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Post Covid Syndrome

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ORIGINAL ARTICLE

Post-coronavirus Disease Syndrome

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Abstract

Introduction: **Severe acute respiratory syndrome coronavirus 2 infection has led to the development of a novel clinical entity known as the post-coronavirus disease (COVID) syndrome. Post-COVID syndrome is characterized by indicators that last for more time than 3 weeks after a diagnosis of COVID-19 has been made. It occurs between 10 and 35 % of the time, but in individuals who have been hospitalized before, the frequency can be as high as 85 %.**

Aim and objectives: **Long-term evaluation of Egyptian patients for post-COVID syndrome such as insomnia, fatigue, dizziness, palpitation, dyspnea, chest pain, and depression.**

Patients and methods: **This was a cross-sectional trial conducted on 200 cases, who had previously contracted the Coronavirus and were cured, aiming to follow up the long-term manifestations that occurred to them. The patients were followed up for 6 months. All patients were hospitalized and diagnosed clinically by history and examinations, and laboratory assessments including COVID laboratory tests such as complete blood count, C-reactive protein, ferritin, and D-dimer, and radiologically by chest computed tomography, ground-glass opacification appearance, and PCR. Patients who have not been diagnosed with the disease were excluded.**

Result: **There were statistically significant ($P = 0.029$) decreased O_2 saturation in patients with insomnia and chest pain ($P = 0.016$). Also, there were highly statistically significant ($P < 0.001$) decreased O_2 saturation in patients with cough. There was a statistically significant ($P = 0.009$) enlarged period of hospitalization in cases with cough (10.4 $\pm$ 4.5 days) when compared with patients without cough (8.8 $\pm$ 4.2 days).**

Conclusion: **In conclusion, individuals with COVID-19 need to be followed up closely for a very long time, even after they have fully recovered. Most medical centers cannot keep up with patient demand during the current COVID-19 outbreak. Therefore, it can be difficult to schedule follow-up visits for patients. However, constant surveillance is required for a sizable portion of the post-COVID population. For post-COVID-19, we need to pay extra care to patients who have respiratory distress, are lethargic, or have had their disease for a long time.**

Keywords: Anti-severe acute respiratory syndrome coronavirus 2 antibodies, Long COVID, Post-COVID syndrome, Primary health care

1. Introduction

The leading cause of death from a communicable disease worldwide is still lower respiratory infections. The new coronavirus induced life-threatening acute respiratory syndrome (SARS-CoV-2). It appeared first in Wuhan, China. The WHO announced that COVID-19 is a global epidemic.[1]

Significant illness outbreaks in East Asia and the Middle East have been linked to coronaviruses (CoVs) throughout the past two decades. Both SARS and Middle East respiratory syndrome first appeared in 2002 and 2012, respectively. In 2019, a new coronavirus, SARS-CoV-2, has emerged and is causing severe respiratory illness (COVID-19).[2,3]

Numerous terms are being used to describe the symptoms that occur after COVID infection, such as long-term effects of COVID, chronic COVID, long-haul COVID, post-acute COVID-19 late sequelae, and post-acute COVID syndrome. Post-COVID problems can be seen as a failure to return to normal health after acute COVID-19 sickness, although equivalent case explanations are continuously being developed. After the initial signs of the

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disease have subsided, some people with post-COVID disorders may experience the onset of other, unrelated symptoms.[4,5]

2. Patients and methods

All subjects participated voluntarily and received a small compensation. The participants provide their written informed consent to participate in this study. The trial was performed at the Chest Medicine Department, Al-Azhar University Hospital, between March 2022 and March 2023.

This study was carried out on 200 patients, who had coronavirus and were cured to follow up the long-term manifestations occurred to them. Patients will undergo6-month follow-ups.

Inclusion criteria: patients older than 18 years of age and of either sex who have tested negative for COVID-19 after a month of follow-up testing following an established history of COVID-19 infection by PCR.

Exclusion criteria: incomplete or unresponsive cases, cases where informed permission was not given, and cases where the patient had a history of major depression, chronic fatigue, or fibromyalgia.

