ECRONICON OPEN ACCESS

EC PULMONOLOGY AND RESPIRATORY MEDICINE

Research Article

Prevalence of Post COVID-19 Syndrome among Egyptian Patients

Heba H Abo ElNaga[1] and Hesham Atef AbdelHalim[2]*

[1]*Pulmonary Medicine Department, Faculty of Medicine, October 6 University, Giza, Egypt*

[2]*Pulmonary Medicine Department, Faculty of Medicine, Ain Shams University, Cairo, Egypt*

***Corresponding Author**: Hesham Atef AbdelHalim, Pulmonary Medicine Department, Faculty of Medicine, Ain Shams University, Cairo, Egypt.

Received: April 11, 2023; **Published:** May 22, 2023

DOI: 10.31080/ecprm.2023.12.00983

Abstract

Background: The struggle against COVID-19 does not halt with diagnosing and treating acute disease. Survivors of COVID-19 experience unfamiliar medium and long-term health consequences known as Post COVID-19 syndrome whose management remains a clinical challenge, as there are no evidence-based international guidelines to follow at the time of writing.

Objective: To determine the incidence of symptoms, demographic associations, and risk factors for the occurrence of the post-COVID-19 syndrome in a cohort in the period from January 2021 to December 2021.

Methods: an observational cross-sectional study on Egyptian subjects post infection with coronavirus (SARS-CoV 2) from different geographical areas in Egypt who replied to an online survey about post-COVID syndrome.

Results: 418 Egyptian subjects included in the study from 5 Egyptian governorates, divided into group 1 (222) subjects who had post-COVID syndrome (PCS), and group 2 included 196 subjects who did not. The mean age was 37.45 ± 10.19 years. Post-viral fatigue was the most prevalent feature (139 (62.6%)) Psychological problems as depression and anxiety (14 (6.3%)) and exertional dyspnea (119 (53.6%)), while symptoms contribute to less than 2%, are anosmia, ageusia and skin rash. The mean duration of PCS symptoms was 6.16 ± 1.03 weeks. being less severe in subjects treated at home and worse in those treated in ICU.

Conclusion: We should consider prioritizing follow-up care for post-COVID infected subjects who develop the highest-burden of ongoing overlapping symptoms of post severe COVID-19 syndrome.

Keywords: *SARS-COV2; Post-COVID Syndrome; Post-Viral Symptoms; COVID-19; Long COVID*

Introduction

Post-acute covid-19 ("long covid") is a multisystem syndrome, sometimes arising after a relatively mild acute disease [1]. Post-acute covid-19 is defined as continuing beyond four weeks from the onset of the first symptoms [2].

Symptoms of Post-acute covid-19 diverge, frequent cough, low-grade fever, and fatigue [3]. Other testified symptoms include dyspnea, chest pain, headaches, neuro-cognitive difficulties, muscle pains and weakness, gastrointestinal upset, rashes, metabolic disorder (such as poor control of diabetes), thromboembolic conditions, and depression, and other psychological disturbances and Skin rashes [4].

The reason for prolonged recovery in some people is indefinite. Many theories were proposed resulting from previous studies as persistent viremia due to weak or absent antibody response [5], relapse or reinfection [6,] inflammatory and other immune reactions [7,8],

de-conditioning, and mental factors such as post-traumatic stress [9,10] may all interpose. As previously described, long-term respiratory, musculoskeletal, and neuropsychiatric sequelae [11].

Post-acute COVID-19 syndrome management remains a clinical challenge as there are no evidence-based international guidelines to follow at the time of writing.

For practical evaluation of post-COVID-19 syndrome, it is essential to know the prevalence, variable presentations, and risk factors of this syndrome.

Objective of the Study

The objective of this study is to determine the prevalence of symptoms, demographic associations, and risk factors for the occurrence of the post-COVID-19 syndrome in a cohort of COVID-19 infected subjects.

Methods

Study design and subject selection

Following the Egyptian Government guidelines (to the public) for reducing face-to-face communication and home isolation, a cross-sectional study was done using an online sampling procedure to collect data from Egyptian residents aged ≥ 18 and < 70 years old during January 2021 and December 2021.

The survey was conducted on subjects who were presented to outpatient department (OPD) on October 6 University (O6U) with confirmed SARS-CoV-2 infection.

