Acta Scientific MEDICAL SCIENCES (ISSN: 2582-0931)

Volume 6 Issue 7 July 2022

Research Article

"Neurological Manifestations and Complications of COVID-19 in Jouf Region"

Waleed Seif El-Din Mohamed[1]*, Hisham Abid Aldabbagh[2], Mohammed Ghazi Thani Alruwaili[2], Khaled Zeki Fouda[3], Mohamed Fawzy Ibrahim[4], Iman Adel Abdel-Almoniem[5], Refah Muflih Alazmi[2] and Zarifa Matar Salem Al Atawi[2]

[1]*Clinical Laboratory Department, College of Applied Medical Sciences, Jouf University, Egypt*

[2]*Qurayyat General Hospital, Directorate of Health Affairs in Qurayyat, Ministry of Health, KSA, Egypt*

[3]*Department of Basic Science for Physical Therapy, Faculty of Physical Therapy, Cairo University, Egypt*

[4]*Paediatric Oncology Department, Egypt*

[5]*Surgical Pathology Department, National Cancer Institute, Cairo University, Egypt*

***Corresponding Author:** Waleed Seif El-Din Mohamed, Clinical Laboratory Department, College of Applied Medical Sciences, Jouf University, Egypt.

Received: April 14, 2022

Published: June 15, 2022

Abstract

Background: The coronavirus pandemic has overwhelmed the health scene in almost all world countries including Middle East region. Neurological manifestations and complications are frequently reported among Covid-19 patients.

Aim of work: To focus on Neurological Manifestations and Complications of COVID-19, aiming to add more clearance of these Manifestations and Complications and their outcomes in COVID-19 patients.

Patients and Methods: The present retrospective study was conducted on 127 COVID 19 patients who were admitted at Qurayyat general hospital from 01-01-2020 to 31-12-2020, in addition to other 127 patients without neurological manifestations (as a control group) recruited from other departments.

Results: Comparison between both groups shows that patients with neurological manifestations are significantly older (61.52 ± 51.29 versus 43.2 ± 19.8 years, p = 0.001). Also, they had significantly higher frequency of Diabetes mellitus (DM) comorbidities (41/127 (32.3%) versus 20/127 (15.7%), p = 0.02), and higher frequency of Hypertension (HTN) comorbidities (54/127 (42.5%) versus 18/127 (14.1%), p = 0.001). In addition, they had significantly higher frequency of chronic obstructive pulmonary disease (COPD) comorbidities (17/127 (13.4%) versus 2/127 (1.6%), p = 0.04). For Chronic kidney disease (CKD), there was a statistically significant difference (p = 0.023) between patients with/or without neurological manifestations. Regarding predictors of mortality in the studied patients, Diabetes Mellitus [OR (95% CI): 1.31 (1.11-1.56), p = 0.01], and presence of neurological manifestations [OR (95% CI): 0.29 (0.14-0.9), p = 0.03] demonstrated as independent risk factors with COVID-19 mortality.

Conclusion: The current study has demonstrated that neurological manifestations are common in Covid-19 patients. Also, diabetes mellitus and presence of neurological manifestations may be considered as two independent risk factors with COVID-19 mortality.

Keywords: Covid-19; Neurological Manifestations and Complications; Covid-19 Mortality

Introduction

Coronavirus disease 2019 (COVID-19) Covid-19 pandemic is the most drastic global health problem since the influenza pandemic that dominated the international scene after World War I and killed tens of millions of people in many countries [1]. Although the most common and important presentation is with respiratory disease, many cases of neurological features are recorded. The pandemic is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The clinical characteristics appear to be a combination of non-specific complications of systemic disease, the effects of direct viral infection, or inflammation of the nervous system and vasculature, which can be para-infectious or post-infectious. The causative pathogen showed distinctive neurological neurotropism in a large proportion of patients [2]. It has been estimated that about one quarter of Covid-19 patients had one or more neurological symptoms. The range of neurological symptoms in covid-19 patients affect both the central and peripheral nervous systems. Reported manifestations include loss of taste and smell, headache, dizziness, Guillain-Barre syndrome, seizures, stroke and encephalitis [3]. The relatively high frequency of neurological sequelae together with the wide spectrum of symptoms raised significant concern. Some authors suggested this may be related to compromised brain lung-brain axis that facilitates induction of brain injury because of concurrent lung injury. The central nervous system may be also affected by the overwhelming cytokine storm known as the hallmark of covid-19 pathogenicity [4]. Other contributing factors are blood pressure dysregulation, hypoxia, and thrombotic complications [5].

