



The Effectiveness of the Active Cycle of Breathing Technique and Peppermint Aroma Therapy on Reducing Shortness of Breath in Pulmonary Tuberculosis Patients at Sidikalang Regional General Hospital, Dairi Regency

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<p>Track Record Article</p> <p>Revised: 18 October 2025 Accepted: 20 November 2025 Published: 31 December 2025</p> <p>How to cite : Silaban, J., Hutagalung, P. M. A. R., Sitohang, T. R., & Naibaho, R. (2025). The Effectiveness of the Active Cycle of Breathing Technique and Peppermint Aroma Therapy on Reducing Shortness of Breath in Pulmonary Tuberculosis Patients at Sidikalang Regional General Hospital, Dairi Regency. <i>Contagion: Scientific Periodical Journal of Public Health and Coastal Health</i>, 7(3), 415–423.</p>	<p style="text-align: center;">Abstract</p> <p><i>Tuberculosis (TB) has been a health problem in Indonesia and many countries, and it is included in Goal 3 of the Sustainable Development Goals (SDGs). Breathing pattern disorders caused by TB are a major problem that can lead to complications. This study aims to analyze the effectiveness of Active Cycle Breathing Technique (ACBT) and peppermint aromatherapy on reducing shortness of breath in patients with Pulmonary TB. The study was carried out in the Sidikalang Regional Hospital Polyclinic in patients with pulmonary TB. This study used a quasi-experimental design with a pre-post test. The number of samples in each case and control group was 35 people. Data analysis used the independent T-test at a significance level of 95% ($\alpha = 0.05$). The results of the independent T-test showed a significance 0,008 (<0.05), which means that ACBT and peppermint aromatherapy are effective in reducing the scale of shortness of breath in Pulmonary TB patients at Sidikalang Regional Hospital. This study reveals that ACBT and peppermint aromatherapy can be integrated into clinical guidelines for the management of patients with respiratory disorders. The findings suggest that ACBT combined with peppermint aromatherapy may serve as an alternative therapy for alleviating shortness of breath. This procedure is relatively easy and inexpensive to perform and can be done independently at home without supervision.</i></p> <p>Keywords: ACBT, Peppermint aromatherapy, Shortness of breath, Pulmonary TB.</p>
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INTRODUCTION

Pulmonary tuberculosis (TB) is caused by Mycobacterium tuberculosis, transmitted through droplets when an infected person coughs or sneezes. Indonesia has the third-highest number of TB cases in the world, after India and China, with a death toll of 8.5% of the 9.9 million people worldwide (Chakaya et al., 2021; Rahmi dan Roslina, 2021). According to the Ministry of Health, the number of positive TB sufferers in Indonesia reached 351,939 in 2020 (RI, 2021), and 397.377 in 2021 (Kemenkes, 2023). In North Sumatra province, the highest incidence of TB cases can be seen in Medan, where 12,105 people (PemprovSU, 2021) were infected by TB, and 0.17% incidence of TB cases in North Sumatra in 2023 (SKI, 2023).

Among TB patients, the common signs and symptoms that significantly worsen the condition are shortness of breath (Naibaho & Kabeakan, 2021). Other symptoms include coughing up blood, blood phlegm, fever, weakness, decreased appetite, weight loss, malaise,

night sweats without physical activity, and fever lasting more than a month. Hemoptysis, a cough with blood-tinged mucus, and chest pain may also occur (Dewi, 2019). These symptoms can trigger shortness of breath among patients with TB.

