Original Article

Long-COVID-19 Impact in non-hospitalized patients: Sleep and quality of life 24 months after SARS-CoV-2 infection

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Abstract

Background and Aims: Sleep disruption and reduced quality of life are common long coronavirus disease (COVID) manifestations, affecting survivors irrespective of initial COVID-19 severity. Limited research investigates symptoms beyond 24 months post-infection. We aimed to address this gap by longitudinally studying sleep patterns and overall quality of life in non-hospitalized adults, 24 months after severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) infection. **Methods:** This prospective observational study involved the enrolment of 337 adult non-hospitalized patients in a consecutive fashion. Individuals with past COVID-19 (from 15 April 2020 to 30 June 2021) were examined at two Government hospitals and completed a telephone interview between 1 May 2023 and 30 June 2023, located in Jharkhand, India. Participants were queried about their sleep patterns and quality of life, utilizing the DSM5 LEVEL 2 and EQ-ED-5L tool, respectively. **Results:** Among 337 non-hospitalized participants, 212 completed the survey. Within this group (59.4% men, mean age 38), 36 (17.0%) experienced sleep impairment. All five dimensions of quality of life (QoL) were adversely affected in long COVID patients. Advanced age, high income, residing in rural or semi-urban areas, and having comorbidities were associated with a higher likelihood of decreased quality of life across various domains. Conversely, participants who were married, employed in healthcare or government positions, and vaccinated exhibited a reduced likelihood of experiencing lower quality of life. **Conclusion:** Long COVID-19 affects sleep and quality of life, with various demographic and clinical factors influencing outcomes. This study provides insights into the extended consequences of long COVID-19 and aids healthcare systems in addressing the challenges posed by this condition.

Keywords: Long-COVID-19, non-hospitalized patients, quality of life, SARS-CoV-2 infection, sleep

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Introduction

Severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), the etiological agent responsible for the coronavirus disease 2019 (COVID-19) pandemic, is frequently associated with persistent and lingering symptoms, commonly referred to

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as post-COVID-19 condition or long COVID.[1] Despite its primary manifestation as a respiratory ailment, an expanding body of scholarly literature underscores the multisystemic impact of COVID-19, extending beyond the pulmonary realm to encompass the gastrointestinal, cardiovascular, neurological, and reproductive domains.[2,3]

The World Health Organization (WHO) defines long COVID as the sustained presence or emergence of novel symptoms at least three months subsequent to the initial SARS-CoV-2 infection, with these symptoms enduring for a minimum of two months without any alternate explanatory cause.[4] Given the presumption that around 10% of COVID-19-infected individuals will encounter protracted symptoms, and taking into account the colossal tally of documented global COVID-19 cases surpassing 651 million,[5,6] a conservative estimate suggests that no less than 65 million individuals worldwide grapple with the ramifications of long COVID.

Earlier investigations have underscored a notable decline in health-related quality of life (HRQoL) during the initial months following the onset of illness.[7-10] However, the exploration of long-term HRQoL in COVID-19 patients, encompassing periods exceeding 12 months, has been somewhat limited thus far. This line of inquiry has yielded a range of outcomes, with certain studies indicating the persistence of compromised HRQL even after a year,[11-14] while others have reported a predominant recovery in physical and functional aspects among most patients.[15,16] It is imperative to note that these inquiries have primarily centered around patients with prior hospitalization, leaving a significant gap in our comprehension. This gap is of critical importance considering the majority of SARS-CoV-2 infections manifesting as either asymptomatic or mildly symptomatic cases that do not necessitate hospital care.[17] Furthermore, it is well established that enduring post-infection repercussions are not confined solely to individuals initially afflicted with severe or critical COVID-19 necessitating hospital admission.[18]

Manifestations of sleep disruption emerge as recurrent themes in the landscape of post COVID-19 conditions, persisting through both the acute phase of COVID-19 and the subsequent convalescent stage.[19] These enduring effects impose sustained hardships upon survivors, precipitating a deterioration in their overall QoL.[20] This deleterious influence on HRQoL manifests irrespective of the severity of the initial COVID-19 infection, spanning from moderate to severe cases, as well as in individuals who experienced mild or asymptomatic episodes.[21]

While select studies have reported the persistence of long COVID symptoms up to 24 months post-COVID-19 contraction,[21-23] the existing corpus of long-term follow-up investigations remains limited. Remarkably, there is a paucity of comprehensive examinations probing the extended ramifications of long COVID-19 among non-hospitalized patients, particularly concerning domains such as sleep patterns, and overall QoL. This research gap has remained conspicuous in the absence of studies dedicated to scrutinizing the enduring effects of long COVID-19 beyond the initial 24 months of convalescence.

