



The Effectiveness of Prone Position Respiratory Rehabilitation in Covid-19 Patients: Literature Review

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ABSTRACT

Introduction: Coronavirus Disease 2019 (Covid-19) which can cause pulmonary complications, cardiovascular, and muscular which results in various organ dysfunctions which in turn can reduce the patient's lung functional capacity. This matter can cause a decrease in the patient's oxygen saturation (SpO₂), causing hypoxaemia due to inadequate ventilation and perfusion diffusion leading to sepsis to septic shock. For this, various efforts to increase oxygen saturation deficit and decrease mortality, including by means of respiratory rehabilitation in a prone position.

Method: This method uses a literature review design by using 3 databases, namely Google Scholar, Science Direct, Pubmed.

Result: The results of this literature review using breathing exercises are: prone position. The time span of 10 journals that have been reviewed using average duration of implementation is 2-4 hours per day, with 1-4 times per session scheduled for 4 weeks. A given patient's lung functional capacity x prone position intervention in 10 journals increased, in results it shows that it is statistically significant in increasing Oxygen saturation SpO₂ ($p < 0.005$).

Conclusion: These results indicate an effective prone position in improving oxygenation.

1. Introduction

The Covid-19 disease causes various emergencies and infections systems in the human body with a focus on attacking the lungs lead to respiratory failure, respiratory dysfunction, physical, psychologically, causing a decrease in the patient's lung functional capacity. Corona virus causes pulmonary, cardiovascular and muscular complications which results in various organ dysfunctions which can ultimately lead to reduce the patient's lung functional capacity. This can cause decreased oxygen saturation (SpO₂) in the patient, causing hypoxaemia due to ventilation perfusion mismatch and diffusion limitation to from sepsis to septic shock ([Vitacca et al., 2020](#))

Patients with Covid-19 may have some residual fibrotic lesions in the lungs after treatment, which may affect the patient's respiratory function. However, the study found an increase in oxygen saturation (SpO₂) and improvement of oxygenation in covid-19 patients after exercise intervention breathing in the prone position. The prone position can also improve ventilation pulmonary in some patients. The potential mechanism of the prone position which corrects hypoxia caused by redistribution of blood and fluid flow edema redistributed to the central side by gravity and alveolar atrophy is reopened in the prone position, leading to increased amount of saturated oxygen ([Bo et al., 2021](#))

2. Methods

This method uses a literature review design by using 3 databases, namely Pubmed, Google Scholar, Scienedirect with keywords "Rehabilitation Respiratory "AND" Pone Position" "Pone Position AND Covid-19". Year of Search set from 2020 – 2022. In the early stages livelihoods are found a total of 444 articles (Pubmed=14, Google scholar=148, Scienedirect=282). After sorting and filtering there are irrelevant articles based on the title and abstracts as many as articles. So there were 318 articles. From 318 there are 278 articles with the outcome of no increase in saturation oxygen and improved oxygenation. The total number of articles that can be reviewed is 10 article. Below is a flowchart of the selection process The articles that will be used in the literature review are sorted from preliminary search on electronic databases, selection of appropriate titles and abstracts, selection of conformity with inclusion criteria, and selected journal articles that used in this literature review.

