Research Article

The Effects of Physiotherapy Management in Hospitalized Patients with Coronavirus Disease Based on Gender Differences

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ABSTRACT

Introduction: COVID-19 which is an infectious disease caused by the SARS-CoV-2 virus hurts patients' respiratory health by necessitating oxygen therapy. The affected patients with COVID-19 experience anxiety and stress with quality of life (QoL) impacted due to frequent medication, hospitalizations, fear of dying, and isolation. In individuals with respiratory problems, physiotherapy is useful in improving oxygenation, stress reduction, and QoL. Therefore, our goal was to assess how physiotherapy management affected the oxygenation rates and QoL of hospitalized COVID-19 patients.

Materials and Methods: The study included 60 hospitalized cases of COVID-19 pneumonia (25–65 years) admitted to the RCU/Al-Hussein teaching hospital. The oxygenation rate was recorded by hospital monitoring. A physiotherapy management prepared according to the pulmonary rehabilitation recommendations for COVID-19 patients. QoL was assessed by the Arabian version of the short-form health survey questionnaire (SF-36) at baseline, at discharge, and 1 month after discharge.

Results: The mean baseline oxygenation percent was 86.10±12.93. The baseline QoL score was 29.14±18.52. A significant increase (P<0.0001) in oxygenation (by 10.22%) was observed at discharge as compared to the baseline values. The QoL was significantly higher (P<0.0001) at 1-month post-discharge as compared to the baseline and the values at discharge (by 157.76%). Similar effects were observed in males and females.

Conclusion: A short-term course of physiotherapy management was effective in increasing the oxygenation rates and QoL in hospitalized male and female COVID-19 patients. A combination of breathing exercises, early mobilization, and positioning can act as an adjuvant in the clinical management of COVID-19 patients.

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Introduction

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) which is a subtype of the β species of coronaviruses causes COVID-19, which emerged in 2019 and manifested with different symptoms in specific lung infections [1, 2]. The major sites of infection are lung epithelial cells due to the building up of serous fluid and fibrin exudates as well as the production of the hyaline membrane in the alveoli [3]. The most typical COVID-19 symptoms are fever (89%), cough (68%), weariness (38%), sputum production (34%), and shortness of breath (19%) [4]. Patients who are elderly, have other chronic conditions, are pregnant, or people with impaired immune systems experience severe COVID-19 problems such as acute respiratory disease syndrome (ARDS). Severe lung involvement causes failure in the function of the respiratory system with necessitations to mechanical ventilation [4, 5-7]. In this situation, the patients need to be admitted to the intensive care unit (ICU) [6]. Nearly 14% of COVID-19 patients experience severe symptoms that necessitate hospitalization, and about 5% of patients need to be admitted to the ICU [8, 9]. It has been noted that pneumonia negatively affects activities of daily living (ADL), quality of life (QoL), and physical and mental functions [10, 11]. Therefore, improved respiratory function should be considered a key factor in enhancing ADL and QoL in COVID-19 patients since this disease primarily attacks to respiratory system.

Although there are different guidelines and recommendations for pulmonary rehabilitation in COVID-19 patients and the effects of treatment on enhancing respiratory function and QoL, previous research has indicated some gender differences in COVID-19 patients [12, 13]. However, the effects of pulmonary rehabilitation based on gender differences are not well known. Regarding this point, the current study aimed to assess gender differences after physiotherapy management based on oxygenation and QoL in hospitalized patients with COVID-19 pneumonia.

Materials and Methods

Study design

This was a pre-post study conducted from May 2022 to November 2022.

Participants

Sixty patients who were 25 to 65 years old (30 females and 30 males) with lung pneumonia due to COVID-19 were included in this study. The patients were in the acute phase and needed to stay at the hospital for at least one to two weeks. The patients should not have other neurological, systemic, orthopedic, other chronic respiratory disorders, or cancer conditions. In addition, the pregnant females were not included in the study. The patients should have been able to contribute to physiotherapy management, therefore, ICU-admitted patients were not included. The reverse transcription polymerase chain reaction (RT-PCR [gold standard]) and computed tomography of the chest (with greater sensitivity) [14] confirmed that the pneumonia was due to SARS- viruses. All infected patients with COVID-19 pneumonia were identified by an emergency or cardiopulmonary physician referred from the Al-Hussein Teaching Hospital in Iraq and included in the study.

All participants (30 women and 30 men) were checked for the inclusion and exclusion criteria. All participants were made aware of the procedures that would be carried out in advance. The study only included those individuals who signed a written consent form indicating their consent to participate in the study.

Outcome measures

The oxygenation rate was recorded by hospital monitoring. It uses light beams to estimate the oxygen saturation of the blood and the pulse rate. Oxygen saturation gives information about the amount of oxygen carried in the blood. Most pulse oximeters show two or three numbers. Oxygen saturation level (SpO_2) is presented as a percentage, and normal values are between 95% and 100% for most healthy individuals, but sometimes it can be lower in people with lung problems [15].

