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Post-COVID-19 Syndrome: Assessment of Short- and Long-Term Post-Recovery Symptoms In Recovered Cases In Western Libya

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Keywords.
COVID-19, Pandemic Coronavirus, Post recovery, Symptoms, Western Libya.

***Received** 09 Jun 25*
***Accepted** 10 Aug 25*
***Published** 18 Aug 25*

ABSTRACT

The coronavirus disease 2019 (COVID-19) pandemic, first identified in late 2019, has caused extensive global morbidity and mortality. While most individuals recover from the acute illness, a considerable proportion develop post-COVID-19 syndrome, characterized by persistent symptoms lasting weeks to months. This study aimed to characterize the prevalence, type, and duration of persistent symptoms following COVID-19 recovery, and to examine their association with the severity of the acute infection. A cross-sectional, analytical observational study was conducted among 515 COVID-19 survivors in western Libya. Data were collected via face-to-face interviews and online questionnaires (Google Forms) comprising demographic information, COVID-19 illness details, comorbidities, and post-COVID-19 symptoms. Associations between symptom persistence and clinical/demographic factors were assessed using Chi-square tests. Persistent symptoms were reported by 72.0% of participants, with over 70% experiencing three or more symptoms. Recovery occurred within three months in 75.5% of respondents, within three to six months in 22.1%, and after more than six months in 2.4%. During acute illness, 78.8% required only home isolation, 21.2% were hospitalized, and 8.3% required intensive care. Most participants (91.7%) experienced mild-to-moderate acute disease, and 81.6% reported no comorbidities. Common persistent symptoms included fatigue, cough, anosmia, ageusia, joint pain, anxiety, and headache; less frequent but more severe sequelae included chest pain, pulmonary fibrosis, and myocarditis. A significant proportion of COVID-19 survivors experienced prolonged symptoms lasting up to 12 months post-recovery, independent of gender, smoking status, or vaccination history. Symptom severity correlated with the severity of the initial illness and the presence of comorbidities. Post-COVID-19 follow-up and targeted rehabilitation are recommended to address these long-term health effects.

Citation info. Madour A, Aboulqasim R, Alghanoudi A, Ikreedeegh S, Aboulqasim S, Alghanoudi K. Post-COVID-19 syndrome: assessment of short- and long-term post-recovery symptoms in recovered cases in Western Libya. Attahadi Med J. 2025;2(3):280-288. https://doi.org/10.69667/amj.25317

Introduction

Coronavirus disease 2019 (COVID-19) is a severe acute respiratory syndrome caused by the novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The infection was first identified in Wuhan, China, in late 2019 and rapidly evolved into a global pandemic [1]. Clinical manifestations range from asymptomatic or mild illness to severe disease, with fever, dry cough, myalgia, fatigue, pneumonia, and dyspnea being the most common early symptoms [2]. Initial reports indicated that approximately 3.5% of severe cases were fatal, particularly among older adults [3]. According to the World Health Organization (WHO), by January 1, 2024, over 776,007,137 confirmed cases of COVID-19 and more than 7,060,000 deaths had been reported worldwide, affecting populations in 190 countries and territories across all continents except Antarctica [4]. With the introduction of COVID-19 vaccines in early 2021, global vaccination campaigns significantly reduced COVID-19–related morbidity and mortality. By the start of 2024, more than 13.64 billion vaccine doses had been administered worldwide [4].

In Libya, the first COVID-19 case was reported on March 24, 2020. Case numbers began to rise sharply two months later. As of August 2024, WHO data indicated 507,264 confirmed cases and 6,437 deaths in the country [4,5]. Vaccination coverage by that time showed that 34% of approximately 2.3 million people had received at least one dose, while 18% of about 1.2 million individuals had completed the full vaccination schedule [5]. Beyond the acute phase, COVID-19 has been associated with a constellation of prolonged, multisystem symptoms collectively referred to as post-COVID-19 syndrome or long COVID. These symptoms can affect the respiratory, cardiovascular, gastrointestinal, neurological, and psychiatric systems [6]. Studies have reported that up to 87.5% of patients who clinically recovered from acute infection continued to experience persistent symptoms, most commonly fatigue, dyspnea, cough, myalgia, and headache [7]. Importantly, post-COVID-19 manifestations have also been observed in individuals with mild disease or asymptomatic infection.

