



## MASK ASSOCIATED DRY EYE AMONG DOCTORS IN A TERTIARY CARE MEDICAL COLLEGE & HOSPITAL, CHENGALPATTU- A CROSS SECTIONAL STUDY IN TAMIL NADU

### Ophthalmology

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### ABSTRACT

Face mask usage has increased globally as a result of the coronavirus disease 2019 (COVID-19) outbreak and the need to minimize disease transmission. We have seen a corresponding increase in ocular dryness and irritation over this period in habitual mask wearers. The study was aimed to access the prevalence of dry eyes during mask usage and to determine its factor associated with severity of dry eyes among doctors working in a tertiary care medical college & hospital. Among 250 participants, majority (54.4%) were in the age group of 31- 45 years with the mean age of  $36 \pm 4.86$  years. More than half (59.6%) were male. There was significant association with usage of face mask and Dry Eyes Diseases (DED) symptoms (with p value  $<0.001$ ). As the face mask usage duration increases, the symptoms of DED also increase which shows significant association (with p value  $<0.001$ ).

### KEYWORDS

Mask-Associated Dry Eye, Dry Eye Disease, Face Mask, Ocular Surface Disease Index, South India.

#### INTRODUCTION:

A highly contagious RNA virus known as coronavirus has been causing devastating mayhem on the entire world since December 2019, causing atypical pneumonia known as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (1). The widespread use of face masks (FMs) was advised as a preventive strategy against the spread of SARS-CoV-2 during the COVID-19 pandemic (2). Long-term mask usage has been associated with issues like headaches, respiratory issues, skin irritability, perspiration, and fogged glasses (3,4). The term "mask-associated dry eye" (MADE) was first used anecdotally in June 2020 by American ophthalmologist Dr. White, who also documented this condition on his blog (5). With continued use of FMs, the frequency of ocular symptoms increased. Additionally, while using FMs, the upward flow of air during expiration or the restricted movement of the lower eyelid encourages faster tear evaporation and consequently, the onset or aggravation of symptoms related to dry eye disease (DED) (6,7). DED is characterized as a multifactorial ocular surface disease in which tear film instability and hyperosmolarity, ocular surface inflammation and damage, and neurosensory abnormalities play etiological roles and are accompanied by ocular symptoms and a loss of tear film homeostasis in the Tear Film and Ocular Surface Dry Eye Workshop II (TFOS DEWS II) report (8). The symptoms of DED include ocular discomfort, dryness, itching, and a sense of a foreign body (9). Evaluation of subjective DED symptoms using patient-reported outcome questionnaires (with the Ocular Surface Disease Index (OSDI) being the most often used) is beneficial for accurate DED assessment (10). This observational, analytical, and cross-sectional study was intended to determine the prevalence of dry eyes disease among doctors who wear face masks as well as the factors that cause this disease and its severity.

#### OBJECTIVE:

1. To access the prevalence and severity of dry eyes among doctors working in a tertiary care medical college & hospital
2. To determine the factors associated with severity of dry eye among doctors using face masks.

#### METHODOLOGY:

A Cross sectional study was conducted over a period of two months from December 2022 to January 2023 in a tertiary care medical college & hospital, Chengalpattu, Tamil Nadu. After obtaining approval from the Institutional Research and Institutional Ethics Committees, data was collected with an interview administered by the principal investigator. The Study was conducted using a Convenient Sampling method among doctors working in a tertiary care medical college & hospital, Chengalpattu. The Questionnaire was filled by the investigator after obtaining informed consent from the study participant using EPICOLLECT application. The Present study

conducted among doctors working in a tertiary care medical college & hospital, Chengalpattu. The study included all the doctor who had graduated with MBBS degree and currently working in medical college & hospital, any gender of 24 to 60 years of age. The study excluded all the doctor below 23 years of age and above 61 years of age and also excluded those who was previously diagnosed with dry eyes and those who not willing to participants in the present study. The prevalence of dry eyes was about 18.4 % of Indian population, with 5% absolute precision and 80% power, sample size was calculated to be 230. Finally, 250 participants were recruited during this survey. A semi structured questionnaire consists of three sections as follows: Section A- Socio demographic profile; Section B- Assessment of face mask usage among doctors; Section C- Assessment of dry Eye using OSDI consists of 12 questions. Each answer was scored on a scale of 0 to 4 of Likert scale and a final score was computed that proceeds from 0 to 100 (13).