Addressing the exigent necessity for longitudinal insights, paramount for ensuring the efficacy of healthcare provisions catering to the specific requisites of long COVID-19 survivors, the primary aim of the current study is to empirically explore the ramifications of long COVID-19 on sleep patterns, and overall QoL in the subset of non-hospitalized COVID-19 patients. The study encompasses an extended follow-up period, surpassing 24 months post the acute phase of infection, facilitating a comprehensive understanding of the enduring impact of long COVID-19.

Materials and Methods

Study design and participants

In July 2023, this observational cohort study took place at two public hospitals. Participants were initially identified from the list of COVID-19 patients who had visited these hospitals from April 2020 to April 2021. Researchers contacted eligible persons with past COVID-19 confirmed by positive polymerase chain reaction (PCR) testing and contacted 337 participants telephonically for study participation between 1 May 2023 and 30 June 2023. The study included adult participants aged 18 years and above who had been infected with COVID-19 but were not hospitalized, having visited the hospitals from 15 April 2020 to 30 June 2021. Exclusion criteria comprised patients who had passed away, were uncontactable, or displayed significant cognitive impairment. The Institute Ethics Committee of our institute granted approval for the study (2022-77-IND-02), which adhered to the ethical principles delineated in the Declaration of Helsinki (2013) and the guidelines of good clinical practice.

Data collection procedure and instruments

Demographic particulars such as age, gender, educational background, occupation, residence, and marital status, along with clinical specifics encompassing COVID-19 symptoms at onset and concurrent comorbidities, were extracted from medical records. Enrolled participants were arranged for a structured telephone interview administered by researchers, scheduled at a point 24 months or more subsequent to their initial COVID-19 infection. Before interview an electronic consent form was sent to each participant and after receiving their consent, interview was conducted. During the interview, participants were systematically interrogated concerning the sleep pattern and QoL.

For the evaluation of sleep disturbance, a validated and standardized instrument, the APA DSM5 LEVEL 2 Sleep Disturbance Adult, was employed.[24] This eight-item scale quantified the degree of sleep disruption experienced by

participants within the past seven days. Responses to each item were rated on a five-point scale (1 = never, 2 = rarely, 3 = sometimes, 4 = often, and 5 = always), with higher scores indicating more pronounced sleep disturbance. The total raw score was computed by summing the scores from all eight items. Subsequently, a standardized T-score table was utilized to deduce the T-score (ranging from 28.9 to 76.5) linked to the participant's total raw score. The T-score facilitated categorization of sleep disturbance severity into none to slight (less than 55), mild (55–59.9), moderate (60–69.9), and severe (70 or more).

The HRQoL was assessed using the EQ-5D-5L standardized scale, comprising five dimensions that encompass various aspects of health: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression.[25] Within each dimension, respondents could indicate one of five severity levels: no problems, slight problems, moderate problems, severe problems, and extreme problems/unable to perform. Scoring and analysis of the EQ-5D-5L involved characterizing the frequency and percentage of patients encountering each problem level across the dimensions.

Statistical analysis

Patient attributes were presented in terms of counts and percentages for categorical variables and as means with standard deviations (SD) for continuous variables. Multivariate logistic regression analysis was executed to ascertain whether demographic variables independently correlated with sleep patterns and HRQoL. The outcomes were expressed as odds ratios (OR) along with 95% confidence intervals (CI). All statistical analyses were executed using SPSS software (version 23; IBM SPSS Statistics, IBM Corp., Armonk, NY), employing a two-sided significance level of 0.05.

Results

Participant characteristics and initial symptoms

Table 1 provides a comprehensive overview of the study cohort. Of the 337 participants, 283 (83.9%) agreed to participate and based on the report of COVID-19 symptoms, 212 (74.9%) were classified as having long COVID. Among 212 individuals (59.4% male; mean age of 38 years with a standard deviation of 13.2) engaged in the 24-month or longer follow-up. A significant proportion of participants had attained a graduation-level education (42.5%), were employed in healthcare profession (33.0%), were married (70.3%), and had received vaccination against SARS-CoV-2 (53.8%). Notably, 47 respondents (22.2%) indicated concurrent co-morbidities. The investigation commenced 776 days post the initial COVID-19 diagnosis, spanning an interquartile range of 749.0–827.3 days.

Additionally, Table 1 provides a comprehensive overview of symptom prevalence during the acute phase of COVID-19. Prominent symptoms reported included fever (70.3% - n = 149), weakness (55.7% - n = 118), sore throat (47.2% - n = 100), loss of smell (33.5% - n = 71), and persistent cough (32.1% - n = 68).