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The burden of post-COVID-19 is substantial. Research indicates that up to 20% of recovered patients require re-hospitalization, and approximately 80% need primary care follow-up within two months of discharge [6]. Although the syndrome is more common in patients with severe disease and comorbidities, it has also been documented in young, otherwise healthy individuals. Dedicated post-COVID-19 clinics have been established in some countries to monitor and manage these patients, but data remain limited in many settings, including Libya.
To date, there is no published evidence on the prevalence, severity, and spectrum of post-recovery symptoms among COVID-19 survivors in the Libyan population. The present study aims to address this gap by assessing the prevalence and severity of persistent symptoms beyond 12 weeks post-infection among recovered patients in northwest Libya, and comparing symptom profiles across different severities of the acute disease. By elucidating the post-COVID-19 burden in this context, our findings may inform healthcare strategies, improve patient management, and contribute to the broader understanding of long-term outcomes of COVID-19.

Material and methods

Study design and setting

A cross-sectional study was conducted among individuals who had recovered from symptomatic, laboratory-confirmed COVID-19 (SARS-CoV-2) infection. The study targeted residents of northwest Libya and was carried out after obtaining ethical approval from the Department of Molecular Biology and Biochemistry, Faculty of Science, Sabratha University.

Participants and Recruitment

Eligible participants were adults with a history of symptomatic COVID-19 confirmed by reverse transcription polymerase chain reaction (RT-PCR) testing. Recruitment was conducted through both electronic and paper-based questionnaires. Both questionnaires, translated into Arabic. An electronic questionnaire was distributed via Google Forms, and paper forms were distributed in community settings. Before participation, all respondents provided informed consent electronically or in writing.

Questionnaire Development

The questionnaire was designed to assess current health status and persistent symptoms during the post-COVID-19 period, to estimate the incidence of post-COVID-19 syndrome. It consisted of three sections:

Demographic Data: age, gender, smoking status, and weight.

COVID-19 History

severity of acute illness, hospitalization, need for respiratory support, time since symptom onset, persistence of symptoms, and comorbidities. Disease severity was classified as mild to moderate, severe, or critical.

Post-COVID-19 Manifestations

symptom type, results of additional investigations, use of medications, and recovery status. Symptoms were categorized by system as follows: General: fatigue, myalgia. Respiratory: chest pain, cough, wheezing. Cardiovascular: palpitations. Neuropsychiatric: headache, hypersomnia, depression, anxiety. Dermatologic: hair loss. Gastrointestinal: diarrhoea, constipation.

Symptom Severity Assessment

Participants rated symptom severity on a scale from 0 (no symptoms) to 10 (extreme symptoms) using the COVID-19 Yorkshire Rehabilitation Screening (C19-YRS) tool.^26 The C19-YRS assesses both symptom severity and functional impairment across domains such as breathlessness, voice, swallowing, nutrition, mobility, fatigue, personal care, daily activities, pain/discomfort, anxiety, depression, post-traumatic stress disorder, continence, cognition, perceived health status, and family perspectives. The tool also aids in identifying patients who may require rehabilitation and facilitates referral to appropriate clinical services.

Data Collection

Self-reported data on acute COVID-19 illness and post-recovery symptoms were obtained directly from participants. Responses were collected anonymously, and no personal identifiers were recorded.

Data Analysis

Data were entered into the Statistical Package for the Social Sciences (SPSS) version 25 (IBM Corp). Categorical variables were summarized as frequencies and percentages. Associations between demographic or occupational variables and study outcomes were tested using the chi-square test. A p-value of <0.05 was considered statistically significant.

