Oftalmologi: Jurnal Kesehatan Mata Indonesia 2025, Volume 7, Number 2.
P-ISSN. 2723-6935, E-ISSN. 2541-4283
Received: 25 April 2025; Revised: 30 August 2025; Accepted: 30 August 2025.

Does Duration of Wearing Face Masks Cause Dry Eye Disease Among Medical Students in Indonesia: A Cross Sectional Study

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How to Cite:
Angelius, C., Irma, J., Onasis, S., Rizki, S. A., Budimulia, P., Salim, J., & Lesmana, M. V. Z. (2025). Does Duration of Wearing Face Masks Cause Dry Eye Disease Among Medical Students in Indonesia: A Cross Sectional Study. *Oftalmologi: Jurnal Kesehatan Mata Indonesia*, *7*(2), 55–58.
https://doi.org/10.11594/ojkmi.v7i2.86

ABSTRACT
Introduction*: During the COVID-19 pandemic, infection control protocols required universal mask use. At the same time, increased reports of dry eye symptoms emerged. Prior studies showed inconsistent results. This study aims to clarify the association, hypothesizing that prolonged mask wearing is linked to a higher risk of dry eye disease.*
Methods*: This study is an analytical comparative cross-sectional study. The purposive sampling technique was used to collect samples. To diagnose dry eye disease, the Ocular Surface Disease Index (OSDI) questionnaire was used. The cut off score we used is >12 points in OSDI. Two categories were established to assess mask usage duration: <6 hours or ≥ 6 hours per day. Data were collected in January 2023 from 278 respondent medical students in Tangerang, Indonesia. Bivariate chi-square data analysis was performed using SPSS 25.0 software.*
Discussion*: 82 respondents (29.5%) experienced dry eye disease, and 221 respondents (79.5%) used masks for ≥ 6 hours during effective working days along the week. No significant relationship was found between both variables. (OR = 0,883; 95% CI: 0.471-1.658; p = 0.669).*
Results*: There was no association between using masks for a longer period of time to dry eye disease.*
Keywords*: Mask usage duration, Facemask, Dry eye, MADE, Mask Associated Dry Eye*

ABSTRAK
Latar belakang: Pandemi COVID-19 mendorong penerapan protokol pengendalian infeksi dengan kewajiban penggunaan masker. Seiring periode tersebut, kasus gejala mata kering meningkat. Namun, bukti ilmiah yang ada masih menunjukkan hasil tidak konsisten. Penelitian ini bertujuan memperkuat evidensi dengan hipotesis bahwa pemakaian masker jangka panjang berkorelasi dengan peningkatan risiko penyakit mata kering.
Metode: Studi *cross sectional* ini dilakukan dengan teknik analitik komparatif dengan *purposive sampling*. Untuk mendiagnosis penyakit mata kering digunakan kuesioner *Ocular Surface Disease Index (OSDI)* dengan nilai *cut off* >12. Durasi penggunaan masker dibagi menjadi: < 6 jam atau ≥ 6 jam per hari. Data diambil pada Januari 2023 dari 278 responden mahasiswa kedokteran di Tangerang, Indonesia. Analisa data bivariat *chi-square* dilakukan menggunakan SPSS 25.0.
Diskusi: 82 responden (29.5%) mengalami gejala mata kering dan 221 responden (79.5%) menggunakan masker untuk > 6 jam. Tidak ada hubungan yang signifikan ditemukan antara kedua variabel (OR = 0,883; 95% CI: 0.471-1.658; p = 0.669).
Hasil: Tidak ditemukan asosiasi antara durasi penggunaan masker wajah yang lebih panjang dengan mata kering.
Kata kunci: Durasi penggunaan masker wajah, Masker wajah, Penyakit mata kering, *Mask Associated Dry Eye*

INTRODUCTION

After the rise of the COVID-19 pandemic in 2020, the *World Health Organization* (WHO) established an infection control protocol to prevent global transmission of the virus. These include: wearing masks in public, washing hands regularly, keeping social distance from each other, and avoiding crowds.[1] Within this period of time, it was found that there was an increased number of dry eye symptoms. This sparks suspicions that there was an association between the new infection control protocol and dry eye symptoms, thus the term Mask Associated Dry Eye (MADE) was established.[2]

Previous studies have found a correlation between mask use longer than 3 hours per day with MADE, especially in the female population with a prior history of dry eye disease (DED).[3] Another study from Saudi Arabia figured that the prevalence of MADE was high, with screen time as a significant independent factor that influenced it.[4] However, in comparison, some studies do not find a correlation between the use of masks and DED. There was, however, a rapid increase in ocular discomfort when wearing a mask.[2,5]

From several research studies previously mentioned, the inconsistency between the association of two variables led to this research. The subjects chosen are medical students due to their lifestyle, who are prone to experiencing DED and increased use of face masks in comparison to other populations. Therefore, the primary objective of this study is to find the association between the duration of mask use and the incidence of dry eyes in medical students in Tangerang, Indonesia.

METHODS

The questionnaire was shared in January 2023. A total of 357 respondents were required through the online-based questionnaire service, yet among those, only 278 respondents were aligned with the study's inclusion and exclusion criteria. We reached a number of respondents that exceeded our minimum sample size, as many of our respondents were aligned with our criteria.

