

Original Research Article

INCIDENCE OF DRY EYE SYNDROME AND OCULAR COMPLAINTS ASSOCIATED WITH CONTACT LENS USE AMONG PRECLINICAL MEDICAL STUDENTS OF THE 2020–2022 COHORT

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ABSTRACT

Introduction: Dry eye syndrome is a condition that affects the tear film, leading to discomfort, visual disturbances, and tear film abnormalities, which can result in damage to the surface of the eye. One of the causes of dry eyes is the use of contact lenses. This study aims to determine the incidence of dry eye syndrome and eye complaints due to the use of contact lenses in pre-clinical medical students from the 2020-2022 cohort. **Methods:** This research is an observational analytical study with a cross-sectional approach. A total of 23 selected students were included using total sampling technique. Variables were measured using the Contact Lens Dry Eyes Questionnaire (CLDEQ-8) and Contact Lens Discomfort Index (CLDI), as well as physical examinations including the Schirmer test and Tear Break-up Time (TBUT). Bivariate analysis was performed using Spearman's rho correlation test. **Results and Analysis:** Seven cases (30.43%) of dry eye were identified. Spearman's rho test revealed statistically significant negative correlations between questionnaire scores and clinical measurements ($r_s = -0.532$ to -0.819 , $p < 0.05$). The negative correlations found indicate that dry eye complaints experienced by contact lens users do not correspond with clinical examination results. This suggests that conventional tear tests are less capable of representing the actual discomfort experienced by contact lens users. **Conclusion:** The incidence of dry eye and eye complaints due to contact lens use based on the results of the questionnaire and physical examination is 7 people (30.43%).

Keywords: Dry eyes, Contact Lens Dry Eyes Questionnaire (CLDEQ-8), Contact Lens Discomfort Index (CLDI), Schirmer test, Tear Break-up Time

INTRODUCTION

Dry eye syndrome is a disease affecting the tear film layer that leads to

discomfort, impaired visual acuity, and disruption of the tear film, all of which can bring up the damage to the ocular surface (Putri Rahmadilla, 2020). This condition

gives rise to various ocular complaints, particularly among contact lens wearers, and is influenced by the material, design, and maintenance of the contact lenses used (Kojima, 2018). Proper understanding of the purpose, method of use, appropriate lens selection, and care practices is essential for contact lens wearers in order to prevent the occurrence of such complaints. Several factors contribute to the development of dry eye syndrome, including advanced age, pregnancy, the use of systemic medications, and contact lens wear. Among these, contact lens use is the most frequently identified contributing factor, accounting for approximately 43% to 50% of cases.¹ Furthermore, ocular complaints related to contact lens wear have been reported in association with dry eye events at a rate of approximately 50%.³ Contact lenses serve as a vision correction device that is convenient to use, provides a wide field of view, and offers greater aesthetic appeal. The primary reasons individuals prefer contact lenses over spectacles include their ability to follow the natural movement of the eyeball, the absence of any visual obstruction from a frame, and their capacity to enhance the appearance of the eyes (Syaqdiyah, Prihatningtias and Saubiq, 2018).

The global number of contact lens users has reached approximately 140 million people, with 38 million users in the United States and 24 million across Asia, indicating widespread adoption of contact lenses on both continents.³ In Indonesia, however, no official data on contact lens usage have been formally recorded. According to the 2013 National Basic Health Research (Riskesdas), the prevalence of spectacle or contact lens use was 2.9% among the 15 to 24 age group and 2.8% among the 25 to 34 age group. The Indonesian Ministry of Health reported in 2013 that contact lens use was more prevalent among university students, with female students representing the largest group of users, predominantly wearing soft contact lenses.

