

Neurological Insights into COVID-19

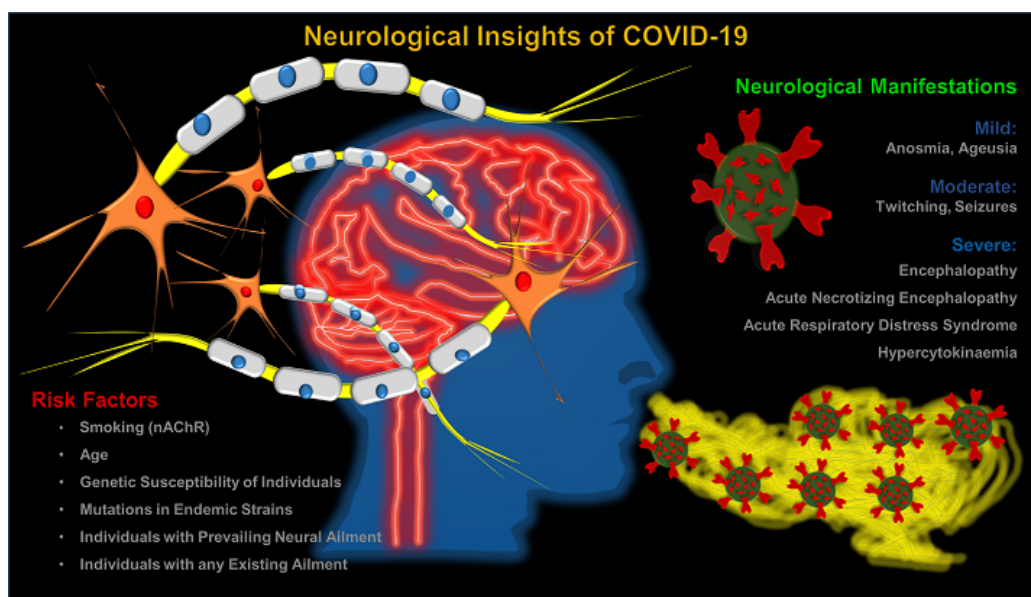
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News and Views

As the coronavirus outbreak becomes more and more vicious with every approaching day, the novel coronavirus disease better known as COVID-19 keeps puzzling the scientists with newer riddles to crack. Several reports now emerging from various European countries, Korea, China, and Iran that many COVID-19 patients are observed to exhibit anosmia (loss of smell) and ageusia (loss of taste) indicate that these could be potential hallmark symptoms in early diagnosis of the disease. This piece of information may actually be a grave cause of concern as this indicates that SARS-CoV-2 (the causative agent of COVID-19) may actually be exhibiting the potential of infecting the brain and the nervous system contrary to the conventional belief that it only infects the pulmonary system and causes lung failure. In this paper, Professor Ghosh and his team have discussed the neurological manifestations of the COVID-19 virus and the probable therapeutic strategies that could be adopted to combat it.

The paper also highlights the geographical topology of the pandemic with a special focus on our country. SARS-CoV-2 is known to interact with a specific human receptor known as hACE2 (human angiotensin-converting enzyme-2) which also happens to be the entry point of the virus. Now, the neuroinvasive nature of the virus can be predicted very well from the fact that this receptor has an almost ubiquitous presence in most human organs ranging from lung parenchyma to nasal mucosa. The brain is also known to express this receptor. The reason for the loss of smell or taste may be attributed to the fact that nose and mouth both are very important entry points of the virus, which then may be slowly making its way to the olfactory bulb using the neurons of the olfactory mucosa. The olfactory bulb located in the forebrain is the structure that is chiefly responsible for olfaction or the sense of smell. This explains the loss of smell associated with many asymptomatic carriers of COVID-19 but what is more worrisome here is the fact that it makes the entire central nervous system (CNS) or the underlying structures in the brain more prone to viral infection, possibly with devastating effects.

The paper recounts a recently conducted study on the brain scans (CT and MRI) of a patient infected by COVID-19 virus that shows a rare encephalopathy called ANE which leads to brain dysfunction with seizures and mental disorientation. This kind of study indicates that in the presence of human ACE2 receptors in CNS, the brain may be infected by the virus not only through the olfactory bulbs but also through any other peripheral nerve terminals or simply through blood circulation and may breach the blood-brain barrier to innervate and attack the CNS. In that case, the results may be horrific as it may completely destroy medulla oblongata of the hindbrain. The medulla oblongata or simply medulla is an extremely important structure of the brain stem as it is the main center that controls blood circulation and breathing in humans. Hence, if medulla gets affected by the virus, it affects the patient in the worst way possible leading to either death or coma.



Currently, to say the least, we are mostly in oblivion about the neurological aspects of COVID-19 which may not be a good thing for the future. Looking at the increasing numbers of COVID-19 patients globally every day, we must start to scrupulously investigate the effects of the virus on the CNS starting with maybe performing more brain autopsies of COVID-19 infected patients and analysis of their cerebrospinal fluid.

The above factors discussed also put patients with pre-existing mental disorders like Parkinson's disease in a more tight space as these are the people that could now turn out to be worst affected by the pandemic if not carefully monitored. The paper also rings warning bells to the asymptomatic carriers of COVID-19 with anosmia or ageusia to self-quarantine themselves as soon as they feel they lack taste or smell, otherwise, they might well turn into carriers of the disease spreading it further. Along with these, those with ageusia or anosmia and testing positive for COVID-19 must consult specialized neurologists as they may be at a greater danger of CNS infection.

The paper along with this also focuses attention on the likeliness of smoking to increase the chances of contracting COVID-19 infection, which may be attributed to the interactions and co-expression of the hACE2 receptor and the nicotinic receptor which is stimulated on smoking. Though more studies are needed on this part, smokers for the time being need to more careful and possibly cut down on their daily number of cigarettes to a bare minimum.

One of the major areas of the paper focuses on the various therapeutic agents that could act as our shields protecting us and boost our immunity in this war against the novel coronavirus. The paper reflects upon several such agents ranging from the peptide-based therapeutics which will curb the interaction between the viral protein and the human receptor to the strategic design of small molecule inhibitors designed against the viral spike protein that interacts with the ACE2. It also takes into account the development of subunit vaccines from the purified virus along with antibody-based drugs.

The paper also touches upon another interesting topic of discussion doing the rounds regarding the endemic response of the people to COVID-19 infection. Well, there is no proof in scientific literature yet to conclusively claim that we have a certain genetic advantage over the Europeans and Americans to COVID-19 infections but some recent computational and sequence analysis does indicate why we might be slightly more genetically blessed to combat the novel coronavirus as a unique anti-viral microRNA unique to only Indian sub-population has been reported in one such study. To say the least, even though such genetic disposition may give us an advantage in these tough testing times we must not breach the rules imposed by our government as only social distancing is the key at this moment to keep the virus at bay. We hope the paper touches upon several key features pertinent to the disease and it does help in raising scientific and public awareness against COVID-19 pandemic. **This paper has been highlighted by major media houses in India since its publication on 22nd April 2020, with article 10859 views, an Altmetric Score 53 and 13 Citations. Department of Science and Technology, Government of India, has posted this work in their website and recently Loss of Smell and Taste Inducted as COVID19 symptom by ICMR India.**

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