Original Research Article



Saudi Medical Journal of Students (SMJS)

Official Journal of Faculty of Medicine University of Tabuk ISSN: 1658-8274 (Print version); 1658-8282 (Electronic version)

THE PREVALENCE OF DRY EYE DISEASE (DED) ASSOCIATED WITH THE PROLONGED USE OF FACE MASKS AMONG THE SAUDI POPULATION IN THE WESTERN REGION DURING THE COVID-19 ERA

Haneen Omar Alhujaili¹, Nada Shahat Ashmawi², Ahmed Hussain Asiree³, Mohammed Saad Khoshhal², Hamad Jubair Aldhafiri³, Ghadi Khalid Alsaadi⁴

¹Ophthalmology consultant at Ohud hospital, Medina, KSA.
²Medical Intern, College of medicine, Taibah University, Medina, KSA
³Student, College of Medicine, Majmaah University, Al-Majmaah, KSA
⁴Student, College of Medicine, Taif University, Taif, KSA

***Corresponding author:** Nada Shahat Ashmawi, College of Medicine, Taibah University, Medina, KSA. Email: Nada.ashmawi70@hotmail.com, Mobile: +996534885370

ABSTRACT

Background: Dry Eye Disease (DED) is a multifactorial disease that results in symptoms of discomfort and visual disturbance as a result of tear film instability. Different protective measures have been taken against the spread of the coronavirus disease 2019 (COVID-19) virus. Our main objective is to identify the prevalence of DED associated with prolonged use of face masks among the Saudi population in the western region during the COVID-19 era, as well as to assess the most common Dry Eye Disease symptoms and determining limitations accompanying Dry Eye Disease. **Method:** An observational cross-sectional study was conducted from 10 August 2021 to 11 February 2022, using a newly designed electronic questionnaire and including male and female adults (18–65 years old) within the western region of Saudi Arabia, including Mecca, Medina, Jeddah, Yanbu, and Taif.

Results: Regarding the duration of wearing face masks per day, 67.1% wore a face mask 1–4 hours/ day, 29.0% for 5–9 hours/ day, and 3.9% for \geq 10 hours/ day. The majority of participants were not diagnosed with DED (76.2%). However, 23.8% had been diagnosed.

Conclusion: The correlation between Dry Eye Disease symptoms and the duration of face mask wearing was statistically insignificant. Except between blurred vision and the daily duration of using a face mask. The majority of participants were not diagnosed with Dry Eye Disease. The most common symptoms were feeling of dryness, grittiness, and scratchiness among the participants. Also, most of the participants did not show any limitation accompanying Dry Eye Disease.

Keywords: Dry Eye Disease (DED), COVID-19, Face mask, Dryness, Blurring of Vision.

To cite this article: Alhujaili HM, Ashmawi NS, Asiree AH, Khoshhal MS, Aldhafiri HJ, Alsaadi GK. The Prevalence of Dry Eye Disease (DED) Associated with the Prolonged Use of Face Masks Among the Saudi Population in the Western Region During the COVID-19 Era. Saudi Med J Students. 2023;4(1):9-16

INTRODUCTION

During the novel coronavirus disease 2019 (COVID-19) pandemic, we observed the world adapting to new changes in many aspects of daily life, especially in the key measures taken against the spread of the virus acute respiratory syndrome-(severe coronavirus 2 [SARS CoV- 2]). These protective measures included hand hygiene, wearing gloves, physical distancing, and selfquarantine. Moreover, they led to the global use and utilization of face masks.^[1,2] Indeed, during the same period of the COVID-19 pandemic, there was a corresponding increase in the prevalence of Dry Eye Disease (DED) symptoms.^[1] Dry Eye Disease is a multifactorial disease that results in symptoms of discomfort, visual disturbance due to tear film instability, and potential damage to the ocular surface, associated with increasing osmolarity of the tear film and inflammation [3]. Although this condition rarely leads to loss of vision, it probably reduces the quality of life when its symptoms appear, and one of the potential contributing factors to this problem is the prolonged use of face masks [4]. A potential explanation for the increase in DED was issued previously in the literature, where it was suggested that the rapid evaporation process of the tears is caused by incorrect mask fit that allows the air to leak upward toward the eyes after breathing out [1,3,4]. Looking at the literature, a study done in the United States of America (USA) revealed that the prolonged and widespread use of face masks might lead

to ocular irritation and dryness [1]. According to a previous cross-sectional study done in Italy, 18.3 % of the study population reported an exacerbation of DED symptoms after wearing face masks [5]. Another study in Italy concluded that the quality of life in patients diagnosed with DED was negatively affected after using face masks regularly, and they had more ocular surface inflammation [6]. In Croatia, a prospective cohort study revealed that there was an association between wearing face masks and DED symptoms, especially in those who had prior DED or those who wore the masks for more than 3 hours a day.^[7] One more study found that prolonged and consistent face mask use is associated with an increase in ocular surface disease index (OSDI) scores, which indicates a probable worsening of dry eye symptoms among the studied population. The OSDI score is a 12-item scale for the assessment of symptoms related to DED and their effect on vision.^[8,9]

