Scientific Reports

https://doi.org/10.1038/s41598-026-44682-3

Article in Press

Symptoms, risk factors, and health outcomes of long COVID in the United Arab Emirates

Received: 28 October 2025

Accepted: 12 March 2026

Published online: 25 March 2026

Cite this article as: Zeidan R.K., Al-Bluwi N., Shukla A. *et al.* Symptoms, risk factors, and health outcomes of long COVID in the United Arab Emirates. *Sci Rep* (2026). https://doi.org/10.1038/s41598-026-44682-3

Rouba K. Zeidan, Najlaa Al-Bluwi, Ankita Shukla, Hamzah AlZubaidi, Manal Awad, Amal Hussein, Razan Agha, Dana Othman, Fatima M. Jamil Sharif, Alaa Chikh Hussein, Satanay Mahmoud, Anas Obaideen, Sara Basel Younes, Myasar AbuEbaid, Abdul Munhem Obaideen, Zahraa AlHano, Ghada Mohammed, Mohamad AlHajjaj, Rabih Halwani & Basema Saddik

Symptoms, Risk Factors, and Health Outcomes of Long COVID in the United Arab Emirates

Short Title: Long COVID in the United Arab Emirates

Rouba K Zeidan[1], Najlaa Al-Bluwi[1], Ankita Shukla[1], Hamzah AlZubaidi[1,2], Manal Awad[3], Amal Hussein[4], Razan Agha[1], Dana Othman[4,5], Fatima M. Jamil Sharif[4,5], Alaa Chikh Hussein[4, 5], Satanay Mahmoud[4,5], Anas Obaideen[4,6], Sara Younes[4,6], Myasar AbuEbaid[7], Abdul Munhem Obaideen[8], Zahraa AlHano[9], Ghada Mohammed[10], Mohamad AlHajjaj[10], Rabih Halwani[1,10], Basema Saddik[11,12]

[1]Research Institute for Medical and Health Sciences, University of Sharjah, Sharjah, United Arab Emirates
[2]College of Pharmacy, University of Sharjah, Sharjah, United Arab Emirates
[3]Department of Preventive and Restorative Dentistry, College of Dental Medicine, University of Sharjah, Sharjah, United Arab Emirates
[4]Department of Family and Community Medicine and Behavioral Sciences, College of Medicine, University of Sharjah, Sharjah, United Arab Emirates
[5]Al Qassimi Hospital, Sharjah, United Arab Emirates
[6]American Hospital Dubai, United Arab Emirates
[7]Rashid Hospital, Dubai Health Authority, Dubai, United Arab Emirates
[8]University Hospital Sharjah, Sharjah, United Arab Emirates
[9]Epidemiology Unit, University of Sharjah, Sharjah, United Arab Emirates
[10]Department of Clinical Sciences, College of Medicine, University of Sharjah, Sharjah United Arab Emirates
[11]Department of Public Health and Epidemiology, College of Medicine and Health Sciences, Khalifa University, Abu Dhabi, United Arab Emirates
[12] School of Population Health, Faculty of Medicine and Health, University of NSW, Sydney, Australia

*Corresponding Author
E-mail: basema.saddik@ku.ac.ae (BS)

Abstract

Long COVID is an ongoing public health challenge. This study aimed to examine Long COVID in previously hospitalized COVID patients in the UAE, determine associated risk factors, and evaluate its influence on self-perceived health. A retrospective cohort study was conducted using medical records and in-depth telephone interviews with adult patients hospitalized for COVID-19 between January 2020 and October 2021. Hospitalization was primarily for COVID-19 illness, although early admissions also included quarantine or surveillance during the initial phase of the pandemic. All patients provided informed consent. The study assessed clinical predictors of Long COVID and its impact on patients' daily lives. Long COVID was identified in approximately 49% of the 533 participants, with 43 distinct manifestations. Female sex, the number of initial symptoms, the need for intensive care during hospitalization, and having two or more comorbidities were associated with an increased risk of long COVID. It was also strongly linked to worsened self-rated health and overall poorer perceived health, as well as significant limitations in work functioning due to both physical and emotional difficulties.

These findings highlight the need for structured post-acute follow-up and targeted support for higher-risk groups to mitigate the long-term clinical and public health burden of COVID-19.

Keywords: UAE, long COVID, quality of life, hospitalized patients, risk factors

Introduction

The COVID-19 pandemic, caused by the novel coronavirus SARS-CoV-2, has profoundly impacted global public health systems, global economies, and societies since its emergence in late 2019.

While the primary focus of research during the pandemic has been on the acute respiratory manifestations of the virus, accumulating evidence has revealed complex and lingering long-term effects for a substantial subset of individuals who have recovered from the acute phase of the illness. The considerable increase in the survival rates following COVID-19 has been accompanied by a growing number of survivors experiencing post-acute symptoms after-SARS-CoV-2 infection [1,2].

Long COVID comprises a diverse set of health issues, whether new, returning, or ongoing, that people might experience after being infected with SARS-CoV-2. As a relatively new condition, understanding its impact on individuals is crucial for providing appropriate treatment and support. While COVID-19 primarily affects the respiratory system, evidence indicates that it also impacts the digestive, cardiovascular, nervous, and reproductive systems [3,4]. Several hypothesized mechanisms underlying long COVID pathogenesis have been suggested [5].

Identifying factors associated with the persistence of long COVID symptoms is crucial for risk stratification and targeted interventions. Certain demographic variables, such as older age and female sex; clinical variables, such as previous hospitalization or intensive care unit (ICU) admission during the acute phase of the disease; and comorbidity-related variables have been found to predispose individuals to a protracted recovery. However, conflicting results have been documented in different populations [6] and investigating these factors could inform clinical decision-making and therapeutic strategies. Moreover, there is a lack of information regarding how symptoms affect individuals' daily functional abilities or their health-related quality of life (QOL).

Therefore, exploring the impact of long COVID symptoms on people's day-to-day functional capacities, QOL, and subjective health ratings is important. While objective clinical assessments provide valuable insights, the lived experiences and self-perceptions of individuals enduring long COVID are central to understanding the true burden of this condition. These subjective measures can inform the development of patient-centered care approaches.

Evolving public health policies during the pandemic must also be taken into account when interpreting long-term COVID findings among hospitalized populations. In the UAE, early containment strategies during the initial phase of the pandemic (January–April 2020) involved hospital or facility-based admission of most individuals with confirmed SARS-CoV-2 infection, regardless of disease severity. National guidelines began allowing mild and asymptomatic cases to isolate themselves at home in May 2020, with hospitalization primarily reserved for moderate to severe illness [7]. Further, in September 2020, the UAE authorized the emergency use of COVID-19 vaccines, initially prioritizing frontline healthcare workers at higher risk of infection. By December 2020, vaccination was rolled out nationwide and offered free of charge to adult residents and citizens [8]. The vaccination program rapidly scaled up, with Suliman et al. [9] reporting that over 70% of the population was fully vaccinated by August 2021.

Specific studies focusing on long COVID in the United Arab Emirates (UAE) are limited. One study conducted in a designated hospital in Abu Dhabi on 71 critically ill patients (who survived after being admitted to either the ICU or high dependency unit (HDU)) explored short-term post-infectious and post-acute disabilities and found that 59% of patients had post-acute complications. It concluded that studies with longer follow-up periods are needed [10].

More research is required to understand the prevalence, manifestations, and impact of long COVID. Therefore, the primary objective of this study was to describe long COVID in hospitalized patients who survived the acute phase of the disease in the UAE. Additionally, this study compared patients with and without long COVID to identify associated factors and evaluate its impact on self-reported health and work limitations due to physical and emotional difficulties.

Methods

Study Design and Setting

A multicenter retrospective cohort study with cross-sectional follow-up was conducted in four major hospitals (including private, governmental, and semi-governmental institutions). While clinical data were collected retrospectively from hospital records, long COVID outcomes were assessed cross-sectionally at follow-up via structured interviews. Hospitals were chosen based on their capacity, range of specialized services, and the diversity of patients served by these facilities.

