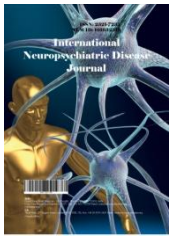

International Neuropsychiatric Disease Journal

16(4): 17-24, 2021; Article no.INDJ.83689
ISSN: 2321-7235, NLM ID: 101632319

The Neurological Manifestation in COVID-19 Patients in Gezira COVID-19 Isolation Centre

Abdallah Faisal [a*≡], Osman Amir [b], Alaaeldeen Attaallah [c≡], Moawia Elbalal [aφ] and Abdallah Abd AL-Kareem Gibriel [a#]

[a] Faculty of Medicine, University of Gezira, Wad Medani, Sudan.
[b] Department of Hematology, Faculty of Medical Laboratory Sciences, Al-Neelain University, Khartoum, Sudan.
[c] Faculty of Dentistry, University of Gezira, Wad Medani, Sudan.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/INDJ/2021/v16i430187
Editor(s):
(1) Dr. Takashi Ikeno, National Institute of Mental Health, National Center of Neurology and Psychiatry, Japan.
(2) Dr. Manabu Makinodan, Nara Medical University, Japan.
Reviewers:
(1) Marizete Argolo Teixeira, Universidade Estadual do sudoeste da Bahia, Brazil.
(2) Hari Shankar Sharma, Sikkim Maniapl University, India
(3) Denise Cristina de Souza Matos, Brazil.
Complete Peer review History, details of the editor(s), Reviewers and additional Reviewers are available here: https://www.sdiarticle5.com/review-history/83689

Original Research Article

Received 23 November 2021
Accepted 25 December 2021
Published 27 December 2021

ABSTRACT

Background: The novel coronavirus (COVID-19), severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), was first identified in December of 2019 in the city of Wuhan, China. In addition to respiratory symptoms, reports are emerging of neurological manifestations of SARS-CoV-2
Objective: To assess the neurological manifestations in COVID-19 positive patients.
Methods: A cross sectional, prospective, descriptive, hospital based study included 106 COVID-19 patients in Gezira COVID-19 Centre during the period from June to September 2020. Data regarding demographics, clinical history, presentations, laboratory investigations, neuroimaging and outcomes were collected.
Results: 106 COVID-19 patients were included in this study, 67(63.2%) were males and 39(36.8%) were females, their mean age was 68±4.3 years and most of them 58(54.7%) aged above 60 years.

[≡] Assistant Professor of Medicine;
[φ] Professor of Medicine;
[#] Associate Professor of Medicine;
**Corresponding author: E-mail: abodiwaf@yahoo.com;*

The main respiratory symptoms of COVID 19 were dyspnea in 66(62.3%), fever in 59(55.7%), cough in 50(47.2%) patients. The non specific neurological symptoms of COVID-19 were headache in 29(27.4%), dizziness in 9(8.5%) and syncope in one (0.9%) patient. Symptoms of COVID-19 related to cranial nerves such as change in smell (n= 87; 82.1%) and dyskinesia (n=80; 75.4%) were the most common neurological manifestations encountered. Focal neurological deficits were TIA in 2(1.9%), intracranial hemorrhage in one (0.9%) and transverse myelitis in one (0.9%) patient.
Conclusion: The study showed that neurological manifestations of COVID-19 were common and mostly olfactory and gustatory dysfunctions among Sudanese subjects. Also, COVID-19 could be a risk factor for stroke and transverse myelitis. The study suggest that objective olfactory and gustatory may be needed to determine their clinical significance.

Keywords: Neurological manifestation; COVID-19; Sudan.

1. INTRODUCTION

Corona virus disease (COVID-19) is caused by the novel virus, severe acute respiratory syndrome corona virus 2 (SARS-CoV-2). Since its recent discovery in Wuhan, China, corona virus disease has spread across the world, leaving physicians challenged by its variable clinical manifestations [1].

