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Research Article

The Effectiveness of the 30^0 and 45^0 Semifowler Positions on Changes in Oxygen Saturation in Pneumonia Patients Installed Ventilator in ICU Room RSPI Sulianti Saroso

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Abstract

Aims : Pneumonia is an acute infectious disease that affects the tissues (lungs) precisely in the alveoli caused by several microorganisms such as viruses, bacteria, fungi, and other microorganisms. The semifowler position is able to maximize lung expansion and decrease the effort to use the muscles of breathing aids, so that maximum ventilation opens, maintains comfort, increases the value of oxygen saturation and secret movements.
Methods : The research method used was quasiexperimental with pre-post-test in one group (One-group pre-post test design) with a sample of 20 patients.
Results : Based on the results of bivariate analysis showed that there was a significant influence between the influence of the position of semifowler 30^0 and 45^0 on changes in oxygen saturation in patients with pneumonia with p-value <α (0.007 <0.05). The semifowler 45^0 position is more effective in increasing oxygen saturation in patients with pneumonia attached to a ventilator having an average increase in oxygen saturation of 2.2%.
Conclusion : It is anticipated that the results of this study can be used by ICU nurses to apply the semifowler 450 position in care, thereby contributing to the renewal and expansion of nursing knowledge.

Keywords
Semifowler Position, Oxygen Saturation, Pneumonia, Ventilator, ICU Room

INTRODUCTION

Pneumonia is an acute infectious disease that affects the tissues (lungs) precisely in the alveoli caused by several microorganisms such as viruses, bacteria, fungi, and other microorganisms. In patients with pneumonia there will be a pressure imbalance, as a result of an infectious process that attacks the alveoli (1). So that its function will be disrupted and result in respiratory failure which causes inadequate oxygen delivery and requires immediate clinical intervention to avoid tissue hypoxia and organ damage which results in decreased lung function and can cause death. (2). Classification of pneumonia according to (3) states that pneumonia is divided based on environment and anatomy. Pneumonia based on the environment in the form of community pneumonia, nosocomial pneumonia/hospital, and ventilator pneumonia. In addition, pneumonia based on anatomy includes lobar pneumonia, lobular pneumonia, and interstitial pneumonia.

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The World Health Organization (WHO) also reported 15 developing countries with the highest number of deaths due to pneumonia with the highest number coming from India with 158,176, followed by Nigeria in second with 140,520 and Pakistan in third with 62,782 deaths. Indonesia is in seventh place with a total of 20,084 deaths. Pneumonia morbidity rate is quite high. Based on data presented by the World Health Organization (4), cases of pneumonia experienced an increase in prevalence of 2.1% in 2007 to 2.7% in 2013. Based on age group, the increase in prevalence occurred at the age of 45-54 years and continues to increase at a later age. Pneumonia is common in 45^0 million people per year. In the world the incidence of pneumonia was recorded as 9.2 million people died in a period of 1 year worldwide, 92% of the total cases that have been recorded were found on the continents of Asia and Africa. According to (5,6) who is a researcher from America, states that in America pneumonia is the fourth leading cause of death in old age, with a mortality rate of 168 people per 100,000 pneumonia patients. Pneumonia is also the main cause of millions of deaths in all groups (7% of the world's total deaths). Hospitalization rates for pneumonia have increased in Denmark, demonstrating that the risk of pneumonia in males is greater than that of females, patients >50 years of age in males as much as 4.2% and in females as much as 3.4% due to males often activities outside the home so that they are easily exposed to pollution and are more likely to consume cigarettes. Meanwhile, based on data from the Medical Record RSPI Prof. Dr. Sulianti Saroso, pneumonia ranks second out of the top ten diseases being treated at RSPI Sulianti Saroso with a total of 790 pneumonia patients in 2021. Whereas in 2022 from January to August there will be 380 patients (7).

Semi-Fowler's position and administration of oxygen are methods that can be used to maintain a stable breathing pattern in pneumonia patients who experience shortness of breath. Giving oxygen to the patient is also expected to reduce the patient's shortness of breath, while maximizing lung expansion can be given a semi-fowler position (8).

