

Original Articles: Case Study

ANALYSIS OF TUBERCULOSIS FAMILY NURSING CARE WITH THE APPLICATION OF EFFECTIVE COUGH AND CHEST PHYSIOTHERAPY TO OVERCOME IN AFFECTIVE RESPIRATORY CLEAR IN BANYU URIP SURABAYA

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Article history:

Received: 22 September 2023

Accepted: 14 February 2024

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Keywords:

*Tuberculosis, Airway Clearance,
Effective Coughing, Chest
Physiotherapy.*

Page Number: 125-133

Abstract

Background: In tuberculosis, excessive secretion production can cause airway obstruction, resulting in the problem of ineffective airway clearance. One of the nursing interventions that can be applied to clear sputum in the airways is chest physiotherapy and effective coughing techniques. Effective cough techniques and chest physiotherapy to make things easier expelling sputum so that the breathing process can run well so that it meets the body's oxygen needs.

Objective: The aim of the research was to determine the application of effective coughing and chest physiotherapy to reduce the ineffectiveness of airway clearance in tuberculosis clients carried out independently.

Methods: This research method uses a descriptive method with a case study approach. The instrument used is an observation sheet. The number of respondents included one tuberculosis family with a nursing diagnosis of ineffective airway clearance.

Result: The results of applying effective cough techniques and chest physiotherapy given twice per day for three days with a duration of 10 to 15 minutes for each appointment showed that complaints of coughing and shortness of breath were reduced and it was easier to expel phlegm.

Conclusion: The application of effective coughing techniques and chest physiotherapy has proven effective in reducing ineffective airway clearance in tuberculosis clients. Effective cough techniques and chest physiotherapy can be used as alternative measures to overcome ineffective airway clearance.

INTRODUCTION

Pulmonary Tuberculosis is an infectious disease caused by *Mycobacterium tuberculosis*. This germ has a high fat content in its cell membrane, which makes this bacteria resistant to acid and not resistant to ultraviolet light, therefore it is transmitted mainly at night (Rabb, 2010). Pulmonary TB disease is transmitted through airborne means, namely inhalation of droplets containing *Mycobacterium tuberculosis* bacteria.

World Health Organization(WHO) shows that there has been an increase in the prevalence of TB cases from 9.6 million to 10.4 million in 2016. Indonesia is ranked second in the world with the most TB disease, namely 1.2 million cases with a death rate of 100,000 people every year (Global Tuberculosis Report, 2016).Indonesia has a big problem in dealing with pulmonary TB disease. In 2018, data on new cases of pulmonary TB in Indonesia was 1,017,290, with the proportion of women being 506,576 and men being 510,714 cases. In East Java, in 2021 there were recorded to be 43,268 sufferers, and this is the number of cases third highest National. Meanwhile, the number of cases Surabaya there were 4,475 cases (East Java Provincial Statistics Agency, 2021). At the Banyu Urip Community Health Center, Surabaya, the number of TB cases in 2022 will be 120 cases and will continue to increase along with the increase in population and the increase in investigative examinations of contacts of tuberculosis sufferers.

Pulmonary TB patients will complain of a cough accompanied by phlegm and/or coughing up blood, shortness of breath, pain in the chest area, night sweats, decreased appetite. Physical examination shows signs in the form of increased respiratory frequency, irregular breathing rhythm, and rhonchi (Ardiansyah, 2012). In pulmonary tuberculosis there is a buildup or accumulation of secretions in the upper respiratory tract. This occurs because bacteria damage the lung parenchyma area causing an inflammatory reaction, namely excessive secretion production which can cause respiratory problems due to airway obstruction (Andra & Yessie, 2013).Referring to these manifestations, a nursing problem that commonly occurs in pulmonary TB patients is ineffective airway clearance (Herdman, 2018). Ineffective airway clearance is the inability to clear secretions or blockages in the airway to maintain a clear airway (Herdman, 2018). So far, the family has not taken action to resolve these health problems, even though the family is the closest part that has an important role.

The impact that occurs if ineffective airway clearance is not immediately addressed can lead to a lack of oxygen in the body's cells. Body cells that lack oxygen will have difficulty concentrating because metabolism is disrupted due to a lack of oxygen supply in the blood. For this reason, it is necessary to take action to mobilize the release of sputum so that the breathing process can run well to meet the body's oxygen needs (Endrawati, Aminingsih S, & Ariasti D, 2014). The family has a duty to care for the health of family members. The family health care tasks include the family's ability to recognize health problems, the family's ability to decide or take appropriate action, the family's ability to provide care to family members, the family's ability to modify the environment, both physical and psychological environments that support the health of family members and the family's ability to utilize health service facilities. In tackling TB problems, it is necessary to pay attention to several aspects by prioritizing preventive as well as promotive as well as curative and rehabilitative.