Participants and Sample Size

Included in this study were individuals aged 18 years or older who were admitted to one of the four selected hospitals between January 29, 2020, and October 14, 2021, who tested positive for COVID-19 using Real-time Reverse Transcriptase Polymerase Chain Reaction (RT-PCR) testing on nasal and/or pharyngeal swab specimens. Follow-up interviews were conducted between January 2021 and July 2022. The study excluded pregnant women and individuals unable to provide informed consent.

To determine the minimum sample size for this study, formula (1) was used, assuming a prevalence of 56.3% (based on the reported prevalence of ongoing COVID-19 symptoms in Saudi Arabia), a margin of error of 5%, and a confidence level of 95%.

$$(1)\, n = p.q\left(\frac{z_{\alpha/2}}{E}\right)^2$$

The minimum sample needed was 378 patients. Accounting for a non-response and incomplete response rate of 20%, the adjusted target minimum sample size was set at 473.

A detailed description of how the final sample size was achieved can be found in Figure 1.

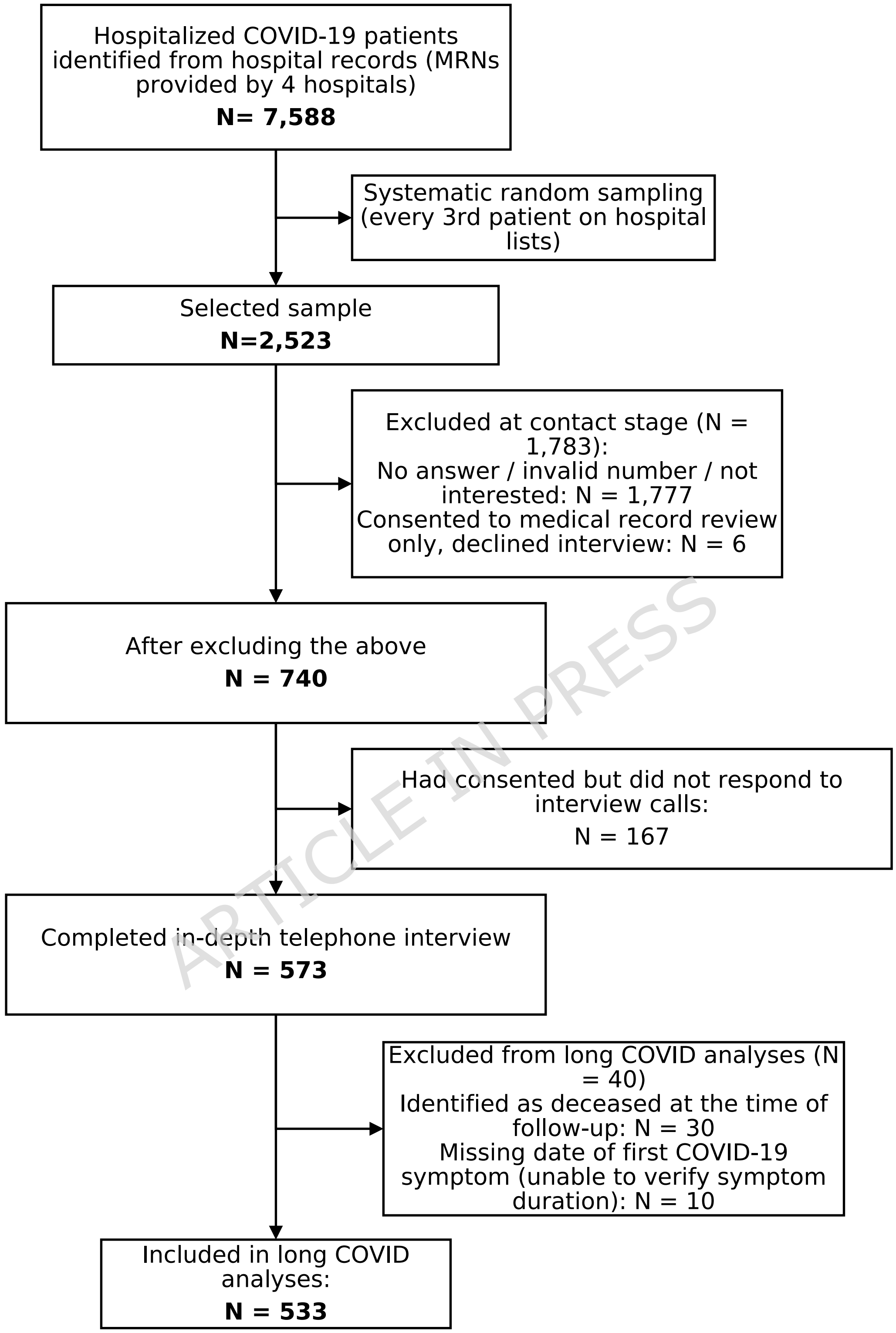


Figure 1. Flow diagram of participant selection and inclusion in the long COVID analyses

Data Collection

Data were collected from medical records and through in-depth telephone interviews with study participants. Content validity was assessed by a panel of five clinical experts who reviewed the questionnaire to ensure that the items adequately covered the relevant domains. Their feedback led to refinements in question wording and structure. Face validity was evaluated by both experts and a pilot group of 15 individuals from the target population, ensuring that the questions were clear, understandable, and relevant to the study objectives.

All selected participants were contacted by phone to obtain their consent before any data collection. A structured interview process ensured standardized data collection. Interviewers underwent training in fundamental interviewing skills, probing techniques, and a comprehensive review of the data collection instrument. Interviews were conducted in Arabic, English, or Urdu, adhering to a script and question protocol for consistency.

Each participating hospital provided a list of eligible inpatients according to the study's inclusion criteria. Patients were selected using systematic random sampling, whereby every third eligible patient listed in chronological order of hospital admission was contacted and invited to participate (Figure 1). Those willing to participate in the study and who provided informed consent were offered a suitable interview date and time. Meanwhile, their clinical data were collected. Participants were contacted again at the agreed-upon date and time for follow-up epidemiological data collection.

Assessment and definition of long COVID

Long COVID was assessed during the telephone interview by asking participants whether they were experiencing any persistent or new symptoms attributed to COVID-19 at the time of the interview. Symptoms were self-reported by participants and self-attributed to prior COVID-19 infection.

The NICE guidelines suggested a classification into three categories: acute COVID-19 (symptoms persisting for up to four weeks), ongoing symptomatic COVID (symptoms lasting from four to twelve weeks), and post-COVID (symptoms emerging during or after an infection and persisting for more than 12 weeks). Within the same guidelines, the term "long COVID" encompassed both ongoing symptomatic COVID-19 and post-COVID-19 syndrome [11]. For the purpose of this study, long COVID was operationally defined as the presence of at least one persistent or new symptom reported at interview, provided that the interview occurred at least four weeks after the onset of acute SARS-CoV-2 infection. All follow-up durations ≥4 weeks were pooled in accordance with the NICE definition of long COVID, encompassing ongoing symptomatic COVID-19 and post-COVID-19 syndrome, without distinguishing between persistent and new symptoms.

Eligibility relative to the ≥4-week criterion was determined using the date of first COVID-19 symptom, as recorded in the medical record, and the interview date. Participants with missing information on the date of first COVID-19 symptom were excluded from the long COVID analyses because eligibility relative to the timing criterion could not be verified. Additionally, participants who were deceased at the time of follow-up were excluded from the long COVID analyses (Fig 1).

Study Tools

Clinical data were extracted from the electronic health records of each patient using a standardized data collection form. This form, a modified iteration of the WHO/International Severe Acute Respiratory and Emerging Infection Consortium acute respiratory infections (ISARIC) case record form, included sections on symptoms and severity upon admission, past medical history, BMI categories (non-obese: BMI <30 kg/m^2 and obese: BMI ≥30 kg/m^2), radiological findings, symptoms, clinical measures, treatments, supportive care, complications, and laboratory test results. Missing or uncertain records were addressed through direct communication with healthcare providers or participants.

The structured interview, designed to gather information on current symptoms related to prior COVID-19 infection, sociodemographic characteristics, behavioral risk factors, and vaccination status, took approximately ten minutes to complete. Additionally, the interview tool, initially prepared in English, was translated into Arabic and Urdu, followed by a back-translation process conducted by bilingual professionals to maintain linguistic and conceptual equivalence across different language versions. The translated versions were reviewed by clinical experts and piloted to assess clarity and relevance; however, no formal cultural adaptation was performed.

