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Prevalence of mask associated dry eye disease symptoms among health care workers during COVID-19 pandemic in Puducherry, India

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ABSTRACT

Aim: The aim of this cross-sectional study is to measure symptoms of mask-associated dry eye disease symptoms among health workers during the COVID-19 pandemic.
Materials and Methods: This was a cross-sectional study which included Health care workers willing to participate in the Questionnaire based study from March 2022 to May 2022. After initial consent participants completed the questionnaire on the duration of mask wear, type of mask, presence and the severity of Dry Eye Disease (DED) symptoms.
Results: A total of 930 completed data had been analyzed. Out of them 651(70%) had reported to have DED symptoms either sometimes or often. About two-third 65% (605) health care workers were in the age group of 18 to 29 years, 55% (465) had been using face mask between 4 to 8 hours per day. Less than a quarter 20% had reported to be having previous dry eye symptoms. Among them 68% (126) reported worsening symptoms. Almost half 45% wore spectacles, among them 72% reported fogging of their glasses while wearing mask. Age group 18 to 29 years were reported to have significant association with DED symptoms along with usage of N95 mask and male gender using Chi square test (P <0.001).
Conclusion: Our study reported ocular discomfort in majority of Health care workers who are in the fore front in this Covid-19 pandemic for long hours, hence counseling of proper wearing of face mask and ocular treatment as and when needed to maintain their ocular surface health by consulting ophthalmologist is recommended.

1. Introduction

Corona virus disease COVID-19 pandemic had emerged during December 2019 in Wuhan province, China and spread to rest of the world causing increased morbidity and mortality of the global population. COVID-19 virus being highly contagious, spread by droplets when infected patient coughs or sneezes.[1] In India there had been nearly 44million confirmed cases with 526,442 deaths reported from January 2020 till March 2023.[2] World Health Organization advised people to follow strict guidelines to prevent the spread of covid-19 like avoiding social gatherings, social distancing, wearing face masks, hand sanitizers to improve hand hygiene.[3]

Ocular manifestations of COVID-19 likeconjunctivitis, keratitis and episcleritis were reported by few studies[4–6] while some had reported dry eye symptoms.[5,7] Dry eye disease (DED) is multifactorial disease which causes symptoms of irritation, ocular pain and conjunctival

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hyperemia. Tear film deficit, local inflammation of ocular surface, environmental factors, prolonged usage of digital gadgets are some of the risk factors.[8,9]

Complaints of DED among the patients who visited hospitals had increased and worsening of symptoms of DED during the pandemic while using face masks had been observed and studies had reported.[10–13] The reason being air from behind the mask which is not fitproperly is blown upwards and causes rapid tear film evaporation.[14,15]

Thus, the aim of the present study was to assess prevalence of the DED symptoms among the health care workers who had been on mask for long hours during this Covid 19 pandemic.

2. Materials and Methods

The Institutional Ethical Committee approved the study. A descriptive cross-sectional study conducted in a tertiary care hospital in Pondicherry, India. For this study we utilized an online questionnaire using Google forms shared with the participants from March 1, 2022, to May 31, 2022 on various social media platform and encouraged them to contribute to the research by completing the questionnaire and sharing with their social contacts. Health care workers (Doctors, Nurses, Lab technician, Pharmacist, Physiotherapist, Radiologist) who were involved in patients with COVID-19 infection hospitalized for their treatment. The participation in the questionnaire-based study was voluntary and the consent statement regarding their voluntary participation had been included in the beginning of the study questionnaire. Personal information was not collected. The questionnaire was reviewed by experts for its simplicity, consistency and relevance. The sample size was calculated to be 928 participants taking 67.9% prevalence of digital eyestrain,[11] 3% absolute precision with 95% confident interval and 10% non response rate using the formula.

$$n = \frac{Z^2_{1-\alpha/2} P(1-P)}{d^2\,(0.03)^2}$$

$$n = \frac{(1.96)^2\,(0.679)\,(1-0.679)}{0.0009}$$

$$n = 0.837311,\ n = 928$$

Using convenient sampling method data had been collected. Responses having insufficient data were excluded.

