



## Original Article

Association of Dry Eyes and Blinking Pattern  
with Contact Lenses

## Authors

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**Objectives:** The purpose of this study was to examine the association of dry eyes with the use of contact lenses.

**Method:** This was analytical cross sectional study in which a proforma was used to examine the association of dry eyes with the use of contact lenses. A sample size of 86 Contact Lens (CL) wearers had taken in this study. Each CL wearer was using CL's for more than four weeks, five days in a week and eight hours in a day or more. A Schirmer test was performed and blink rate per minute of the CL wearers was measured in this study to label them whether they had normal or dry eyes. CL wearers having Schirmer test values  $\geq 15$ mm were considered normal, those having Schirmer test values 9 – 14 mm had mild dry eyes, those having Schirmer test values 4 – 8 mm had moderate dry eyes and those having  $< 4$ mm Schirmer test values had severe dry eyes. This study was conducted in September, October and November 2018.

**Results:** This study revealed that out of total 86 CL wearers, 56(65%) CL wearers had dry eyes having Schirmer test values less than 15 mm and 30(35%) CL wearers had normal eyes having normal Schirmer test values. The subjects who were using CL (both hard as well as soft) did not have a significant proportion of dry eyes. ( $p=0.088$ ) according to independent sample t-test. Similarly, out of 56 CL wearers that had dry eyes, 27 CL wearers had mild dry eyes having Schirmer test values 9 – 14mm, 25 CL wearers had moderate dry eyes having Schirmer test values 4 – 8mm and 4 CL wearers had severe dry eyes having Schirmer test value less than 4mm. Out of 86 CL wearers, 43(50%) CL wearers have excess blink rate  $> 15$  per minute, 42(49%) CL wearers have normal blink rate 12 – 15 blinks per minute and only one CL wearer have less than 12 blink rate per minute. The subjects using CL (both soft as well as hard) also did not have a significantly increased blink rate per minute. ( $p=0.157798$ ) according to independent sample t-test.

**Conclusion:** This analytical cross sectional study concluded that the Contact lens wearers are most often suffering from the dry eye disease and blink rate per minute has also increased among contact lens wearers due to dry eye disease.

**Keywords:** Dry eye (DE), Contact lens (CL), Tear Film (TF)

## Introduction:

The surface of eye needs a widespread Tear Film (TF) to preserve the physical condition and function of the eye. Sufficient production, reservation and stabilized removal of tears is essential for the stability of the TF. Any instability in the TF can be a cause of Dry Eye (DE) disease<sup>1</sup>. The Dry Eye (DE), also called keratoconjunctivitis sicca, can occur due to an inadequate production of tears or too much evaporation of tears, which produces a hyperosmolarity of tears that produces symptoms of discomfort<sup>2</sup>.

Instability in the TF can produce dry eye signs. TF instability can be occurred by exposure to air pollutants, goblet cell loss, prolonged use of contact lenses and conjunctival squamous metaplasia etc. Thus leading to the DE syndrome<sup>3</sup>. Symptoms that can occur due to DE are photophobia, pain, itching, ocular burning, grittiness/foreign body sensation, excessive blinking and blurred vision<sup>4</sup>. Preservation of the TF is necessary to maintain the ocular health. TF stability can be assessed through a number of methods designed for clinical as well as for research purposes. Different methods or techniques used to evaluate the instability in the TF are evaluation of tear break-up time via fluorescence strips on slit lamp, Schirmer test and phenol red thread test<sup>5</sup>. The Schirmer test is one of the common test performed to assess the DE disease and this test takes almost 5 minutes to demonstrate the results. In Schirmer test, a 5mm wide and 35mm long Schirmer strip made up of Whatman filter paper no. 41 is used. This strip is placed in the lower eyelid near the lateral canthus for 5 minutes and wetting portion of the strip is measured up to the crease after 5 minutes. A value less than 15 mm indicates dry eyes and above or equal to this value indicates normal eyes<sup>6</sup>.