Table 1: Demographic and clinical profile of non-hospitalized COVID-19 patients (*n*=212)

Demographic Profile of participant	*n* (%)
Age (Mean±SD)	38±13.2
Sex	
Men	126 (59.4)
Women	86 (40.6)
Occupation	
Homemaker	27 (12.7)
Govt employees	49 (23.1)
Healthcare workers	70 (33)
Unemployed/students	25 (11.8)
Others	41 (19.3)
Marital status	
Unmarried	58 (27.4)
Married	149 (70.3)
Divorced/Widow	5 (2.4)
Income (Family)	
Rs. ≤10000/-	24 (11.3)
Rs. 10001/- to 20000/-	39 (18.4)
Rs. 20001/- to 30000/-	39 (18.4)
Rs. >30000/-	110 (51.9)
Habitant	
Rural	54 (25.5)
Semi urban	31 (14.6)
Urban	127 (59.9)
Days from SARS COVID-19 report were positive to research survey, median (IQR)	676 (646.0-753.0)
Vaccination (COVID-19 infection)	
Yes	114 (53.8)
No	98 (46.2)
Existence of any comorbidities	
Yes	47 (22.2)
No	165 (77.8)
Comorbidity	
DM	12 (5.7)
Hypertension	26 (12.3)
Respiratory problems (COPD, Asthma)	3 (1.4)
Kidney, Thyroid, and other disease	6 (2.8)
Symptoms of SARS COVID-19 during hospital visit*	
Fever	149 (70.3)
Anosmia	71 (33.5)
Backpain	51 (24.1)
Weakness	118 (55.7)
Coughing frequently	68 (32.1)
Sore Throat	100 (47.2)
Joint pain	43 (20.3)
Loss of appetite	25 (11.8)
Ageusia	44 (20.8)
Nausea	26 (12.3)
Shortness of breath	38 (17.9)
Headache	18 (8.5)

DM: Diabetes mellites; IQR: Interquartile range; *Multiple response; *n*=Number of respondents; SD: Standard deviation

Impact of Long COVID-19 on sleep and health related quality of life

Sleep disturbance levels were presented in Figure 1, revealing that 14.2% of patients experienced mild sleep disturbance, while 2.8% reported a significant disruption in sleep patterns. The distribution of HRQoL issues reported by participants for each dimension of the EQ-5D-5L scale is graphically shown in Figure 2a. The analysis reveals that a substantial percentage of patients reported an absence of problems (representing a healthy state) across various dimensions. Specifically, the proportions of individuals indicating no problems in the domains of mobility, self-care, usual activities, pain/discomfort, and anxiety/depression were 78.3%, 87.7%, 82.1%, 79.7%, and 79.2%, respectively. The mean utility index at 24 months after COVID-19 patients was 0.105 (SD, 0.211), ranging from 0.0136 to 0.390 presented in Figure 2b.

Factors associated with sleep and quality of life

The regression analysis did not yield any discernible links between demographic variables and the presence of sleep disturbances during the 24-month follow-up period for COVID-19 patients who were not hospitalized, as outlined in Table 2. A comprehensive assessment of factors influencing QoL scores 24 months after the acute COVID-19 infection was also conducted across the entirety of non-hospitalized COVID-19 patients, as detailed in Table 3.

Among patients, those in older age groups exhibited a greater propensity for encountering issues in aspects related to self-care and usual activities compared to their younger counterparts. Notably, certain occupational categories like government employees (OR = 0.011; CI: 0.01–0.20) and healthcare professionals (OR = 0.008; CI: 0.00–0.18) demonstrated a reduced likelihood of experiencing self-care difficulties relative to individuals categorized as homemakers. Similarly, married patients exhibited a diminished likelihood of grappling with issues tied to anxiety/depression (OR = 0.017; CI: 0.05–0.66) in comparison to unmarried patients. Patients possessing higher incomes displaying an increased likelihood of encountering self-care issue (OR = 4.08; CI: 1.66–10.07) as opposed to those with lower incomes. Geographical residency further emerged as a pertinent factor, whereby patients living in semi-urban and rural locales faced a heightened probability of experiencing complications related to mobility, routine activities, and pain or discomfort compared to their urban-dwelling counterparts. Encouragingly, patients who had received the COVID-19 vaccine showcased a reduced likelihood of encountering mobility issues (OR = 0.317; CI: 0.13–0.75), self-care difficulties (OR = 0.59; CI: 0.01–0.35), and pain or discomfort (OR = 0.412; CI: 0.17–0.99) when juxtaposed with those who had not been vaccinated against the virus. Furthermore, patients with underlying comorbidities exhibited an elevated likelihood of experiencing pain/discomfort issues (OR = 2.779; CI: 1.03–7.48) in comparison to those without any existing comorbidity.