Most patients infected by SARS-CoV-2 have presented with a mild clinical course: beginning with fever and dry cough, progressing to a form of mild or moderate respiratory disease, and resolving without specific treatment [2]. Serious complications of the infection, however, remain a central concern. Acute respiratory distress syndrome, acute heart injury or failure, acute kidney injury, sepsis, disseminated intravascular coagulation, and life-threatening metabolic derangements have all been reported in COVID-19 patients, particularly among those with underlying comorbidities or advanced age [3].

As knowledge of SARS-CoV-2 and its clinical appearance continue to grow, the literature has shown a significant number of infected patients exhibit neurological symptoms [4].

Although we are still in the early phases of our attempts to understand the syndromic complexity of COVID-19, growing evidence indicates that the disease is not limited to the respiratory system and that SARS-CoV-2 has an organotropism beyond the respiratory tract, including the kidneys, liver, heart, skin and brain. In particular, as the disease spreads, neurological manifestations in patients with COVID-19 are reported more and more frequently in the scientific literature [5].

In first case series, Mao et al detected neurological symptoms in 78 out of 214 patients (36.4%) with COVID-19, and an analysis of the ALBACOVID registry in Spain by Romero-Sánchez et al. [6] detected neurological symptoms in 483 out of 841 patients (57.4%) with COVID-19. Pinna et al detected neurological symptoms in 50 out of 650 patients (7.7%) hospitalized with COVID-19 in Chicago, Illinois [7], and Karadaş et al detected neurological symptoms in 83 out of 239 patients (34.7%) with COVID-19 in Ankara, Turkey [8]. In a case series from 56 hospitals designated as COVID-19 treatment centres in China, Xiong et al detected new-onset specific neurological events in 39 out of 917 patients (4.2%) with COVID-19 [9].

In addition to respiratory symptoms, reports are emerging of neurological manifestations of SARS-CoV-2, which range from milder presentations such as headache to severe complications such as seizures and strokes. Therefore, the purpose of our study was to systematically characterize neurological manifestations in hospitalized patients with COVID-19 from Gezira COVID-19 Isolation Centre in Sudan.

2. MATERIALS AND METHODS

In this cross-sectional, prospective,descriptive, hospital based study a total of 106 COVID-19 patients diagnosed by defined reverse-transcriptase polymerase chain reaction (RT-PCR) test by nasopharyngeal swab were recruited in COVID-19 Isolation Center in Gezira State,of central Sudan, during the period from June to September 2020. This study included adult patients (18 years and above) of both genders. Patients with known neurological disorders were excluded.

Informations and investigations were collected from the patients records in hospital system. The variables that were considered for the study

included age, gender, COVID-19 symptoms, COVID-19 severity, neurological manifestations, co-morbidities, neuroimaging findings, duration of admission and the outcome of the patient (recovered or died).

2.1 Data Analysis

Data was analyzed by using a computer program Statistical Package for Social Sciences (SPSS V. 21.0). Frequencies with proportions were reported for categorical variables and means with standard deviations (SDs) reported for continuous variables. The analyzed data was presented in form of tables and figures designed by Microsoft Excel 2010.

3. RESULTS

Among 106 COVID-19 patients, 67(63.2%) were males and 39(36.8%) were females, their mean age was 68±4.3 years and most of them 58(54.7%) had an age above 60 years. Diabetes (n=50; 47.2%) and hypertension (n=35; 33%) were the main comorbidities. About one-half of the cases (n=54; 50.9%) had moderate COVID-19 infection. The majority of the patients presented with dyspnoea (n=66; 62.3%) fever (n=59; 55.7%) and cough (n=50; 47.2%). The characteristics of patients were shown in Table (1).

As illustrated in Fig. (1), symptoms of COVID-19 related to cranial nerves were change of olfaction/anosmia in 87(82.1%) and change of taste/dyskinesia in 80(75.4%) patients. The non specific neurological symptoms were headache in 29(27.4%), dizziness in 9(8.5%) and syncope in one (0.9%) patient. Disorders of consciousness were acute confusion syndrome in 8(7.8%), coma in 4(3.8%) and disorientation in 3(2.8%) patients. Motor symptoms were hemiparesis/plegia in 2(1.9%) and lower limb weakness in one (0.9%) patient. Sensory symptoms were numbness and loss of sensation in one (0.9%) patient, for each.