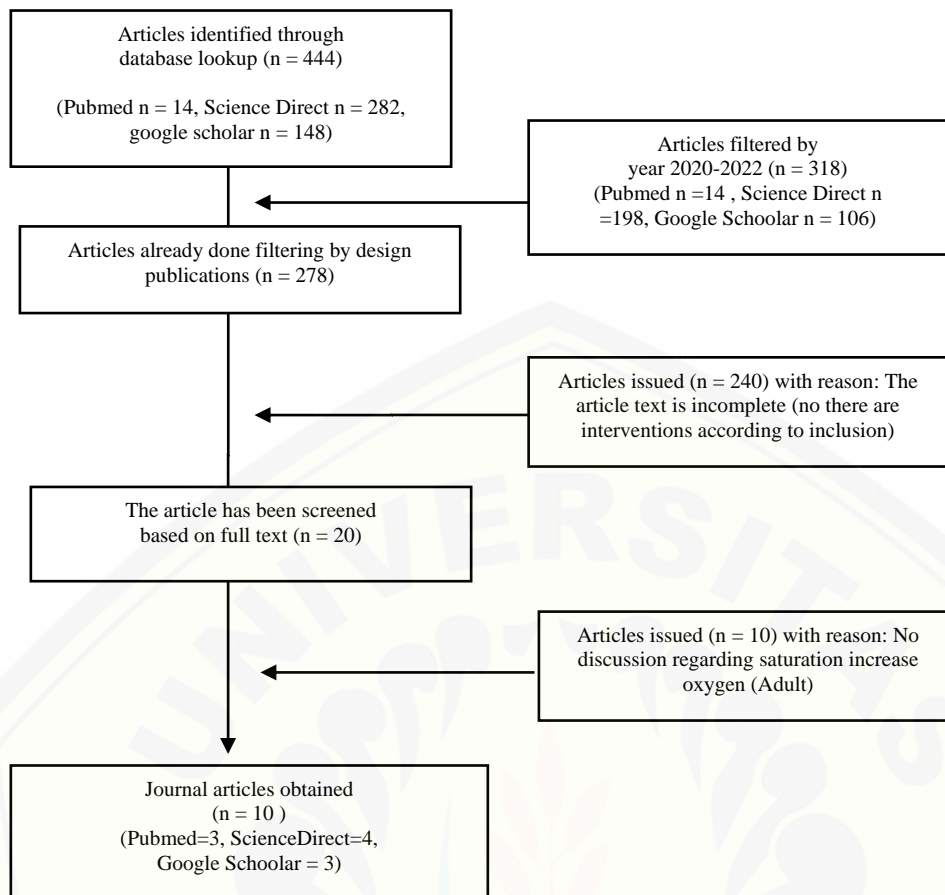


Figure 1. Flowchart

3. Result and Analysis

A total of 10 (ten) articles that meet the inclusion criteria based on on the topic of a literature review.

TABLE 1
Characteristics of Study Respondents

Author	Characteristics of Study Respondents (age)	Characteristics of Study Respondents (gender)
(Ashra dkk., 2022)	38 - 60 years old	Male and Female
(Kumar dkk., 2022)	50-60 years old	No explained
(Ibarra-Estrada dkk., 2022)	≥ 18 years old	Male and Female
(Rosén dkk., 2021)	≥ 18 years old	Male and Female
(Fazzini dkk., 2022)	>18 years old	Male and Female
(Ramanathan dkk., 2020)	≥ 18 years old	Male and Female
(Althunayyan dkk., 2022)	> 18 years old	Male and Female
(Fralick dkk., 2022)	45-56 years old	Male and Female
(Zaretsky dkk., 2022)	> 18 years old	Male
(Kaur dkk., 2021)	50-60 years old	No explained

The results obtained from the research that the age range of the respondents is 18-60 years with male and female sex

TABLE 2
Types of Breathing Exercises

No	Author	Types of Breathing Exercises
1	(Ashra dkk., 2022)	Prone Position
2	(Kumar dkk., 2022)	Prone Position and High Flow Nasal Oxygen
3	(Ibarra-Estrada dkk., 2022)	APP (Awake Prone Positioning)
4	(Rosén dkk., 2021)	APP (Awake Prone Positioning) Prone Position Awake



No	Author	Types of Breathing Exercises
5	(Fazzini dkk., 2022)	Prone Position, Simple Oxygen Therapy
6	(Ramanathan dkk., 2020)	APP (Awake Prone Positioning)
7	(Althunayyan dkk., 2022)	Prone Position
8	(Fralick dkk., 2022)	Prone Position
9	(Zaretsky dkk., 2022)	Prone Position
10	(Kaur dkk., 2021)	APP (Awake Prone Positioning)

Overall, 10 articles used the prone position as the primary intervention.

TABLE 3
Prone Position Respiratory Duration

NO	Author	Length of Implementation of the Prone Position		
		Hours Per Session	Sessions Per Day	Week
1	(Ashra dkk., 2022)	12-16 hours	1-3 sessions	4 weeks
2	(Kumar dkk., 2022)	30 minutes - 2 hours	No explained	No explained
3	(Ibarra-Estrada dkk., 2022)	3-4 hours	4 sessions	6 weeks
4	(Rosén dkk., 2021)	2-16 hours	No explained	No explained
5	(Fazzini dkk., 2022)	3-9 hours	3 sessions	4 weeks
6	(Ramanathan dkk., 2020)	4-16 hours	No explained	No explained
7	(Althunayyan dkk., 2022)	4 hours	4 sessions	3 weeks
8	(Fralick dkk., 2022)	1-12 hours	4 sessions	2 weeks
9	(Zaretsky dkk., 2022)	2-4 hours	2 sessions	4 weeks
10	(Kaur dkk., 2021)	4-16 hours	2-4 sessions	4 weeks

The duration of the prone position on average is 2-4 hours per day with the division of sessions per day 1-4 times for 4 weeks regularly scheduled, all studies consider different implementation times for the prone position.

TABLE 4
Assessment Instrument

No	Author	Tools
1	(Ashra dkk., 2022)	Pulse Oximetry (SpO ₂)
2	(Kumar dkk., 2022)	ABG (Arterial Blood Gas)
3	(Ibarra-Estrada dkk., 2022)	Pulse Oximetry (SpO ₂)
4	(Rosén dkk., 2021)	ABG (Arterial Blood Gas)
5	(Fazzini dkk., 2022)	ABG (Arterial Blood Gas)
6	(Ramanathan dkk., 2020)	Pulse Oximetry (SpO ₂)
7	(Althunayyan dkk., 2022)	Pulse Oximetry (SpO ₂)
8	(Fralick dkk., 2022)	Pulse Oximetry (SpO ₂)
9	(Zaretsky dkk., 2022)	Pulse Oximetry (SpO ₂)
10	(Kaur dkk., 2021)	Pulse Oximetry (SpO ₂)

The instruments used are (ABG) Arterial Blood Gas and Pulse Oxymeter tools that play an important role in determining the value of oxygen saturation.