From the results of (9,10), with the title the effect of giving the semi-fowler position 30^0 and 45^0 on the effectiveness of breathing patterns in pulmonary TB patients, the results show that the semi-fowler position of 45^0 can show the patient's respiratory frequency is normal, so that the function of the movement of the chest wall and diaphragm is normal or better chest expansion and more oxygen entering. According to the semi-fowler position, it is the simplest and most effective method for reducing the risk of decreasing chest wall expansion and being able to maximize lung expansion and reduce the effort to use accessory muscles for breathing, so that ventilation opens maximally, maintains comfort and increases secret movement.

METHODS

The research method uses a quasi-experimental research design with pre-test in one group (one-group pre-post test design without control group). In this study, two groups were observed which were observed twice, namely before and after the treatment. Observations before the experiment (O1) are called pre and observations after the experiment (O2) are called post (11). Population is any object that has certain quantity and characteristics determined by the researcher (12). The target population in this study were all pneumonia patients in the ICU RSPI Prof Dr. Sulianti Saroso uses a mechanical ventilator with an average number of patients per month in 2022 of 25 patients. This study used bivariate analysis of the group that received the treatment. To find out the comparison of the treatment group in the semi-fowler position of 30º and the treatment group in the semi-fowler position of 45º.

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RESULT

In the following univariate analysis, the patient characteristics will be explained descriptively, namely age, sex, smoking, nutritional status, and research variables, including semifowler positions 30^0 and 45^0 and oxygen saturation in pneumonia patients on ventilators in the ICU RSPI Sulianti

Table 1. Distribution of Patients Based on Characteristics according to Age, Gender, Smoking and Nutritional Status in Pneumonia patients in the ICU Room of RSPI Sulianti Saroso, North Jakarta (n = 30).

Variable	Frequency	Percentage (%)
Age		
<30 years	3	10,0
31 – 40 years	5	16,7
41 – 50 years	8	26,7
>50 years	14	46,7
Gender		
Man	18	60
Woman	12	40
Smoke		
Yes (smoking)	17	56,7
Do Not Smoke	13	43,3
Nutritional status		
Malnutrition	7	23,3
Good Nutrition	17	56,7
More Nutrition	6	20

Based on table 1, the characteristics according to age in pneumonia patients installed on a ventilator in the ICU room of RSPI Sulianti Saroso found that most patients were aged over 50 years, namely 14 patients (46.7%). Whereas for under 30 years there were 3 patients (10%), characteristics based on gender, for pneumonia patients the male sex was more with a total of 18 patients (60%) and female sex as many as 12 patients (40%). Based on smoking characteristics, most of the male patients with pneumonia smoked. The data obtained were 17 patients with male sex smoking. Based on the characteristics of the nutritional status of pneumonia patients, data obtained on pneumonia patients with good nutrition were 17 patients (56.7%), and 7 patients (23.3%) in the criteria of undernutrition and 6 patients (20%) in the criteria of overweight.

Table 2. Frequency Distribution with N Valid 15 Patients Based on the Characteristics of the Semifowler 30^0 Position on Oxygen Saturation Values.

Variable	Mean Modus	Median	Standard Deviation	Minimum- Maximal
oxygen saturation	96,67 98	96	1,589	93 - 99
Increase in oxygen saturation	1,2	0	1,082	0 – 3

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From table 2 it can be seen that the average oxygen saturation value after the intervention of the semifowler 30^0 position was 96.67%, in the sorted oxygen saturation the median value was 96% and the highest oxygen saturation value was 98% and the lowest oxygen saturation was 93% with standard deviation value of 1.589. From the results of the increase in oxygen saturation from the supine position to the 30^0 semi-fowler position, it can be seen that the average increase in oxygen saturation from the supine to 30^0 semi-fowler position is 01.2% with a standard deviation of 1.082. There is an increase in oxygen saturation 0-3 after being given a semi-fowler position of 30^0 from the previous supine position.