Fig. (2) showed the neuroimaging findings in which 2(1.9%) patients had transient ischemic attack (TIA), 2(1.9%) had brain atrophy, one (0.9%) had acute hemorrhage and another one (0.9%) patient had transverse myelitis

Regarding the outcomes, 90(85%) patients were normally discharged, 2(2%) were referred and the remaining 14(13%) patients were dead as demonstrated in Fig. (3).

4. DISCUSSION

In this study we assessed the neurological manifestation in COVID-19 patients. The mean age of patients was 68±4.3 years and male to female ratio was 1.7: 1, indicating that older ages and males were the most affected groups by the first wave of COVID 19 in the study area. Similar to a meta-analysis that analyzed data of 47,344 patients, noted a sex ratio (male to a female) of 1.06 and most of the affected subjects were aged above 40 years [10]. Another large study, describing data of 5700 hospitalized patients from New York, USA, reported a median age of 63 years (range 1–107 years) and 60% of cases were males [11].

Common presenting symptoms of COVID-19 were dyspnea (n=66; 62.3%) fever (n=59; 55.7%) and cough (n=50; 47.2%). This pattern was comparable to study by Huang et al showed that the patients infected by SARS-CoV-2 have presented with a mild clinical course: beginning with fever and dry cough, progressing to a form of mild or moderate respiratory disease, and resolving without specific treatment [2]. Serious complications of the infection, however, remain a central concern. Acute respiratory distress syndrome, acute heart injury or failure, acute kidney injury, sepsis, disseminated intravascular coagulation, and life-threatening metabolic derangements have all been reported in COVID-19 patients, particularly among those with underlying comorbidities or advanced age [3].

The non specific neurological symptoms of COVID-19 were headache in 29(27.4%), dizziness in 9(8.5%) and syncope in one (0.9%) patient. In the study of Liguori et al who assessed 103 patients, about 91.3% of participants had one or more subjective neurological manifestation [12].

Symptoms of COVID-19 related to cranial nerves were change of olfaction/ anosmia in 87(82.1%) and changes of taste / dysgeusia in 80(75.4%) patients, most of them were moderate to severe cases. Consistently, Lechien et al reported that out of 417 mild-to-moderate COVID-19 patients, 86% and 88% had anosmia and ageusia, respectively [13]. Anosmia in many patients was the first manifestation of COVID-19 [14]. Beltrán-Corbellini et al noted that anosmia and ageusia were more frequent in COVID-19 than in influenza. The SARS-CoV-2 virus utilizes angiotensin-converting enzyme 2 receptors, presents in the olfactory epithelium, to enter into the neuronal cells, and then via the olfactory nerve, it spreads to the olfactory bulb [15].

Disorders of consciousness were acute confusion syndrome in 8(7.8%), coma in 4(3.8%) and disorientation in 3(2.8%) patients. These findings were comparable to the study of Helms et al. [16] who examined neurological manifestations in 58 severely ill patients (median age= 63 years) and reported that, agitation was the most frequent neurological complication (69%; 40/58).

Focal neurological deficits found in patients of COVID-19 were TIA 2(1.9%), intracranial hemorrhage and transverse myelitis in one (0.9%), for each, other patients with focal neurological deficits were dropped out by exclusion criteria, those patients were elder, severely ill and have comorbidities, except the patient of transverse myelitis was 30 years old and had mild disease. Correspondingly, in

Table 1. Characteristics of study subjects (N= 106)

