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RESEARCH ARTICLE

The effect of Deep Breathing Exercise on Oxygen Saturation of Patients with COVID-19

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ABSTRACT
Coronavirus disease is a highly contagious respiratory disease that is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Approximately 80% of people infected with COVID-19 get a moderate form of the disease, which includes a respiratory tract infection with or without pneumonia. Breathing exercises and chest physiotherapy may help post-COVID-19 patients improve their respiratory function and quality of life. Physical rehabilitation is utilized as an adjuvant treatment during the acute period. However, in discharge conditions or COVID-19 patients with a mild degree of infection, breathing exercises and chest therapy may be the primary treatment options to alleviate symptoms. The goal of this study was to see how deep breathing exercises affected oxygen saturation in COVID-19 patients in Thi Qar Province, Iraq. An experimental comparative study design was done for 30 patients to assess the effect of deep breathing exercises on the oxygen saturation of patients with COVID19 in Imam Hussein Teaching Hospital / Thi Qar. The reliability of the questionnaire was achieved through a pilot study and then presented to experts to prove its validity. The total number of items was 20-items in questionnaire and measure oxygen saturation for five days before and after deep breathing exercises. The data was collected by using simple random methods and analyzed by the application of a descriptive and inferential statistical data analysis approach. The results showed for 30 patients there was significant improvement in oxygen saturation values after chest breathing exercises and deep breathing exercises from 82.3333 ± 2.78337 in first before intervention day to 93.5000 ±1.38340 in day five after chest breathing exercises and deep breathing exercises at $P < 0.05$. Also there were no significant statistical correlation between patient's age and their oxygen saturation after chest breathing exercises and deep breathing exercises at $P > 0.05$. The results also showed there were no significant statistical differences between patient's gender, housing environment, and level of education, marital status and occupation with their oxygen saturation after chest breathing exercises and deep breathing exercises at $P > 0.05$. The results accepted the alternative hypothesis there is significant difference in oxygen saturation values after chest breathing exercises and deep breathing exercises in five days for patients with COVID19. Conclude the study there was no statistically significant association between patient's socio-demographic characteristics with their oxygen saturation after chest breathing exercises and deep breathing exercises.

Keywords: Deep Breathing Exercise, Oxygen Saturation and COVID19

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INTRODUCTION

Coronavirus disease, formally known as COVID-19 by the World Health Organization (WHO), is a highly contagious respiratory illness caused by a coronavirus 2 that causes severe acute respiratory syndrome (SARS-CoV-2). Coronavirus disease is the name given to the sickness caused by SARS-CoV-2 infection (COVID-19) (World Health Organization [WHO], 2021). COVID-19 causes a mild disease, such as a respiratory tract infection with or without pneumonia, in 80 percent of cases, and most of them recover. However, in 14 percent of cases, COVID-19 progresses to a more serious disease requiring hospitalization, and the remaining 6% of cases experience critical illness requiring intensive care. COVID-19-related hospitalizations result in a 4% death rate (ECDC, 2020).

Coughing and sneezing create respiratory droplets, which carry the virus quickly from one person to another (Ahmed et. al., 2015). The most prevalent COVID-19 symptoms were non-specific, with fever, cough, and myalgia being the most common. Sore throat, headache, chills, nausea or vomiting, diarrhea, ageusia, and conjunctival congestion were among the other mild symptoms. The COVID-19 was divided into three categories: mild to moderate disease (non-pneumonia and pneumonia), severe disease (dyspnea, respiratory frequency greater than 30/min, oxygen saturation less than 93 percent, PaO2/FiO2 ratio less than 300, and/or lung infiltrates covering more than 50% of the lung field within 24–48 hours), and critical disease (respiratory failure, septic shock, and/or multi-organ dysfunction/fail (Raoult, 2020).

The measurement of oxygen saturation is crucial in the management and comprehension of patient care. Because hypoxemia can have a variety of acute negative consequences on various organ systems, oxygen is strictly controlled inside the body. The brain, heart, and kidneys are among them. The amount of hemoglobin that is now bound to oxygen vs the amount that is unbound is measured by oxygen saturation (Kaufman, 2015).

Breathing exercises and chest physiotherapy may help post-COVID-19 patients improve their respiratory function and quality of life. Physical rehabilitation is utilized as an adjuvant treatment during the acute period. However, under discharge settings or for COVID-19 patients with a slight illness, breathing exercises and chest therapy may be the primary treatment (Abdullahi, 2015). Therefore, this study concerns the effect of deep breathing exercises on the oxygen saturation of patients with COVID-19 in Thi Qar Province/ Iraq.