Variable Definition

COVID-19 severity on admission was categorized into four categories according to the National Health Commission of China guidelines available when the study was designed. The classification was defined as : (i) Mild: presented with mild symptoms without radiographic features; (ii) Moderate: presented with fever, respiratory symptoms, and radiographic features; (iii) Severe: met one of the three criteria: (a) dyspnea, respiration rate (RR) greater than 30 times/min, (b) oxygen saturation less than 93% in ambient air, and (c) PaO_2/FiO_2 less than 300 mm Hg; and (iv) Critical: met one of the following criteria: (a) respiratory failure, (b) septic shock, or (c) multiple organ failure[12]. COVID-19 severity on admission was further grouped into three categories: mild, moderate, and severe/critical.

Complications during hospital stay were defined as the occurrence of at least one acute clinical event documented in the medical record during hospitalization for COVID-19. Complications were extracted from electronic health records using a standardized data collection form based on the WHO/ISARIC case record form and included shock, seizure, meningitis, anemia, cardiac arrhythmia, cardiac arrest, pneumonia, bronchiolitis, acute respiratory distress syndrome (ARDS), bacteremia, bleeding, endocarditis, myocarditis/pericarditis, acute renal injury, pancreatitis, liver dysfunction, and cardiomyopathy. The variable was analyzed as a binary indicator (yes/no).

ICU admission was included as a proxy indicator of acute disease severity (in-hospital severity).

Ongoing symptoms were classified into organ systems based on categories used in the review by Sylvester et. al. [13]. Organ systems included: cardiovascular, dermatological, head, ears, eyes, nose, and throat (HEENT), respiratory, psychiatric/mood, neurological, musculoskeletal, and other. The number of symptoms was calculated by summing the number of symptoms the patient experienced.

The effect of long COVID on health was measured using self-reported questions. Participants rated their current health as poor, fair, good, very good, and excellent. For regression analyses, this was dichotomized into "good health rating" (good, very good, excellent) and "bad health rating" (poor, fair). Participants also rated their current health compared to their pre-COVID-19 health as much worse, somewhat worse, about the same, somewhat better, or much better. These categories were further grouped into two categories: worse health (much worse, somewhat worse) and same or better health (about the same, somewhat better, much better).

Participants were also asked if they felt they had work limitations due to physical or emotional issues (yes/no).

Ethics Approval

Ethical approval for this study was obtained from the Research Ethics Committees at the Ministry of Health and Prevention (MOHAP) (MOHAP/DXB-REC/SSS/No.124/2020), the University of Sharjah Hospital (UHS-HERC-098-10042022), and the Dubai Health Authority (DSREC-09/2021_14). All procedures performed in this study adhered to the ethical standards of these committees and conformed to the principles outlined in the Helsinki Declaration of 1975, as revised in 2008.

Data Analysis

Data were analyzed using SPSS version 28 [14]. Continuous variables were summarized as means with standard deviations (SD) or medians with interquartile ranges (IQR), while categorical variables were presented as frequencies and percentages. Bivariate analyses were first conducted to describe demographic, behavioral, and clinical differences between participants with and without long COVID. Associations between categorical variables were explored using Chi-square and Fisher's exact tests. Two-group comparisons involving continuous variables were conducted using the Independent Samples T-test. A multivariable logistic regression analysis was performed to determine the potential factors associated with long COVID. Based on prior literature and clinical relevance, age, sex, time since infection, comorbidities, admission severity, and ICU admission during hospital stay were identified a priori as potential confounders and were forced into all multivariable models regardless of statistical significance. Additional variables demonstrating bivariate associations with long COVID at $p < 0.05$ or considered clinically relevant were included as candidate predictors. Backward stepwise elimination (Wald) was applied only to these candidate variables to derive a parsimonious final model. Models only included complete cases (N = 447 (83.9%)). Linearity in the logit for continuous predictors (age, number of signs and symptoms at admission, and time since infection) was assessed using the Box–Tidwell approach while adjusting for all covariates. No evidence of violation was observed.

Multivariable logistic regressions were also used to calculate the AOR of the association between the different affected organ systems by long COVID and health status questions after adjusting for age and sex. The reproductive/genitourinary and endocrine systems were excluded from these analyses due to the low number of observations. Missing data were handled using a complete-case approach. Participants with missing information on key variables required for outcome definition (e.g., date of first COVID-19 symptom) were excluded a priori from the long COVID analyses. For regression analyses, only participants with complete data for the variables included in each model were analyzed. No imputation methods were applied. A two-sided *P*-value of < 0.05 was considered statistically significant.

Results

Among 533 participants, 327 (61.4%) were male, with a mean age of 51.7 years (SD = 16.4). Most were married (78.9%) and of Arab (60.0%) or Asian (37.7%) ethnicity. The majority lived in Sharjah/Ajman (61.9%) and had a high school (20.2%) or a bachelor's degree (40.1%). All demographics are presented in Table 1. Regarding lifestyle factors and clinical profile, 25.6% reported exercising regularly for years, 38.2% were classified as obese, 9.5% were current smokers, and 56.0% of participants had two or more comorbidities. In terms of COVID-19 vaccination, two-thirds of the participants (67.0%) had received the first dose, and 62.9% had received the second dose (Table 2). Findings related to vaccination status should be considered descriptive and exploratory, as vaccination timing could not be aligned with infection.

On average, participants presented with 3.2 symptoms (SD = 1.3) upon hospital admission, and 24.5% were severe or critical on admission. During their hospital stay, 69.0% experienced at least one complication. Regarding medication, a substantial proportion of patients received corticosteroids (67.0%), antibiotics (68.3%), and antiviral medication (76.2%) during hospitalization. Further, 18.2% of participants required ICU admission, 56.5% needed oxygen supplementation, and only 1.9% needed intubation. The mean follow-up time was 10.8 months (SD = 6.2) (Table 3).

Long COVID syndrome was reported by 48.8% of the sample. A significant sex difference was found with 42.2% of males and 59.2% of females developing long COVID (OR = 1.99, 95% CI [1.40, 2.83], $P < 0.001$).

Participants who exercised regularly for years were less likely to develop long COVID (OR = 0.64, 95% CI [0.43, 0.95], $P = 0.026$). A significant difference was also found in the number of symptoms on hospital admission, with long COVID patients having a higher number of symptoms (M = 3.3) compared to those without long COVID (M = 3.0, $P = 0.008$). Participants with two or more comorbidities were more likely to develop long COVID ($P = 0.014$). Other demographic and clinical characteristics did not show significant associations with long COVID (Tables 2 and 3).

In the multivariable analysis (Table 4), sex played a notable role, with females being 1.7 times more likely to develop long COVID symptoms compared to males ($P = 0.012$). The number of initial symptoms upon hospital admission was also a significant predictor, indicating that for each additional symptom, the odds of experiencing long COVID symptoms increased by 22% (AOR = 1.22, 95% CI [1.05, 1.42], $P = 0.010$). Furthermore, a history of ICU admission significantly increased the odds of developing long COVID symptoms by 81% (AOR = 1.81, 95% CI [1.05, 3.13], $P = 0.033$). The presence of comorbidities was another significant predictor; individuals with two or more comorbidities had twice the odds of experiencing long COVID symptoms compared to those with no comorbidities (95% CI [1.04, 4.15], $P = 0.039$).

The prevalence of long COVID based on the duration since infection is shown in Fig. 2a. Among those with infection dates exceeding six months, 46.4% were diagnosed with long COVID. After 12 or more months, the prevalence remained relatively stable at 46.6%. Notably, among individuals whose infection dates were beyond 24 months, the prevalence of long COVID was still at 41.2%.

In the analysis of organ systems affected by long COVID, significant sex differences emerged (Fig. 2b). Females exhibited a higher prevalence of symptoms in several systems compared to males. Specifically, the most pronounced sex differences were observed in: dermatologic symptoms (23.6% in females vs. 4.0% in males, $P < 0.001$), musculoskeletal symptoms (19.7% in females vs. 9.5% in males, $P < 0.001$), psychiatric/mood symptoms (13.0% in females vs. 3.4% in males, $P < 0.001$), HEENT symptoms were also more prevalent in females (9.1%) compared to males (4.2%, $p = 0.024$). Additionally, females had a higher prevalence of symptoms in the “other systems” category (38.0% in females vs. 22.2% in males, $P < 0.001$) and CV symptoms (7.7% in females vs. 1.5% in males, $P < 0.001$).

