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Wearing Eyeglasses and transmission of Coronavirus Disease 2019: A Cross-Sectional Study in Saudi Arabia

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Abstract

Background: *Wearing a face mask can reduce the risk of COVID-19 infection through the nose and mouth. But it does not protect the eyes from getting the viral infection through respiratory droplets. Limited studies are available on the relationship between eyeglasses wearing and the risk of COVID-19 infection. Hence, we conducted this study to assess the relationship between daily wear of eyeglasses with susceptibility to COVID-19 among the Saudi population.*

Methods: *This is a cross-sectional study that included inpatients with COVID-19 aged from 10 to 90 years old at King Faisal Specialist Hospital & Research Centre, from April 2021 to June 2021. The proportions of daily eyeglasses wearers among COVID-19 patients were compared with those of the normal population from previous studies.*

Results: *A total of 206 patients with COVID-19 were enrolled in the study; of them, 144 were females **(**69.9%**)** and 62 were males **(**30.1%**)**. Sixty patients out of 206 with COVID-19 wore eyeglasses all the time **(**29.1%**)**. The proportion of people who wore eyeglasses, based on previous studies, ranged from 45.8% to 74.6%, which was much higher than the proportion of patients with COVID-19 who used eyeglasses in the present study.*

Conclusion: *The number of normal persons who used eyeglasses for extended daily periods was more than that in the COVID-19 group, indicating that daily wearing of eyeglasses has reduced the exposure to the COVID-19 infection.*

Keywords: *COVID-19, eyeglasses, spectacles, cross-sectional study, Saudi Arabia.*

Introduction

Coronavirus disease 19 **(**COVID-19**)** is an infectious disease caused by severe acute respiratory syndrome coronavirus 2 **(**SARS-Cov-2**)**, with a high potential of spreading and infecting humans worldwide **(**1**)**. Since January 2020, when the virus was identified in humans, the literature on COVID-19 has grown exponentially, and the novel coronavirus outbreak is highly contagious **(**2**)**. The first reports of COVID-19 cases among the Middle East countries were from both Iran and the United Arab Emirates, post the Wuhan coronavirus outbreak in China **(**3**)**. The Middle East countries have reacted in a pre-emptive approach and ensured that the curve of the infection is flattened.

Wearing a face mask properly by a healthy person can reduce the risk of virus infection via droplets and aerosols into the nose and mouth, during coughing, sneezing, or talking **(**4, 5**)**. But wearing a face mask does not protect the eyes from getting the viral infection through respiratory droplets and self-inoculation. The conjunctival mucosa may be the initial site of infection because it is directly exposed to external pathogens, where angiotensin converting enzyme- 2 **(**ACE-2**)** receptors are present **(**6**)**. SARS CoV-2 virus enters host cells via the ACE- 2 receptors **(**7, 8**)**. Besides, the nasolacrimal duct may be another route that can transfer the virus from the conjunctival sac to the nasopharynx **(**9**)**. The mucosa of the conjunctival sac is in continuation with that of the upper respiratory tract through the nasolacrimal duct **(**4**)**.

At the beginning of the COVID-19 pandemic, a previous study in the Hubei Province, China, showed that among a group of 276 patients, the proportion of patients with COVID-19 who routinely wore eyeglasses more than 8 hours per day was smaller than in the general population. Consequently, eyeglasses wearing more than 8 hours per day may protect against COVID-9 infection, possibly because wearing eyeglasses can prevent touching their eyes, thus avoiding transferring the virus from the hands to the eyes **(**10**)**. Presently, many COVID-19 guidelines state the need to pay attention to preventing infections through the eyes **(**11**)**. In this present, study we aimed to find out the relationship of daily wear of eyeglasses with susceptibility to COVID-19 among the Saudi population.

Methods

Design, setting, and participants

We employed this cross-sectional study at King Faisal Specialist Hospital & Research Centre, Riyadh, Saudi Arabia from April 2021 to June 2021. We included patients aged 10 to 90 years, Saudi citizens, and residents, with the admission criteria of a diagnosis of COVID-19. The diagnostics and clinical

classification of COVID-19 were based on the fifth edition of Chinese COVID-19 diagnostic guidelines **(**12**)**. Throat swab samples were obtained from patients at admission and tested using real-time reverse transcriptase–polymerase chain reaction **(**PCR**)** assays to identify COVID-19 infection.