After obtaining approval from the Institutional Research and Institutional Ethics Committees, data was collected with an interview administered questionnaires by the principal investigator. Using a Convenient Sampling method, the doctors were selected for the study. After obtaining informed consent from the study participants, the questionnaire such as socio-demographic variables, face mask usage related questions and OSDI was filled by principal investigator using EPICOLLECT application.

#### Operational Definitions:

**Mild Dry Eye:** The participants with OSDI score within 13 to 22 score were considered to have mild dry eyes.

**Moderate Dry Eyes:** The participants with OSDI score within 23 to 32 score were deemed to have moderate dry eyes.

**Severe Dry Eyes:** The participants with OSDI score more than 33 score suffered to have severe dry eyes.

#### Statistical Analysis:

The Data extracted from EPICOLLECT software and Data coding were done in Microsoft Excel software 2019 version. These data were analyzed using SPSS version 20. Descriptive statistics was used to describe the frequency of variables and Chi-square test was applied at 95% confidence interval to test association of the risk factors.

#### RESULTS:

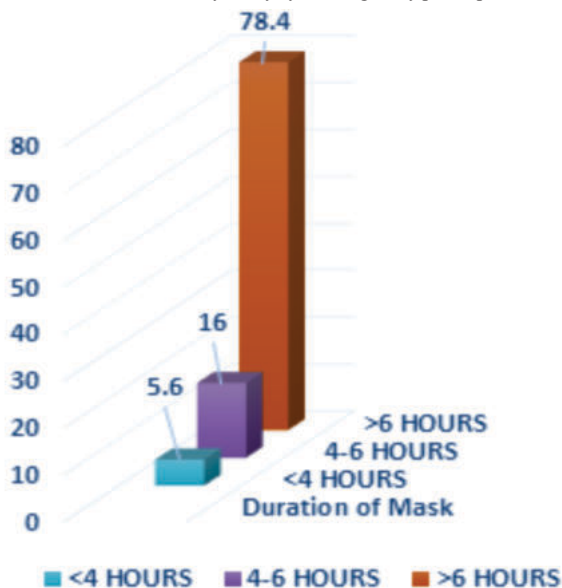
The target sample population was 230 subjects, but 250 participants were recruited to completed the survey. The mean age of the study participants was  $36 \pm 4.86$  years. Among 250 participants, about 54.4% of the participants were between the ages 31 to 45 followed by 25.2% of participants were less than 30 years of age and 20.4% between 46 to 60 years of age, with. There were 149 (59.6%) male and 101 (40.4%)

female. All of the study participants were doctors, most of them working as Junior resident (44.8%), followed by Assistant professor (25.6%) and Senior resident (17.2%). Overall, 250 participants, 75 participants (30%) had diabetes, 26 participants (10.4%) had arthritis and 62 participants (24.8%) had thyroid disease as shown in (Table-1). The number of participants using face mask regularly were 242 (96.8%). Additionally, the participants who had reported usage of only three-ply masks (58.8%) 147 participants, 79 of them used (31.6%) N95 masks, and remaining 24 of them used both three ply and N95 masks (9.6%). Among them, 75.2% of the participants claimed that their face masks did not fit effectively. (Table-2)

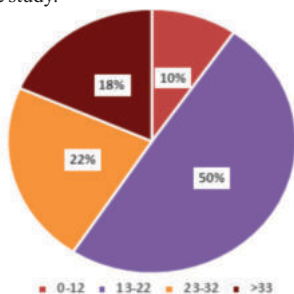
The duration of face mask usage among the participants were displayed in (Figure -1), more than half of them (78.4%) were using face mask more than 6 hours and least of them (5.6%) had used only less than 4 hours.