RATIONALE

Although there are some previous studies done exploring this problem globally, there are few similar studies done in Saudi Arabia. Therefore, this study aims to identify the prevalence of DED and its association with prolonged face mask use among the adult group in the western region of Saudi Arabia, including Mecca, Medina, Jeddah, Yanbu, and Taif, during the COVID-19 era.

METHODS

Study design and participants:

An observational cross-sectional study was conducted from 10 August 2021 to 11 February 2022 using a newly designed electronic questionnaire approved by the Deanship of Scientific Research, Majmaah University for Research Ethics Committee, distributed on social media among the general population of the western region of Saudi Arabia including Mecca, Medina, Jeddah, Yanbu, and Taif. The criteria for selecting participants were adults between 18–65 years old, including both males and females.

Sample size:

The convenience non-probability sampling method was used, and the number of participants was 231.

Questionnaire sections:

The structured questionnare consisted of 12 main questions as follows: 1) age, 2) gender, 3) residency, 4) previous COVID-19 infection, 5) COVID-19 vaccine, 6) duration of wearing face mask per day, 7) the previous diagnosis of Dry Eye Disease (DED), 8) regular use of medical treatment for Dry Eye Disease (DED) such as HyFresh drops, Artelac and Systane-Ultra, among others, 9) any increase of dry eye symptoms after wearing a face mask during the past 3 months, 10) presence or absence of following symptoms during the last 3 months (dryness, grittiness, or scratchiness, soreness/ irritation, burning or watering of the eye, eye fatigue, blurred vision and light sensitivity), 11) limitation of any of the following within the last 3 months (reading, driving at night, working on computers or watching television) and 12) frequency of presence of the following symptoms within the last 3 months (dryness, grittiness, or scratchiness, soreness/ irritation, burning or watering of the eye, eye fatigue, blurred vision and light sensitivity).

Statistical analysis:

After collection, the raw data were checked, edited, and analyzed using Statistical Package for the Social Sciences (SPSS) software [version 25]. The frequencies, and percentages, were calculated to describe the profile of the participants, and the Pearson correlation test was used to evaluate correlational relationships. A P-value (0.05) was considered significant.

Ethical considerations:

This type of research used a questionnaire, which is a private type of data collection that helped us to take information from the participants. We wrote a clear explanation and clarification in the first section of the questionnaire to obtain informed consent from each participant. An ethical review was done by the Deanship of Scientific Research, Majmaah University Research Ethics Committee.

RESULTS

In this study, 300 electronic questionnaires were distributed with a complete response rate of 77% and 231 participants. 45.5% were males, and 54.5% were females. The age distribution was as follows (**Figure 1**): 61.5% of the participants were within the age of 18–25 years, 12.1% were within 26 35 years, 14.3% were within 36–45 years, 7.4% were within 46-55 years, and 4.8% were within 56-65 years. Of the participants, 64.1% had had a COVID-19 infection, while 35.9% had not. Furthermore, 79.2% had received two doses of COVID-19 vaccine, 18.6% had received

SMJS is the official journal of the Faculty of Medicine, University of Tabuk. All rights reserved with SMJS. © SMJS 2022

Figure 1: Distribution of the participants by age



one dose and only 2% had never received the vaccine. Regarding the daily duration of wearing face masks, we found that 67.1% wore a face mask for 1-4 hours per day, 29.0% wore a face mask for 5-9 hours per day, and 3.9% wore a face mask for ten or more hours per day. The majority of participants (76.2%) were not diagnosed with Dry Eye Disease; however, 23.8% had been diagnosed. Furthermore, 77.5% of the participants did not use any medical treatments for dry eyes, while 22.5% regularly used medical treatments for dry eyes. Moreover, 68.0% of the participants did not notice any increase in any dry eye symptoms after wearing a face mask over the past three months, while 25.1% noticed a slight increase in dry eye symptoms, and 6.9% noticed a severe increase in dry eye symptoms. The percentage of each Dry Eye Disease symptom the participants had within the last three months is shown (Figure 2). Regarding the frequency of each symptom within the last three months among the participants, the majority were asymptomatic (Figure 3). The majority of participants did not have any limitations caused by DED for reading, driving at night, working on a computer, or watching television (Figure 4). **Table 1:** The correlation between the presenceof DED symptoms and wearing a facemask formore than 4 hours

