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Original Research Article

Assessment of mask associated dry eye among doctors and medical students at a tertiary care centre

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ABSTRACT

Background: When faced with outbreaks of infectious respiratory diseases in the past, the use of face masks has often been mandated. The world collectively experienced the devastating COVID-19 pandemic, which originated in Wuhan, China, in October 2019 and rapidly spread across the globe. Wearing face masks became the primary defense against infection. However, during this period, many individuals reported experiencing symptoms of dry eye. This study aimed to investigate the correlation between mask usage and dryness among healthcare workers.

Materials and Methods: A hospital-based cross-sectional study was conducted using an online survey, which included a modified version of the Ocular Surface Disease Index (OSDI) questionnaire. Electronic consent was obtained to gather information about the occurrence of dryness while wearing masks.

Results: Among the 284 participants, females exhibited a higher OSDI score (12.5) compared to males. Notably, individuals with pre-existing dry eye conditions had a significantly higher OSDI score (23.96) when wearing face masks. Across different age groups, no significant variations were observed. In terms of the duration of face mask use, those who wore masks for less than 4 hours and more than 6 hours had an OSDI score of 12.5, whereas individuals wearing masks for 4 to 6 hours had a score of 8.3.

Conclusion: Wearing face masks may pose a risk for dryness, particularly among females, and can exacerbate dryness symptoms in individuals with pre-existing dry eye conditions.

1. Introduction

With the emergence of COVID-19 in December 2019, the World Health Organization (WHO) made it mandatory for well-fitted face masks to be worn.[1,2]

This measure was not only effective in preventing the transmission of viruses but also provided personal protection against them. As most people adapted to wearing face masks, some individuals reported adverse effects from prolonged mask usage, such as respiratory difficulties, skin rashes, acne breakouts, headaches, and dry eye symptoms.[3]

The combination of increased screen time during the COVID-19 pandemic, along with the continuous use of face masks, led to a significant rise in the number of patients seeking treatment for dry eye symptoms from ophthalmologists. This condition is referred to as 'Mask-associated dry eye' (MADE).[4]

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Wearing a face mask effectively reduces the dispersion of exhaled air. However, when a mask is loosely fitted around the nose, exhaled air can escape upward along the nose and cheeks, causing evaporative dryness of the eyes, contributing to the development of MADE.

2. Aims and Objectives

Wearing of face masks became a necessity to control spread of COVID-19 but this led to increase in ocular irritation and dryness. Doctors and medical students are especially at risk of DED due to prolonged use of face masks. Hence, the aim of this study is to determine if wearing a facemask causes a new onset or deterioration of previously existing dry eye disease among the Doctors and Medical students at a tertiary care centre.

3. Materials and Methods

This hospital based cross-sectional study was conducted within The Oxford Medical College Hospital and Research Centre, located in Attibele, Bengaluru. It encompass all doctors and medical students who meet the specified inclusion criteria.

3.1. Inclusion criteria

1. Use of face masks
2. Doctors and medical students

3.2. Exclusion criteria

Nil.

3.3. Clinical methodology

This cross-sectional study is conducted at The Oxford Medical College, Hospital, and Research Centre in Bangalore. It includes doctors and medical students who meet the inclusion criteria during the study's time frame. All participants in this study wore either surgical or N95 masks.

Each participant was requested to complete an online survey form, providing electronic consent and information relevant to the study. This survey incorporates a modified version of the Ocular Surface Disease Index (OSDI) questionnaire. The questionnaire's adaptation involves the addition of 'while wearing a face mask' to the end of each question. Furthermore, it includes three YES/NO questions and one inquiry regarding the duration of face mask usage:

Did you experience any dry eye symptoms (such as pain, irritation, redness, or discomfort) before you began wearing a face mask?

If yes, did you use artificial tears or any other lubricant therapy to alleviate these dry eye symptoms before you started wearing a face mask?

Have you observed the occurrence or worsening of dry eye symptoms after you started wearing a face mask?

How many hours per day do you typically wear a face mask?

After participants completed and submitted the survey, they were categorized into groups based on gender (male/female), age, duration of face mask usage, and whether they had a prior history of Dry eye disease (DED). The OSDI INDEX was calculated using the following formula: OSDI = (Sum of Scores x 25) / (Number of questions attempted).