A contact lens (CL) is a thin lens located directly on the surface of the eye. Contact lenses are considered medical devices and can be used for vision correction or for cosmetic or therapeutic reasons<sup>7</sup>. It is evaluated that the number of CL users goes beyond 140 million globally. Despite the fact that contact lenses have brought a remarkable benefit for the users besides its CL can also cause some complications in eyes if not used properly<sup>8</sup>. Prolonged use of the soft CL can be a reason of some major problems of eyes like redness, dry eye, corneal inflammation, corneal ulcers/scars and papillae on the conjunctiva etc<sup>9</sup>. 50% of the contact lens users experience dry eye symptoms and CL discomfort due to which CL users stop using the CL and due to this CL discomfort dryness occurs<sup>10</sup>. Blink rate per minute in CL users reported to be increases from 15 times per minute to more than 20 times per minute in order to balance the change occur in TF due to CL<sup>11</sup>.

According to a study conducted in 2013 in university of Zagreb, Croatia to evaluate the signs and symptoms of DE reported by the soft and hard CL wearers. All the individuals

were of adult age ranging between 21 – 42 years of age. Tear break-up time and Schirmer tests were performed on the individuals to demonstrate the results. This study concluded that DE was diagnosed in both soft and hard CL wearers using tear break-up time and Schirmer tests. Another study conducted in Nepal concluded that the out of 129 CL wearers almost 96% of the CL wearers were suffering from some types of symptoms. The most common symptoms reported were discomfort in almost 88% of the wearers, almost 73% reported foreign body sensation, 65% wearers reported redness and almost 64% wearers reported dryness due to prolonged use of CL. About 63% wearers reduced the wearing time of CL due to these symptoms.

CL related DE is considered as a major health growing issue around the world and one of the attentions seeking problem for the optometrists and ophthalmologists.

## Methods:

Ethical clearance to conduct this analytical cross sectional study was obtained from the College of Ophthalmology and Allied Vision Sciences, King Edward Medical University, Lahore. A total of 86 CL wearers were included in this study. This study was conducted in College of Ophthalmology and Allied Vision Sciences (COAVS) and Eye ward of Mayo hospital Lahore. Student and Patients that were using contact lenses were identified in this study. A self-made proforma was used in this study and each subject was given an informed consent to read and sign it so the study could be carried out. A Schirmer test was performed on each individual and blink rate per minute was also measured with stop watch. In Schirmer test individuals with Schirmer test values equal or greater than 15 mm were considered have normal eyes and individuals with Schirmer test values less than 15 mm were considered have dry eyes. In this study both genders (male and female) of 15-40 years of age using any type of contact lens, for more than four weeks, five days a week and 8 hours or more in a day and individuals aware of use of contact lenses were included. In this study exclusion criteria were Individuals having any ocular pathology such as squint, nystagmus, presbyopia and amblyopia. Individuals having any systemic disease such as Sjogren's syndrome, rheumatoid arthritis, diabetes mellitus, systemic lupus erythematosus (SLE), hormonal disorders and hypertension etc. known to be associated with defective tear film or dry eye and/ or using any type of systemic medication that could cause dry eye syndrome were also excluded.

## Data Analysis Method:

Data was analyzed by the Statistical Package for the Social Sciences (SPSS) 21.0 software. Descriptive analyses like, frequency, percentage, mean and standard deviation

was done. Graphs and tables were taken from SPSS 21.0 software after analyzing the data. Cross tabulation was applied to see the association among Schirmer test, blink pattern and blink rate per minute with contact lens.

### Results:

A total of 86 CL wearers were identified in this study. Out of 86 individuals 31 were males and 56 were females. Out of 86 CL wearers 62 individuals were soft CL users and 26 were hard CL users. Each individual was tested with Schirmer test and following results were obtained.

**Table 1:**  
Type of Contact lens used vs Schirmer test

Type Of Contact Lens Used	Schirmer Test				Total
	Normal Value (=15 mm)	Mild (9-14 mm)	Moderate (4-8mm)	Severe (<4 mm)	
Soft Contact Lens	28	15	19	0	62
Hard contact Lens	2	12	6	4	24
Total	30	27	25	4	86

Using t-test for comparison of means t score was 1.526 with a p value 0.088 which means that there is no statistically significant difference in Schirmer test values between soft and hard contact lens users.