METHOD

An experimental comparative study design was done for 30 patients to assess the the effect of deep breathing exercises on oxygen saturation of patients with COVID19.

Study instrument: The questionnaire is one of the means to help collect data that contribute to achieving the results expected by the study, so the researcher designed this questionnaire.

This questionnaire consists of three for parts which includes the following:

Part I: This section composed of socio-demographic information which includes age, gender, housing environment and occupation.

Part II: This section deals with the patients to done deep breathing exercises for 10 minutes in prone and sitting and Simi flower positions and documented the effect by using the questioner consist of 20 items and three likert scale from 1 = never to 3= always with minimum and maximum 20- 60.

Part III: That used were digital pulse oximeter (Pulse Oximeter Jumper 500 E) to measure oxygen saturation for five days before and after deep breathing exercises and chest physiotherapy.

Content validity was determined by evaluation of the questionnaire through a panel of (10) experts, who had more than 10 years of professional experience in their fields, to investigate the content of the questionnaire. The reliability of the questionnaire is determined through (10) patients selected from Imam Hussein Teaching Hospital in Thi Qar and the interval period was five weeks. Cronbach's alpha was discovered to be 0.88.

The data were analyzed using (SPSS) version 21 application of statistical analysis system for 30 Samples for patients with COVID19. First, the Mean, Standard deviation, Frequency and Percentage , then, Paired sample t- test, Pearson correlation, one way ANOVA and linear regression. The Significance level is at $p< 0.05$.

RESULTS

The finding in table 1 revealed that age of participant with Mean ± SD 59.066 ± 11.116. According to gender, the male that participant in the study was (63.3%). According to housing environment more than 50% of participant living in the center of the city, regarding the occupation 43.3% of participants not work.

Findings demonstrated in table 2 the evaluation level of participants for the effect of chest breathing exercises and deep breathing exercises on improving oxygen saturation was moderate.

Findings demonstrated in table 3 there was significant improvement in oxygen saturation values after deep breathing exercises from 82.3333 ± 2.78337 in first before intervention day to 93.5000 ±1.38340 in day five after deep breathing exercises at P < 0.05.

The results in table (4) showed there were no significant statistical correlation between patient's age and their oxygen saturation after deep breathing exercises at P > 0.05. The results also showed there were no significant statistical differences between patient's gender, housing environment and occupation with their oxygen saturation after deep breathing exercises at P > 0.05.

Table 1. Demographic characteristics related to participants.

Characteristics		f.	%
Age			
18 – 35 years		1	3.3
36 – 50 years		6	20
51 – 65 years		14	46.7
66 - Above		9	30.0
M ± SD 59.066 ± 11.116			
Total		**30**	**100**
Gender			
Male		19	63.3
Female		11	36.7
Total		**30**	**100**
Housing environment			
Rural		14	46.7
Centre			
Total		16	53.3
		30	**100.0**
Occupation			
Earner		9	30.0
Employer		7	23.3
Student		1	3.3
Not work		13	43.3
Total		**30**	**100.0**

Table 2. Distribution the evaluation level of participants for the effect of deep breathing exercises on improving oxygen saturation

Deep breathing exercises 20Q = 20 - 60		
Range of scores	N.	%.
20-33 Poor	3	10.0
34-46 Moderate	19	63.3
47-60 High	8	26.7
Total	30	100.0
Mean ± SD 43.26 ± 7.357		

Table 3. Distribution oxygen saturation before and after chest breathing exercises and deep breathing exercises

	Spo2 before		Spo2 after		P. value
Day1	82.3333	2.78337	84.4333	2.76285	**.000**
Day2	84.0667	2.47656	86.3333	2.32428	**.000**
Day3	85.9000	2.32453	88.6667	2.03983	**.046**
Day4	87.8667	2.14530	90.9333	1.81817	**.043**
Day5	90.0333	1.86591	93.5000	1.38340	**.032**
Total	**86.040 ± 2.232**		**88.773 ± 1.969**		**.003**

Table 4. The association between patients' demographics and their oxygen saturation after deep breathing exercises

Demographics	Statistical analysis	p. value	Sig.
Age	Cc = -.269-	.150	NS
Gender	F = .714	.581	NS
Occupation	F = 1.542	.198	NS
Housing environment	F = .886	.506	NS

DISCUSSION

This study used an experimental comparative study design assess the the effect of deep breathing exercises on oxygen saturation of patients with COVID19. The present study samples consist of 30 patients with COVID19 in random selection by using simple random methods.