Shortness of breath can be managed without medication through techniques like the Active Cycle of Breathing (ACBT). This is a breathing exercise that helps people control their breathing so it becomes calm and regular. It strengthens the respiratory muscles and helps loosen and clear mucus (sputum), making it easier to open the airways (Pratama, 2021). According to Bulu et al. (2023), as a result of pulmonary tuberculosis, experiencing shortness of breath is a serious problem that should not be ignored, as it can lower both productivity and quality of life. To address this, safe, affordable, and easy-to-use non-drug treatments are needed. One such method is the Active Cycle of Breathing Technique (ACBT), a breathing exercise proven to help clear the airways, improve lung function, and reduce breathlessness in people with chronic respiratory conditions. ACBT also supports chest expansion and makes it easier to expel phlegm. When applied to patients with bronchiectasis caused by tuberculosis, this technique has been shown to improve oxygen levels and reduce shortness of breath, as reflected in lower Borg scale scores. ACBT has been proven to overcome ineffective airway clearance characterized by dyspnea and caused by excessive sputum, especially in patients with pulmonary tuberculosis (Endria et al., 2022), (Zisi & Chryssanthopoulos, 2022), (Sawitri et al., 2024).

Shortness of breath among TB patients causes difficulty for the patients to breathe. It was known that peppermint aromatherapy can reduce shortness of breath in TB patients because it has the essential oil menthol (Sundari et al., 2021). The mint leaves aromatherapy can reduce shortness of breath in pulmonary tuberculosis patients (Butar-butur & Sitepu, 2023). The combination of ACBT and peppermint aromatherapy has not been widely studied simultaneously in populations of pulmonary tuberculosis (TB) patients, particularly within the context of healthcare services in Indonesia.

To prove this effectiveness, this study is crucial to evaluate the effectiveness of combining these two interventions in reducing shortness of breath among pulmonary TB patients. The findings are expected to provide a scientific basis for developing more comprehensive and easily applicable nursing interventions in clinical practice. Recent clinical evidence from a systematic review and meta-analysis shows that inhaling peppermint oil can significantly reduce respiratory symptoms and nausea-related discomfort, while also improving overall well-being. Although the studies did not directly measure its effect on sputum

clearance, the findings support the idea that peppermint may be useful as a complementary aid for breathing and coughing exercises (Gergo et al., 2025).

The number of pulmonary tuberculosis cases in Dairi Regency was 492 positive cases in 2020, 719 positive cases in 2021, and 536 visits to the Lung Polyclinic of Sidikalang Regional Hospital in 2022. In 2023, 1.112 cases were identified out of an estimated 1079 cases. Thus, this study aims to analyze the effectiveness of active cycle breathing techniques and peppermint aromatherapy in reducing shortness of breath in pulmonary tuberculosis patients.

METHODS

This study used a quasi-experimental pre-post test design with a control group. The sample size was 70, with 35 participants in each group, using an accidental sampling technique. The intervention group was given Active Cycle of Breathing Technique therapy and Peppermint Aromatherapy, while the control group was only given a leaflet on health education about tuberculosis transmission prevention. The selected respondents underwent a pretest to determine their shortness of breath, and were given ACBT therapy and peppermint aromatherapy. The selected respondents with inclusion criteria are pulmonary tuberculosis (TB) patients who visit the pulmonary clinic, can communicate well, and are willing to participate as respondents, have no other diseases that may cause shortness of breath besides pulmonary TB, and are experiencing shortness of breath.

The intervention was carried out six times over three consecutive days, conducted in the morning and evening. After the intervention, a post-test was conducted in the form of measuring the dyspnea scale. Data were collected from interviews and observations, documentation from Sidikalang Regional Hospital, and published manuscripts. The therapy was administered for a duration of 10–15 minutes by adding 3–5 drops of peppermint essential oil aromatherapy into a diffuser tube filled with hot water. The patient was positioned in an orthopneic position and remained compliant throughout the therapy. Clients who experienced allergies to aromatherapy, particularly peppermint or menthol content, immediately discontinued the intervention, were given warm water to drink, and received oxygen via nasal cannula at a rate of 2 liters per minute.

