

Investigation of dry eye symptoms of medical staffs working in hospital during 2019 novel coronavirus outbreak

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Abstract

The aim of this study was to survey the prevalence of dry eye symptoms (DES) among doctors and nurses in the period of 2019, novel coronavirus (COVID-19) outbreak.

To evaluate the DES of doctors and nurses worked at front-line hospitals with protective glasses for a mean time of 4 to 6 hours, a questionnaire developed by the researchers with the Ocular Surface Disease Index (OSDI) was used. These data were evaluated using descriptive statistics and correlation test with SPSS 22.0.

The study included 13 doctors and 40 nurses, among which 16 were male and 37 were female, and the mean age of the participants was 32.43 ± 5.15 years old. According to the OSDI scores, 64.15, 24.52, 7.54, and 3.77% of the participants experienced occasional, mild, moderate, and severe DES, respectively. The factors significantly correlated with OSDI scores were age and duration of wearing protective glasses, while the duration of wearing protective glasses may be a protective factor of dry eye symptoms.

Our study showed that most of the doctors and nurses worked at the front-line of combating COVID-19 did not experience DES, while the symptoms of those who experienced DES might be improved by wearing protective glasses.

Abbreviations: COVID-19 = 2019 Novel coronavirus, DED = Dry eye disease, DES = Dry eye symptoms, DEWS = Dry eye workshop, OSDI = Ocular Surface Disease Index.

Keywords: 2019 novel coronavirus, doctors and nurses, dry eye symptoms, protective glasses

1. Introduction

At the end of 2019, a precipitate novel coronavirus (COVID-19) had emerged from Wuhan, China and spread rapidly throughout the world. As of March 10, 2020, data from the World Health Organization (WHO) have shown that more than 110,000 confirmed cases identified in 112 countries, including 80,000 cases detected in China, among which more than 3000 medical workers were confirmed as COVID-19 positive. On January 30,

2020, the WHO declared COVID-19 as the sixth public health emergency of international concern. Meanwhile, thousands of doctors and nurses, called the most beautiful ‘NiXingZhe’, joined in defending and treatment of COVID-19 at the front-line in hospitals. Some studies^[1,2] had reported recently that COVID-19 could be detected in the tears and conjunctival secretions of patients with COVID-19 pneumonia. For safety reasons, the medical staff have to wear protective glasses for preventing the person-to-person and contact transmission of COVID-19.

Dry eye disease (DED) is a common and multifactorial disease in ocular surface, which is characterized by a loss of homeostasis in the tear film, accompanying with a variable clinical presentation, including tear film instability and hyperosmolarity, ocular surface inflammation and damage, and neurosensory abnormalities.^[3] According to the 2017 Dry Eye workshop (DEWS) II,^[4] DED is becoming a severe health issue worldwide with a global prevalence ranging from 20% to 50%, which affects the patient’s ocular health, general health and well-being, quality of life, and brings socioeconomic burden at a certain extent as well. Through clinical research studies, it is suggested that multiple relative factors, such as age, gender, race, general and partial soft tissue diseases, and the use of special drugs, are tightly associated with the development of DES. At the same time, several risk factors including current alcohol consumption, prolonged computer and smartphone usage, use of contact lens, low humidity, and environmental pollution also contribute significantly to the increased prevalence of DES, whereas, these risk factors, in fact, could be controlled and limited in our daily life. Dry eye can induce various ocular symptoms, such as pain, irritation, and poor vision. These symptoms could be targeted and included for the preliminary self-evaluate screening test of DES, which is mainly based on questionnaires,^[5] such as Short

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Followed the tenets of Declaration of Helsinki and was approved by the ethics review board of Zhejiang University.

Informed consent for the publication was obtained from all subjects.

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The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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Form 12-Health Survey(SF-12), the National Eye Institute's Visual Function Questionnaire(NEI VFQ-25), Dry Eye Questionnaire (DEQ-5), McMonnies Questionnaire(MQ), Ocular Surface Disease Index (OSDI) and Saliabury Eye Evaluation Questionnaire(SEEQ).

In our study, we designed a questionnaire based on OSDI, developed by the Outcomes Research Group at Allergan Inc,^[6] to evaluate the incidence of DES among doctors and nurses with protective glasses during the period of fighting against COVID-19 pneumonia. The outcomes from this study could provide us information on ways of maintaining ocular health of medical staffs during extremely long time working in hospital under pressure and at risk of COVID-19 infection.