Symptoms	Pearson correlation	Р
Dryness, grittiness, or	0.025	0.705
scratchiness		
Soreness or irritation	0.124	0.060
Burning or watering	0.009	0.892
Eye fatigue	0.051	0.442
Blurred vision	0.145*	0.028*
Sensitive to light	0.125	0.057

The correlation between the presence of DED symptoms and wearing a face mask for more than 4 hours is shown in (**Table1**). There was no statistically significant difference between DED symptoms and wearing the face mask for more than 4 hours per day (P > 0.05), except that blurred vision was statistically significant (r=0.145, P=0.028). In addition, there was a negative correlation between the severity of the DED symptoms and the duration of wearing a face mask which was statistically significant (r=-0.239, P=0.000).

DISCUSSION

In our study, we tried to identify the prevalence of Dry Eye Disease (DED) associated with the prolonged use of face masks among the Saudi population in the western region, including Mecca, Medina, Jeddah, Yanbu, and Taif, during the COVID-19 era. Our study included 231 participants. The results of our study indicate that the association between the symptoms of DED and the daily duration that the participants usually wore a face mask was not statistically significant (P value greater than 0.05).

SMJS is the official journal of the Faculty of Medicine, University of Tabuk. All rights reserved with SMJS. © SMJS 2022



Figure 2: Distribution of the participants by the symptoms that they had within the last three months

Figure 3: Distribution of the participants by the frequencies of symptoms that they had within the last three months



However, a study in Jeddah found a significant positive correlation between dry eye symptoms severity and frequency and face masks among 70.9% of healthcare workers [10]. Also, another study in Saudi Arabia found out wearing a face mask for> 6 hours/day was significantly associated with moderate to severe DED among female nursing staff [11]. Similar to our study, a

cross-sectional study done in Italy determined that most participants reported no change in ocular symptoms while wearing a face mask. However, a significant proportion of them reported an increase in ocular discomfort when wearing a face mask [5]. There are several studies showing a relationship between eye dryness symptoms and wearing a face mask. For example, a

SMJS is the official journal of the Faculty of Medicine, University of Tabuk. All rights reserved with SMJS. © SMJS 2022



Figure 4: Distribution of the participants by the limitations that they had within the last three months

study done in Italy concluded that the quality of life in patients diagnosed with DED was negatively affected after using face masks regularly, and they had more ocular surface inflammation [6]. Also, it's important to mention that, in our study, the correlation between blurred vision and the duration that the participants wore the face mask per day was statistically significant (r=0.145, P=0.028). To support the idea that regular mask usage can cause blurry vision, we found a prospective cohort study done in Croatia that revealed that there was an association between wearing face masks and DED symptoms, especially in those who had prior DED or those who wore the masks for more than 3 hours a day [7]. Moreover, our study showed that 32% of our participants noticed an increase in DED symptoms after wearing a face mask. In addition, we found that dryness, grittiness, or scratchiness were the most common symptoms reported by 35.1% of participants, followed by eye fatigue (33.3%) and blurred vision (30.3%) reported by the remaining participants. Similarly, a study by the University of Bologna in Italy found that prolonged and consistent face mask use was associated with an increase in

OSDI scores, indicating that prolonged face mask use could worsen dry eye symptoms [8-9]. In addition, we found a study performed by the University of Utah, which reported that numerous individuals had a subjective worsening in symptoms assessed by the scores. and participants OSDI these described an awareness of air blowing upward from the mask into their eyes [11]. In addition, it is important to mention that our study demonstrates that the majority of participants (61.2%) did not have any limitations in the past three months caused by DED, like reading, driving at night, working on computers, or watching television. However, the remaining participants had limitations; 12.1% had limitations in watching television, 17.7% in working on computers, 9.5% in driving at night and 17.7% in reading (Figure 4).

