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Association between hospitalization, endurance level, and quality of life in post-COVID patients - A cross-sectional correlation study

Arulmozhe A[1], Sakambari Dash[2], S Rajesh[3], V B Jayakumar[1], Dr. B S Santhosh Kanna[4]
[1] Associate Professor, College of Physiotherapy, NIEPMD (D), Govt. of India, TN Dr. M.G.R. Medical University, Tamil Nadu, India
[2] College of Physiotherapy, NIEPMD (D), Govt. of India, TN Dr. M.G.R. Medical University, Tamil Nadu, India
[3] Professor, College of Physiotherapy, NIEPMD (D), Govt. of India, TN Dr. M.G.R. Medical University, Tamil Nadu, India
[4] Principal, College of Physiotherapy, NIEPMD (D), Govt. of India, TN Dr. M.G.R. Medical University, Tamil Nadu, India

Abstract
Background: Post-COVID-19 patients commonly experience reduced endurance and impaired quality of life (QoL), potentially influenced by hospitalization. However, the relationship between duration of hospitalization, endurance capacity, and QoL remains unclear.
Objective: To determine the association between duration of hospitalization, endurance levels, and quality of life in post-COVID-19 patients.
Methods: This cross-sectional correlation study included 30 post-COVID-19 patients aged 20-30 years, hospitalized between 2021 and 2022, and assessed a least 100 days post-discharge. Endurance was measured using the Six-Minute Walk Test (6MWT), and QoL was evaluated using the Short Form-36 (SF-36) questionnaire. Pearson's bivariate correlation analysis was used to assess relationships between duration of hospitalization, endurance, and QoL domains.
Results: The findings demonstrated a weak negative correlation between duration of hospitalization and endurance level ($r = -0.213$, $p = 0.259$), which was not statistically significant. Similarly, weak negative correlations were observed between hospitalization duration and all SF-36 domains, including physical functioning, role limitations (physical and emotional), energy/fatigue, emotional well-being, social functioning, pain, general health, and health change ($p > 0.05$). None of these associations reached statistical significance.
Conclusion: Duration of hospitalization (≤14 days) showed no significant association with endurance capacity or quality of life in post-COVID-19 patients. These findings suggest that hospitalization duration alone is not a strong predictor of long-term functional outcomes, highlighting the importance of other factors such as disease severity, persistent symptoms, and psychosocial influences in post-COVID rehabilitation.

Keywords: Post-COVID-19, hospitalization, endurance, quality of life, Six-Minute Walk Test, SF-36, Long COVID, rehabilitation, physical function, correlation study

Introduction

Corona virus (CoV) is derived from the word 'Corona', meaning 'crown' in Latin. It causes a range of human respiratory tract infections, varying from a mild cold to severe respiratory distress syndrome. [1] Although the virus usually first invades and infects the lung and respiratory tract tissue, in extreme cases, almost all major organs in the body are now known to be negatively impacted, often leading to severe systemic failure in some people. The SARS-CoV-2-caused COVID-19 pandemic has resulted in a devastating threat to human society in terms of health, economy, and lifestyle.

Due to sustained quarantine, hospitalization, bed rest, and social distancing, the ability of organ systems to resist viral infection and increase the risk of damage to the immune, respiratory, cardiovascular, musculoskeletal systems, and the brain has been downregulated [9]. Hospitalization during COVID-19 infection May likely lead to compromised performance when exercising shortly after recovery.

The reduced activity in the patient's daily life may lead to deconditioning, i.e., muscle function alteration. Investigations of skeletal muscle with nuclear magnetic resonancehaveshownabnormalitiesinmusclemetabolisminthe sepatients,indicating reduced oxidative capacity which suggests that skeletal muscle endurance (the ability to withstand against fatigue in short specific conditions or perform for long period of time is known as endurance) is decreased, and such an alteration could explain the well-known fatigue described in COVID-19 patients [39]. This suggests the importance of endurance in COVID-19 patients of daily living [8].