The study was conducted from January 2024 to December 2024 at Sidikalang Regional Hospital, Dairi Regency. Data were collected from interviews and observations, documentation from Sidikalang Regional Hospital, and published manuscripts. A questionnaire instrument used to collect data is from the American Thoracic Society with data analysis using the SPSS program to compare the means between the independent and dependent variables. Independent T-tests at a significance level of 95% ($\alpha = 0.05$) were conducted to identify whether or not

ACBT and peppermint aromatherapy affected reducing shortness of breath in pulmonary tuberculosis patients.

This research has obtained ethical approval from the Health Research Ethics Committee (KEPK) of the Medan Ministry of Health Polytechnic with letter number 01.26 024/KEPK/POLTEKKES KEMENKES MEDAN/2024, which is valid from June 11, 2024 to June 11, 2025. The ethical assessment process was declared ethically appropriate based on the seven WHO research ethics standards (2011), namely: (1) social values, (2) scientific values, (3) equitable distribution of burdens and benefits, (4) risks, (5) inducement or exploitation, (6) confidentiality and privacy, and (7) informed consent. All participants received a complete explanation of the purpose, benefits, procedures, and their rights in this research before giving their consent to participate voluntarily.

RESULTS

The results of the univariate analysis are described as follows:

1. Respondents' characteristics

The independent and dependent variables are described by the respondent characteristics. The following is a description of the characteristics of respondents in this study.

a. Frequency distribution of respondent characteristics

Table 1. Frequency distribution of respondent characteristics

No	Characteristics	Case Group		Control Group	
		f	%	f	%
A. Gender					
1	Man	21	60.0	22	62.9
2	Woman	14	40.0	13	37.1
	Total	35	100.0	35	100.0
B Age					
1	Teenager	6	17.1	3	8.6
2	Young adult	8	22.9	5	14.3
3	Old adults	14	40.0	14	40.0
4	Pre elderly	5	14.3	10	28.6
5	Elderly	2	5.7	3	8.6
	Total	35	100.0	35	100.0
C Education					
1	Elementary school	2	5.7	2	5.7
2	Junior high school	15	42.9	7	20.0
3	Senior high school	14	40.0	20	57.1
4	Bachelor	3	8.6	5	14.3
5	Master	1	2.9	1	2.9
	Total	35	100.0	35	100.0
D Occupation					
1	Farmer	13	37.1	12	34.4
2	Civil Servants/State-Owned Enterprise Employees	4	11.4	4	11.4

No	Characteristics	Case Group		Control Group	
		f	%	f	%
3	Self-employed	0	0	2	5.7
4	Laborer	5	14.3	8	22.9
5	Private sector employee	4	11.4	2	5.7
6	Student	6	17.1	3	8.6
7	Uncertain	3	8.6	4	11.4
Total		35	100.0	35	100.0

Based on the findings, it was found that 60% of pulmonary TB sufferers in the case group at Sidikalang Regional Hospital were male, compared to 62,9 % in the control group. There were 40% of old adults in the case group and 40% in the control group. In both groups, the majority of occupations were farmers (37.1% and 34.3%, respectively). Only 2.9% of people in both groups had a master's degree.

b. Effectiveness of ACBT and peppermint aromatherapy

ACBT and peppermint aromatherapy were administered twice a day, morning and evening, for three consecutive days. The results showed a decrease in shortness of breath on the scale after intervention.

Table 2. Average reduction in the shortness of breath scale

No	Intervention	Average Reduction in Shortness of Breath	
		Case Group	Control Group
1.	1	1.06	0.086
2.	2	1.14	0.171
3.	3	0.97	0.114
4.	4	1.0	0.086
5.	5	1.0	0.057
6.	6	0.94	0.086
Average		1.01	0.100

The average reduction in shortness of breath for the case group was 1.01, while the average reduction for the control group was 0.10

2. Bivariate Analysis

The results of the independent t-test for the case and control groups are shown in the table below.

Table 3. Independent t-test results

Variable	Intervention	Mean	SD	P-value
Decreased shortness of breath	Case group	1.0143	.31142	.000
	Control group	.1009	.11572	

The p-value obtained was 0.000 or less than 0.05. This indicates a significant difference in average shortness of breath reduction between the case and control groups from the first to sixth days of the intervention at Sidikalang Regional Hospital.