CONCLUSION

In conclusion, our study found that the symptoms of DED and the duration of wearing face masks were statistically insignificant except for the association between Blurred vision and the daily duration of using a face mask. The majority of

SMJS is the official journal of the Faculty of Medicine, University of Tabuk. All rights reserved with SMJS. © SMJS 2022

participants were not diagnosed with DED. The most common symptoms of DED were feeling of dryness, grittiness, and scratchiness among the participants. Also, most participants did not show any limitation accompanying DED. Our study's limitations were that we are studying a common condition that the general population may not consider a disease requiring medical intervention. We also used a self-assessment questionnaire, which may have a subjective bias affecting the precision of results. Our study has multiple strengths. First, we involved the entire western region rather than focusing on a single city. Second, our study is one of the few in Saudi Arabia that studied the association between face masks and dry eye disease. Third, our study has a relation with the COVID-19 era because mask use is compulsory these days. Hence, our research has the ability to answer the query of people wondering if face masks whether or not it increases the prevalence of DED. We advise anyone interested in conducting research similar to ours to use investigative tools so future studies achieve more precise outcomes while eliminating subjective bias. We also recommend that future studies involve patients who have been diagnosed with DED.

ACKNOWLEDGMENTS

The completion of this research could not have been possible without the support of the first author and our supervisor. The coauthor would like to thank her for her professional effort and work. Additionally, ethical approval was obtained from the Research Ethics Committee of Majmaah University, and we would like to thank them for their work.

REFERENCES

- Moshirfar, M., West, W.B. & amp; Marx, D.P. Face mask-associated ocular irritation and dryness. Ophthalmol Ther 9, 397–400 (2020).
- Wang J, Pan L, Tang S, Ji JS, Shi X. Mask use during COVID-19: a risk-adjusted strategy. Environ Pollut. 2020; 266 (Pt 1):115099.
- Tavares Fde P, Fernandes RS, Bernardes TF, Bonfioli AA, Soares EJ. Dry eye disease. Semin Ophthalmol. 2010 May; 25(3):84-93.
- 4. Giannaccare G, Vaccaro S, Mancini A, Scorcia V. Dry eye in the COVID-19 era: how the measures for controlling pandemic might harm ocular surface. Graefes Arch Clin Exp Ophthalmol. 2020; 19:1–2.
- Boccardo, Laura. Self-reported symptoms of mask-associated dry eye: A survey study of 3,605 people. Contact Lens and Anterior Eye (2021): 101408.
- Mastropasqua L, Lanzini M, Brescia L, D'Aloisio R, Nubile M, Ciancaglini M, D'Amario C, Agnifili L, Mastropasqua R. Face mask-related ocular surface modifications during COVID-19 pandemic: A clinical, in vivo confocal microscopy, and immune-cytology study.Trans Vis Sci Tech. 2021; 10(3):22.
- 7. Krolo I, Blazeka M, Merdzo I, Vrtar I, Sabol I, Petric-Vickovic I. Mask-associated dry eye during COVID-19 pandemic-how face masks contribute to dry eye disease symptoms. Med Arch. 2021; 75(2):144-148.
- Dougherty BE, Nichols JJ, Nichols KK. Rasch analysis of the ocular surface disease index (OSDI). Invest Ophthalmol Vis Sci. 2011; 52(12):8630-8635. Published 2011 Nov 7. doi:10.1167/iovs.11-8027.
- 9. Scalinci SZ, Pacella E, Battagliola ET. Prolonged face mask use might worsen dry eye symptoms.

SMJS is the official journal of the Faculty of Medicine, University of Tabuk. All rights reserved with SMJS. © SMJS 2022

Indian J Ophthalmol. 2021 Jun; 69(6):1508-1510. doi: 10.4103/ijo.IJO_2641_20. PMID: 34011730; PMCID: PMC8302327.

- Alghamdi NM, Mandoura NA. Facemask Associated Dry Eyes among Healthcare Workers during COVID-19 Pandemic, Jeddah, Saudi Arabia. Medical Science, 2022, 26, ms272e2361.doi:https://doi.org/10.54905/disssi/ v26i125/ms272e2361.
- Alsulami RA, Alotaibi R, Alsulami G, Alharbi R, Alamoudi R, Badeeb NO, Al Kadi H. Effects of Face-Mask Use on Dry Eye Disease Evaluated Using Self-Reported Ocular Surface Disease Index Scores: A Cross-Sectional Study on Nurses in Saudi Arabia. Cureus. 2022 Dec 28;14(12):e33071. doi: 10.7759/cureus.33071. PMID: 36589704; PMCID: PMC9797759.



To receive the weekly newsletter of the Faculty of Medicine, University of Tabuk, KSA, please send your email to mededutabuk@ut.edu.sa

SMJS is the official journal of the Faculty of Medicine, University of Tabuk. All rights reserved with SMJS. © SMJS 2022