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Prevalence of dry eye disease related to contact lens wear in young adults

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Abstract

Background & objectives: Dry eye disease is a multifactorial disorder which affects millions of people worldwide. The aim of the study is to investigate prevalence of dry eye disease among young contact lens (CL) wearers, compare with non-wearers and evaluate correlations between different features of contact lens usage and the manifestation of dry eye disease.

Methods: Questionnaire CLDEQ-8 was used for contact lens wearers and DEQ-5 for non-wearers. For contact lens wearers questions about the type of their contact lens was inquired to determine lens parameters. The character of the symptoms was measured with the dimensions of frequency and intensity. Water content and oxygen transmissibility values were conducted through reports of the manufacturer.

Results: The dry eye questionnaires were completed by 238 students (126 DEQ-5 and 112 CLDEQ-8). Most students use CL for more than 5 years (57,1%) and monthly CL are the most popular (76,8%). Most common wearing time of CL was between 8h. and 16h (51,8%). The most common symptom of dry eyes experienced in contact lens wearers was dryness of eyes (85,7%), while eyes discomfort (84,9%) was the most common symptom in non-contact lens wearers. Correlations between expressed dry eye symptoms and contact lenses parameters were not significant ($p = 0,632$, $p = 0,347$)

Conclusions: Dry eye disease is a common pathology in young adult population, especially for contact lens wearers. Symptoms usually increase at the end of the day, but does not depend on composition of the lens.

Keywords: contact lens, dry eye disease.

Introduction

Dry eye disease (DES) is a multifactorial disorder in which homeostasis of ocular surface is damaged (1). DES has a tendency to manifest itself as different discomfort symptoms of the eye - e.g. itching, dryness, foreign body sensation etc. (2) Prevalence of DES varies depending on the study, but during 2017, in Europe and Asia from 5 to 50% of the population was suffering from this disease (3). Schein et al. reported that 1 in 7 people aged from 65 to 84 suffer from dry eye disease, while Moss et al. reported that 14,4% people aged 48 to 91 are prone to dry eye disease. (4,5) Risk factors include age, sex, autoimmune diseases and other environmental factors (6). One of the most significant environmental factors are long term usage of contact lenses (CL). (7)

More than 140 million people worldwide wear contact lenses every day (8). Nowadays the most popular CL are silicone hydrogel lenses (9). These lenses include silicone within the hydrogel material to increase the oxygen transmissibility of the lenses (10). They transmit up to six times more oxygen to the cornea than regular soft lenses (11). Oxygen permeability (Dk) is a parameter used to describe ability of contact lens to deliver oxygen to the surface of the eye and it differs depending on water content of the lens. (12) Oxygen transmissibility (Dk/t) is a derived variable that shows the degree to which oxygen may pass through a particular material of a given thickness (12).

Even though CL is a popular way to correct refractive errors, in the long term about 10 to 50 % of people go back to wearing prescription glasses (13). When CL wearers insert a contact on the ocular surface, the tear film becomes separated into pre- and post-lens tear film (14). After this, aqueous layer of the pre-lens tear film is decreased and becomes unstable which leads to faster tear break up time. Faster tear break up time leads to increased tear film osmolarity which initiates inflammation to the ocular surface (15). Also if the tear volume is not sufficient, the post-lens tear film becomes thin and friction between CL and the ocular surface increases (14). This mechanism of action leads to DES symptoms which can have a significant impact on the quality of life. Different structure of contact lenses might induce different effect on the ocular surface. Recent study showed that choosing right lens material that fits one's eye and frequent replacement of the lens can help to improve DES symptoms (16).

In conclusion, people wearing contact lenses are at high risk for developing dry eye disease and it is important to address and treat clinical symptoms in order to prevent further damage to the ocular surface.

The aim of this study was to investigate prevalence of dry eye disease among young adult population wearing contact lenses, compare it to non-contact lens wearers and to evaluate any possible correlations between different features of CL usage and the manifestation of dry eye disease.