In examining the distribution of organ systems affected by long COVID across different ages (Figure 2c), individuals with psychiatric/mood symptoms were older (57 years, SD = 16.3) compared to those without these symptoms (51.3 years, SD = 16.3, $P = 0.035$). Conversely, participants with neurological symptoms were younger (47.1 years, SD = 12.4) compared to those without these symptoms (52.1 years, SD = 16.6, $P = 0.018$).

Figure 2d presents the prevalence of specific symptoms experienced by study participants with long COVID, categorized by various organ systems. Among the observed symptoms, those pertaining to the respiratory system were prominent. Shortness of breath was reported by 17% of participants, while sore throat/difficulty swallowing and cough were reported by 6.2% and 5%, respectively. Cardiovascular symptoms included chest pain (6%) and palpitations (3%). Additionally, a substantial proportion of participants experienced fatigue (23.6%), hair loss (10.5%), sleep difficulties (6.4%), and decreased appetite (6.4%). The prevalence of symptoms across these different organ systems underscores the diverse and multifaceted nature of long COVID-19 symptoms experienced by the participants.

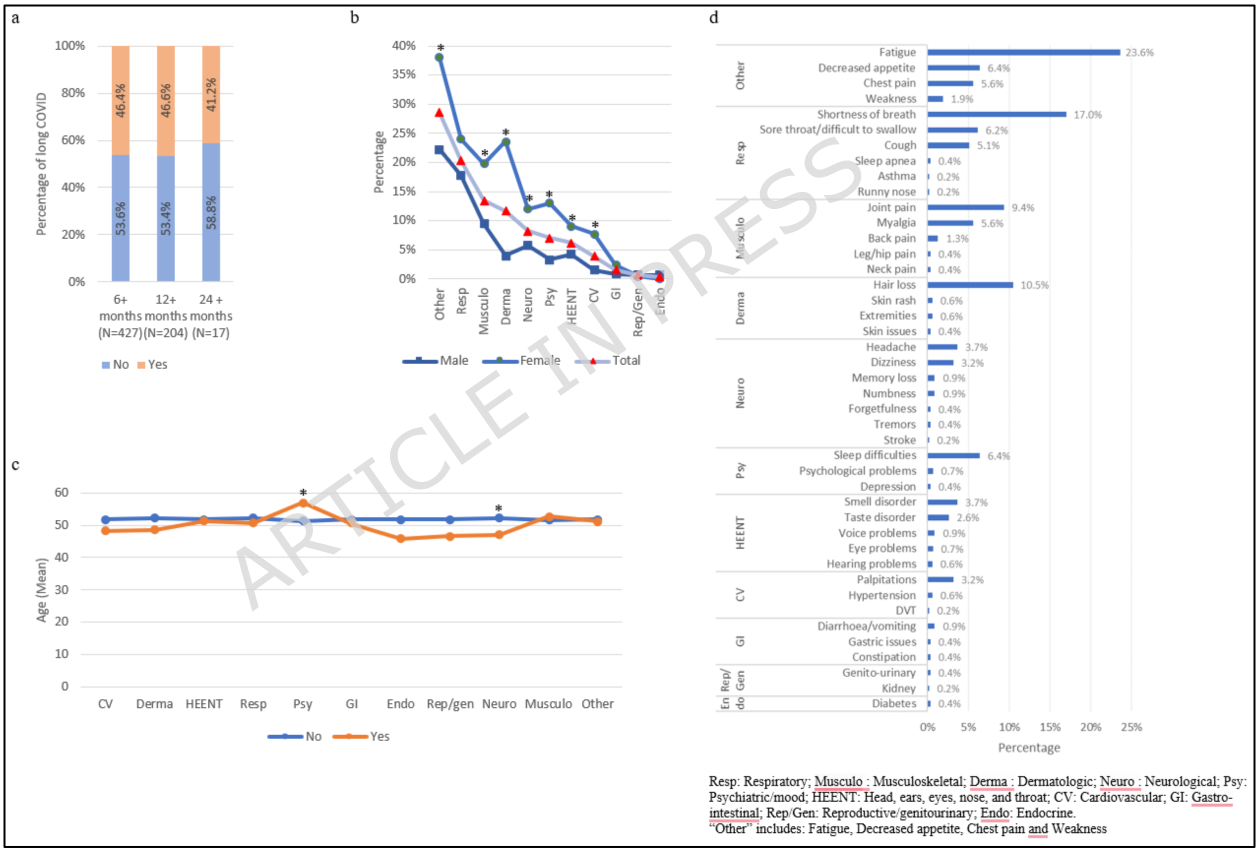


Figure 2. Long COVID characteristics and symptoms

Figure 3 presents the subjective health ratings and health status of individuals following their experience with COVID-19, providing insights into how they perceive their health and the impact of long COVID on their daily lives.