Table 1. Respondent Characteristics

Variable	Frequency n (%)
Gender	
Male	82 (29.5)
Female	196 (70.5)
Age	
Mean±SD [Min-Max]	19.22±1.23 [17-27]
< 20 years old	167 (60.1)
≥ 20 years old	111 (39.9)
Total	278 (100.0)

Table 1 shows that the respondents were predominantly female. The mean age of the subjects is 19 years old. In this study, dry eye disease was diagnosed using the OSDI questionnaire, where students who got a > 12 score are considered to have dry eye disease.

Table 2. Subject Questionnaire Results

Variable	Frequency n (%)
Dry Eye	
No	196 (70.5)
Yes	82 (29.5)
Mean Use of Mask Duration (hours/day)	
< 6 hours	57 (20.5)
≥ 6 hours	221 (79.5)
Total	278 (100.0)

Based on Table 2, most of the respondents do not have dry eye symptoms, and the average mask usage of masks was above 6 hours.

Table 3. Chi-square Bivariate Statistical Test Results

Variable	Dry Eyes Yes n (%)	Dry Eyes No n (%)	OR (95% CI)	p
Mask Use Duration				
≥ 6 hours	64 (23.0)	157 (56.4)	0.883	0.823
< 6 hours	18 (6.5)	39 (14.0)		

Table 3 shows the bivariate analysis using the Chi-square method. Based on the table, the odds ratio obtained was 0.883 with a P value 0.823.

DISCUSSION

Educational activities conducted for medical students have recently shifted to offline activities around the campus with infection control protocols. The increasing use of screen time has also been more demanding around this time, which also becomes a risk factor for dry eye symptoms. Around 221 (79%) students wore face masks for more than 6 hours around campus, and 82 students (29.5%) were diagnosed with dry eye disease with no previous history of eye diseases. Analytical statistics showed that there was no significant relationship between duration of mask usage and dry eye symptoms ($p > 0.05$).

This finding supports the result of a study conducted previously by Al-dolat et al, which was also conducted around a homogenous subject population, namely medical students. The difference lies in the location of the research, and the research was conducted on medical students in Jordan.[2] Another study conducted by Krolo et al., which was conducted in Croatia, stated that there was no significant relationship found in participants who wore masks for more than 6 hours with the other groups towards the probability of getting dry eye disease.[3] Meanwhile, a study by Fan et al. found that the incidence of dry eye increased significantly with the intensive use of face masks. It is estimated that this difference lies in the variety of participants, which varies widely from 6 to 79 years old, with an average age of 43 years. Research by Fan et al. took place in China.[6]

It is important to note that the geographical difference between these countries could become a precursor of the different results presented by the report, as dry temperature has been proven to cause dry eye disease.[7,8] In Jordan, the mean annual maximum temperature is around 24-25℃, and the mean annual minimum temperature is around 11-15℃.[9] Similarly, in Indonesia, the mean annual maximum temperature is around 28-28.5℃, and the mean annual minimum temperature is around 24-25℃.[10] On the warmer side, Croatia has a mean annual maximum temperature is around 32-36℃.[11]

Fan et al. conducted their study in China, which has a peak temperature of about 10℃ in areas where COVID-19 infections are most prevalent.[12] Since Indonesia has warm weather, the prevalence of dry eye syndrome is not as marked as in Jordan and other countries. Similar to Fan et al.'s conclusion, Alghamdi et al. stated in their research that there was a significant positive correlation between the severity of dry eye symptoms and the frequency of using masks. However, this finding also found that participants aged 31-40 years had an almost 3x higher chance of getting MADE, and participants aged 41-50 years had a 2.5x higher chance of experiencing MADE.[4] Since we used university students as our respondents, MADE is less prevalent in comparison to older age research groups.

Alghamdi et al. conducted their studies in Saudi Arabia, which has a mean temperature of 19-24℃, similar to Al-dolat et al, and this research, which was conducted in Indonesia. However, it is important to note that the research of Al-dolat et al. and our research were conducted in medical students, and Alghamdi et al. included older age groups in their research. In which they proved that participants aged 31 and above had a higher chance of getting MADE. [4] Research conducted by Scalinci et al. also notes an association between the use of face masks and the development of dry eye disease in samples with a mean age of 45.27 years old.[13]

It could be concluded that differences in the sample population could cause the difference in results. Subjects aged 40 and above are more prone to developing dry eye disease when having a prolonged use of face masks in comparison to subjects of younger age, as studied in our research. Apart from differences in population study, environmental situations such as weather could also become a confounding factor in establishing the association between duration of mask usage and dry eyes.

Limitations of this study include confounding factors such as the type and material of face masks used, in which we did not differentiate between surgical masks and N95 masks, whether or not the mask is used appropriately by the medical students, and recall bias that could be considered in further research. This research might also be biased due to the small portion of the general population that is being used; in this case, we only chose to do the research in university students.

CONCLUSION

It was found in this research that there is no significant relationship between the duration of wearing masks and the incidence of dry eyes in medical students in Tangerang. It is important to highlight that this result could be specified, especially in university students, and results might be different in other research groups or the general population.

The clinical implication of this research is to highlight that it's best to give the eye some rest when using a mask for a long period of time or try giving artificial tears when symptoms of MADE arise. In the next research, longitudinal studies and objective tests to see the association between mask usage and MADE could be conducted to obtain more accurate results.

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