

The Application of Peppermint Essential Oil Aromatherapy for Airways Clearance is not Effective in Pulmonary Tuberculosis Patients in the Rose Room of Hospital X

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Tuberculosis (TB) is a pulmonary infectious disease caused by *Mycobacterium tuberculosis* and can lead to respiratory problems such as coughing, shortness of breath, and ineffective airway clearance. This study aimed to evaluate the effectiveness of mint leaf aromatherapy as an alternative therapy to improve airway clearance in patients with pulmonary TB in the Mawar Ward of X. A descriptive method with a nursing care approach was applied to two patients selected through purposive sampling. Mint leaf aromatherapy was administered three times daily for 15 minutes over three consecutive days. Observed parameters included respiratory rate and pattern, the presence of adventitious breath sounds, and the patient's ability to expectorate sputum before and after the intervention. The results showed significant improvements, including normalization of respiratory rate, more regular breathing patterns, disappearance of adventitious breath sounds, and improved sputum expectoration. In conclusion, mint leaf aromatherapy has potential as an effective complementary therapy, although further studies are needed to strengthen these findings and explore the underlying mechanisms.

Keywords: Aromatherapy, Mint leaves, Airway clearance, Pulmonary tuberculosis

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1. Introduction

Tuberculosis (TB) is a disease caused by infection with the bacterium *Mycobacterium tuberculosis* in lung tissue and is therefore often referred to as pulmonary TB. This infection can lead to various respiratory disorders, such as a persistent cough and shortness of breath [1]. Patients with TB commonly also experience additional symptoms, including excessive night sweats and fever. The management of TB requires long-term drug therapy with high adherence to prevent antibiotic resistance. Without proper treatment, this disease can be fatal. In addition to affecting the lungs, *Mycobacterium tuberculosis* can also infect other organs such as the kidneys, bones, joints, lymph nodes, and meninges, a condition known as extrapulmonary TB. Indonesia ranks third globally in the number of TB cases after India and China. In 2019, approximately 845,000 TB cases were recorded in Indonesia. Although TB can have serious consequences if neglected, it is a preventable and curable disease with appropriate treatment [2].

According to reports from the World Health Organization (WHO), the global number of TB cases in 2021 was estimated at 10.6 million. This figure places TB as the second highest disease in terms of case numbers worldwide and represents an increase of about 600,000 cases compared to 2020, when an estimated 10 million cases were reported. Of the total 10.6 million cases, approximately 6.4 million people (60.3%) were reported and received treatment, while the remaining 4.2 million people (39.7%) were not identified, not diagnosed, or not recorded in reporting systems [1]. Of the total cases in 2021, around 6 million occurred in adult men, 3.4 million in adult women, and 1.2 million in children. The TB incidence rate in Indonesia is

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354 per 100,000 population, meaning that out of every 100,000 people, about 354 suffer from TB. This condition remains a major obstacle to achieving the TB elimination target by 2030 [3].

It is important to understand that TB transmission does not occur only from adults; children can also be a source of transmission. Therefore, several factors can increase a person's risk of contracting TB [4]. These factors include living with or having close contact with TB patients, healthcare workers caring for TB patients, individuals with weakened immune systems, those with a history of HIV or diabetes mellitus, living in unhygienic environments, and individuals who abuse drugs, consume excessive alcohol, or reside in areas with high TB incidence. In terms of gender, the number of TB cases in men is significantly higher than in women, which may be due to greater exposure to risk factors such as smoking [5].

The signs of TB disease usually differ from an ordinary cough, mainly because they persist for a longer period [6]. Patients with pulmonary TB typically present with a characteristic cough lasting two weeks or more, even after taking cough medication. This cough may occur with or without sputum and may sometimes be accompanied by blood. In addition, patients may experience shortness of breath, excessive fatigue, loss of appetite, general weakness, night sweats without physical activity, and prolonged fever lasting up to one month [7]. Shortness of breath and coughing in TB patients occur due to the accumulation of secretions or sputum in the airways, leading to ineffective airway clearance. Therefore, inhalation therapy is needed to reduce the buildup of secretions. Aromatherapy is one intervention commonly used, including mint leaf therapy. In addition to being effective in clearing the airways, mint leaf therapy is relatively easy to perform independently at home [6].

