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Original Research Article

Effect of Breathing Exercises on Spo_2 Levels and Pulse Rate in Covid-19 Patients

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ABSTRACT

The impact of COVID-19 grew worse by its quick onset, the overwhelming number of patients in need of urgent care, and the lack of awareness of its signs beforehand. It mostly affected the respiratory system, making respiratory rehabilitation extremely important. This study was carried out to see the effectiveness of breathing exercises along with the postural changes in COVID-19 patients under acute hospital care. A total of 40 subjects with age group between 18 years to 60 years, diagnosed with COVID-19 were included according to the selection criteria and were divided into 2 equal groups of 20 subjects each. The subjects in Group A received positioning protocol while those in Group B received breathing exercises along with positioning protocol. After 7 days of intervention, the mean SpO_2(88.6% vs 89.9%, P<0.001) and pulse rate (82 vs 91 beats/minute, P<0.001) for Group A and Group B respectively. This study concluded that breathing exercises along with postural changes in patients hospitalized with COVID-19 is an effective rehabilitation program for improving SPO_2 levels and pulse rate.

KEYWORDS: Breathing exercises, COVID-19, Postural changes, Respiratory rehabilitation.

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INTRODUCTION

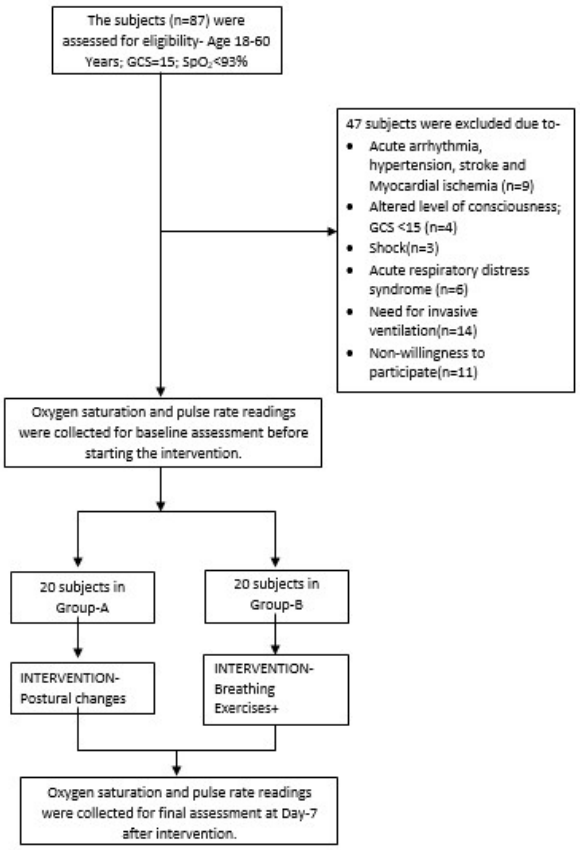
A highly infectious coronavirus (CoV), known as SARS-CoV-2, emerged for the first time in late 2019 and quickly spread over the world, resulting in millions of cases [1]. SARS-CoV-2 causes COVID-19, which has a predilection for the lungs and can result in severe pneumonia, inducing serous fluid, fibrin exudates, and hyaline membrane formation in the alveoli, associated with intensive care unit (ICU) admission and high death rate [2], according to WHO COVID-19 disease severity classification for adults, the moderate disease is described as having clinical indications of pneumonia (fever, cough, dyspnoea, quick breathing) but no indicators of severe pneumonia, including peripheral oxygen saturation (SpO_2) $\geq$ 90% on room air. Adults with severe disease have at least one of the following symptoms besides the clinical indicators of pneumonia (fever, cough, dyspnoea): respiratory rate >30 breaths/min, significant respiratory distress, or SpO_2 < 90% on room air. This classification states that among those who develop COVID-19 symptoms, the majority only experience mild (40%) or moderate (40%) disease, whereas 15% experience a severe condition that requires oxygen support, and 5% experience a critical condition that includes complications like respiratory failure, acute respiratory distress syndrome (ARDS), septic shock, thromboembolism, and/or multi-organ failure [3,4].

