Case report

Neurological Manifestations of COVID-19: a Case Series

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Abstract

Although the respiratory system is preferentially affected by SARS-CoV-2, many patients have been presented with neurologic symptoms. In this report, we describe COVID-19 patients with neurological manifestations. Here, we present 14 patients referred to Semnan Kowsar Hospital, Iran. The mean age was 54.25 ± 20.01 years. At admission, they had mild symptoms of respiratory involvement with a wide range of neurological conditions like impaired consciousness, seizure, stroke, ataxia, and muscle numbness. After hospitalization, they developed overt respiratory symptoms. They were positive for COVID-19. All patients received standard care of COVID-19. During SARS-CoV-2 pandemic disease, clinicians should be aware of the neurological manifestations of COVID-19.

Keywords: COVID-19, Neurologic; Seizure, Stroke

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Introduction

Severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) is declared a pandemic disease by the World Health Organization (WHO) on 11 March 2020 (1). Many patients have been presented with neurologic symptoms like dizziness, impaired consciousness, and complications related to the peripheral nervous system, and skeletal muscular injuries (2,3). Here, we report the clinical and laboratory characteristics of patients with confirmed COVID-19 who admitted to our neurology department. The study was approved by the Ethics Committee of Semnan University of Medical Sciences (IR.SEMUMS.REC.1399.035).

This study was performed from 5th to 20th June 2020, in Kowsar Hospital, Semnan, Iran. Fourteen suspected patients (9 males, 5 females) were analyzed consecutively. The demographic and clinical characteristics of patients are shown in Table 1. At admission, all patients had neurologic complaints with mild pulmonary symptoms.

Case Report

A confirmed case of COVID-19 was defined by a positive result on a reverse-transcriptase polymerase chain reaction (RT-PCR) assay (ABI, USA) of nasopharyngeal (NP) and/or oropharyngeal (OP) swabs. Fourteen cases were present with confirmed SARS-CoV-2 infection without typical clinical manifestations of COVID-19. The mean

Table 1: Baseline and clinical characteristics of 14 patients.

Characteristics	Value
Age, y	54.25 ± 20.01
Age (range)	24-84
Female	5 (35)
Male	9 (65)
Comorbidity	
Diabetes mellitus (DM)	2 (14)
Hypertension (HTN)	4 (28.5)
Coronary artery disease (CAD)	3 (21.4)
CAD+DM	3 (21.4)
CAD+HTN	3 (21.4)
CAD+HTN+DM	1 (7.1)
Malignancy	1 (7.1)
Chronic renal disease	1 (7.1)
Organ transplantation	1 (16.6)
Neurological manifestations	
Dizziness	4 (28.5)
Seizure	9 (64.2)
Impaired consciousness	4 (28.5)
Dizziness+Seizure	2 (14.2)
Dizziness+Impaired consciousness	1 (7.1)
Seizure+Impaired consciousness	1 (7.1)
Stroke	5 (35.7)
Balance disorder	2 (14.2)
Decreased force	4 (28.5)
Lab findings	
Lymph (%)	12.09
PLT ($\times 10^3$/ µL)	189.07
ESR(mm/h)	22.07
CRP	2
CPK(U/L)	133.2
LDH(U/L)	459.3
AST(U/L)	26
ALT(U/L)	16.5
FR(ng/mL)	213
BUN (mg/dL)	18.2
Cr (mg/dL)	1
Total WBC (10^9/L)	10

Data are shown as mean ± SD or number (%).WBC: white blood cell, CRP: C-reactive protein, PLT: platelet, ESR: erythrocyte sedimentation rate, CPK: Creatine phosphokinase, LDH: lactate dehydrogenase, AST: aspartate transaminase, ALT: alanine aminotransferase, FR: ferritin, BUN: blood urea nitrogen, Cr: creatinine.

age was 54.25 ± 20.01 years with a range of 24-84 yr. The mean oxygen saturation was 93%.

Four cases (28.5%), (third, fourth, twelfth, and thirteenth), experienced **impaired consciousness** and weakness. Case 3, an 84-year-male with a history of hypertension, who had neurologic problems, including impaired consciousness and weakness, and case 4, a 66-year-old female experienced frequent vomiting, impaired consciousness, and stroke. However, in case 12, a 24-year-old female who had a history of pulmonary disease and experienced an impaired consciousness.

Of the total cases, 8 patients (57.14%) had a history of seizure. In case 1, a 27-year-old female with no history of fever, chills, nausea, vomiting, and diarrhea had frequent seizures. Blood tests revealed lymphopenia (4% of total WBCs). Besides, cases 5 (a 62-year-old male), 7 (a 43-year-old male), 9 (a 62-year-old female), 10 (a 79-year-old male), 11 (a 58-year-old male), 13 (a 44-year-old female), and 14 (a 40-year-old male) with no history of underlying SARS-CoV-2 infection, complained of seizure, weakness, and headache at admission.

Case number 2 (a 32-year-old-male) had a chief complaint of headache, dizziness, hyposmia, and balance disorder. Head CT revealed a **stroke**. Case 8 (a 62-year-

old male) with no past medical history was present with decreased muscular force.

Case 6, a 70-year-old male with mild hypoxemia with oxygen saturation < 93%, presented with acute weakness, anorexia, decreased muscular force, and polyneuropathy. Finally, he was diagnosed with **Guillain-Barré Syndrome** (GBS).

He was admitted to ICU for a postoperative course. His fever persisted for the days to follow and we encountered an unfounded lymphopenia and high C-reactive protein whilst the patient's hemoglobin remained stable. Another CT angiography was performed, revealing bilateral multilobar ground-glass opacities and consolidations lacking specific distribution. We supposed that they could be attributable to pulmonary contusion and superimposed infection (Figure 4A, 4B, 4C, and 4D). The patient's condition deteriorated and he did not respond to ordinary treatments. Meanwhile, the COVID-19 outbreak was announced officially in Iran; so, the patient's nasopharyngeal swab specimens were performed for reverse transcription-polymerase chain reaction (RT-PCR) analysis, leading to early COVID-19 confirmed diagnosis.

Discussion

Herein, we reported 14 patients with various neurological manifestations such as fatigue, headache, dizziness, impaired consciousness, seizure, and decreased muscular force with positive SARS-CoV-2 infection. Noteworthy, stroke was common in these patients (35.71%). Patients had a history of hypertension, diabetes, coronary artery disease, chronic renal disease, neoplastic disease, and organ transplantation. Half of the patients experienced hypoxemia (<93%), 3 cases had a fever, one had a dry cough and 5 experienced anorexia. Lymphopenia was observed in all cases. However, the WBCs and platelets count was normal. Abnormal laboratory results, including elevated CRP, CPK, LDH, and BUN were also detected, whereas the levels of ESR, AST, ALT, and Cr were normal. Patients received recommended supportive care and antibiotic therapy.

Coronavirus related involvement is not primarily neurotropic but its host-cell receptor, ACE2, is present in the brain, spinal neurons, and skeletal muscles (4). Also, an increase of permeability of the blood-brain barrier (BBB) and attack to the peripheral nerve terminals, may cause the initiation of complications (4,5). Mao et al. reported an impaired consciousness in 14.8% and 2.4% in patients with more severe systemic presentations compared with non-severe patients (6). Moreover, stroke has been recognized as a complication of COVID-19. Li et al. showed that approximately 5% of COVID-19 patients with a median age of 71.6 years had stroke (7).

Conclusion

During SARS-CoV-2 pandemic disease, clinicians should be aware of the neurological manifestations of COVID-19.

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Conflicts of Interest

The authors declare that there are no conflicts of interest.

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