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Effective Coughing Exercises and Aromatherapy Can Clean The Air Tracts in Pulmonary TB Patients : a Case Study

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ABSTRACT

Pulmonary tuberculosis (pulmonary TB) is an infectious disease caused by Mycobacterium Tuberculosis. Pulmonary TB can also cause secretion retention due to increased mucus production by epithelial cells of the lungs. Pulmonary TB This study aims to determine the effectiveness of effective coughing ability in pulmonary TB patients. The case study design in 4 patients used a multiple case study, namely studying in depth several patients with the same case, the case study was carried out by identifying patients, conducting patient assessments, conducting planning, determining diagnoses, and providing implementation and evaluation. After 3 days of intervention, there was a decrease in sputum production in the four patients, indicating that the intervention given was effective in helping clear the patient's airway.

Keywords: Pulmonary tuberculosis; effective cough; nursing care

Background

Pulmonary tuberculosis (pulmonary TB) is a contagious infectious disease caused by the bacterium Mycobacterium tuberculosis, which generally attacks the lung tissue and is transmitted through droplets when an active sufferer coughs or sneezes. Pulmonary TB can cause respiratory problems such as prolonged productive coughing, ineffective phlegm production, and difficulty breathing, thus disrupting the patient's respiratory function. Pulmonary tuberculosis is the third leading cause of death in the world after cardiovascular disease and respiratory tract disease, and is the number one cause of death among infectious diseases (2).

According to a report by the World Health Organization shows that in 2023–2024 an estimated 10.8 million people worldwide will experience active TB, with Indonesia ranking second as one of the countries with the highest case burden in the world and thousands of deaths each year due to this disease (3). In Indonesia, cases of pulmonary tuberculosis will reach 969,000 cases of pulmonary TB in 2025, this figure shows an increase of around 17% compared to the previous year and reflects the magnitude of the problem of TB infection in the community (4). These epidemiological trends indicate that pulmonary tuberculosis is not only an individual clinical problem but also a major challenge in health care, particularly in terms of detection, reporting, and access to appropriate treatment. This situation demonstrates that pulmonary TB remains a significant burden on the Indonesian health system and is a primary target of infectious disease control policies through a multisectoral approach and improvements to the detection system. The 2020-2024 Indonesian Tuberculosis Control Strategy uses a people-centered planning framework (PCF) recommended by WHO in 2019 (5). One way to establish the PCF framework through accurate diagnosis is through sputum examination. Coughing occurs due to irritation of the bronchi. This cough is necessary to remove inflammatory products. Because the involvement of the bronchi in each disease is different, it is possible that a cough only appears after the disease has developed in the lung tissue, namely after weeks or months of inflammation . The nature of the cough starts from a dry cough, then after inflammation appears, it becomes productive (producing sputum). Coughing is the earliest symptom and is the most frequently complained of disorder (6).

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The role of nurses in pulmonary TB patients is crucial in helping meet basic needs and reducing complaints. Nursing actions include positioning the patient in a semi-Fowler's position to reduce shortness of breath, practicing effective coughing, administering a nebulizer to help expel secretions and improve respiratory function, and monitoring medication. In this regard, nurses play a crucial role as controllers of OAT administration and as educators, providing information on pulmonary TB risk factors and preventative measures. Nurses also play a role in providing moral support and motivation to patients to maintain adherence to treatment, and in involving families in accompanying patients in taking their medications regularly, given the significant role of families in the success of pulmonary TB treatment. In addition to physical care, pulmonary TB patients also require psychosocial support because they often experience low self-esteem and social isolation due to the stigma of the disease. Previous nursing care tended to focus on physical symptoms, while educational and psychosocial aspects were not optimal. Therefore, nurses play a crucial role as educators, motivators, and facilitators in providing comprehensive nursing care to pulmonary TB patients (7). The results of interviews conducted by researchers on pulmonary TB patients in the Intensive Treatment Phase at Srengat Blitar Regional Hospital found that on average, patients had difficulty in expelling phlegm/sputum and did not know about effective coughing correctly to facilitate the expulsion of phlegm/sputum, from the results of the interview, the researchers were interested in conducting a case study of nursing care for pulmonary TB patients.