The diagnosis of dry eye syndrome can be established based on clinical symptoms and supplementary diagnostic tests. Clinical symptoms may be assessed through validated questionnaires designed to evaluate complaints arising from contact lens use in relation to dry eye syndrome, including the *Contact Lens Dry Eye Questionnaire* (CLDEQ) and the *Contact Lens Discomfort Index* (CLDI). The CLDEQ is used to measure the intensity and severity of dry eye symptoms in contact lens wearers, and the abbreviated CLDEQ-8 version has been validated as the most suitable instrument by the *Tear Film and Ocular Surface Society* (TFOS) workshop (Arroyo-del Arroyo *et al.*, 2022). The CLDI, on the other hand, is a questionnaire designed to assess discomfort experienced during contact lens wear and has similarly been validated as an instrument structured to allow a simpler and more rapid evaluation of contact lens-related discomfort. In addition to questionnaire-based assessment, dry eye syndrome can be evaluated using the Schirmer test and *Tear Break-Up Time* (TBUT). The increasing adoption of contact lenses among university students, alongside ongoing developments in lens technology, highlighted the need for further investigation in this population. Therefore, this study was conducted to identify the incidence of dry eye syndrome and associated ocular complaints among preclinical medical students from the 2020 to 2022 cohort.

METHOD AND ANALYSIS

This study employed an observational cross-sectional design. The research was conducted at the Faculty of Medicine, Tanjungpura University, and the Ophthalmology Clinic of Tanjungpura University over a one-month period from

July to August 2023. The target population comprised medical students from Tanjungpura University, from 2020 to 2022, who were contact lens users. A total of 23 students were recruited using total sampling method. Dry eye assessment utilized two approaches: questionnaires (Contact Lens Dry Eye Questionnaire and Contact Lens Discomfort Index) and physical examinations (Schirmer test and Tear Break-Up Time). Ethical approval for this study was obtained from the Ethics Committee of the Faculty of Medicine, Tanjungpura University, under Ethical Clearance Certificate Number 4885/UN22.9/PG2023.

Data obtained were processed using Statistical Product and Service Solution (SPSS). The data analysis methods used univariate and bivariate analysis. Univariate analysis was performed to describe the characteristics of the studied variables. This analysis presented the frequency of each variable, including respondent characteristics (age and sex), the independent variable (ocular complaints related to contact lens use), and the dependent variable (dry eye syndrome). All data obtained from the questionnaires were

processed and presented in tables showing frequency distribution and percentage. The calculation formula applied was $P = (F/N) \times 100\%$, where P represents percentage, F represents frequency, and N represents total sample size.

Bivariate analysis was conducted to examine the relationship between independent and dependent variables. Spearman's rho correlation test was applied using SPSS to measure the strength of association between two variables. Statistical testing was performed using SPSS to determine the significance, strength, and direction of correlation between research variables. A relationship was considered statistically significant when the sig. (2-tailed) value was less than 0.05. Correlation coefficient values were interpreted as follows: 0.00 to 0.25 (very weak), 0.26 to 0.50 (moderate), 0.51 to 0.75 (strong), 0.76 to 0.99 (very strong), and 1.00 (perfect). A positive correlation coefficient indicated a direct relationship between variables, while a negative value indicated an inverse relationship.

RESULTS

Table 1. Distribution of Respondents by Academic Cohort

Respondent Characteristics	Frequency	Percentage (%)
2020	8	34,8%
2021	5	21,7%
2022	10	43,5%
Total	23	100%

Source: Author Database, 2023

Table 1 presents the distribution of respondents by academic cohort. The 23 participants were distributed across three enrollment years as follows: 8 students (34.8%) from the 2020 cohort, 5 students

(21.7%) from the 2021 cohort, and 10 students (43.5%) from the 2022 cohort. The age range of respondents was 18 to 21 years.

