Application of Therapy *Pursed Lips Breathing* Regarding the Increase in Oxygen Saturation of Pulmonary Tuberculosis Patients in the Lung Inpatient Room at Raden Mattaher Hospital, Jambi Province

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Abstract

Tuberculosis is an infectious disease caused by infection with the bacteria Mycobacterium tuberculosis which can attack various organs of the body, especially the lungs in the lung parenchymal tissue. One of the symptoms that can appear in pulmonary TB patients is shortness of breath, where the shortness felt will cause oxygen saturation to decrease below normal limits. Interventions that can be given to patients who experience shortness of breath can be done by administering bronchodilator drugs, additional oxygen, positioning and non-pharmacological breathing exercises. One non-pharmacological therapy that can be used to increase patient saturation is the pursed lips breathing exercise. The design of this scientific paper uses a case report design. The research subjects used were patients with pulmonary tuberculosis. Data was carried out used descriptive analysis by looking at oxygen saturation before and after giving pursed lips breathing therapy for 5 days of application. Application showed that after applying pursed lips breathing for 5 days, there is an increase in oxygen saturation in pulmonary tuberculosis patients, namely from 90% to 97%. The application of pursed lips breathing can increase oxygen saturation in pulmonary tuberculosis patients, so this therapy can be used as an intervention to increase oxygen saturation.

Keywords : Pulmonary Tuberculosis, Oxygen Saturation, Pursed Lips Breathing.

Introduction

Tuberculosis is an infectious disease caused by infection with the bacteria Mycobacterium tuberculosis which attacks various organs of the body, especially the lungs in the lung parenchymal tissue.[1] According to WHO in 2021, tuberculosis is the second most deadly infectious disease after Covid-19 and is in thirteenth place as the main cause of death worldwide.[2]. Tuberculosis can be transmitted through the air, someone who has been diagnosed with tuberculosis can spread small particles through coughing, sneezing or when talking. Organisms that have entered the body will typically reside in the lungs where they will then infect other body organs[3,4].

The World Health Organization (WHO) in its Tuberculosis Report on Global Control 2023 stated that tuberculosis cases in the world rose from 10 million people in 2020 to 10.3 million people in 2021 and will continue to increase in 2022 to 10.6 million people. WHO also stated that TB cases in Indonesia in 2022 will still be in second place in the world with an estimated 1,060,000 cases with deaths reaching 134,000, this position is after India, followed by China. This shows that there has been an increase in position from 2020 where Indonesia was in third position with a total of 824,000 cases and increased in 2021 to second place with a total of 969,000 cases and continued to increase to 1,060,000 cases in 2022[2].

Riskesdas in 2018 stated that TB cases were based on doctors' diagnosis history by province, West Java was the province with the most TB cases with a total of 186,809 cases (0.63%) and Jambi City was in seventeenth place with 13,692 cases found (0.27%)[5]. Based on a preliminary study carried out by the author at the Raden Mattaher Regional Hospital, Jambi City in the pulmonary inpatient room, it was found that pulmonary TB was the disease with the most cases from January to June 4, namely 102 cases.

Pulmonary tuberculosis will cause effects on sufferers such as shortness of breath, physical weakness, chest pain, decreased appetite, cough accompanied by sputum and decreased body weight.[6,7]. Tuberculosis bacteria will attack the lung parenchyma so that the infected part of the lung will contain air or collapse which will result in incomplete lung expansion so that the sufferer will have shortness of breath. The accessory breathing muscles will work when respiratory abnormalities occur so that breathing ventilation becomes optimal[6,8]. Shortness of breath experienced by pulmonary TB sufferers will cause a decrease in oxygen saturation below normal limits. Decreased oxygen levels in the blood will cause oxygen to not be able to penetrate the walls of red blood cells so that the amount of oxygen carried by red blood cells by hemoglobin to the left atrium of the heart decreases which automatically reduces flow to the peripheral capillaries. This will cause disruption to the oxygen

supply, then the blood in the arteries will lack oxygen which will result in a decrease in oxygen saturation[9,10].

