

IMPROVING OXYGEN SATURATION IN COPD PATIENTS THROUGH THE COMBINED APPLICATION OF THE *TRIPOD POSITION* AND *BALLOON BLOWING EXERCISES*

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ABSTRACT

Chronic Obstructive Pulmonary Disease (COPD) is a chronic lung disease characterized by progressive airflow obstruction that causes ventilation disorders and gas exchange that lowers oxygen regulation. This study aims to analyze the effect of the combination of *tripod position* and *balloon blowing exercise* on oxygen saturation in COPD patients at the Pulmonary Polyclinic of RSI Sakinah Mojokerto. The research uses a pre-experimental design with a *one group pretest-posttest* approach. The sample amounted to 50 COPD patients who were selected using the *consecutive sampling* technique. Oxygen saturation was measured using a *pulse oximeter* before and after the intervention. The results showed that the average oxygen saturation increased from 93.72% to 95.02% with a difference of 1.30%. Data were analyzed using the Wilcoxon Signed Rank Test with a value of $Z = -5.811$ and $p\text{-value} = 0.000$ ($p < 0.05$), so that the combination of *tripod position* and *balloon blowing exercise* had an effect on increasing oxygen saturation. This intervention helps improve alveolar ventilation, reduce *water trapping*, and improve gas exchange so that it can increase oxygen saturation in COPD patients.

Keywords: *balloon blowing exercise, COPD, oxygen saturation, tripod position*

INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is a chronic lung disease characterized by obstruction of airflow that is progressive and cannot be fully reversible. This condition occurs as a result of chronic inflammatory processes in the airways and lung tissues caused by long-term exposure to cigarette smoke, air pollution, and other harmful particles (Retti & Kristinawati, 2023). The obstruction of airflow causes ventilation disruption and gas exchange so that oxygen levels in the blood decrease. A decrease in oxygen saturation will improve respiratory work, aggravate shortness of breath

COPD is one of the main causes of morbidity and mortality in the world. COPD ranks third in global mortality with more than three million deaths annually (WHO, 2024). In line with this, (GOLD, 2024) also states that around 251 million people in the world are living with COPD. In Indonesia, data Basic Health Research (RIKESDAS) shows an increase in COPD cases, especially in the adult to elderly age group (Ministry of Health of the Republic of Indonesia, 2022). The Health Profile of East Java Province in 2024 shows the prevalence of COPD at 3.6% of the population, the achievement of COPD screening in Mojokerto Regency reaches 2.02% of the population, while in Mojokerto City it is 1.77% of the population based on the evaluation of the screening target in 2024 (East Java Provincial Health Office, 2024).

Decreased oxygen saturation in COPD patients occurs due to chronic inflammation that causes narrowing of the bronchi, increased mucus production, damage to the alveoli, and the occurrence of air trapping and pulmonary hyperinflation. This condition results in a ventilation-perfusion imbalance so that the oxygen diffusion process does not take place

optimally (Yunus et al., 2021). The management of COPD has so far been dominated by pharmacological therapy, while non-pharmacological interventions have not been optimally implemented. In fact, non-pharmacological interventions have an important role in increasing the oxygen saturation of COPD patients (Earl & Grivell, 2021).

One of the nonpharmacological interventions that can be carried out is a combination of tripod position and balloon blowing exercise. Tripod position Helps optimize diaphragm function, increase the expansion of the chest cavity, and reduce the use of the respiratory support muscles so that alveolar ventilation becomes more effective (Gina, 2024). While balloon blowing exercise is a breathing exercise that aims to prolong the expiratory phase, reduce air trapping, increase the strength of the respiratory muscles, and improve alveolar ventilation so that the gas exchange process becomes more optimal (Wilma et al., 2023).

Furthermore, this is also supported by research that has previously been conducted by (Putri & Fadhani, 2025) that tripod position can increase oxygen saturation with an average oxygen saturation before intervention of 89.86% to 92.93% after tripod position. Meanwhile, research that has been conducted by (Sumarni et al., 2025) balloon blowing exercise it can increase oxygen saturation with an average oxygen saturation value of 76.43% before intervention to 81.74% after intervention.

Based on medical record data from RSI Sakinah Mojokerto, during the last three months in December 2025 - February 2026, 250 patients (pulmonary poly) never had breathing exercise combination tripod position and balloon blowing exercise.