Methods

A descriptive case study with a nursing process approach was carried out at Srengat Regional Hospital, Blitar Regency, Nursing care through several interrelated stages, namely nursing assessment, nursing diagnosis, nursing intervention, nursing implementation and nursing evaluation. The assessment was conducted on four pulmonary TB patients with complaints of secretion retention who were at Srengat Regional Hospital Mutiara Room for 3 consecutive days by building a relationship of mutual trust and requesting informed consent, interviews according to the interview format and observation through assessment, physical examination, and measurement of vital signs such as blood pressure using a digital sphygmomanometer, pulse and RR using a count for 1 minute, and spo2 measured by oxygen saturation, the use of APD level 2. The assessment data were analyzed to determine nursing problems, and provide interventions related to effective coughing techniques according to SOP and the use of peppermint aromatherapy using a 3-drop nebulizer used for 5 minutes and a frequency of 2 times a day.

Results

Based on nursing care data for four pulmonary TB patients at Srengat Hospital, Mutiara Room, it was found that all four patients had primary complaints of shortness of breath and difficulty in producing sputum. The assessment results showed that the nursing diagnoses found in all clients were ineffective airway clearance, nausea, and hyperthermia. Nursing interventions provided included effective coughing exercises and the use of lavender aromatherapy. A three-day evaluation showed a decrease in sputum production and decreased nausea. The results of the sputum production evaluation were measured using a syringe, while the results of the nausea management evaluation were measured using the Numeric Rating Scale (NRS) instrument for nausea.

Tabel Data pre test dan post test intervensi

Variabel		Sputum Volume (cc)	
		Before intervention	After intervention
Patient 1	Morning	50	20
	Afternoon	40	10
Patient 2	Morning	60	20
	Afternoon	50	20
Patient 3	Morning	80	40
	Afternoon	70	20

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Patient 4	Morning	80	40
	Afternoon	60	30

Variabel		**Nuremic Rating Scale (NRS) Mual**	
		Before intervention	After intervention
Patient 1	Morning	Medium	Light
	Afternoon	Medium	Light
Patient 2	Morning	Medium	Light
	Afternoon	Medium	Light
Patient 3	Morning	Medium	Medium
	Afternoon	Medium	Light
Patient 4	Morning	Heavy	Medium
	Afternoon	Heavy	Medium

Discussion

Based on the gender of the four patients suffering from pulmonary TB, two patients were female and two patients were male. This study found that the two genders had the same ratio, namely 2:2. According to previous research, the results of a survey showed that the prevalence of tuberculosis in men was three times higher than in women. This is likely because men are more exposed to TB risk factors, such as smoking and lack of knowledge about the disease(8). However, this study also found female patients suffering from pulmonary TB. The two female patients' TB cases were caused by a history of smoking and the other living in the same house as a TB patient, increasing their risk of contracting TB.

Based on the age data of the four patients treated, TB was found to be more prevalent in productive age groups (25-58 years), with three patients. This finding aligns with previous research that the highest prevalence of pulmonary TB with positive TCM results is in the productive age group, as this age group is more active outside the workplace, making it easier for someone to spread the virus (9). People of productive age are at greater risk of contracting pulmonary TB than older adults due to frequent outdoor activities, which facilitate the spread of Mycobacterium tuberculosis.