Results

Patients demographic characteristics

A total of 515 individuals who had recovered from COVID-19 completed the study questionnaire. Females accounted for 63.6% (n = 328) of participants, while males represented 36.3% (n =

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187). Participants were stratified into three age groups: 15–29 years (n = 294; 57.1%), 30–49 years (n = 177; 34.4%), and ≥50 years (n = 44; 8.5%) (Table 1).

Most respondents (n = 389; 75.5%) reported recovery within <3 months, 114 (22.1%) recovered within 3–6 months, and 12 (2.4%) required >6 months to recover. Only 109 participants (21.2%) were hospitalized, of whom 43 (8.3%) required intensive care unit admission. The majority (n = 406; 78.8%) underwent home isolation without oxygen therapy. Overall, 472 participants (91.7%) experienced mild-to-moderate disease, and 95 (18.4%) reported having no comorbid conditions.

Among participants with comorbidities, 20 (21.1%) reported diabetes mellitus, 20 (21.1%) had dyslipidemia, 14 (14.7%) had asthma, 12 (12.6%) had hypertension, 11 (11.9%) had rheumatoid arthritis, 9 (9.5%) had hyperthyroidism, and 9 (9.5%) had peptic ulcer disease (Table 1)(Figure 1).

Table 1. Demographic and general characteristics of participants

Characteristics of participants		%	n
Gender	Female	63.7	328
	Male	36.3	187
Age	Age ≥50	8.5	44
	Age 30-49	34.4	177
	Age 15-29	57.1	294
Weight	Normal	86.8	447
	Obese	0.2	1
	Over	13.0	67
Smoking	Non-smoking	79.4	409
	Smoking	20.6	106
Severity of disease	Mild	55.1	284
	Moderate	36.5	188
	Sever (ICU)	8.3	43
Hospitalization	Non-hospitals	78.8	406
	Hospitals	21.2	109
Comorbidity	No chronic disease	81.6	420
	Chronic disease	18.4	95
Vaccination states	1 dose	14.8	76
	2 doses	6.6	34
	3 doses	0.2	1
	Non-vaccination	78.4	404

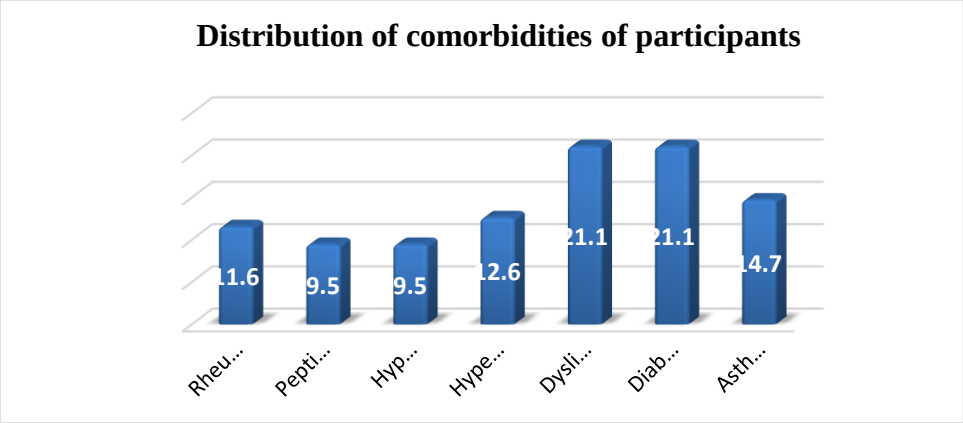

Figure 1. Distribution of comorbidities of participants

Clinical characteristics of participants with chronic diseases

(Table 2) presents the association between comorbidities and disease severity. Asthma cases were predominantly moderate (71.4%) with no severe presentations. Similarly, peptic ulcer was mainly moderate (77.8%) and showed no severe cases. Hypothyroidism had the highest proportion

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of severe cases (55.6%), followed by dyslipidemia (40.0%) and rheumatoid arthritis (36.4%). Diabetes and hypertension exhibited a more balanced distribution across severity levels but still had notable severe proportions (23.8% and 23.1%, respectively). Overall, asthma and peptic ulcer were least associated with severe outcomes, whereas hypothyroidism, dyslipidemia, and rheumatoid arthritis showed a greater propensity for severe disease (Table 2).

