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The Relationship Between Body Weight and Recurrence of Bacteriologically Confirmed Pulmonary Tuberculosis Patients at Lampaseh Public Health Center in 2021–2024

Nurul Fitria, Cut Putri Riska, Gisheila Julinda Tami, Rahmalia Hadiyana, Fina Faradina
UPTD Puskesmas Lampaseh, Indonesia
Email: nurul.fitria0590@gmail.com, nyakputri@gmail.com, tamigisheila@gmail.com, rahmalia.hadiyana@gmail.com, finafaradina91@gmail.com

ABSTRACT

Tuberculosis (TB) is an infectious disease caused by the Gram-positive bacterial infectious agent *Mycobacterium tuberculosis* which is an obligatory aerobic which generally attacks the lung organs in humans. This disease is transmitted by patients who spread through nuclei droplets that come out when the patient coughs or sneezes. Many new cases of tuberculosis are associated with malnutrition. The tendency to lose weight itself is a result of the symptoms of anorexia experienced by tuberculosis patients. Meanwhile, the inability to gain weight during therapy will be closely related to the risk of disease severity. The study aims to analyze the relationship between weight changes in patients with bacteriologically confirmed pulmonary tuberculosis and the recurrence of the disease at the Lampaseh Health Center from 2021 to 2024. This study uses a descriptive observational method with *a cross sectional approach.* The results show based on weight, the majority experienced weight gain, which amounted to 12 people (86%). Bacteriological confirmed pulmonary TB patients are equal in number between men and women, namely 7 people (50%) each. Age group of people with pulmonary TB. confirmed bacteriological highest in the age group of 40-59 years as many as 7 people (50%). Of all pulmonary TB patients who gained weight, none relapsed (0%). Meanwhile, those who lost weight or remained at a fixed weight and experienced a recurrence after undergoing treatment amounted to 1 person (50%). The conclusion of this study is that there is a relationship between the weight of patients with bacteriological confirmed pulmonary tuberculosis and the recurrence of pulmonary tuberculosis at the Lampaseh Health Center in 2021-2024

Keywords: *Pulmonary TB, Weight, Bacteriological*

INTRODUCTION

Tuberculosis (TB) is the disease that most often attacks the lungs and is caused by *Mycobacterium tuberculosis*. Tuberculosis remains a major problem worldwide. In 2019, around 10 million new cases occurred globally, and there were around 1.4 million deaths due to TB. In 2022, about 10.6 million new cases of TB were reported globally, which included 1.3 million cases in children under the age of 15. Tuberculosis was responsible for 1.3 million deaths worldwide in 2022, including 167,000 deaths of people living with *HIV* (*Human Immunodeficiency Virus*). The highest number of TB cases occurred in Southeast Asia, reaching 44%, followed by Africa at 25% and the Western Pacific at 18%. The incidence of tuberculosis in South Africa is among the highest in the world, with an estimated 468 cases per 100,000 people in 2022. While TB incidence is found in every part of the world, eight countries account for two-thirds of the global cases. Indonesia ranks second for TB incidence after India. The *WHO* considers that one-third of the world's population is infected with *Mycobacterium tuberculosis* (*Mtb*). *Mycobacterium tuberculosis* infection causes chronic lung disease characterized by continuous inflammation that damages lung tissue. Despite the global efforts to minimize the prevalence of tuberculosis, TB remains a major health problem in developing countries.

In Indonesia, tuberculosis is still the leading cause of disease and death. Based on the 2022 *Global TB* report from *WHO*, Indonesia ranks second in the world with the highest number of TB cases, after India. The estimated incidence in Indonesia is 969,000 cases, or equivalent to 354 cases per 100,000 population, with a mortality rate of 144,000 cases, or 52 deaths per 100,000 population.

Tuberculosis is a preventable and usually treatable disease. In 2022, TB was still the second leading cause of death worldwide from a single infectious agent, after *COVID-19*, causing nearly twice as many deaths as *HIV*. More than 10 million people are infected with TB every year. Immediate action is needed to end the global TB epidemic by 2030. This is the goal of all members of the United Nations (*UN*) and *WHO*.

