Original Article

Journal of Iranian Medical Council, Volume 8, Issue no. 4
http://dx.doi.org/10.18502/jimc.v8i4.19534

Quality of Life and Psychiatric Symptoms in Post-COVID-19 Patients Six Months after Discharge: A Prospective Study Six Months Post-Discharge

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Received: 23 Jul 2024
Accepted: 21 Dec 2024

Citation to this article
Namvar L, Jalali P, Farhang S, Motedaien F, Gilani N, Rahimi M, *et al.* Quality of Life and Psychiatric Symptoms in Post-COVID-19 Patients Six Months after Discharge: A Prospective Study Six Months Post-Discharge. *J Iran Med Counc.* 2025;8(4):678-86.

Abstract

Background: The aim of this study is to prospectively assess the quality of life and psychiatric symptoms in individuals who have been discharged after COVID-19, with a specific focus on understanding the enduring effects six months post-discharge and contributing valuable information for comprehensive post-COVID-19 care strategies.

Methods: This prospective study enrolled 99 patients with COVID-19 who visited the university outpatient clinic and 92 healthy age and gender matched individuals without COVID-19. The Depression Anxiety Stress Scale-59 (DASS-59) assessed stress, anxiety, and depression severity. For evaluating the Quality of life (QOL), the World Health Organization Quality-of-Life Scale (WHO QOL-BREF) questionnaire was employed. Multiple linear regression model addressed confounding factors including case group, age, gender, education, employment status, and marital status.

Results: This study included 92 COVID-19 patients and 92 age and sex-matched healthy individuals. For the COVID-19 patient group, significant positive associations were found across all the psychiatric symptoms, with β values of 8.52 for depression, 11.62 for stress, and 8.15 for anxiety, all with p-values less than 0.001, indicating strong statistical significance. Conversely, quality of life was negatively impacted (β= -9.57, $p<0.0001$) that post-COVID-19 patients exhibited significantly higher levels of depression, stress, and anxiety, with notable declines in quality of life, particularly among older individuals and the unemployed.

Conclusion: The results of this study highlight the multifaceted impact of COVID-19 on mental health and quality of life, emphasizing the need for comprehensive care that addresses both physical and psychological recovery.

Keywords: Anxiety; COVID-19; Depression; Quality of life; Stress; SARS-COV-2

Introduction

Coronavirus Disease 2019 (COVID-19), caused by SARS-CoV-2, primarily affects the respiratory tract and has emerged as a global health concern since 2019. While many patients recover without specific treatment, the mortality and morbidity rates surpass those of Influenza or the common cold (1). The lack of clear data on risk factors, preventive measures, and definitive treatments has heightened fear and stress worldwide (2). Prolonged stress and anxiety can have detrimental effects over an extended period (3).

Physiologically, the secretion of the cortisol hormone is triggered in response to critical stress factors (4). Long-term cortisol secretion and activation of the sympathetic nervous system can compromise the immune system, rendering individuals more susceptible to various infections (5). Additionally, studies indicate a reduction in serum antibody titers in individuals experiencing high-stress levels (6,7) Fear often leads to heightened self-awareness and false assumptions about virus affliction, resulting in unnecessary medical visits with an increased risk of virus transmission. Conversely, individuals recovering from the virus may endure lingering symptoms such as muscular atrophy, the need for supplemental oxygen, and fluctuations in vital signs (8). Some report mild symptoms persisting for months, including fatigue, shortness of breath, joint and chest pain, and cough (8). These symptoms can significantly impact the Quality of Life (QOL), predisposing patients to psychological distress (9).

Since the onset of the COVID-19 pandemic, a considerable number of patients have reported psychiatric symptoms, including depression and anxiety (10,11). These symptoms not only affect QOL, but also may persist, necessitating psychological or medical intervention (12).

Previous studies have documented elevated levels of psychiatric symptoms, such as depression and anxiety, in COVID-19 survivors, often linking these symptoms to factors like hospitalization severity and social isolation. However, there remains a paucity of research specifically examining how COVID-19 impact psychiatric status and overall quality of life in patients six months post-infection (13).

Some studies have indicated a decline in QOL measurements in these patients over time (14). However, the extent of this impact remains unclear. A study by Jaeghere *et al* reported that, in a cohort of 355 cancer patients, QOL was not influenced by COVID infection, with depression being more prevalent than stress and anxiety (15). The aim of this study is to prospectively assess the quality of life and psychiatric symptoms in individuals who have been discharged after COVID-19. The objectives included identifying key risk factors and the psychological implications of lingering symptoms, thereby filling a crucial knowledge gap regarding the long-term effects of COVID-19 on mental health. The findings aim to inform healthcare providers regarding the need for targeted interventions and support systems for COVID-19 recovery, contributing to comprehensive post-COVID care strategies. Additionally, the study's extended follow-up period offers valuable insights into the long-term mental health effects, essential for ongoing patient outcome assessments.