2.1. Statistical analysis

Data entry, processing, and statistical analysis were conducted using SPSS, version 20 (USA Statistical Package for the Social Sciences, Chicago, USA). Tests of significance (Kruskal–Wallis, Spearman's correlation, χ^2, Wilcoxon's, and logistic regression analysis) were used. Data were presented, and suitable analysis was done according to the type of data (parametric and nonparametric) gained for each parameter. *P* values less than 0.05 (5 %) were reflected to be statistically significant. *P* value level of significance: *P* value more than 0.05: nonsignificant, *P* value less than 0.05: significant, and *P* value less than 0.01: highly significant.

Descriptive statistics: median and interquartile range for nonparametric numerical data, the mean with SD and range for parametric numerical data. Frequency and percentage for nonnumerical data.

Analytical statistics: when comparing more than two groups on a nonparametric variable, the Kruskal–Wallis test was used to determine statistical significance. Analyzed variables test for continuously distributed variables (one-way analysis of variance). Following analysis of variance, a Tukey test and a Mann–Whitney *U* test were applied in the follow-up exploratory analysis.

3. Results

3.1. Demographic data of the studied group

The description of age in all studied patients. The mean age of all studied patients was 61.6 ± 13.4 years with a minimum age of 19 years and a maximum age of 88 years (Fig. 1).

There were 84 (42 %) males and 116 (58 %) females in the studied patients (Fig. 2, Table 1).

Regarding the period of hospitalization in all studied patients, the mean period of all studied patients was 9.3 ± 4.3 days with a minimum period of 3 days and a maximum period of 21 days (Fig. 3, Table 2).

The mean O_2 saturation of all studied patients was 81.6 ± 8.6 % with a minimum O_2 saturation of 60 % and a maximum O_2 saturation of 90 %.

Note: all the patients were hospitalized until their O_2 saturation returned to normal levels and then discharged (Fig. 4).

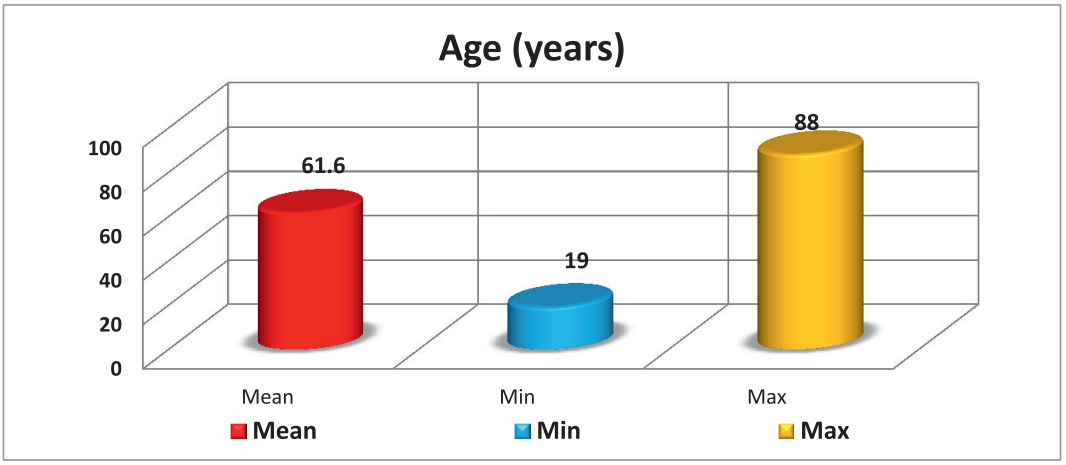

Fig. 1. Description of age in all studied patients.

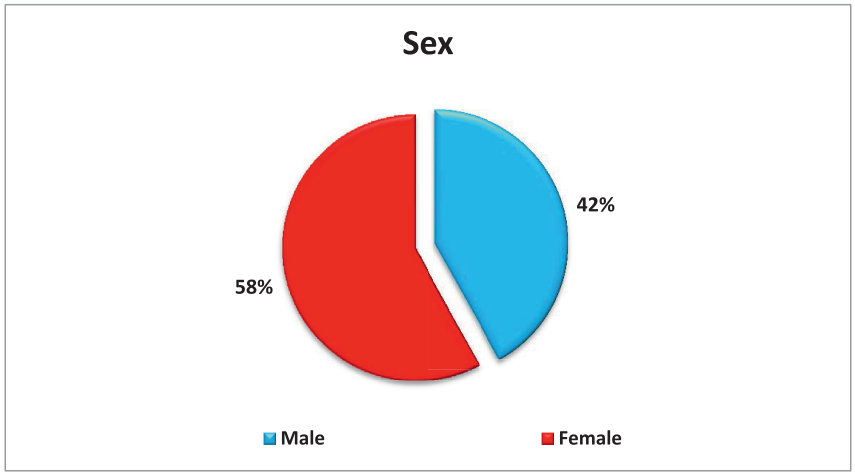

Fig. 2. Description of sex in all studied patients.

