The possibility of COVID-19 transmission from eye to nose

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The Coronavirus Disease 2019 (COVID-19), caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), is not only spreading throughout China but has reached more than 20 countries and has already posed threats to global health and economy. So far, the number of people infected in China has climbed to more than 70,000. Of them, at least 3019 healthcare workers have been infected. However, the specific causes of infection among healthcare workers in hospital environments are unclear. It has been confirmed that COVID-19 is mainly transmitted through both respiratory droplets and direct contact. Aerosols are another possible transmission route requiring attention. In February 2020, a report in The Lancet raised the issue that ocular surfaces may be a potential target for SARS-CoV-2 invasion (Lu et al. 2020). However, two recent studies do not fully support this assumption (Li et al. 2020; Zhou et al. 2020, unpublished paper). The reason is that although a small number of COVID-19 patients have conjunctivitis, not all of them show positive test of SARS-CoV-2 nucleic acid in conjunctival sac swabs. In addition, some patients did not have conjunctivitis despite positive test results for the SARS-CoV-2 nucleic acid in their conjunctiva sac swabs (Dr. Yanping Song from Wuhan City, China, the outbreak area in China, unpublished paper). Interestingly, the medical history of the clinical physicians with COVID-19 revealed that neither of them used eye goggles when examining (physician 1) and intubating infected patients (a high-risk procedure to produce aerosol) (physician 2).

Studies show that, like the severe acute respiratory syndrome coronavirus (SARS-CoV) that caused SARS, SARS-CoV-2 binds to human angiotensin-enzyme II (ACE2), using it as a cell entry receptor to invade respiratory and lung epithelium through the spike (S) protein (Zhou et al., 2020a, 2020b). However, ACE2 is mainly expressed in posterior tissues of the eye, such as the retina and the retinal pigment epithelium, not in the human conjunctival and corneal epithelium (Choudhary et al. 2017). We presume that these previous studies ignored the characteristics of lacrimal drainage. Tears are constantly renewed by the lacrimal system. Therefore, we speculate that the virus enters the tears through droplets, which may pass through the nasolacrimal ducts and then into the respiratory tract. Combined with all this information, we assert that, when coming into contact with confirmed or suspected cases of COVID-19, healthcare workers should wear eye safety goggles. This should become one of the critical measures for preventing the spread of COVID-19. The authors hope this topic is helpful for work in the outbreak area.

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Editor,

S since the end of 2019, an outbreak of a novel coronavirus (SARS-CoV-2) originating in the Chinese city of Wuhan has rapidly spread across the world. The disease is designated COVID-19, an abbreviation for coronavirus disease 2019 (World Health Organization 2020a, 2020b). While most patients experience mild sickness or are asymptomatic, COVID-19 can
lead to severe respiratory illness and even death (Wu & McGoogan 2020). In February 2020, the coronavirus epidemic reached Norway; ground zero was the Department of Ophthalmology at Oslo University Hospital (OUH). The outbreak practically brought all clinical activity to a 2-week standstill. We present a summary of the experience and review potentially modifiable factors.

Week 8 is the annual winter holiday in Oslo, and at its end, many citizens return from vacation abroad. On February 24th (Monday, Week 9), the Norwegian Institute of Public Health (NIPH) published new travel advices in the form of a news bulletin on their homepage. It stated that limited information suggested COVID-19 was spreading in northern Italy, particularly the Lombardy region; travellers returning from areas with risk of contagion were advised to seek medical attention if developing respiratory symptoms within 14 days (Norwegian Institute of Public Health 2020). On February 25th, a physician from the department, who had returned from holiday in northern Italy, developed mild symptoms of respiratory tract infection. The individual had not stayed in any of the areas on the NIPH list and was deemed not to fulfill criteria for SARS-CoV-2 testing. Consequently, the physician completed the workday but called in sick the following day because of exacerbation (fever and myalgia). On February 27th, the individual insisted on testing for SARS-CoV-2 and turned out to be positive. Meanwhile, other physicians at the department were developing similar symptoms, and by the end of week 9, five cases of COVID-19 were confirmed, all of whom were vitreoretinal surgeons. The next week, testing confirmed COVID-19 in a ward nurse, who had not been at work since February 27th. The nurse remains the final affected subject from the department. More than a hundred employees (including several with symptoms of respiratory tract infection) were also tested SARS-CoV-2 negative, and no patients acquired COVID-19 in the department.

By the end of week 9, the hospital management at OUH had declared a state of emergency. The six COVID-19 cases were placed in home isolation, and employees, students, and patients who had been in close contact with them were placed in home quarantine. All elective appointments were cancelled. The surgical retina service was shut down, and patients requiring surgery were sent by ambulance plane to other regional centres. The outbreak also attracted considerable media attention, including breaking news headlines and live updates. Following a thorough decontamination, the department will reopen on March 13th, resuming normal activity after 2 weeks. Delayed treatment courses will require extra efforts for months to come.

In an unfolding outbreak, coordinating preventive actions and distributing knowledge are particularly challenging. The responsibility must lie with national health authorities; appropriate countermeasures and formal channels of communication are crucial. A COVID-19 epidemic in northern Italy coinciding with citizens returning from winter holiday clearly posed a risk of further spread of the disease. Two weeks prior, World Health Organization had published key considerations for repatriation and quarantine of travellers in relation to the outbreak, but the strictest measures had not been adopted by Norwegian authorities at the time (World Health Organization 2020a, 2020b). Moreover, the NIPH advice regarding travellers returning from specific regions of northern Italy was issued only one day prior in the form of a homepage message, in other words not actively distributed to health services. Without knowledge of further spread of the virus in Italy, mild upper respiratory tract symptoms were ignored (many employees with similar symptoms did indeed not suffer from COVID-19). These observations raise the question as to whether modest preventive measures and warnings were disproportionate to an imminent threat to public health.

Fortunately, the infected staff members quickly recovered from COVID-19, and no patients were infected. The true burden was the extensive efforts made to confine the outbreak. To a larger degree than the disease itself, the negative health consequences can be attributed to delayed ophthalmic treatment. A separate building houses the Department of Ophthalmology at OUH. A single site containing specialized healthcare services to a large population is especially vulnerable, not only to an infectious outbreak but also to other setbacks, such as natural disasters or terrorism. Inability to perform retinal surgery or more than a hundred planned intravitreal injections per day, for instance, was a devastating experience. Risk spreading, for example a satellite centre for intravitreal injections, could have limited the negative consequences and should be considered as a precaution when organizing future healthcare services.

In conclusion, the COVID-19 outbreak requires coordinated efforts at both national and international level. Preventive measures should be resolute and proportionate to the public health threat.

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