The new emerged COVID-19, has presented firstly by Acute respiratory disorder, resulted in acute respiratory failure, may require ICU care, Mechanical ventilation support, sometimes complicated by severe ARDS, or even sudden death, but later on with consequent wide international spread of COVID-19, a lot of others different manifestations and complications of COVID-19 were reported consequently throughout the world, including, hematologic, gastro-intestinal, cardiac, renal, dermatologic, neurological, and psychiatric disorders.

In this research we will focus on Neurological Manifestations and Complications of COVID-19, aiming to add more clearance of these Manifestations and Complications and their outcomes in COVID-19 patients.

Patients and Methods

The present retrospective study was conducted on 127 COVID 19 patients who were admitted at Qurayyat general hospital from 01-01-2020 to 31-12-2020, in addition to other 127 patients without neurological manifestations (as a control group) recruited from other departments.

All participants were subjected to careful history taking, thorough clinical examination and routine laboratory investigations. Patients with neurological manifestations were in addition submitted to computed tomography (CT) or magnetic resonance imaging (MRI) as appropriate. The primary outcome of the present study is patients' in-hospital mortality.

Severity of Covid-19 illness was assessed according to the recommendations of Infectious Diseases Society of America/American Thoracic Society Criteria. Patients were classified to have severe disease if they have at least one of two major criteria (septic shock with need for vasopressors or invasive mechanical ventilation) or ≥ 3 minor criteria (respiratory rate ≥ 30 breaths/min, pao2/fio2 ratio ≤ 250, multilobar infiltrates, confusion/disorientation, uremia (bun level ≥ 20 mg/dl).

Exclusion Criteria. Actually, there is not any potential risk for anyone, because there is no any direct contact or any intervention with any individual or samples.

Data obtained from the present study were presented as mean and standard deviation (SD) or number and percent. Categorical data were compared using chi square test or Fisher's exact test while numerical data were compared using student t test. Logistic regression analysis was used to identify predictors of mortality in the studied patients. All statistical operations were computed using SPSS 26 (IBM, IL, USA). P value was considered statistically significant.

Results

The present retrospective study was conducted on 127 COVID 19 patients who were admitted at Qurayyat general hospital from 01-01-2020 to 31-12-2020 and other 127 patients without neurological manifestations as a control group.

Comparison between both groups shows that patients with neurological manifestations are significantly older (61.52 ± 51.29

Parameter	Patients with Neurological Manifestations	Patients without Neurological Manifestations	P- value
Age (years) mean ± SD	61.52 ± 51.29	43.2 ± 19.8	0.001*
Gender Male/Female n	76/51	46/39	0.06
Associated comorbidities n (%)			
Diabetes mellitus (DM)	41/127 (32.3)	20/127 (15.7)	0.02*
Hypertension (HTN)	54/127 (42.5)	18/127 (14.1)	0.001*
Biliary Atresia (BA)	6/127 (4.7)	9/127 (7.1)	0.42
Chronic kidney disease (CKD)	13/127 (10.2)	1/127 (0.8)	0.023*
Systemic lupus erythematosus (SLE)	1/127 (0.8)	2/127 (1.6)	0.68
Solid tumors	7/127 (5.5)	8/127 (6)	0.69
ischemic heart disease (IHD)	18/127 (14.1)	13/127 (10.2)	0.43
Hypothyroidism	2/127 (1.6)	3/127 (2.3)	0.67
Chronic obstructive pulmonary disease (COPD)	17/127 (13.4)	2/127 (1.6)	0.04*
Pulmonary embolism (PE)	13/127 (10.2)	3/127 (2.3)	0.6
leukemia, Lymphoma	3/127 (2.3)	2/127 (1.6)	0.68
BM transplant	2/127 (1.6)	3/127 (2.3)	0.64
Renal transplant	1/127(0.8)	2/127 (1.6)	0.61
Covid-19 severity			
Severe	78/127 (61.4)	45/127 (35.4)	0.001*
Non-Severe	49/127 (38.6)	82/127 (64.6)	

Table 1: Comparison between patients with/or without neurological manifestations.