Materials and Methods

This prospective study received approval from the ethics committee of Tabriz University of Medical Sciences, Tabriz, Iran (IR.TBZMED.REC.1400.552). 92 patients who had been admitted to Imam Reza Hospital or visited the university outpatient clinic were enrolled. Additionally, 92 age and gender-matched healthy individuals without documented COVID-19 infection or symptoms in the last six months were included. Data collection was conducted six months after the discharge of the patients with COVID-19 admitted to the ICU of Imam Reza Hospital, Tabriz University of Medical Sciences. The exposure was confirmed for COVID-19 through PCR testing and the interpretation of lung CT scan findings consistent with the virus.

Inclusion and exclusion criteria

Participation was open to individuals aged 18 years and above, willing to take part in the study, without self-reported or documented psychiatric diseases, and not taking psychedelic medications. Those with chronic diseases, and those unable to complete questionnaires (with over 20% unanswered questions), were excluded. All the participants provided written informed consent, and their decision to withdraw from the study did not impact their treatment.

Measurements

The Depression Anxiety Stress Scale-59 (DASS-59) assessed stress, anxiety, and depression severity (16). The severity of stress, anxiety, and depression was assessed using the Depression Anxiety Stress Scale (DASS) questionnaire in both groups. Developed by Lovibond *et al*, DASS is a self-reporting tool designed to gauge the intensity of depression, stress, and anxiety. It is applicable to individuals or groups aged over 15, featuring 21 four-choice questions that can be completed in 10 minutes. The questionnaire captures symptoms over the last week, offering insights into severity over time and treatment response. Notably, DASS has demonstrated acceptable psychometric properties in the Iranian population for both clinical and non-clinical samples. The World Health Organization Quality-of-Life Scale (WHO QOL-BREF) measured quality of life (QOL) across psychological, social, environmental, and physical domains (17). For evaluating the quality of life (QOL), the World Health Organization Quality-of-Life Scale (WHOQOL-BREF) questionnaire was employed. Comprising 26 questions across four sections (psychology, social, environmental, and physical), this questionnaire yields a general QOL score. Each section is scored from 0 to 100, and the mean score is calculated.

Sample size

To determine the sample size using the mean (± standard deviation) of the total score of (77.7±54.48) from the Epifanio study (18), a 95% confidence level was considered along with a permissible relative error of 5% around the standard deviation. The minimum required sample size was estimated based on the formula $n = \frac{z^2\sigma^2}{d^2}$, α= is the standard deviation from the pilot study, Z(1−α/2)=1.96 is derived from the cumulative normal distribution at α=0.05 (the confidence coefficient), and d=0.05. This resulted in an estimate of 32 individuals. Considering a 30% dropout rate (given the current conditions of the population), the minimum required sample size was determined.

Statistical analysis

Statistical analyses were performed using the Statistical Package for Social Science, Version 23, for Windows (IBM Corp., Armonk, NY, USA). Continuous variables with normal distribution underwent comparison *via* the independent sample t-test, reported as mean and standard deviation. Non-normally distributed variables were assessed using the Mann-Whitney U test, expressed as the median and Interquartile Range (IQR). Qualitative variables were compared using the Chi-square or Monte Carlo Chi-square test, presented as frequency and percentages. Scores were reported with the maximum and minimum values, mean, and standard deviation. Pearson's correlation coefficient (r) facilitated correlation analysis between the main variables. Multiple Linear Regression model addressed confounding factors including case group, age, gender, education, employment status, marital status. A significance level of $p<0.05$ was considered.

Results

Table 1 shows the sociodemographic characteristics of the participants in both case and control groups. The mean age of the respondents was 43.35 (SD=17.63) years. Demographic and psychological assessments revealed significant differences between the two groups, except for gender, marital status, and occupation. Mean scores for physical health, psychological health, social relationships, environmental health, QOL, and general health were significantly lower 6 months after COVID-19 infection compared to healthy controls (Table 1).

Correlation and regression analysis

Correlation analysis identified strong associations between variables, with notable correlations between depression and stress ($r=0.83$, $p<0.01$), physical health and psychological health ($r=0.78$, $p<0.01$), and depression and anxiety ($r=0.74$, $p<0.01$) (Table 2).