Table 2. Correlation between *Contact Lens Dry Eye Questionnaire (CLDEQ-8)* results and Schirmer test

CLDEQ-8	Schirmer			Total
	Normal	Moderate	Dry	
Normal	15	1	0	16
Dry	1	6	0	7
Total	16	7	0	23
Spearman's rho	Sig. (2-tailed)= 0,009 rs=-0,532			

Source: Author Database, 2023

Spearman's rho bivariate analysis shown in Table 2 revealed a statistically significant correlation between Contact Lens Dry Eye Questionnaire (CLDEQ-8) scores and Schirmer test results among medical students at the Faculty of

Medicine, Tanjungpura University, with a sig. (2-tailed) value of 0.008, which was less than the alpha level of 0.05. The correlation coefficient of -0.541 indicated a strong negative relationship between the variables.

Table 3. Correlation between *Contact Lens Dry Eyes Questionnaire (CLDEQ-8)* results and *Tear Break Up Time (TBUT)*

CLDEQ-8	TBUT		Total
	Normal	Dry	
Normal	15	1	16
Dry	1	6	7
Total	16	7	23
Spearman's rho	Sig. (2-tailed)= 0,009 rs=-0,532		

Source: Author Database, 2023

Spearman's rho bivariate analysis displayed in Table 3 demonstrated a statistically significant correlation between Contact Lens Dry Eye Questionnaire (CLDEQ-8) scores and Tear Break Up Time (TBUT) results among medical

students at the Faculty of Medicine, Tanjungpura University, with a sig. (2-tailed) value of 0.009, which was less than the alpha level of 0.05. The correlation coefficient of -0.532 indicated a strong negative relationship between the variables.

Table 4. Correlation between *Contact Lens Discomfort Index (CLDI)* results and Schirmer Test

CLDEQ-8	Schirmer			Total
	Normal	Moderate	Dry	
Asymptomatic	16	1	0	17
Symptomatic	0	6	0	6
Total	16	7	0	23
Spearman's rho	Sig. (2-tailed)= 0,005 rs=-0,566			

Source: Author Database, 2023

Spearman's rho bivariate analysis presented in Table 4 showed a statistically significant correlation between Contact Lens Discomfort Index (CLDI) scores and Schirmer test results among medical students at the Faculty of Medicine,

Tanjungpura University, with a sig. (2-tailed) value of 0.005, which was less than the alpha level of 0.05. The correlation coefficient of -0.566 indicated a strong negative relationship between the variables.

Table 5. Correlation between *Contact Lens Discomfort Index (CLDI)* and *Tear Break Up Time (TBUT)*

CLDEQ-8	TBUT		Total
	Normal	Dry	
Asymptomatic	16	1	17
Symptomatic	0	6	6
Total	16	7	23
Spearman's rho	Sig. (2-tailed)= 0,000 rs=-0,819		

Source: Author Database, 2023

Spearman's rho bivariate analysis illustrated in Table 5 indicated a statistically significant correlation between Contact Lens Discomfort Index (CLDI) scores and Tear Break Up Time (TBUT) results among medical students at the

Faculty of Medicine, Tanjungpura University, with a sig. (2-tailed) value of 0.000, which was less than the alpha level of 0.05. The correlation coefficient of -0.819 indicated a very strong negative relationship between the variables.

DISCUSSION

The study was conducted among medical students from the 2020 to 2022 cohorts based on the inclusion criteria. The research sample from the population consisted of 8 active undergraduate medical students from the 2020 cohort, 5 students from the 2021 cohort, and 10 students from the 2022 cohort. This study utilized a total sampling technique. The research began with validation of the instruments used in the study after obtaining ethical clearance from the Ethics Committee of the Faculty of Medicine, Tanjungpura University. Furthermore, the age of contact lens users was consistent with the 2013 Basic Health Research (Riskesdas), which reported that the age group most frequently using glasses or contact lenses ranged from 15 to 24 years. Younger contact lens users have a higher risk of contact lens-related incidents in the 15 to 29 age group. This age group

carries twice the risk of contact lens-related conditions (Steele and Szczotka-Flynn, 2017).