DISCUSSION

The findings of this study revealed that 60% of pulmonary tuberculosis patients in the case group at Sidikalang Regional Hospital were male, compared to 62.9% in the control group. There were 40% of the old adults (36-40) in the case group and 40 % in the control group, 2.9% of patients in both groups had a master's level of study. The majority of patients in both groups were farmers: 34.3% in the case group and 37.1% in the control group.

The characteristics of people suffering from pulmonary tuberculosis (TB) have changed over time. Previously, TB patients were young, productive adults (aged 15 – 45) who worked in crowded environments and led unhealthy lifestyles. TB patients now include the elderly, children, people with moderate nutrition, obese individuals, and those with an educated background. The elderly are susceptible to TB due to a weakened immune system, while children are more susceptible due to an immature system (Deniati et al., 2025).

The results of the independent t-test showed that ACBT therapy and peppermint aromatherapy effectively reduced shortness of breath in pulmonary tuberculosis patients at Sidikalang Regional Hospital, with a p-value of less than 0.05. The ACBT breathing technique reduced the respiratory rate (RR) by increasing lung elasticity and compliance, thereby improving pulmonary ventilation. Patients experienced a faster reduction in shortness of breath with ACBT exercises (Cahyono & Yuniartika, 2020). ACBT has also been shown to be effective in reducing dyspnea and improving oxygenation status and sputum production in patients with pulmonary tuberculosis (Subiakto, T., Nasihin, N., Dalami, E., & Natasya, 2023; Endria et al., 2022).

Research on non-pharmacological interventions using peppermint aromatherapy showed that pulmonary tuberculosis patients experienced decreased respiratory frequency and shortness of breath (Rahman et al., 2023). Respiratory rate significantly decreased from 25.33 to 20.83 times per minute with peppermint aromatherapy (Rahman et al., 2023). This is also in line with Ichsan et al., (2022), which mentions the effectiveness of peppermint aromatherapy in reducing shortness of breath in patients with pulmonary tuberculosis. Unlike pharmacological drugs such as bronchodilators or steroids, peppermint therapy does not cause dependency (Prastio et al., 2023).

Breathing exercises performed during ACBT increased transpulmonary pressure, expanded lung tissue, and mobilized bronchial secretions. On average, the case group experienced a 1.01 reduction in shortness of breath, while the control group experienced a 0.10 reduction. These results indicate that ACBT combined with peppermint aromatherapy

effectively reduces shortness of breath in patients with pulmonary tuberculosis at Sidikalang Regional Hospital.

The findings of this study have important implications for nursing practice and health service delivery, particularly in the management of patients with pulmonary tuberculosis. The results indicate that the combination of the *Active Cycle of Breathing Technique* (ACBT) and peppermint aromatherapy is effective in reducing shortness of breath, highlighting its potential as a safe, easy-to-implement, and relatively low-cost non-pharmacological nursing intervention. This intervention may be integrated into standard nursing care for patients with pulmonary tuberculosis, both in healthcare facilities and community-based care settings, as a complementary approach to standard medical treatment. From a theoretical perspective, the study supports the concept that active breathing exercises combined with sensory stimulation through aromatherapy can produce a synergistic effect in improving respiratory comfort and function, thereby contributing to the growing body of evidence on complementary therapies in respiratory nursing care.

Despite these promising implications, several limitations should be considered when interpreting the findings. The relatively small sample size may limit the generalizability of the results to the broader population of patients with pulmonary tuberculosis with varying levels of disease severity. In addition, the influence of pharmacological therapy could not be fully controlled, as all participants continued to receive standard anti-tuberculosis treatment (OAT). Consequently, the observed reduction in shortness of breath cannot be attributed solely to the ACBT and peppermint aromatherapy interventions. In addition, the assessment of shortness of breath relied on subjective measurement tools based on patients' perceptions, which may have introduced response bias. It was difficult to fully monitor how well participants followed the breathing techniques and used aromatherapy, especially when they practiced outside the direct supervision of the researchers. Differences among participants, such as age, nutrition, disease stage, other health conditions, and smoking habits, may also have affected their responses to the intervention, and these factors could not be completely controlled in this study.