Table 2. Clinical characteristics of participants with chronic diseases

Chronic disease	Mild	Moderate	Sever (ICU)
Asthma	4 (28.6%)	10 (71.4%)	0 (0%)
Diabetes	5 (23.8%)	10 (47.6%)	5 (23.8%)
Dyslipidemia	4 (20%)	8 (40.0%)	8 (40%)
Hypertension	4 (30.8%)	5 (38.5%)	3 (23.1%)
Hypothyroidism	1 (11.1%)	3 (33.3%)	5 (55.6%)
Peptic ulcer	2 (22.2%)	7 (77.8%)	0 (0%)
Rheumatoid	1 (9.1%)	6 (54.5%)	4 (36.4%)

Characteristics of post-COVID-19 symptoms

Approximately three-quarters of participants (n = 377; 72%) reported persistent symptoms following recovery (Figure 2), with more than 70% experiencing three or more symptoms (Figure 3).

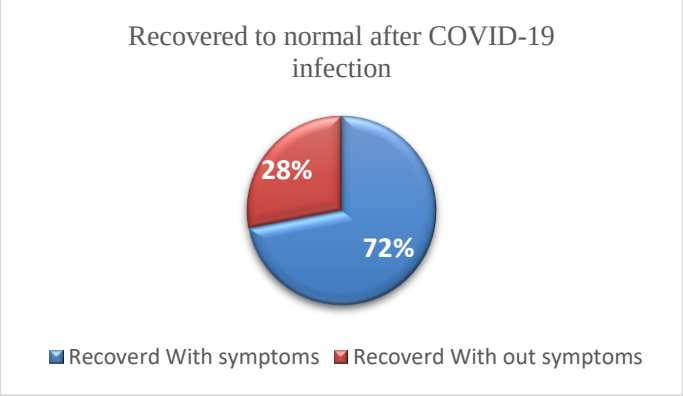

Figure 2. Recovered to normal after COVID-19 infection

Loss of taste and smell was the most frequently reported complaint, affecting 70% of respondents. Respiratory manifestations were common, with 377 participants (73.2%) experiencing persistent cough, chest pain, or pulmonary fibrosis, and 168 (32.6%) reporting subjective dyspnea. Systemic symptoms included fatigue (n = 314; 61%), joint pain (n = 294; 57.1%), headache (n = 224; 43.5%), and migraine (n = 53; 10.3%). Notably, 110 participants (21.3%) experienced three of these systemic symptoms, and 191 (37.1%) reported at least two. Neuropsychiatric manifestations were also prevalent: 361 participants (70%) reported anxiety or depression, while 58 (11.2%) experienced fear or social aversion. Gastrointestinal symptoms—including nausea, vomiting, abdominal pain, diarrhea, bloating, and constipation—were present in 224 participants (43%). Cardiovascular complaints, such as palpitations, arrhythmia, or myocarditis, were reported by 172 participants (33.4%). Additional post-COVID sequelae included weight loss, fever, newly diagnosed diabetes mellitus, and renal impairment (Figure 3).