Material and methods

This study was conducted among young adult in Lithuania aged between 18 and 30 who wear contact lenses. Study was conducted from August till October of 2019. Participants who wear contact lenses were given contact lens dry eye questionnaire (CLDEQ-8). CLDEQ-8 is a specific questionnaire designed to assess prevalence of dry eyes among CL wearers (17). Contact lens wearers were asked to report symptoms they experienced while wearing contact lenses. Questionnaire included categorical scales to measure the prevalence, frequency, severity, and occurrence of common ocular surface symptoms. Ocular symptoms that were assessed included discomfort, dryness, blurring of vision. The CLDEQ-8 score of ≥ 12 points was used to identify CL wearers who could benefit from clinical management of their symptoms (18). Dry eye questionnaire (DEQ-5) was given to non-contact lens wearers. They were asked to evaluate their symptoms and their severity. DEQ-5 score of > 6 indicate dry eyes and > 12 might indicate further testing for Sjogren syndrome induced dry eyes (19).

For CL wearers questionnaire also included questions about the duration of lens wear (by months, by days per week and by hour per day), type of contact lens (daily, weekly, monthly lenses) and full name of the contact lenses brand they were using, in order to determine their material and parameters. Water content and oxygen transmissibility (Dk/t) values were conducted through reports of the manufacturer.

Statistical analysis and calculations were done with SPSS version 26.0 (SPSS Inc.,

Chicago, IL, USA) software package. Descriptive statistics are given as percentages and mean \pm standard deviation ($M \pm SD$). The Kolmogorov-Smirnov test showed the data was not normally distributed. Spearman correlation analysis was used to detect associations between variables. Results of all statistical analysis were evaluated within a 95% confidence interval and p values less than 0.05 were accepted as significant

Results

Questionnaire was uploaded online and total of 238 responders filled it. 47% (112) of them were contact lens wearers and 53% (126) non-contact lens wearers.

Contact lens wearers:

Out of 112 contact lens wearers who filled out our questionnaire 85,7% ($n = 96$) were female, 14,3% ($n = 16$) were male and the mean age was $22,86 \pm 2,34$ (range, 18 - 30) years. Among 112 participants 5,4% ($n = 6$) wore contact lenses less than a year overall, 18,8% ($n = 21$) between 1 and 2 years, 18,8% ($n = 21$) between 3 and 4 years and 57,1% ($n = 64$) wore contact lenses more than 5 years overall. 15,2% ($n = 17$) were using daily disposable contact lenses, 0% ($n = 0$) weekly contact lenses, 8% ($n = 9$) bi-weekly contact lenses, 76,8% ($n = 86$) monthly contact lenses. The daily wearing time of contact lenses varied: 7,1% ($n = 8$) wore contact lenses less than 4h, 17,9% ($n = 20$) between 4h. and 8 h., 51,8% ($n = 58$) between 8h. and 16h., 23% ($n = 26$) wore lenses more than 16h. a day.

Between the given symptoms the most common was feeling of eye dryness in 85,7% (n = 96) out of whom 44,6% (n = 50) rarely felt it, 24,1% (n = 27) complained sometimes, 15,2% (n = 17) felt it frequently and 1,8% (n = 2) constantly suffered from it. The intensity of this symptom varied and 17% (n = 19) complained of a very intense feeling of dryness at the end of

wearing time. The least common symptom was blurred vision which was present in 58,9% (n = 41) of participants out of whom 39,3% (n = 44) rarely felt it, 8% (n = 9) frequently felt it, 5,4%(n = 6) and 6,3%(n = 7) suffered from it constantly. Only 6,3% (n = 7) of participants complained of very intense blurred vision at the end of wearing time (figure 1).