The impact of COVID-19 grew worse by its quick onset, the overwhelming number of patients in need of urgent care, and the lack of awareness of its signs beforehand. COVID-19 patients experienced significant problems because of the disease's considerable impact on the respiratory system, causing lung inflammation and damage that can lead to shortness of breath, fatigue, coughing, and trouble performing physical exercise. For these people to recover from the virus-induced lung damage, pulmonary rehabilitation is crucial in acute and chronic phases [3]. Respiratory rehabilitation includes breathing exercises, body positioning exercises, relaxation, and respiratory muscle training [3]. Therefore, this study was carried out to understand the effectiveness of breathing exercises and posture changes in COVID-19 patients under acute hospital care.

METHODOLOGY

A total of 40 subjects, 26 males and 14 females, with age group between 18 years to 60 years, were diagnosed with mild to moderate COVID-19, SPO_2 levels <93%, GCS Score-15, and needing oxygen supplementation in the form of Nasal prongs or simple oxygen masks were included in the study whereas the subjects with severe COVID-19 symptoms, acute arrhythmia, hypertension, stroke, and myocardial ischemia, altered level of consciousness (GCS <15), shock, Acute respiratory distress syndrome, subjects on invasive ventilation and who were not willing to participate were excluded. The demographic data of all the subjects was collected from hospital records. As outcomes in the study, oxygen saturation and pulse rate readings were collected before the intervention and at follow-up (after seven days) from a pulse oximeter (mfd. by Semiconductor Global Solutions LLP) by placing it on the index finger. These subjects were conveniently divided into two groups, with 20 subjects each. The subjects in Group A received Postural changes, while those in Group B received Breathing exercises and postural changes. However, pulmonary rehabilitation was given as an adjuvant treatment, meaning the subjects of both groups also received symptomatic treatment, antiviral treatment, and high-flow oxygen supplementation.

Flowchart showing the procedure of the study.



Interventions: The subjects in Group-A received Postural changes according to COVID awake repositioning prone protocol [5]. This protocol consisted of 30 mins to 2 hours in left side lying (Left Lateral Recumbent) followed by 30 minutes to 2 hours in right side lying (Right Lateral Recumbent), then 30 mins to 2 hours in supported sitting (Sitting Upright 60-90 degrees) followed by 30 mins to 2 hours in full prone and then in Trendelenburg position (Supine, Bed 30 degrees Head Down). The subjects in Group B received Breathing exercises [6],[7],[8] along with Postural changes according to COVID awake repositioning prone protocol [5].

Exercises included active breathing exercises, breathing control, diaphragmatic breathing (5-7 repetitions), thoracic breathing (3-5 repetitions of deep breathing plus a 5-second breath hold), huffing, coughing (1-2 repetitions), and incentive spirometer (5-7 repetitions) [9].

STATISTICAL ANALYSIS AND RESULTS

The Statistical Analysis was done using SPSS (version 20). The dependent variables were

Table 1: Demographic profiles of patients of both groups.

Demographic Profile	Group-A(n=20)	Group-B(n=20)
Mean age (in years)	43.1	42.85
Males, (n) %age	60	70
Females, (n) %age	40	30
Marital status(married), (n) %age	65	70%
Population(rural), (n) %age	70	65
Employment status (employed), (n) %age	55	60

Table 2: Comparison of SpO_2 and pulse rate between two groups at baseline & follow-up (7 days).