Table 3. Frequency Distribution with N valid 15 Patients Based on the Characteristics of the Semifowler 45^0 Position on Oxygen Saturation Values

Variable	Mean Modus	Median	Standard Deviation	Minimum-Maximal
oxygen saturation	98,47 100	99	1,767	95 – 100
Increase in oxygen saturation	2,27		1,163	1 – 5

From table 3 it can be seen that the average oxygen saturation value after the intervention of the semifowler 45^0 position was 98.47%, in the sorted oxygen saturation the median value was 99% and the highest oxygen saturation value was 100% and the lowest oxygen saturation was 95% with standard deviation value of 1.767. From the results of an increase in oxygen saturation values from the supine position to the semi-fowler 45^0 position, which was previously carried out in the supine position, the average value of the increase in oxygen saturation is greater than the semi-fowler 30^0 position, which is 2.27% with a standard deviation of 1.163 with a minimum value of 1% increase and a maximum 5% increase At the time of the semifowler 45^0 position, all 10 patients experienced an increase in oxygen saturation.

Table 4. Results of Bivariate Analysis of the effect of the semifowler position 30^0 and 45^0 on changes in oxygen saturation in pneumonia patients on ventilators in the ICU Room of RSPI Sulianti Saroso

Variable	Mean	Standar Deviasi	Std. Error Mean	P value
Position 30^0	96,67	1,589	,410	0,001
Position 45^0	98,47	1,767	,456	0,000

Based on table 4, this study was analyzed using the paired T test using the degree of significance $\alpha = 0.05$. After statistical tests were carried out with the help of the SPSSS program, the semifowler positions were 30^0 and 45^0, the p-value = 0.001 at the semifowler 30^0 position and the p-value = 0.000 at the semifowler 45^0 position. With the number of respondents being 30 people so that the p-value $<\alpha$ (<0.05) means that H0 is rejected and Ha is accepted, it can be interpreted that the semifowler positions 30^0 and 45^0 both affect the increase in oxygen saturation in pneumonia patients on ventilators in the ICU RSPI Sullianti Saroso. Henceforth, a normality test will be carried out using the Shapiro Wilk test (data < 60). With the provision that if the sig value > 0.05 then the decision data is normally distributed, and if the sig value < 0.05 then the decision data is not normally distributed. If the data is normally distributed, an

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independent sample T test will be performed which is part of parametric statistics. If the data is not normally distributed, the alternative is to use non-parametric statistics, namely the Mann Wihitney test.

Table 5. Results of the Normality Test Analysis of the Shapiro Wilk Semifowler 30^0 and 45^0

semifowler	df	Statistik	sig
Position 30^0	15	0,939	0,001
Position 45^0	15	0,820	0,000

it is known that the overall value of df (degrees of freedom) is 30, meaning that the total number of data samples for the whole is less than 60. So the use of the Shapiro – Wilk technique to detect the data normality test in this study is appropriate. Then because at the semifowler 45^0 position a sig value of 0.007 or <0.05 is obtained, which means that it can be concluded that the data is not normally distributed. For this reason, the data will then be carried out using non-parametric statistics, namely the Mann Whitney test.

Table 6 The results of the Mann Whitney analysis at semifowler positions 30^0 and 45^0

Semifowler	N	Mean Rank	Sum of Rank	Asymp Sig (2-tailed)
Position 30^0	15	11,20	168.00	
Position 45^0	15	19,80	297.00	0,007

Based on the Mann Whitney table 6 data above, after the semifowler position of 30^0 and 450 was compared for effectiveness using the non-parametric Mann Whitney statistical test, the mean rank result for the semifowler 30^0 position was 11.20. While the results of the mean rank at the semifowler 45^0 position are at 19.80. This explains that the semifowler 45^0 position is more effective compared to the semifowler 30^0 position. And in the Mann Whitney statistical test table, the Asymp results are obtained. Significance (2-tailed) 0.007 (<0.05) which means Ho is rejected and Ha is accepted, which we can conclude that there is a significant difference between the semifowler 30^0 and 45^0 positions. Which semifowler 45^0 position is better in terms of its effectiveness against changes in saturation oxygen in Pneumonia patients attached to a ventilator in the ICU RSPI Prof. Dr. Sullianti Saroso.