A decrease in oxygen saturation is something that often occurs in pulmonary tuberculosis sufferers, this is because lung patients experience shortness of breath. Shortness of breath is one of the problems with oxygenation that can occur due to imperfect lung expansion because the part of the lung infected with bacteria does not contain air or collapses and this can also result in a decrease in oxygen saturation in pulmonary tuberculosis patients.[5,11,29]. In nursing care with a medical diagnosis of pulmonary TB, nursing problems will arise, one of which is ineffective airway clearance due to the presence of secretions in the airway. Ineffective airway clearance is the inability to clear secretions or airway obstruction to maintain a patent airway[9,12]. Interventions that can be given to patients who experience shortness of breath include administering bronchodilator drugs, additional oxygen, positioning and non-pharmacological breathing exercises.

One non-pharmacological therapy that can be done is exercise *pursed lips breathing. Pursed lips breathing* is a technique of inhaling slowly and controlled by inhaling air from the nose and then exhaling from the mouth which aims to increase ventilation to the maximum[13,14]. Therapy *pursed lips breathing* can slow expiration, prevent lung collapse, control breathing frequency and can increase oxygen saturation in the body[8,27]. *Pursed lips bretahing* is a breathing method by inhaling air through the nose and exhaling through a pursed mouth, where this breathing exercise can increase ventilation optimally and open the airways. When the airways and alveoli are open, it will facilitate the process of getting in and out of air rich in oxygen and carbon dioxide which will result in expanding the air exchange area so that the body will get more oxygen.[16,17,28]. This breathing technique is very easy to do every day because it does not require any tools and there are no negative effects such as using drugs. Pursed lips during exhalation can lengthen exhalation thereby preventing bronchiole collapse and air trapping[18,19].

Nirnasari, et al. In 2021, research results showed that therapy *pursed lips breathing* for 5 days with a medical diagnosis of pulmonary tuberculosis can increase the oxygen saturation of pulmonary tuberculosis patients. The intervention that has been implemented is technique *pursed lips breathing* which is effective for increasing oxygen saturation in pulmonary tuberculosis patients, due to breathing techniques *pursed lips breathing* can make it easier for oxygen to enter the lungs and reduce the energy expended when breathing so that it can reduce shortness of breath and increase oxygen saturation values in respondents whose initial saturation was <95% on the first day to >95% on the fifth day[20].

Based on the data results above, the author is interested in providing non-pharmacological interventions regarding "Application of Therapy *Pursed Lips Breathing* "On Increasing Oxygen Saturation in Pulmonary Tuberculosis Patients in the Lung Inpatient Room at Raden Mattaher Regional Hospital, Jambi Province" which aims to provide an overview of the implementation of the Therapy *Pursed Lips Breathing* On Increasing Oxygen Saturation in Pulmonary Tuberculosis Patients in the Lung Inpatient Room at Raden Mattaher Regional Hospital, Jambi Province.

Methods

This scientific paper uses a case report design *(case report)* The research subjects used were patients with pulmonary tuberculosis who had saturation below <95%. Nursing interventions *pursed lips breathing* applied based on *evidence based nursing* by analyzing 6 related journals. Data analysis used descriptive analysis by looking at oxygen saturation before and after therapy was given *pursed lips breathing* for 5 days of implementation.

Results

The application of pursed lips breathing therapy to Mr. M for 5 times in 1 visit per day with a duration of 10-15 minutes, each cycle of approximately 6 breaths with a break between cycles of 2 seconds shows that there is an increase in oxygen saturation in pulmonary tuberculosis patients, namely:

a. Image of oxygen saturation before and after therapy *pursed lips breathing*

Table 1.1 Mr. M's saturation before and after therapy *pursed lips breathing*

Time	Oxygen Saturation	
	Before	**After**
Wednesday, May 29, 2024	90%	92%
Thursday, May 30, 2024	92%	93%
Friday, May 31, 2024	92%	94%
Saturday, 01 June 2024	95%	96%
Sunday, 02 June 2024	95%	97%

Based on table 1.1 above, it shows that there was an increase in oxygen saturation in Mr. M who was suffering from pulmonary tuberculosis, namely on May 29 2024 before the intervention, Mr..