Sample size calculation

The sample size was calculated with an assumption of a population proportion of 20% with an absolute precision of ± 5% and a confidence level of 95%. A sample of 206 patients was obtained.

Ethical consideration

The study was conducted according to the declaration of Helsinki principles. The Research Ethics Committee approved the study protocol at King Faisal Specialist Hospital & Research Centre, Riyadh, Saudi Arabia. Informed consent was obtained from each participant before proceeding to fill out the data collection form.

Questionnaire and data collection

We used a standard Arabic and English questionnaire **(**Appendix 1**)**, which was developed by a multidisciplinary group of scientists from the hospital. Following a structured review of the literature, a draft survey was created, which was reviewed and edited by the researchers of the project. The questionnaire has two parts: Part "A" consisted of personal questions including age, gender, education, and nationality. Part "B" consisted of details about the wearing glasses and the length of time that they wore glasses during daily activities. Part "C" consisted of awareness-related questions. A pilot survey was conducted to confirm the usefulness and feasibility of the questionnaires.

The questionnaire was prepared using SurveyMonkey® online instrument and sent to the participants **(**13**)**. All filed data was protected by an enhanced security system **(**Secure Sockets Layer, SSL, a protocol for encrypting information over the Internet**)**. The questionnaires were completed following the "checklist for reporting results of internet e-surveys, CHERRIES" **(**14**)**. The survey used a skip logic pattern, allowing participants to avoid certain sections according to their responses to the preceding questions. Questions were presented in a fixed order and most of them were close-ended; however, an optional free-text box was supplied in some of the questions to avoid missing unexpected information. Most of the questions were designed to be answered compulsorily. To estimate the

population myopia and glasses rate, we extracted data from previous research on the general population.

Statistical Analysis

Data analysis was carried out using Statistical Package for Social Sciences version 26 (SPSS Inc., Chicago, IL, United States). Dichotomous data were expressed as frequencies and percentages. In addition to the descriptive analysis, the chi-square test (for categorical variables) was performed to identify variables associated with the dependent variables. A p-value of <0.05 was considered statistically significant.

Results

As shown in the Table, a total of 206 patients with COVID-19 were enrolled in the study; of them, 144 were females (69.9%) and 62 were males (30.1%). Sixty-five patients aged from 41 to 50 years old (31.6%) and 64 aged from 31 to 40 years old (31.1%). The participants were 57.8% college graduates, 21.4% postgraduates, 14.6% below college, and 6.3% college students. Most participants were Saudi citizens (n= 157, 76.2%).

One hundred and twelve patients (54.4%) do not have proper vision. One hundred and seven patients used spectacles (51.9%) and three used contact lenses (1.5%). Sixty patients wore eyeglasses all the time (29.1%), 34 patients wore eyeglasses only while reading (16.5%), and 26 patients wore eyeglasses occasionally (12.6%). One hundred and eighteen patients (57.3%) used sunglasses; of them, 57 (27.7%) used them always when going out and 61 (29.6%) used them occasionally.

One hundred and twenty-six patients (61.2%) used the facemask to avoid COVID-19 and 50 participants (38.8%) took other precautions, such as sterilization (13.6%), handwashing (3.4%), social distancing (1.9%), gloves (0.5%), and niqab (0.5%). Sixty-four participants (31.1%) believed that wearing glasses may protect them from Coronavirus.

The results from a previous cross-sectional study showed that the rate of myopia among university students in Saudi Arabia was 53.5%. Out of the respondents to the question of vision aid usage, 74.6% were using glasses and 10% were using contact lenses (15). Another study showed that the rate of myopia was 66.7% and 45.8% of participants used spectacles (16). The myopia rate in the previous studies is higher than the 29.1% among our patients with COVID-19.

Males were using other precautions than facemask less than females **(**OR= 0.39, 95% CI [0.20, 0.76], p=0.006, Figure 1**)**. While Saudi citizens were using other precautions more than non-Saudi residents **(**OR= 2.4, 95% CI [1.14, 4.86], p= 0.02, Figure 2**)**. No other significant results were found with other variables.