Table 1. Description of occupation in all studied patients.

	Studied patients (N = 200)	
Occupation		
Builder	2	1 %
Carpenter	2	1 %
Doctor	8	4 %
Driver	4	2 %
Engineer	4	2 %
Farmer	26	13 %
Fruitier	8	4 %
Grocer	2	1 %
Hairdresser	4	2 %
Housewife	76	38 %
Lawyer	2	1 %
Mechanic	2	1 %
Nonworker	26	13 %
Nurse	8	4 %
Pharmacist	4	2 %
Student	4	2 %
Tailor	4	2 %
Teacher	10	5 %
Welder	2	1 %

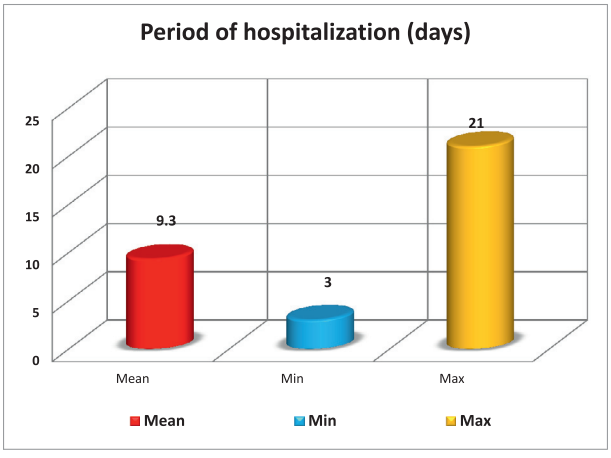

Fig. 3. Description of the period of hospitalization in all studied patients.

Table 3, Fig. 5.
Tables 4–6, Figs. 6–8.

4. Discussion

The results of this investigation indicate that patients' average age upon study enrollment was 61.6 ± 13.4 years with a minimum age of 19 years and a maximum age of 88 years. There was a statistically significant decreased age in cases with dyspnea when equated with patients with no dyspnea. There was a highly statistically significant increased age in patients with chest pain compared with individuals without chest discomfort. There was statistically significant longer age in people with cough when compared with patients without cough. There was no statistically significant correlation

Table 2. Description of post-coronavirus disease syndrome in all studied patients.

	Studied patients (N = 200)	
Post-COVID syndrome		
Insomnia	88	44 %
Fatigue	60	30 %
Dyspnea	68	34 %
Chest pain	70	35 %
Cough	66	33 %
Palpitation	28	14 %
Headache	26	13 %
Bowel changes	16	8 %
Mood changes	42	21 %
Sleep disorders	32	16 %
Indigestion	20	10 %
Rash	8	4 %
Arrhythmia	20	10 %
Dizziness	18	9 %
Myocardial infraction	16	8 %
Stroke	8	4 %
Hypoxemia	200	100 %

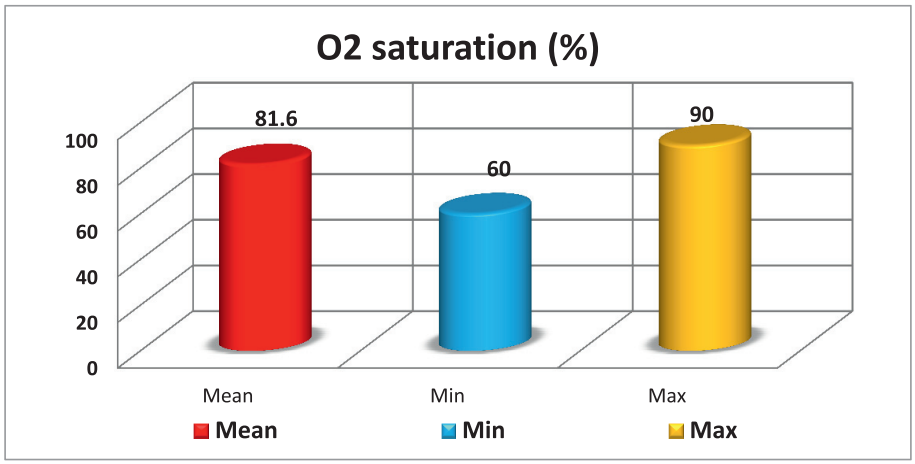

Fig. 4. Description of O_2 saturation in all studied patients. (b) Correlation between O2 saturation and post-COVID symptoms of the studied group.