	N	%
Age (Years); mean ± SD	68±4.3	
• <40	13	12.3
• 40-59	35	33.0
• 60+	58	54.7
Gender		
• Male	67	63.2
• Female	39	36.8
Comorbidities		
• Diabetes mellitus	50	47.2
• Hypertension	35	33.0
• Heart disease	13	12.3
• Renal diseases	13	12.3
• Asthma/COPD	12	11.3
• Others	8	7.5
Smoking	4	3.8
Symptoms		
• Dyspnea	66	62.3
• Fever	59	55.7
• Cough	50	47.2
• Fatigue	33	31.1
• Abdominal pain	12	11.3
• Sore throat	8	7.5
• Vomiting	6	5.7
• Diarrhea	5	4.7
• Muscle pain	3	2.8
• Refuses of feeding	1	0.9
COVID-19 severity		
• Mild	26	24.5
• Moderate	54	50.9
• Severe	26	24.5
Leucocyte (*103 cell/cumm); mean ± SD	10.9±5.5	
Neutrophils (%);mean ± SD	66.1±28.5	
Lymphocyte (%);mean ± SD	11.5±10.6	
CRP (mg/L); Median	447	
D-dimer(ng/ml); Median	3580	
Hospital stay (Days)		
• <7	45	42.4
• 7-14	43	40.6
• >14	18	17.0

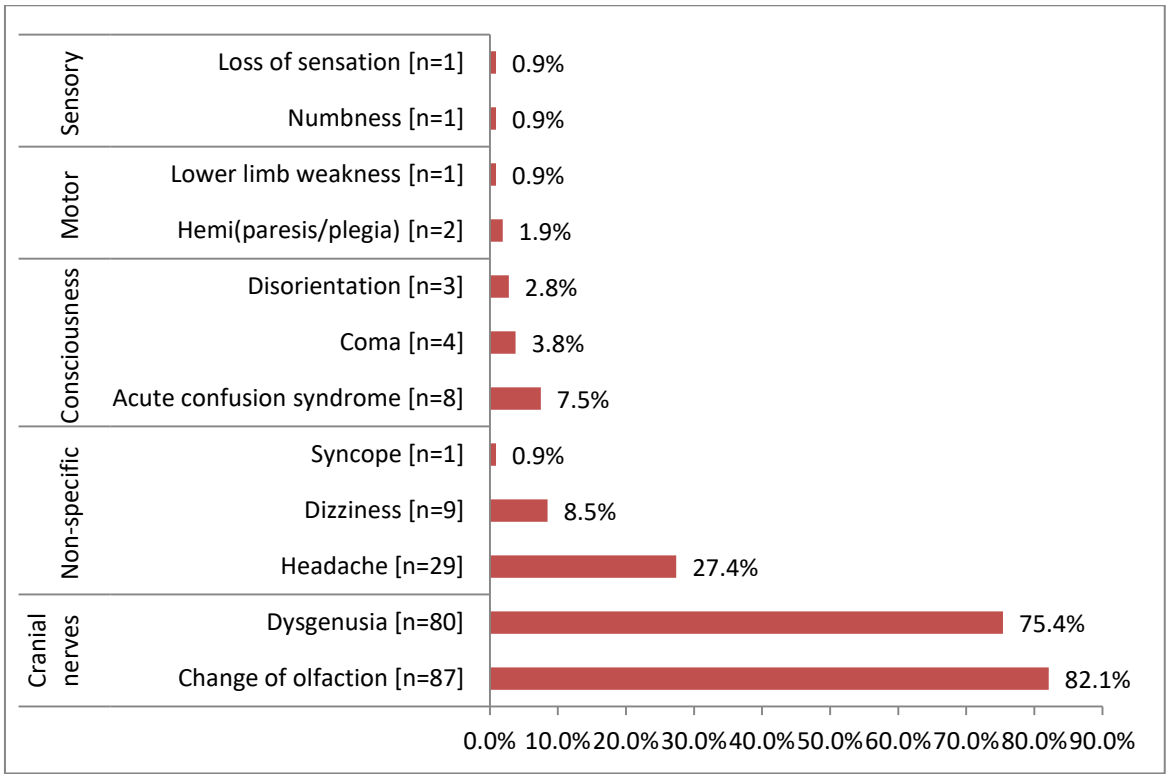

Fig. 1. The neurological manifestations among COVID-19 patients (N=106)