Discussion

a. Nursing Assessment Analysis

The results of the study carried out on May 29 2024 found data: Mr. M complained of feeling short of breath, coughing accompanied by sputum, where the sputum was green. The patient said that sometimes it was difficult to expel sputum, when auscultation was carried out there were additional sounds *rhonchi* in both lung fields. The patient feels the shortness of breath increases after activity, such as going to the bathroom. Apart from that, the patient said he felt pain on the left side of his chest radiating to his left shoulder. The pain felt by the patient was like being stabbed with a pain scale of 6, the pain felt came and went. The patient also said that his body felt weak and it was difficult to carry out activities as usual because of the tightness he felt. When he checked his vital signs, he found BP: 108/89 mmHg, N: 87x/minute, RR: 24x/minute, S: 36.4C, SpO2: 90%.

In this case, it was found that the complaint felt by the patient was in accordance with existing facts and theories, namely that there was a cough accompanied by secretions and the patient felt short of breath. The results of the study of the cases studied showed that there were similarities between major and minor data in accordance with the Indonesian Nursing Diagnostic Standards (SDKI) in the nursing problem of ineffective airway clearance, namely the patient complained of

shortness of breath, coughing up phlegm, inability to expel secretions, decreased oxygen saturation and there were additional breath sounds in the form of rhonchi in both lung fields.[21,26]. This is also in line with research conducted by Afifah in 2022 which discussed oxygenation disorders in pulmonary TB patients, finding that the symptoms that appeared in pulmonary TB patients were shortness of breath, coughing accompanied by sputum, difficulty expelling phlegm and crackles during auscultation.[22].

b. Nursing Diagnosis Analysis

The priority nursing diagnosis in managed cases is ineffective airway clearance related to retained secretions with signs that include coughing accompanied by sputum, sometimes difficulty expelling secretions, shortness of breath, there are additional rhonchi breath sounds in both lung fields and when vital signs were checked the results were BP: 108/89 mmHg, N: 87x/minute, RR: 24x/minute, S: 36.4C, SpO2: 90%. The actual diagnoses that arise in managed cases are acute pain related to physiological injurious agents and activity intolerance related to an imbalance between oxygen supply and demand.

The priority nursing diagnosis assigned to the case is ineffective airway clearance which is in accordance with the theory in determining nursing diagnoses according to Indonesian nursing diagnosis standards, namely containing 80-100% of major signs and symptoms which are supported by minor signs and symptoms that appear during the assessment9. This is also in line with research conducted by Afiah and Murniati in 2023 with the title "Cleaning the Airway in An.[23].

c. Nursing Intervention Analysis

Patients are given the main nursing interventions, namely airway management, pain management, and energy management which are in accordance with the Indonesian Standard Nursing Intervention theory[15]. In diagnosing cases of airway clearance, the author provides innovative interventions in the form of breathing exercises *pursed lips breathing*. Utilization of breathing exercises *pursed lips breathing* as therapy in increasing oxygen saturation in pulmonary tuberculosis sufferers in accordance with research conducted by Nirnasari, et al with the title

"Effect of Technique *Pursed Lip Breathing* "Regarding the Oxygen Saturation Value of Pulmonary Tuberculosis Patients at Raja Ahmad Tabib Regional Hospital, Riau Islands Province" which showed the results of an increase in oxygen saturation of more than 95% after giving pursed lips breathing intervention for 5 days with a duration of 10 minutes per day. The results of statistical tests carried out by researchers showed a ρ statistic of 0.005 (<0.05) which means that there is an effect of giving breathing exercises. *pursed lips breathing* which significantly increased the respondents' oxygen saturation[11].

d. Nursing Implementation Analysis

In the case management priority diagnosis is given, namely ineffective airway clearance given implementation according to the plan that has been made, namely, monitoring the patient's breathing pattern, monitoring additional breath sounds, positioning the patient in semi-Fowler's position, monitoring oxygen frequency and saturation. Apart from that, for priority diagnoses, patients are also given the implementation of breathing exercise therapy *pursed lips breathing* which was carried out for 5 days from 29 May 2024 to 2 June 2024 at Raden Mataher Regional Hospital, Jambi City, the results showed that there was an increase in oxygen saturation in patients before and after the innovative intervention was carried out. *pursed lips breathing.*