The questionnaire had questions over sections of socio demographic data which included age, gender, and profession. Ocular & medical history included questions on systemic illness, usage of spectacles or contact lens, previous history of DED symptoms. Also, questions about treatment taken were included. Information on face mask wearing included type of mask used and duration of wear, also PPE kit usage by health care workers and its duration. Symptoms of DED like burning sensation, irritation, itching, eye fatigue, eye rubbing and foreign body sensation with options of never often or sometimes and frequency of occurrence from 1 to 10 (1-4 mild, 4-8 moderate, 8-10 severe). The frequency of the dry eye symptoms based on the severity (from 1 to 10) as reported by the participants were categorized as mild with a score 1- 4, moderate between 5 to 8 and severe > 8.

The data was entered in an excel sheet and analyzed using the Statistical program for Social Sciences (IBM SPSS Corp, SPSS Statistics ver. 22, USA). The data was expressed using descriptive statistics. Chi square test was used for comparing categorical variables. Statistical significance was considered at P value of < 0.05.

3. Results

A total of 942 responses collected of which 12 were not included due to insufficient data and hence we had 930 responses for analysis. Out of 930 respondents 55% (512) were female and 45% (418) were males. Age of the participants ranged from 18 to 50 years, 65% (605) was between 18 to 29years, 22% (204) was between 30 to 39 years and 13% (121) was between 40 to 50 years. Among them 36% of them were doctors by profession, 17% were staff nurse, 15%, 13%, 9%and 5% were pharmacist, lab technicians, radiotherapist, and physiotherapist respectively.

The type of mask usage among the health care workers is given in Figure 1. As for the duration of the wearing mask, 55% had been using it between 4 to 8 hours per day, 40% had been using for 8 to 12 hours per day, for 12 to 16 hours (4%) and 1% more than 16hours per day. Usage of PPE kit (PPE KIT with Full body coverall, Latex gloves, Shoe cover, Face mask, Face shield) had been reported by 22% (204) of them. Out of 930 participants 5% (46) responded to have systemic disease which included diabetes mellitus, hyperlipidemia & hypertension. Diabetes mellitus reported among 26 participants, Hypertension among 14, and 6 participants had both diabetes and hypertension with hyperlipidemia. Among the participants 45%(418) wore spectacles, 8% (74) were using contact lens. 24% (223) had reported to have history of allergy.

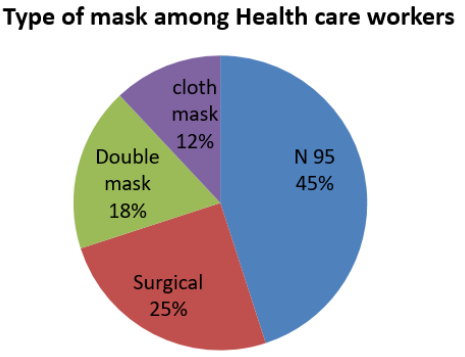

Figure 1: Type of the mask usage among the health care workers

Table 1: Association between demographic variables and dry eye symptoms

Demographic variables		Dry eye symptoms		Chi square value	P value
		Absent N=279	Present N=651		
Gender	Male	84 (30.1)	428 (65.7)	100.239	<0.001*
	Female	195 (69.9)	223 (34.3)		
Age	18-29	170 (60.9)	435 (66.8)	4.819	0.09
	30-39	63 (22.6)	141 (21.7)		
	40-50	46 (16.5)	75 (11.5)		
Mask type	N95	123 (44.1)	296 (45.5)	18.455	<0.001*
	Cloth mask	36 (12.9)	76 (11.)		
	Double mask	31 (11.1)	136 (20.9)		
	Surgical mask	89 (31.9)	143 (22)		

Table 2: Association between demographic variables and severity of dry eye

Demographic variables		Mild N=465	Moderate N=326	Severe N=135	Chi square value	P value
Gender	Male	281 (60.4)	135 (41.4)	96 (69.1)	40.98	<0.001*
	Female	184 (39.6)	191 (58.6)	43 (30.9)		
Age	18-29	303 (65.2)	198 (60.7)	104 (74.8)	38.624	<0.001*
	30-39	110 (23.7)	60 (18.4)	34 (24.5)		
	40-50	52 (11.2)	68 (20.9)	1 (0.7)		
Mask type	N95	288 (61.9)	128 (39.3)	3 (2.2)	303.82	<0.001*
	Cloth mask	58 (12.5)	42 (12.9)	12 (8.9)		
	Double mask	90 (19.4)	60 (18.4)	17 (12.6)		
	Surgical mask	29 (6.2)	96 (29.4)	103 (76.3)		