Table 3. Correlation between post-coronavirus disease symptoms and O_2 saturation in all studied patients.

	N		O_2 saturation %	MW	*P* value
Insomnia					
No	112	56 %	82.3 ± 8.6	4046	0.029 S
Yes	88	44 %	80.7 ± 8.4		
Fatigue					
No	140	70 %	82.5 ± 8.2	3538	0.076 NS
Yes	60	30 %	79.6 ± 8.9		
Dyspnea					
No	132	66 %	81.3 ± 8.8	4348	0.717 NS
Yes	68	34 %	82.2 ± 7.9		
Chest pain					
No	130	65 %	82.6 ± 7.9	3618	0.016 S
Yes	70	35 %	79.8 ± 9.3		
Cough					
No	134	67 %	83.6 ± 7.6	2684	<0.001 HS
Yes	66	33 %	77.6 ± 9.1		

MW; Mann–Whitney *U* test.
P value less than 0.001 is considered highly significant (HS); NS, *P* value more than 0.05 is considered nonsignificant (NS); *P* value less than 0.05 is considered significant (S).

Table 4. Correlation between post-coronavirus disease symptoms and age in all studied patients.

	N		Age (years)	MW	*P* value
Insomnia					
No	112	56 %	61.6 ± 13.9	4766	0.690 NS
Yes	88	44 %	61.7 ± 12.7		
Fatigue					
No	140	70 %	62.2 ± 12.7	4124	0.839 NS
Yes	60	30 %	60.4 ± 14.7		
Dyspnea					
No	132	66 %	63.1 ± 12.5	3684	0.038 S
Yes	68	34 %	58.8 ± 14.5		
Chest pain					
No	130	65 %	59.4 ± 13.6	3106	<0.001 HS
Yes	70	35 %	65.8 ± 11.9		
Cough					
No	134	67 %	59.8 ± 13.3	3188	0.001 S
Yes	66	33 %	65.3 ± 12.9		

MW, Mann–Whitney *U* test.
P value less than 0.001 is considered highly significant (HS); *P* value more than 0.05 is considered nonsignificant (NS); *P* value less than 0.05 is considered significant (S).

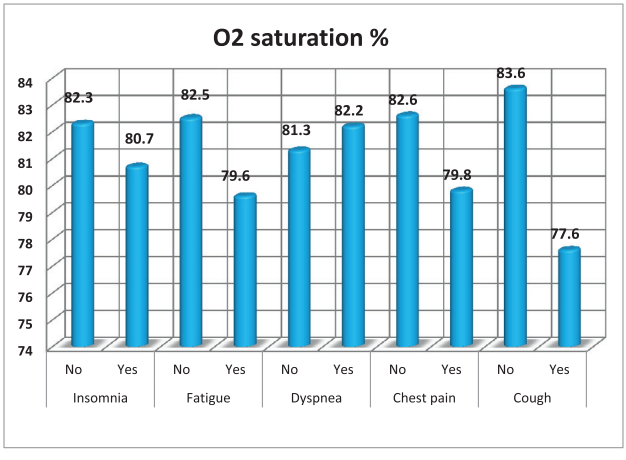

Fig. 5. Correlation between post-COVID symptoms and O2 saturation in all studied patients. COVID, coronavirus disease. (c) Correlation between post-COVID symptoms and age, sex, and hospitalization time of the studied group.

Table 5. Correlation between post-coronavirus disease symptoms and sex in all studied patients.