2. Materials and methods

A cross-sectional study was performed with a total of 53 doctors and nurses (including 16 males and 37 females) between the ages of 24 to 45 years old recruited in the First Affiliated Hospital, College of Medicine, Zhejiang University from January to March, 2020. Exclusion criteria included:

- (1) age less than 18 years old
- (2) subjects with successive working days (<10d) or duration per day (<3 h)
- (3) significant ocular and systemic diseases
- (4) use of contact lens or undergone ocular surgery (including corneal refractive surgery) within the previous 6 months
- (5) concomitant medications or topical eye drops that might influence the ocular surface
- (6) cigarette or alcohol use

The isolation wards for COVID-19 were settled in a separate space with the following conditions: an average humidity of 55%, an average temperature of 20°C, and with no air conditioner. The floor and equipment were daily sterilized with 2500 mg/L chlorine-containing disinfectant for more than 30 minutes by 3 times. The protocol followed the tenets of Declaration of Helsinki, and it was approved by the Ethics Review Board of Zhejiang University.

The subjects were surveyed for age, gender, division of work, DES (photophobia, foreign body sensation, ache, blurred vision), the duration of using protective glasses, history of corneal refractive operation, use of contact lens, chronic diseases, medications prescribed, the average time spent on using computer and smartphone per day, depression caused by dry eye and desire for treatment, with a questionnaire developed based on OSDI.

The OSDI was assessed on a scale ranging from 0 to 100, with higher scores representing greater disability. Scores ≥ 13 indicate symptomatic dry eye, in which 13 to 22, 23 to 32, and 33 to 100 indicate mild, moderate, and severe presence of DES, respectively.^[7]

The data were analyzed using SPSS22.0 package software. Chi-squared test was used to analyze categorical variables, while the correlation between parameters was checked using the Spearman and Binary logistic regression test. Differences with $P < .05$ were considered statistically significant.

3. Results

The study consisted of 53 subjects, including 24.53% of doctors and 75.47% of nurses, among which 30.19% were males and 69.81% were females. Their average age was 32.43 years old,

their average time spent on computer and smartphone was 6.62 ± 0.49 hours per day, and their average duration of wearing protective glasses was 5.06 ± 0.80 hours per day. Two subjects who had history of corneal refractive surgery for half a year and 2 years, with a duration of 6 hours wearing protective glasses at isolation ward, had OSDI scores of 5 and 2, respectively. The distribution characteristics according to OSDI scores are shown in (Table 1), including 24.52% are mild cases, 7.54% are moderate cases, 3.77% are severe cases, and 64.15% are occasional DES cases.

The Spearman and logistic regression test results (Table 2, Fig. 1) exhibited a significantly positive correlation between the age and the OSDI scores($r = 0.415$), indicating an increasing risk of DES with older age. On the other hand, significantly negative correlation was found between the OSDI scores and the duration of wearing protective glasses($r = -0.646$), which indicates DES could be alleviated with prolonged time of wearing protective glasses.

4. Discussion

The prevalence of DED has become higher with the popularization of electronic devices recently. The questionnaire is an important self-evaluate way for the preliminary screening of DED, which can evaluate the DES for screening and diagnosis, as well as assess the severity, related factors, and feasible treatment. The OSDI questionnaire is commonly used in clinical studies, which includes 6 questions on visual function, 3 questions on ocular symptoms, and 3 questions on environmental factors. Compared with the SF-12 and MQ, OSDI questionnaire has relatively higher sensitivity of 60% and specificity of 79%.^[8]

In our study, we found that 19 (35.84%) subjects experienced DES, among which 13 (24.52%) had mild, 4 (7.54%) had

Table 1
Distribution characteristics according to OSDI score. (Chi-squared test).

Variable	Normal (0–12 points) N (%)	Symptomatic (≥ 13 points) N (%)	P
Age (yrs)			
24–34y	26 (76.5)	14 (73.7)	.821
35–45y	8 (23.5)	5 (26.3)	
Gender			
Male	8 (23.5)	8 (42.1)	.158
Female	26 (76.5)	11 (57.9)	
Division of work			
Doctors	8 (23.5)	5 (26.3)	.821
nurses	26 (76.4)	14 (73.7)	
Protective glass use (hours/per day)			
4–5h	19 (55.9)	12 (63.2)	.606
$\geq 6h$	15 (44.1)	7 (36.8)	
Computer and smartphone use (hours/per day)			
1–3h	3 (8.8)	0 (0)	.507
3–5h	11 (32.4)	7 (36.8)	
5–7h	9 (26.5)	7 (36.8)	
$\geq 7h$	11 (32.4)	5 (26.3)	
Anxiety or depression			
Yes	2 (5.9)	4 (21.1)	.095
No	32 (94.1)	15 (78.9)	
Desire for treatment			
Yes	16 (47.1)	4 (21.1)	.061
No	18 (52.9)	15 (78.9)	

Table 2
Correlation characteristics between the 5 factors and OSDI score.