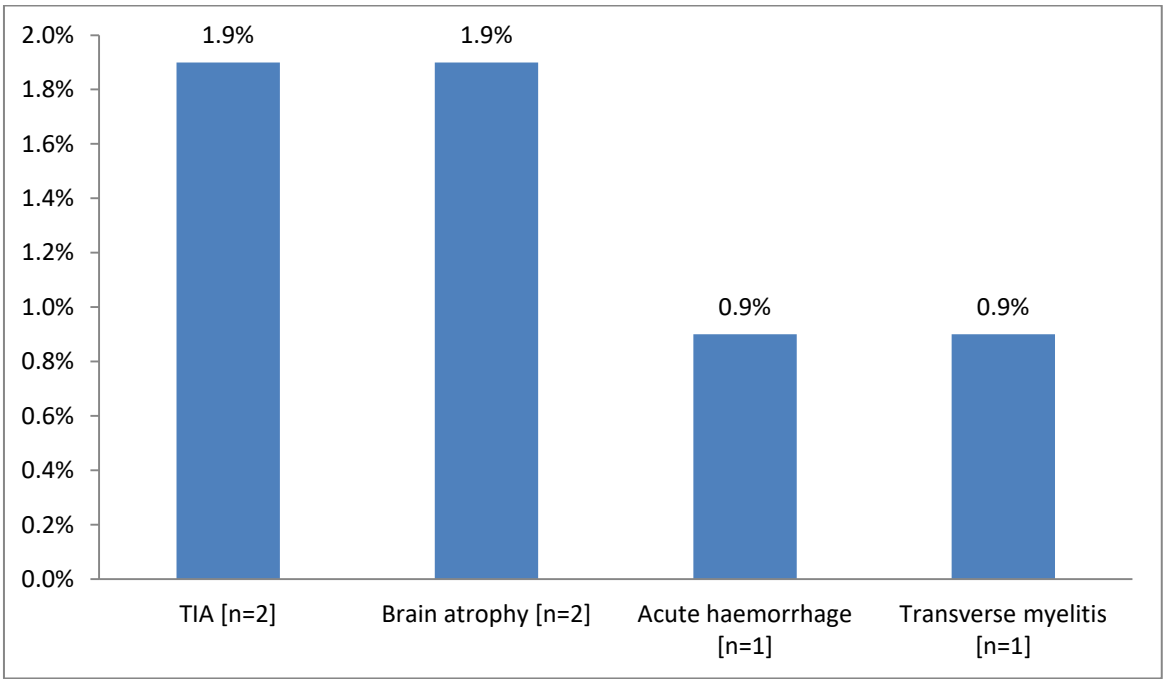

Fig. 2. The neuroimaging findings of COVID-19 patients (N=106)