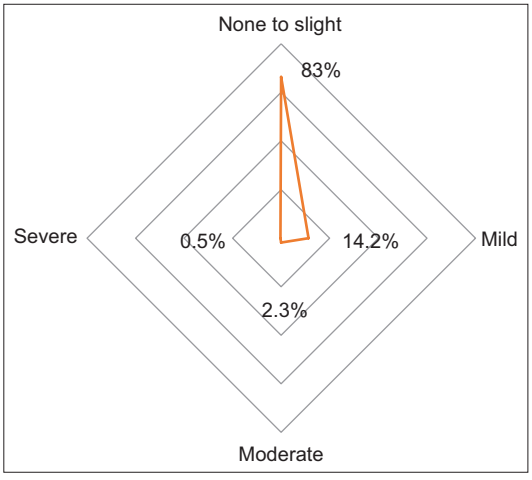

Figure 1: Sleep Disturbance (APA DSM5 Level-2) among non-hospitalized COVID-19 patients

Discussion

This study represents a pioneering endeavour in the realm of long COVID-19 research, specifically delving into its repercussions on sleep patterns and the QoL experienced by non-hospitalized patients, even beyond the 24-month mark following their initial infection. Notably, the existing body of knowledge concerning non-hospitalized individuals has predominantly been informed by investigations spanning shorter follow-up durations, typically capped at 6–18 months.[3,5,11-15] Consequently, the endeavour to draw direct parallels between our findings and those gleaned from previous studies poses an intricate challenge. Nevertheless, antecedent research endeavours have intimated that the enduring effects of long COVID-19 on sleep quality and overall quality of life appear to be comparatively less pronounced in non-hospitalized patients when juxtaposed with their hospitalized counterparts.[22,23]

The current investigation revealed that, even after 24-months interval following their SARS-CoV-2 infection, a notable proportion (17%) of individuals who were not hospitalized exhibited a spectrum of mild to severe sleep quality impairments. This result is in line with a study conducted in Korea, which reported that at 24 months after acute COVID-19 approximately 20% of patients were suffering with insomnia.[26] It is worth noting that a separate study conducted in Germany reported a 40% prevalence of sleep-related issues among non-hospitalized patients at the two-year post-COVID mark.[27] This persistent presence of sleep disturbances extending beyond the two-year threshold underscores the imperative for comprehensive exploration into the enduring ramifications of long COVID-19, along with an investigation into the factors that either mitigate or exacerbate these symptoms over time. Furthermore, the study's findings, which indicate the persistence of long COVID-19 in individuals who had experienced mild COVID-19 courses, signify that a substantial segment of the population may necessitate ongoing medical attention to address health issues stemming from long COVID-19 over an extended duration.

Table 2: Odd ratio and corresponding 95% confidence interval for sleep disturbance associate with demographic variable of non-hospitalized COVID-19 patients

Demographic variable	Sleep Disturbance		
	None to slight *n* (%)	Mild to severe *n* (%)	OR (95% CI)
Age			
<30	69 (80.2)	17 (19.8)	Reference
31-45	57 (83.8)	11 (16.2)	0.981 (0.296-3.253)
>46	50 (86.2)	8 (13.8)	0.873 (0.198-3.847)
Sex			
Male	103 (81.7)	23 (18.3)	Reference
Female	73 (84.9)	13 (15.1)	0.927 (0.347-2.478)
Occupation			
Homemaker	26 (96.3)	1 (3.7)	Reference
Govt employees	40 (81.6)	9 (18.4)	3.029 (0.184-49.77)
Healthcare workers	57 (81.4)	13 (18.6)	2.596 (0.170-39.70)
Unemployed/students	21 (84)	4 (16)	3.558 (0.221-59.94)
Others	32 (78)	9 (22)	7.271 (0.564-93.75)
Marital status			
Unmarried	45 (77.6)	13 (22.4)	Reference
Married	128 (85.9)	21 (14.1)	0.367 (0.109-1.233)
Widow/Divorced	3 (60)	2 (40)	1.896 (0.191-18.77)
Family Income			
Rs. ≤10000/-	21 (87.5)	3 (12.5)	Reference
Rs. 10001/- to 20000/-	37 (94.9)	2 (5.1)	0.318 (0.027-3.770)
Rs. 20001/- to 30000/-	30 (76.9)	9 (23.1)	1.786 (0.287-11.12)
Rs. >30000/-	88 (80)	22 (20)	2.053 (0.288-14.65)
Habitant			
Urban	108 (85)	19 (15)	Reference
Semi urban	22 (71)	9 (29)	2.449 (0.825-7.272)
Rural	46 (85.2)	8 (14.8)	1.032 (0.364-2.927)
Vaccination history prior to COVID-19 infection			
Yes	93 (81.6)	21 (18.4)	Reference
No	83 (84.7)	15 (15.3)	0.686 (0.272-1.729)
Existence of any comorbidity			
No	136 (82.4)	29 (17.6)	Reference
Yes	40 (85.1)	7 (14.9)	1.180 (0.374-3.725)