The present study showed the age of participant with Mean ± SD 59.066 ± 11.116, according to gender, the male that participant in the study was (63.3%).

The present study supported by Jiandani, et al. 2021 in India that stated in the results for 112 samples (83 men and 29 females) with mean age was 53.87 ± 15 years (, 2015).

Mejía, et al. 2020 stated in the study that conducted in Peru that showed 369 patients (65.31 percent) were male, with a median age of 59 years. Obesity (42.55 percent), diabetes mellitus (21.95 percent), and hypertension were all present in the majority of patients (68.56 percent) (21.68 percent) (Meji, 2020).

According to Thenmozhi & Bindya, 2021, in a survey performed in India, 33.3 percent were illiterates and had secondary education, 33.3 percent were agriculturists and self-employed, and 73.3 percent were in the Rs.10000 – Rs.50000 income range and 73.3 percent were married (Thenmozhi, 2021).

The present study showed there was significant improvement in oxygen saturation values after chest breathing exercises and deep breathing exercises from 82.3333 ± 2.78337 in first day before intervention to 93.5000 ±1.38340 in day five after chest breathing exercises and deep breathing exercises for patients with COVID19 at $P < 0.05$.

The present study showed that the evaluation level of participants for the effect of chest breathing exercises and deep breathing exercises on improving oxygen saturation for patients with COVID19 was moderate.

According to Nirmalasari, Mardiyono, and Dharmana, 2019, a study conducted in Indonesia revealed a 1.69 percent increase in oxygen saturation, demonstrating the effect of deep breathing exercise intervention and active range of motion on oxygen saturation (p=0,000) (Nirmalasari, 2020).

The present study, conducted in Italy by Battaglini, et al. 2021, found that chest physiotherapy is beneficial in enhancing long-term respiratory physical performance in ICU survivors (Battaglini, 2021).

The current study, which was sponsored by Jiandani, et al. 2021 in India, found that following breathing exercises and prone positioning, all patients on oxygen supplementation had a statistically significant improvement in SpO2, in patients using non-invasive ventilation and a facemask, side-lying orientation improved oxygen saturation. In individuals with COVID-19, both breathing exercises and posture demonstrate an immediate increase in oxygen saturation (Jianda et. al., 2021).

Alahmri, et al. 2021 stated in the study that conducted in Saudi Arabia that showed the paired t-test was used to compare the means pre- and post-the breathing exercises with p-value >0.05 and also showed a significant difference in inspiratory lung volume and SPO2 p-value= 0.001 (Alahmari et. al., 2021).

Kumar, et al., 2020 reported in a study done in India that attempted to determine the association between dyspnea and age, as well as SPO2 levels in COVID-19, that the dyspnea and SPO2 levels were better and statistically significant in contrast to the control group (Kumar et. al., 2020).

The current investigation, which was supported by Grbovic et al., 2021 in Serbia, found that the levels of oxygen saturation changed considerably before and after respiratory exercise sessions (95.77 to 98.02) ($p < .001$) (Grobovic et. al., 2015).

The present study showed there were no significant statistical correlation between patient's age and their oxygen saturation after chest breathing exercises and deep breathing exercises at $P > 0.05$.

According to Kumar, et al., 2020, a study done in India found a slight positive connection between levels of dyspnea and age ($r= 0.0385$) $p > 0.05$, which is no statistically significant [13].

CONCLUSIONS

The characteristics of the current study revealed the highest percentage were male at age with mean fifty years old, in addition, the highest percentage of them living in the center of the city.

The results accepted the alternative hypothesis there is significant difference in oxygen saturation values after chest breathing exercises and deep breathing exercises in five days for patients with COVID19. Conclude the study there was no statistically significant association between patient's socio-demographic characteristics with their oxygen saturation after deep breathing exercises.

ETHICAL CONSIDERATIONS COMPLIANCE WITH ETHICAL GUIDELINES

This study was completed following obtaining consent from the University of Baghdad.

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AUTHOR'S CONTRIBUTIONS

Study concept, Writing, Reviewing the final edition by all authors.

DISCLOSURE STATEMENT:

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