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Editorial

# Seizures in the Current COVID Pandemic: An Editorial

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The current COVID pandemic has been a life altering and history-changing event worldwide and has had massive repercussions in patient life and medical sciences. The WHO estimates that millions of people have been affected by the pandemic and deaths will eventually range in the hundreds of thousands and potentially exceed a million. While respiratory failure is the overwhelming concern in these COVID patients, medical providers have noted that many comorbidities have complicated medical care and worsened outcomes in these patients. Seizures and epilepsy represent common comorbidities in these patients due to their high burden in the general population and special attention has been paid to their interactions with the COVID pandemic. We briefly discuss interactions, associations and complications of seizures and epilepsy in the setting of COVID patients and other coronaviruses as well.

Coronaviruses were considered minor human pathogens until the SARS outbreak in 2003. Since then, we have had the MERS outbreak and the current pandemic with COVID 19 as well. Research into coronaviruses has been exponentially increasing and greater attention is now being drawn towards the respiratory and extra-respiratory effects of these viral infections. Multiple neurological symptoms have been described for these infections including, delirium, strokes, seizures and further research is ongoing [1].

These viruses use multiple routes to achieve penetration of the nervous system. Many viruses penetrate the CNS after achieving viremia in blood after the initial infection, by bypassing the blood brain barrier through the transendothelial route using endocytic vesicles [2]. Many viruses also penetrate the CNS using the neurons of peripheral nerves as a gateway to enter the CNS [3]. Viruses use motor proteins that are responsible for intra-neuronal transport mechanisms to achieve this method of transmission. The olfactory nerve may serve as an alternative pathway to achieve CNS penetration by similar mechanisms, rather than peripheral nerves, especially due to its proximity to the CNS and easier penetration for pathogens offered by it [4]. This is especially common, given the number of respiratory viruses that pass through the nasal passageways and have access to the olfactory nerve endings. The cells that are permissive to coronavirus infection are macrophages, microglia and astrocytes; enabling excellent CNS penetration and virulence of disease from these agents [5]. Despite initially limited interest in nervous involvement by the coronaviruses, CNS penetration by these agents was known as far back as 1980.

Seizures in coronavirus infections were first described in 2003, in patients with SARS [6]. The incidence of seizures in coronavirus infections ranges from 9 - 25% of patients, depending on the case series and the type of coronavirus studied [7]. COVID 19 appears to have a higher rate of seizures than the other coronaviruses. This is probably a false incidence rate, given that most patients with COVID 19 are asymptomatic and never truly develop significant symptoms in the first place. The exact mechanism causing seizures is not well defined and hypotheses include neuroinfection and brain damage, inflammation, metabolic derangements, worsening systemic disease, cerebral hypoxia from respiratory involvement, cerebral ischemia from hypercoagulability and strokes, toxic effect of antiviral medications or a combination of these factors [7].

The management of seizures in COVID 19 follows similar principles as in other patients with seizures. Most seizures are brief and do not always need emergency rescue medications. Seizure medications must be initiated as usual in such COVID patients as well. Emergency meds may be considered if the patient is in status epilepticus or persistent encephalopathy from a heavy seizure burden. Seizure meds like valproate, phenytoin, phenobarbital, that undergo hepatic metabolism or have interactions with other systemic medications must be avoided due to high probability of interaction with such medications and co morbidity of systemic illness in such patients [8]. Extracorporeal membrane oxygenation (ECMO) would

also affect the protein binding and metabolism of such medications and must be considered. Lacosamide may cause conduction defects in cardiac patients, those with CHF or arrhythmias or even patients on hydroxychloroquine (due to its cardiotropic effects), or even patients with cardiotropic medications and must be avoided in COVID patients, unless absolutely necessary [9]. Levetiracetam and Brivaracetam may represent the best options for such patients.

Other issues that have affected seizure and epilepsy patients during the COVID pandemic have been access to medical providers and medication supplies. A study of 227 patients with epilepsy during the SARS outbreak in 2003 in Taiwan, showed that 22% of the people did not receive their medications due to loss of contact with their healthcare providers; 12% of the patients suffered seizure control status worsening during the outbreak (including two patients with status epilepticus) [10]. Similar reports have been noted during the current pandemic and a full inventory of such shortcomings is ongoing. Meanwhile, providers and support groups scramble to ensure that patients are able to maintain access to providers and medications in this difficult time. Telemedicine has been shown to help ensure access to providers in resource limited settings and would serve as a perfect method to optimize the use of technology to overcome this treatment gap in the current pandemic situation and ensure minimal transmission of the virus and exposure to disease [11]. Healthcare systems have been scrambling to meet patients' needs at this challenging time and many technological upgrades and techniques have been implemented to sustain treatment options for patients, including the use of web conferencing and electronic pharmacies.

Seizures and epilepsy remain a public health challenge, and the recent COVID 19 pandemic has not done much to attenuate their impact on public health. Critically ill patients face multiple difficulties with severe systemic disease and worsening seizures, while stable patients face difficulties in healthcare and medication access. The proper and efficient use of resources along with innovative adaptation of technologies should help offset many of these limitations in medical care at this difficult time. Further research into the neurological complications of COVID 19 is ongoing and imperative to expand our understanding of this condition and improve treatment for it. Greater public and government investment into managing this condition is essential to support the increasing scientific investment into it.

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