Age	**Frequency, n= 206 (%)**
10 - 20	3 **(**1.5%**)**
21 - 30	31 **(**15.0%**)**
31 - 40	64 **(**31.1%**)**
41 - 50	65 **(**31.6%**)**
51 - 60	34 **(**16.5%**)**
61 - 70	9 **(**%**)**
Gender	
Female	144 **(**69.9%**)**
Male	62 **(**30.1%**)**
Education	
Below college	30 **(**14.6%**)**
College Student	13 **(**6.3%**)**
College Graduate	119 **(**57.8%**)**
Postgraduate	44 **(**21.4%**)**
Nationality	
Non-Saudi	49 **(**23.8%**)**
Saudi	157 **(**76.2%**)**
Do you have proper vision?	
No	112 **(**54.4%**)**
Yes	94 **(**45.6%**)**
Do you use spectacle?	
No	96 **(**46.4%**)**
Yes	107 **(**51.9%**)**
I use contact lenses	3 **(**1.5%**)**
Duration of wearing spectacles	
All the time	60 **(**29.1%**)**

Only while reading	30 (14.6%)
Occasionally	19 (9.2%)
Do you use sunglasses?	
No	88 (42.7%)
Yes	118 (57.3%)
Duration of wearing sunglasses	
Always when go out	57 (27.7%)
Occasionally	61 (29.6%)
Are you taking any precautions other than the face mask to avoid the COVID 19?	
No	126 (61.2%)
Yes	80 (38.8%)
Does wearing glasses protect you from Coronavirus?	
No	142 (68.9%)
Yes	64 (31.1%)

Table: Patients responses to the survey.

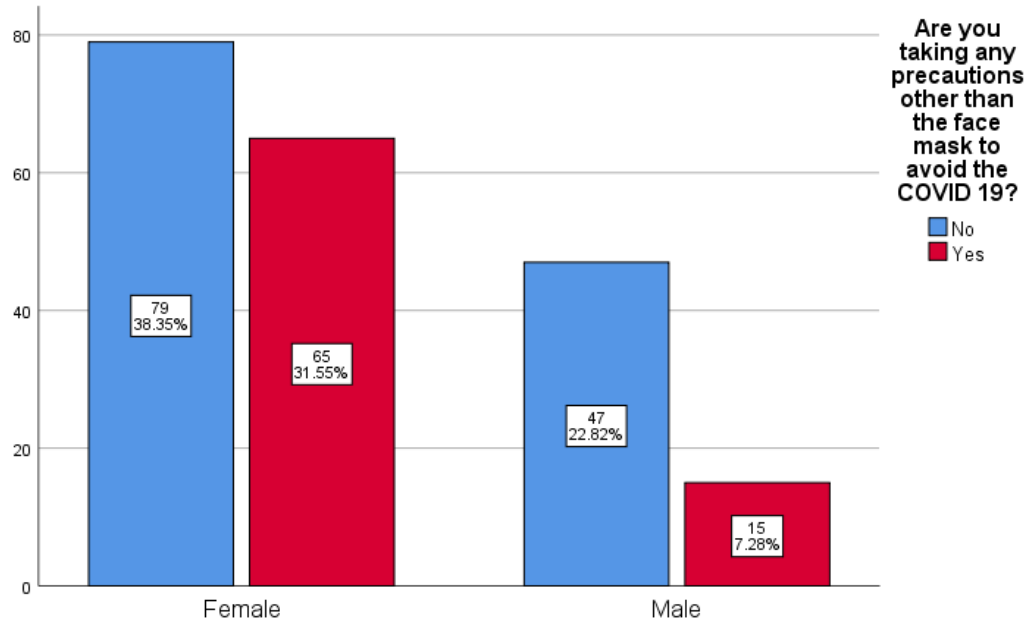

Figure 1: Bar chart showing the comparison between males and females using other precautions than face mask.