One of the nursing interventions that can be applied to clear sputum in the airways is chest physiotherapy and effective coughing. Many studies have proven that chest physiotherapy and coughing can effectively help patients expel sputum (Nugroho, 2011; Kapuk, 2012; Endrawati, Aminingsih S, & Ariasti D, 2014; Maidartati, 2014). According to Perry & Potter in Alie (2015), an effective cough is a

method of coughing correctly, where the client saves energy so that he does not get tired easily and can expel phlegm optimally. According to Marni (2016), an effective cough is an effort to expel phlegm to keep the lungs clean. The treatment given to the family is to overcome these signs and symptoms. The combination of chest physiotherapy and effective coughing has been able to reduce shortness of breath and make it easier for sufferers to expel phlegm. This effective cough technique and chest physiotherapy can be done at home with flexible time, so it can help families carry out independent care.

METHODS

Study Design

This final scientific work uses a descriptive case study design. Where research data will be presented in the form of a case study using a nursing process approach and describing the process of implementing family nursing care.

Settings

This case study was carried out in the work area of the Banyu Urip Community Health Center, Surabaya on March 16 2023 – March 18 2023. The selection of location and time is carried out in conjunction with community and family nursing practice.

Research subject

The subject of this research was Mrs. L is 45 years old and has a family with pulmonary tuberculosis who experiences problems with ineffective airway clearance.

Instruments

The instrument in this research is a family nursing care assessment format using an interview guide to obtain information on what the client and family feel and using a Respiratory Rate observation sheet and a shortness of breath questionnaire (modified Borg scale).

Data collection

Interview Method

The researcher directly interacted with pulmonary TB patients, obtained informed consent from the respondent indicating that the respondent was willing to be a case study subject, contracted the time, place and topic of the interview with the respondent and asked several questions in accordance with the interview guidelines.

Observation Method

The researcher made direct observations about the client's response to the application of effective coughing and chest physiotherapy which was carried out systematically.

Physical examination

Carrying out a physical examination using IPPA (inspection, palpation, percussion and auscultation) to assess physical changes due to ineffective airway clearance

Documentation

Record information on the client's health status regarding the problem of ineffective airway clearance including laboratory and treatment data. As well as journals as theoretical references.

Data Analysis

The data analysis used in this study is descriptive analysis based on data in the format of nursing care.

Ethical Consideration

The researcher applied for permission to the Banyu Urip Community Health Center to conduct research by bringing an application permission letter from Nahdlatul Ulama University Surabaya (along with Community and Family Nursing practice in the Banyu Urip Community Health Center Work Area). Meanwhile, research subjects were given informed consent before family nursing care was carried out.

RESULTS AND DISCUSSION

The study was carried out on March 14 2023 at 09.15 WIB by means of observation and interviews. Obtained observational data on lung examination by inspection: spontaneous breathing, symmetrical chest wall movement, percussion: dull sound, palpation: tactile fremitus felt the same, auscultation: crackles heard in both lungs, compos mentis consciousness, appeared weak, short of breath, blood pressure 110 /70 mmHg, pulse 78 x/minute, temperature 36.7 °C, respiration 26 x/minute, weight 37 kg, TB156 cm. Meanwhile, the results of the interview with Mrs. L and family obtained data from Mrs. L said he had difficulty coughing up phlegm for approximately 2 months, his body felt weak and sometimes short of breath, his appetite decreased and his weight was difficult to gain. Mrs. L and his family also said they did not know how to treat tuberculosis as a whole, especially the ease of expelling phlegm in the respiratory tract. This is in line with research by Wibowo (2016), that phlegm that is not expelled smoothly causes a buildup of sputum which creates adhesions in the airway, so that the airway is ineffective and causes shortness of breath.

In patients with pulmonary tuberculosis, sputum production increases over time. The sputum is initially mucoid in nature and the effect of effective coughing techniques is to expel the sputum in small amounts, then turns thick when it has cooled and softened (Alsagaff, 2012). Success in removing sputum is supported by several things, including sputum production, the patient's condition and the presence of airway obstruction by a foreign object. If one of these three things is present in a patient with pulmonary tuberculosis, then little sputum will be released.