A simple method is to use mint aromatherapy by applying two to three drops onto tissue or cotton [8]. Mint leaves contain aromatic herbal compounds used in traditional medicine due to their pharmacological properties. Mint is an aromatic plant recognized as one of the oldest herbal plants in the world. The main active component of mint leaves is menthol, which is used as an antiseptic, antipruritic, antispasmodic (antitussive), and carminative agent [9]. Menthol has anti-inflammatory effects that can open the airways and reduce shortness of breath. Simple inhalation therapy using mint leaf aromatherapy is one method that can be applied to address nursing problems related to ineffective airway clearance in patients with pulmonary TB. Inhaling mint leaf aromatherapy can help relax the airways, suppress inflammation, and dilate the respiratory passages. This inhalation therapy may also help treat infections caused by bacteria due to the antibacterial properties of mint leaves.

Based on the results of a preliminary study conducted on August 18, data showed that there were 10 existing pulmonary TB patients and 2 new patients in August 2024 in the Mawar Ward of RSUD Dr. Adhyatma MPH. Although the hospital has implemented an integrated screening program and provided TB medications, no non-pharmacological interventions have yet been applied. Therefore, the researchers are interested in conducting this study to evaluate the effectiveness of mint leaf aromatherapy in addressing ineffective airway clearance in patients with pulmonary TB.

Pulmonary tuberculosis remains a major public health problem in Indonesia, with respiratory disorders as the primary symptoms. Mint leaf aromatherapy is known to help alleviate these disturbances, but related research is still limited. This study is expected to serve as a foundation for the development of non-pharmacological interventions for patients with pulmonary TB and to be applicable in healthcare services at RSUD Dr. Adhyatma.

2. Literature Review and Problem Statement

Pulmonary tuberculosis is an infectious disease caused by *Mycobacterium tuberculosis* and remains one of the leading causes of death worldwide [10]. This disease primarily affects the lungs due to their high blood

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flow and oxygen levels, but it can also spread to other organs through the bloodstream and lymphatic system, such as the kidneys, bones, and brain [11]. Transmission of tuberculosis occurs through the air, particularly via droplet nuclei released when an infected individual coughs or sneezes, where the bacteria can survive for extended periods in enclosed, dark, and humid environments [12]. However, not all individuals exposed to the bacteria will immediately develop active disease, as in most cases the bacteria can remain latent until the host's immune system weakens [13].

Clinically, pulmonary tuberculosis is characterized by systemic and respiratory symptoms, including fever, especially in the afternoon or evening; night sweats, malaise, weight loss, persistent productive cough, shortness of breath, chest pain, and hemoptysis in certain conditions [11]. The pathophysiological process begins when the bacteria enter the alveoli and trigger an immune response in the form of inflammation, granuloma formation, and tissue necrosis, which eventually leads to impaired ventilation and secretion retention [14]. If not properly treated, pulmonary tuberculosis may result in serious complications such as pleural effusion, pulmonary fibrosis, respiratory failure, and dissemination of infection to other organs [12]. Therefore, tuberculosis management requires long-term structured pharmacological therapy, which may be complemented by non-pharmacological interventions to help relieve respiratory symptoms and improve patients' quality of life [7], [13], [15].

Based on the results of previous studies, it can be concluded that patients with pulmonary tuberculosis very often experience problems with ineffective airway clearance due to the accumulation of secretions and impaired respiratory function. One non-pharmacological intervention that has been reported to be effective in helping expectorate phlegm and clear the airway is mint aromatherapy, which contains menthol with the effect of opening the airways and reducing inflammation. However, the application of mint aromatherapy as an effort to improve airway clearance in patients with pulmonary tuberculosis in the community still requires further study. Therefore, the research problem formulation in this study is whether the application of mint aromatherapy is effective in ineffective airway clearance in patients with pulmonary tuberculosis in the community.

3. Methods

This study employed a descriptive case study design to describe the characteristics of problems experienced by patients with pulmonary tuberculosis, particularly ineffective airway clearance. The approach used was nursing care with the application of mint leaf aromatherapy as an intervention to reduce the accumulation of airway secretions. The study subjects consisted of three patients diagnosed with pulmonary tuberculosis who were selected based on inclusion and exclusion criteria. The inclusion criteria were patients diagnosed with pulmonary TB, experiencing productive cough, shortness of breath, ineffective airway clearance due to excessive secretions, being conscious, able to communicate well, and willing to participate as respondents. The exclusion criterion was the presence of other infections, as this could complicate treatment and affect the study outcomes.

