



NEUROLOGICAL MANIFESTATIONS IN COVID-19: A STUDY FROM PATIENTS ADMITTED IN TERTIARY CARE HOSPITAL IN WEST BENGAL

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ABSTRACT **Introduction:** SARS-CoV-2 infection, leading to Coronavirus disease 2019 (COVID-19), has significantly affected the whole world. World Health Organization labelled it a pandemic disease.. Although it commonly produces respiratory symptoms, neurological features are also commonly noted. Interestingly, pure neurological manifestations may be present at the onset of disease whereas non-neurological features may be manifesting few days later. **AIM:** We planned this study to get an insight into the relation of COVID-19 and neurological manifestation in order to facilitate its management and improve outcome in such patients. **Materials & Methods:** This was a retrospective study. 100 patients with COVID-19 confirmed with RT-PCR were evaluated in detail from a neurological point of view. Neurological involvements obtained with this evaluation were noted and reported. **Results:** Neurological symptoms were found in 71% out of 100 patients irrespective of their onset to other symptoms. Out of the 100 COVID-19 patients, 18(18%) developed neurological complications during hospitalization. **Conclusion:** Better understanding of relation of various neurological symptoms and complications with manifestations and outcomes of coronavirus disease 2019 (COVID-19) is the need of today.

KEYWORDS : Coronavirus, COVID-19 . . neurological manifestations . SARS-CoV-2

INTRODUCTION

An outbreak of atypical pneumonia due to severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) was first reported in December 2019 from Wuhan in China [1]. Its high rate of transmissibility resulted in a rapid rise in number of cases, and on March 11, 2020, WHO declared COVID-19 a pandemic with serious health concerns [2]. COVID-19 infection symptoms arise after approximately 5 days of incubation period [3]. The most common symptoms noted in COVID-19 are fever, cough, and fatigue. Apart from these, headache, dyspnea, and diarrhea are the other observed findings of the disease [4]. Pneumonia, acute respiratory distress syndrome, and multi-organ failure may be seen in the most severe cases. Pathogenesis of neurological manifestation of coronavirus have been defined [5]. Coronavirus enters the central nerve system (CNS) via nervous olfactory causing nasal infection, and then leading to the inflammation and demyelization [5], leading to neurological manifestations. Hence, coronaviruses not always affect only our respiratory system, rather can affect the CNS [6]. According to various studies, neurological involvement is not rare in human coronaviruses infections. Virus was found in cerebrospinal fluid (CSF) in reported SARS-CoV patients [7]. Epileptic seizures and mental state changes were reported in one study conducted on 70 patients with MERS-CoV infection [8]. Clinical manifestations of COVID-19 such as fever, cough, dyspnea and fatigue have been focussed in many studies, but data related to neurological findings are not sufficient [6, 9]. It is possible to detect the neurological manifestations in COVID-19 patients with detailed neurological examination. In our study, 100 patients with COVID-19 confirmed with RT-PCR were evaluated in detail from a neurological point of view. Neurological involvements obtained with this evaluation were noted and reported.

MATERIALS AND METHODS

This retrospective study was conducted in the tertiary care teaching hospital of West Bengal. The hospital is designated as COVID 19 hospital (code Red with bed capacity 100 reserved for Covid 19 patients), for the care of hospitalized patients who have positive Real-time reverse transcription-polymerase chain reaction (RTPCR) as per guidelines. We included all RTPCR Positive admitted patients of age more than 18 years and excluded those with negative RTPCR (report not confirmed or pending), unconscious and patient on the ventilator (unable to communicate), age <18 years, and non-consenting patients. The study was conducted after getting approval from the Institutional Ethics Committee.

100 patients were enrolled from April 2020 to December 2020 in the study. The data was collected through medical records, discharge summaries and radiological studies. Data abstracted included age, sex, exposure history, general respiratory symptoms, neurological symptoms, comorbidities, vital signs and severity. The chronology of the onset of different systemic symptoms was recorded cautiously. We

considered only new-onset neurological symptoms; that are neurological symptoms appearing within ± 7 days of Covid-19 diagnosis. Preexisting neurological symptoms were not included. Brain CT/MRI and/or electroencephalography (EEG) investigations were evaluated according to the neurological symptoms in need. High-resolution thorax CT (HRCT) and laboratory findings (IL-6, D-dimer, and CK) of all patients were evaluated.

Statistical analysis

The collected data were assessed with SPSS for Windows 26. To summarize the features of demographic data, descriptive statistics were used. Qualitative variables were indicated with frequency and percentage; numerical variables were summarized by mean $\pm$ standard deviation. To compare the variables, t tests were performed, and $p < 0.05$ was accepted as statistically significant.