	Male (*N* = 84)		Female (*N* = 116)		χ^2	*P* value
Insomnia						
No (*N* = 112)	48	57.1 %	64	55.2 %	0.077	0.782 NS
Yes (*N* = 88)	36	42.9 %	52	44.8 %		
Fatigue						
No (*N* = 140)	64	76.2 %	76	65.5 %	2.6	0.104 NS
Yes (*N* = 60)	20	23.8 %	40	34.5 %		
Dyspnea						
No (*N* = 132)	52	61.9 %	80	69 %	1.08	0.298 NS
Yes (*N* = 68)	32	38.1 %	36	31 %		
Chest pain						
No (*N* = 130)	60	71.4 %	70	60.3 %	2.6	0.105 NS
Yes (*N* = 70)	24	28.6 %	46	39.7 %		
Cough						
No (*N* = 134)	62	73.8 %	72	62.1 %	3.03	0.081 NS
Yes (*N* = 66)	22	26.2 %	44	37.9 %		

χ^2, χ^2 test.
P value more than 0.05 is considered nonsignificant (NS).

Table 6. Correlation between post-coronavirus disease symptoms and hospitalization time in all studied patients.

	N		Hospitalization time (days)	MW	*P* value
Insomnia					
No	112	56 %	9.6 ± 4.3	4502	0.293 NS
Yes	88	44 %	9.0 ± 4.4		
Fatigue					
No	140	70 %	9.4 ± 4.5	4114	0.818 NS
Yes	60	30 %	9.1 ± 3.9		
Dyspnea					
No	132	66 %	9.2 ± 4.1	4470	0.963 NS
Yes	68	34 %	9.6 ± 4.8		
Chest pain					
No	130	65 %	8.9 ± 3.9	3884	0.087 NS
Yes	70	35 %	10.1 ± 4.8		
Cough					
No	134	67 %	8.8 ± 4.2	3422	0.009 S
Yes	66	33 %	10.4 ± 4.5		

MW, Mann–Whitney *U* test.
P value more than 0.05 is considered nonsignificant (NS); *P* value less than 0.05 is considered significant (S).

among age and insomnia and fatigue in studied patients.

These results were compatible with Garout et al.,[6] who reported that there were 398 (53.5 %) aged from 30 to 50 years, 207 (27.9 %) were more than 50 years, and 186 (18.6 %) were aged from 18 to 29 years. Both age more than 50 years and existence of coexisting disorders interrelated with post-COVID-19 indications.

In the present trial, we found that there were 84 (42 %) males and 116 (58 %) women in the examined persons. There was no statistically significant correlation among sex and post-COVID symptoms in studied individuals.

In agreement with our results, Garout et al.[6] stated that 366 (49.3 %) were male and 378 (50.7 %) were females. No statistically significant variations were seen by sex or sickness severity.

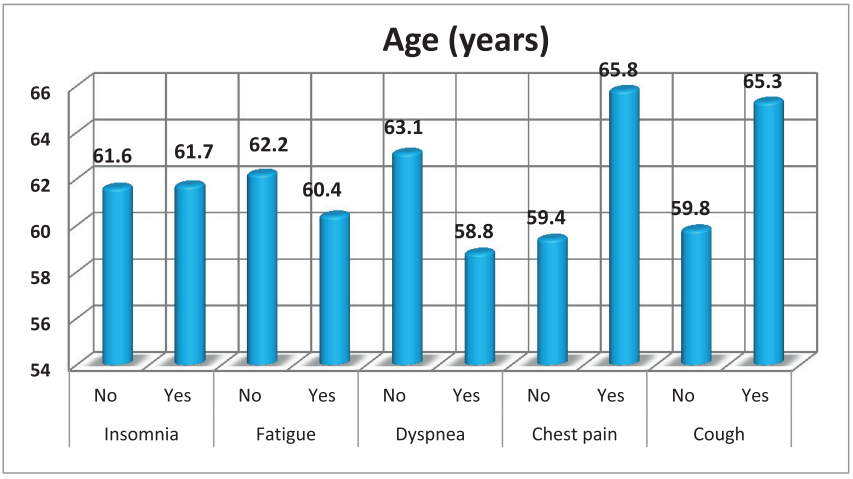

Fig. 6. Correlation between post-COVID symptoms and age in all studied patients. COVID, coronavirus disease.