*P-value < 0.05 is statistically significant.

versus 43.2 ± 19.8 years, p = 0.001). Also, they had significantly higher frequency of Diabetes mellitus (DM) comorbidities (41/127 (32.3%) versus 20/127 (15.7%), p = 0.02), and higher frequency of Hypertension (HTN) comorbidities (54/127 (42.5%) versus 18/127 (14.1%), p = 0.001). Also, they had significantly higher frequency of chronic obstructive pulmonary disease (COPD) comorbidities (17/127 (13.4%) versus 2/127 (1.6%), p = 0.04). For Chronic kidney disease (CKD), there was a significant difference (p = 0.023) between patients with/or without neurological manifestations (Table 1).

The most common central neurological manifestations & complications reported was headache (78.7%), followed by dizziness (55.9%), then decreased consciousness (39.4%), and Encephalopathy (32.3%), as shown in table 2. On the other hand, the most common peripheral neurological manifestations & complications recorded was hyposmia and hypoesthesia (71.7%), followed by neuralgia (63%), then skeletal muscle injury (51.1%) (Table 3).

Regarding predictors of mortality in the studied patients, It was also shown that 81 patients (64.0 %) died among patients with neurological manifestations while in patients without neurological affection only 38 patients (30.0 %) died (p = 0.001). For univariate analysis, older age [OR (95% CI): 1.18 (1.08-1.29), p = 0.001], hypertension [OR (95% CI): 1.11 (1.03-1.20), p = 0.001], diabetes mellitus [OR (95% CI): 1.34 (1.10-1.64), p = 0.02], COPD [OR (95% CI): 1.31 (1.11-1.56), p = 0.04], and neurological affection [OR (95% CI): 0.35 (0.14-0.88), p = 0.025] might increase the risk of mortality among patients with COVID-19. In the multivariate analysis, Diabetes Mellitus [OR (95% CI): 1.31 (1.11-1.56), p = 0.01], and presence of neurological manifestations [OR (95% CI): 0.29 (0.14-0.9), p = 0.03] demonstrated as independent risk factors with COVID-19 mortality.

Central Neurological Manifestations and Complications	Frequency (n)	Percentage (%)
dizziness	(71/127)	55.9 %
Headache	(100/127)	78.7 %
Cerebrovascular Accident	(6/127)	4.7%
decreased consciousness	(50/127)	39.4%
Transverse myelitis	(4/127)	3.4%
Encephalopathy	(41/127)	32.3%
Epilepsy	(3/127)	2.4%
Ataxia	(1/127)	0.8 %
Tremor	(3/127)	2.4%
Others	(28/127)	22%

Table 2: Frequency of Central Neurological Manifestations and Complications.

Peripheral Neurological Manifestations and Complications	Frequency (n)	Percentage (%)
Hypoesthesia	(91/127)	71.7%
Hyposmia	(91/127)	71.7%
Neuralgia	(80/127)	63%
Guillain Barré Syndrome	(1/127)	0.8 %
Skeletal muscle injury	(65/127)	51.1%
Others	(1/127)	0.8 %

Table 3: Frequency of Peripheral Neurological Manifestations and Complications.

Discussion

Neurological manifestations of infection with COVID-19 have been reported, associated with a broad spectrum of diverse neurological symptoms and syndromes. Estimating rate and relevance of these manifestations remains difficult as there is a lack of standardised case definitions [6].

The current study aimed to analyse two groups of Covid-19 patients with, and without neurological manifestations and complications. Our results have shown that patients with neurological affection are significantly older. Also, they had significantly higher frequency of previous pulmonary morbidities. This is in line with the study of Romagnolo., *et al.* [7,8] who noted that Covid-19 patients with neurological disorders are significantly older than those without neurological manifestations.

Regarding diabetes mellitus and hypertension morbidities, they were higher in covid 19 cases with neurological complications than those without one. This finding agrees well with previous records reported by Palmer [9] where she stated that COVID-19-positive patients who have hypertension and type 2 diabetes are more likely to experience the neurological complications, including bleeding in the brain and stroke, that come with the virus.

Our results also demonstrated that headache was the most common central nervous system manifestation while hyposmia and hypoesthesia were the most common manifestations affecting the peripheral nervous system. These findings are matched well with studies done by other authors [8,10,11]. On the other hand, Makda., *et al*. [12] reported that the most common central neurological manifestation and complication was dizziness.