The subject of the case study in this case is a family with pulmonary TB who experience nursing problems with ineffective airway clearance and do not know how to care for it. Airway ineffectiveness is the inability to clear secretions or blockages in the airway to maintain a clear airway.

The results of the study conducted on the subject Mrs. L, the patient has been coughing for ± 2 months, coughing up phlegm that is difficult to expel and has a history of OAT treatment in 2019. Based on this condition, namely coughing up phlegm, the body feels weak, short of breath, decreased appetite

and weight is difficult to gain and tends to fall according to several symptoms contained in the theory (Abata, 2014). Mrs. L also knows that she is sick with pulmonary tuberculosis, but is not yet able to understand the problem of pulmonary TB well. When asked what pulmonary TB disease is, the causes, signs and symptoms of TB, Mrs. L answered that pulmonary TB is a disease that attacks the lungs caused by bacteria with signs and symptoms of coughing. When asked how to treat TB in dealing with phlegm that is difficult to expel,

Based on data from the results of the assessment, the nursing diagnoses obtained were ineffective airway clearance and ineffective health maintenance. According to researchers, this nursing diagnosis was based on analysis of the data obtained, namely subjective data where Mrs. L said she had been coughing for 2 months and had difficulty expelling phlegm, shortness of breath, difficulty gaining weight and the family did not know how to care for families with TB. The objective data obtained from Mrs. L was RR 28 x/minute and crackles were heard in both lungs during auscultation. Mrs. L's family cannot explain how to care for families with TB. This occurs due to increased production of secretions in the respiratory tract (Somantri I., 2009).

The nursing action that will be taken to address problems experienced by airway management subjects is the application of effective coughing techniques to overcome the problem of ineffective airway clearance nursing in pulmonary tuberculosis patients. Effective coughing is a way to train patients who do not have the ability to cough effectively with the aim of clearing the larynx, trachea and bronchioles from secretions or foreign objects in the airway (Hidayat, 2012). Before carrying out an effective cough, chest physiotherapy is first carried out, because chest physiotherapy is a series of nursing actions consisting of percussion and vibration, postural drainage, breathing/deep breathing exercises, and effective coughing (Brunner & Suddarth, 2002: 647).

This is in accordance with the main aim of carrying out an effective cough, namely maintaining airway patency so that it can function properly (SLKI, 2016). With this intervention, it is hoped that the ineffectiveness of airway clearance in Mrs. L can be resolved so that the patient's breathing can function optimally. This shows that by coughing correctly, namely coughing effectively, you can save energy so you don't get tired easily and can expel phlegm optimally, this was conveyed in research conducted by Yulia Alie and Rodiyah (2013).

The next intervention given to Mrs. L is measuring vital signs which include blood pressure, temperature, pulse and breathing. Identifying knowledge regarding caring for families suffering from TB, especially the ability to expel phlegm and training in the application of effective cough techniques and chest physiotherapy. This is in accordance with research conducted by Ariyanto (2018), concluding that there is an influence of effective coughing techniques on the quality of sputum expulsion for the discovery of *Mycobacterium Tuberculosis* (MTB) in Tuberculosis patients at Dr Kariadi Hospital. And also, research conducted by Alie and Rodiyah (2013) showed that there was an effect of effective coughing on sputum production in Tuberculosis patients at the Peterongan Community Health Center, Jombang Regency.

Implementation carried out by Mrs. L is adjusted to the intervention, namely the application of effective cough techniques and chest physiotherapy. Before implementation, the client was given an informed consent sheet (consent sheet to conduct research) and the author made a contract with Mrs. L and family to teach effective cough techniques and chest physiotherapy. On the first day, what was done was to take the first measurement of the breathing score and shortness score felt by Mrs. L. Then, Mrs. L's family was given education about effective coughing and chest physiotherapy including the benefits, goals and how to do it. auscultating breath sounds, positioning the patient to maximize ventilation, teaching and demonstrating effective cough techniques and chest physiotherapy, auscultating breath sounds after effective coughing, and monitor the ability to cough effectively. Next, Mrs. L's family was asked to use an effective cough every time they felt phlegm accumulating in the respiratory tract, while chest physiotherapy was carried out twice a day for 10 - 15 minutes for 3 days.

Table 1. Respiratory Rate Before and After Intervention.

Respiratory Rate (RR)	Day					
	I		II		III	
	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
Before	28	28	27	26	24	23
After	27	27	26	24	24	22

Sources: Research Data, March 2023.