TABLE 5
SpO₂ value Before and After Prone Position

No	Artikel Jurnal	Before	After
1	(Ashra dkk., 2022)	95.37%	97.45%
2	(Kumar dkk., 2022)	90%	94%
3	(Ibarra-Estrada dkk., 2022)	92.98%	94.60%
4	(Rosén dkk., 2021)	93%	95%
5	(Fazzini dkk., 2022)	91.86%	95.34%
6	(Ramanathan dkk., 2020)	91%	94%
7	(Althunayyan dkk., 2022)	91.75%	95.25%
8	(Fralick dkk., 2022)	95%	96%
9	(Zaretsky dkk., 2022)	No explained	95%
10	(Kaur dkk., 2021)	92%	94%

The results showed that the average range of oxygen saturation before the prone position was (91-94%), after the prone position increased by an average of 95%, these results indicate that after the prone position there is an increase in SpO₂

TABLE 6
Statistical Test Results

Author	Statistical Test Type	Statistical Test Results
(Ashra dkk., 2022)	Test Test Q and I ²	P = < 0.05
(Kumar dkk., 2022)	Shapiro-wilk test	P = < 0.05
(Ibarra-Estrada dkk., 2022)	Mann-Whitney U test	P = < 0.05
(Rosén dkk., 2021)	Whitney U-test	P = < 0.05
(Fazzini dkk., 2022)	Test Test Q and I ²	P = 0.05
(Ramanathan dkk., 2020)	I ² and Chi squared (χ^2) test	P = 0.05
(Althunayyan dkk., 2022)	Paired T-tests	P = < 0.05
(Fralick dkk., 2022)	Not explained	P = 0.05
(Zaretsky dkk., 2022)	Paired T-tests	P = < 0.05
(Kaur dkk., 2021)	Mann-Whitney U test	P = < 0.05

Of 10 journal articles more than 90% showed good results from giving the prone position to increase SpO₂/FiO₂ in Covid-19 patients, namely with P < 0.05.

4. Discussion

Coronavirus Disease 2019 (Covid-19) can cause a decrease in oxygen saturation (SpO₂) in patients, causing hypoxemia due to inappropriate ventilation perfusion and limited diffusion leading to sepsis to septic shock. To increase oxygen saturation that has a deficit and reduce mortality, one of them is by means of respiratory rehabilitation in the prone position. In the prone position, the dorsal aspect of the lung has lower recruitment, which means that theoretically, it has less fluid, and other inflammatory secretions. In addition, changing the patient's position can increase atelectasis on the dorsal side as well as improve ventilation. All 10 articles used the prone position as the primary intervention. In research ([Kaur et al., 2021](#)). The prone position has been part of clinical practice since the 1970s and is considered the standard of care for mechanically ventilated patients who have severe acute respiratory distress syndrome. The duration of the prone position on average is 2-4 hours per day with the division of sessions per day 1-4 times for 4 weeks regularly scheduled, all studies consider different implementation times for the prone position.

The effects of the prone position are time-dependent and stage-dependent (mild to severe respiratory failure). The instrument used is (ABG) Arterial Blood Gas to check oxygen saturation (SpO₂), acidity (pH) and the amount of oxygen (O₂) and carbon dioxide (CO₂) in the blood. Then according to other researchers ([Fralick et al., 2022](#)) an instrument that is often used and easy to apply is the Pulse Oxymeter to determine and identify before and after giving the prone position. The results showed that the average range of oxygen saturation before the prone position was (91-94%), after the prone position increased by an average of 95%, these results indicate that after the prone position there was an increase in SpO₂. From 10 articles, it was shown that giving the prone position in increasing was effective in increasing SpO₂/FiO₂ in Covid-19 patients, namely with P < 0.05, which means that giving the prone position had an effect on increasing SpO₂/FiO₂. Meanwhile, if the value is > 0.05, it means that there is no significant effect.

5. Conclusion

The type of breathing exercise as the main intervention is giving the prone position which can be given 1-4 times in 4 weeks with an average duration of 2-4 per hour per session. The value of SpO₂/FiO₂ in the prone position before the prone position was obtained with a result range of 0.60 then after the prone position intervention increased by a range of 1.59 and in this study there was an increase in the value of SpO₂/FiO₂ with an average difference in the range of increase. The results of statistical tests from 10 journal articles of more than 90% showed good results from giving the prone position to increase SpO₂/FiO₂ in Covid-19 patients, namely with P < 0.05, which means that giving the prone position is effective in increasing SpO₂/FiO₂.

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