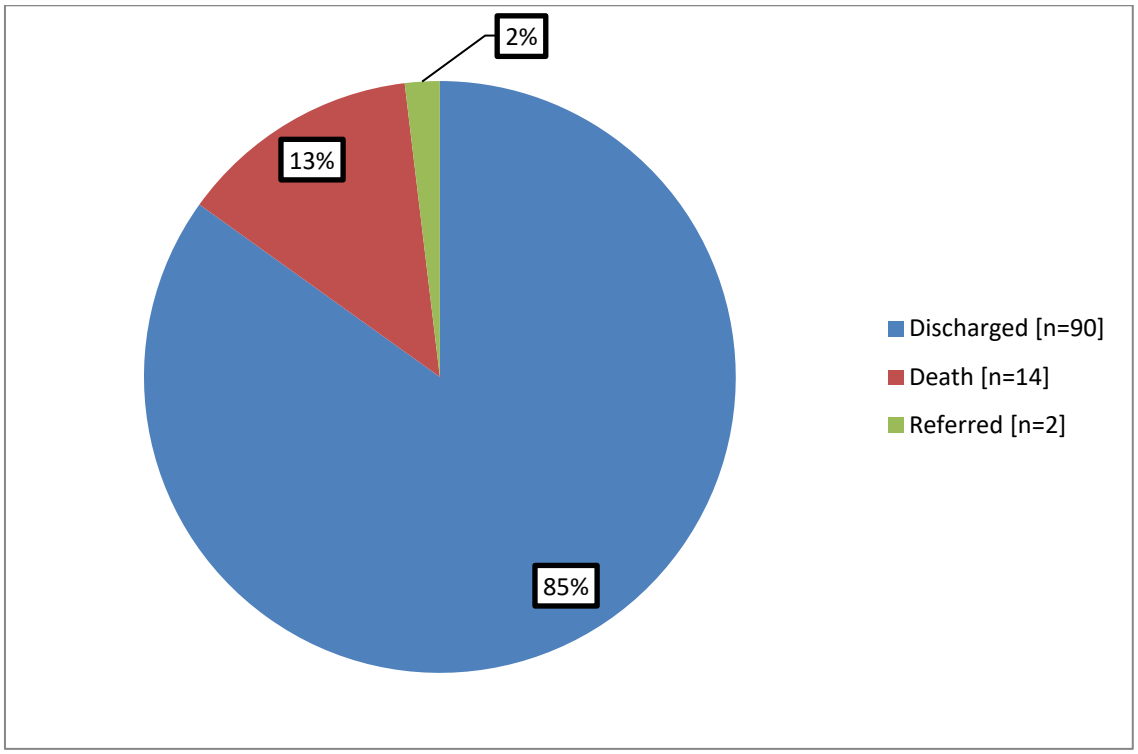

Fig. 3. The outcomes of COVID-19 patients (N=106)

the study of Li et al. [17] out of 221 patients, 4.9% (n=11) had acute ischemic stroke and 0.5% (n=1) of them had cerebral venous thrombosis and cerebral hemorrhage, also the majority of stroke patients were elderly and suffering from severe COVID-19 in addition to comorbidities [17]. Also, in the work of Zhao et al. [18] an acute myelitis in a 66-year-old patient was described. The patient developed acute flaccid paraplegia with spinal sensory level at T10 and urinary incontinence. The patient was treated with intravenous immunoglobulin and corticosteroids, and he responded well to the treatment. The cytokine storm and exaggerated inflammatory changes resulted in acute transverse myelitis [18].

Muscle symptoms were fatigue in 33(31.2%) and muscle pain in 3(2.8%) patients. Similarly several studies noted that myalgia, muscle soreness and fatigue occurred in up to 35% of patients [19-21]. Mao et al have noted muscle injury in 10% (23/214) of COVID-19 patients. Muscle involvement was much more common in severe cases [22].

Seizures were reported in one (0.9%) patient with liver cirrhosis. However in multicentre Chinese retrospective study it was noted that among 304 COVID-19 patients (108 with severe disease) no symptomatic seizures or status epilepticus were observed despite the presence of severe metabolic alterations [23].

The limitations of this study could be summarized in the limited sample size and a single centre design, thus a large scale multicenter studies with full neurological examinations are warranted in our context.

5. CONCLUSION

The study showed that neurological manifestations of COVID-19 are common. Olfactory and gustatory dysfunction appears to be the commonest in these patients, but objective olfactory and testing and long term follow up will be needed to determine its clinical significance, and whether we can use these clinically both as screening and prognostic indicators. Moreover, focal neurological deficits, such as stroke and myelitis can occur, as presenting complains or a complication.

CONSENT

The authors certify that they have obtained all appropriate patient consent forms. Informed consent obtained for participation.