Table 3 presents the results of a multiple linear regression analysis assessing the impact of various demographic and social factors on psychiatric symptoms (depression, stress, anxiety) and quality of life in post-COVID-19 patients. The coefficients (β) indicate the magnitude and direction of the association, while the 95% Confidence Intervals (CI) provide a range of values within which the true effect is likely to lie. For the COVID-19 patient group, significant positive associations were found across all the psychiatric symptoms, with β values of 8.52

Table 1. Differences in the two groups of participants based on their demographic characteristics (n=130)

Variables	Category	Total N (%)	Case group (n=65)	Control group (n=65)	p*
Age	< =30	5(3.8)	4(6.2)	1(1.5)	<0.001**
	31-60	72(55.4)	26(40.0)	46(70.8)	
	> =61	53(40.8)	35(53.8)	18(27.7)	
	Mean±SD (years)	43.35±17.63	43.49±18.40	43.23±17.04	
Gender	Male	67(51.5)	36(55.4)	31(47.7)	0.380*
	Female	63(48.5)	29(44.6)	34(52.3)	
Education	Middle school	61(47.3)	38(59.4)	23(35.4)	0.001**
	Diploma	37(28.7)	19(29.7)	18(27.7)	
	Associate degree	9(7.0)	1(1.6)	8(12.3)	
	BS (bachelor's degree)	15(11.6)	2(3.1)	13(20.0)	
	MS (Master's degree)	7(5.4)	4(6.3)	3(4.6)	
Marital Status	Married	112(86.2)	54(83.1)	58(89.2)	0.310*
	Single	18(13.8)	11(16.9)	7(10.8)	
Occupation	Unemployed	11(8.5)	8(12.3)	3(4.6)	0.119*
	Employed	47(36.2)	22(33.8)	25(38.5)	
	Housewife	56(43.1)	24(36.9)	32(49.2)	
	Retired	16(12.3)	11(16.9)	5(7.7)	
Depression	Normal	68(52.3)	21(32.3)	47(72.3)	<0.001*
	Mild	21(16.2)	8(12.3)	13(20.0)	
	Moderate	20(15.4)	15(23.1)	5(7.7)	
	Severe	8(6.2)	8(12.3)	0(0.0)	
	Extremely Severe	13(10.0)	13(20.0)	0(0.0)	
	Mean±SD	12.43±9.79	17.32±11.53	7.54±3.41	<0.001***
Anxiety	Normal	53(40.8)	13(20)	40(61.5)	<0.001*
	Mild	15(11.5)	4(6.2)	11(16.9)	
	Moderate	26(20.0)	16(24.6)	10(15.4)	
	Severe	9(6.9)	7(10.8)	2(3.1)	
	Extremely Severe	27(20.8)	25 (38.5)	2(3.1)	
	Mean±SD	13.38±8.71	15.72±9.39	6.86±4.46	<0.001***
Stress	Normal	93(71.5)	28(43.1)	65(100.0)	<0.001*
	Mild	6(4.6)	6(9.2)	0(0.0)	
	Moderate	11(8.5)	11(16.9)	0(0.0)	
	Severe	7(5.4)	7(10.8)	0(0.0)	
	Extremely Severe	13(10.0)	11(20.0)	0(0.0)	
	Mean±SD	13.72±10.77	19.82±12.11	7.63±3.41	<0.001***
Physical health	Mean±SD	59.50±17.76	51.70±19.11	67.41±11.98	<0.001***
Psychological health	Mean±SD	55.93±15.44	47.12±14.69	64.74±10.34	<0.001***
Social relationships	Mean±SD	57.18±17.01	48.59±17.53	65.77±11.23	<0.001***
Environmental health	Mean±SD	46.42±10.07	39.90±7.75	52.93±7.61	<0.001***
Quality of life and General health	Mean±SD	51.15±14.47	44.81±14.81	57.50±11.00	<0.001***

* Chi-square test

**Monte carlo chi-square test

***Independent sample t-test

Table 2. The correlations and descriptive statistics for all the main variables

Variables	1	2	3	4	5	6	7	8
Depression	-	0.74**	0.83**	-0.15	-0.23**	-0.24**	-0.26**	-0.23**
Anxiety		-	0.67*	-0.20*	-0.22*	-0.21*	-0.29**	-0.30**
Stress			-	-0.04	-0.16	-0.19*	-0.31**	-0.16
Physical health				-	0.78**	0.65**	0.51**	0.72**
Psychological health					-	0.56**	0.61**	0.66**
Social relationships						-	0.44**	0.41**
Environmental health							-	0.58**
Quality of life and General health								-
Min-Max	2-42	0-38	0-42	3.57-92.86	16.67-87.50	8.33-75.00	21.88-71.88	25-75

*Correlation is significant at the 0.05 level (2-tailed).