Regarding the duration of contact lens use per day, the majority of respondents wore contact lenses for more than 8 hours daily, comprising 14 individuals. Excessive use, particularly beyond 8 hours, can cause dry eye syndrome and fatigue, and may even lead to damage to the visual muscles and nerves (Zhahira, 2018). Contact lens use exceeding 8 hours can also result in keratoconus development (Zhahira, 2018). Several respondents reported wearing contact lenses for more than 8 hours due to activities requiring continuous vision correction, such as academic classes or extracurricular activities including family events, social gatherings with friends, and organizational commitments.

Prolonged duration of use can cause dry eye syndrome symptoms such as

itching, red eyes, watery eyes, and blurred vision. Most respondents experienced dry eye syndrome, totaling 13 individuals. Therefore, proper contact lens use practices warrant attention to prevent further complications.

Additionally, based on the findings, the highest number of respondents used soft lenses made of silicone hydrogel, comprising 15 respondents (65.2%). Five respondents wore Poly(2-Hydroxyethyl Methacrylate) lenses, and three wore Vinyl Copolymer lenses. Seven individuals experienced dry eyes, of whom four used soft lenses made of Poly(2-Hydroxyethyl Methacrylate) and three used soft lenses made of Vinyl Copolymer. This finding is supported by research from Nina Tahhan, et al. (2022), which stated that silicone hydrogel soft lens users meet oxygen transmission requirements. Moreover, according to research by Saptaji et al. (2021),

Poly(2-Hydroxyethyl Methacrylate) tends to undergo more significant dehydration in saline solution compared to pure water, which can cause contact lens dryness. This material also has a tendency to increase protein deposition on its surface, which can result in eye irritation. Vinyl Copolymer has lower oxygen permeability compared to silicone hydrogel lenses, which can lead to decreased corneal health and increased risk of complications, especially during prolonged use (Zhang *et al.*, 2018). Thus, these findings underscore the importance of understanding individual needs and preferences in selecting appropriate contact lens types for ocular health.

Based on the Contact Lens Dry Eye Questionnaire (CLDEQ-8) results, 8 individuals were found to have moderate category dry eyes. This moderate category indicates the severity level experienced by contact lens wearers. In this context, it refers to dry eye symptom levels that are neither too mild nor severe. Contact lens wearers can still manage or tolerate these symptoms.

The Contact Lens Discomfort Index (CLDI) identified 6 individuals with symptoms. Contact lens users who felt discomfort when in dry environments (air-conditioned or hot) with low humidity or exposed to wind numbered 18 individuals (78.3%). The reason contact lens users experience discomfort in dry environments (air-conditioned or hot) is that air-conditioned rooms or hot areas with low humidity can cause the eyes to become dry. Additionally, open environments or strong air conditioning or cold temperatures can cause increased friction between the contact lens and the ocular surface. This can result in discomfort, irritation, or even damage to the eyes.

Contact lens use during electronic device operation was reported by 14 individuals. Several factors may influence this practice, including visual comfort, as contact lenses provide users with a more natural view free from disturbances often caused by glasses, such as light reflection, and some individuals experience discomfort when using glasses compared to contact lenses. This finding indicates that the additional layer from glasses causes discomfort, such as pressure on the nose bridge or areas around the ears. Conversely, prolonged electronic device use can increase ocular evaporation rate and cause eye strain. This can also lead to dry eye syndrome (Akkaya *et al.*, 2018). Furthermore, using contact lenses may increase the risk of computer vision syndrome because certain types of contact lenses can cause ocular inflammation, disrupt tear film balance, and reduce blinking frequency (Asroruddin, 2025).

Schirmer test I performed without topical anesthesia revealed moderate category dry eyes (5-10 mm) in 7 individuals. According to research conducted by Sitompul (2015), contact lens use can reduce tear film activity due to increased evaporation and decreased tear production. The moderate category indicates that dry eye symptoms in this group have a fairly significant severity level

but do not reach a severe degree. Decreased tear production or poor tear quality is a primary factor in the occurrence of dry eyes.

