

EDITORIAL

Link of COVID-19 and Neurodegenerative Disorders

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In December 2019, for the first time, a mysterious pneumonia illness was reported in a patient in Wuhan, China, which later spread to several countries. Later, investigations revealed that mysterious pneumonia is termed “coronavirus disease 2019”. It was caused by “2019-nCoV”, a new member of the coronavirus family, which was responsible for this epidemic (later declared as a pandemic). The newly identified 2019-nCoV belongs to the member of enveloped RNA virus family comprising of SARS-CoV (Severe Acute Respiratory Syndrome Corona Virus-19) and MERS-CoV. The SARS-CoV-2 mediated COVID-19 spread rapidly all over the world and has been officially recognized as a pandemic by WHO. To date (23rd December 2021), this virus has infected several million populations (275,233,892 confirmed cases) with mortality close to 5,364,996, even though 8,387,658,165 vaccine doses have been administered [1]. A large number of recent research highlights the detailed impact of COVID-19 on the general population. Several previous findings on SARS-CoV on patients and experimental animals show that this virus also infects the brain, including the brainstem. Findings also revealed the entry of MERS- or SARS-CoV via olfactory nerves. There are findings reporting the presence of the virus within the brain, suggesting the direct transfer of the virus within the central nervous system (CNS) via olfactory nerves. The purpose of this special issue was to provide information on the relationship between SARS-CoV2 mediated viral infection and the CNS, as well as its impact on patients with neurodegenerative disorders and the use of computational approaches. (Artificial Intelligence, Deep Machine Learning, and Bibliometric analysis).

Chavda *et al.* highlighted SARS-CoV-2 infection and its neurological manifestations [2]. The nasal cavity is the promising gateway of SARS-CoV-2 to reach the brain via systemic circulatory distribution. Recent reports have revealed that the loss of involuntary breathing control into the brainstem that results in death is the straight signal of neurological involvement. The loss of involuntary control of breathing is a result of an active gateway of systemic blood circulation through the lungs into the brain. Early neurological symptoms, like loss of smell, convulsions, and ataxia, are the clues of the involvement of CNS that makes an entry of SARS-CoV-2 further fatal, life-threatening, and with the requirement of artificial respiration and emergency admission in hospitals. Studies performed on patients infected with SARS-CoV-2 has revealed three-stage involvement of the CNS in the progression of SARS-CoV-2 infection: Direct involvement of CNS with headache, ataxia, dizziness, altered or impaired consciousness, acute stroke or seizures as major symptoms; peripheral involvement with impaired taste, smell, vision, and altered nociception; and skeletal muscle impairment that includes skeletal muscle disorders leading to acute paralysis in a particular area of the body. In the previous era, most studied and researched viruses were beta coronavirus and mouse hepatitis virus, which were studied for acute and chronic encephalitis and multiple sclerosis. Although the early symptoms of SARS-CoV are respiratory pathogenesis, the differential diagnosis should always be considered for neurological perspective to prevent mortalities [2].

Javed presented a systematic review on “neurological associations of SARS-CoV-2 infection” based on a search carried out by key-electronic databases, controlled vocabulary, and indexing of trials to evaluate the available pertinent studies, which included both medical subject headings (MeSH) and advanced electronic databases comprising of PubMed, Embase, Scopus, Cochrane Central Register of Controlled Trials (CENTRAL) [3]. Peer-reviewed studies published in English and Spanish were considered, which reported data on the neurological associations of individuals with suspected or laboratory-confirmed SARS-CoV-2 infection. Outcomes were nervous signs or symptoms, symptom severity, and diagnoses. His search identified 45 relevant studies, with 21 case reports, 3 case series, 9 observational studies, 1 retrospective study, 9 retrospective reviews, and 2 prospective reviews. This systematic review revealed that the most commonly reported neuronal presentations involved headache, nausea, vomiting, and muscular symptoms like fibromyalgia. Anosmia and ageusia, defects in clarity or sharpness of vision (error in visual acuity), and pain may occur in parallel. Notable afflictions in the form of anxiety, anger, confusion, post-traumatic stress symptoms, and post-intensive care syndrome were observed in individuals who were kept in quarantine and those with long-stay admissions in healthcare settings. SARS CoV-2 infection may result in cognitive impairment. Patients with

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more severe infection exhibited uncommon manifestations, such as acute cerebrovascular diseases (intracerebral haemorrhage, stroke), rhabdomyolysis, encephalopathy, and Guillain-Barré syndrome. SARS-CoV-2 patients experience neuronal presentations varying with the progression of the infection. Healthcare professionals should be acquainted with the divergent neurological symptoms to curb misdiagnosis and limit long term sequelae. Healthcare planners and policymakers must be prepared for this eventuality while the ongoing studies increase our knowledge based on acute and chronic neurological associations of this pathogen [3].