Measure	Group-A (n=20)			Group-B (n=20)			Between groups (A and B) P-value
	Pre	Post	Within group P-value	Pre	Post	Within group P-value	
Oxygen saturation (SpO_2) Mean±SD	82.1 ± 4.01	88.6 ± 3.33	<0.01	80.5 ± 3.92	89.9 ± 3.57	<0.01	-5.96557 (p<0.01)
Pulse rate Mean±SD	90.3 ± 14.09	82 ± 11.02	<0.01	105.6 ± 7.7	91 ± 7.9	<0.01	-4.88124 (p<0.01)

expressed by arithmetic means and standard deviation and tested using paired t-tests within the group and unpaired t-tests between the groups. A p-value of less than 0.05 was considered significant**.** The mean age of Group-A subjects was 43.1 years, and that of Group-B subjects was 42.85 years. The male-female ratio (M:F) in Group-A and Group B was 3:2 and 7:3, respectively. The percentage of males in Group-A was 60%, and in Group B was 70%. The sociodemographic data did not differ statistically between both groups (p<0.05) (Table 1). After seven days of intervention, the mean SpO_2 was (88.6 vs. 89.9, P<0.001) and pulse rate (was 82 vs. 91 beats/minute, P<0.001) for Group A and Group B, respectively (Table 2).

DISCUSSION

A novel coronavirus outbreak (SARS-CoV-2) that started in December 2019 led to a syndrome known as the "Coronavirus disease of 2019" ("COVID-19") due to a variety of clinical signs. COVID-19 can cause symptoms including fever, coughing up more secretions from the airways, dyspnoea, and others. Due to prolonged bed rest in isolation or care in the ICU, patients have weakness, sarcopenia, and impaired exercise tolerance [10]. This emphasizes the importance of effective rehabilitation methods for improvement in respiratory parameters in COVID-19 patients. In this study, the major finding was that both the groups showed improvements in oxygen saturation and pulse rate at the end of 7 days. But Group B showed higher significant improvement in SPO_2 levels and pulse rate compared to Group A. Thus, the results indicated that breathing exercises, combined with postural changes, were more effective in improving Group B's oxygen saturation and pulse rate.

The findings of this study are consistent with the previous studies [3,11,12] done in this area. A statistically significant improvement in SPO_2 levels and heart rate [the mean SpO2 (96.6±1.9 vs. 90.7±1.8), P<0.001), the need for oxygen (0.81±2.6 vs. 2.3±2.9 L/min, P<0.001) and heart rate (81.2±9.5 vs. 89.2±8.9 beats/min P<0.001)] was documented in the intervention group receiving breathing exercises compared to control group in one study [3].

Another study [11] also reported a significant improvement in oxygen saturation values after chest breathing exercises and deep breathing exercises from 82.3333 ± 2.78337 on the first before-intervention day to 93.5000 ±1.38340 in day five after chest breathing exercises and deep breathing exercises at P<0.05. A significant improvement in oxygen saturation by Awake early self-phoning in the emergency department in COVID-19-positive patients was also documented by one [12] of the previous studies, the results of which showed that 5 minutes of phoning added to the application of supplemental oxygen, the SpO_2 levels improved to 94% (IQR 90 to 95), P = 0.001. The physiological explanation

for the improvement may be that breathing exercises improve the function of the respiratory muscles, ribcage flexibility, and gas exchange and may also reduce blood pressure, respiratory rate, and stress. As a result, these studies discovered improvements in several parameters, including oxygen saturation, heart rate, pulse rate, and the need for oxygen. There was also a documented case report [13] of an adult woman who developed potential secondary complications of prone positioning, including airway obstruction, pressure injuries, and brachial plexopathies while hospitalized for severe COVID-19 infection. The results of our study are not consistent with this particular case report because the subject in this study had other co-morbidities as well as the duration of the study was much longer than our study.

Our study has opened an interesting perspective for future clinical application and research concerning pulmonary rehabilitation in COVID-19 patients in acute hospital settings. However, this study has limitations such as a small sample size, no follow-up, and evaluation of the effect of respiratory rehabilitation only on two parameters, i.e., oxygen saturation and pulse rate and acute situation of the patients. Future studies with a larger and more generalized sample size, and a longer duration of treatment, along with control comparison subjects who receive medical treatment only, are required to confirm the results of the present study.