RESULT

A total of 100 COVID-19 hospitalized patients confirmed by RT-PCR were included in this study. The mean age of the patients was 53.39 years, 60 (60%) of the total patients were males and 40(40%) were females.

30% of the patients presented with mild symptoms, 57% with moderate and 13% had severe symptoms. 49% of the patients presented with at least one comorbidity, where hypertension was noted in 35%, followed by diabetes in 25%, COPD in 79%, obesity in 60%, cardiovascular disease in 24%, chronic liver disease in 24% and chronic kidney disease in 24%.

Out of the total study population ($n = 100$) subjects, the most common general symptoms at presentation was fever. 76% of the patients reported having a fever during their course of illness, while remaining 24 patients (24%) did not have a fever any time during the course of their illness. Other general symptoms noted were cough in 75%, dyspnoea in 45%, sore throat in 40% and fatigue in 46%.

Neurological symptoms were found in 71% out of 100 patients irrespective of their onset to other symptoms. Of these 71 patients, headache (39%), myalgia (35%), altered taste (26%) and altered smell (24%), were the most common neurological symptoms.

Out of the 100 COVID-19 patients, 18(18%) developed neurological complications during hospitalization. The most common complication was altered sensorium which was seen in 9 (50%), followed by ischemic stroke in 3(16.6%), seizure in 3(16.6%), hemorrhagic stroke in 2(11.1%) and encephalitis in 1 (05%). None of the patients with mild symptoms developed any neurological complications.

A significantly more number of patients with neurological manifestation at the time of admission developed neurological

complications during hospitalization and resulted in longer duration of hospital stay in these patients.

DISCUSSION

This study describes the neurological manifestations at admission and neurological complications developed during hospitalization of COVID-19 patients in a tertiary hospital of West Bengal. In this study, 100 hospitalized RT-PCR confirmed COVID-19 patients were included.

Wei-Jie Guan et al. reported the mean age of patients to be 47 years with males accounting for 58.1% in a study of 1099 patients.[10] Similar results were shown by Huang et al. with the median age of 49.0 years (n = 41).[9] Mao et al. reported the mean age to be 52.7 years (n = 214).[6] Our results were comparable with other studies with a mean age of 53.39 years and males constitute 60% of the study population. Fever and respiratory system involvement are the cardinal manifestations of Covid 19 infection.[6,10,11] Wang et al. reported fever in 98.6%, dry cough in 59.4%, and dyspnea in 31.2% of patients, in his retrospective analysis of 138 patients.[9] Other recent studies also reported fever and cough to be the most common symptom.[6,9]. We found fever in 76 %, cough in 75%, throat pain in 40%, and breathlessness in 45% patients. Our results are comparable with previous data showing fever and cough to be the most common manifestation.

In our study, 71% of patients had at least one neurological symptom. Similar observations were made by Flores-Silva et al.[12] and Fan et al.,[13] who reported neurological manifestations at the time of admission in 69.3% and 62.8% of patients, respectively. Others have shown a much lower incidence of neurological symptoms, for example, Mao et al.,[6] Luigetti et al.,[14] and Karadaş et al.,[15] reported neurological manifestation in only 36.4%, 30%, and 36.7% of patients, respectively. This difference could be due to the different effects of different strains of the SARS-CoV-2 virus.

Headache (39%) was the most common neurological manifestation in our study followed by myalgia (35%), loss of taste (26%) and loss of smell (24%). A similar observation was made by Karadaş et al.,[15] and Flores-Silva et al.,[12] who found headache to be the most common manifestation (26.7% and 41.7%, respectively). Consistent with the previous studies,[6,14,15] muscle symptoms were also common in our study.

Neurological complications involving the central nervous system (CNS) were seen in 18% of hospitalized patients. The most common complication observed was delirium/altered sensorium, seen in 50% of patients. Other complications observed in our study were ischemic stroke (16.6%), seizure (16.6%), hemorrhagic stroke (11.1%), and encephalitis (5%), which were similar to the observations made by Fan et al.,[13] who also noted delirium to be the most common neurological complication in his study.

CONCLUSION

A wide range of neurological symptoms and complications are observed with COVID-19 infection and their occurrence is associated with greater mortality and morbidity in these patients. It is noted that these manifestations can precede the cardinal manifestation in substantial number of patients. Keeping this in mind, a high index of suspicion should be kept in patients presenting with these symptoms even in absence of fever and respiratory symptoms. Holistic correlation of individual neurological manifestation with severity of COVID-19 will provide a more meaningful insight regarding the approach to the management of such patients, which can improve the rate of mortality and morbidity.

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