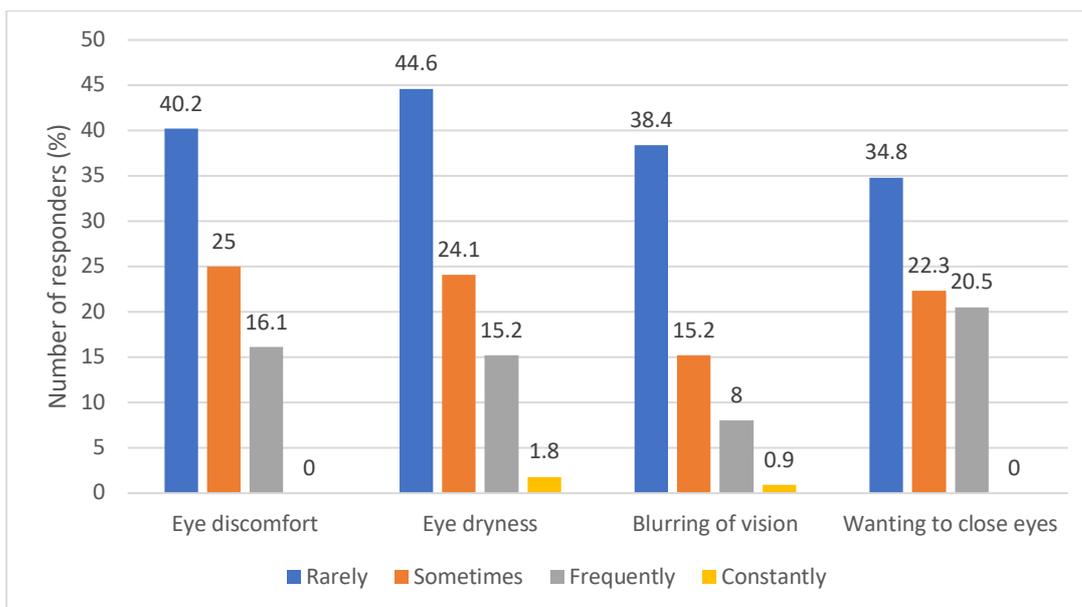


Figure 1: Frequency of dry eye symptoms in contact lens wearers

Non-contact lens wearers

Out of 126 non-contact lens wearers 77,8% (n = 98) were female and 22,2% (n = 28) were male, their mean age was $22,89 \pm 2,54$ (range, 18 - 30).

Between the given symptoms the most common was feeling discomfort in 84,9% (n = 107) out of whom 37,3% (n = 47) rarely felt it, 27% (n = 34) complained sometimes, 16,7% (n = 21) felt it frequently and 4% (n = 5) constantly suffered from it. The intensity of this symptom varied and 2,4% (n = 3) complained of a very intense feeling of discomfort at the end of the day. The least common symptom was excessively watery eyes which was present in 61,1% (n = 77) of participants out of whom 38,1% (n = 48) rarely felt it, 18,3% (n = 23) frequently felt it, 4% (n = 4) and 0,8% (n = 1) suffered from it constantly (figure 2).