CONCLUSION

This study concluded that breathing exercises and postural changes in patients hospitalized with COVID-19 are effective rehabilitation programs for improving SPO_2 levels and pulse rate. Patients should be directed to a pulmonary rehabilitation program as soon as possible, especially those admitted to a hospital, given the significant burden of respiratory impairment following the acute phase of COVID-19. These findings should be regarded as preliminary until verified in larger samples and various settings. More research is required to ascertain the long-term impact of breathing exercises on patients with COVID-19 overall respiratory functions.

ABBREVIATIONS

ARDS- Acute Respiratory Distress Syndrome

CoV- Corona Virus

GCS- Glasgow Coma Scale

ICU- Intensive Care Unit

SPO_2- Oxygen Saturation

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COMPETING INTERESTS: The authors declare that they have no competing interests.

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Conflicts of interest: None

REFERENCES

[1]. Wu YC, Chen CS, Chan YJ. The outbreak of COVID-19: An overview. Journal of the Chinese medical association. 2020 Mar;83(3):217-20.

[2]. Contou D, Claudinon A, Pajot O, Micaëlo M, Longuet Flandre P, Dubert M, Cally R, Logre E, Fraissé M, Mentec H, Plantefève G. Bacterial and viral co-infections in patients with severe SARS-CoV-2 pneumonia admitted to a French ICU. Annals of intensive care. 2020 Dec;10:1-9.

[3]. Kader M, Hossain M, Reddy V, Perera NK, Rashid M. Effects of short-term breathing exercises on respiratory recovery in patients with COVID-19: a quasi-experimental study. BMC Sports Science, Medicine and Rehabilitation. 2022 Dec;14(1):1-11.

[4]. World Health Organization. COVID-19 clinical management: living guidance, 25 January 2021. World Health Organization; 2021.

[5]. Government of Maharashtra: Directorate of Health Services, Public Health Department. Standard Treatment Protocol For Covid 19 (15 April 20). 2020 ;1–14.

[6]. Kisner C. Therapeutic exercise Foundations and Techniques Seventh Edition. Clin Calcium. 2018;18(11):1611–5.

[7]. Gosselink R. Breathing techniques in patients with chronic obstructive pulmonary disease (COPD). Chronic respiratory disease. 2004 Jul;1(3):163-72.

[8]. Bott J, Blumenthal S, Buxton M, Ellum S, Falconer C, Garrod R, Harvey A, Hughes T, Lincoln M, Mikelsons C, Potter C. Guidelines for the physiotherapy management of the adult, medical, spontaneously breathing patient. Thorax. 2009 May 1;64(Suppl 1):i1-52.

[9]. Kader M, Hossain M, Reddy V, Perera NK, Rashid M. Effects of short-term breathing exercises on respiratory recovery in patients with COVID-19: a quasi-experimental study. BMC Sports Science, Medicine and Rehabilitation. 2022 Dec;14(1):1-0.

[10]. Zhu Y, Wang Z, Zhou Y, Onoda K, Maruyama H, Hu C, Liu Z. Summary of respiratory rehabilitation and physical therapy guidelines for patients with COVID-19 based on recommendations of World Confederation for Physical Therapy and National Association of Physical Therapy. Journal of physical therapy science. 2020;32(8):545-9.

[11]. Alwan MK, Abd Mohsen RI. The effect of Deep Breathing Exercise on Oxygen Saturation of Patients with COVID-19. Mosul Journal of Nursing. 2022 Aug 21;10(3):51-5.

[12]. Caputo ND, Strayer RJ, Levitan R. Early self proning in awake, non intubated patients in the emergency department: a single ED's experience during the COVID 19 pandemic. Academic Emergency Medicine. 2020 May;27(5):375-8.

[13]. Le MQ, Rosales R, Shapiro LT, Huang LY. The down side of prone positioning: the case of a COVID-19 survivor. American journal of physical medicine & rehabilitation. 2020 Jul 7;99(10):870–2.

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