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Self-reported symptoms of mask-associated dry eye: A survey study of 3,605 people

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ABSTRACT

Purpose: During the COVID-19 pandemic, the widespread use of face masks was recommended as a key measure against the spread of SARS-CoV-2. A marked increase in dry eye symptoms among regular mask users was reported, but the prevalence of this condition has not been described in the literature yet. The aim of this observational, descriptive, and cross-sectional study was to measure self-reported symptoms of mask-associated dry eye in the general population and to identify factors influencing this condition.
Methods: An anonymous online survey was distributed using Google Forms through different social media platforms.
Results: A total of 3,605 surveys were analysed. Of the 2,447 having symptoms, 658 (26.9 %) participants reported their symptoms were exacerbated when wearing a mask, thus 18.3 % of all participants experienced mask-associated dry eye. There was no significant association between perceived mask-associated dry eye and age, refractive correction, and pre-existing ocular discomfort, while a positive association was observed with female sex and retail work.
Conclusions: Although the results of this survey showed that most people reported no change in ocular symptoms while wearing a face mask, a significant proportion reported an increase in ocular discomfort when wearing a face mask. As face masks are necessary to slow down the spread of COVID-19, it is important not to underestimate all symptoms that could discourage the population from using them. Eye care professionals should verify the presence of clinical signs in all patients complaining about mask-induced eye discomfort, and suggest methods to mitigate this condition.

1. Introduction

During the COVID-19 pandemic, the widespread use of face masks was recommended as a key measure against the spread of SARS-CoV-2 [1]. This has led to some concerns, with masks being perceived as uncomfortable, or inconvenient: prolonged use of masks has been associated with complaints of headache, difficulty in breathing, skin irritation, sweating, and fogged glasses [2,3].

The first anecdotal observations of mask-associated dry eye (MADE) date back to June 2020, when D.E. White, an American ophthalmologist, described this condition on his blog and coined the acronym "MADE" [4]. A recent review indicated a marked increase in dry eye symptoms among regular mask users [5], but the prevalence of these symptoms has not been reported.

The aim of this observational, descriptive, and cross-sectional study was to measure self-reported symptoms of MADE in the general population and to identify factors influencing this condition, such as age, sex, occupation, and the use of different refractive corrections (glasses or contact lenses).

2. Methods

The study was approved by the institutional review board of the Institute for Research and Study in Optics and Optometry (IRSOO, Vinci, Italy), and performed in agreement with the tenets of the Declaration of Helsinki. An anonymous online survey was distributed using Google Forms through different social media platforms, asking people to contribute to the research by completing the questionnaire and sharing it with their social contacts. Data were collected from September 11 to October 27, 2020. Participants were asked to respond about their age,

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sex, profession, and the frequency of dry eye symptoms (i.e. foreign body sensation, dryness, irritation, itching, or burning) [6]. For symptom frequency, participants could select: never, sometimes or often. Instead of using a structured questionnaire, to facilitate the dissemination of the survey, the number of questions was minimised, and all symptoms were grouped into one single question [7]. If no symptoms were reported, no further survey questions were completed. Participants who reported symptoms of ocular discomfort were asked if these symptoms were better, worse, or stayed the same, while wearing a face mask. Participants were also asked if they wore glasses or contact lenses. For this study, MADE was defined as the condition in which dry eye symptoms are present at least sometimes and become worse using a face mask. By this definition, both people who had symptoms only while wearing the face mask, and people who had symptoms that became worse with the face mask were considered affected by MADE. Instead, people who had no symptoms, and those who had symptoms but no worsening, were considered not affected by MADE.

Descriptive statistics were used to summarise the results, and an Odds Ratio was calculated to quantify the magnitude of association using 95 % Confidence Interval (CI) and P-value (< 0.05). Demographic and descriptive variables achieving a P-value < 0.05 in the univariate analyses were included in the stepwise logistic regression model. The final model was created to predict factors associated with perceived MADE. Statistical analyses were performed using MedCalc for Windows, version 19.0.6 (MedCalc Software, Ostend, Belgium).