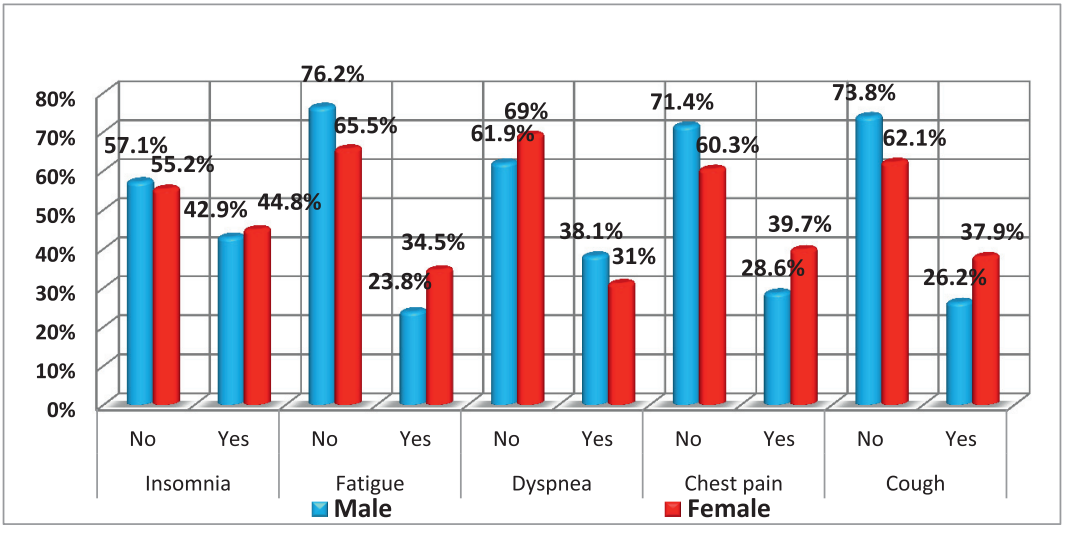

Fig. 7. Correlation between post-COVID symptoms and sex in all studied patients. COVID, coronavirus disease.

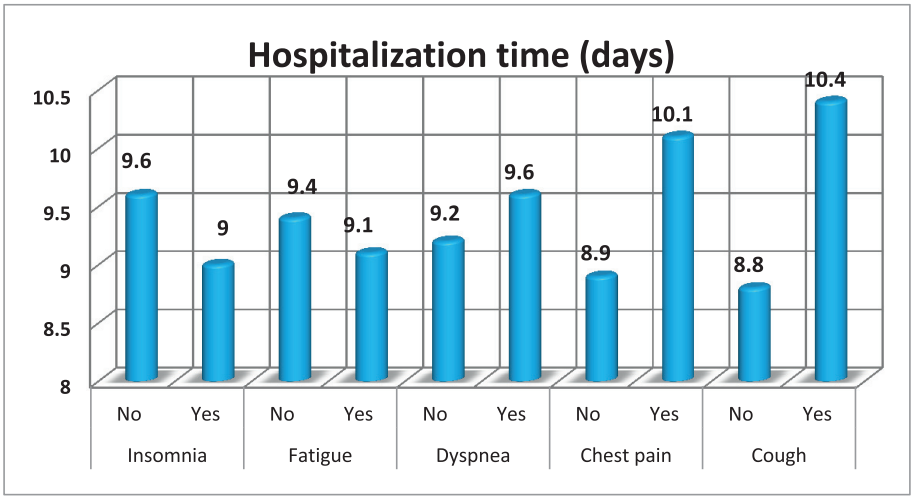

Fig. 8. Correlation between post-COVID symptoms and hospitalization time in all studied patients. COVID, coronavirus disease.

However, Mahmud et al.[7] informed that women, who took longer to show clinical improvement after COVID-19, had a greater prevalence of post-COVID-19 characteristics. Patients with advanced stages of illness at presentation were also more likely to experience post-COVID-19 symptoms.

The results of our recent studies on the period of hospitalization revealed that the mean period of all researched participants was 9.3 ± 4.3 days with a minimum period of 3 days and a maximum period of 21 days.

Kamal et al.[8] stated that there were three groups of patients with COVID-19 based on the severity of their symptoms: those with mild symptoms who were able to stay at home and rest were 80.2 %; those with moderate symptoms who needed oxygen therapy made up 14.9 %; and those with severe symptoms who needed to be admitted to the ICU made up only 4.9 %.