DISCUSSION

Univariate analysis

Age

Based on table 1, the results of the study show that of the 30 patients with pneumonia in the ICU room at Prof. Hospital. Dr. Sulianti Saroso found that the highest number of pneumonia patients was more than 50 years old, namely 14 patients (46.7%) according to the theory from (13) which states that age affects human physiology, the older you are, the lower the function in the body. The theory above is also supported by a statement who is a researcher from America, stating that pneumonia is the fourth leading cause of death in old age, with a mortality rate of 168 people per 100,000 pneumonia patients.

Gender

That patients who are male have unhealthy habits or lifestyles such as smoking, lack of

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physical activity, are often exposed to harmful pollution or gases. According to the research results of (14,15), entitled the relationship between gender, stress, and smoking behavior in early adulthood, stated that the prevalence of pneumonia was higher in males than females. Men who smoke will feel more excited, alert, relaxed, less stressed and feel more manly, so they enjoy the positive feelings that arise from smoking. So it can be concluded that male sex has a greater risk of developing pneumonia, one of which is due to unhealthy lifestyle or habits.

Smoking habit

Based on the results of the study, the highest number of pneumonia patients with smoking history was consumed by males with data obtained from 17 patients with male sex smoking and only 1 patient who did not smoke, while patients with female gender did not smoke. From the information obtained from the family, the average patient smokes from a young age. A person who inhales cigarette smoke can inhibit the activity of the workings of the cilia or hairs in the nose thereby inhibiting the body's defense system which functions to protect the body from attacks by foreign bodies thereby increasing mucus secretion and can inhibit or reduce gas exchange between oxygen and carbon dioxide which will reduce the level of oxygen saturation in the blood. (16) So researchers can conclude that smoking behavior is a factor in the occurrence of pneumonia.

Nutritional status

Good nutritional status in pneumonia patients who are treated in the ICU room does not necessarily have a body weight that matches the characteristics of good nutrition, in some conditions patients with concomitant diseases CHF (Congestive Heart Failure), hepatitis, and CKD (Chronic Kidney Disease) anasarca edema occurs which is swelling throughout the body resulting from increased volume of extracellular and extravascular fluids accompanied by abnormal accumulation of fluid in the sidelines of the tissues and serous cavities. Likewise in the lungs, thus disrupting the diffusion process between oxygen and carbon dioxide, due to the increased distance between the alveoli and capillaries because there is fluid that affects oxygen saturation levels (2). So researchers can conclude that good nutritional status can maintain the body's condition from disease, but when poor nutritional status is one of the factors in the emergence of a disease. This will affect the immune system, when the immune system decreases, it will be easy to get infected with diseases, including pneumonia.

Changes in oxygen saturation after being given a semifowler position of 30^0

Based on the results of a study of 15 patients who underwent the 30^0 semifowler position intervention in the ICU room of RSPI Sulianti Saroso, it can be seen that the average oxygen saturation value after the 30^0 semifowler position intervention was 96.67%, the oxygen saturation that has been sorted, the median value is 96% and the highest oxygen saturation value is 99% and the lowest oxygen saturation is 93% with a standard deviation value of 1.589. From the results of the increase in oxygen saturation values from the supine position to the semi-fowler's position of 30^0, it can be seen that the average value of the increase in oxygen saturation from the supine position to the semi-fowler's position is 1.2% with a standard deviation of 1.082. By doing the semi-Fowler's position of 30^0 it means that using gravity can help expand the lungs and reduce pressure from the abdomen on the diaphragm. (17) So the researchers can conclude that there is no significant change in oxygen saturation values after the intervention in the semi-fowler position of 30^0, there is an increase in oxygen saturation but it is not too maximal in helping lung development and reducing pressure from the abdomen on the diaphragm so it does not maximize lung volume and capacity in patients with installed pneumonia ventilator.