Assessment of QoL

QoL was assessed by the Arabian version of the short-form health survey questionnaire-36 (SF-36) [16]. The SF-36 questionnaire consists of 36 items with eight subscales: Physical functioning (PF), role physical (RP), bodily pain (BP), general health (GH), vitality (VT), social functioning (SF), role emotional (RE), and mental health (MH). Scores for the SF-36 scales range between 0 and 100, with higher scores indicating a better QoL. The Arabic version of SF-36 is a valid and reliable instrument for measuring QoL [16].

Table 1. Baseline characteristics of the patients

Baseline Characteristics	Mean±SD	
	Male (n=30)	Female (n=30)
Age (y)	43.73±12.52	43.30±12.77
Weight (kg)	78.23±11.38	75.50±19.61
Height (cm)	169.53±8.54	157.80±7.85
BMI (kg/m^2)	27.25±3.91	30.48±8.16
Baseline oxygenation (%)	88.27±5.11	83.93±17.44
Baseline QoL	30.22±20.22	28.05±16.92

BMI: Body mass index; QoL: Quality of life.

Procedure

The demographic data were collected for both female and male groups. According to the rehabilitation recommendations for COVID-19 patients, an exercise program customized to the patient's needs was given as follows: Breathing exercises included diaphragmatic breathing, segmental breathing, slow inhalation and exhalation, pursed lips breathing, effective cough, bronchial hygiene techniques (assisted cough, postural drainage, and percussion), clearance of secretion (chest maneuvers, cupping, and huffing), early mobilization, transfer to and from bed, chair sitting in bed, sitting out of bed, walking, bed mobilization, aerobic exercise, and positioning with support. Peripheral muscle training, changing of position, simple exercises and range of motion exercises, and simple stretching were also provided to the patients [17, 18]. The SF-36 was administered to patients at the initial session, right after the rehabilitation program was completed (but before hospital discharges) and one month after discharge. While the oxygenation rate was not checked one month after discharge, it should be mentioned that the number of rehabilitation sessions was not the same for all the patients.

Statistical analysis

SPSS software, version 26, was used for the statistical analysis. Kolmogorov-Smirnov (K-S) test was used to check the normality of the data. Continuous variables were presented as Mean±SD, minimum and maximum, and categorical variables were presented as frequency (%). A student t-test was performed to compare oxygenation and QoL between females and males. Paired sample t-test was performed to compare the baseline means with the means at discharge. $P<0.05$ was considered significant. Cohen's d effect size was used for the detection of the size of the effect of physiotherapy management in both groups.

Results

This study included 60 cases of COVID-19 pneumonia with a 1:1 ratio of male-to-female. The baseline characteristics of patients are represented in Table 1.

Paired and independent sample t-test was performed for analysis of results between pre-post data in each group and between male and female groups, respectively. Cohen's d was used to determine the effect size. $P<0.05$ were considered significant.

Table 2. Comparison of oxygenation rates in males and females

Group	Baseline (%)	After Discharge (%)	P	% Change
Male (n=30)	88.27±5.11	96.57±2.50	<0.0001	9.40
Female (n=30)	83.93±17.44	93.23±17.64	<0.0001	11.08
P	0.05	0.14		

Table 3. QoL based on gender differences

Parameter	Gender	Baseline	After Discharge	1-month Post-discharge	P	% Change (Baseline vs Discharge)	% Change (Baseline vs 1-month Post-discharge)
QoL	Male	30.22±20.22	61.03±20.90	72.26±17.03	<0.0001	101.95	139.11
	Female	28.05±16.92	61.13±19.45	77.38±14.92	<0.0001	117.93	175.96
	P	0.14	0.47	0.47			

A significant increase (P<0.0001) in oxygenation (9.40% in males vs. 11.08% in females) was observed at discharge as compared to the baseline values in both males and females (Table 2). The mean QoL showed an increasing trend from baseline to 1-month post-discharge. The QoL was significantly higher (P<0.0001) in 1-month post-discharge as compared to the baseline and the values at discharge (Table 3).

Physiotherapy intervention showed a similar effect in both males and females regarding QoL and oxygenation rate (Tables 2 and 3).

Discussion

The current study assessed how physiotherapy management affected oxygenation and QoL in hospitalized COVID-19 patients. Oxygenation levels improved between baseline and discharge in both males and females. In addition, the QoL was considerably better one month after discharge compared to the baseline and the values at discharge.

Recent studies have demonstrated that COVID-19 hurts patients' QoL as well as their mental health. According to Del Corral et al.'s study, pulmonary and functional capability, psychological state, cognition, and QoL were affected following COVID-19 infection, and over 60% of the patients' QoL was impaired and remained impaired for 6-7 months [18, 19].