TB is caused by the mycobacterial bacterium *Mycobacterium tuberculosis*, which spreads when people sick with TB bacteria expel airborne droplets (e.g., through coughing). About a quarter of the world's population is estimated to be infected with TB. After being infected, the risk of developing TB disease is highest in the first two years, reaching 5%, after which the risk decreases. In some individuals, the infection will resolve without progressing to disease. Approximately 90% of those who develop TB disease each year are adults, with men being more affected than women.

Tuberculosis is an infectious disease caused by the Gram-positive bacterial agent *Mycobacterium tuberculosis*, an obligatory aerobe, which generally attacks the lung organs in humans. This disease is transmitted by *BTA* (acid-fast bacilli) positive patients, spreading through droplet nuclei expelled when the patient coughs or sneezes. The pathophysiology of tuberculosis begins when bacteria enter the alveoli, triggering an immune response and inflammation.

Once infected, the body detects tuberculosis bacteria through innate immune receptors. The activation of these receptors causes various cellular events, including phagocytosis and apoptosis. Tuberculosis results in systemic lesions due to bacterial and immune system reactions. Following phagocytosis, granulomas form, serving as a defense mechanism. However, the tuberculosis bacteria can utilize granulomas as a medium for intercellular expansion, spreading to other organs. Bacteria may remain latent in the body and later reactivate, leading to clinical manifestations.

Without treatment, the mortality rate from TB disease is quite high, reaching 50%. However, with treatment recommended by the *WHO* (4-6 months with anti-TB drugs), about 85% of people will be cured. Regimens ranging from 1 to 6 months are suitable for treating TB infection. *Universal Health Coverage* (*UHC*) is necessary to ensure that everyone who needs TB treatment can access it.

Nutritional status is one of the most important factors in the body's defense against infection. Many new cases of tuberculosis are associated with malnutrition. Epidemiological studies have shown that poor nutritional status is a significant risk factor for tuberculosis, and malnutrition is also an important cause of poor outcomes in TB patients. Weight loss itself is a result of the anorexia symptoms experienced by tuberculosis patients. Meanwhile, the inability to regain weight during therapy is closely related to the risk of disease severity.

Pulmonary tuberculosis is an infectious disease that can affect the body mass index (BMI) of the patient. Patients with pulmonary tuberculosis often experience a decline in nutritional status due to metabolic disorders caused by inflammation and immune response. In

addition to the effects of anorexia, insufficient nutrient intake, including protein, may result from the side effects of treatment. If not balanced with a proper diet, this condition leads to poor nutritional status. This study aims to determine the relationship between the weight of patients with bacteriologically confirmed pulmonary tuberculosis and the recurrence of pulmonary tuberculosis at the Lampaseh Health Center from 2021 to 2024.

Previous studies have examined the relationship between malnutrition and tuberculosis (TB) outcomes. A study by Akinmoladun et al. (2020) investigated the impact of malnutrition on TB progression, emphasizing that poor nutritional status significantly worsens the severity of the disease and complicates treatment. Similarly, a study by Afolabi et al. (2019) highlighted the importance of addressing malnutrition in TB patients to improve treatment outcomes and reduce the risk of recurrence. However, these studies did not specifically focus on the relationship between weight loss during treatment and the recurrence of pulmonary TB, especially in the context of Indonesia, where TB remains a major health challenge. This research fills that gap by exploring the connection between patient weight changes and the recurrence of pulmonary TB at the Lampaseh Health Center, providing new insights into the role of nutritional status in TB treatment outcomes.

The study aims to analyze the relationship between weight changes in patients with bacteriologically confirmed pulmonary tuberculosis and the recurrence of the disease at the Lampaseh Health Center from 2021 to 2024. By examining how nutritional status, particularly weight loss, affects the risk of TB recurrence, the study aims to provide important recommendations for improving patient care, emphasizing the need for better nutritional support during treatment. The findings will help healthcare providers and policymakers design more effective interventions that integrate nutritional management into TB treatment regimens, ultimately improving patient outcomes and reducing TB recurrence rates.

METHOD

This study uses a descriptive observational method with a cross-sectional approach. Data collection for this study began in January 2021 and ended in December 2024, using both primary and secondary data. Primary data were collected through interview techniques and patient weight measurements. Secondary data were obtained from the patient's medical records and the *SITB* app to assess the diagnosis and results of the patient's laboratory examination.