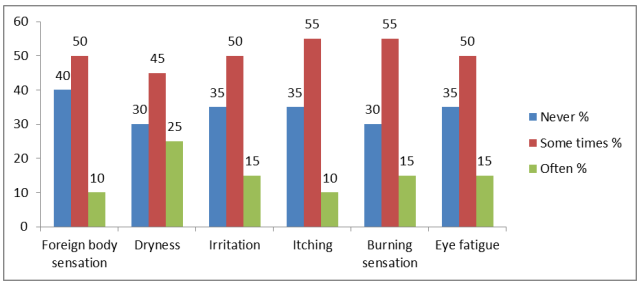

Figure 2: The dry eye symptoms reported by participants

Out of the 930 participants one –third of them never experienced DED 30% (279), 55% (512) sometimes and 15% (139) often. Around 20% (186) had reported to be having dry eye symptoms earlier with 34% (63) of them reported using eye lubricants with variable frequencies. About two-thirds 68% (126) of them had reported worsening of symptoms with mask usage. This worsening of the symptoms was noted in all the groups with previous DED regardless of the duration of mask usage. Most of the spectacle wearers 72% (301) reported fogging of their glasses while wearing mask. The dry eye symptoms reported by the participants as occurring sometimes or often had been shown in Figure 2.

The frequency of the dry eye symptoms based on the severity (from 1 to 10) as reported by the participants were 50% as mild (1- 4), 35% moderate (5 to 8) and severe 15% (> 8). The presence of dry eye symptoms was significantly associated with male gender and wearing face mask (P<0.001) (Table 1), and the severity of the symptoms were significantly associated with male sex, age 18 to 29 years and usage of N95 mask (P<0.001)(Table 2).

4. Discussion

This study shows that about two-thirds of the participants who participated had DED symptoms either sometimes or often 651 participants (70%). TFOS DEWS II Epidemiology Report shows a range of 5 to 50% occurrence,[16] while Boccardo L reported 67.9%(11) also Al-dolat et al. reported 71.7% like our study.[17] About two-thirds (68%) of the health care workers who had previous history of DED had reported to have worsening of their symptom in this study. Scalinci et al had reported similar worsening of symptoms among health care workers.[12] Though neurosensory abnormalities and decreased corneal sensation are recognized features of DED,[9,18] study by Tagawa et al. had shown corneal hyperalgesia in DED patients which might explain the increased perception of the symptoms by those who already has DED.[19]

Most studies report a higher prevalence of DED among women compared to men[11,16] however in our study we noticed male were affected significantly. Also, higher prevalence of DED is described in literature showing a linear association with age[11,13,16] in our study age 18 to 29 years were significantly affected. This could be due to

that younger healthy individual volunteered and had been in the forefront in managing the Covid infected areas, thereby had to wear mask for longer duration also PPE kit as well wherever needed. Furthermore, as there had been lockdown and social distancing,[3] to prevent the spread of pandemic, usage of digital devices among public had increased many folds, which might also play part in the higher prevalence among young individuals[20] but this aspect had not been explored in the present study.

This study reported a significant DED symptom among N95 mask users, possible explanation might be related to the loose fit around the nose. The humidity and the temperature of air inside mask can be higher than the atmospheric air as reported in studies[21,22] when these are diverted upwards through the space between the mask and the nasal bridge, leading to the symptoms of DED. Moreover, prolonged use in intensive care units leads to exhaustion of health care workers[12] while Matusiak et al[23] also Roberge et al[24] had reported wearing of surgical mask to have lower risk of adverse reactions than cloth mask or N95 due to its insignificant physiological and thermal changes.

The possible remedy may be to use tape around the nose to prevent the air from the mask reaching the ocular surface leading to DED symptoms.[25] Limitations of the study being subjective nature of the data, and presence of confounders other than age and mask type. Selection of respondents using social media platform is also a limitation as it was not subjected to random sampling.

5. Conclusion

The results of the study show prolonged mask usage is associated with symptoms of DED and worsening of the symptoms in those who had prior DED. Hence, usage of proper mask appropriately and usage of recommended lubricating eye drops by ophthalmologist for the prescribed period and follow up as advised had to be adhered for their ocular health among health care workers.

6. Source of Funding

None.

7. Conflict of Interest

None.

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