Tear Break-Up Time (TBUT) examination identified dry eyes in 7 individuals. TBUT tends to be a reliable and effective parameter in diagnosing dry eye compared to other examinations (Mou *et al.*, 2021) Patient blinking patterns have a substantial influence on tear film stability because the completeness of blinking affects tear film reformation. Complete blinks trigger tear film formation. This examination uses cobalt blue light where the respondent's lower eyelid is first moistened with fluorescein using a fluorescein strip. In this process, tears from the upper and lower eyelids mix to form the aqueous layer, while the meibomian glands secrete lipids to form the lipid layer. However, in incomplete blinking, the upper eyelid only partially covers the ocular surface without contacting the lower lid, so the aqueous layer, lipids, and other secretions cannot be fully distributed across the ocular surface.

Statistical analysis revealed a relationship between physical examination results (Schirmer test and TBUT) and questionnaire results (CLDEQ-8 and CLDI). The correlation between Schirmer test and CLDEQ-8 (Sig. 2-tailed = 0.008; $r_s = -0.541$) demonstrated a strong relationship. The correlation between TBUT and CLDEQ-8 (Sig. 2-tailed = 0.009; $r_s = -0.532$) showed a strong relationship. The correlation between Schirmer test and CLDI (Sig. 2-tailed = 0.005; $r_s = -0.566$) indicated a strong relationship. The correlation between TBUT and CLDI (Sig. 2-tailed = 0.000; $r_s = -0.819$) demonstrated a very strong significant relationship. These findings are consistent with the interpretation of questionnaires and physical examinations.

A clear discussion of the differences between questionnaire results and physical examination findings in contact lens users demonstrates the importance of examining

the complexity of dry eye more thoroughly. The research findings indicate that dry eye symptoms reported in questionnaires show an inverse relationship with measurable physical changes in physical examinations such as Schirmer test and TBUT. The explanation for these differences refers to the subjectivity factor of questionnaires, contact lens user adaptation to discomfort, and the influence of environmental factors. Questionnaires, such as CLDEQ-8 and CLDI, base their results on subjective reports from respondents, which can be influenced by individual perception of dry eye symptoms. Contact lens users who have worn them for an extended period may have adapted to the discomfort and therefore report lower symptoms. This is supported by research from Cristina Arroyo-del Arroyo *et al.*,⁴ which showed that most contact lens users felt satisfied and did not experience discomfort when wearing contact lenses because these users had adapted to long-term contact lens use. Among contact lens users who had worn them for an extended period, four individuals had used them for more than four years, two individuals had used them for three years, and one individual had used them for one year and three months. These results also reported dry eyes experienced by respondents, while the remainder had only been using contact lenses for less than 6 months. Apart from the duration of contact lens use, soft lens material was reported to predominantly use silicone hydrogel. This became the reason for the low reported incidence rate of dry eye occurrence. Additionally, environmental conditions such as air humidity levels can affect Schirmer test results, which can produce differences between subjective reports and physical findings. Thus, a holistic approach to understanding dry eye in contact lens users requires a combination of subjective and objective data. Subjective data from questionnaires provide insights into individual experiences, while physical examinations provide an objective picture of the physical condition of the eyes. By

understanding these differences, eye care practitioners can provide more effective and targeted care to contact lens users experiencing dry eye problems.

The significant relationship in this research is also supported by research conducted by Eunika et al. (2016), which demonstrated a significant relationship between contact lens use and dry eye symptoms, with a correlation coefficient (r) of -0.612 and a p value of 0.000, which was smaller than the significance level (α) of 0.05. The research findings revealed that the most common type of contact lens wear was daily users, with 25 respondents (83.3%) choosing this type. Meanwhile, Rigid Gas Permeable (RGP) contact lens type was the most widely used, with 14 respondents (46.7%) selecting it. Additionally, this lens type is available in various colors and can also be used as bifocal lenses, making it a good choice for maintaining appearance.

CONCLUSION

The incidence rate of dry eye and ocular complaints due to contact lens use based on questionnaire and physical examination results was 7 individuals (30.43%).

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