Regarding predictors of mortality in the studied patients, there was a statistically significant difference ((p = 0.001) between patients with neurological manifestations than those without neurological affection. For univariate analysis, older age [OR (95%

CI): 1.18 (1.08-1.29), p = 0.001], hypertension [OR (95% CI): 1.11 (1.03-1.20), p = 0.001], diabetes mellitus [OR (95% CI): 1.34 (1.10-1.64), p = 0.02], COPD [OR (95% CI): 1.31 (1.11-1.56), p = 0.04], and neurological affection [OR (95% CI): 0.35 (0.14-0.88), p = 0.025] might increase the risk of mortality among patients with COVID-19. In the multivariate analysis, diabetes mellitus [OR (95% CI): 1.31 (1.11-1.56), p = 0.01], and presence of neurological manifestations [OR (95% CI): 0.29 (0.14-0.9), p = 0.03] demonstrated as independent risk factors with COVID-19 mortality. The association between neurological manifestations and poor outcome in Covid-19 patients were reported by other studies [8,13,14].

However, Logistic regression analysis which performed by Essmat [8] stated only neurological manifestations as an independent predictor of mortality [OR (95% CI): 0.35 (0.14-0.88), p = 0.025]. This finding does not match well with our findings where our results demonstrated diabetes mellitus and presence of neurological manifestations as two independent risk factors with COVID-19 mortality. This discrepancy in results may be explained by the small sample size (50 patients with neurological affection and 50 patients without one as a controls) that performed by Essmat[8] compared to 127 patients with neurological manifestations/complications and 127 control group without neurological affections that done by our study.

Conclusions

The current study has demonstrated that neurological manifestations are common in Covid-19 patients. Also, diabetes mellitus and presence of neurological manifestations may be considered as two independent risk factors with COVID-19 mortality.

Bibliography

1. Ellul MA., *et al*. "Neurological associations of COVID-19". *The Lancet. Neurology* 19.9 (2020): 767-783.

2. Beghi E., *et al*. "COVID-19 Infection and Neurological Complications: Present Findings and Future Predictions". *Neuroepidemiology* 54.5 (2020): 364-369.

3. Soltani Zangbar H., *et al*. "A Review on the Neurological Manifestations of COVID-19 Infection: a Mechanistic View". *Molecular Neurobiology* (2020): 1-14.

4. Nuzzo D and Picone P. "Potential neurological effects of severe COVID-19 infection". *Neuroscience Research* 158 (2020): 1-5.

5. Wenting A., *et al*. "COVID-19 Neurological Manifestations and Underlying Mechanisms: A Scoping Review". *Frontiers in Psychiatry* 11 (2020): 860.

6. Yana Leven Y and Bösel J. "Neurological manifestations of COVID-19-an approach to categories of pathology". *Neurological Research and Practice* 3 (2021): 39.

7. Romagnolo A., *et al*. "Neurological comorbidity, and severity of COVID19". *Journal of Neurology* (2020): 1-8.

8. Ahmed Essmat. "Neurological Manifestations in Egyptian Covid-19 Patients". *Al-Azhar International Medical Journal (AIMJ)* (2021).

9. Whitney J Palmer. "Hypertension, Diabetes Increase Risk of COVID-19 Neurological Complications". *Diagnostic Imaging* (2020).

10. Favas TT., *et al*. "Neurological manifestations of COVID-19: a systematic review and meta-analysis of proportions". *Neurological sciences: Official Journal of the Italian Neurological Society and of the Italian Society of Clinical Neurophysiology* 41.12 (2020): 3437-3470.

11. Agarwal P., *et al*. "Neurological manifestations in 404 COVID-19 patients in Washington State". *Journal of Neurology* (2020): 1-3.

12. Makda A., *et al*. "The Frequency of Neurological Symptoms in COVID-19 Patients at a Tertiary Care Hospital in Pakistan". *Cureus* 12.9 (2020): e10360.

13. Shekhar R., *et al*. "Neurological Complications Among Native Americans with COVID-19: Our Experience at a Tertiary Care Academic Hospital in the U.S". *Journal of Stroke and Cerebrovascular Diseases: The Official Journal of National Stroke Association* 29.12 (2020): 105260.

14. Chua TH., *et al*. "Neurological manifestations in COVID-19: a systematic review and meta-analysis". *Brain Injury* (2020): 1-20.