ETHICAL APPROVAL

The study was approved by the institutional ethics committee

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Guan WJ, Ni ZY, Hu Y, Liang WH et al. Clinical characteristics of coronavirus disease 2019 in China. N Engl J Med. 2020;382(18):1708–20.
2. Huang C, Wang Y, Li X, Ren L, Zhao J et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet. 2020;395(10223):497–506.
3. Bhatraju PK, Ghassemieh BJ, Nichols M, Kim R et al. Covid-19 in critically ill patients in the Seattle region—case series. N Engl J Med. 2020;382(21):2012–22
4. Nath A. Neurologic complications of coronavirus infections. Neurology. 2020;94(19):809–10.
5. Koralnik IJ, Tyler KL. COVID-19: A global threat to the nervous system. Ann. Neurol. 2020;88:1–11.
6. Romero-Sánchez CM. et al. Neurologic manifestations in hospitalized patients with COVID-19: the ALBACOVID registry. Neurology; 2020. Available:https://doi.org/10.1212/WNL
7. Pinna P, et al. Neurological manifestations and COVID-19: Experiences from a tertiary care center at the frontline. J. Neurol. Sci. 2020;415:116969.
8. Karadaş Ö, Öztürk B, Sonkaya AR. A prospective clinical study of detailed neurological manifestations in patients with COVID-19. Neurol. Sci. 2020;41:1991–1995.
9. Xiong W, et al. New onset neurologic events in people with COVID-19 infection in three regions in China. Neurology; 2020. Available:https://doi.org/10.1212/WNL.
10. Hu Y, Sun J, Dai Z, Deng H et al. Prevalence and severity of coronavirus disease 2019 (COVID-19): A systematic review and meta-analysis. J Clin Virol. 2020;127:104371.
11. Richardson S, Hirsch JS, Narasimhan M, Crawford JM et al. Presenting characteristics, comorbidities, and outcomes among 5700 patients hospitalized with COVID-19 in the New York City area. JAMA. 2020;323:2052-9.
12. Liguori C, Pierantozzi M, Spanetta M, Sarmati L et al. Subjective neurological symptoms frequently occur in patients with SARS-CoV2 infection. Brain Behav Immun. 2020:S0889-1591(20):30876.
13. Lechien JR, Chiesa-Estomba CM, Place S, Van Laethem Y et al. Clinical and epidemiological characteristics of 1,420 European patients with mild-to-moderate coronavirus disease 2019. J Intern Med; 2020. DOI: 10.1111/joim
14. Lechien JR, Chiesa-Estomba CM, De Siati DR, Horoi M et al. Olfactory and gustatory dysfunctions as a clinical presentation of mild-to-moderate forms of the coronavirus disease (COVID-19): A multicenter European study. Eur Arch Otorhinolaryngol. 2020;1-11.
15. Beltrán-Corbellini Á, Chico-García JL, Martínez-Poles J, Rodríguez-Jorge F, et al. Acute-onset smell and taste disorders in the context ofCovid-19: A pilot multicenter PCR-based case-control study. Eur J Neurol; 2020. DOI: 10.1111/ene
16. Helms J, Kremer S, Merdji H, Clere-Jehl R et al. Neurologic features in severe SARS-CoV-2 infection. N Engl J Med. 2020;382:2268-70.
17. Li Y, Wang M, Zhou Y, Chang J, Xian Y, Mao L, et al. Acute cerebrovascular disease following COVID-19: A single center, retrospective, observational study. SSRN Electron J; 2020. DOI: 10.2139/ssrn
18. Zhao K, Huang J, Dai D, Feng Y, Liu L, Nie S. Acute myelitis after SARS-CoV-2 infection: A case report. medRxiv; 2020. DOI: 10.1101/2020.03
19. Jin M, Tong Q. Rhabdomyolysis as potential late complication associated with COVID-19. Emerg Infect Dis. 2020;26. DOI: 10.3201/eid2607
20. Suwanwongse K, Shabarek N. Rhabdomyolysis as a presentation of 2019 novel coronavirus disease. Cureus. 2020;12:e7561.
21. Chan KH, Farouji I, Abu Hanoud A, Slim J. Weakness and elevated creatinine kinase as the initial presentation of coronavirus disease 2019 (COVID-19). Am J Emerg Med. 2020;S0735-6757(20):30353-3.
22. Mao L, Jin H, Wang M, Hu Y, Chen S, He Q, et al. Neurologic manifestations of

hospitalized patients with coronavirus disease 2019 in Wuhan, China. JAMA Neurol. 2020;e201127.

23. Lu L, Xiong W, Liu D, Liu J, Yang D, Li N, et al. New-onset acute symptomatic seizure and risk factors in Corona Virus Disease 2019: A retrospective multicenter study. Epilepsia; 2020.
DOI: 10.1111/epi

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/83689