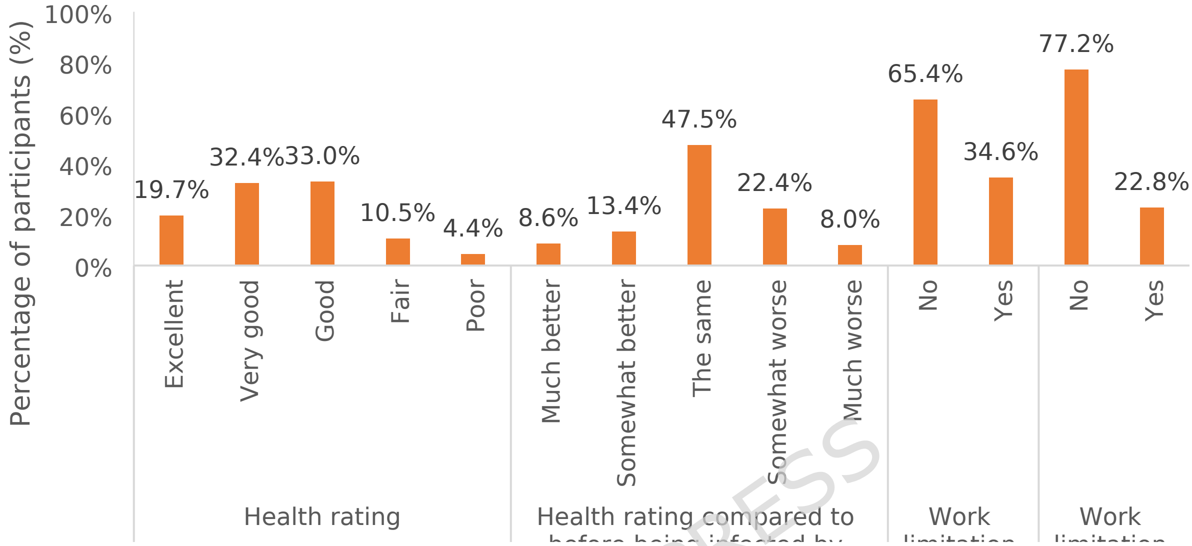


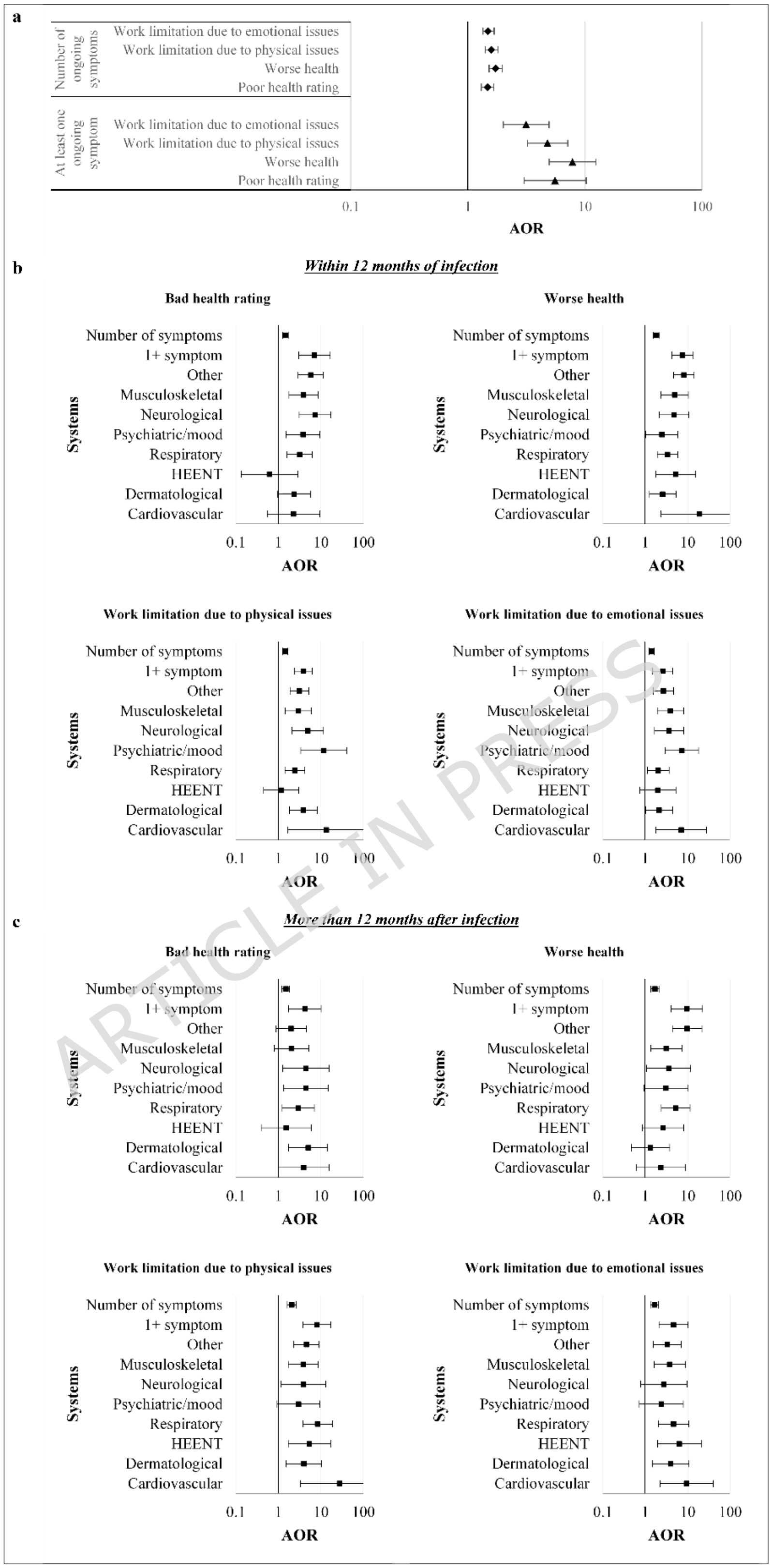
Figure 3. Post-COVID-19 Subjective Health Ratings and Work Limitations among interviewed participants (N = 533).

When comparing their current health to their health pre-COVID-19, a diverse range of responses emerged. While a substantial portion reported their health as "about the same" (47.5%), a notable number indicated a decline. Specifically, 8.0% felt "much worse" and 22.4% reported feeling "somewhat worse" compared to their pre-COVID health status.

Regarding work limitations, a significant proportion (34.6%) reported facing physical issues that impacted their ability to work. Emotional issues also played a role, although to a somewhat lesser extent, with 22.8% reporting work limitations due to emotional issues.

Figure 4a presents the results of logistic regression analyses, focusing on the impact of having at least one long COVID symptom and the number of symptoms on health rating, perceived worsening of health since COVID-19 infection, and work limitations at work due to physical or emotional issues, after adjusting for age and sex. Individuals experiencing at least one symptom were significantly more likely to report poor health ratings (AOR = 5.576, 95% CI [3.029 to 10.265], $P < 0.001$) and worse health status (AOR = 7.842, 95% CI [4.954 to 12.415], $P < 0.001$). They were also more likely to face work limitations due to physical (AOR = 4.808, 95% CI [3.229 to 7.158], $P < 0.001$) and emotional issues (AOR = 3.149, 95% CI [2.01 to 4.933], $P < 0.001$). Moreover, an increase in the number of symptoms was positively associated with all four measurements.

In the analysis of the impact of long COVID symptoms on participants' QOL, various organ systems were investigated, with stratification by duration since infection (Figure 4b). Most systems seemed to affect QOL measurements both in the first year after infection and beyond the first year (Figure 4c).



a
Number of ongoing symptoms
At least one ongoing symptom
Work limitation due to emotional issues
Work limitation due to physical issues
Worse health
Poor health rating
0.1
1
10
100
AOR
b
Within 12 months of infection
Bad health rating
Worse health
Work limitation due to physical issues
Work limitation due to emotional issues
Systems
Number of symptoms
1+ symptom
Other
Musculoskeletal
Neurological
Psychiatric/mood
Respiratory
HEENT
Dermatological
Cardiovascular
c
More than 12 months after infection

Figure 4. Impact of Long COVID on Subjective Health Ratings and Work Limitations.

Discussion

This study describes long COVID symptoms in the UAE and provides insights into factors associated with long COVID and its impact on affected individuals.

Prevalence and Symptom Presentation

The prevalence of long COVID was 48.7% in the present study population. This prevalence is slightly lower than that observed in Saudi Arabia, where 56.3% of patients complained of persisting symptoms [15]. However, that study had a shorter follow-up period (median of 122 days post-discharge compared to 305 days in the present study). The occurrence of long COVID has been estimated at 10%-30% in non-hospitalized cases and 50%-70% in hospitalized cases [5]. Although all participants in the present study had been hospitalized, it is important to note that during the early phase of the pandemic, some admissions occurred for quarantine or surveillance rather than disease severity, before hospitalization policies were later restricted primarily to moderate-to-severe cases. However, in our cohort, the distribution of admission severity did not differ significantly between the early and later phases of the pandemic, suggesting that changes in hospitalization policy are unlikely to have substantially biased the observed prevalence.

The study highlights the multisystemic nature of long COVID, with participants reporting symptoms across respiratory, musculoskeletal, dermatological, neurological, and psychiatric domains. Fatigue was the most prevalent symptom, aligning with prior research [4,16,17], followed by shortness of breath, hair loss, joint pain, sleep difficulties, and decreased appetite. Neuropsychiatric symptoms–including fatigue, fibromyalgia, anxiety, and depression–are believed to have neuroimmune and neuro-oxidative origins [18], Respiratory and pulmonary manifestations, such as dyspnea, sore throat/difficulty swallowing, cough, and chest pain, were frequent and likely linked to persistent lung involvement following the initial infection [17].

Several pathophysiological mechanisms have been proposed to explain the musculoskeletal manifestations of long COVID, including direct viral entry, systemic inflammation, central and peripheral sensitization, and psychosocial factors [19]. Hair loss is most commonly attributed to telogen effluvium, although other mechanisms have also been suggested [20].

Factors Associated with Long COVID

This study identifies key factors associated with long COVID in the UAE population. Notably, females were nearly twice as likely to experience long COVID compared to males, emphasizing sex-based disparities in post-COVID outcomes. Although male sex has been linked with increased COVID-19 severity and mortality [21], female sex appears to be associated with more persistent symptoms post-recovery [15]. A recent comprehensive review and meta-analysis of 41 studies, including 860,783 patients, revealed a significant association between female sex and long COVID [6]. Several authors have proposed mechanistic explanations for this correlation, including the potential role of hormones in sustaining the hyperinflammatory state of COVID-19 even post-recovery [22,23]. Additionally, studies have noted higher production of IgG antibodies in females during the acute phase of COVID, which could potentially prolong symptom duration [24,25]. Beyond biological mechanisms, cultural and healthcare access factors may also contribute to the observed sex differences. Research indicates that women in the UAE demonstrate higher health literacy levels compared to men, which may facilitate greater healthcare utilization and symptom recognition [26].