Most activities of daily living represent exertion at sub-maximal exercise levels, so a measure of the ability to sustain a given sub-maximal exercise (endurance capacity) is an important component of the assessment of disability [6]. In COVID-19 the decrease in endurance capacity affects the active status of the individual thereby having a detrimental effect on the quality of life. Patients with moderate or severe COVID-19 as well as those with mild or asymptomatic COVID-19 both have extended COVID that is associated with poor health-related quality of life. The clinical spectrum of the extended COVID-19 includes a number of symptoms. Include fatigue, dyspnea, trouble focusing, anxiety, insomnia, memory loss, and cognitive impairment, all of which have a negative impact on quality of life [41].

The literature on previous coronavirus infections reports that patients may experience persistent impairment in respiratory function after being discharged which makes it imperative to focus on the level of endurance as well as the quality of life led by the individuals [42].

As there is no direct evidence linking endurance levels of post-COVID patients with a history of hospitalization to their quality of life and endurance, this survey aims to find the correlation between the same with the aid of assessment tools such as the SF-36 questionnaire and the 6-minute walk test. So, this study has been focused on finding out the association between how hospitalization due to corona virus infection affects the endurance capacity and overall quality of life in COVID-19 recovered patients.

Methodology

An observational study was conducted on post-COVID-19 patients aged between 20 and 30 years, both male and female who were hospitalized between the years of 2021 and 2022. A total of thirty patients were included with prior informed written consent based on a confirmed RT-PCR and/or antibody diagnosis test, as well as a minimum of 100 days interval post discharge from a COVID-19 ward in the study that lasted for about three months. However, patients with a history of prior invasive mechanical ventilation, any chronic infections or lung diseases, any autoimmune diseases or cancer, drug or alcohol abuse, or any condition that hindered their participation in the study were excluded. The patients were assessed using the Short-Form Health Survey (SF-36) Questionnaire and the Six-Minute Walk Test to measure quality of life and endurance, respectively, and demographic data like age, height, weight, and pre-test medication were collected for all the individuals.

The 6MWT protocol included 3 phases: five minutes of resting phase, six minutes of walking phase, and five minutes of recovery phase. During the resting and recovery phase, the individuals were comfortably seated on a stool, and their blood pressure and blood oxygen saturation levels were noted using a sphygmomanometer and a pulse oximeter. The heart rate, fatigue and dyspnea levels were noted using Borg's scale. During walking phase, the individuals were asked to walk as long as possible along a 20m corridor for 6 minutes. After the 6MWT, the individuals were assessed for Quality of life by SF-36 questionnaire that was filled by the individuals themselves with assistance from the therapist wherever an understanding of the question was required. Care was taken to only provide descriptive answers and abstain from interpretive ones so as not to misguide the patient. After completion of data collection, as the variable passed normality, Pearson Bivariate correlation test was used to find out the correlation between the collected data using SPSS Software.

Results

The result of this study shows that there is a weak negative correlation between hospitalization and endurance level (r is 0.213, p=0.259), and it is statistically insignificant. The association between hospitalization and parameters of SF-36 also denotes that there is a weak negative correlation between hospitalization and physical functioning (r is -0.112, p=0.093), role limitations due to physical health (r is -0.112, p=0.555), role limitations due to emotional problems (r is -0.022, p=0.909), energy/fatigue (r is-0.160,p=0.397), emotional well-being (r is-0.166, p=0.381),social functioning (r is -0.172, p=0.362), pain (r is -0.170, p=0.368), general health (r is -0.213, p=0.258), and health change insignificant (r is -0.284, p=0.128). However, none of these correlations were statistically significant ($p > 0.05$), indicating that duration of hospitalization did not have a significant association with endurance level or any domain of quality of life in the studied population (Table 1).