**Table 2:**

Type Of Contact Lens Used	Blink Rate per minute			Total
	Less (<12)	Normal (12-15)	Excess (>15)	
Soft Contact Lens	1	34	27	62
Hard contact Lens	0	8	16	24
Total	1	42	43	86

Using t-test for comparison of means t score was 1.4626 with a p value 0.157798 which means that there is no statistically significant difference in blinking rate between soft and hard contact lens.

### Discussion:

The tear film is a very thin layer of liquid on the surface of the cornea. Tear film is the most vital structure of the eye as it moisturizes the ocular surface and provides lubrication. Its production and drainage is necessary to maintain the health of the ocular surface. The tear film is specifically composed of three layers: the mucin layer, aqueous layer and lipid layer. Mucin layer is the outer most layer secreted by the meibomian glands, Aqueous layer is the middle layer formed by the lacrimal glands and accessory

lacrimal glands, Lipid layer is the innermost layer of the tear film which is secreted by the goblet cells present in the conjunctiva of the eye. . Stability of the tear film is very necessary in maintaining the ocular health through lubrication, nutrition and oxygen supply etc to the cornea. Any instability in the tear film can cause dry eye signs and symptoms.

Dry eye syndrome is a multifactorial disease also known as keratoconjunctivitis sicca caused by decreased tear production, increased tear evaporation or instability in the tear film. Dry eye syndrome is associated with a number of causes which includes environmental conditions (e.g.: allergens, cigarette smoke, dry climate), inflammatory disease (vascular, allergic), hormonal imbalance and contact lens wear. Systemic diseases such as diabetes mellitus, thyroid disease and rheumatoid arthritis can also cause dry eye syndrome. Long term contact lens use is also a cause of dry eyes as it desensitizes the cornea.

It has been noted that the number of contact lens users is increasing globally day by day. About 140 million people around the world are using contact lenses. A contact lens is a thin lens placed directly on the surface of eye used for different purposes as cosmetically, therapeutically, refractive error correction and other multiple purposes. Contact lenses are playing such an important role in their life that no one can deny the benefits of the contact lenses. Besides the remarkable advantages of the contact lenses, contact lenses can also cause some complications if they are not handle carefully and hygiene is not maintained. Contact lenses can cause a number of complications in human eye such as; dry eye, papillary conjunctivitis, corneal infections etc. Different studies reported that 50% of the contact lens wearers often complain of the dryness, burning sensation, itching, foreign body sensation and redness etc. and these are the symptoms of the dry eye syndrome. Due to which the contact lens wearers discontinue the contact lens wear. Blinking rate per minute also increases in contact lens wearers with dry eyes to overcome their discomfort. Dry eye disease is considered one of the major complications caused by the contact lens wear. The prevalence of dry eye disease is 0.39% to 33.7% in the general population and about 50% of contact lens wearers often present with symptoms of dry eyes.

According to a study in which the rate of evaporation of TF was evaluated in CL wearers and CL non-wearers. A total of 240 CL wearers and 139 CL non-wearers were included in this study. This study concluded that a significant increase in rate of evaporation of TF was assessed among CL wearers than non-wearers. Due to increase in rate of evaporation of TF, the complaints of signs and symptoms of DE were also more in CL wearers than non-wearers.

Different studies have been done in the past which concluded that the signs and symptoms of the dry eye disease

were common among the contact lens users. A study was conducted in university of Malaysia which concluded that the signs and symptoms of dry eyes were common in contact lens users than non-users. Another study done in which Different diagnostic tools were used such as: Tear break-up time, surface staining and Schirmer test etc to diagnose the stability of the tear film. This study concluded that the mean break-up time was lower and that the silicone hydrogel contact lenses cause remarkable changes in the tear film causing the eyes to become dry.

In this study Schirmer test was performed, to assess tear film stability and blink rate per minute was also measured in CL wearers. 86 CL wearers were diagnosed in this study. Each CL wearer was using CL for more than four weeks and was using CL eight hours or more in a day. A Schirmer test was performed on each CL user and blink rate per minute is measured in each CL user. This study revealed that an insignificant proportion of individuals who were using CL (both soft & hard) had dry eyes and similarly a blink rate that was also insignificant statistically.

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