METHODS

This study uses a pre-experimental design with a one group pretest-posttest approach. The study aims to analyze the effect of the combination of tripod position and balloon blowing exercise on oxygen saturation in patients with Chronic Obstructive Pulmonary Disease (COPD) at the Pulmonary Polyclinic of RSI Sakinah Mojokerto.

The population of this study is all COPD patients who underwent examination and treatment at the Pulmonary Polyclinic of RSI Sakinah Mojokerto during the research period. The research sample amounted to 50 respondents who were selected using consecutive sampling techniques in accordance with the inclusion and exclusion criteria of the study. A combination of tripod position and balloon blowing exercise interventions were given according to the standard operational procedures of the research. Oxygen saturation was measured using a pulse oximeter before and after the intervention.

Data analysis was carried out using univariate analysis to describe the characteristics of respondents as well as the distribution of oxygen saturation values before and after the intervention. Before the hypothesis test was carried out, a normality test was carried out using Shapiro-Wilk and showed that the data was not normally distributed. Therefore, bivariate analysis was performed using the Wilcoxon Signed Rank Test. Decision-making is based on a significance level of $\alpha = 0.05$. The p-value is 0.000 ($P < 0.05$). Thus, the combination of tripod position and balloon blowing exercise significantly affected oxygen saturation in COPD patients at the Pulmonary Polyclinic of RSI Sakinah Mojokerto.

FINDINGS AND DISCUSSION

RESEARCH RESULTS

GENERAL DATA

Table 1 Distribution of Respondent Characteristics at the Pulmonary Polyclinic of RSI Sakinah Mojokerto

Category	Frequency (n)	Percentage (%)
Late adults 42 - 45 years old	4	8
Early Elderly 46 - 55 years old	25	50
Elderly 56 - 60 years old	21	42
Gender		
Male	35	70
Women	15	30
Smoking		
Yes	32	64
No	18	36
Job		
Housewives	6	12
Private employees	7	14
Farmer	17	34
Civil servant/retired	8	16
Self-Employed	12	24
Total	50	100

Source: Primary Data

Table 1 of the characteristics of respondents based on age is in the range of 46–55 years, which is as many as 25 respondents (50%). Based on gender, most of the respondents were male, namely 35 respondents (70%). Based on smoking history, more than half of the respondents had a history of smoking, namely 32 respondents (64%). Meanwhile, based on work, most of the respondents work as farmers, namely 17 respondents (34%).

SPECIAL DATA

Table 2 Oxygen Saturation (SpO₂) Before Tripod *Position* and Balloon *Blowing Exercise Combination*

Variabel	Minimum	Maximum	Mean	Std. Deviation
SpO ₂ pretest	93	95	93,72	0,784

Source: Primary Data

Table 2 shows that before the combination of *tripod position* and *balloon blowing exercise*, from 50 respondents, an average oxygen saturation (SpO₂) value of 93.72 with a std. deviation of 0.784 was obtained.

Table 3 Oxygen Saturation (SpO₂) After Combination *Tripod Position* and *Balloon Blowing Exercise*

Variabel	Minimum	Maximum	Mean	Std. Deviation
SpO ₂ posttest	93	97	95,02	1,020

Source: Primary Data

Table 3 shows that after the combination of *tripod position* and *balloon blowing exercise*, from 50 respondents, an average (mean) oxygen saturation (SpO₂) of 95.02 with a std. deviation of 1.020 was obtained.

Table 4 Results of Oxygen Saturation Normality Test Before and After Giving Combination Interventions

Variabel	Shapiro-Wilk Statistic	df	p-value
SpO ₂ pretest	0,765	50	0,000
SpO ₂ posttest	0,899	50	0,000

Source: Primary Data

Table 4 of the results of the normality test using Shapiro-Wilk obtained a significance value on oxygen saturation before and after the combination of *tripod position* and *balloon blowing exercise* of 0.000 ($p < 0.05$), so that the data was not normally distributed. Therefore, the analysis was continued using the wilcoxon signed rank test.

Table 5 Results of the Wilcoxon Signed Rank Test Effect of the Combination of Tripod Position and Balloon Blowing Exercise on Oxygen Saturation

Variabel	Mean pretest	Mean posttet	Differences	Z	p-value
Oxygen Saturation (SpO ₂)	93,72	95,02	+1,30	5,811	0,000

Source: Primary Data

Table 5 shows that the average oxygen saturation (SpO₂) of the respondents increased from 93.72 to 95.02 after being given a combination of *tripod position* and *balloon blowing exercise*, with a difference of 1.30. The results of the Wilcoxon Signed Rank Test obtained a Z-value of -5.811 which showed a consistent difference between the oxygen saturation value before and after the intervention, and a p-value of 0.000 ($p < 0.05$) was obtained, indicating that the difference was statistically significant. Thus, the combination of *tripod position* and *balloon blowing exercise* has an effect on increasing oxygen saturation in COPD patients at the Pulmonary Polyclinic of RSI Sakinah Mojokerto.