CONCLUSIONS

Patients with pulmonary TB in both the case and control groups experienced a decrease in shortness of breath with ACBT and peppermint aromatherapy treatment. An independent t-test revealed a significant difference in the average reduction in shortness of breath in both groups, with a p-value: 0,008 (<0.05). These results suggest that ACBT combined with peppermint aromatherapy may serve as an alternative therapy for alleviating shortness of breath. This procedure is relatively easy, inexpensive, and can be performed independently at

home without supervision, making it suitable for use in resource-limited settings. While findings are promising, further studies with larger populations and longer follow-up periods are needed to confirm the sustainability of these benefits and to explore their integration into broader TB management strategies.

REFERENCE

- Butar-butur, M. L., & Sitepu, S. A. (2023). Pengaruh Inhalasi Sederhana Dengan Menggunakan Aromaterapi Daun Mint (*Mentha Piperita*) Terhadap Penurunan Sesak Napas Pada Pasien Tuberculosis Paru Di Puskesmas Desa Pon Kecamatan Sei Bamnam Tahun 2019. *Kesehatan Deli Sumatera*, *1(1)*(1), 1–7.
- Cahyono, Y. N., & Yuniartika, W. (2020). Efektifitas Active Cycle Of Breathing Pada Keluhan Sesak Nafas Penderita Tuberkulosis. *Prosiding Seminar Nasional Keperawatan Universitas Muhammadiyah Surakarta 2020 (Profesi Ners XXII)*.
- Chakaya, J., Khan, M., Ntoumi, F., Aklillu, E., Fatima, R., Mwaba, P., Kapata, N., Mfinanga, S., Hasnain, S. E., Katoto, P. D. M. C., Bulabula, A. N. H., Sam-Agudu, N. A., Nachega, J. B., Tiberi, S., McHugh, T. D., Abubakar, I., & Zumla, A. (2021). Global Tuberculosis Report 2020 - Reflections on the Global TB burden, treatment and prevention efforts. *International Journal of Infectious Diseases: IJID: Official Publication of the International Society for Infectious Diseases*, *1(1)*, S7–S12. <https://doi.org/https://doi.org/10.1016/j.ijid.2021.02.107>
- Deniati, E. N., Fauzia, Z. H., & Imthiatyiah, S. M. (2025). *Preventia: The Indonesian Journal of Public Health Demographic Characteristics and History of Pulmonary TB Treatment in Malang City in 2022-2023 Demographic Characteristics and History of Pulmonary TB Treatment in Malang City in 2022-2023*. *10(1)*. <https://doi.org/10.17977/um044v10i12025p16-26>
- Dewi, B. D. N. (2019). *Diabetes Mellitus dan Infeksi Tuberkulosis: Diagnosis dan Pendekatan Terapi*. ANDI.
- Endria, V., Yona, S., & Waluyo, A. (2022). Penerapan Active Cycle of Breathing Technique Untuk Mengatasi Masalah Bersihan Jalan Nafas Pada Pasien Tuberculosis Paru dengan Bronkiektasis: Studi Kasus. *Journal Telenursing*, *4(1)*, 144–152. <https://doi.org/10.31539/joting.v4i1.3435>
- Gergo, D., Garmaa, G., Nguyen, U., To, D., Harnos, A., & Nagy, R. (2025). *Inhaling Peppermint Essential Oil as a Promising Complementary Therapy in the Treatment of Nausea and Vomiting*. 1–25.
- Hutabarat, V., Sitepu, S. A., & Sinambela, M. (2019). Pengaruh inhalasi sederhana menggunakan aromaterapi daun mint (*mentha piperita*) terhadap penurunan sesak nafas pada pasien tuberculosis paru di puskesmas. *Jurnal Penelitian Kebidanan & Kespro*, *2(1)*, 11–16. <https://doi.org/https://doi.org/10.36656/jpk2r.v2i1.101>
- Ichsan, M., Caroline, L., Sunusi, M., & Irawati, L. (2022). Literature review: aromaterapi daun mint efektif dalam menurunkan sesak napas pada pasien tb paru. *Madago Nursing Journal*, *3(1)*, 35–42. <https://doi.org/10.33860/mnj.v3i1.1091>
- Kemkes. (2023). *Profil Kesehatan Indonesia 2022* (F. Sibuea (ed.)). Kementerian Kesehatan Republik Indonesia.
- Naibaho, E. N. F., & Kabeakan, S. M. H. (2021). Pengaruh Terapi Active Cycle Of Breathing Technique (Acbt) Terhadap Frekuensi Pernafasan (Respiratory Rate) Pada Penderita Tuberculosis Paru Di Rumah Sakit Umum Imelda Pekerja Indonesia Medan. *Indonesia Trust Health Journal*, *4(2)*. <https://doi.org/https://doi.org/10.37104/ithj.v4i2.84>
- Pemprovsu, D. (2021). *Profil kesehatan sumatera utara tahun 2020*.
- Prastio, J., Imamah, I. N., Yulianti, R., & Pernafasan, F. (n.d.). *Peppermint Terhadap Masalah*