Non-Egyptian subjects and subjects younger than 18 years old and older than 70 were excluded from the study. Confirmed SARS-COV2 infection defined as a person with laboratory confirmation (by Molecular testing using polymerase chain reaction (PCR) with a nasopharyngeal swab) of SARS-COV2 infection, irrespective of clinical signs and symptoms [12,13].

Data collection

We designed an online questionnaire using Google forms and then shared the questionnaire with the study participants via the WhatsApp online application. A 13-question anonymous online questionnaire included four components: the demographic data of the respondents, the clinical presentation and the duration of illness, comorbidities, and method of diagnosis and site of management.

The questionnaire was sent to the participants eight weeks after first attendance to OPD of O6U with symptoms suspicious of COVID infection and confirmed by positive PCR results for SARS-COV2 infection. Subjects were advised to continue home management and isolation or categorized as moderate or severe infection, indicating admission to isolation hospital or ICU.

Post-COVID conditions are a wide range of new, returning, or ongoing health problems people can experience more than four weeks after first being infected with SARS-CoV-2, the virus that causes COVID-19 [14].

The total number of eligible subjects were divided into two groups: group 1 included subjects with post-COVID syndrome (PCS) and group 2, which included subjects who did not experience PCS symptoms.

After reviewing previous studies, we determined the following criteria to calculate the minimum sample size: population size of 100400000, expected frequency of 50%, confidence level of 95%, and a margin of error of 5% and clusters = 2. Therefore, the calculated lowest sample size = 384 subjects and the cluster size = 192. However, we sent the survey to 480 subjects to overcome any unexpected invalid questionnaires. A total of 480 subjects enrolled in the study. Forty-three subjects declined to answer the questionnaires, 6 reported younger than 18 years, and the remaining 13 were either non-Egyptian (4 respondents) or did not complete the questionnaires (9 respondents). So, 418 participants completed the study.

We calculated the smallest sample size using the Epi-Info version 7.2 StatCalc available on the Centers for Disease Control and Prevention (CDC) website www.cdc.gov/epiinfo/.

The questionnaire was piloted on 50 randomly selected people to ensure the reliability and validity of the questions. The questions were written in Arabic; the author proceeded to widely distribute the survey after all bugs were fixed and addressed minor feedback on the wording of the questions.

The study was approved by the ethical committee of the faculty of medicine, October 6 University, as a general clearance to the chest department for further COVID-19 related studies. This study was conducted as per Helsinki principles.

Data analysis

To associate between data variables, we used Chi-square (χ^2) test for categorical variables and Pearson's correlation for simple correlations between variables. We performed a logistic regression test to study the post-COVID syndrome predictors.

We used the statistical package for the social sciences (SPSS version 17; SPSS Inc., Chicago, Illinois, USA) statistical software. Significance was considered at a P value less than 0.05.

Results

Demographic data

Four hundred and eighty subjects confirmed COVID-19 respiratory infection were involved in the study; 43 subjects declined to answer the questionnaires, 6 reported younger than 18 years, and the remaining 13 were either non-Egyptian (4 respondents) or did not complete the questionnaires (9 respondents). So, 418 participants completed the study (Figure 1).