The severity of dry eye response to 12 item questionnaires (OSDI) were illustrated in (Figure-2). The distribution of dry eyes was classified into mild, moderate and severe forms. About 50% of participants found to have mild dry eyes followed by 22% of them observed to have moderate dry eyes and remaining 18% of them suffered with severe dry eyes.

The various risk factor association with severity of dry eyes by Chi-Square test are given in Table 3& 4. While Severe Dry Eye Diseases (DED) symptoms were higher among 31-45 and 46-60 years of age, there were shown highly statistically significant ( $p$  value < 0.001). The male subjects found to have an increased of symptoms DED with  $p$ -value 0.0001 showing greater significance. The previous history of Diabetes, Arthritis and Thyroid disease participants also shows significance with DED symptoms ( $p$  value < 0.001). There was significant association with usage of face mask and DED symptoms ( $p$  value < 0.001). As the face mask usage duration increases, the symptoms of DED also increase which shows significant association ( $p$  value < 0.001). Additionally, the type and fit of face mask also associated with the severity of dry eye among study participants.



**Figure-1:** Duration of face mask usage distribution among participants in the study.



**Figure-2:** Distribution of Dry Eyes and their severity using OSDI among participants

## DISCUSSION

This study investigated the prevalence of dry eyes and its severity among doctors who use face mask for prolonged duration in Tertiary medical college and hospital. The study participants were between the ages of 25 to 60, with a mean age of  $36 \pm 4.86$  years.

A study conducted in Saudi Arabia by Alkhaldi SA et al revealed the prevalence of DED around 49.5% among healthy adults (16). Whereas, a study conducted in Australia by Eric B Papas observed the prevalence of DED around 12% (14). The present study conducted in South India indicates that the prevalence of moderate to severe DED among the participants wearing face masks regularly was 40.8%. Similarly, A study in North India done by Jeewan singh et al, showed the prevalence of DED as 32% (15).

This study revealed a statistically significant association between diabetes and dry eyes among the participants. Likewise, a meta-analysis done by Tae Keun Yoo in South Korea suggests that diabetes has significant association with the risk of dry eye (17). Additionally, the study by Lijun Qian et al also showed association between dry eyes and diabetes mellitus (18). This may be due to the fact that, Hyperosmolarity, a condition in which the blood takes water from organs in order to bring the glucose level down to normal, can be brought on by diabetes. Hyperosmolarity may cause the tear film and the eye's surface to dry up, resulting in causing symptoms of dry eyes.

Globally many other studies by Harkaran S Rana et al (19) from united states and a study Christopher Lo et al (20) revealed there was an association between thyroid disease and dry eyes. Similarly, our current study also showed statistically significant association between dry eyes and thyroid disease. Dry eyes can result from lacrimal gland inflammation, which can be brought on by thyroid dysfunction. Also, autoimmune conditions like arthritis can affect lacrimal gland and other glands of eyelids leading to its decreased secretion and causing dry eyes. Furthermore, a study by Kimberley Yu et al (21) from Philadelphia, showed association between dry eyes and systemic conditions like arthritis which was also statistically significant in the present study.

The symptoms of dry eyes worsened when using face masks, according to a self-reported symptoms of mask-associated dry eye study by Laura Boccardo (22) in Italy, which was also highly statistically significant in the present study. The use of face mask could represent an important cause of dry eyes due to the displacement of the mask or its incorrect fitting which could disperse air around the eyes that leads to a rapid evaporation of tears.

This study verified with statistical significance of analysis done by Sergio Zaccaria Scalinci et al. (23) that prolonged and consistent mask use is linked to higher OSDI scores. Wearing a face mask for longer than 3 to 6 hours per day may contribute to or exacerbate the symptoms of dry eye disease, according to a cross-sectional study by Rohini Motwani et al (24), which was supported by the present study showing increased severity of dry eyes with face mask use.