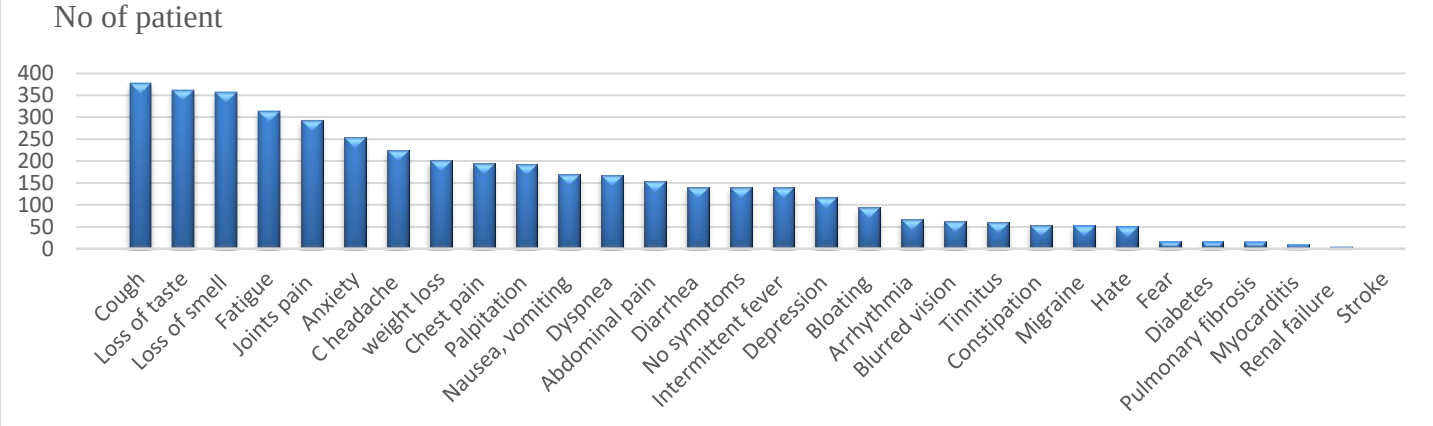

Figure 3. COVID-19 persistent symptoms in the study participants

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Prevalence of post-recovery short- and long-term symptoms

Initial analyses identified several factors associated with the development of post-COVID-19 symptoms. Participants aged >50 years, those with obesity, severe acute illness, comorbidities, or a history of hospitalization were more likely to report incomplete recovery compared with younger participants, those of normal weight, individuals with mild disease, those without chronic conditions, and non-hospitalized patients (Table 2). In multivariable analysis among symptomatic participants, both age >50 years and the presence of comorbidities were independently associated with persistent post-COVID-19 symptoms. No statistically significant associations were observed for sex, disease severity, or hospitalization status (Table 3).

Table 3. Assessment of the development of short- and long-term symptoms post-COVID-19 and their association with the different groups of participants

Variables	No symptoms	Pos symptoms	Total	% Absent	% Present	p value
Female	89	239	328	27	73	0.8
Male	49	138	187	26	74	
Age ≥50	4	40	44	9	91	0.014
Age 15-29	88	206	294	30	70	
Age 30-49	46	131	177	26	74	
Normal	131	316	447	29	71	0.004
Obese	0	1	1	0	100	
Over	7	60	67	10	90	
Non-smoking	116	293	409	28	72	
Smoking	22	84	106	21	79	
Mild	93	191	284	33	67	0
Moderate	43	145	188	23	77	
Sever (ICU)	2	41	43	5	95	
Non-Hospitals	116	290	406	29	71	0.04
Hospitals	22	87	109	20	80	
No chronic disease	122	298	420	29	71	
Chronic disease	16	79	95	17	83	0.015
Start of symptoms 15 days	1	9	10	10	90	
Start of symptoms 3 days	9	55	64	14	86	0.032
Start of symptoms 30 days	34	70	104	33	67	
Start of symptoms 7 days	94	243	337	28	72	
1 dose	24	52	76	32	68	
2 doses	8	26	34	24	76	
3 doses	1	0	1	100	0	
Non-Vaccination	105	299	404	26	74	

All participants with asthma or hypothyroidism (100%) reported persistent post–COVID-19 symptoms. High proportions of patients with dyslipidemia (95%), rheumatoid arthritis (81.8%), diabetes mellitus (70%), hypertension (66.7%), and peptic ulcer disease (66.7%) also experienced post–COVID-19 symptoms. These findings suggest a strong association between underlying comorbidities and the persistence of post-COVID-19 symptoms (Table 4).