In the nursing diagnosis of acute pain, after the pain management nursing action was carried out and the pain was reduced on the 3rd day, whereas in the nursing diagnosis of activity intolerance, the intervention given was energy management and the problem of activity intolerance was resolved on the 5th day.

e. Nursing Evaluation Analysis

After giving pursed lips breathing therapy for 5 days, the patient's complaints of shortness of breath decreased, fatigue after activities decreased, sputum decreased, weakness decreased, oxygen saturation values increased (97%) and the patient's ability to use non-pharmacological techniques increased as evidenced by subjective data. The patient stated that he felt more comfortable than before the therapy was given, and the patient felt more relaxed. Apart from that, after therapy

pursed lips breathing, The patient said that the shortness of breath felt had decreased until on the last day of intervention the patient no longer felt short of breath and the objective data was an increase in the patient's oxygen saturation value, where on the first day the patient's oxygen saturation was at 90% and increased to 92% after therapy was given, then on the 2nd day the patient's oxygen saturation value was 93%, on the 3rd day the oxygen saturation result after the procedure was 94%, on the 4th day the oxygen saturation result was 96%, on the 5th day the oxygen saturation result was obtained. 97%. Therefore, it can be concluded that the provision of breathing techniques *pursed lips breathing* effective for increasing oxygen saturation in patients with a diagnosis of pulmonary tuberculosis and thus the problem of ineffective airway clearance nursing is resolved.

f. Analysis of Therapy Implementation Interventions *Pursed Lips Breathing*

Providing innovative interventions to the subjects of this study is the implementation of therapy *pursed lips breathing* which was given once a day for 5 days with a duration of 10-15 minutes, approximately 6 breaths per cycle with a break between cycles of 2 seconds, where the saturation obtained on the first day before the intervention was 90% and after the intervention for 5 days it was found that Mr. M's oxygen saturation increased to 97%. Pursed lips breathing exercises are useful for reducing shortness of breath and increasing oxygen saturation, apart from that, this breathing technique can also overcome respiratory distress and can make sufferers relax. This is supported by research conducted by Nirnasari, et al. in 2021, results were obtained after implementing the intervention *pursed lips breathing* in 21 respondents with pulmonary tuberculosis for 5 days with a duration of 10-15 minutes, that there was an increase in oxygen saturation in pulmonary tuberculosis patients which was initially below normal limits (<95%) to above normal (>95%) with a statistical value of ρ of 0.005 (<0.05)[20].

The research was conducted by Fitriani with the intervention being breathing exercises *pursed lips breathing* which was carried out for 3 days with a duration of 2-5 minutes or 10 breaths per day, it was found that before the intervention was

given the average oxygen saturation in respondents was 93% and increased to 94.33% on the third day. This shows that there was an increase of 1.33%, which means breathing exercises were provided *pursed lips breathing* for 3 days can increase oxygen saturation in pulmonary tuberculosis patients[25,30].

Conclusion

In the study carried out on Mr. M, 36 years old with a medical diagnosis of pulmonary tuberculosis, the patient said he felt short of breath, coughing accompanied by sputum, sometimes it was difficult to expel the sputum and the tightness felt increased after activities such as going to the bathroom. The priority nursing diagnosis that emerged in the patient was ineffective airway clearance related to retained secretions, characterized by the patient saying he felt short of breath, coughing accompanied by phlegm and sometimes having difficulty expelling phlegm. The intervention given to the problem of ineffective airway clearance is in the form of airway management where non-pharmacological therapy is also applied in the form of pursed lips breathing in accordance with *Evidence Based Nursing*. The implementation carried out in patients with ineffective airway clearance problems is airway management where non-pharmacological therapy is also applied in the form of *pursed lips breathing* in accordance with the *Evidence Based Nursing*. Evaluation obtained from the results of implementing therapy *pursed lips beathing* What has been done shows that there was an increase in the patient's oxygen saturation from the first day (90%) to the last day (97%) of the intervention.

The implementation and completion of this final scientific work by Ners was not free from various difficulties and obstacles that the author identified, including: The position for implementing pursed lips breathing therapy is half sitting or supine, but during implementation it becomes sitting because the patient is more comfortable in the sitting position.

Apart from that, future researchers can develop research related to airway clearance in tuberculosis patients and other factors in airway clearance in tuberculosis patients.

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