3.4. Statistical analysis

In our research, we included a total of 284 participants with an average age of 24.46 years. Among these individuals, 68.31% (194) were female. Our findings reveal that women exhibit a statistically significant higher OSDI score than men, with scores of 12.5 (IQR = 4.17 – 22.92) compared to 8.71 (IQR = 2.08 – 20.31). The Mann-Whitney test yielded a p-value of .1883 (Figure 1).

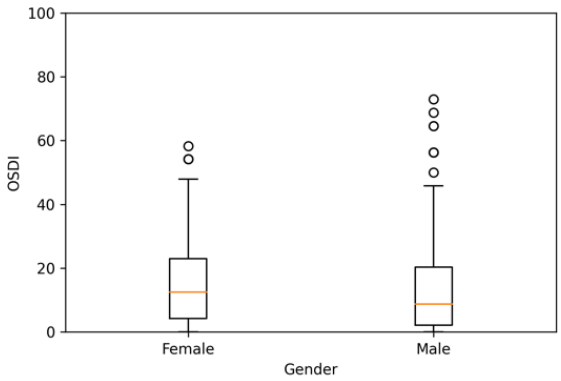

Figure 1: OSDI score differences by gender. Females demonstrate significantly higher OSDI scores compared to males

The participants were categorized into three age groups: those younger than 20 years (18.66%), individuals aged 20 to 30 years (67.61%), and those over 30 years of age (13.73%). Analysis of the OSDI median values across these age groups revealed no significant differences. The OSDI median values for the three age groups were 8.33 (IQR = 2.08 – 22.92), 12.5 (IQR = 4.17 – 22.92), and 10.42 (IQR = 5.21 – 20.83), respectively. The statistical test used, Kruskal-Wallis, produced a p-value of 0.61, indicating no significant variation among the OSDI scores across the three age groups. (Figure 2).

We also categorized the participants based on the duration of face mask wear into three groups: less than 4 hours per day, 4-6 hours per day, and more than 6 hours per day. Overall, there were some differences observed among these groups (evaluated using the Mann-Whitney test, p-value = 0.06). Specifically, the group that wore masks for 4 to 6 hours per day exhibited significantly lower OSDI scores

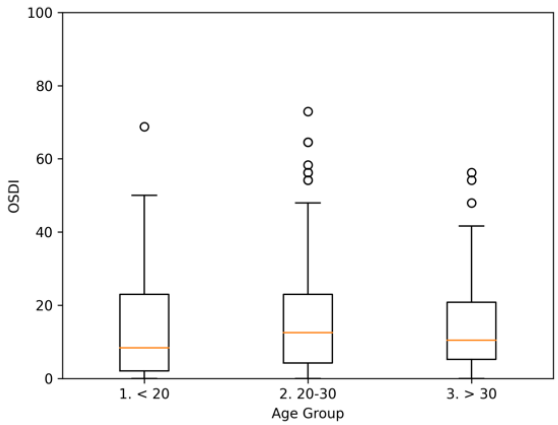

Figure 2: OSDI score differences by age. The median OSDI values did not exhibit a significant difference

compared to the other groups. The OSDI scores for the three groups were as follows: less than 4 hours per day (median = 12.5, IQR = 2.08 – 23.96), 4-6 hours per day (median = 8.33, IQR = 2.08 – 16.67), and more than 6 hours per day (median = 12.5, IQR = 4.17 – 25.0). (Figure 3).

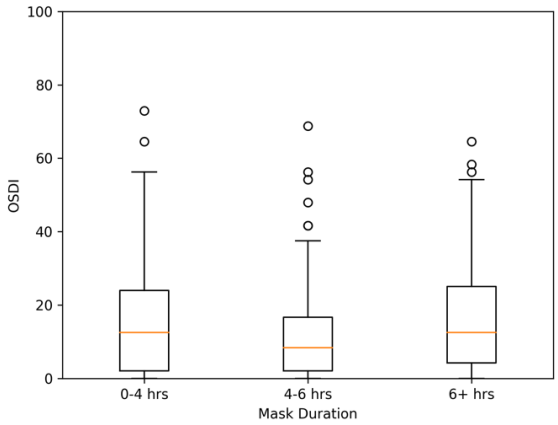

Figure 3: SDI score differences based on daily face mask-wearing duration. A significantly lower OSDI score was observed in the group wearing masks for 4-6 hours per day