Table 4. Association of the post-COVID-19 symptoms and comorbidity

Chronic disease	No post-COVID-19 symptoms	COVID-19 symptoms
Asthma	0 (0%)	14 (100%)
Diabetes	6 (30%)	14 (70%)
Dyslipidemia	1 (5%)	19 (95%)
Hypertension	4 (33.3%)	8 (66.7%)
Hypothyroidism	0 (0%)	9 (100%)
Peptic ulcer	3 (33.3%)	6 (66.7%)
Rheumatoid	2 (18.2%)	9 (81.8%)

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(Table 5) shows that the duration of post-COVID-19 symptoms ranged from 30 days to 1 year, with most participants (n = 323; 62.7%) reporting symptom resolution within 30 days.

Table 5. Duration of post-COVID-19 symptoms in the participants

Symptoms disappear	Frequency	%
Ongoing	6	1.2
1 year	4	0.8
180 days	18	3.5
90 days	96	18.6
60 days	39	7.6
45 days	24	4.7
30 days	328	63.7

Discussion

Characteristics of post-COVID-19 symptoms

The COVID-19 pandemic has caused substantial global morbidity and mortality, placing unprecedented strain on healthcare systems [8]. Beyond the acute phase, many patients experience persistent symptoms lasting more than 12 weeks, in the absence of alternative diagnoses, a condition clinically recognized as post-acute COVID-19 syndrome or long COVID [8,9]. In this study, we evaluated 515 recovered patients in western Libya to determine the prevalence, characteristics, and risk factors for persistent post-COVID symptoms. Demographic and clinical characteristics are summarized in (Table 1), and clinical profiles are presented before and during acute infection in (Table 2).

We found that 72% of participants reported ongoing symptoms after recovery, highlighting the high burden of post-COVID syndrome in this population. Multivariate analysis identified several independent predictors, including age, body weight, comorbidities, hospitalization, and acute disease severity (Table 3). Persistent symptoms were not associated with gender or smoking status, emphasizing the multifactorial nature of long COVID and the need for patient-specific follow-up care.

Interestingly, disease severity appeared to be independent of vaccination status in our cohort, contrasting with the findings of Allam, who suggested that vaccination contributed to lower hospitalization rates, given that 83% of their participants were vaccinated [10]. However, the protective effect of vaccination against long-term COVID remains controversial. Vaccines reduce the risk of infection and subsequent long COVID, but among those who become infected, vaccination may not significantly modify the course of persistent symptoms [11].

Our study demonstrated a strong correlation between acute disease severity and persistent post-COVID symptoms, consistent with prior work from Egypt [10]. Patients with severe COVID-19, particularly those requiring hospitalization or ICU care, were more likely to experience prolonged manifestations. Conversely, studies from Saudi Arabia found no association between disease severity and persistent symptoms [12]. Differences across studies may reflect variations in population characteristics, study design, follow-up duration, or unmeasured viral variants.

Age and comorbidities were also important predictors of long COVID. Consistent with previous research, older age and conditions such as asthma, dyslipidemia, diabetes, and hypertension were associated with persistent symptoms [13,14,15,16]. These findings underscore the importance of close monitoring and targeted interventions in high-risk populations.

The timing of symptom onset in our cohort differed from reports in other regions. In 65% of participants, post-COVID symptoms began within 7 days, with 63.4% resolving within 30 days. Other studies report later onset: 50.9% of Spanish patients experienced post-COVID syndrome 10–14 weeks post-infection [17] while systematic reviews indicate symptom emergence beyond 60 days [18]. In the UK, some patients remained symptomatic for up to seven months [19], whereas a one-year cohort demonstrated near-complete physical recovery, though overall health remained slightly lower than controls [20]. These differences likely reflect study population characteristics, follow-up duration, assessment methods, and viral variants.

