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COMBINATION OF MINT INHALATION THERAPY AND BALLON BLOWING EXERCISE ON OXYGEN SATURATION AND BREATHING FREQUENCY IN CHILDREN'S PULMONARY TUBERCULOSIS: CASE REPORT

Innasa Permata Triaswidadi[1]*, Meivita Dewi Purnamasari [2]
[1]Student of Nursing Department, Faculty of Health Sciences, Jenderal Soedirman University
[2]Department of Nursing, Faculty of Health Sciences, Jenderal Soedirman University

*Correspondence Author:
Innasa Permata Triaswidadi;
Student of Nursing Department, Faculty of Health Sciences, Jenderal Soedirman University, Purwokerto, Indonesia
innasatriaswidadi@gmail.com

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ABSTRACT

Background: Children aged < 5 years have a high risk of developing primary progressive pulmonary tuberculosis (TB) and are at risk of developing a serious disease that can cause death or long-term disability. Pulmonary TB is an infectious respiratory disease caused by the bacteria Mycobacterium tuberculosis. This case study aims to determine the effect of a combination of mint leaf inhalation therapy and balloon blowing exercise on oxygen saturation and respiratory frequency in children with pulmonary TB. Methodology: Implementation of Evidence Based Nursing (EBN) based on PICO with article searches for 2020 – 2024 using ScienceDirect, Pubmed, Research Gate and Google Scholar. A combination of mint leaf inhalation therapy and balloon blowing exercise was the intervention chosen to be implemented. The intervention was carried out by inhaling mint leaf essential oil vapor for 15 minutes and continued by blowing up the balloon 8 – 10 times until it was 7 inches in size. The intervention will be provided on April 18 – 24 2024. Results: After being given intervention, the oxygen saturation of the research subjects increased from 94% to 98% and the respiratory frequency decreased from 42x/minute to 36x/minute. Conclusion: The combination of pappermint inhalation therapy and balloon blowing exercise has an effect on increasing oxygen saturation and reducing respiratory frequency in children with pulmonary TB.

Keywords: Balloon blowing exercise, respiratory frequency, pappermint inhalation therapy, pulmonary tuberculosis, oxygen saturation
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INTRODUCTION

Pulmonary tuberculosis (TB) is a respiratory tract disease caused by the bacterium *Mycobacterium tuberculosis* (M. tuberculosis) and is an infectious disease through droplets from people with TB and inhaled by other individuals then enter the alveolus through close contact (Manurung et al., 2022). According to WHO (2021), around 10.6 million people in the world have TB and about 1.2 million of them occur in children. Meanwhile, according to the Indonesian Ministry of Health (2022), TB cases of children aged <15 years in Indonesia are estimated at 110,881 or around 15.3% of all TB cases in Indonesia (Kemenkes 2023). Data from the Banyumas Regency Health Office in 2023 found 1460 cases of pulmonary TB in children from 2019– 2023.

Children have a high risk of TB infection, especially infants and toddlers. Research by Bofinger and Schlossberg (2007) and Starke et al (2014) in Wijaya, Mantik & Rampengan (2021) states that children aged < 5 years have a high risk of developing primary progressive pulmonary TB, while children aged < 2 years have a very high risk (30%-40%) of developing primary progressive pulmonary TB within one year. Children infected with pulmonary TB are at risk for developing severe pulmonary TB which can cause death or long-term disability (Kemenkes 2023).

Respiratory symptoms that occur in

pulmonary TB such as coughing up phlegm within 2 weeks or more, dyspnea, cyanosis and hypoxia can cause problems with ineffective airway clearance (Wulandari, Sudiarti & Virgo, 2024). Ineffective airway clearance is the inability to clear airway secretions or obstructions to maintain a patent airway (PPNI, 2017). Unpatented airway will cause hyperventilation which consequently makes the oxygen supply to the lungs decrease then causes chest pain and shortness of breath (Wulandari, Sudiarti & Virgo, 2024).

