas (33.3%) have frequently felt the need and (12%) have felt it constantly. Almost half (46%) of contact lens wearers responded that contact lens related discomfort alters their wearing schedule, while (54%) wearers have no such problem. Around one quarter of contact lens wearers (22.7%) never take off their contact lenses, while (36%) take them off less than once a week, 34% take off several times a week while 7.3% take lenses off several times a day because of contact lens related ocular discomfort. Moreover, most of the contact lens wearers rarely (62%) use lubricants while (79.3%) have not visited an eye care professional for contact lens related discomfort (Table-II).

Paired t-test showed a statistically significant reduction ( $p < 0.001$ ) in mean Tear break-up time (TBUT) prior and after using soft contact lenses (SCL) from 12.26 seconds to 8.54 seconds (Table-III). An independent sample t-test showed males had less TBUT compared to females before and after using the contact lenses with P values of 0.01 and 0.04 respectively.

TBUT was significantly affected by the mode of contact lens wear, with daily wearers ( $7.01 \pm 0.01$ ) showing lower TBUT after contact lens usage compared to extended wearers ( $9.03 \pm 1.08$ ),  $P < 0.001$ . With regards to the purpose of wearing contact lenses, no significant mean difference was detected in term of post-wearing TBUT between those who wear contact lenses for refractive ( $8.67 \pm 0.96$ ) and

those using for cosmetic reason ( $8.50 \pm 1.36$ ),  $p = 0.49$ . ANOVA test indicated no significant difference in post contact lens TBUT regarding times of using lubricants,  $p = 0.39$ .

**Table I:** Demographics of Respondents (n=150)

Variables	Frequency (Percentage)
<b>Gender</b>	Male 42 (28%)
	Female 108 (72%)
<b>Age</b>	18-22 123 (82%)
	23-28 27 (18%)
<b>Purpose of Contact Lens Wear</b>	Cosmetic 114 (76%)
	Refractive 36 (24%)
<b>Type of CL wearing schedule</b>	Daily wear 36 (24%)
	Extended wear 114 (76%)
<b>Any eye discomfort before using CL?</b>	Yes 22 (14.7%)
	No 128 (85.3%)
<b>Are your eyes sensitive to smoke, air, dry and dusty weather?</b>	Yes 130 (86.7%)
	No 20 (13.3%)

**Table II:** Contact lens wear and comfort profile (n=150)

Category	Frequency (Percentage)
<b>Do you feel CL related eye discomfort?</b>	Never 15 (10%)
	Sometimes 29 (19.3%)
	Frequently 98 (65.3%)
<b>How often do your eyes feel contact lens related dryness?</b>	Constantly 8 (5.3%)
	Never 15 (10%)
	Sometimes 40 (26.7%)
<b>How often wearing contact lenses bothers your eyes that you wanted to close them?</b>	Frequently 81 (54%)
	Constantly 14 (9.3%)
	Never 26 (17.3%)
<b>Have contact lens related discomfort alters your wearing schedule?</b>	Sometimes 56 (37.3%)
	Frequently 50 (33.3%)
	Constantly 18 (12%)
<b>Do you felt the need to take your contact lenses off because of discomfort?</b>	Yes 69 (46%)
	No 81 (54%)
<b>How many times a day do you use lubricating eye drops?</b>	Never 34 (22.7%)
	< once a week 54 (36%)
	Several times a week 51 (34%)
<b>Have you visited an eye care professional for contact lens related discomfort guidance?</b>	Several times a day 11 (7.3%)
	Rarely 93 (62%)
	2-3 times per day 54 (36%)
<b>Have you visited an eye care professional for contact lens related discomfort guidance?</b>	4-6 times per day 3 (2%)
	Yes 31 (20.7%)
	No 119 (79.3%)

**Table III:** Paired Samples Statistics of Tear Breakup Time Before and After CL usage (n=150).

Paired Samples Statistics		Mean	Std. Deviation	Sig. (2-tailed)
<b>Tear Breakup Time Before CL</b>		12.2600	.83	.000
<b>Tear Breakup Time After CL</b>		8.5400	1.27	

## DISCUSSION

This cross-sectional survey-based study provided information about usage of lubricants and CL-related discomfort among CL wearers in a university student population. One of the most considerable findings of this study is the reduction in Tear break-up time (TBUT) before and after using soft CL from 12.26 seconds to 8.54 seconds, respectively. It was in agreement to a previous study that depicted a decrease in TBUT from 13.7 seconds before wearing soft CL to 12.7 seconds after wearing them for 6 hours.<sup>10</sup> It has been suggested that CL use is associated with dry eyes and discomfort, leading to discontinuation of the wear schedule. Furthermore, CL wearers are at a greater risk of developing dry eye, and symptoms of dryness and discomfort are more frequent and severe in CL wearers than in non-wearers.<sup>11</sup>

The prevalence of contact lens drop with dryness symptoms in soft contact lens wearers is approximately 50%.<sup>11,12</sup> The study results indicate that most of the CL wearers (43.33%) do not use lubricants often. Contact lens wearers who did not use lubricants have been shown to face complications of tear film instability as dry eye is highly dependent upon tear film stability.<sup>13</sup> This study suggests that CL wearers may require the use of lubricants to avoid complications, as the disturbance in tear film is believed to be a leading cause of CL dropout.