**Correlation is significant at the 0.01 level (2-tailed).

Table 3. Quality of life and psychiatric symptoms in post-COVID-19 patients six months after discharge

Variable	Dependent variable							
	Depression		Stress		Anxiety		Quality of life	
	β(95% CI)	p	β(95% CI)	p	β(95% CI)	p	β(95% CI)	p
Groups								
Case (COVID-19)	8.52 (5.24, 11.99)	<0.001	11.62 (8.31.14.92)	<0.001	8.15 (5.38, 10.93)	<0.0001	-9.57 (-13.3, -5.75)	<0.0001
Control (Non-COVID-19)	Ref. category		Ref. category		Ref. category		Ref. category	
Age (year)								
≤30	Ref. category		Ref. category		Ref. category		Ref. category	
31-60	0.993 (-7.94-9.93)	0.826	-6.04 (-15.05, 2.96)	0.186	-0.56 (-8.12, 6.99)	0.883	-22.65 (-33.05, -12.24)	<0.0001
≥60	0393 (-8.7-9.54)	0.932	-10.98 (-20.2, -1.76)	0.020	1.64 (-6.09, 9.38)	0.674	-31.97 (-42.62, -21.32)	<0.0001
Gender								
Male	Ref. category		Ref. category		Ref. category		Ref. category	
Female	6.76 (-.82, 14.3)	0.08	3.12 (-4.52, 10.77)	0.420	3.99 (-2.42, 10.4)	0.220	-1.39 (-10.23)	0.745
Education								
Middle school	Ref. category		Ref. category		Ref. category		Ref. category	
Diploma	-0.742 (-4.8, 3.34)	0.72	0.856 (-3.26, 4.97)	0.682	2.26 (-1.19, 5.72)	0.197	2.82 (-1.93, 7.58)	0.243
Associate degree	-1.7 (-8.95, 5.53)	0.641	-4.64 (-11.94, 4.97)	0.210	-0.65 (-6.78, 5.46)	0.832	1.21 (-721, 9.64)	0.776

Contd. table 3.

Bachelor degree	-3.95 (-10.26, 2.355	0.217	-3.56 (-9.92, 2.79)	0.262	3.08 (-2.25, 8.41)	0.255	6.21 (-1.13, 13.55)	0.097
Master's degree	-6.19 (-13.72, 1.34)	0.107	-7.23 (-14.8, 0, 358)	0.062	-1.35 (-7.72, 5.02)	0.675	14.70 (5.92, 23.47)	<0.0001
Marital status								
Married	Ref. category		Ref. category				Ref. category	
Single	0.292 (-4.34, 4.92)	0.901	-.307 (-4.97, 4.36)	0.896	-3.07 (-6.99, 0.84)	0.123	0.59 (-4.79, 5.99)	0.827
Job								
Housewife	Ref. category		Ref. category		Ref. category		Ref. category	
Unemployed	11.12 (1.7, 20.46)	0.020	9.08 (-0.33, 18.49)	0.058	9.04 (1.14, 16.94)	0.025	-10.29 (-21.16, 0.58)	0.063
Employed	6.87 (-1.31, 15.05)	0.099	6.43 (-1.81, 14.68)	0.125	1.30 (-5.61, 8.22)	0.710	-2.75 (-12.16, 0.58)	0.567
Retired	4.70 (-4.15, 13.57)	0.861	3.66 (-5.23, 12.62)	0.414	1.18 (-6.30, 8.67)	0.755	-4.14 (-14.46, 6.16)	0.427

for depression, 11.62 for stress, and 8.15 for anxiety, all with p-values less than 0.001, indicating strong statistical significance. Conversely, quality of life was negatively impacted (β=-9.57, p<0.0001). Age was also a notable factor; individuals aged 31-60 demonstrated no significant differences, but those over 60 experienced a significant reduction in quality of life (β=-31.97, p<0.0001). Gender revealed no significant differences in most outcomes, although females showed a marginally significant increase in depression. Education level, particularly at the master's degree level, was associated with a significantly better quality of life (β=14.70, p<0.0001). Employment status was a significant factor, with unemployed individuals reporting higher levels of depression (β=11.12, p=0.020) and anxiety (β=9.04, p=0.025). Overall, the results illustrate how the experience of COVID-19, along with age, employment, and education, significantly influence mental health and quality of life in affected individuals.