Respiratory complications were prominent, with cough, chest pain, pulmonary fibrosis, and dyspnea frequently reported (Figure 3). These findings align with prior literature documenting persistent respiratory symptoms in approximately 50% of recovered patients [10,21]. Fatigue was also common, consistent with previous reports [22,23,24,25], although cough (73.2%) was the most frequently reported symptom in our cohort (Figure 3).

Psychological sequelae were significant, with 49.3% and 22.7% of participants reporting depression and anxiety, respectively. These rates exceed prior meta-analytic estimates (15.97% for depression, 15.15% for anxiety) [26]. These findings also contrast with other regional studies [12], potentially reflecting the younger age distribution of our cohort. A small subset also reported fear (3.5%) and interpersonal hostility (9.9%).

Cardiac manifestations were common: 37.5% reported chest pain and palpitations, 13% had arrhythmias, and 1.9% experienced myocarditis. These rates exceed those reported in other studies from Saudi Arabia [6,12]. Shortness of breath, cough, and fatigue were also frequently reported in prior hospitalized cohorts [6].

This study is the first in Libya to explore post-COVID syndrome across the full spectrum of disease severity, from mild to severe. However, it is limited by reliance on self-reported symptoms, which may introduce reporting bias, and by the inability to assess the impact of vaccination on persistent symptoms.

The heterogeneity of post-COVID manifestations suggests that long COVID represents overlapping syndromes with distinct trajectories rather than a single clinical entity.21 COVID-19 appears to cause organ-dominant disease, with severity potentially driven by excessive inflammatory responses, microangiopathy, unresolved inflammation, and hypoxia.22,3 These mechanisms likely explain why some individuals experience more severe or prolonged symptoms than others.

Conclusion

This study demonstrated that a substantial proportion of patients recovering from COVID-19 experienced persistent symptoms lasting between 1 and 12 months following their last negative SARS-CoV-2 test, irrespective of gender, smoking status, or vaccination history. Furthermore, the severity of post-COVID-19 manifestations was positively associated with the initial severity of the infection, which in turn correlated with the presence of underlying comorbidities. Systematic follow-up of these persistent symptoms is essential to support recovery and maintain long-term quality of life. The most frequently reported post-COVID-19 symptoms included cough, fatigue, joint pain, anxiety, and headache, while more severe complications such as chest pain, pulmonary fibrosis, and myocarditis were also observed.

