



## Perspective

## Neurological manifestations of COVID-19: A perspective from Pakistani medical students

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Coronavirus disease 2019 (COVID-19) was first discovered in Wuhan, China when individuals started developing atypical viral pneumonia [1]. Nearly 1,530,000 cases of COVID-19 from Pakistan were reported to the World Health Organization from January 2020 to June 2022 [2]. Since the outbreak of this disease, associated complications have also emerged. Among these complications have been complex neurological manifestations such as headaches, ataxia, vertigo, myelitis, encephalitis, and cerebrovascular accidents [1].

Some studies have aimed to prove a relationship between the novel coronavirus and its effects on the nervous system. One such study was conducted by Mao L et al., who collected data from 214 COVID-19 patients and found that 78 of those included had neurological manifestations [3]. Furthermore, data collected from 2 coronavirus patients during the pandemic showed that one experienced anosmia and ageusia while the other suffered from acute ischemia and hemorrhagic infarction. Both of the patients could not be treated successfully, and one died after 48 hours [4]. This further proved the presence of a potential link between the two conditions and highlighted the difficulty of treating lethal symptoms.

Moreover, a recent study conducted in Pakistan found that 23% of participants infected with the novel coronavirus experienced severe neurological complications [5]. Despite the significant frequency of occurrence of these symptoms, there has been limited research conducted on the relevant topic in the Asian country [6–8]. Makda A. et al., after performing a cross sectional study in Karachi, concluded that neurological complications are frequently observed in Pakistani COVID-19 patients and that the most common symptom is dizziness [7]. Conversely, Kumar J. et al. noted that the neurological deficit most likely experienced is headache and insomnia [8]. These contradictory findings make it difficult to address the presenting symptoms and signify the need to perform further research.

Intiguously, present research revealed that angiotensin-converting enzyme 2 (ACE2) is a receptor for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and the expression of ACE2 in neurons and glial cells is responsible for these neurological symptoms [9]. Furthermore, a key component, transmembrane protease serine 2 (TMPRSS2), activates the S protein of SARS-CoV-2, which binds to ACE2 to allow it to invade the host cell [10]. Predictably, blockage of angiotensin receptors

can help inhibit ACE expression and thus, angiotensin-converting enzyme inhibitors (ACEI) may have a favorable impact on these adverse symptoms of the coronavirus [11].

However, necessary medicine such as ACEI can be expensive and difficult to import. This may be due to an increasing demand for medicine in the market and the growing strain of lack of storage facilities available [12]. Other factors contributing to the matter of contention include a lack of understanding and fear of discrimination. Moreover, owing to the ingrown prejudices and unawareness, there is a growing stigma surrounding people with neurological and psychological deficits. These individuals are thus hesitant to seek help for their possible illness [13]. However, for those who are interested in seeking help, there is unfortunately a finite number of neurologists available in Pakistan (nearly one per million population) and sparse training programmes, failing to treat these patients effectively. Consequently, there is an immense need to direct focus on the fragility of this situation and resolve the presenting issues urgently.

Neurological deficits are often misdiagnosed and mismanaged, and to appropriately treat these abnormalities, it is important to understand the various risk factors associated with them. Healthcare facilities in the country can help raise awareness about the neurological complications of COVID-19, thereby allowing people to learn more about the condition and report any unfavorable developments. The media can broadcast these messages to ensure that the reach to the audience is widespread. In addition, government agencies can fund research aiming to identify an effective treatment for these complications and existing medicine can be imported from foreign countries in trade schemes, allowing optimum treatment efficacy. By collecting donations and allocating funds with the assistance of the government and health-care organizations, mental health services can be made available for free to all those affected. Making these adjustments may help play a part in controlling the rising number of COVID-19 patients with neurological complications.

**Ethical approval**

This paper did not involve patients, therefore no ethical approval was required.

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## Author contribution

Mariam Adil: conception of the study, drafting of the work, final approval and agreeing to the accuracy of the work, Aayat Ellahi: conception of the study, drafting of the work, final approval and agreeing to the accuracy of the work, Haider Kashif: conception of the study, drafting of the work, final approval and agreeing to the accuracy of the work, Zunera Huda: conception of the study, drafting of the work, final approval and agreeing to the accuracy of the work.

## Registration of research studies

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## Guarantor

Mariam Adil, Aayat Ellahi, Haider Kashif, Zunera Huda.

## Consent

This study was not done on patients or volunteers, therefore no written consent was required.

## Declaration of competing interest

The authors declare that there is no conflict of interest.

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