n=Number of participants; OR=Odd ratio; CI=Confidence interval

Significantly, individuals who experienced persistent long COVID symptoms for a duration of two years demonstrated a noteworthy decline in their HRQoL. In this present study, it is noteworthy to report that, with the exception of the self-care domain, nearly 20% of patients indicated experiencing varying degrees of difficulty ranging from slight to extreme across all other domains of the EQ-ED-5L instrument. These findings align with the outcomes of a study conducted by Kirchberger *et al.*,[27] which documented that a substantial proportion of patients, ranging from approximately 33% to 20%, exhibited diminished QoL across all domains, except for the self-care domain. Conversely, an alternate study[22] observed an improvement in the patients' QoL across all domains, except for the pain/discomfort domain, where 25% of patients reported issues.

The disparities in these results may be attributed to the considerable heterogeneity observed in follow-up studies of COVID-19. Notably, the preceding study featured aged participant cohort (median age of 57 years),[22] whereas present investigation had a younger demographic (mean age of 38 years). This divergence suggests that younger individuals may experience a more pronounced impact of COVID-19 and its associated long-term symptoms than their older counterparts, which is consistent with previous research indicating that the risk of developing long COVID escalates with age.[28]

Additionally, it is imperative to acknowledge that several factors contribute to the decline in HRQoL. Emotional and social factors linked to the evolving circumstances of the COVID-19 pandemic, contingent upon each country's situation like Indian scenario where people moved from one place to other place for their livelihood and depend on agriculture, can exert a substantial influence.[29] Furthermore, the pervasive social isolation stemming from the enduring COVID-19 pandemic may serve as a major catalyst for the emergence of depressive symptoms and the deterioration of the quality of life in individuals grappling with long COVID symptoms.[28-32]

Table 3: Odd ratio and corresponding 95% confidence interval for Quality of life at 18-month follow-up according to demographic and clinical profile of non-hospitalized COVID-19 patients