Among the total of 284 participants, 48 individuals (16.9%) reported prior symptoms of Dry eye disease (DED). The OSDI score for this group was significantly higher compared to those without a history of DED symptoms, with scores of 23.96 (IQR = 12.5 – 35.94) versus 8.33 (IQR = 2.08 – 18.75). This difference was found to be statistically significant using the Mann-Whitney test ($p < 0.001$). (Figure 4).

Among the 48 participants with prior symptoms of Dry eye disease (DED), 28 individuals (58.33%) were using

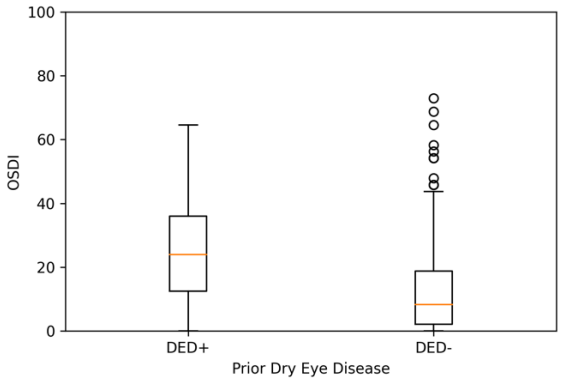

Figure 4: OSDI score based on previous history of Dry Eye Disease (DED). The group with prior DED symptoms exhibited a significantly higher OSDI score. DED- individuals without a previous history of dry eye disease, and DED+ presence of prior dry eye disease

local eye lubricant therapy, while 20 (41.67%) were not. However, we did not observe a significant difference in OSDI scores between these two groups. The OSDI scores for the local eye lubricant therapy group and the non-therapy group were 21.88 (IQR = 12.5 – 40.10) and 25.0 (IQR = 13.54 – 33.85), respectively. The Mann-Whitney test yielded a p-value of 0.8.

Participants who reported prior DED symptoms experienced a significantly greater worsening of their symptoms during the mask-wearing period compared to those without a previous history of dry eye. The prevalence of worsening disturbances during mask-wearing was 31.25% in the group with prior DED symptoms, whereas it was 15.91% in the group without previous dry eye history. This difference was statistically significant according to the Mann-Whitney test ($p = 0.03$) (Figure 5). This finding was consistent across all groups with prior DED, regardless of the duration of daily mask wear (Figure 6).

3.5. Method of data collection

For a duration of three months, doctors and medical students at The Oxford Medical College, Hospital, and Research Centre were invited to complete an online survey form. This form included an electronic consent section and provided information about the purpose of the study. The survey included a modified version of the Ocular surface disease Index (OSDI) questionnaire.

4. Discussion

There are two distinct types of Dry eye disease (DED): one is attributed to the hyposecretion of the aqueous component, known as the Hyposecretive Component, while the other arises from evaporation, referred to as the evaporative

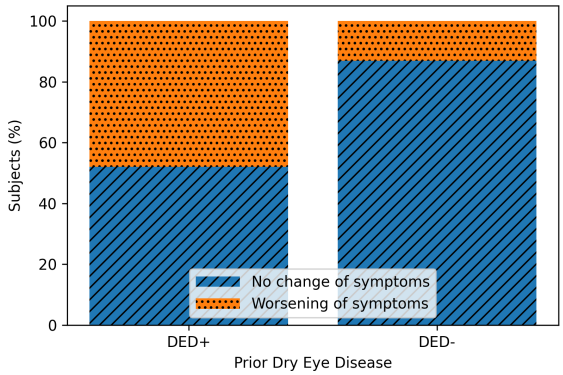

Figure 5: Worsening of the dry eye symptoms during mask wearing period was significantly more common in participants who previously exhibited DED. DED– No previous history of dry eye disease, DED+ Existence of previous dry eye disease