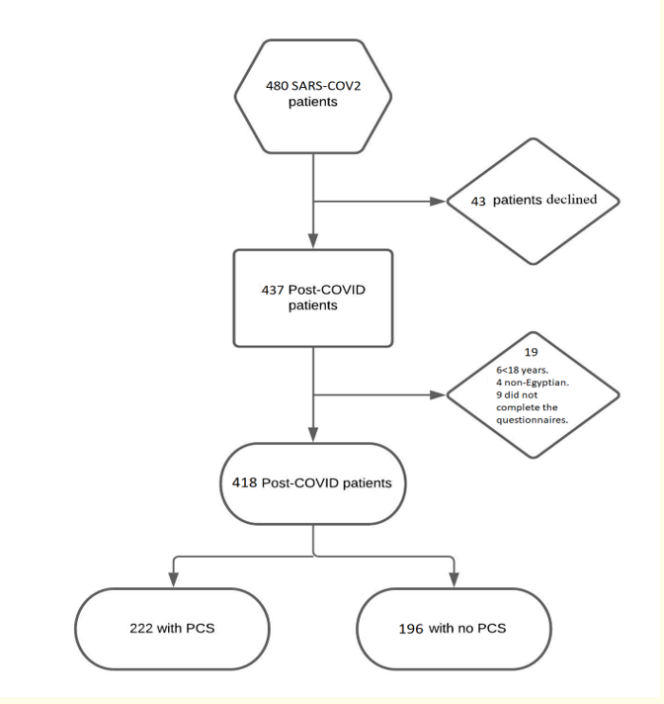

Figure 1: *Flowchart of patient participation in the study. PCS: Post COVID Syndrome.*

The subjects are specifically from 5 Egyptian governorates: Cairo (157), Giza (78), and Alexandria (85) in northern Egypt and Fayoum (63), and Assiut (35) in southern Egypt, were obtained randomly selected for data collection [15].

This study describes the clinical assessment of 418 subjects with confirmed COVID-19 reviewed eight weeks following hospital discharge or first attendance to the outpatient department (OPD).

After the assessment, we divided the total 418 subjects into two groups: group 1 included 222 subjects who had post-COVID syndrome (PCS), and group 2 included 196 subjects who did not experience PCS symptoms.

The participants' mean age was 37.45 ± 10.19 years. All subjects were younger than 70 years of age with significantly higher age in subjects with PCS (group 1).

The male to female ratio was 1.42:1. There was no significant difference between the two groups regarding sex distribution.

The mean BMI in total participants was 26.39 ± 8.64, and 18.9% were current smokers.

Three hundred and eighty (90.9%) subjects had mild to moderate disease with home management, whereas 28 (6.7%) subjects had severe disease necessitated hospital care, and 10 (2.4%) subjects had a critical disease that needed ICU admission.

One hundred and nine (26.08%) of the total participants had comorbidities. Table 1 shows the characteristics of the following groups of participants, as well as a summary of their COVID-19 diagnosis, level of care, and associated comorbidities.

	Total **n = 418**	**Group 1** **n = 222**	**Group 2** **n = 196**	**p value**
Age (Years)	29.44 ± 15.42	31.17 ± 16.06	25.6 ± 13.18	<.01*
Sex				
Males	245 (58.61%)	126 (56.76%)	119 (60.71%)	.427
Females	173 (41.39%)	96 (43.24%)	77 (39.29%)	
Smoking				
Current	79 (18.9%)	50 (22.5%)	29 (14.8%)	.046
Non	339 (81.1%)	172 (77.5%)	167 (85.2%)	
BMI (Kg/m^2)	26.39 ± 8.64	26.3 ± 5.2	26.66 ± 13.58	.720
Duration of illness (Weeks)	3.77 ± 3.41	5.59 ± 3.01	1.71 ± 2.56	<.01*
Level of care				
Home	380 (90.9%)	190 (85.6%)	190 (96.9%)	<.01*
Hospital	28 (6.7%)	24 (10.8%)	4 (2.04%)	
ICU	10 (2.39%)	8 (3.6%)	2 (1.02%)	
Comorbidities				
Chronic respiratory	26 (6.22%)	15 (6.75%)	11 (5.61%)	.688
IHD	10 (2.39%)	6 (2.7%)	4 (2.04%)	.756
CKD	7 (1.67%)	7 (3.15%)	0 (0%)	.005*
HTN	50 (11.96%)	33 (14.86%)	17 (8.67%)	.069
DM	39 (9.33%)	25 (11.26%)	14 (7.14%)	.178
None	309 (73.9%)	157 (70.72%)	152 (77.55%)	.119

Table 1: *Descriptive data of participating subjects with the comparison of the two groups.*

Data are presented as mean ± SD for quantitative data or frequency (%) for categorical data. Comparing variables in group 1 and group 2 is made using the independent t-test for quantitative data and the Mann-Whitney U test for categorical data. IHD: Ischemic Heart Disease; CKD: Chronic Kidney Disease; HTN: Hypertension; DM: Diabetes Mellitus.

**p < .05, statistically significant.*

Comparison between both groups regarding the associated comorbidities are presented in figure 2.