References

1. Hu B, Guo H, Zhou P, Shi ZL. Characteristics of SARS-CoV-2 and COVID-19. Nat Rev Microbiol. 2021;19(3):141-54.
2. Adhikari SP, Meng S, Wu YJ, Mao YP, Ye RX, Wang QZ, et al. Epidemiology, causes, clinical manifestation and diagnosis, prevention and control of coronavirus disease (COVID-19) during the early outbreak period: a scoping review. Infect Dis Poverty. 2020;9(1):29.
3. European Centre for Disease Prevention and Control. COVID-19 situation update worldwide, as of 4 April 2020. Stockholm: ECDC; 2020.
4. World Health Organization. WHO Coronavirus (COVID-19) Dashboard. Geneva: WHO; 2024.
5. National Center for Disease Control Libya. COVID-19 Situation Reports. Tripoli: NCDC Libya; 2024.
6. Garout M, Abuhasna S, Hakami O, Alharbi A, Alhejaili A, Almutairi A, et al. Post COVID-19 syndrome: a multisystem disease. J Infect Public Health. 2022;15(5):529-36.
7. Sivan M, Taylor S. NICE guideline on long COVID. BMJ. 2020;371:m4938.
8. Zhang JJ, Dong X, Liu GH, Gao YD. Risk and protective factors for COVID-19 morbidity, severity, and mortality. Clin Rev Allergy Immunol. 2023;64(1):90-107.
9. Zhou P, Yang XL, Wang XG, Hu B, Zhang L, Zhang W, et al. A pneumonia outbreak associated with a new coronavirus of probable bat origin. Nature. 2020;579(7798):270-3.
10. Allam H, Elsheikh MS, Elwahidy A, Monir R, Medhat A, Ziada YM, et al. Post-COVID-19 syndrome and its sequelae: a cross-sectional study. Egypt J Bronchol. 2024;18(1):29.
11. Buonsenso D, Munblit D, De Rose C, Sinatti D, Ricchiuto A, Carfì A, et al. Preliminary evidence on long COVID-19 in children. Acta Paediatr. 2021;110(7):2208-11.
12. Antonelli M, Penfold RS, Merino J, Sudre CH, Molteni E, Berry S, et al. Risk factors and disease profile of post-vaccination SARS-CoV-2 infection in UK users of the COVID Symptom Study app: a prospective, community-based, nested, case-control study. Lancet Infect Dis. 2022;22(1):43-55.
13. Kamal M, Abo Omirah M, Hussein A, Saeed H. Assessment and characterisation of post-COVID-19 manifestations. Int J Clin Pract. 2021;75(3):e13746.
14. Tenforde MW, Fisher KA, Patel MM. Identifying COVID-19 risk through observational studies to inform control measures. JAMA. 2021;325(14):1464-5.
15. Tleyjeh IM, Saddik B, Ramakrishnan RK, AlSwaidan N, AlAnazi A, Alhazmi D, et al. Long-term predictors of breathlessness, exercise intolerance, chronic fatigue and well-being in hospitalized patients with COVID-19: a cohort study with 4 months median follow-up. J Infect Public Health. 2022;15:21-8.
16. Buonsenso D, Roland D, De Rose C, Vásquez-Hoyos P, Ramly B, Chakakala-Chaziya JN, et al. Schools closures during the COVID-19 pandemic: a catastrophic global situation. Pediatr Infect Dis J. 2021;40(4):e146-50.
17. Moreno-Pérez O, Merino E, Leon-Ramirez JM, Andres M, Ramos JM, Arenas-Jiménez J, et al. Post-acute COVID-19 syndrome. Incidence and risk factors: a Mediterranean cohort study. J Infect. 2021;82(3):378-83.
18. Malik J, Muhammad Jawad Zaidi S, Iqbal R, Khan K, Ali M, Sattar Rana A, et al. Post-acute

COVID-19 syndrome and its prolonged effects: an updated systematic review. medRxiv [Preprint]. 2021 May 10.
19. Davis HE, Assaf GS, McCorkell L, Wei H, Low RJ, Re'em Y, et al. Characterizing long COVID in an international cohort: 7 months of symptoms and their impact. EClinicalMedicine. 2021;38:101019.
20. Huang L, Yao Q, Gu X, Wang Q, Ren L, Wang Y, et al. 1-year outcomes in hospital survivors with COVID-19: a longitudinal cohort study. Lancet. 2021;398(10302):747-58.
21. Delbressine JM, Machado FVC, Goërtz YMJ, Van Herck M, Meys R, Houben-Wilke S, et al. The impact of post-COVID-19 syndrome on self-reported physical activity. Int J Environ Res Public Health. 2021;18(11):6017.
22. Cénat JM, Dalexis RD, Guerrier M, Noorishad PG, Derivois D, Bukaka J, et al. Frequency and correlates of anxiety symptoms during the COVID-19 pandemic in low- and middle-income countries: a multinational study. J Psychiatr Res. 2021;132:13-7.
23. Tleyjeh IM, Kashour T, Riaz M, Amer SA, AlSwaidan N, Almutairi L, et al. Persistent COVID-19 symptoms at least one month after diagnosis: a national survey. J Infect Public Health. 2022;15(5):578-85.
24. Marshall M. The lasting misery of coronavirus long-haulers. Nature. 2020;585(7825):339-41.
25. Michielsen HJ, De Vries J, Van Heck GL. Psychometric qualities of a brief self-rated fatigue measure: the Fatigue Assessment Scale. J Psychosom Res. 2003;54(4):345-52.
26. Yong SJ. Long COVID or post-COVID-19 syndrome: putative pathophysiology, risk factors, and treatments. Infect Dis (Lond). 2021;53(10):737-54