The focus of this study was to reduce excessive secretions and improve airway clearance in patients with pulmonary tuberculosis through the use of mint leaf aromatherapy. Data were collected using pre- and post-observation sheets to assess changes in respiratory rate, breathing pattern, adventitious breath sounds, and the ability to expectorate sputum, in accordance with Standard Operating Procedures (SOPs). Data collection methods included in-depth interviews and direct observation. Interviews were conducted to obtain detailed information regarding the patients' conditions before and after the intervention, while observation was carried out systematically to record clinical changes following the inhalation of mint leaf aromatherapy.

The study was conducted in the Mawar Ward of RSUD X after obtaining permission from the institution and informed consent from the respondents. Data analysis was performed descriptively and presented in a narrative form by comparing patient conditions before and after the intervention. Throughout the research process, ethical principles were strictly applied, including confidentiality, beneficence, justice, non-maleficence, and obtaining informed consent. These principles ensured the protection of respondent rights and the safe, fair, and responsible conduct of the study.

4. Results and Discussion

Case Study Results

The assessment in Case 1 was conducted on August 18, 2025, in the Mawar Ward of RSUD X on Mr. S, a 67-year-old male who presented with the main complaints of shortness of breath, productive cough, and difficulty expectorating sputum. The cough had persisted for three weeks and occurred more frequently at night, with thick yellowish-white sputum. The patient appeared weak, complained of nausea, and reported a decreased appetite. Physical examination revealed rapid and shallow breathing with a respiratory rate of 27 breaths per minute, heart rate of 84 beats per minute, blood pressure of 108/58 mmHg, temperature of 36.6°C, and oxygen saturation of 95% using a nasal cannula at 3 Lpm. Lung auscultation revealed bilateral rhonchi, indicating retained secretions. Based on these findings, the primary nursing problem was identified as ineffective airway clearance due to increased secretion production related to pulmonary tuberculosis. The care plan included respiratory monitoring, education on effective coughing techniques, semi-Fowler positioning, nebulizer collaboration, and an independent intervention of peppermint aromatherapy inhalation for three days.

On the first day of intervention, the patient remained dyspneic with a respiratory rate of 27 breaths per minute and oxygen saturation of 95%. Rhonchi were clearly audible, and the patient still had significant difficulty expectorating sputum. Peppermint aromatherapy was administered in an upright sitting position for 15 minutes, three times a day. Although initially tense, the patient attempted to follow instructions. On the second day, improvement was observed, marked by a decrease in respiratory rate to 23 breaths per minute, an increase in oxygen saturation to 96%, and reduced intensity of rhonchi. The patient began to expectorate sputum with a thinner consistency, and breathing appeared more regular after aromatherapy. By the third day, the most significant improvement was noted, with a respiratory rate of 20–21 breaths per minute and stable oxygen saturation at 98%. Sputum was easily expelled, rhonchi were almost absent, and the patient reported lighter breathing without dyspnea.

The assessment for Case 2 was carried out on August 19, 2025, on Mrs. R, a 57-year-old female who appeared weak and complained of a productive cough lasting more than three weeks. Thick sputum that was difficult to expel caused shortness of breath and discomfort during breathing. Objectively, the cough was nonproductive, the breathing pattern was irregular, and rhonchi were clearly heard on auscultation, accompanied by an increased respiratory rate as a compensatory response. These findings supported the diagnosis of ineffective airway clearance due to retained secretions. Nursing interventions focused on restoring airway clearance through respiratory monitoring, evaluation of breath sounds, observation of sputum expectoration ability, education on effective coughing, and the administration of peppermint aromatherapy according to standard operating procedures, as menthol content is known to help open the airways, reduce inflammation, and liquefy secretions.

On the first day of therapy, the patient followed the peppermint aromatherapy procedure, although coughing remained unproductive and respiratory improvement was not yet significant. However, the patient appeared more relaxed after the session. More meaningful progress was observed on the second

day, with a decrease in respiratory rate to 21 breaths per minute and an increase in oxygen saturation to 98%. Rhonchi were no longer detected, breathing became more regular, and sputum could be expelled more easily. Aromatherapy was continued to maintain the positive response. On the third day, the patient's respiratory condition remained stable with no complaints of coughing or sputum production. Final evaluation indicated that the problem of ineffective airway clearance had been optimally resolved through consistent nursing interventions and peppermint aromatherapy.