Demographic and clinical profile	Mobility			Self-care		
	No Problem *n* (%)	Slight to extreme problem *n* (%)	OR (95% CI)	No Problem *n* (%)	Slight to extreme problem *n* (%)	OR (95% CI)
Age						
<30	77 (89.5)	9 (10.5)	Reference	84 (97.7)	2 (2.3)	Reference
31-45	55 (80.9)	13 (19.1)	1.498 (0.43-5.23)	56 (82.4)	12 (17.6)	16.69 (1.51-184)
>46	34 (58.6)	24 (41.4)	3.001 (0.71-12.7)	46 (79.3)	12 (20.7)	10.93 (0.90-132)
Sex						
Male	100 (79.4)	26 (20.6)	Reference	107 (84.9)	19 (15.1)	Reference
Female	66 (76.7)	20 (23.3)	1.267 (0.46-3.45)	79 (91.9)	7 (8.1)	0.236 (0.04-1.14)
Occupation						
Homemaker	16 (59.3)	11 (40.7)	Reference	22 (81.5)	5 (18.5)	Reference
Govt employees	36 (73.5)	13 (26.5)	0.875 (0.13-5.62)	43 (87.8)	6 (12.2)	0.011 (0.01-0.2)
Healthcare workers	63 (90.0)	7 (10)	0.338 (0.04-2.33)	66 (94.3)	4 (5.7)	0.008 (0.00-0.18)
Unemployed/students	20 (80.0)	5 (20)	1.750 (0.27-11.1)	22 (88)	3 (12)	3.095 (0.16-57.5)
Others	31 (75.6)	10 (24.4)	0.664 (0.14-3.11)	33 (80.5)	8 (19.5)	0.178 (0.02-1.62)
Marital status						
Unmarried	53 (91.4)	5 (8.6)	Reference	56 (96.6)	2 (3.4)	Reference
Married	109 (73.2)	40 (26.8)	1.908 (0.44-8.25)	126 (84.6)	23 (15.4)	1.002 (0.08-11.3)
Widow/Divorced	4 (80.0)	1 (20)	1.082 (0.07-15.4)	4 (80)	1 (20)	4.224 (0.07-243)
Family Income						
Rs. ≤10000/-	19 (79.2)	5 (20.8)	Reference	23 (95.8)	1 (4.2)	Reference
Rs. 10001/- to 20000/-	27 (69.2)	12 (30.8)	0.970 (0.19-4.81)	36 (92.3)	3 (7.7)	1.716 (0.07-39.8)
Rs. 20001/- to 30000/-	31 (79.5)	8 (20.5)	0.988 (0.20-4.82)	32 (82.1)	7 (17.9)	1.832 (0.94-3.06)
Rs. >30000/-	89 (80.9)	21 (19.1)	1.251 (0.22-6.92)	95 (86.4)	15 (13.6)	4.08 (1.66-10.7)
Habitant						
Urban	105 (82.7)	22 (17.3)	Reference	114 (89.8)	13 (10.2)	Reference
Semi urban	22 (71.0)	9 (29)	2.584 (0.85-7.84)	25 (80.6)	6 (19.4)	2.253 (0.44-11.3)
Rural	39 (72.2)	15 (27.8)	2.987 (1.12-7.97)	47 (87)	7 (13)	2.953 (0.71-12.1)
Vaccination history prior to COVID-19 infection						
No	84 (85.7)	14 (14.3)	Reference	92 (93.9)	6 (6.1)	Reference
Yes	82 (71.9)	32 (28.1)	0.317 (0.13-0.75)	94 (82.5)	20 (17.5)	0.059 (0.01-0.35)
Existence of any comorbidity						
No	136 (82.4)	29 (17.6)	Reference	150 (90.9)	15 (9.1)	Reference
Yes	30 (63.8)	17 (36.2)	0.997 (0.37-2.65)	36 (76.6)	11 (23.4)	1.963 (0.54-7.02)

Demographic and clinical profile	Usual activities			Pain/discomfort			Anxiety/depression		
	No Problem *n* (%)	Slight to extreme problem *n* (%)	OR (95% CI)	No Problem *n* (%)	Slight to extreme problem *n* (%)	OR (95% CI)	No Problem *n* (%)	Slight to extreme problem *n* (%)	OR (95% CI)
Age									
<30	82 (95.3)	4 (4.7)	Reference	73 (84.9)	13 (15.1)	Reference	73 (84.9)	13 (15.1)	Reference
31-45	55 (80.9)	13 (19.1)	7.543 (1.41-40.4)	53 (77.9)	15 (22.1)	1.832 (0.51-6.47)	52 (76.5)	16 (23.5)	3.379 (0.92-12.2)
>46	37 (63.8)	21 (36.2)	14.30 (2.22-92.3)	43 (74.1)	15 (25.9)	1.358 (0.30-6.15)	43 (74.1)	15 (25.9)	3.550 (0.73-17.1)
Sex									
Male	106 (84.1)	20 (15.9)	Reference	99 (78.6)	27 (21.4)	Reference	103 (81.7)	23 (18.3)	Reference
Female	68 (79.1)	18 (20.9)	2.340 (0.73-7.47)	70 (81.4)	16 (18.6)	0.944 (0.36-2.45)	65 (75.6)	21 (24.4)	1.685 (0.62-4.53)
Occupation									
Homemaker	17 (63)	10 (37)	Reference	21 (77.8)	6 (22.2)	Reference	20 (74.1)	7 (25.9)	Reference
Govt employees	39 (79.6)	10 (20.4)	0.661 (0.07-5.72)	34 (69.4)	15 (30.6)	2.295 (0.32-16.1)	33 (67.3)	16 (32.7)	3.051 (0.33-27.5)
Healthcare workers	63 (90)	7 (10)	0.770 (0.08-7.17)	60 (85.7)	10 (14.3)	1.034 (0.14-7.47)	55 (78.6)	15 (21.4)	1.361 (0.15-12.0)
Unemployed/students	21 (84)	4 (16)	5.402 (0.64-45.3)	20 (80.0)	5 (20)	1.424 (0.19-10.4)	25 (100)	0 (0)	--------
Others	34 (82.9)	7 (17.1)	0.485 (0.07-3.03)	34 (82.9)	7 (17.1)	0.682 (0.11-3.96)	35 (85.4)	6 (14.6)	0.866 (0.13-5.628)
Marital status									
Unmarried	54 (93.1)	4 (6.9)	Reference	48 (82.8)	10 (17.2)	Reference	46 (79.3)	12 (20.7)	Reference

Contd...