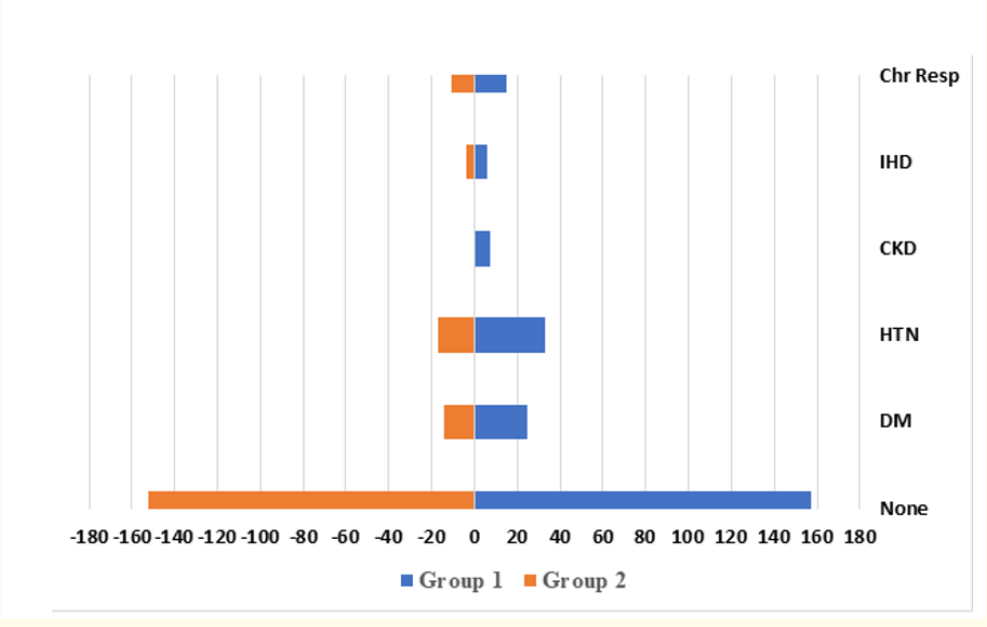

Figure 2: *The frequency of comorbidities in both groups' subjects with and without Post COVID syndrome.*

In total, 44 (19.8%) subjects showed at least one post-COVID-19 symptom, while 178 (80.2%) subjects showed more than one symptom.

Among subjects having PCS, Post-viral fatigue was the most prevalent feature (139 (62.6%)). Other features included repeated cough (126 (56.8%)), recurrent headache (120 (54.1%)), exertional dyspnea (119 (53.6%)), myalgia (104 (46.8%)), dizziness and confusion (82 (36.9%)), Sore throat (49 (22.1%)), Poor quality of sleep (43 (19.4%)), Psychological problems as depression and anxiety (14 (6.3%)). Other symptoms, each contributes to less than 2%, are anosmia, ageusia, impaired memory, palpitation, skin rash, running nose, diarrhea, abdominal pain, tinnitus, blurring of vision, excessive sweating. The mean duration of PCS symptoms was 6.16 ± 1.03 weeks (Table 2).

Studying the association between different post-COVID symptoms and the demographic data and comorbidities revealed that post-viral fatigue was more evident in subjects with high BMI ($p = .048$).

PCS respiratory symptoms as cough and exertional dyspnea were significant post-COVID symptoms. Dyspnea on mild exertion appeared to be significantly associated with smoking ($p = .008$).

There was also a significant correlation between dyspnea and the level of care of the acute illness being less severe in subjects treated at home and worse in the ICU ($p = .008$).

Moreover, cough and exertional dyspnea were significantly present in hypertensive and diabetic subjects. ($p < .01$).

	Group 1 (n = 222)
Poor quality of sleep	43 (19.36%)
Sore throat	49 (22.07%)
Psychological	14 (6.31%)
Myalgia	104 (46.9%)
Fatigue	139 (62.61%)
Dyspnea	119 (53.6%)
Cough	126 (56.8%)
Headache	120 (54.05%)
Confusion	82 (36.94%)
Duration of PCS symptoms (weeks)	6.16 ± 1.03
Frequency of symptoms	
One symptom	44 (19.8%)
> one symptom	178 (80.2%)
The severity of acute COVID-19	
Mild to Moderate	190 (85.6%)
Severe	24 (10.8%)
Critical	8 (3.6%)

Table 2: *Post-COVID 19 syndrome symptom profile.*

Data are presented as mean ± SD for quantitative data or frequency (%) for categorical data.