Table 1: Correlation statistics of Duration of hospitalization with Endurance level and QoL

	Endurance Level		Physical Functioning	Role Limitations due to Physical Health	Role Limitations due to Emotional Problems	Energy / Fatigue	Emotional Well- being	Social Functioning	Pain	General Health	Health Change
Duration of hospitalization	Pearson Correlation	-0.213	-0.312	-0.112	-0.022	-0.160	-0.166	-0.172	-0.170	-0.213	-0.284
	Sig.(2-tailed)	0.259	0.093	0.555	0.909	0.397	0.381	0.362	0.368	0.258	0.128

Discussion

The present study investigated the relationship between duration of hospitalization and long-term outcomes, specifically endurance and quality of life (QoL), in post-COVID-19 patients assessed one year after infection. The findings demonstrated a weak negative correlation between duration of hospital stay and both endurance capacity and SF-36 QoL scores, suggesting that prolonged hospitalization within a short-duration range may have a minimal but inverse association with long-term functional outcomes.

Recent longitudinal evidence supports the persistence of functional limitations and QoL impairments even at one year following COVID-19 infection. A prospective cohort study by O'Brien *et al*. reported that, despite partial recovery, hospitalized COVID-19 survivors continued to exhibit significant deficits in physical functioning and health-related QoL at 12 months post-infection. Similarly, Betschart *et al*. demonstrated incomplete recovery in physical performance and QoL domains at one-year follow-up, particularly among previously hospitalized individuals. These findings are consistent with the current study, indicating that long-term sequelae persist regardless of relatively short hospitalization duration.

The weak negative correlation observed in this study may be explained by the role of disease severity and systemic involvement**,** rather than the duration of hospitalization itself. Evidence suggests that severity-related factors—including inflammatory burden, pulmonary involvement, and ICU admission—have a stronger influence on long-term outcomes than length of stay alone. Catalán *et al*. reported that although QoL tends to improve over one year, factors such as severity of illness, comorbidities, and demographic variables remain significantly associated with poorer QoL outcomes.

Furthermore, emerging literature highlights that persistent fatigue, reduced exercise tolerance, and impaired functional capacity remain key determinants of reduced QoL in long-COVID populations. Arruda *et al*. demonstrated that post-COVID fatigue is significantly associated with reduced 6-minute walk distance and lower QoL scores, with an inverse correlation between fatigue severity and endurance performance ($r \approx -0.39$). This supports the current findings,

where endurance deficits may persist independently of hospitalization duration, contributing to diminished QoL outcomes.

Another plausible explanation for the weak association observed is the restricted variability in hospitalization duration within the study cohort. Short hospital stays may not adequately capture the heterogeneity of disease burden, thereby limiting their predictive value for long-term outcomes. Previous studies have indicated that longer hospitalization and ICU admission are more strongly associated with persistent symptoms; however, within shorter durations, this relationship becomes less pronounced and statistically weaker.

Additionally, psychological and biopsychosocial factors appear to play a crucial role in long-term recovery. D'Ors - Vilardebó *et al*. demonstrated that psychological distress at discharge is significantly associated with poorer exercise capacity, physical function, and QoL up to six months post-hospitalization. Given that such factors persist beyond the acute phase, it is plausible that they continue to influence outcomes at one year, thereby attenuating the direct effect of hospitalization duration.

Importantly, one-year follow-up studies suggest that while some domains of QoL improve over time, residual impairments persist, particularly in physical and functional domains. Hawlader *et al*. reported that QoL improved across psychological and social domains at one year; however, severity of illness and comorbid conditions remained significant determinants of reduced QoL. This aligns with the present findings, reinforcing that long-term outcomes are multifactorial and not solely dependent on hospitalization duration [42].

Overall, the weak negative correlation observed in this study suggests that while longer hospital stay may be marginally associated with poorer endurance and QoL, it is not a primary determinant of long-term outcomes. Instead, disease severity, persistent symptoms (e.g., fatigue), and psychosocial factors appear to exert a more substantial influence on recovery trajectories at one year post-COVID-19.

Conclusion

The present study concludes that, among post-COVID-19 patients assessed, 100 days after infection, duration of hospitalization demonstrates only a weak negative correlation with endurance and SF-36 QoL scores**.** These findings suggest that hospitalization duration alone is insufficient to predict long-term functional outcomes, emphasizing the need to consider disease severity, symptom burden, and psychosocial determinants in post-COVID rehabilitation strategies.

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