	Age	Gender	Division	Time of computer and smartphone use	Duration of wearing protective glasses
OSDI score	0.415**	0.164	-0.026	0.209	-0.646**

Spearman test, **means $P < .01$; * means $.01 < P < .05$.

moderate, and 2 (3.77%) had severe DES. No significant difference among OSDI score categories, in terms of age, gender, division of work, time of using computer and smartphone, duration of wearing protective glasses, sensation of anxiety or depression, and desire for treatment, was detected.

A large number of studies^[9-16] have shown that the major risk factors for DED include female gender, older age, medication intakes for treatment of systemic diseases, prolonged using of visual display, corneal refractive surgery, and the use of contact lens. In our study, we revealed that older age was significantly associated with a higher risk of DES, which was consistent with the findings reported by Stapleton et al.^[4] Surprisingly, we also found that wearing protective glasses was correlated with a lower risk of DES among the participated medical staff. We speculate that the significantly negative correlation between the OSDI scores and the duration of wearing protective glasses might be explained by its similar effect as moisture chamber spectacles,^[17,18] which has been suggested as a safe and promising alternative treatment for DED. Furthermore, the water vapor, generated in the protective glasses due to long time (4 – 6 hours) continuous wearing of N95 surgical mask, might contribute to the improvement of DES as well. As for ophthalmologists who do not wear protective glasses as a routine equipment when they examine patients at ordinary times, especially for posterior segment ophthalmologists who examine the fundus for patients

at a near distance and complete retinal laser photocoagulation for a long time, whether wearing the protective glasses could be a routine require needs further studies involving more centers and participants.

However, our study has several shortcomings and limitations.

- (1) We surveyed the DES using the pre-designed OSDI questionnaire which did not include several other examinations of DED, such as tear break-up time (TBUT), Schirmer I test without anesthesia, and corneal fluorescein staining for various subjective and objective factors. These factors could be informative for the extremely busy medical staff as well during the special period of fighting against COVID-19 pneumonia in Zhejiang province.
- (2) There is statistical disparity on the gender and the division of work, since a majority of the participated medical staff were nurses and females.
- (3) The sample size was also limited due to the involvement of merely a special medical team.

5. Conclusion

Our results suggest that wearing protective glasses may not only protect the medical staff from COVID-19 infection, but also improve their DES to a certain extent.

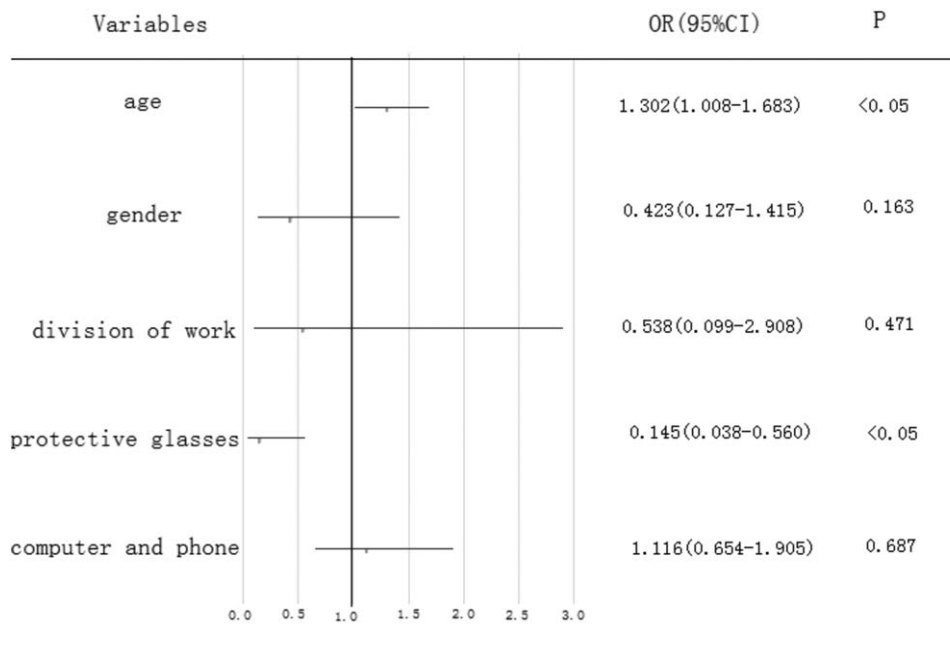


Figure 1. Regression characteristics between the 5 factors (age, gender, division of work, duration of wearing protective glasses, the time of computer and smartphone use) and dry eye symptoms (Binary logistic regression test).

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Author contributions

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All authors read and approved the final manuscript.

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