Based on the complaints experienced by the four patients, they all had similar symptoms, including coughing, shortness of breath, fever, and nausea. These TB symptoms, in line with the 2015 Ministry of Health (MOH) guidelines, include coughing, which can be accompanied by additional symptoms such as blood-tinged phlegm, coughing up blood, shortness of breath, weakness and decreased appetite, weight loss, malaise, night sweats without physical activity, and fever lasting more than a month (10). Symptoms of pulmonary TB can vary, but common symptoms typical of TB patients include a cough lasting more than two weeks accompanied by blood, fever, nausea, and weight loss. After conducting the assessment, the diagnostic data for the four patients were consistent in their primary diagnosis: ineffective airway clearance related to retained secretions, characterized by patients complaining of coughing, shortness of breath, wheezing, and difficulty expelling phlegm. This aligns with the data from the majority of case study subjects who reported ineffective airway clearance, as indicated by patients complaining of shortness of breath and coughing up phlegm. This is caused by the ineffective expectoration of phlegm due to airway ineffectiveness, resulting in difficulty breathing.

In the second diagnosis there is a difference in diagnosis between the first patient and patients 2, 3, 4. In the first patient Mrs. S, the diagnostic analysis found a diagnosis of hyperthermia related to the disease process characterized by a temperature of 37.9. This is in line with the major data of the case study subjects who experienced hyperthermia indicated by the patient experiencing a temperature above 37.5, hot extremities, This is caused by an inflammatory reaction that occurs in response to Mycobacterium tuberculosis bacterial infection, while in patients Mrs. M, Mr. S, and Mr. F have similarities in the second diagnosis, namely Nausea related to the effects of pharmacological agents characterized by patients complaining of nausea, not wanting to eat. This is

in line with the major data of the case study subjects who experienced nausea indicated by the patient complaining of nausea, decreased appetite. This is due to the side effects of the drug because some anti-TB drugs can cause nausea as a side effect. In the third diagnosis only appeared in the fourth patient (Mr. F). In the analysis of the 3rd diagnosis, a diagnosis of hyperthermia was found related to the disease process characterized by a temperature of 37.8, hot extremities. This is in line with the major data of the subject of the hyperthermia case study in Mrs. S that hyperthermia is caused by an inflammatory reaction that occurs in response to Based on the first intervention table, the interventions provided to the four patients included effective coughing exercises, such as identifying coughing ability, adjusting the patient's position in a semi-Fowler's position, teaching effective coughing, and collaborating with the doctor to administer medications such as codeine, NAC, and cetirizine. The focus of the intervention in this case study was effective coughing exercises. Therapeutic measures included adjusting the patient's position in a semi-Fowler's position and providing warm fluids. Meanwhile, education included teaching effective coughing techniques. Effective coughing exercises aim to expel difficult-to-expell secretions. Effective coughing exercises aim to expel phlegm. Furthermore, effective coughing exercises also contribute to the diagnosis of tuberculosis through sputum examination. When a patient can cough effectively, sputum can be obtained for laboratory testing, rather than saliva or nasal secretions. This ensures optimal results during sputum examination(11).

In the subsequent intervention analysis, the interventions given to the three patients (Mrs. M, Mr.S, Mr. F) included nausea management, such as identifying factors that cause nausea, monitoring nutritional intake, encouraging deep breathing techniques, and collaborating with doctors in administering medications such as ranitidine 50mg/iv injection and metoclopramide 10mg/iv. Therapeutic interventions were carried out by providing small, attractive meals. Meanwhile, education was carried out by providing aromatherapy. Providing aromatherapy can be one method used to help reduce nausea in TB patients, such as peppermint or lavender aromatherapy. In addition to reducing nausea, the use of aromatherapy can also help reduce symptoms of shortness of breath caused by patients. Aromatherapy interventions that use natural ingredients can be used as complementary therapy to pharmacological treatment in pulmonary TB patients with the main symptom of shortness of breath (12).

In the subsequent intervention analysis, the interventions given to the 2 patients (Mrs. S, Mr. F) were hyperthermia management such as identifying the cause of hyperthermia, monitoring body temperature, providing a cool environment, recommending warm compresses, collaborating with doctors in administering NS infusion 1000cc/24 hours and injection and santagesic 1 gr/iv. Therapeutic was carried out by providing warm compresses. Warm compresses are actions using a cloth or towel that has been dipped in warm water and placed on certain parts of the body so as to provide a feeling of comfort and lower body temperature (13).

