

Is wearing a face mask safe for people with epilepsy?

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Abstract

Since December 2019, the world has been experiencing a catastrophic pandemic of coronavirus disease (COVID-19) caused by SARS-CoV2. This virus primarily targets the human respiratory system. Available information suggests that people with epilepsy (PWE) are not at higher risk of being infected by the virus, nor of more severe COVID-19 manifestations, as a result of the epilepsy alone. However, COVID-19 is a serious disease that currently has no effective treatment or vaccine. A face mask is probably effective in preventing the spread of a respiratory pathogen, at least to some extent. So, should we recommend wearing a face mask to all during a pandemic of respiratory infectious disease (e.g., COVID-19) without any precautions or exemptions? While concrete evidence is lacking, if we consider that wearing a face mask may simulate hyperventilation, at least to some extent, we would probably avoid recommending this practice indiscriminately to all PWE. On the other hand, in the absence of any proven treatment or vaccine to combat COVID-19, prevention is the best available strategy and it is probably not reasonable to suggest avoid wearing face masks in PWE under any circumstances. Logically, PWE do not need to wear a face mask most of the time, as long as there is no close contact with others, especially during intense physical activities such as exercise. To the contrary, it is probably more advantageous to wear a face mask in crowded locations, with intermittent breaks in safe locations, away from others.

Key words: Coronavirus; COVID; Epilepsy; Mask; Seizure

1. Introduction

Since December 2019, the world has been experiencing a catastrophic pandemic of coronavirus disease (COVID-19) caused by SARS-CoV2.¹ This virus primarily targets the human respiratory system.² Available information on the pandemic suggests that people with epilepsy (PWE) are not at higher risk of being infected by the virus, nor of more severe COVID-19 manifestations, as a result of the epilepsy alone.³ However, anybody with COVID-19, could develop a severe illness characterized by severe pneumonia, acute respiratory distress syndrome, organ failure, acute cardiac injury, and death.¹ Risk factors for severe disease have been recognised as older age, diseases restricting mobility, respiratory conditions (including asthma), diabetes mellitus, hypertension, severe heart disease, and impaired immune function due to underlying conditions or drug treatment.¹⁻³ People with epilepsy may also have any of these conditions.

2. Is wearing a face mask necessary during a pandemic of a respiratory infectious disease?

COVID-19 is a serious disease that currently has no effective treatment or vaccine. Deaths due to COVID-19 are rising and health systems are under significant pressure. This raises a question: should policy makers apply any precautionary principle and encourage all people to wear face masks on the grounds that we have little to lose and potentially something to gain from this measure?⁴

A systematic review compared various masks (i.e., standard surgical masks vs. respirator masks)⁵; this review included a single clinical trial from 2009 of respirator masks, standard masks, and no masks among the general public during an influenza epidemic in Australia.⁶ That trial demonstrated a benefit of masks over no masks, but no advantage of respirator masks over standard ones.^{5,6} Some experts have suggested that “Masks are simple, cheap, and

potentially effective. We believe that, worn both in the home (particularly by the person showing symptoms) and also outside the home in situations where meeting others is likely (for example, shopping, public transport), they could have a substantial impact on transmission with a relatively small impact on social and economic life”.⁴ Wearing a face mask is one of the preventative measures that can limit the spread of COVID-19. However, the use of a mask alone is not enough to provide an adequate level of protection, and other measures (e.g., hand hygiene) should also be adopted.⁷ In other words, the use of face masks in the community should not create a false sense of security, with neglect of other essential measures, such as hand hygiene practices and physical distancing.⁷ The World Health Organization (WHO) states that “The use of masks is part of a comprehensive package of the prevention and control measures that can limit the spread of certain respiratory viral diseases, including COVID-19. Masks can be used either for protection of healthy persons (worn to protect oneself when in contact with an infected individual) or for source control (worn by an infected individual to prevent onward transmission)”.⁸

3. Are face masks really harmless for all?

A face mask is probably effective in preventing the spread of a respiratory pathogen, at least to some extent. So, should we recommend wearing a face mask to the general public during a pandemic of respiratory infectious disease (e.g., COVID-19) without any precautions or exemptions?

In multiple studies, wearing face masks have been associated with respiratory and physiological impacts. In one study, wearing an N95 mask for 4 hours during hemodialysis significantly reduced PaO₂ and increased respiratory adverse effects in people with end-stage renal disease.⁹ In another study, the authors concluded that breathing through N95 mask impedes gaseous exchange and imposes an additional workload on the metabolic system of

pregnant healthcare workers.¹⁰ In a study of 53 surgeons, the authors reported that pulse rates of the surgeons increased and their SpO₂ decreased after the first hour of wearing surgical masks during operations.¹¹ Finally, in one study of patients with chronic obstructive pulmonary disease (COPD), breathing frequency, blood oxygen saturation, and exhaled carbon dioxide levels showed significant differences before and after N95 mask use.¹² Experts have stated that “Face masks make breathing more difficult. Moreover, a fraction of carbon dioxide previously exhaled is inhaled at each respiratory cycle. Those two phenomena increase breathing frequency and deepness”.¹³ Based on the above evidence and also personal experience of wearing an N95 mask during hospital rounds, this is probably a true statement. Some of the likely disadvantages of the use of face mask by healthy people in the general public include: potential headache and/or breathing difficulties, potential increased risk of self-contamination, and potential development of facial skin lesions.⁸ The WHO encourages countries adopting policies on face masks use in the general public to conduct good quality research to assess the effectiveness (and potentially the disadvantages) of this intervention to prevent and control transmission of COVID-19.⁸