The assessment in Case 3 was conducted on August 20, 2025, at 10:30 a.m. on Mr. N, a 46-year-old male who appeared weak and showed signs of respiratory distress. The patient complained of a productive cough lasting one week, thick sputum that was difficult to expel, shortness of breath, nausea, and decreased appetite. Examination showed a respiratory rate of 24 breaths per minute, oxygen saturation of 94%, and rhonchi on lung auscultation, with yellow-green sputum. Medical history revealed a relapse of pulmonary tuberculosis after completing six months of treatment. These data supported the diagnosis of ineffective airway clearance due to secretion accumulation. Interventions included respiratory monitoring, periodic auscultation, sputum evaluation, education on effective coughing, and the application of peppermint aromatherapy as an independent nursing intervention.

On the first day of implementation, the patient's condition did not yet show significant improvement. Rhonchi were still present, sputum was not optimally expelled, and the respiratory rate remained elevated. The patient also complained of chest pain that affected comfort, prompting nonpharmacological interventions such as relaxation techniques and warm compresses. Significant improvement was observed later that evening, with a reduction in respiratory rate to 21 breaths per minute, an increase in oxygen saturation to 98%, and the disappearance of adventitious breath sounds. By the third day, the patient no longer experienced coughing or dyspnea, no secretions were detected, and breathing patterns were within normal limits. The final evaluation concluded that ineffective airway clearance had been resolved, and peppermint aromatherapy was shown to help improve airway clearance and respiratory quality in patients with pulmonary tuberculosis.

Discussion

The discussion of the three cases of pulmonary tuberculosis patients illustrates a strong relationship between the clinical condition of impaired airway clearance and the role of a nonpharmacological intervention in the form of mint leaf aromatherapy in supporting the recovery of respiratory function. The three patients in this study had different clinical characteristics in terms of age, disease history, and severity of respiratory impairment; however, all demonstrated the typical symptom pattern of pulmonary tuberculosis, with the main problems being excessive secretion production, ineffective cough, irregular breathing, and difficulty expectorating sputum. All three met the study's inclusion criteria as described in the document, including complaints of productive cough, shortness of breath, and impaired airway clearance due to the accumulation of secretions.

In all three cases, the initial assessment revealed objective signs such as increased respiratory rate, adventitious breath sounds in the form of rhonchi, and thick sputum that was difficult to expel. Data from the first case showed a pattern similar to the second and third cases, namely reduced ventilatory capacity due to retained secretions. These clinical manifestations are consistent with the theoretical framework in the literature review, which states that pulmonary tuberculosis triggers a chronic inflammatory process resulting in mucus hypersecretion and lung tissue damage, leading to impaired ventilation and airway obstruction. This condition places all three patients at high risk for ineffective airway clearance, as explained in the nursing diagnosis section, where secretion stagnation and impaired coughing mechanisms are identified as the main causes of airway non-patency in tuberculosis patients.

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When compared comprehensively, the three cases showed similarities in symptom progression patterns. In the first case, the patient experienced ineffective coughing, increased respiratory rate, and rhonchi indicating secretion buildup in the airways. The second case presented a similar picture with a longer duration of illness, characterized by a productive cough lasting three weeks with sputum that was difficult to expel. The presence of rhonchi and irregular breathing were key factors confirming impaired airway clearance, and this problem was also evident in the third case, where the patient had a longer history of tuberculosis and a relapse that worsened respiratory conditions. This aligns with objective data indicating rhonchi and respiratory rates reaching 23–28 breaths per minute in two male patients in other cases documented, demonstrating compromised ventilation. Factors influencing the inability to maintain airway cleanliness across the three cases shared similarities and differences. All patients experienced problems due to secretion accumulation, but secondary factors such as limited disease-related knowledge, prolonged TB history, and treatment adherence patterns influenced severity. For instance, in the third case, a history of TB for two years without follow-up for one year led to disease worsening, making airway clearance impairment more pronounced due to unmanaged inflammation. This is reinforced by the document, which states that lack of knowledge and irregular treatment contribute to deteriorating respiratory conditions in pulmonary TB patients.