3. Results

A total of 3,615 surveys were collected, 10 questionnaires were removed due to incomplete data, leaving 3,605 questionnaires for analysis. The participants' age ranged from 11 to 88 years (median: 31; IQR: 25–47).

About one-third of participants (32.1 %) never experienced dry eye symptoms, 54.3 % sometimes, and 13.6 % often. Of the 2,447 reporting symptoms, only 20 (0.8 %) participants felt their symptoms improved when they wore a face mask, 1,769 (72.3 %) did not notice any change, and 658 (26.9 %) said their symptoms got worse. Thus, 18.3 % of the entire sample experienced MADE. Fig. 1 summarises the changes in ocular discomfort while wearing face masks. Participants who often had ocular discomfort were more likely to report a worsening of their condition while wearing a mask, compared to participants who had symptoms only sometimes (Odds Ratio: 1.28; 95 % CI: 1.03–1.59; $P < 0.05$).

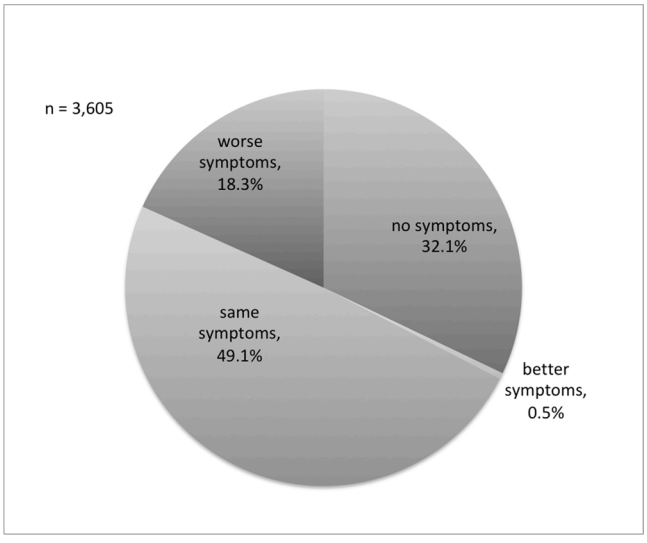

Fig. 1. Pie chart describing percentages of participants never having symptoms of ocular discomfort, or experiencing better, same, or worse symptoms while wearing a face mask.

In this sample, age was neither associated with the presence of dry eye symptoms (Odds Ratio: 0.99; 95 % CI: 0.98–1.00; $P < 0.05$), nor with symptoms worsening with masks (Odds Ratio: 1.00; 95 % CI: 0.99–1.01; $P = 0.14$).

The sample consisted of 923 (25.6 %) males and 2,682 (74.4 %) females. Females were more likely to report symptoms of ocular irritation (Odds Ratio: 1.54; 95 % CI: 1.18–1.86; $P < 0.05$) and also a worsening of dry eye symptoms due to wearing a face mask (Odds Ratio: 1.48; 95 % CI: 1.32–1.81; $P < 0.05$).

The majority of participants usually wore glasses (60 %), 10.8 % wore contact lenses and 29.2 % did not wear any correction. There were no statistically significant differences in ocular discomfort between participants who wore glasses or contact lenses (Odds Ratio: 1.20; 95 % CI: 0.88–1.62; $P = 0.25$), while those who wore no correction reported less frequent symptoms (Odds Ratio: 0.67; 95 % CI: 0.54 to 0.86; $P < 0.05$). Likewise, there were no statistically significant differences in perceived worsening of symptoms among participants who wore glasses or contact lenses (Odds Ratio: 1.08; 95 % CI: 0.81–1.44; $P = 0.24$), while those who wore no correction experienced MADE less frequently (Odds Ratio: 0.81; 95 % CI: 0.66 to 0.99; $P < 0.05$).