From the table above, it can be seen that the RR decreased from 28 x/minute to 22 x/minute and reduced rhonchi sounds on auscultation after effective coughing and chest physiotherapy. The results of the implementation of education on the application of effective cough techniques and chest physiotherapy in Mrs. L's family were that the family's knowledge of tuberculosis treatment increased with the indicator of being able to explain and carry out the interventions provided independently.

Table 2. Degree of Tightness (Modified Borg Scale).

Score	Degree of tightness (Modified Borg Scale)	Day											
		I				II				III			
		Morning		Afternoon		Morning		Afternoon		Morning		Afternoon	
		Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
0	There is no tightness												
1	Very light												√
2	Light								√	√	√	√	
3	Currently				√	√	√	√					
4	Sometimes it's heavy	√	√	√									
5	Heavy												

Sources: Research Data, March 2023.

Nursing evaluation of nursing interventions with the problem of ineffective airway clearance in Mrs. L's family which was carried out within 3 days. Evaluation on the first day by providing education and demonstration regarding effective coughing and chest physiotherapy. Clients are advised to continue carrying out the same interventions, namely by using effective coughing techniques and explaining how to care for TB families on the second day. During evaluation on the third day, there was a decrease in RR and rhonchi sounds. The results of monitoring vital signs showed that blood pressure was 100/70 mmHg, temperature 36.5 oC, pulse 78 x/min and RR 22 x/min. The nursing problems experienced by Mrs. L's family can be resolved with the result of increased knowledge about how to provide care for TB families,

These results are in accordance with research conducted by Almuddatsir (2014), there was a significant difference between the volume of secretions pre and post intervention of effective coughing and deep breathing exercises in Tuberculosis patients. Likewise, research on the effectiveness of coughing on sputum production conducted by Nugroho (2011) showed that the majority of respondents produced small amounts of sputum with a percentage of 53.33% and it became a lot after treatment, namely with a percentage of 66.67%. According to the researchers, at the final evaluation there was a decrease in RR and rhonchi sounds on the second and third days.

At this evaluation stage, the researcher also documented the results of the client's and family's understanding of tuberculosis, namely its causes, prevention that can be carried out by the client and family, as well as tuberculosis treatment, both pharmacological (OAT) and non-pharmacological treatment (effective cough techniques and chest physiotherapy).

LIMITATION

In preparing this final scientific work, there were several limitations that the author experienced, namely the schedule of meetings with family according to official schedules at work and ongoing community and family practices.

CONCLUSION

The results of the assessment showed that the family did not know how to treat tuberculosis as a whole and Mrs. L experienced coughing and difficulty expelling phlegm with RR measurements of 28 x/minute and rhonchi sounds.

Priority nursing diagnoses that emerged in Mrs. L is ineffectiveness of airway clearance and ineffectiveness of health maintenance. The intervention provided is airway management by applying effective cough techniques and chest physiotherapy and TB family health care education which is carried out twice every day for 3 days.

The results of the implementation that has been carried out in Mrs. L, namely increasing family

knowledge in maintaining health and making it easier to expel phlegm so that complaints of coughing and shortness of breath are reduced, followed by a decrease in RR and a decrease in rhonchi sounds. At this evaluation stage the researcher also documented the results of the family's understanding of tuberculosis, namely its causes, signs/symptoms, prevention that can be carried out by the client and family, as well as tuberculosis treatment, both pharmacological (OAT) and non-pharmacological (effective cough techniques and chest physiotherapy) treatment.

For the development of nursing science, based on research results, effective cough technique intervention and chest physiotherapy can reduce the ineffectiveness of airway clearance. The application of effective coughing techniques and appropriate chest physiotherapy is highly recommended as a non-pharmacological therapy to reduce the ineffectiveness of airway clearance in clients with pulmonary tuberculosis.

For clients and families, it is hoped that effective cough techniques and chest physiotherapy should be applied correctly and regularly to facilitate phlegm expulsion and reduce cough complaints in pulmonary tuberculosis clients.

AUTHOR CONTRIBUTION

Nanang Nurrachmat Setiadi: Literature review, conceptualization, methodology, carrying out the nursing process, and manuscript drafting.

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Nety Mawarda Hatmanti: Literature review, conceptualization, methodology, manuscript drafting, and supervise

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CONFLICT OF INTEREST

There is no conflict of interest in this study.

ACKNOWLEDGEMENT

Thank you to the Banyu Urip Surabaya Community Health Center, the supervisors and all parties who have helped ensure the smoothness and success of this case study.

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