The main intervention applied in all cases was peppermint aromatherapy through a simple inhalation method, administered three times daily for three days. This intervention followed the research procedure described in the document, which notes that peppermint aromatherapy is effective in reducing airway obstruction because menthol contained in mint leaves acts as a mild bronchodilator, a secretion-softening agent, and provides a sensation of ease during breathing. This therapy was combined with breathing techniques such as effective coughing and vital sign monitoring to evaluate patients' responses to the nonpharmacological intervention. The mechanism of action of aromatherapy is explained by the inhalation of warm vapor containing mint essence, which increases airway humidity, loosens mucus, and reduces bronchial spasm, thereby helping to maximize the expectoration process.

The progression of all three cases after receiving the intervention showed a consistent pattern. In the first case, improvement in respiratory function was evident from reduced sputum production, disappearance of rhonchi, and decreased respiratory rate after three days of mint leaf inhalation therapy. Similar results were observed in the second case, where the patient showed significant improvement by the second day, with respiratory rate returning to normal and relief of dyspnea following regular therapy. Progress notes indicated the absence of adventitious breath sounds and an increase in oxygen saturation to 98 percent. In the third case, improvement was observed even more rapidly, occurring on the same evening after peppermint aromatherapy was administered, with rhonchi disappearing and breathing becoming more regular, despite the patient's initially more complex condition due to a long TB history.

Overall, the findings from the three cases indicate that peppermint aromatherapy had a tangible effect on improving impaired airway clearance. This is consistent with studies cited in the document, which conclude that simple inhalation using mint leaves is effective in reducing respiratory rate and improving sputum expectoration after three days of therapy in pulmonary TB patients. Factors supporting the effectiveness of this intervention include consistent therapy administration, patient cooperation, and proper inhalation techniques. In addition, combining aromatherapy with other nursing interventions such as teaching effective coughing techniques, respiratory monitoring, and collaboration in bronchodilator administration accelerated respiratory recovery in all three cases.

In conclusion, the three cases demonstrate a strong relationship between clinical disturbances caused by secretion accumulation in pulmonary tuberculosis and the positive impact of peppermint aromatherapy as

a nonpharmacological intervention. Each patient experienced significant improvements in respiratory rate, disappearance of adventitious breath sounds, and enhanced expectoration ability. These results reinforce that mint leaf aromatherapy can be a safe, effective, and widely applicable independent nursing intervention as a complementary therapy in managing ineffective airway clearance in patients with pulmonary tuberculosis.

5. Conclusion

The application of simple inhalation using mint leaf aromatherapy in patients with pulmonary tuberculosis has been proven to be beneficial in overcoming ineffective airway clearance. Mint leaf aromatherapy helps to liquefy retained secretions in the airways, thereby facilitating sputum expectoration. In addition, this therapy provides comfort for patients by reducing symptoms such as shortness of breath, anxiety, sleep disturbances, and dizziness, which are commonly experienced by individuals with pulmonary tuberculosis. Improvement in airway patency after the intervention was indicated by respiratory rates within normal limits, the absence of adventitious breath sounds such as rhonchi, and an increased ability to expectorate sputum.

The effectiveness of mint leaf aromatherapy is supported by the content of peppermint essential oil, which is rich in menthol (73.7–85.8%) and other compounds such as menthone, monoterpenes, sesquiterpenes, flavonoids, tannins, and minerals that function as antitussive, anti-inflammatory, soothing, and mucus-thinning agents. The results of this study demonstrate that the application of mint leaf aromatherapy significantly improves airway clearance in patients with pulmonary tuberculosis, as evidenced by an increase in productive coughing, a decrease in respiratory rate, and the absence of additional breath sounds. Therefore, mint leaf aromatherapy can be considered a safe, effective, and easy-to-apply independent nursing intervention and complementary therapy, both in healthcare settings and for family-assisted care at home.

It is recommended that the findings of this study be utilized to enhance nursing education and clinical practice, particularly in the application of nonpharmacological interventions for pulmonary tuberculosis patients. Mint leaf aromatherapy can be incorporated as a complementary nursing intervention to manage ineffective airway clearance, provided it is administered according to standard operating procedures. Furthermore, future researchers are encouraged to conduct studies with larger sample sizes and more robust research designs to further validate the effectiveness of mint leaf aromatherapy and expand evidence-based practice in the management of pulmonary tuberculosis.

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