Mint leaf inhalation therapy and *balloon blowing exercise* can be nonpharmacological therapies used to reduce shortness of breath and increase oxygen saturation in the body. An important ingredient in mint leaves is menthol. Menthol has anti-bacterial properties that can reduce infection, loosen the bronchi and thin the sputum. Menthol can also help relieve breathing so that it can make breathing easier (Maimunah & Rachmawati, 2023). Balloon blowing exercise is a breathing relaxation technique by blowing balloons that can stretch the lungs so as to facilitate the increase in vital lung capacity. Oxyhemoglobin in red blood cells will increase and will increase oxygen saturation (Manurung et al., 2022).

Research on the administration of mint leaf inhalation therapy to reduce shortness of breath of pulmonary TB patients has been conducted by Wulandari, Sudiarti & Virgo (2024) With the results of the study showed that there was a decrease in breathing frequency. While research on the effect of *balloon blowing exercise* on oxygen saturation in pulmonary TB patients has been conducted by Manurung et al. (2022) The results showed significant changes in oxygen saturation before and after the intervention. Based on the description above, the author is interested in implementing nursing in the form of a combination of mint leaf inhalation therapy and *balloon blowing exercise* in children with pulmonary TB in the work area of the Sumbang 1 Health Center.

METHOD

This research uses the case study research method. The subjects in this case study were a 2-year-old toddler with fifth month treatment pulmonary TB in Banteran Village, Sumbang District, Central Java. The study starts from April 16 – 24, 2024.

This research flow begins with the search for *Evidence Based Nursing* (EBN) which is a decision about health services based on available, current, valid and relevant evidence (Dawes *et al*, dalam Evans, 2023). The stages in the EBN implementation process consist of: (1) compiling questions focused on PICO (*Population, Intervention, Comparison, Outcome*) to be solved, (2) tracing evidence related to the case to be discussed, (3) critically assessing the evidence that has been obtained and (4) evaluating EBN implementation (Evans, 2023).

After conducting a journal search using the PICO method, a combination intervention of mint leaf inhalation therapy was selected by inhaling steam from *a diffuser* and *balloon blowing exercise* by blowing rubber inflatable balloons which were carried out 7 times in a row. Inhalation therapy with mint leaves is done by dripping mint leaf essential oil as much as 2-3 drops into a diffuser filled with enough water then steam inhaled for 15 minutes. While *balloon blowing exercise* is done by blowing balloons 8-10 times until they are 7 inches in size.

Observation of the client's condition is always carried out before and after the intervention at each meeting. Measurement of oxygen saturation using an *oximetry device* and breathing frequency is calculated manually for 1 minute. The final evaluation was carried out at the 7th meeting to see the effect of administration was a combination of inhalation therapy and *balloon blowing exercise*.

RESULT

The implementation of nursing is carried out for 7 consecutive days from April 18 – April 24, 2024. Implementation is carried out once a day. The problem observed

during implementation is that airway clearance is ineffective, especially in changes in oxygen saturation and breathing frequency. Observations are made before and after implementation every day.

Table 1. An.F Client Observation Results

Indicator	SpO2 (%)		RR (x/minutes)	
Date	Before	After	Before	After
18 April 2024	94	95	42	40
19 April 2024	94	96	41	39
20 April 2024	94	96	40	38
21 April 2024	95	95	40	39
22 April 2024	96	98	39	37
23 April 2024	95	97	38	37
24 April 2024	96	98	38	36

Table 1 shows an increase in oxygen saturation from 94% to 98% on the last day of intervention. The frequency of breathing decreased from the initial 42x/minute on the first day to 36x/min on the last day of intervention.

DISCUSSION

Based on the observations, it was found that after a combination of inhalation therapy intervention with mint leaves for 15 minutes and *balloon blowing exercise*, there was an increase in oxygen saturation and a decrease in respiratory frequency in An.F. This is in accordance with research from Wulandari, Sudiarti & Virgo (2024) with the result that inhalation therapy with mint leaves can reduce breathing frequency in pulmonary TB clients after being given intervention for 3 days. Research results belong to Marlina et al. (2020) It also has the same result that inhalation therapy using mint leaves can reduce shortness of breath in pulmonary TB clients after being given interference for 1 week.