The population in this study consists of all patients who are clinically diagnosed with tuberculosis through thoracic and bacteriological photo-examination and the *GeneXpert* molecular rapid test (*TCM*) at the Lampaseh Health Center, totaling 45 people. The sampling technique used was purposive sampling, selecting 13 people with the inclusion criteria: the patient must be an outpatient at the Lampaseh Health Center, diagnosed with tuberculosis bacteriologically through the *GeneXpert* molecular rapid test (*TCM*) examination, and without other disease complications.

RESULTS AND DISCUSSION

Table 1. Distribution of the frequency of patients with Pulmonary TB by type of examination

Types of Inspections	Amount(s)	Percentage(%)
Bacteriologist	14	40%
Photo by Torax	21	60%
Sum	35	100%

Table 1 shows that patients with Pulmonary TB based on the type of Thoracic Photo examination are higher, namely 21 people (60%), while the type of TCM GeneXpert bacteriological examination is 14 people (40%).

Table 2. Distribution of the frequency of weight gain in patients with pulmonary tuberculosis confirmed bacteriological

Weight Gain in Patients with Pulmonary TB	Amount(s)	Percentage (%)
Weight Gain	12	86%
Weight Loss or Fixed Weight	2	14%
Sum	14	100%

Table 2 shows that the majority of patients with bacteriological confirmed pulmonary TB have increased their weight, amounting to 12 people (86%), and pulmonary TB patients who have lost weight or remain weight only 2 people (14%)

Table 3. Sex frequency distribution of bacteriologically confirmed pulmonary TB patients

Gender	Amount(s)	Percentage(%)
Man	7	50%
Woman	7	50%
Sum	14	100%

Table 3 shows that the data of bacteriologically confirmed pulmonary TB patients are the same between men and women, each amounting to 7 people (50%).

Table 4. Distribution of age frequency of patients with pulmonary tuberculosis confirmed bacteriologically

Age Group (year)	Amount(s)	Percentage(%)
0 - 19	1	7%
20 - 39	6	43%
40 - 59	7	50%
≥ 60	0	0%
Sum	14	100%

Table 4 shows that the age group of pulmonary TB patients confirmed bacteriologically confirmed at the Lampaseh Health Center is highest in the age group of 40-59 years, which is as many as 7 people (50%), followed by the age group of 20-39 years, which is as many as 6 people (43%). The age group of 0-19 years is only 1 person (8%) and none at the age of ≥ 60 years.

Table 5. The Prevalence of Pulmonary TB Recurrence to Weight Gain in Pulmonary TB Patients Confirmed Bacteriologically

Recurrence	Weight Gain(n)	Percentage (%)	Weight Loss or Fixed Weight (n)	Percentage (%)
Relapse	0	0%	1	50%
No relapse	12	100%	1	50%
Sum	12	100%	2	100%

Table 5 shows that bacteriologically confirmed lung TB patients who gained weight completely did not relapse (0%). Meanwhile, patients with Pulmonary TB were confirmed bacteriologically lost or had a fixed weight and experienced a recurrence after undergoing treatment amounting to 1 person (50%), who did not relapse after undergoing treatment amounting to 1 person (50%).

DISCUSSION

Based on the results of research in the work area of the Lampaseh Health Center from early January 2021 to the end of December 2024, it shows that there are more patients with Pulmonary TB based on the type of Thoracic Photo examination, namely 21 people (60%), while the type of bacteriological examination is 14 people (40%). This is related to the sensitivity and specificity of each of these examinations. Thoracic photographs have sensitivity and specificity of 86% and 83%. This low specificity is because the thoracic photographic image in TB patients has similarities with other lung diseases. For example, pulmonary TB lesions that resemble infiltrates in pneumonia have a patch-like image similar to tuberculosis. In addition, TCM GeneXpert showed sensitivity and specificity results of 96% and 98%. Because of this high sensitivity, TCM GeneXpert is often used as a screening tool for patients suffering from pulmonary TB, while for high specificity values it can be used to determine whether patients are diagnosed with pulmonary TB or not. Therefore, TCM GeneXpert can be used as a screening tool or a determinant of the diagnosis of pulmonary TB. However, the quality of the patient's sputum also affects the results of the GeneXpert TCM examination. Phlegm that has a mucopurulent consistency will show better results because *Mycobacterium* bacteria are easier to find compared to purulent phlegm.