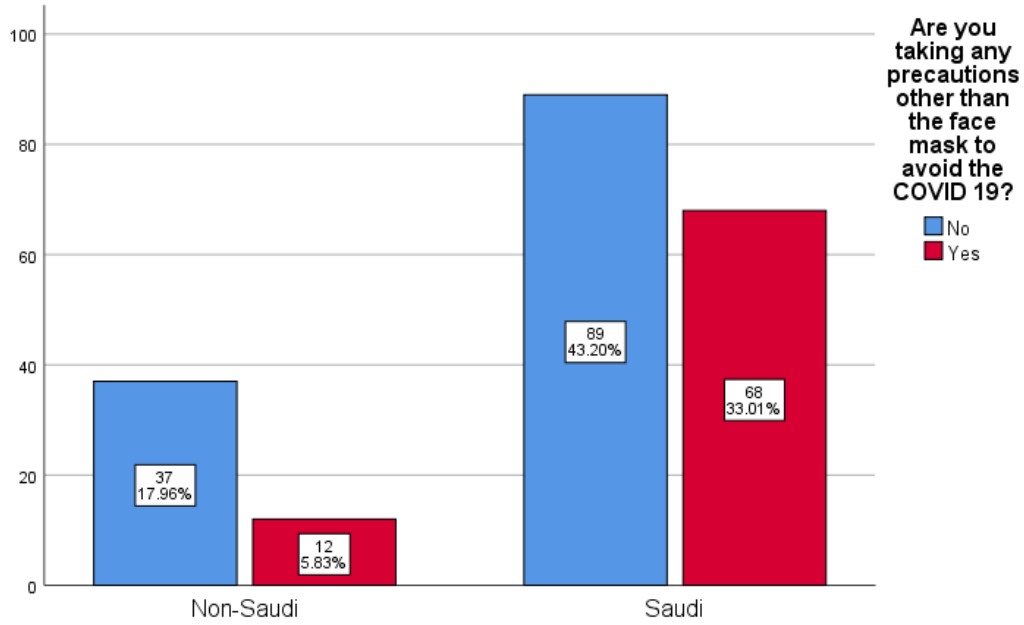

Figure 2: Bar chart showing the comparison between Saudi and non-Saudi using other precautions than face mask.

Discission

This is the first research in Saudi Arabia and the Arab region to evaluate the association between wearing eyeglasses and COVID-19 infection. We hypothesized that eyeglasses enable patients to prevent touching their eyes, therefore decreasing transmitting the virus from the hands to the eyes **(**17**)**. SARS-CoV-2 penetrates the human body through the ocular surface, where the SARS-CoV-2 angiotensin-converting enzyme 2 receptors are present **(**18**)**. In addition, SARS-CoV-2 may be transmitted to the nasal and nasopharyngeal mucosa due to continuous tear irrigation of the lacrimal duct, resulting in chest infection **(**19**)**. The prevalence of ocular manifestations ranged from 1% to 12% of patients with COVID-19 infection **(**20**)**. SARS-CoV-2 was found in tears or the conjunctival sacs of patients with COVID-19, and some ophthalmologists were infected during routine treatment **(**21, 22**)**. Thus, the eye offers a window through which SARS-CoV-2 can penetrate the human body **(**23**)**.

A previous study by Zeng et al reported that eyeglasses prevent persons from touching their eyes, thus reducing the transfer of the virus from hands to eyes **(**10**)**. Similarly, another study by Navaratnam et al reported a significant reduction in the risk of COVID-19 infection among those who always wear glasses **(**24**)**. Further, a face shield can protect the mouth, nose, and eyes from the virus, which can be transmitted by respiratory droplets, or by touching the face or eyes with virus-laden hands **(**25**)**. Despite

eyeglasses do not safeguard the eye as a face shield, they may work as a partial barrier and diminish viral dose, comparable to what has been described for cloth masks (25). In addition, the eye was seen to protect against other respiratory viruses, including influenza and respiratory syncytial virus, which are infectious in exhaled aerosol particles (26, 27).

Spectacles can protect against COVID-19 infection by several mechanisms. Previous research has reported that the average number of eye touching in normal people is about 10 times per hour and wearing glasses may decrease the frequency of contaminated fingers with SARS-CoV-2 touching the eyes (28). Glasses may exhibit a barrier to the direct deposition of viruses on the eyes. Deposition of SARS-CoV-2 on the eye may also occur directly from the impaction of droplets produced by coughing, sneezing, and talking.

Conclusion

The prevalence of inpatients with COVID-19 who wear eyeglasses for extended daily periods was less than that of the general population, indicating that daily wear of eyeglasses was related to less exposure to COVID-19 contamination. These results show that the eye may be an important window for COVID-19 infection, and more awareness should be given to preventive measures such as frequent hand washing and avoiding touching the eyes as well as wearing face masks and practicing social distancing. Future large multi-centre studies are required to explain the reasons that wearing eyeglasses may reduce susceptibility to COVID-19.

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