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Changes in oxygen saturation after being given a semifowler position of 45⁰

Based on the results of a study of 15 patients after being given the 45⁰ semifowler position in the ICU room of RSPI Sulianti Saroso, the average oxygen saturation value after the 45⁰ semifowler position intervention was 98.47%, the oxygen saturation that has been sorted, the median value was 99%. and the highest oxygen saturation value is 100% and the lowest oxygen saturation is 95% with a standard deviation value of 1.767. From the results of an increase in oxygen saturation values from the supine position to the semi-fowler 450 position, which was previously carried out in the supine position, the average value of the increase in oxygen saturation is greater than the semi-fowler 30⁰ position, which is 2.27% with a standard deviation of 1.163 with a minimum value of 1% increase and a maximum 5% increase At the time of the semifowler 45⁰ position, all 15 patients experienced an increase in oxygen saturation.

The semi-fowler position of 45⁰ makes the oxygen in the lungs increase, thereby reducing breathing difficulties. This position will reduce damage to the alveolar membrane due to accumulation of fluid. Shortness of breath will decrease, oxygen saturation will increase and eventually the patient's condition will improve faster. This is influenced by the force of gravity so that O_2 delivery becomes optimal. The effectiveness of these actions can be seen from the oxygen saturation value has increased (17). So researchers can conclude that the 45⁰ semifowler position is more effective in increasing oxygen saturation in pneumonia patients on ventilators in the ICU Room of RSPI Sulianti Saroso.

Bivariate Analysis

The researcher uses the paired t-test which is part of parametric statistics, therefore as a rule in statistics the research data must be normally distributed. To find out whether the data is normally distributed or not, a normality test is performed first. In this case the researcher used the Shapiro Wilk test. After the normality test was carried out with the Shapiro Wilk test at the semifowler 45⁰ position, the sig value was 0.007 or <0.05, which means that it can be concluded that the data is not normally distributed. For this reason, the data will then be carried out using non-parametric statistics, namely the Mann Whitney test. The results of this study aim to determine whether there is an effect of the semifowler position of 30⁰ and 45⁰ on changes in oxygen saturation in pneumonia patients on ventilators in the ICU Room of RSPI Sulianti Saroso.

From the Mann Whitney test values, it can be seen that the mean rank value for oxygen saturation at a semifowler position of 30⁰ is smaller than a semifowler position of 45⁰ (11.20 < 19.80). And at the output asymp sig (2 - tailed) where the p-value is 0.007 so that the p-value <α (0.007 <0.05) means that H0 is rejected and Ha is accepted, it can be interpreted that position 45⁰ has a more significant effectiveness value when compared semifowler 30⁰ position on changes in oxygen saturation in pneumonia patients on ventilators in the ICU Room of RSPI Sulianti Saroso.

From the results of research conducted by researchers, it shows that the semifowler 45⁰ position has a better average value of 98.47% than the average frequency of the semifowler 30⁰ position, which is 96.67%. From the results of an increase in oxygen saturation values between 15 pneumonia patients who were intervened in the 30⁰ semifowler position compared to 15 pneumonia patients who were treated to an intervention in the 45⁰ semifowler position, a different increase in oxygen saturation was found. The average increase in oxygen saturation from the supine position to the semifowler 30⁰ position is 1.2% with a standard deviation of 1.082. There were 11 patients who experienced an increase in oxygen saturation and 4 patients did not experience an increase in oxygen saturation after being given a semi-fowler position of 30⁰ from the previous supine position. While

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the results of an increase in oxygen saturation from the supine position to the semifowler 45^0 position have an average increase in oxygen saturation value greater than the semifowler 30^0 position, which is 2.27% with a standard deviation of 1.163 with a minimum value of 1% increase and a maximum increase of 5%. At the time of the semifowler 45^0 position, all 15 patients experienced an increase in oxygen saturation. This proves that the 45^0 semifowler position is more effective in increasing oxygen saturation in pneumonia patients on ventilators in the ICU Room of RSPI Sulianti Saroso.

CONCLUSION

The 45^0 semifowler position is more effective in increasing oxygen saturation in pneumonia patients on ventilators in the ICU Room of RSPI Sulianti Saroso. After the Mann Whitney statistical test was carried out, the asymp sig (2–tailed) value was obtained with a p-value = 0.007 so that the p-value <α (0.007 <0.05). So researchers can conclude that the semifowler 45^0 position is more effective in increasing oxygen saturation in Pneumonia patient on a ventilator in the ICU room of RSPI Sulianti Saroso.

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