Table 3: Contd...

Demographic and clinical profile	Usual activities			Pain/discomfort			Anxiety/depression		
	No Problem *n* (%)	Slight to extreme problem *n* (%)	OR (95% CI)	No Problem *n* (%)	Slight to extreme problem *n* (%)	OR (95% CI)	No Problem *n* (%)	Slight to extreme problem *n* (%)	OR (95% CI)
Married	116 (77.9)	33 (22.1)	1.273 (0.23-6.98)	116 (77.9)	33 (22.1)	0.633 (0.16-2.36)	117 (78.5)	32 (21.5)	0.176 (0.05-0.66)
Widow/Divorced	4 (80)	1 (20)	0.522 (0.01-14.4)	5 (100)	0 (0)	---------	5 (100)	0 (0)	--------
Family Income									
Rs. ≤10000/-	20 (83.3)	4 (16.7)	Reference	17 (70.8)	7 (29.2)	Reference	20 (83.3)	4 (16.7)	Reference
Rs. 10001/- to 20000/-	33 (84.6)	6 (15.4)	0.437 (0.05-3.27)	32 (82.1)	7 (17.9)	0.234 (0.04-1.22)	34 (87.2)	5 (12.8)	0.291 (0.03-2.41)
Rs. 20001/- to 30000/-	31 (79.5)	8 (20.5)	2.504 (0.35-17.6)	33 (84.6)	6 (15.4)	0.238 (0.04-1.18)	34 (87.2)	5 (12.8)	0.324 (0.04-2.66)
Rs. >30000/-	90 (81.8)	20 (18.2)	4.876 (0.54-43.5)	87 (79.1)	23 (20.9)	0.367 (0.07-1.74)	80 (72.7)	30 (27.3)	1.003 (0.14-7.52)
Habitant									
Urban	110 (86.6)	17 (13.4)	Reference	107 (84.3)	20 (15.7)	Reference	103 (81.1)	24 (18.9)	Reference
Semi urban	22 (71)	9 (29)	6.156 (1.72-22.0)	22 (71.0)	9 (29)	3.788 (1.28-11.2)	23 (74.2)	8 (25.8)	2.349 (0.75-7.31)
Rural	42 (77.8)	12 (22.2)	3.999 (1.29-12.3)	40 (74.1)	14 (25.9)	2.824 (1.10-7.25)	42 (77.8)	12 (22.2)	1.636 (0.58-4.60)
Vaccination history prior to COVID-19 infection									
No	86 (87.8)	12 (12.2)	Reference	83 (84.7)	15 (15.3)	Reference	83 (84.7)	15 (15.3)	Reference
Yes	88 (77.2)	26 (22.8)	0.482 (0.17-1.32)	86 (75.4)	28 (24.6)	0.412 (0.17-0.99)	85 (74.6)	29 (25.4)	0.506 (0.20-1.24)
Existence of any comorbidity									
No	141 (85.5)	24 (14.5)	Reference	139 (84.2)	26 (15.8)	Reference	132 (80)	33 (20)	Reference
Yes	33 (70.2)	14 (29.8)	1.249 (0.42-3.70)	(63.8)	17 (36.2)	2.779 (1.03-7.48)	36 (76.6)	11 (23.4)	1.013 (0.34-2.95)