PCS, Post-Covid Syndrome.

Myalgia was another common symptom among the study participants; it was a significant PCS symptom in subjects having IHD (p = .003), HTN (p = .013), and DM (p < .01).

Headache appeared to be a characteristic post-covid symptom which was associated significantly with longer COVID illness duration (p = .010), subjects having hypertension (p = .007), and diabetes mellitus (p = .006).

Poor quality of sleep was a prominent symptom associated with obesity (p = .049), participants having a chronic respiratory disease (p = .006), IHD (p = .003), HTN (p = .028), and DM (p = .001) besides, it strongly correlates with the acute COVID disease severity being worse with a higher level of care (p = .001).

We decided to perform a logistic regression test to study the post-COVID syndrome predictors.

The logistic regression model explains 54% of the PCS in total (the overall accuracy of this model is 83.7% with a predicted probability of 0.5 or greater).

Patents with age categories from 31 to 45 years and duration of the COVID illness appeared to be the principal predictors for having PCS (Table 3).

	OR (95% CI)	p
Age (31-45 years)	.168 (.078-.358)	<.01*
Male gender	1.280 (.736-2.227)	.382
Current smoker	.612 (.302-1.243)	.174
BMI (Kg/m^2)	.996 (.965-1.027)	.776
Duration of illness (Weeks)	1.862 (1.613-2.150)	<.01*
Level of care		
Hospital	1.036 (.170-6.307)	.970
ICU	2.549 (.308-21.085)	.385
Comorbidities		
Chronic respiratory	1.048 (.321-3.423)	.938
IHD	.845 (.063-11.275)	.899
HTN	.783 (.333-1.841)	.575
DM	1.387 (.510-3.773)	.522

Table 3: *Logistic regression for demographic data and comorbidities as predictors for PCS.*

Data are presented as odds ratio (95% CI), OR: Odds Ratio; CI: Confidence Interval; IHD: Ischemic Heart Disease; CKD: Chronic Kidney Disease; HTN: Hypertension; DM: Diabetes Mellitus.

**p < .05, statistically significant.*

Discussion

This study describes the clinical assessment of 418 subjects with COVID-19 reviewed eight weeks following hospital discharge or first attendance to the outpatient department (OPD). After the assessment, 418 subjects were divided into two groups: group 1 included 222 subjects who had post-COVID syndrome (PCS), and group 2 included 196 subjects who did not experience PCS symptoms.

All subjects included in this study were younger than 65 years of age, with a mean age of the study subjects was 37.45 ± 10.19 years. However, there was a statistically significant difference in the frequency of adopting PCS in preference to a higher age. Different earlier studies asserted that post-covid-19 symptoms may affect subjects of any age but seem common in elderly subjects [16].

Although this study attained that PCS was significantly predominant in males, there was no significant difference between the two groups regarding the sex distribution. Moreover, in comparison between the two groups regarding associated comorbidities, ischemic heart disease (IHD), chronic kidney disease (CKD), hypertension (HTN), diabetes Mellitus (DM), there was no significant statistical difference. Daugherty and colleagues' findings oppose our results as they reported that enduring symptoms post COVID-19 are more common in women and those with pre-existing comorbidities [17].

Based on a statistical analysis of our data collected from following-up COVID-19 subjects discharged from the hospital or after home isolation after recovery, the presentations of PCS varied widely; (80.2%) subjects showed more than one symptom even in mild cases. Many studies have concluded that PCS is a much more complex multisystem syndrome and disputed what was initially supposed, that COVID-19 was respiratory disease. However, now it is understood that this is not the case [17,18].

Some subjects had overlapping symptoms affecting many systems, although fatigue appears to be the prominent feature; subjects who participated in the study affirmed that they could not resume their usual activity level. They find insignificant daily deeds, fatigue-inducing, fatigue, and myalgia were major complaints acknowledged by the previous study [19].

Meanwhile, myalgia was the common symptom among the studied participants, associated with older age and those with a longer duration of illness. Indeed, myalgia is also joint in subjects having IHD, HTN, and DM comorbidities.