Keperawatan Pada Anak Bronkopneumonia. 19–26.

- Pratama, A. D. (2021). Efektivitas Active Cycle of Breathing Technique (ACBT) Terhadap Peningkatan Kapasitas Fungsional pada Pasien Bronkiektasis Post Tuberkulosis Paru. *Jurnal Vokasi Indonesia*, 9(1), 65–72.
- Rahman, V., Arjuna, & Ardiansyah. (2023). Efektifitas penerapan inhalasi sederhana aromaterapi peppermint terhadap penurunan frekuensi pernapasan pada penderita tuberculosis paru di wilayah kerja puskesmas mentok tahun 2023. *Jurnal Keperawatan Dirgahayu (JKD)*, 5(2), 9–15. <https://doi.org/10.52841/jkd.v5i2.372>
- RI, K. K. (2021). Profil Kesehatan Indonesia Tahun 2020. In *Kementerian Kesehatan RI*. <https://doi.org/10.1524/itit.2006.48.1.6>
- Sawitri, A. M., Yuniarti, E. V., & Pratiwi, R. M. (2024). *Active Cycle of Breathing Technique (ACBT) and Effective Coughing on Respiratory Rate Changes in COPD Patients*. 8(2), 145–151.
- Siswantoro, E. (2019). Pengaruh aroma terapi daun mint dengan inhalasi sederhana terhadap penurunan sesak nafas pada pasien tuberculosis paru. *Keperawatan Dan Kebidanan Stikes Dian Husada Mojokerto*.
- Subiakto, T., Nasihin, N., Dalami, E., & Natasya, E. (2023). Effectiveness active cycle of breathing technique therapy on dyspnea in pulmonary tuberculosis patients at tangerang hospital. *Journal of Smart Nursing and Health Science*, 1(1), 15–23.
- Sundari, L., Fitri, & Surwono. (2021). Penerapan Inhalasi Sederhana Menggunakan Daun Mint (Mentha Piperita) Terhadap Penurunan Sesak Nafas Pada Pasien Tb Paru (Mentha Piperita) To Reduce Shortness Of Breath. *Jurnal Cendikia Muda*, 1, 256–261.
- Zisi, D., & Chryssanthopoulos, C. (2022). *The effectiveness of the active cycle of breathing technique in patients with chronic respiratory diseases : A systematic review*. 53.