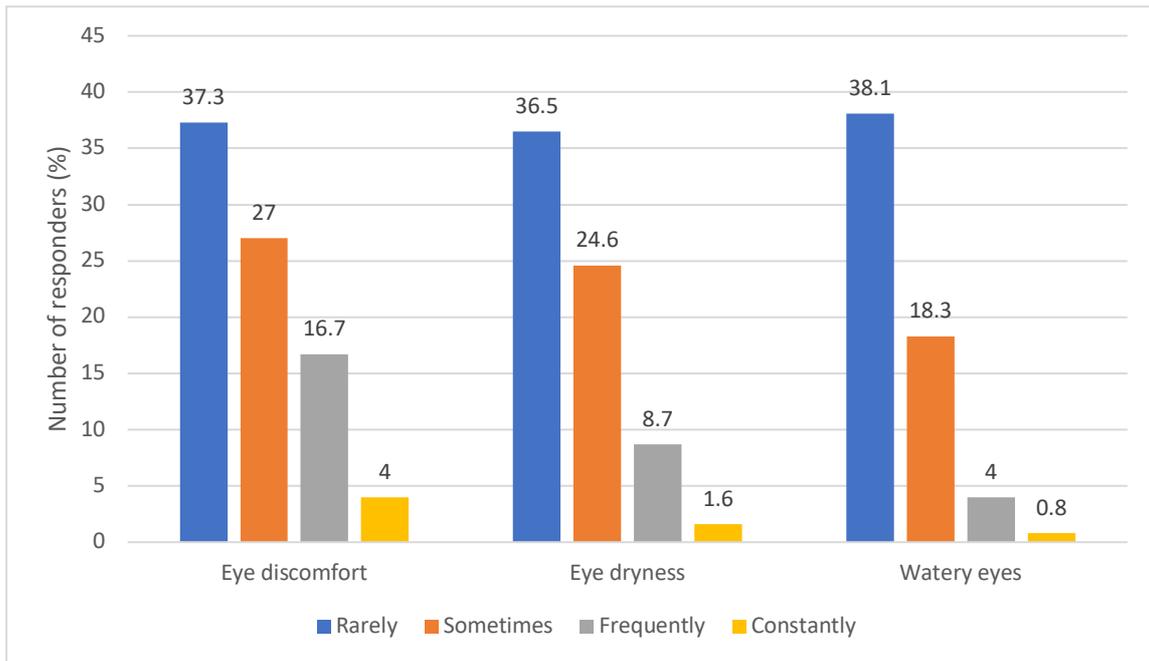


Figure 2: Frequency of dry eye symptoms in non- contact lens wearers

CL wearers vs. non- CL wearers

Prevalence of dry eye and discomfort symptoms were the same between CL wearers and non-CL wearers ($p > 0,05$). By the end of the day symptoms increased significantly for CL wearers comparing with non-CL wearers ($p < 0,05$). CL wearers scored a median of 8 (0 - 28) points. According to CLDEQ-8 guidelines 42% ($n = 47$) of subjects scored more than 12 points which indicates that they might be prone to dry eye syndrome. Non-CL wearers scored a median of 6 (0 - 19) points. According to DEQ-5 evaluations 34,1% ($n = 43$) of non-CL wearers have dry eyes and 20,6% ($n = 26$) might need further testing for the cause of dry eyes.

Dry eyes and contact lens parameters:

No significant links between daily and overall usage of contact lenses with manifestation of clinical symptoms were found ($p = 0,068$, $p = 0,24$). CL wearers who scored more than 12 points used contact lenses in which water content

median was 48 (24 - 69) and Dk/t median 160 (24-175). For those who scored less than 12 points water percentage in CL was 38 (24 - 69) and Dk/t 160 (21 - 175). Correlations between expressed dry eye symptoms and contact lenses parameters were not significant ($p = 0,632$, $p = 0,347$).

Discussion

We conducted a small study on a young adult population and it supported a global population study, which states that a lot of people these days are prone to dry eye (3). Contact lens wear is a known factor for this disease, but there is still lack of studies which would show the prevalence of DES in adults younger than 40 years old (1). In our study a lot of young CL wearers and non-CL wearers were feeling symptoms related to dry eyes. In CL wearers the feeling of dryness was the most common. In another study the same symptom was also the

most popular among students (20). According to this study prevalence of DES was higher in CL wearers, while in our study it was even between the groups (20). Difference in the results might have been due to a smaller sample size and accuracy of questions, which were translated from English language.

Our hypothesis about DES prevalence due to contact lens composition was proven wrong, which might be because of minor water content and oxygen transmissibility differences between high-end silicone contact lenses. According to F. Stapleton et. al, most of lenses that are available nowadays have sufficient oxygen transmissibility to eliminate the symptoms traditionally associated with chronic hypoxia and have limited effect on corneal homeostasis (11). To accurately evaluate different clinical manifestation of DES between contact lens users and non-contact lens wearers more in-depth studies with a bigger sample size and improved methods are required.

We concluded that majority of young adults are wearing contact lenses for more than 5 years, 8-16 hours per day and monthly lenses are the most popular. Our study showed that the most common symptom of dry eye syndrome, experienced in contact lens wearers, is the subjective feeling of dry eyes and discomfort in non-contact lens wearers. The majority of participants were rarely bothered so much that they needed to cope by closing their eyes and needed to take out contact lenses due to discomfort less than once a week. Prevalence of dry eye symptoms were the same during the day amongst contact lens wearers and non-wearers, but increased for contact lens wearers significantly by the end of the day. Contact lenses

parameters did not correlate with clinical manifestation of dry eye disease.

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Conflicts of interest: none

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