The implementation carried out by the researcher was based on the planned intervention. Based on the implementation table, it can be seen that the four pulmonary TB patients with a nursing diagnosis of ineffective airway clearance were given effective coughing exercises. According to Tahir et al. in their research, effective coughing exercises can help overcome airway clearance problems so that the airway becomes patent. Airway patency consists of four outcome criteria: respiratory frequency, respiratory rhythm, additional breath sounds, and the ability to expel sputum(11). Implementation was carried out for 3 days, the first day's implementation identified coughing ability, set the semi-fowler position, explained the purpose of effective coughing techniques, taught effective coughing techniques, collaborated with doctors in providing therapy, the second implementation identified coughing ability, set the semi-fowler position, taught effective coughing techniques, collaborated with doctors in providing therapy, and the third implementation identified coughing ability, set the semi-fowler position, taught effective coughing techniques, collaborated with doctors in providing therapy.

Based on the implementation table, it can be seen that the three patients (Mrs. M, Mr. S, Mr. F) with pulmonary TB diagnosed with nausea were given education on the use of aromatherapy to reduce nausea. In addition, aromatherapy can also be used to reduce shortness of breath. Aromatherapy can be used with a simple inhalation method by inhaling warm steam from boiling water mixed with aromatherapy
(7). Implementation was carried out for 3 days, the first day's implementation identified factors

causing nausea, monitored nausea, monitored nutritional and calorie intake, provided food in small quantities, and recommended non-pharmacologic techniques using aromatherapy, the second day's implementation monitored nausea, monitored nutritional and calorie intake, provided food in small quantities, and recommended non-pharmacologic techniques using aromatherapy, the third day's implementation identified factors causing nausea, monitored nausea, monitored nutritional and calorie intake, provided food in small quantities, and recommended non-pharmacologic techniques using aromatherapy.

Based on the implementation table, it can be seen that both patients (Mrs. S, Mr. F) with pulmonary TB with a nursing diagnosis of hyperthermia were given the implementation of the use of warm compresses. The actions or roles of hospital staff during providing health services to pulmonary tuberculosis patients are very important in providing information about the importance of encouraging clients to drink lots of water, encouraging clients to wear thin clothing, compressing using warm water on the groin and axilla because blood vessels will widen due to warm temperatures which can help facilitate heat release in the body, and taking medication regularly and completely, explaining the rules of warm compresses, taking medication correctly and symptoms of side effects that patients may experience, the willingness of officers to listen to patient complaints and provide solutions and the role of officers in providing health education to patients (14)(15). Implementation for 3 days, the first day implementation identifies the cause of hyperthermia, monitors body temperature, loosens clothing, recommends increasing fluids, recommends warm compresses, recommends bed rest, collaborates with doctors in providing therapy, the second day implementation monitors body temperature, recommends increasing fluids, recommends warm compresses, recommends bed rest, collaborates with doctors in providing therapy, the third day implementation monitors body temperature, recommends increasing fluids, recommends warm compresses, recommends bed rest, collaborates with doctors in providing therapy.

In conducting research, researchers have limitations in conducting research, namely a small number of samples and limited time so that the provision of intervention is less than optimal.

Conclusions and Recommendations

Based on the nursing care provided, the assessment revealed a nursing diagnosis and nursing planning based on the priority problems identified. All clients reported ineffective airway clearance, nausea, and hyperthermia. Nursing interventions provided included effective coughing exercises and the use of lavender aromatherapy. The evaluation showed decreased sputum production and decreased shortness of breath. For nurses, this research is expected to enrich nursing knowledge, particularly in the nursing care of pulmonary TB patients, addressing current nursing needs and issues. For hospitals, this research is expected to provide information regarding the use of aromatherapy to reduce nausea and shortness of breath. For respondents, the results of this study are expected to provide a better understanding of pulmonary TB and its independent management to alleviate symptoms through non- pharmacological methods.

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