In a study by Shirin Hamed Azzam et al (25) on assessment of dry eye disease in n95 versus surgical face mask, it was found that the use of n95 face mask caused significant dry eyes than three ply masks. In contrast the present study observed that majority of participants had dry eyes in three ply face masks than n95, it might be due the fact that the study participants using three ply mask was higher than that of n95 mask users.

## CONCLUSION:

The current study provided evidence of mask-associated dry eye (MADE), which is most severe among individuals who use masks for an extended period of time (more than 6 hours per day). Additionally, it suggests that an improperly fitted face mask may contribute to worsening of dry eyes symptoms. Eye specialists ought to caution their patients about the possible dangers of using facemasks that are not appropriately suited for their eyes.

## Acknowledgments:

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## Conflict of interest:

The authors declare that they have no conflict of interest.

**Table1: Demographic and past history distribution among the study participants:**

| Variable        |                                 | Number of Participants | Percentage (%) |
|-----------------|---------------------------------|------------------------|----------------|
| Age             | <30                             | 63                     | 25.2           |
|                 | 31-45                           | 136                    | 54.4           |
|                 | 46-60                           | 51                     | 20.4           |
| Gender          | Male                            | 149                    | 59.6           |
|                 | Female                          | 101                    | 40.4           |
| Designation     | Junior Resident                 | 112                    | 44.8           |
|                 | Senior Resident                 | 43                     | 17.2           |
|                 | Assistant Professor             | 64                     | 25.6           |
|                 | Associate Professor & Professor | 31                     | 12.4           |
| Diabetes        | Yes                             | 75                     | 30             |
|                 | No                              | 60                     | 24             |
|                 | Uncertain                       | 115                    | 46             |
| Arthritis       | Yes                             | 26                     | 10.4           |
|                 | No                              | 190                    | 76             |
|                 | Uncertain                       | 34                     | 13.6           |
| Thyroid Disease | Yes                             | 62                     | 24.8           |
|                 | No                              | 66                     | 26.4           |
|                 | Uncertain                       | 122                    | 48.8           |

**Table 2: Distribution of face mask usage among study participants.**

| Variable                  |                | Number of Participants | Percentage (%) |
|---------------------------|----------------|------------------------|----------------|
| Do You Use Mask Regularly | Yes            | 242                    | 96.8           |
|                           | No             | 8                      | 3.2            |
| Type Of Facemasks         | Three Ply Mask | 147                    | 58.8           |
|                           | N95 Mask       | 79                     | 31.6           |
|                           | 3ply Mask+N95  | 24                     | 9.6            |
| Does Mask Fit Properly    | Yes            | 62                     | 24.8           |
|                           | No             | 188                    | 75.2           |