Discussion

This study investigated the impact of COVID-19 on the mental health and quality of life of patients six months after discharge. The findings reveal that individuals who had COVID-19 experience higher levels of depression, stress, and anxiety compared to those who did not contract the virus. This aligns with existing literature highlighting the psychological burden associated with COVID-19, which may stem from a combination of factors including the acute illness itself, prolonged recovery, social isolation, and the uncertainties surrounding the pandemic. The substantial β coefficients for depression (8.52), stress (11.62), and anxiety (8.15) in the COVID-19 patient group suggest a pronounced psychological impact that warrants attention. These findings indicate the need for targeted mental health interventions for COVID-19 survivors, particularly as they navigate the aftermath of their illness. The negative β value for quality of life (-9.57) further emphasizes the detrimental effects of the virus on overall well-being, suggesting that recovery from COVID-19 extends beyond physical health to encompass mental health and social functioning. The findings align with previous reports from diverse populations. Chen *et al* (19) observed higher scores for physical health and lower scores for psychological domains one month after recovery. However, both scores were significantly lower than population norms. Notably, different instruments, such as the SF-36 and PROMIS®, were used in these studies, emphasizing the global quality measured by the WHO QOL-BREF score (20). The case group exhibits significantly higher levels of psychiatric

symptoms, with a greater percentage experiencing moderate to extremely severe depression (32.3 *vs*. 0.0% in controls), anxiety (20 *vs*. 3.1%), and stress (56.9 *vs*. 0.0%) (all p<0.001). The mean scores for these symptoms are also markedly higher in the case group, indicating a pronounced mental health burden.

Age emerged as a critical determinant of quality of life, particularly for individuals over 60, who reported a significant decline in quality of life (β=-31.97). This finding may reflect the compounded effects of age-related vulnerabilities and the challenges faced during the pandemic, including increased risk of severe illness and social isolation. These results highlight the necessity for age-specific support systems that can address the unique needs of older adults recovering from COVID-19. A systematic review by Nandasena *et al* suggested that older age is associated with low QOL in most studies evaluating QOL in COVID-19 patients. Other factors such as gender, admission to the ICU, prolonged mechanical ventilation, extended ICU stay, and co-morbidities have been associated with lower QOL (21). However, gender did not emerge as a predictor in the current study. Age, as a risk factor for stress, anxiety, and depression, was consistent with findings by Ozamiz-Etxebarria (22). A study in China highlighted increased anxiety and depression in students during the initial outbreak, possibly due to the rapid transition to online education (23), which resonates with the population in this.

Employment status was a notable factor influencing mental health, particularly among unemployed individuals who faced heightened levels of depression (β=11.12) and anxiety (β=9.04). The stress associated with job loss and financial insecurity during an economic downturn could exacerbate psychological distress, indicating a critical area for intervention. Support programs aimed at re-employment, and mental health resources could benefit this population significantly.

Limitations

The study faced limitations, including self-reported medical and psychiatric history data, potentially missing undocumented problems, particularly psychiatric disorders. Additionally, the use of questionnaires instead of psychiatric interviews during the COVID pandemic might have implications. However, the study employed standard questionnaires to ensure reliable data.

One notable limitation of this study was the absence of baseline quality of life assessments for both groups prior to the onset of COVID-19. Without this initial comparison, it was challenging to determine the extent to which COVID-19 and its aftermath have directly impacted the participants' quality of life. Although various confounding variables were controlled in the analysis, the lack of baseline data may limit the robustness of our conclusions regarding the long-term effects of COVID-19 on mental health and overall well-being. The study did not examine the severity of COVID-19 and its complications as influential factors on the quality of life and psychiatric symptoms of the participants. This omission may impact the comprehensiveness of the findings and is acknowledged as a limitation in the analysis.

Conclusion

In conclusion, the results of this study highlight the multifaceted impact of COVID-19 on mental health and quality of life, emphasizing the need for comprehensive care that addresses both physical and psychological recovery. Targeted interventions for vulnerable populations, including older adults, unemployed individuals, and women, are essential to mitigate the long-term effects of the pandemic on mental health. As we move forward, integrating mental health support into post-COVID care will be crucial in fostering holistic recovery for individuals affected by the virus. Future research should continue to explore these relationships and evaluate the effectiveness of specific interventions in improving outcomes for post-COVID patients.

Ethical approval

Informed written consent was obtained from all the participants. All the methods included in this study are in accordance with the declaration of Helsinki. The study received ethical approval from the Ethics Committee of Tabriz University of Medical Sciences (IR.TBZMED.REC.1400.552).

Funding

There is no funding source.

Acknowledgement

We acknowledge the contributions of Tabriz University of Medical Sciences, Tabriz, Iran for providing facilities to the study.

Conflict of Interest

There was no conflict of interest in this manuscript.

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