Other PCS included repeated cough, recurrent headache, exertional dyspnea, which is prominent among subjects who experienced severe COVID-19 disease and were admitted to ICU. They might have developed changes suggestive of post-COVID-19 pulmonary fibrosis evidenced in their chest computer tomography and whose management is also uncertain [17,18].

The study determined non-specific neurological symptoms in PCS, which seem to co-occur with fatigue and breathlessness, including headaches, dizziness, confusion, poor quality of sleep, and psychological problems as depression and anxiety. This study established that post-acute covid-19 dizziness and confusion were more present in diabetic subjects and those with a longer COVID illness duration.

While poor sleep quality was a prominent symptom associated with participants having chronic respiratory disease, IHD, HTN, and DM, it strongly correlates with the acute COVID disease severity being worse with a higher level of care.

On the other hand, most publications on post-acute covid-19, including the World Health Organization, have highlighted these individual reactions to the pandemic, such as anxiety and stress. They suggest explanations to these due to broken routines, loneliness, and social isolation, often associated with low mood, hopelessness, heightened anxiety [20-23].

Other symptoms, such as anosmia, indicate intra-nasal implantation of SARS-CoV-2 into the olfactory neural stem cells, causing a neuro-invasion that could result in chronic neurodegenerative disease [24,25].

Participants judged the severity of PCS symptoms. The majority of 190 (85.6%) had mild to moderate symptoms, and the mean duration of PCS symptoms was 6.16 ± 1.03 weeks. We anticipate many subjects whose covid-19 illnesses treated their symptoms with non-steroidal anti-inflammatory drugs. So, most subjects do not seem to need a referral to a specialist rehabilitation service.

This study showed an association between different post-COVID symptoms; the demographic data and comorbidities revealed that post-viral fatigue was more evident in Subjects having higher BMI.

Furthermore, dyspnea on mild exertion appeared significantly associated with smoking. Additionally, cough and exertional dyspnea were significantly present in subjects having chronic respiratory disease, hypertension, and diabetic subjects. Moreover, dyspnea was significantly correlated with the level of care of the acute illness being less severe in subjects treated at home and worse in the ICU.

Myalgia was another common symptom among the study participants; it was a significant PCS symptom in subjects having IHD, HTN, and DM.

Headache appeared to be a characteristic post-covid symptom which was associated significantly with longer COVID illness duration, subjects having hypertension, and diabetes mellitus.

Poor quality of sleep was a prominent symptom associated with obesity, participants having chronic respiratory disease, IHD, HTN and DM. besides, it strongly correlates with the acute COVID disease severity being worse with a higher level of care.

Since most previous studies did not label risk factors related to the post-COVID-19 syndrome [26-28]. The results of the logistic regression test of this study predicted that Subjects with age categories from 31 to 45 years and duration of the COVID illness appeared to be the principal predictors for having PCS.

There are still considerable unknown data to be investigated about post COVID symptoms. The cause for persistence of symptoms, and whether they are the tip of an iceberg where damage is still occurring, of infected organs, with SARS-CoV-2 infection. Moreover, how long do residual post-COVID symptoms last, and if they permanently affect the quality of life?

Conclusion

In conclusion, we should consider prioritizing follow-up care for post-COVID infected subjects who develop the highest-burden of ongoing overlapping symptoms of shortness of breath, or fatigue, especially post severe COVID-19 disease and admitted to ICU. The development of the integrated discipline of healthcare models improves survivors' mental and physical health with Post COVID syndrome.

Recommendations

A unified post-covid-19 functional status scale must be developed pragmatically with a formal validated definition and characterization of its manifestation for early detection. In addition, more research should be a guide to recognize risk factors and precise mechanisms leading to the development of post- COVID syndrome, such knowledge offered by further research intended to prevent complications.

Conflicts of Interest

No conflicts of interest.