Age did not appear to be significantly associated with long COVID in this study, contrasting with previous research that has identified older age as an independent risk factor for long COVID [27,28]. However, it is important to note that long COVID prevalence is inherently linked to survival beyond the acute phase of infection. Advanced age, particularly with multiple underlying comorbidities, is at higher risk of severe disease and mortality [29], which may contribute to lower long COVID prevalence among older survivors in this cohort.

This study further highlights the role of disease severity in predicting long COVID outcomes. A higher number of symptoms at initial diagnosis and ICU admission during hospitalization were both significant predictors of long COVID. A recent meta-analysis found that individuals hospitalized or requiring ICU admission faced more than twice the risk of developing long COVID, underscoring the elevated risk for patients with prior critical illness, necessitating comprehensive strategies for prevention, rehabilitation, and management of ongoing symptoms associated with long COVID during their follow-up [6].

Comorbidities also played a crucial role in long COVID risk, with patients having two or more preexisting conditions facing over twice the odds of experiencing long COVID symptoms. Specific conditions, such as anxiety/depression, asthma, COPD, diabetes, ischemic heart disease, and immunosuppression, were significantly associated with a higher risk of long COVID [6].

As for vaccination, given the timing of infections and the rollout of COVID-19 vaccination in the UAE, vaccination status could not be reliably aligned with infection, and no conclusions regarding causal or temporal effect can be drawn.

Impact on Health Ratings

Self-reported health ratings provided valuable insights into the lived experiences of patients post-COVID-19. While some participants reported positive health perceptions and improvements, a substantial proportion continued to experience persistent health challenges. The presence of long COVID, the number of symptoms, and the number of affected systems were all significant predictors of lower subjective health ratings and greater functional limitations. This remained evident even one year after infection. These findings are consistent with previous research examining the effects of long COVID on QOL and work [31,32]. A study by Kim et al. examined long-term QOL outcomes of two years post-infection. They reported that patients with long COVID had lower levels of health-related quality of life (HRQOL), increased mental health problems, and higher healthcare utilization after discharge compared to those without long COVID.[33] However, HRQOL continued to improve in both physical and mental health domains, with most individuals returning to their original work within two years, despite the burden of ongoing symptoms remaining relatively high [34].

Clinical Implications

Our findings have important implications for the clinical management of long COVID. The observed sex-based differences and the strong association between acute symptom burden and subsequent long COVID highlight the need for early risk stratification and targeted follow-up. Patients presenting with multiple acute symptoms, those requiring intensive care, and individuals with pre-existing comorbidities may benefit from structured post-COVID monitoring and multidisciplinary care.

The persistence of symptoms beyond 12 and up to 24 months after infection underscores the importance of long-term follow-up strategies, even among patients who experienced mild acute disease. Reduced self-rated health and work limitations associated with long COVID indicate the need for individualized management approaches, including rehabilitation and supportive interventions, to address ongoing physical and emotional challenges.

Limitations

A key limitation is that this study did not include a control group, such as COVID-19-negative individuals or non-hospitalized patients. While this limits direct comparisons, the study still provides valuable insights into the long-term effects of COVID-19 among previously hospitalized individuals. Future research incorporating control groups could further clarify the specific impact of long COVID.

The extended follow-up period, which reached a maximum of 28 months, may also pose challenges in attributing persistent symptoms solely to prior COVID-19 infection. With extended follow-up, some reported symptoms may be unrelated to prior infection, raising the possibility of misattribution. Because follow-up duration varied widely, prevalence estimates may differ by time since infection, and inclusion of earlier post-acute assessments may overestimate prevalence compared with longer-term follow-up. Additionally, the long recall period may introduce recall bias. To mitigate this, interviews followed a structured questionnaire with predefined symptom lists and probing questions to facilitate recall; however, recall bias cannot be fully excluded.

Another limitation is that no individualized diagnostic tests were performed; instead, results relied solely on self-reported symptoms. Sampling bias may also be present, as 23.2% of contacted patients declined participation, and 70.4% were unreachable by phone. This may have disproportionately excluded certain populations, including migrant workers or individuals who returned to their home countries after recovery, potentially biasing the study toward participants with more stable contact information.

Additionally, our study is subject to survival bias, as it includes only individuals who survived COVID-19 and were reachable for follow-up interviews. Patients with the most severe disease who did not survive may have had different symptom trajectories or long-term health effects had they lived. Consequently, our findings may underestimate the full burden of post-COVID complications. Furthermore, residual confounding by disease severity, treatment intensity, and vaccination status cannot be fully excluded. Finally, as the study population consists of hospitalized survivors, caution is needed when generalizing the results to all COVID-19 patients, including non-hospitalized cases. However, it is important to note that data collection included cases from the early stages of the pandemic, when even some non-severe cases were hospitalized.

Conclusion

Long COVID is a complex and debilitating condition characterized by persistent symptoms and sustained functional impairment. In this multicenter cohort of previously hospitalized patients in the UAE, nearly half reported long COVID, with female sex, acute disease characteristics, and pre-existing comorbidities associated with increased risk. Although symptoms typically improve over time, our study shows that long COVID can continue to affect self-rated health and work capacity one year after the acute infection.

Further research is needed to better understand the long-term health effects of COVID-19, their impact on QOL, and the effectiveness of interventions such as vaccination. Additionally, future research should explore targeted interventions and treatment strategies to mitigate the impact of long COVID-19 on affected individuals.

References

1. Rubin, R. As Their Numbers Grow, COVID-19 “Long Haulers” Stump Experts. *JAMA* **324**, 1381 (2020).
2. Marshall, M. The lasting misery of coronavirus long-haulers. *Nature* **585**, 339–341 (2020).
3. Subramanian, A. *et al.* Symptoms and risk factors for long COVID in non-hospitalized adults. *Nat. Med.* **28**, 1706–1714 (2022).
4. Michelen, M. *et al.* Characterising long COVID: a living systematic review. *BMJ Glob. Health* **6**, e005427 (2021).
5. Davis, H. E., McCorkell, L., Vogel, J. M. & Topol, E. J. Long COVID: major findings, mechanisms and recommendations. *Nat. Rev. Microbiol.* **21**, 133–146 (2023).
6. Tsampasian, V. *et al.* Risk Factors Associated With Post−COVID-19 Condition. *JAMA Intern. Med.* **183**, 566 (2023).

7. Al, N. *et al.* Universal health care access for all residents reduce mortality in COVID-19 patients in Abu Dhabi, UAE: A retrospective multicenter cohort study. https://doi.org/10.21203/RS.3.RS-87753/V1 (2020) doi:10.21203/RS.3.RS-87753/V1.
8. Ibrahim, D. & Firoz, F. National Vaccination Program in the UAE. in *Healthcare in the United Arab Emirates* 163–173 (Springer Nature Singapore, Singapore, 2026). doi:10.1007/978-981-96-0523-1_12.
9. Suliman, D. M. *et al.* UAE efforts in promoting COVID-19 vaccination and building vaccine confidence. *Vaccine* **39**, 6341–6345 (2021).
10. Ibrahim, H. *et al.* Post-infectious and post-acute sequelae of critically ill adults with COVID-19. *PLoS One* **16**, e0252763 (2021).
11. National Institute for Health and Care Excellence (NICE), R. C. of G. P. H. I. S. S. *COVID-19 Rapid Guideline: Managing the Long-Term Effects of COVID-19* . https://www.nice.org.uk/guidance/ng188 (2020).
12. Wu, Y. *et al.* Evolution and major changes of the diagnosis and treatment protocol for COVID-19 patients in China 2020–2023. *Health Care Science* **2**, 135–152 (2023).
13. Sylvester, S. V. *et al.* Sex differences in sequelae from COVID-19 infection and in long COVID syndrome: a review. *Curr. Med. Res. Opin.* **38**, 1391–1399 (2022).
14. IBM Corp. Released 2021. IBM SPSS Statistics for Windows, Version 28.0. *Armonk, NY: IBM Corp* Preprint at (2021).
15. Tleyjeh, I. M. *et al.* Prevalence and predictors of Post-Acute COVID-19 Syndrome (PACS) after hospital discharge: A cohort study with 4 months median follow-up. *PLoS One* **16**, e0260568 (2021).
16. Healey, Q., Sheikh, A., Daines, L. & Vasileiou, E. Symptoms and signs of long COVID: A rapid review and meta-analysis. *J. Glob. Health* **12**, 05014 (2022).
17. Lopez-Leon, S. *et al.* More than 50 long-term effects of COVID-19: a systematic review and meta-analysis. *Sci. Rep.* **11**, 16144 (2021).
18. Al-Hakeim, H. K., Al-Rubaye, H. T., Al-Hadrawi, D. S., Almulla, A. F. & Maes, M. Long-COVID post-viral chronic fatigue and affective symptoms are associated with oxidative damage, lowered antioxidant defenses and inflammation: a proof of concept and mechanism study. *Mol. Psychiatry* **28**, 564–578 (2023).
19. Khoja, O. *et al.* Clinical Characteristics and Mechanisms of Musculoskeletal Pain in Long COVID. *J. Pain Res.* **Volume 15**, 1729–1748 (2022).
20. Ohyama, M., Matsudo, K. & Fujita, T. Management of hair loss after severe acute respiratory syndrome coronavirus 2 infection: Insight into the pathophysiology with implication for better management. *J. Dermatol.* **49**, 939–947 (2022).
21. Pijls, B. G. *et al.* Temporal trends of sex differences for COVID-19 infection, hospitalisation, severe disease, intensive care unit (ICU) admission and death: a meta-analysis of 229 studies covering over 10M patients. *F1000Res.* **11**, 5 (2022).