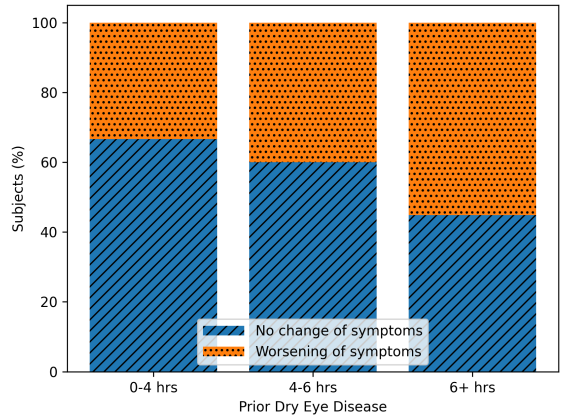

Figure 6: Worsening of the DED symptoms during mask-wear was noted in subjects with prior DED history, regardless of face mask-wearing duration

component. Mask-associated dry eye (MADE) falls into the latter category. This type of evaporative dryness occurs due to air leakage around the mask's edges during both inhalation and exhalation,[4,5] potentially impacting ocular surface health, as noted by Giannaccare et al.[6] As previously documented, increased airflow can result in the evaporation of moisture from the precorneal tear film, leading to dryness.[7,8]

Conversely, the effect of airflow on healthy eyes remains a topic of debate. In contrast, Wyon et al.[9] reported that exposing the tear film to high air velocity (1.0 m/s) for 30 minutes resulted in a significant reduction in tear stability, as evidenced by a decreased Break-up time (BUT) in individuals with healthy eyes.

Our study conducted a straightforward evaluation of dry eye based on the OSDI (Ocular Surface Disease Index) score. According to this score, a range of 0-12 points indicates a normal ocular surface, 13-22 points signify mild ocular surface disease, 23-32 points indicate moderate disease, and a score of 33-100 points suggests severe ocular surface disease.

In our research, we found compelling evidence that females had significantly higher OSDI scores compared to males, a result that aligns with the findings of Krolo et al.[10] Hyon et al. reported that dry eye symptoms among undergraduate medical students were significantly associated with female sex.[11] Many studies have identified female gender as a potential risk factor for Dry Eye Disease (DED) in women, potentially attributed to genetic, physiological, and hormonal factors.[12]

Age has also been considered a risk factor for dry eye. With age, individuals often develop comorbidities such as diabetes, reduced corneal sensitivity, meibomian gland dysfunction, goblet cell loss, and more. Interestingly, in our study, we observed minimal differences in OSDI scores across various age groups. This observation might be due to our study's relatively small sample size and the predominance of a younger population.

Regarding the duration of face mask usage, individuals using masks for less than 4 hours had OSDI scores averaging 12.5, indicating mild dryness. This may be linked to their choice to wear masks for shorter duration. Those who wore masks for 4 to 6 hours had normal OSDI scores, whereas individuals who wore masks for more than 6 hours also had OSDI scores of 12.5, suggesting mild dryness. Prolonged mask usage has been associated with continuous airflow, potentially leading to chronic insults to the ocular surface, as demonstrated by Mastropasqua et al.[7] Research has shown that wearing face masks for over 6 hours a day over a 3-month period can worsen clinical parameters of ocular surface disease and increase inflammatory biomarkers, even in healthy subjects.[7,13] This effect was even more pronounced in patients with a prior history of Dry eye disease,[14] as reflected in our study, where individuals with prior symptoms exhibited a higher OSDI score of 23.96.

5. Conclusion

While our study did not specifically consider the total duration of mask usage, it did reveal that individuals of female gender and those with a history of dry eye disease appeared to be at a higher risk for Mask-associated dry eye (MADE). It's important to note that during the COVID-19 pandemic, the benefits of wearing a properly fitted mask to mitigate the spread of the virus often outweigh the risk of developing MADE.

To address the symptoms of MADE, it is crucial to identify individuals at risk, promote the use of properly

fitted masks, and encourage the use of lubricating eye drops when necessary.

6. OSDI Questionnaire Link

http://www.supereyecare.com/resources/OSDI.pdf

7. Source of Funding

None.

8. Conflict of Interest

None.

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