In the present study, a poor QoL was seen after COVID-19 but the physiotherapy intervention significantly improved QoL at discharge and 1-month post-discharge as compared to the baseline values.

According to Pestelli et al., physical therapy improved chest pain during deep inspiration, chest tightness, inability to yawn, fatigue during ADL, as well as health status in COVID-19 patients. Respiratory muscle strength, lung function, exercise capacity, and QoL improved significantly post-physiotherapy [20]. In line with the findings of this study, we also observed that physiotherapy intervention improved the QoL in hospitalized COVID-19 patients at discharge and 1-month post-discharge compared to the baseline. By enhancing mobility, independence, and health-related QoL, COVID-19 patients with predominantly respiratory diseases can greatly benefit from physiotherapy management. The findings of the present study suggest that physiotherapy intervention can be useful in mild and moderate COVID-19 patients and a significant improvement in QoL in the enrolled COVID-19 patients.

Due to some of the pathological characteristics of COVID-19 including impaired gas exchange, and atelectasis, chest physiotherapy can be used in patients with this condition and the majority of hospitalized patients need to use oxygen therapy. Previous study results revealed that physical therapy consisting of upright body positioning, mobilization, and exercise, as well as the active cycle of breathing exercise technique could significantly increase arterial oxygen levels, and resolve radiographic infiltration [17, 21]. An increase in the oxygenation rate in hospitalized COVID-19 patients in the present study highlights that early administration of physiotherapy in COVID-19 patients can be useful in improving the oxygenation rates in patients with COVID-19 and physiotherapy can act as an adjuvant in the clinical management of the symptoms.

In a study conducted on ward-based patients admitted with COVID-19, it was observed that after physiotherapy and modified positions, the oxygen requirements of patients decreased [22]. The physiotherapy regimen in the present study included a combination of breathing exercises, early mobilization, and positioning. This combination of activities in the physiotherapy regimen significantly enhanced the oxygenation rates in the patients. Some evidence suggests that standard chest physical therapy affects COVID-19 patients with hypoxemic

respiratory failure and dry cough during the acute phase of the illness. However, bronchial hygiene procedures and maneuvers that induce coughing may be advantageous for some patients with productive cough. Respiratory and pulmonary examinations should be performed on the patient in these circumstances, particularly during tracheal intubation and oxygen supplementation, as well as for patients who are candidates for non-invasive ventilation or high-flow oxygen administration [5, 22].

For physiotherapists, it is imperative to follow the guidelines strictly while administering physiotherapy to patients. Throughout a patient's hospital stay, physical therapy is crucial. To minimize the danger of infection while also giving patients the best care possible, the hospital's physiotherapy staff must be knowledgeable about specific care [23, 24].

Only a few interventional trials have included physiotherapy treatments specifically for COVID-19 patients, and this study is one of them. The data for men and women in this study were evaluated independently. This study attempted to analyze the influence of physiotherapy during hospitalization, which is one of its favorable characteristics, in contrast to many previous studies that concentrated on measuring the impact of physiotherapy during the recovery process. There are, however, some limitations as well. The results' generalizability may be impacted by the limited sample size and the type of physiotherapy management methods. Another limitation was having no control group using only medication or recovering over time.

The long-term effects of physiotherapy on COVID-19 patients may be further supported by long-term follow-up of the patients who were discharged. The second goal was to compare rehabilitation effects between males and females. The present study results revealed no difference between males and females in regards to changes in oxygenation rate and QoL improvement after physiotherapy management. Previous studies showed sex differences in hospitalized patients with acute COVID-19 respiratory tract infection. Very intense inflammatory responses appeared in male versus female patients, even in matched groups. Males have a stronger natural immune response, but females organize and prepare a stronger adaptive immune response to COVID-19 respiratory tract infection. Lifestyles, smoking habits, and poor eating habits, more frequently found in men than women may lead to a higher incidence of comorbidities in men compared with women [14, 15]. Our study results showed the same response in both treatment groups in regards to increasing oxygenation rate and QoL improvement. There was no previous study about physiotherapy management based on gender-related differences, therefore, we could not compare our study results with other research results.

Conclusion

The findings suggested that physiotherapy can help raise oxygenation and improve QoL without difference between males and females. Future research should evaluate the various physiotherapy techniques and different patient groups (severe, moderate, and mild).

Ethical Considerations

Compliance with ethical guidelines

This study was approved by the Ethics Committee of Tehran University of Medical Sciences (Code: IR.TUMS.MEDICINE.REC.1401.040). and was registered at the Iranian Registry of Clinical Trials (IRCT) (Code: IRCT20220719055493N1).

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Authors' contributions

All authors equally contributed to preparing this article.

Conflict of interest

The authors declared no conflict of interest.

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