Regarding occupation, there were no statistical differences in the prevalence of dry eye symptoms, while there were significant differences in the perceived worsening of symptoms while using a mask: retailers most frequently reported MADE (Odds Ratio: 2.29; 95 % CI: 1.59–3.30; $P < 0.05$), followed by housewives (Odds Ratio: 1.53; 95 % CI: 1.04–2.26; $P < 0.05$). Other professions, such as teachers, healthcare professionals, office employees, factory workers, students, and retirees, showed no statistically significant association with the dependent variable studied. Data from other categories were not analysed due to the small number of participants.

Stepwise logistic regression showed that there was no significant association between self reported MADE and age, refractive correction, and pre-existing ocular discomfort; whereas the male sex was negatively associated with MADE (Odds ratio: 0.65; 95 % CI: 0.51 to 0.81) and working as a retailer was positively associated (Odds ratio: 2.12; 95 % CI: 1.51–2.96) (Significance level of Overall Model Fit: $P < 0.001$).

4. Discussion

This study aimed to investigate self reported symptoms of MADE in a general population. About two-thirds of the participants who responded to the survey had dry eye symptoms with some frequency, and of these, 26.7 % had increased symptoms with mask wear. This is the first study describing the prevalence of this condition.

The prevalence of ocular discomfort was significantly higher in the present study than reported previously [8]. However, Chalmers et al. [7] observed that clinicians often underestimated the severity of participants self-assessment of dry eye. As face masks are necessary, along with social distancing and hygiene measures, to slow down the spread of COVID-19 [1], it is important not to underestimate all symptoms that could discourage the population from using them. Although the results of this survey showed that most people report no change in ocular symptoms while wearing a face mask, a significant proportion of people with dry eye symptoms experienced exacerbated symptoms when wearing a face mask, and this problem can affect about 18 % of the general population.

The majority of studies report a significantly higher prevalence of dry eye disease in women compared to men [8]: the results of the present study confirm these findings both for dry eye symptoms and for MADE.

Although a higher prevalence of dry eye disease in older people is described in the literature, [9] in this sample, the worsening of symptoms due to the use of the mask was not correlated with age. Further studies are needed to confirm and explain this finding since few studies have investigated MADE, which is a temporary condition induced by an environmental change of a different aetiology to dry eye disease.

Furthermore, perhaps older people wear masks for fewer hours than workers, but this point was not explored in the present study.

In this sample, participants wearing glasses or contact lenses experienced dry eye symptoms more frequently than people without any correction, but there were no differences in self reported MADE between correction type.

Regarding occupation, it is difficult to explain why retailers report more MADE, compared to other professions, such as healthcare workers, who may wear masks for longer periods of time. However, other physiological and psychological factors may contribute to their perception of discomfort [3]. The results of the present study are in line with White's observation [4], that MADE was not more or less prevalent in any particular population. As dry eyes can make it difficult to perform everyday activities, eye care professionals should verify the presence of clinical signs in all patients complaining about MADE and suggest methods to mitigate this condition. Experts recommend that mask wearers experiencing dry eye symptoms should ensure that the mask is worn appropriately, apply lubricating drops, limit time in air-conditioned environments, and take regular breaks from digital devices [10]. Moreover, Matusiak et al. [2] documented that wearing surgical masks was linked to a significantly lower risk of adverse reactions than cloth mask or respirators (N95 + FFP). This is supported by Roberge et al. [11] who postulated that surgical mask use at a low--moderate work rate was not associated with clinically significant physiological impact, but it would be useful to verify if the use of different types of masks may have effects on ocular discomfort.

Although the evaluation of dry eye using only the symptoms may be partial, because obviously, it does not take into account clinical signs, online surveys can be useful for assessing self-reported discomfort, especially during the pandemic period, which limits contact between people.

The major limitation of the present study was the lack of clinical confirmation of dry eye disease. As the widespread use of mask will likely extend into the future for some time, further studies that relate symptoms to clinical signs are warranted.

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