22. Bienvenu, L. A., Noonan, J., Wang, X. & Peter, K. Higher mortality of COVID-19 in males: sex differences in immune response and cardiovascular comorbidities. *Cardiovasc. Res.* **116**, 2197–2206 (2020).
23. Mohamed, M. S., Moulin, T. C. & Schiöth, H. B. Sex differences in COVID-19: the role of androgens in disease severity and progression. *Endocrine* **71**, 3–8 (2021).
24. Bai, F. *et al.* Female gender is associated with long COVID syndrome: a prospective cohort study. *Clinical Microbiology and Infection* **28**, 611.e9-611.e16 (2022).
25. Zeng, F. *et al.* A comparison study of SARS-CoV-2 IgG antibody between male and female COVID-19 patients: A possible reason underlying different outcome between sex. *J. Med. Virol.* **92**, 2050–2054 (2020).
26. Nair, S. C., Sreedharan, J., Satish, K. P. & Ibrahim, H. Health literacy in a high income Arab country: A nation-wide cross-sectional survey study. *PLoS One* **17**, e0275579 (2022).
27. Maglietta, G. *et al.* Prognostic Factors for Post-COVID-19 Syndrome: A Systematic Review and Meta-Analysis. *J. Clin. Med.* **11**, 1541 (2022).
28. Thompson, E. J. *et al.* Long COVID burden and risk factors in 10 UK longitudinal studies and electronic health records. *Nat. Commun.* **13**, 3528 (2022).
29. Romero Starke, K. *et al.* The isolated effect of age on the risk of COVID-19 severe outcomes: a systematic review with meta-analysis. *BMJ Glob. Health* **6**, e006434 (2021).
30. Román-Montes, C. M. *et al.* Post-COVID-19 syndrome and quality of life impairment in severe COVID-19 Mexican patients. *Front. Public Health* **11**, (2023).
31. Nandasena, H. M. R. K. G., Pathirathna, M. L., Atapattu, A. M. M. P. & Prasanga, P. T. S. Quality of life of COVID 19 patients after discharge: Systematic review. *PLoS One* **17**, e0263941 (2022).
32. Kim, Y., Bae, S., Chang, H.-H. & Kim, S.-W. Long COVID prevalence and impact on quality of life 2 years after acute COVID-19. *Sci. Rep.* **13**, 11207 (2023).
33. Huang, L. *et al.* Health outcomes in people 2 years after surviving hospitalisation with COVID-19: a longitudinal cohort study. *Lancet Respir. Med.* **10**, 863–876 (2022).

Acknowledgement

We acknowledge and thank all the participants who took part in the study.

Author Contributions

HA, MA, AH, MAH, RH, and BS conceptualized the study and designed the methodology. BS acquired the funding and supervised the project. RKZ, NA, AS, RA, DO, FS, ACH, SM, AO, SY, MAE, AMO, and GM carried out the investigation. RKZ managed the project. RKZ, NA, AS, HA, MA, AH, and BS performed the formal analysis. RKZ, NA, ZA, and BS wrote the original draft. All authors reviewed the manuscript.

Data Availability

The data that support the findings of this study are not openly available due to reasons of confidentiality and are available from the corresponding author upon reasonable request.

Competing interests

The authors declare no competing interests.

Funding

This work was supported by grants from, Clinical Epidemiology Research group operational grant (Grant code:150389) and COVID-19 research grant (CoV19-0301), University of Sharjah, UAE.

Figure legends

- **Figure 1. Flow diagram of participant selection and inclusion in the long COVID analyses**

Figure 2. Long COVID characteristics and symptoms

a. Frequency of long COVID by time since infection; b. Differences in systems involved in long COVID between sexes; c. Mean age differences in systems involved in long COVID; d. Prevalence of symptoms, categorized by organ systems.

Abbreviations: Resp, respiratory; Musculo, musculoskeletal; Derma, dermatological; Neuro, neurological; Psy, psychiatric/mood; HEENT, head, ears, eyes, nose, and throat; CV, cardiovascular; GI, gastrointestinal; Rep/Gen, reproductive/genitourinary; Endo, endocrine. “Other” includes fatigue, decreased appetite, chest pain, and weakness.

* Statistically significant differences between groups ($p < 0.05$), assessed using chi-square tests for categorical variables and independent samples t-tests for continuous variables.

Figure 3. Post-COVID-19 Subjective Health Ratings and Work Limitations among interviewed participants (N = 533).

Bars represent the percentage of participants reporting each outcome at the time of the follow-up interview. Self-rated health was assessed on a five-point scale (excellent, very good, good, fair, poor). Perceived health compared with pre-COVID-19 status was categorized as much worse, somewhat worse, about the same, somewhat better, or much better. Work limitations due to physical or emotional issues were assessed as yes/no.

Percentages are calculated using the total number of interviewed participants as the denominator.

Figure 4. Impact of Long COVID on Subjective Health Ratings and Work Limitations.

a. Association of long COVID and the number of ongoing symptoms with health ratings and work limitations; b. Effect of long COVID, number of symptoms, and affected systems on health ratings and work limitations in participants assessed within 12 months of infection; c. Effect of long COVID, number of symptoms, and affected systems on health ratings and work limitations in participants assessed more than 12 months after infection.

Forest plots display adjusted odds ratios (AORs) with 95% confidence intervals derived from multivariable logistic regression models adjusted for age and sex. Outcomes include poor self-rated health (poor/fair vs. good/very good/excellent), worse health compared with pre-COVID-19 status (much worse/somewhat worse vs. same or better), and work limitations due to physical or emotional issues (yes vs. no). The vertical reference line indicates an AOR of 1.0.

Abbreviations: HEENT, head, ears, eyes, nose, and throat.