**Table 3: Association between demographic, past history variables and Dry eyes status of the study participants:**

| Variable        |                       | Normal   | Mild Dry Eye | Moderate Dry Eye | Severe Dry Eye | Chi Square Test | Significant (P<0.05) |
|-----------------|-----------------------|----------|--------------|------------------|----------------|-----------------|----------------------|
| Age             | <30                   | 14 (5.6) | 8 (3.2)      | 36 (14.4)        | 5 (2)          | 101.6896        | 0.0001**             |
|                 | 31-45                 | 8 (3.2)  | 91 (36.4)    | 16 (6.4)         | 21 (8.4)       |                 |                      |
|                 | 46-60                 | 2 (0.8)  | 25 (10)      | 4 (1.6)          | 20 (8)         |                 |                      |
| Gender          | Male                  | 13 (5.2) | 58 (23.2)    | 44 (17.6)        | 34 (13.6)      | 21.0502         | 0.0001**             |
|                 | Female                | 11 (4.4) | 66 (26.4)    | 12 (4.8)         | 12 (4.8)       |                 |                      |
| Designation     | Junior Resident       | 12 (4.8) | 51 (20.4)    | 22 (8.8)         | 26 (10.4)      | 20.3579         | 0.02**               |
|                 | Senior Resident       | 5 (2)    | 17 (6.8)     | 15 (6)           | 6 (2.4)        |                 |                      |
|                 | Assistant Professor   | 4 (1.6)  | 40 (16)      | 16 (6.4)         | 4 (1.6)        |                 |                      |
|                 | Associate & Professor | 3 (1.2)  | 16 (6.4)     | 3 (1.2)          | 10 (4)         |                 |                      |
| Diabetes        | Yes                   | 5 (2)    | 26 (10.4)    | 31 (12.4)        | 13 (5.2)       | 42.4143         | 0.0001**             |
|                 | No                    | 4 (1.6)  | 27 (10.8)    | 20 (8)           | 9 (3.6)        |                 |                      |
|                 | Uncertain             | 15 (6)   | 71 (28.4)    | 5 (2)            | 24 (9.6)       |                 |                      |
| Arthritis       | Yes                   | 6 (2.4)  | 7 (2.8)      | 9 (3.6)          | 4 (1.6)        | 72.8064         | 0.0001**             |
|                 | No                    | 12 (4.8) | 115 (46)     | 42 (16.8)        | 21 (8.4)       |                 |                      |
|                 | Uncertain             | 6 (2.4)  | 2 (0.8)      | 5 (2)            | 21 (8.4)       |                 |                      |
| Thyroid Disease | Yes                   | 12 (4.8) | 27 (10.8)    | 18 (7.2)         | 5 (2)          | 28.3107         | 0.0001**             |
|                 | No                    | 8 (3.2)  | 37 (14.8)    | 15 (6)           | 6 (2.4)        |                 |                      |
|                 | Uncertain             | 4 (1.6)  | 60 (24)      | 23 (9.2)         | 35 (14)        |                 |                      |

**Table 4: Association of Face mask usage and Severity of dry eyes among participants:**

| Variable                  |                    | Normal   | Mild Dry Eye | Moderate Dry Eye | Severe Dry Eye | Chi Square test | Significant (P<0.05) |
|---------------------------|--------------------|----------|--------------|------------------|----------------|-----------------|----------------------|
| Do You Use Mask Regularly | Yes                | 20 (8)   | 122 (48.8)   | 55 (22)          | 45 (18)        | 15.2476         | 0.0016***            |
|                           | No                 | 4 (1.6)  | 2 (0.8)      | 1 (0.4)          | 1 (0.4)        |                 |                      |
| Duration Of Facemasks     | <4 Hours           | 5 (2)    | 2 (0.8)      | 6 (2.4)          | 1 (0.4)        | 68.7886         | 0.00001***           |
|                           | 4-6 Hours          | 13 (5.2) | 4 (1.6)      | 12 (4.8)         | 11 (4.4)       |                 |                      |
|                           | >6 Hours           | 6 (2.4)  | 118 (47.2)   | 38 (15.2)        | 34 (13.6)      |                 |                      |
| Type Of Facemasks         | Three Ply Mask     | 15 (6)   | 85 (34)      | 30 (12)          | 17 (6.8)       | 21.9168         | 0.0013***            |
|                           | N95 Mask           | 5 (2)    | 33 (13.2)    | 22 (8.8)         | 19 (7.6)       |                 |                      |
|                           | Three Ply Mask+N95 | 4 (1.6)  | 6 (2.4)      | 4 (1.6)          | 10 (4)         |                 |                      |
| Does Mask Fit Properly    | Yes                | 10 (4)   | 16 (6.4)     | 18 (7.2)         | 18 (7.2)       | 19.7558         | 0.0002***            |
|                           | No                 | 14 (5.6) | 108 (43.2)   | 38 (15.2)        | 28 (11.2)      |                 |                      |

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