Bibliography

1. L Geddes and R Cigna. Why strange and debilitating coronavirus symptoms can last for months, 2021.
2. A Nalbandian., *et al*. "Post-acute COVID-19 syndrome". *Nature Medicine* 27 (2021): 601-615.
3. CS Study. "How long does COVID-19 last?', Kings College. London (2020).
4. A Dasgupta., *et al*. "Long term complications and rehabilitation of COVID-19 patients". *Journal of Pakistan Medical Association* 70 (2020): S131-S135.
5. F Wu., *et al*. "Neutralizing Antibody Responses to SARS-CoV-2 in a COVID-19 Recovered Patient Cohort and Their Implications". *SSRN Electronic Journal* (2020).
6. L Lan., *et al*. "Positive RT-PCR Test Results in Patients Recovered from COVID-19". *The Journal of the American Medical Association 323* (2020): 1502-1503.
7. S Colafrancesco., *et al*. "COVID-19 gone bad: A new character in the spectrum of the hyperferritinemic syndrome?" *Autoimmunity Reviews* 19 (2020).
8. MZ Tay., *et al*. "The trinity of COVID-19: immunity, inflammation and intervention". *Nature Reviews Immunology* 20 (2020): 363-374.
9. G Forte., *et al*. "COVID-19 pandemic in the Italian population: Validation of a post-traumatic stress disorder questionnaire and prevalence of PTSD symptomatology". *International Journal of Environmental Research and Public Health* 17 (2020): 1-16.
10. HJ Jiang., *et al*. "Psychological impacts of the COVID-19 epidemic on Chinese people: Exposure, post-traumatic stress symptom, and emotion regulation". *Asian Pacific Journal of Tropical Medicine* 13 (2020): 252-259.
11. T Zhang., *et al*. "[Comparison of clinical and pathological features between severe acute respiratory syndrome and coronavirus disease 2019]". *Zhonghua Jie He He Hu Xi Za Zhi* 43 (2020): E040.
12. WHO COVID-19: Case Definitions (2020).
13. HH Abo Elnaga., *et al*. "Wallop of Symptoms and Co-morbidities on COVID-19 Outcome". *The Open Respiratory Medicine Journal* 15 (2021): 46-51.

14. N Nabavi. "Long covid: How to define it and how to manage it". *British Medical Journal* 370 (2020): m3489.

15. Central Agency for Public Mobilization and Statistics (CAPMAS), "Central Agency for Public Mobilization and Statistics, Egypt Stat". *Final Results 2017 Census* (2017): 1-91.

16. L Wang., *et al*. "Coronavirus disease 2019 in elderly patients: Characteristics and prognostic factors based on 4-week follow-up". *Journal of Infection* 80 (2020): 639-645.

17. CM Roberts., *et al*. "COVID-19: a complex multisystem disorder". *British Journal of Anaesthesia* 125 (2020): 238-242.

18. MK Bohn., *et al*. "Pathophysiology of COVID-19: Mechanisms underlying disease severity and progression". *Physiology* 35 (2020): 288-301.

19. S Shi., *et al*. "Association of Cardiac Injury with Mortality in Hospitalized Patients with COVID-19 in Wuhan, China". *JAMA Cardiology* 5 (2020): 802-810.

20. L Duan and G Zhu. "Psychological interventions for people affected by the COVID-19 epidemic". *The Lancet Psychiatry* 7 (2020): 300-302.

21. RP Rajkumar. "COVID-19 and mental health: A review of the existing literature". *Asian Journal of Psychiatry* 52 (2020).

22. World Health Organization, Mental health and psychosocial considerations during the COVID-19 outbreak (2020).

23. Paul Garner. "Covid-19 at 14 weeks-phantom speed cameras, unknown limits, and harsh penalties". *BMJ BLOG* (2020).

24. AY Han., *et al*. "Anosmia in COVID-19: Mechanisms and significance". *Chemical Senses* 45 (2020): 423-428.

25. L Mao., *et al*. Neurological Manifestations of Hospitalized Patients with COVID-19 in Wuhan, China: a retrospective case series study (2020).

26. A Carfi., *et al*. "Persistent symptoms in patients after acute COVID-19". *The Journal of the American Medical Association* 324 (2020): 603-605.

27. T Greenhalgh., *et al*. "Management of post-acute covid-19 in primary care". *British Medical Journal* 370 (2020).

28. MW Tenforde., *et al*. "Morbidity and Mortality Weekly Report Symptom Duration and Risk Factors for Delayed Return to Usual Health Among Outpatients with COVID-19 in a Multistate Health Care Systems Network-United States" (2020).

Volume 12 Issue 4 April 2023