Table 1. Demographics of Study Participants (N=533)

Variables		**N**	**%**
Sex	Male	327	61.4

	Female	206	38.6
Age (years)	Mean ± SD	51.8 ± 16.3	
	Median (Q1-Q3)	49.9 (38.8-63.1)	
Marital Status	Single	55	10.5
	Married	414	78.9
	Divorced/Widowed	56	10.7
Ethnicity	Arab	314	60.0
	Asian	197	37.7
	Black/African	5	1.0
	Caucasian	5	1.0
	Hispanic or Latino	2	0.4
Emirate of Residence	Dubai	181	34.7
	Sharjah/Ajman	323	61.9
	Other	18	3.4
Educational level	Less than high school	177	33.8
	High school	106	20.2
	Bachelor	210	40.1
	Post-graduate	31	5.9
Working status	Not working	228	43.7
	Working	294	56.3
Occupation	Labor/cleaner/delivery	77	26.2
	Admin work	78	26.5
	Managerial	83	28.2
	Business	33	11.2
	Health care	23	7.8
Income per household	<15,000	309	64.0
	15,000–29,999	102	21.1
	≥30,000	72	14.9
Crowding index	1–2 persons/room	350	69.0
	≥3 persons/room	157	31.0

Table 2. Demographic, Behavioral, and Clinical Differences Between Study Participants With and Without Long COVID

		Total N = 533		Long COVID					
				No N = 273 (51.2%)		Yes N= 260 (48.8%)		*OR (95% CI)*	*P*
		N	%	N	%	N	%		
Demographics									
Sex	Male	327	61.4	189	57.8	138	42.2	1	<0.001 *
	Female	206	38.6	84	40.8	122	59.2	1.99 (1.40–2.83)	
Age (in years)	Mean ± SD	51.8 ± 16.3		51.8 ± 17.3		51.8 ± 15.3		1.00 (0.99–1.01)	0.977**
	Median (Q1-Q3)	49.9 (38.8-63.1)		50.2 (37.8-63.9)		49.3 (40.0-63.1)			
Arab	No	218	40.9	116	53.2	102	46.8	1	0.444*
	Yes	315	59.1	157	49.8	158	50.2	1.14 (0.81–1.62)	
Crowding	1-2 person/room	350	69.0	168	48.0	182	52.0	1	0.252*
	3+ person/room	157	31.0	84	53.5	73	46.5	0.80 (0.55–1.17)	
Behavioral/Clinical profile									
Smoking status	Non-/Former Smoker	477	90.5	242	50.7	235	49.3	1	0.921*
	Current Smoker	50	9.5	25	50.0	25	50.0	1.03 (0.58–1.84)	
Exercising regularly for years	No	389	74.4	186	47.8	203	52.2	1	0.026*
	Yes	134	25.6	79	59.0	55	41.0	0.64 (0.43–0.95)	
Obesity	Normal weight/Overweight	283	61.8	152	53.7	131	46.3	1	0.191*

	Obese	175	38.2	83	47.4	92	52.6	1.29 (0.88–1.88)	
First dose of COVID-19 vaccine	No	176	33.0	94	53.4	82	46.6	1	0.478*
	Yes	357	67.0	179	50.1	178	49.9	1.14 (0.79–1.64)	
Second dose of COVID-19 vaccine	No	198	37.1	104	52.5	94	47.5	1	0.643*
	Yes	335	62.9	169	50.4	166	49.6	1.09 (0.77–1.55)	
Number of comorbidities	0	81	15.2	46	56.8	35	43.2	1	0.014*
	1	156	29.3	92	59.0	64	41.0	0.91 (0.53–1.57)	
	2+	296	55.5	135	45.6	161	54.4	1.57 (0.96–2.57)	

*Pearson Chi-Square test; **Independent Samples T-test

Table 3. Hospital Admission, Treatment, and Supportive Care Among Study Participants With and Without Long COVID

		Total N = 533		Long COVID					
				No N = 273 (51.2%)		Yes N= 260 (48.8%)		*OR (95% CI)*	*P*
		N	%	N	%	N	%		
Admission characteristics <u>and follow-up time</u>									
Admission severity	Mild	175	33.0	83	47.4	92	52.6	1	0.073*
	Moderate	225	42.5	128	56.9	97	43.1	0.68 (0.46–1.01)	

	Severe/Critical	130	24.5	60	46.2	70	53.8	1.05 (0.67–1.66)	
Number of symptoms on hospital admission	Mean ± SD	3.2 ± 1.3		3.0 ± 1.4		3.3 ± 1.3		1.19 (1.04–1.36)	0.008***
	Median (Q1-Q3)	3 (2-4)		3 (2-4)		3 (2-4)			
Follow-up time**** (in months)	Mean ± SD	10.8 ± 6.2		11.3 ± 6.3		10.2 ± 6.0		0.97 (0.95–1.00)	0.054***
	Median (Q1-Q3)	10.0 (6.0-14.0)		10.5 (6.0-15.0)		10.0 (6.0-13.0)			
Time since infection in weeks	4-12 weeks	67	12.6	28	41.8	39	58.2	0.65 (0.39-1.09)	0.099*
	> 12 weeks	466	87.4	245	52.6	221	47.4		
In-hospital complications									
At least one complication during hospital stay	No	161	31.0	84	52.2	77	47.8	1	0.755*
	Yes	359	69.0	182	50.7	177	49.3	1.06 (0.73–1.54)	
Medications during hospitalization									
Antiviral	No	127	23.8	62	48.8	65	51.2	1	0.535*
	Yes	406	76.2	211	52.0	195	48.0	0.88 (0.59–1.31)	
Corticosteroid	No	176	33.0	98	55.7	78	44.3	1	0.148*
	Yes	357	67.0	175	49.0	182	51.0	1.31 (0.91–1.88)	
Antibiotics	No	169	31.7	92	54.4	77	45.6	1	0.311*
	Yes	364	68.3	181	49.7	183	50.3	1.21 (0.84–1.74)	
Antifungal agent	No	496	93.1	255	51.4	241	48.6	1	0.746*
	Yes	37	6.9	18	48.6	19	51.4	1.12 (0.57–2.18)	
Antimalarial agent	No	446	83.7	222	49.8	224	50.2	1	0.131*
	Yes	87	16.3	51	58.6	36	41.4	0.70 (0.44–1.11)	
Experimental agent	No	394	73.9	210	53.3	184	46.7	1	0.106*
	Yes	139	26.1	63	45.3	76	54.7	1.38 (0.93–2.03)	
NSAID	No	389	73.0	205	52.7	184	47.3	1	0.261*

	Yes	144	27.0	68	47.2	76	52.8	1.25 (0.85–1.83)	
ACEi	No	487	91.4	251	51.5	236	48.5	1	0.630*
	Yes	46	8.6	22	47.8	24	52.2	1.16 (0.63–2.13)	
ARBs	No	496	93.1	258	52.0	238	48.0	1	0.178*
	Yes	37	6.9	15	40.5	22	59.5	1.59 (0.81–3.14)	
Supportive Care									
ICU admission	No	436	81.8	232	53.2	204	46.8	1	0.051*
	Yes	97	18.2	41	42.3	56	57.7	1.55 (1.00–2.42)	
Intubation	No	523	98.1	268	51.2	255	48.8	1	1**
	Yes	10	1.9	5	50.0	5	50.0	1.05 (0.30–3.67)	
O2	No	232	43.5	115	49.6	117	50.4	1	0.503*
	Yes	301	56.5	158	52.5	143	47.5	0.89 (0.63–1.25)	
Non-invasive ventilation	No	437	82.0	223	51.0	214	49.0	1	0.852*
	Yes	96	18.0	50	52.1	46	47.9	0.96 (0.62–1.49)	
ECMO	No	530	99.4	271	51.1	259	48.9	1	1**
	Yes	3	0.6	2	66.7	1	33.3	0.52 (0.05–5.80)	
Convalescent plasma therapy	No	524	98.3	271	51.7	253	48.3	1	0.098**
	Yes	9	1.7	2	22.2	7	77.8	3.75 (0.77–18.22)	
Other	No	470	88.2	243	51.7	227	48.3	1	0.543*
	Yes	63	11.8	30	47.6	33	52.4	1.18 (0.70–1.99)	

*Pearson Chi-Square test; **Fisher’s exact test; ***Independent Samples T-test; ****Months since infection at the time of the interview.

Table 4. Factors related to long COVID symptoms.

	AOR	95% CI	*P*
Age (in years)	0.99	0.98; 1.00	0.106
Female (vs male)	1.69	1.12; 2.54	0.012
Number of symptoms	1.22	1.05; 1.42	0.010
Admission severity			
Mild	1		
Moderate	0.71	0.44; 1.14	0.153
Severe/critical	0.70	0.40, 1.14	0.218
ICU admission	1.81	1.05; 3.13	0.033
Number of comorbidities			
0	1		
1	1.31	0.66; 2.59	0.442
2+	2.08	1.04; 4.15	0.039
Time since infection (in months)	1.02	0.98; 1.07	0.252

Logistic regression using the backward (Wald) method. Final model: Omnibus Test of Model Coefficients: $\chi^2(9) = 29.56$, $P < 0.001$; Hosmer–Lemeshow Test: $P = 0.943$; Nagelkerke $R^2 = 0.087$.