Table 2 shows that the majority of patients with bacteriological confirmed pulmonary TB have increased their weight, which amounts to 12 people (86%), and pulmonary TB patients who have lost weight or maintain weight are only 2 people (14%). This is in line with research conducted by Mandala in 2015, namely out of 80 people with pulmonary TB, more than half experienced weight gain, namely 69 people (86.3%).

Table 3 shows that the data of bacteriologically confirmed pulmonary TB patients are the same between men and women, each amounting to 7 people (50%). This is not in line with

Wagnew's research in Northwest Ethiopia in 2024 showing that the highest number of MDR (Multi Drug Resistant) TB patients in men as many as 265 people (63.3%), while women amounted to 154 people (36.7%). These results are different from the study in Marva in 2021 where it was found that more men had tuberculosis infections.

Table 4 shows that the age group of patients with bacteriologically confirmed pulmonary TB at the Lampaseh Health Center is highest in the age group of 40-59 years, which is as many as 7 people (50%), followed by the age group of 20-39 years, which is 6 people (43%). The age group of 0-19 years is only 1 person (8%) and none at the age of ≥ 60 years. This is in line with Tandililing's research at Dr. M. Haulussy Hospital in 2024 which shows that the frequency based on age obtained as a result of patients suffering from pulmonary TB is highest in the age range of 45-54 years as many as 19 people (30.2%), followed by in the age range of 25-34 years as many as 17 people (27%).[13] The same results were shown from Mandala's research in 2015, namely the highest pulmonary TB patients were in the age range of 46-55 as many as 32 people (40%), followed by the age range of 26-35 as many as 22 people (27.5%), then in the age range of 36-45 as many as 15 people (18.8%), and the lowest in the age range of 15-25 as many as 11 people (13.7%).[14] This is also in line with the research of Pauline et al. (2021) found that the highest age group that experienced pulmonary tuberculosis was the age range of 25-54 years. Meanwhile, children are the age group that has the least experience pulmonary TB.

Table 5 shows that bacteriologically confirmed lung TB patients who gained weight completely did not relapse (0%). Meanwhile, patients with Pulmonary TB were confirmed bacteriologically lost or had a fixed weight and experienced a recurrence after undergoing treatment amounting to 1 person (50%), who did not relapse after undergoing treatment amounting to 1 person (50%). As research from Wagnew in Northwest Ethiopia in 2024 shows that the highest number of MDR (Multi Drug Resistant) TB patients in patients who have a Body Mass Index of ≤ 18.5 kg/m2, which is 255 people (60.9%). Meanwhile, patients who have a Body Mass Index ≥ 18.5 kg/m2 are 164 people (39.1%). Weight loss during treatment may lead to a risk of treatment failure.[15] This is also in accordance with the incident that occurred in Africa where cases of TB recurrence were found in patients with low body weight. Malese et al. Showing weight can be a predictor of the success of pulmonary TB treatment.

Illness and poor nutritional status will indirectly affect healing. Therefore, adequate nutrition is needed so that it is expected to accelerate the improvement of nutritional status coupled with the provision of drugs according to the treatment of pulmonary TB.

CONCLUSION

Based on the research on the relationship between the weight of pulmonary tuberculosis (TB) patients and the recurrence of the disease at the Lampaseh Health Center from 2021 to 2024, several conclusions can be drawn. First, the majority of patients diagnosed with pulmonary TB were identified through thoracic photo examination (60%), followed by bacteriological examination using the *TCM GeneXpert* method (40%). Among the bacteriologically confirmed patients, 86% experienced weight gain, while only 14% had either weight loss or no change in weight. The study also found that the number of patients was equally distributed between men and women, with the highest incidence in the 40-59 years age

group (50%), followed by the 20-39 years age group (43%). Interestingly, none of the patients in the ≥60 years age group had pulmonary TB. Furthermore, while no patients with weight gain experienced recurrence, 50% of those with weight loss or no weight change had a recurrence after treatment. These findings suggest that weight gain during treatment may be linked to a lower risk of recurrence. Future studies should consider a larger sample size to better understand the correlation between weight change and TB recurrence. It would also be beneficial to assess the role of nutritional interventions during treatment to prevent recurrence and improve outcomes for patients. Additionally, research into the effectiveness of weight monitoring as part of TB treatment plans could help in managing and reducing recurrence rates more effectively.

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