n=Number of participants; OR=odd ratio; CI=confidence interval

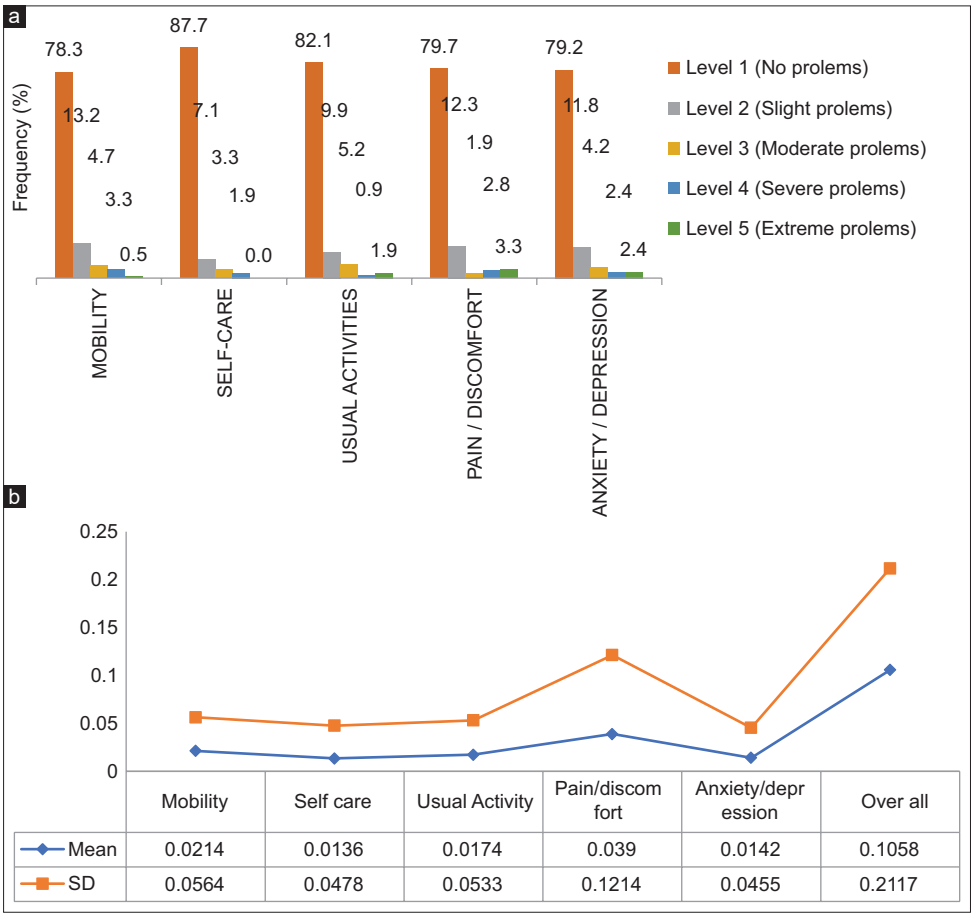

Figure 2: (a) Frequency and percentage (b): Mean and Standard deviation (SD) of the component of Quality of life (EQ-5D-5L) among non-hospitalized COVID-19 patients

The present study encompassed individuals with COVID-19 who were non-hospitalized during their acute phase of illness. The research outcomes illuminated the enduring nature of long COVID in COVID-19 patients, emphasizing its persistence over an extended period. This underscores the significance of long COVID as a protracted societal burden, even among those individuals who experienced only mild COVID-19 infection, and suggests that it may account for a substantial proportion of COVID-19 cases. Primary care physicians play a pivotal role in the early identification and management of sleep-related issues, thereby improving overall QoL.[31,32] Their expertise enables them to employ distinctive strategies in addressing challenges linked to sleep problems, particularly among individuals experiencing symptoms of long COVID-19. By intervening at an early stage, they can significantly enhance the QoL of affected individuals, fostering better health outcomes.

To the best of our knowledge, this is the inaugural study to conduct a 24-month follow-up assessment of non-hospitalized individuals in India who contracted COVID-19, specifically exploring the impact of long COVID on sleep quality and overall QoL. Our study exclusively included individuals with confirmed positive results from PCR testing, ensuring the reliability of the cohort. It is worth acknowledging that a common definition of long COVID remains elusive across studies, posing a limitation to the comparability of findings across the scientific community. Moreover, the reporting of long COVID symptoms may have been influenced by psychosocial factors and the heightened media attention devoted to this condition. The third limitation was that we did not assess other issues such as social, economic or personal that resulted in QOL or sleep pattern disturbances. The last limitation of this study is the exclusion of hospitalized patients and small sample size, highlighting the necessity for further research that compares the long-term outcomes of both inpatients and outpatients, thereby enhancing the comparability of the sample. It is important to note that the symptoms relied upon self-reporting by the patients and were collected through telephone interviews.

Conclusion

While long COVID typically ameliorates over time, sleep disturbances can persist for as long as 24 months following acute infection and may manifest more frequently alongside other symptoms. Notably, individuals with mild COVID-19, who constitute the majority of cases, may continue to experience a diminished QoL. Consequently, the findings from this study emphasize the imperative of equipping healthcare providers with the requisite expertise and resources to adeptly manage the multifaceted challenges presented by individuals grappling with post-acute sequelae of SARS-CoV-2 infection. Furthermore, our healthcare system should proactively institute measures to furnish supplementary support to both healthcare professionals and those affected by the enduring health issues associated with long COVID.

Ethical policy and Institutional review board statement

The Institute Ethics Committee of our institute granted approval for the study (2022-77-IND-02), which adhered to the ethical principles delineated in the Declaration of Helsinki (2013) and the guidelines of good clinical practice.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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