Increasing reports of neurological symptoms in COVID-19 patient's warrant clinicians to adopt and define the standardized diagnostic and managing protocols to investigate the link of neurological symptoms in COVID-19 [4]. Encephalitis, anosmia, acute cerebrovascular disease, and ageusia are some of the emerging neurological manifestations reported in several cohort studies on hospitalized patients with COVID-19. Although the COVID-19 pandemic is primarily associated with the respiratory tract system but measures like lockdown and restricted physical movements to control the spread of this infection will certainly have neurobehavioural implications. Additionally, some of the patients with pre-existing neurological manifestations like epilepsy, Parkinson's, and Alzheimer's disease (AD) are more prone to infection and demand extra improvisation in their treatment therapy. Sharma *et al.* focused on the neurovirological clinical manifestations associated with the COVID-19 pandemic [4]. Although the prevalence of neurovirological manifestations is rare, increasing reports cannot be ignored and need to be discussed thoroughly concerning risk analysis and considerations for developing a management strategy. This also helps in defining the burden of neurological disorders associated with COVID-19 patients [4].

Chauhan and Yadav explored dietary nutrients and prevention of AD, which is an irrevocable, progressive brain disorder that gradually destroys memory and cognitive skills [5]. One of the extensively studied methods of preventing AD disease progression is by providing a nutritional diet. Several reports have shown that intake of nutritional elements as huperzine A, ursolic acid, vitamins can directly influence the pathogenesis of AD. Surprisingly, metabolic abnormalities caused by a poor diet have long been recognised as a key environmental factor of Alzheimer's disease. It has been noted that AD disease severity can be controlled by supplementing dietary supplements containing huge amounts of health-promoting ingredients. These elements promote cell health, regeneration, and the anti-aging process that specifically interrupt the pathogenic pathways in AD development. Fortunately, incorporating changes in the nutritional content is inexpensive, easy, acceptable, safe, effective, and in most cases, free from major adverse events. Many nutritional phytoconstituents such as flavonoids, alkaloids, and terpenoids are still being evaluated in the hope of identifying a successful therapy for AD. They also discussed the therapeutic potential of several key nutrients that have been researched for treating AD treatment and the method of their neuroprotective intervention [5].

It is noteworthy how the novel coronavirus has spread from Wuhan China into the whole world, affecting the lives of people worldwide [6]. All the data related to the precautionary measures, diagnosis, treatment, and even the epidemiological data, are being made freely accessible and reachable in very little time as well as being rapidly published to save human beings from this pandemic. There might be neurological complications of COVID-19, and patients suffering from neurodegenerative conditions like AD and Parkinson's disease might have repercussions as a result of the pandemic. Sood *et al.* explored the effect of SARS-CoV-2 viral infection on the people affected with neurodegenerative disorders such as Parkinson's and AD. It primarily emphasizes two issues, *i.e.*, on vulnerability to infection and on modifications of course of the disease concerning the clinical neurological manifestations, the advancement of the disease and novel approaches to support health care professionals in disease management, the susceptibility to these diseases, and impact on the severity of disease and management [6].

REFERENCES

- [1] Coronavirus disease (COVID-19) pandemic. Available from: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019>.
- [2] Vishal C, Arif TJ, Dhananjay Y. Mini-review on SARS-CoV-2 infection and neurological manifestations: A Perspective. *CNS Neurol Disord Drug Targets*. 2022; 21(3): 210-6.
- [3] Amaan J. Neurological associations of SARS-CoV-2 infection: A systematic review. *CNS Neurol Disord Drug Targets*. 2022; 21(3): 246-58.
- [4] Sumit S, Sonali B, Saurabh G, Vivek K, Md Habibur R, Mohammad AK. Persons with co-existing neurological disorders: Risk analysis, considerations and management in COVID-19 pandemic. *CNS Neurol Disord Drug Targets*. 2022; 21(3): 228-34.
- [5] Pallavi SC, Dhananjay Y, Ananta PA. Dietary nutrients and prevention of Alzheimer's disease. *CNS Neurol Disord Drug Targets*. 2022; 21(3): 217-27.
- [6] Ankita S, Ravi G, Harshdeep S, *et al.* Implication of COVID-19 on neurological complications: with specific emphasis on Alzheimer's and Parkinson's disease. *CNS Neurol Disord Drug Targets*. 2022; 21(3): 235-45.