The results of observations on *balloon blowing exercise* are supported by research owned Manurung et al. (2022) which states that *balloon blowing* can increase oxygen saturation in pulmonary TB clients after being given an intervention for 7 days. Other supporting research is the property Astriani, Dewi & Yanti (2020) which states that *balloon blowing* can increase oxygen saturation in individuals with breathing problems for 4 weeks.

An.F's client is currently undergoing 5 months of OAT treatment. Clients routinely consume FDC OAT RH at a dose of 1 tablet and taken 3 times a week because the client is already in the advanced phase. This pharmacological therapy will continue along with a combination of mint leaf inhalation therapy and *balloon blowing exercise* from April 18 – April 24, 2024. The results of intervention observations showed an increase in oxygen saturation and a decrease in breathing frequency. It can be concluded that the combination of inhalation therapy with mint leaves and *balloon blowing exercise* can be a support for pharmacological therapy.

One of the symptoms of pulmonary TB is shortness of breath caused by a blockage in the respiratory tract due to the presence of M. *tuberculosis* (Kemenkes, 2023). Menthol is the highest content in mint leaves of 30-45% which has anti-inflammatory properties so that it can help reduce infection, relieve breathing and breathing can be easier and regular. In addition, mint leaves can also overcome *bronchospasm*, thin sputum and reduce bronchial hyperactivity so that airway obstruction is reduced and breathing frequency can decrease (Silitonga et al., 2020).

The presence of excess sputum in the airway will cause blockage in the airway so that it can reduce oxygen saturation Manurung et al. (2022). Therefore, *balloon blowing exercise* can be combined with mint leaf inhalation therapy because this exercise will strengthen the intercostal muscles that contribute to lifting the ribs

and diaphragm so that the tension on the lung surface decreases, lung expansion increases and facilitates the increase in vital capacity of the lungs (Misra, Pawar & Pal, 2023). This is in line with proprietary research Rinarto, Setiadi & Sari (2021) which states that *breathing exercise* gives better results to increase lung expansion of pulmonary TB sufferers compared to effective coughing. An increase in the vital capacity of the lungs will increase the quantity of gas that can diffuse through the alveolar membrane. This increase can make red blood cell oxyhemoglobin increase and oxygen saturation increases (Manurung et al. 2022).

The limitation in this study is that there has not been found a specific EBN combining inhalation therapy with mint leaves and *balloon blowing exercise*. This combination of interventions is an innovation from researchers with the aim that emerging problems can be better addressed. Inhalation therapy with mint leaves is not always liked by everyone, including children. Then other interventions are needed that the child can like. *Balloon blowing exercise* is a breathing relaxation technique by blowing a balloon that can stretch the lungs (Manurung et al. 2022). Ordinary breathing relaxation techniques applied to children can allow children difficulty in implementing them. So a *balloon blowing exercise* intervention was chosen which can also be a children's play area. Another limitation is the lack of EBN from *balloon blowing exercise* which is implemented in cases of pulmonary TB.

Based on the explanation above, it can be concluded that the combination of mint leaf inhalation therapy by inhaling diffuser vapor containing 2-3 drops of mint *leaf essential* oil and *balloon blowing exercise* by blowing a diving balloon 8-10 times has an effect on increasing oxygen saturation and reducing the respiratory frequency of children with pulmonary TB.

CONCLUSION

Interventions given for 7 meetings with a combination of mint leaf inhalation therapy interventions and *balloon blowing exercises* can improve airway clearance with criteria for cough results that were initially quite decreased to decrease, sputum production that was initially quite increased to quite decreased and the frequency of breathing that was initially quite worsening to improve. Before the intervention, An.F showed 94% oxygen saturation and 42x/min breathing frequency. After 7 days of intervention, the condition of oxygen saturation became 98% and the frequency of breathing became 36x / minute. Based on this, it can be concluded that the combination of mint leaf inhalation therapy and *balloon blowing exercise* has an effect in increasing oxygen saturation and decreasing breathing frequency.

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