



# Coronavirus disease pandemic and dry eye disease: A methodology concern on the causal relationship

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## Dear Editor

Digital screen use reduces tear breakup time, increases ocular surface staining, and causes meibomian gland dysfunction, all of which contribute to dry eye disease (DED) [1]. A pre-pandemic cross-sectional study found a high prevalence of DED among young to middle-aged visual display terminal users with a female preponderance [2]. Inomata et al. found that users with screen exposure for more than 8 h/day had a significantly higher incidence of symptomatic DED than those with screen exposure for less than 4 h/day [3].

Coronavirus disease (COVID-19), caused by severe acute respiratory syndrome coronavirus 2, emerged in December 2019 in Wuhan, China [4]. Increased usage of visual display terminals during lockdown worsened DED symptoms in patients [5]. Napoli et al. estimated a global increase in DED prevalence during the pandemic and termed it “quarantine dry eye” [6]. An increasing number of people have been using digital devices to work from home, attending online classes, and wearing masks since the COVID-19 outbreak. These factors may contribute to the development of DED and asthenopia [7-9]. In an online survey during the COVID-19 pandemic, 10.3% of students reported the development or deterioration of ocular discomfort, with 57% having a pathologic ocular surface disease index (OSDI) score [8]. Respondents with pre-existing DED reported worsening of DED symptoms during the pandemic [10].

Moreover, wearing masks can cause DED. A plausible mechanism is air leakage leading to tear evaporation and eye discomfort, as described in the context of continuous positive airway pressure treatment [8, 11]. In a previous study, healthcare providers wearing a face mask for more than 6 h/day had a significantly higher OSDI score than did healthy individuals [12]. Krolo et al. found that the OSDI score was higher in participants wearing face masks for 3–6 h/day than in those wearing face masks for less than 3 h/day, with a female preponderance. Patients with a history of DED showed greater disturbances during the mask-wearing period than those with no history of DED, irrespective of the daily mask wearing duration [13].


Based on the literature, a causal relationship between DED and COVID-19 is plausible. However, studies are lacking with efficient designs and robust conclusions investigating whether this increased incidence and severity of DED during the COVID-19 pandemic is causal or coincidental. The cause-and-effect relationship cannot be confirmed with cross-sectional studies because establishing a temporal sequence is impossible, and cohort studies are preferred [14]. Thus, the current literature suggests that establishing a causal relationship between the COVID-19 pandemic and DED remains challenging. The increased severity and incidence of DED during the COVID-19 pandemic should be investigated using clinical trials and longitudinal studies. Furthermore, confounding factors, such as age, sex, systemic comorbidities, pre-existing ocular disease, and history of ocular and systemic drugs, in patients with DED should be controlled during statistical analyses before causation is suspected [15] (Figure 1). Future studies addressing these limitations are warranted to confirm the causal relationship between COVID-19 and DED.

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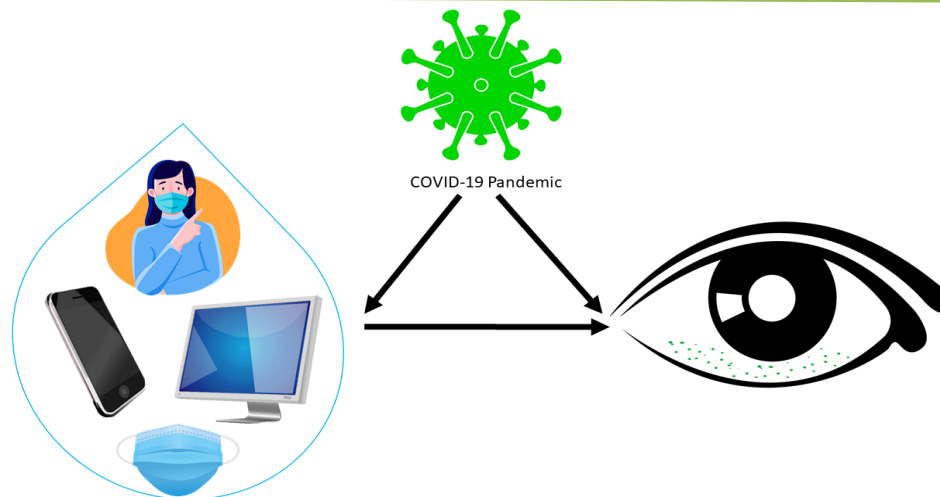


Figure 1. Studies on the worsening or development of dry eye disease (DED) during the coronavirus disease (COVID-19) pandemic should control for confounding factors, such as usage of visual display terminals and mask-wearing duration, before causation is suspected. Future studies addressing these and other plausible confounding factors, such as age, sex, systemic comorbidities, pre-existing ocular disease, and history of ocular and systemic drugs, in patients with DED are warranted on a clinical trial basis to confirm a causal relationship between the COVID-19 pandemic and DED.

## ETHICAL DECLARATIONS

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**Conflict of interests:** None.

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