

# Impact of COVID-19 on Ophthalmology and Future Practice of Medicine

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The World Health Organization declared the Coronavirus Disease 2019 (COVID-19) caused by the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) a world pandemic on March 11, 2020. As of May 27, 2020, 213 countries were affected with >5.5 million infected and >0.35 million deaths worldwide. The overall case fatality rate (CFR) of COVID-19 is around 6.36%, trailing that of Severe Acute Respiratory Syndrome (SARS) (9.6%) and Middle East Respiratory Syndrome (MERS) (34.4%).<sup>1</sup> Nonetheless, with a mean basic reproduction number ( $R_0$ ) estimated to be approximately 2.35 (95% confidence interval: 1.15 – 4.77),<sup>2</sup> it has higher infectivity and transmissibility than both Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV) ( $R_0 = 0.95$ ) and Middle East Respiratory Syndrome Coronavirus (MERS-CoV) ( $R_0 = 0.91$ ).<sup>1</sup> The impacts of COVID-19 on the general population and health care system worldwide should not be neglected given the virus's capability to generate a large number of cases in the context of a pandemic.

Breazzano et al<sup>3</sup> reported that ophthalmology was among the specialties with the highest proportion of residents with confirmed COVID-19 across all residency programs in New York. Concerns for the possible increased risk of infection in ophthalmic practice require extra precautionary measures. Droplets, close contact, and aerosols are the most common routes of COVID-19 transmission.<sup>4</sup> Ophthalmologists are at heightened risk of infection due to exposure to viral particles through these routes in routine face-to-face ophthalmic clinical examination by slit lamp or direct ophthalmoscope during which they are in close proximity to patients. Although uncertainties prevail, we believe we could win the battle against COVID-19 by taking reference from the valuable experiences derived from SARS and the current COVID-19 outbreaks in the protection of both patients and co-workers in ophthalmic practices.<sup>5,6</sup>

COVID-19 has as much impact on other disciplines of medicine as on ophthalmology. In a time of pandemic, we tend to maintain social distancing and avoid crowded areas and clustering, especially clinics or hospitals, to avoid the risk of infection. With the rapid advancement of artificial intelligence and the emergence of fifth-generation (5G) mobile network, smartphone-based apps, telemedicine, and online consultations would likely gain popularity as a modality of innovative and supplementary medical service.<sup>7–12</sup> Physical face-to-face contact can be minimized by virtue of these technologies resulting in less risk of infection. COVID-19 could be the spark to facilitate the integration of online medical services into routine medical practices. Some institutions around the world, including those in the Asia-Pacific regions such as China and Hong Kong, are actively implementing and refining their online platforms to maintain clinical services while the pandemic ensues. Governments and institutions may take advantage of their advanced technologies and the demand for medical services at safe distances during this period to turn the challenges brought by COVID-19 into opportunities.

Despite the relentless efforts of scientists and physicians, there is currently no definitive cure for COVID-19. A multitude of vaccine candidates is in the development pipeline worldwide, with some in the phases of animal and human trials. However, experts still expect at least 12 to 18 months before an effective vaccine is ready. Until then, effective implementation of public health interventions remains indispensable to mitigate the outbreak, flatten the peak of the epidemic, and prevent the health care system from being overwhelmed by rapid surges of cases.

Deep Knowledge Group, a consortium of commercial and nonprofit organizations based in various major cities around the globe, evaluated 130 qualitative and quantitative parametric variables grouped under 6 broad and top-level categories (quarantine efficacy, government efficiency of risk management, monitoring and detection, healthcare readiness, regional resiliency, and emergency preparedness). An interesting observation was made from their COVID-19 regional safety assessment: 6 countries in the Asia-Pacific region (Australia, China, Japan, New Zealand, Singapore, and South Korea)

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were ranked among the top 10 regions with the highest COVID-19 Safety Ranking.<sup>13</sup> China, the initial epicenter of the outbreak, and some of the geographically adjacent regions such as Hong Kong, Taiwan, and Singapore were also among the entire list of the top 20 regions with the highest safety ranking. On the other hand, a survey jointly conducted by Toluna and Blackbox Research in Singapore measured the sentiments of citizens from 23 countries toward their governments' responses to COVID-19 across 4 main indicators (corporate leadership, national political leadership, media, and community), wherein China tops the index score with the most respondents satisfying with its COVID-19 crisis response.<sup>14</sup> These results are likely due to strict and aggressive measures most governments in the Asia-Pacific regions have adopted in response to the pandemic. These included strict quarantine and isolation to the scale of a *cordon sanitaire*, social distancing, liberal laboratory testing, advocacy of personal hygiene practice such as hand hygiene, cough etiquette, and mass masking.<sup>15</sup> The synergistic effect of these nonpharmaceutical interventions contributed to Hong Kong's success in reducing the spread of COVID-19 and could be adopted in other nations across the world.<sup>16</sup> To achieve maximal efficacy of curbing the outbreak, citizens' understanding and willingness to abide by the policies issued by relevant authorities is also critical until effective treatments and vaccines become readily available so that their normal lives could resume.

Some governments have considered adopting the herd immunity strategy by allowing enough people to be infected and eventually develop immunity against the virus, so that it will eventually stop spreading throughout the population. We have reservations regarding herd immunity as a mitigation strategy. The threshold for achieving herd immunity varies and is determined by several variables including the  $R_0$ . The current estimated  $R_0$  of SARS-CoV-2 to be around 2, at least 60% of the population would need to be infected and have protective immunity for such strategy to work.<sup>1,17</sup> Considering a population of 66.65 million in the UK, nearly 40 million Brits need to be infected. With a CFR of around 6.36%, this would result in approximately 2.54 million deaths. The seemingly low CFR of SARS-CoV-2 is magnified into enormous impacts if the coronavirus outbreak is allowed to propagate unchecked. Furthermore, should there be an underestimation of the current  $R_0$  or mutations in the process of uncurbed spread, the threshold to achieve herd immunity and CFR could be higher. The resulting outcome would be beyond imagination.

In this hard-fought battle between humanity and the coronavirus that is yet to be triumphed, we would like to express our deepest gratitude to all frontline health care workers around the globe who sacrificed their personal interests or even lives to fight against COVID-19. Their professionalism, perseverance, compassion, and courage deserve our utmost respect. Their act of valor also reminds us of the history of the "1665 plague outbreak," which took the lives of >70% of villagers in the Eyam village, England.<sup>18</sup> As the disease spread, William Mompesson, the rector of the village, in conjunction with a clergyman, made the courageous and resolute decision to quarantine the entire village. Although the plague finally claimed the lives of many villagers, including Mompesson's wife, the quarantine successfully averted the spread of the plague to the entire England. As William Shakespeare said, "Virtue is bold, and goodness never fearful." With goodness, we are destined to find the key to achieve the ultimate victory!

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