In the current study, we found that regarding the explanation of post-COVID syndrome in all investigated cases insomnia was present in 44 (44 %) individuals, fatigue in 30 (30 %) participants, dyspnea in 68 (68 %) patients, chest pain in 35 (35 %) cases, cough in 33 (33 %) patients, palpitation in 14 (14 %) patients, headache in 13 (13 %) patients, bowel changes noticed in eight (8 %) participants, mood disorders in 21 (21 %) patients, sleep disorders in 16 (16 %) persons, indigestion in 10 (10 %) patients, rash in four (4 %) individuals, arrhythmia was noted in 10 (10 %) participants, dizziness in nine (9 %) cases, myocardial infraction in eight (8 %) cases and stroke was presented in four (4 %) individuals. The entire sample of patients in the study had hypoxemia (100 %). Also in the present study, we found that the mean O_2 saturation of all studied patients was 81.6 ± 8.6 % with the lowest O_2 saturation of 60 % and extreme O_2 saturation of 90 %. There was statistically significant decreased O_2 saturation in patients with insomnia when compared with patients without insomnia. When comparing individuals with and without chest discomfort, those experiencing chest pain had significantly lower O_2 saturation levels. There was a highly statistically significant decreased O_2 saturation in cases with cough when equated with patients without cough. There was no statistically significant connection between O_2 saturation and fatigue and dyspnea in studied patients.

Garout et al.[6] demonstrated that nearly half of the people taking part 410 (47.5 %), had persistent symptoms as well as more than half of them had two or more symptoms. Common systemic symptoms include lethargy 189 (25.4 %), headache 118 (15.9 %), and myalgia 63 (8.5 %), with at least one of these symptoms present in 128 (31.3 %) patients. In general, respiratory symptoms, such as cough, wheezing, and chest pain, were prevalent persistent symptoms among 137 (66.5 %) patients and 51 (6.9 %) reported subjective dyspnea. Common persistent symptoms included cough, wheezing, and chest pain in 137 (66.5 %), while 51 (6.7 %) reported experiencing subjective dyspnea. The recipients reported rates of anxiety and depression of 13.2 and 9.5 %, respectively. Eleven percent of people who have dermatological problems also have chronic hair loss. However, 334 (or 45 %) patients reported experiencing none of the aforementioned side effects once they had fully recovered.

Only 10.8 % of participants had no manifestation after recovering from COVID, as recorded by Kamal et al.[8]; nonetheless, a high percentage of patients

suffered from several symptoms. The majority of participants experienced exhaustion (72.8 %), anxiety (38 %), joint pain (31.4 %), persistent headache (28.9 %), chest pain (28.9 %), dementia (28.6 %), depression (28.6 %), and dyspnea (28.2 %). Of the rehabilitated patients (2.4 %) have recently been diagnosed with diabetes. The majority of patients (67.6 %) have recovered from post-COVID-19 manifestations, whereas 32.4 % of patients have persistent symptoms.

Fatigue, cough, anosmia, sleep problems, dyspnea, arthralgia, headache, and mental health/post-traumatic stress disorder were shown to be the most prevalent persisting symptoms of post-COVID syndrome as reported by Malik et al.[9] There is a lack of understanding of the mechanism underlying these persistent symptoms in post-COVID-19 individuals.

Tawfik et al.[10] informed that fever was the leading presenting symptom, occurring in 69 (57.5 %) people, followed by bodily pain in 53 (44.2 %), and finally anosmia in 50 (41.7 %). Forty-five (37.5 %) people reported having a cough, whereas 42 (35.0 %) people reported having dyspnea and 35 % reported having weariness. A total of 34 (28.3 %) people reported having a headache as well and 23 (19.2 %) people had diarrhea.

4.1. Conclusion

Individuals with COVID-19 need to be monitored and treated for symptoms that may arise even after the initial infection has cleared. Such patients must have access to a thorough rehabilitation program during hospital stays. Most medical centers cannot keep up with the patient demand during the current COVID-19 outbreak. Therefore, it can be difficult to schedule follow-up visits for patients. However, in the post-COVID era, constant surveillance of a sizable population is necessary. Patients experiencing respiratory distress, cases with lethargy, and those with a long history of disease all necessitate additional care in the post-COVID-19 era.

Conflicts of interest

There are no conflicts of interest.

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