DISCUSSION

The results of the study showed that before being given a combination *tripod position* and *balloon blowing exercise*, from 50 respondents, an average (mean) oxygen saturation value (SpO₂) of 93.72 with std. deviation 0.784. These results showed that the respondents experienced a decrease in oxygen saturation. Decreased oxygen saturation in COPD patients is caused by the consequences of ventilation disturbances and gas exchange (Brown, 2026). In COPD patients, chronic inflammation, narrowing of the airway, increased mucus production, and damage to the alveoli cause *air trapping* and ventilation-perfusion imbalance (*ventilation-perfusion mismatch*), so that the diffusion of oxygen into the blood

becomes not optimal. This condition contributes to a decrease in oxygen saturation in COPD patients (Sakar et al., 2023).

After being given a combination *tripod position* and *balloon blowing exercise*, the average oxygen saturation increased to 95.02%. This improvement suggests that both interventions are able to improve lung ventilation and improve gas exchange efficiency. *Tripod position* helps optimize the work of the diaphragm and increase the expansion of the chest cavity (Lewsley, 2023). While *balloon blowing exercise* is a nonpharmacological breathing exercise that helps improve lung ventilation by prolonging the expiratory phase, reducing water trapping, increasing CO₂ excretion, and strengthening respiratory muscles. The ventilation repair increases gas exchange so that the oxygen saturation of COPD patients increases. In addition, this exercise can also reduce respiratory work and reduce shortness of breath, making it effective as part of pulmonary rehabilitation (Shivany et al., 2025). The results of this study are in line with the research conducted by (Wahyuni & Dewi, 2023) which states that the intervention *tripod position* and effective breathing exercises to improve oxygenation status in COPD patients.

Although the results of the study showed an increase in the average oxygen saturation (SpO₂) after the combination administration *tripod position* and *balloon blowing exercise*, out of a total of 50 respondents, there were 8 respondents who did not experience an increase in oxygen saturation after the intervention. Most of the respondents were female and had no history of smoking. According to (WHO, 2024), people are also at risk of experiencing COPD even though they have no smoking history because they can be exposed to other risk factors, such as passive cigarette smoke and air pollution. Meanwhile, overall the results of the study showed that most of the respondents were male, namely as many as 35 respondents. These findings are in line with the theory that COPD is more common in men due to the higher prevalence of smoking, exposure to dust and irritants in the work environment (GOLD, 2025). Physiologically, increased oxygen saturation after combination administration *tripod position* and *balloon blowing exercise* occurs through the improvement of alveolar ventilation, increased expansion of the chest cavity, reduced *air trapping*, as well as improved gas exchange (Guyton & Hall, 2021).

Although most of the respondents who did not experience an increase in oxygen saturation in this study were women, the findings could not be interpreted as influencing the effectiveness of the combination of *tripod position* and *balloon blowing exercise* in increasing oxygen saturation. This is because this study did not analyze the relationship between sex and changes in oxygen saturation, but only described the characteristics of respondents who did not experience an increase in oxygen saturation after the intervention. The highest increase in oxygen saturation after the combination of *tripod position* and *balloon blowing exercise* was 2%. Although numerically small, it still has clinical significance in COPD patients because it shows improved ventilation and gas exchange so that the alveoli are able to receive and distribute oxygen more effectively (Widoroni et al., 2024).

CONCLUSION

The results of the study, which has been conducted on 50 COPD patients at the Pulmonary Polyclinic of RSI Sakinah Mojokerto, obtained the average oxygen saturation (SpO₂) before being given a combination of *tripod position* and *balloon blowing exercise* of

93.72 and after being given intervention, oxygen saturation increased to 95.02 with a difference of 1.30. The results of the Wilcoxon Signed Rank Test obtained a Z-value of -5.811 which indicates a difference between oxygen saturation before and after the intervention, with a p-value of 0.000 ($p < 0.05$). Thus, it can be concluded that there is an effect of a combination of *tripod position* and *balloon blowing exercise* on increasing oxygen saturation in COPD patients at the Pulmonary Polyclinic of RSI Sakinah Mojokerto

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