4. Should people with epilepsy wear face masks?

There is no direct evidence in the literature to answer this question with confidence. However, hyperventilation (i.e., deep and rapid respiration) (HV) is an effective method of seizure activation in PWE during electroencephalography (EEG) recording. The mechanisms of the activation effect of HV on seizures in PWE are still poorly understood. Some experts suggest that the EEG slowing is due to cerebral vasoconstriction and diminution of oxygen and dextrose supply to the cerebral cortex.¹⁴ Others believe that the low levels of carbon dioxide would lead to the predominance of nonspecific thalamic projection system over the activating reticular ascending system.¹⁵ In any ways, it is well-known and documented that

HV can provoke seizures in PWE.¹⁶ Hyperventilation may provoke 3-Hz generalized spike-and-wave complexes in about 80% of patients with idiopathic generalized epilepsies, and slow spike and wave complexes in $\leq 50\%$ of patients with symptomatic generalized epilepsies, who are able to adequately undertake the activation procedure.¹⁶ Activation may also be observed in 6–28% of people with focal epilepsies.¹⁶

Therefore, while concrete evidence is lacking, if we consider that wearing a face mask may simulate HV, at least to some extent, we would probably avoid recommending this practice indiscriminately to all PWE. On the other hand, in the absence of any proven treatment or vaccine to combat COVID-19, prevention is the best available strategy and it is probably not reasonable to suggest avoid wearing face masks in PWE under any circumstances. Logically, PWE (and many other people) do not need to wear a face mask most of the time, as long as there is no close contact with others, especially during intense physical activities such as exercise (e.g., walking, jogging, etc.). To the contrary, it is probably more advantageous to wear a face mask in crowded locations (e.g., shopping malls, theme parks, movie theaters, etc.), with intermittent breaks in safe locations, away from others.

5. Should a face mask be removed from a person at the time of a seizure?

While there is no direct evidence in the literature to answer this question with confidence, it would be considered reasonable to remove a mask from a patient, who is actively seizing or is in postictal state, to facilitate their breathing. However, it is highly suggested to adopt

maximum precautionary measures to protect ourselves from being exposed to any potential harm (e.g., secretions), including of course thorough hand washing.

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References

1. Rothan HA, Byrareddy SN. The epidemiology and pathogenesis of coronavirus disease (COVID-19) outbreak. *J Autoimmun.* 2020; 109: 102433.
2. Asadi-Pooya AA, Simani L. Central nervous system manifestations of COVID-19: A systematic review. *J Neurol Sci* 2020; 413: 116832.
3. <https://www.ilae.org/patient-care/covid-19-and-epilepsy/covid-19-information-for-clinicians/faqs-for-clinicians/> accessed on May 24, 2020.
4. Greenhalgh T, Schmid MB, Czypionka T, Bassler D, Gruer L. Face masks for the public during the covid-19 crisis. *BMJ* 2020; 369: m1435.
5. Long Y, Hu T, Liu L, et al. Effectiveness of N95 respirators versus surgical masks against influenza: A systematic review and meta-analysis. *J Evid Based Med* 2020: 10.1111/jebm.12381.
6. MacIntyre CR, Cauchemez S, Dwyer DE, et al. Face mask use and control of respiratory virus transmission in households. *Emerg Infect Dis* 2009; 15: 233-241.
7. World Health Organization. (2020). Advice on the use of masks in the context of COVID-19: interim guidance, 6 April 2020. World Health Organization. <https://apps.who.int/iris/handle/10665/331693>. License: CC BY-NC-SA 3.0 IGO/ accessed on June 11, 2020.
8. World Health Organization. (2020). Advice on the use of masks in the context of COVID-19: interim guidance, 5 June 2020. World Health Organization. <https://apps.who.int/iris/handle/10665/332293>. License: CC BY-NC-SA 3.0 IG/ accessed on June 11, 2020.
9. Kao TW, Huang KC, Huang YL, et al. The Physiological Impact of Wearing an N95 Mask During Hemodialysis as a Precaution Against SARS in Patients With End-Stage Renal Disease. *J Formos Med Assoc* 2004; 103: 624-628.

10. Tong PS, Kale AS, Ng K, et al. Respiratory consequences of N95-type Mask usage in pregnant healthcare workers—a controlled clinical study. *Antimicrob Resist Infect Control* 2015; 4: 48.
11. Beder A, Büyükköçak U, Sabuncuoğlu H, Keskil ZA, Keskil S. Preliminary report on surgical mask induced deoxygenation during major surgery. *Neurocirugia (Astur)* 2008; 19: 121-126.
12. Kyung SY, Kim Y, Hwang H, et al. Risks of N95 Face Mask Use in Subjects With COPD. *Respir Care* 2020; 65: 658-664.
13. Lazzarino AI, Steptoe A, Hamer M, Michie S. Covid-19: Important Potential Side Effects of Wearing Face Masks That We Should Bear in Mind. *BMJ* 2020; 369: m2003.
14. Davis H, Wallace WM. Factors affecting changes produced in electroencephalogram by standardized hyperventilation. *Arch Neurol Psychiatry* 1942; 47: 606-625.
15. Sherwin I. Differential effects of hyperventilation on the excitability of intact and isolated cortex. *Electroencephalogr Clin Neurophysiol* 1965; 18: 599-607.
16. Guaranha MSB, Garzon E, Buchpiguel CA, et al. Hyperventilation Revisited: Physiological Effects and Efficacy on Focal Seizure Activation in the Era of Video-EEG Monitoring. *Epilepsia* 2005; 46: 69-75.