It has been shown that lubricants that do not have a symmetric interface between the contact lens and cornea are not favorable for contact lens wearers. Furthermore, contact lenses with 37% water content, like polyanionic hyaluronate, work better for dry cornea with preserved mucin layer, whereas contact lenses with 57% water content work better on dry cornea with removed mucin.<sup>13</sup>

There has been extensive work done previously on comparing different types of lubricants available in the market with contact lens solution. High osmolarity triggers the release of inflammatory mediators and proteases and causes discomfort or damage to the ocular surface.<sup>14,15</sup> On the other hand, hypoosmolar products decrease and heal the damage caused by the pathophysiology of hyperosmolar tear film.<sup>16</sup>

Hypoosmotic saline drops are preferred by contact lens wearers while wearing contact despite the fact that hypoosmotic lubricants reduce the osmolarity of the tear film after instilling drops.<sup>17</sup> However, further studies are needed to determine the effect of contact lens solution and lubricant osmolarity on the comfort of the eye surface. During insertion, a tight-fitting lens due to acidification because of dehydration can result in ocular discomfort.<sup>18</sup> It is suggested that eye care professionals need to be aware of the physical properties of lubricants commercially available for appropriate recommendation in contact lens wear as well as dry eye management and patient education.<sup>19</sup>

The Tear Film and Ocular Surface (TFOS) reported that there is reduced compatibility between the ocular environment and contact lenses.<sup>20</sup> An epidemiologic study including office workers in Japan revealed that CL wearers showed a 2.38 times greater risk of dry eye than non-contact lens wearers.<sup>21</sup> Moreover, CL showed 3.61 times greater chances of having severe dry eye symptoms compared to non-CL wearers.<sup>22</sup>

When a CL is inserted on the ocular surface, the tear film becomes divided into pre-lens tear film and post-lens tear film. Thus, the total volume of the aqueous layer in the pre-lens tear film is reduced. As the tear film functions mainly as a lubricant, the friction between the ocular surface and eyelid increases at the site of tear film breakup. If the tear volume is not reduced, the post-lens tear film also becomes thin, and the friction between the corneal/conjunctival and the contact lens surface increases.

The friction between the ocular surface and the contact lens causes foreign body sensations, discomfort, and dryness.<sup>23</sup> This study showed that ocular discomfort caused by contact lenses altered the CL wearing schedule among the participants. As interrupted wear of CL may

affect the vision quality, especially among university students who require good quality of vision to pursue their studies, corrective measures need to be pursued. As artificial eye tear drops can help in this condition, CL wearers need to seek professional advice on proper use of lubricants while wearing CL.<sup>24</sup> Interestingly, this study indicated that most CL wearers do not consult eye care professionals for CL-related ocular discomfort (79.33%). Thus, it is imperative to encourage and educate CL wearers regarding regular consultation and follow up with eye care professionals to ensure optimum CL wearing experience.

## CONCLUSION

This study concludes that the majority of contact lens wearers among a university student population in Pakistan experience dryness and discomfort related to contact lens use. Additionally, more than half of participants reported altering their wearing schedule, while almost two thirds of them had no choice but to remove their lenses and close their eyes. Interestingly, some participants used lubricants on their own, but the majority were unaware of what action to take and simply ignored the discomfort. Most importantly, most of the participants never sought the help of an eye care professional for their contact lens-related discomfort.

Despite questioning the participants about sensitivity to smoke, one limitation to this study is not asking about smoking habits or considering the effect of second-hand smoking. Furthermore, as this study was conducted on a university student population, it did not investigate the relation between occupation and contact lens discomfort. The significance of this study lies in promoting the use of lubricants among contact lens wearers. Eye care professionals should make it a priority to educate and advise their patients on the proper use of lubricants, particularly preservative-free options, on a daily basis after removing their lenses. This practice can greatly minimize contact lens-related eye discomfort and maintain a healthy and stable tear film, ultimately preventing numerous contact lens complications.

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**Data Availability:** The authors declare that all data supporting the findings of this study are available within the article and its supplementary information file.

**Competing interests:** The authors declare no competing interests.

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**Ethics declarations:** All procedures performed in the study followed the 1964 Helsinki declaration and its later amendments, University Ethics Committee approved the project.

## Conflict of interest

This study has no conflict of interest to declare by any author. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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