PUBLIC HEALTH RESEARCH

Influencing Factors of Adult Pulmonary Tuberculosis Patients' Clinical Improvement at the End of the Intensive Phase at Public Health Care in Central Jakarta, Indonesia

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ABSTRACT

Introduction	Clinical improvement at the end of the intensive phase is one of the indicators of the Directly Observed Therapy Shortcourse (DOTS) program used to evaluate the success of tuberculosis (TB) therapy. This study aimed to identify factors influencing clinical improvement among adult pulmonary TB patients at the end of intensive phase in public health centers in Central Jakarta.
Methods	This was an observational analytic study employing a case–control design with a convenience sampling method. The study population comprised 281 adult pulmonary TB patients who had completed the intensive phase of treatment at three health centers in Central Jakarta: Johar Baru, Tanah Abang, and Gambir. Data were obtained from medical records in the Sistem Informasi Tuberkulosis (SITB) database for the treatment period from July 2023 to June 2024. Bivariate analysis using the chi-square test was conducted to determine the association between variables.
Results	Bivariate analysis revealed that age, comorbidities, and initial nutritional status were significantly associated with clinical improvement among pulmonary TB patients.
Conclusions	Clinical improvement among adult pulmonary TB patients at public health centers in Central Jakarta is influenced by several factors, particularly age, comorbidities, and initial nutritional status.
Keywords	Influencing Factors; Pulmonary Tuberculosis; Clinical Improvement; Intensive Phase; Adult Patients.

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INTRODUCTION

Tuberculosis (TB) is an infectious disease that affects the lungs and is caused by Mycobacterium tuberculosis infection.[1] It is among the top ten causes of death globally, with Indonesia ranking second worldwide for the highest number of TB cases.[2,3] According to data from the Central Statistics Agency of the Special Capital Region (Daerah Khusus Ibukota, DKI) Jakarta in 2021, Central Jakarta recorded the second-highest number of pulmonary TB cases in the province.[4]

Age, alcohol consumption, smoking habits, and a history of contact with TB patients are among the risk factors for TB. TB treatment consists of two stages: the initial (intensive) phase, during which patients take medication daily for two months, followed by the continuation phase from the second to sixth month.[1] One measurable outcome of TB treatment is clinical improvement, which may be assessed through Acid-Fast Bacilli (AFB) smear conversion, weight gain, and the reduction of clinical symptoms.[5]

Individuals in the productive age group constitute the majority of TB patients, as drug metabolism is influenced by age.[5,6] Pulmonary TB patients undergoing treatment simultaneously fight Mycobacterium tuberculosis infection and metabolize anti-tuberculosis drugs (Obat Anti Tuberkulosis, OAT).[7]

The Indonesian Ministry of Health (2022) reported that the prevalence of TB is higher in men (57.8%) than in women (42.2%).[3] Nevertheless, treatment success is generally higher among men, while women tend to visit healthcare facilities less frequently and less promptly.[8]

Comorbid conditions among TB patients vary, with Diabetes Mellitus (DM) being one of the most common.[1] Patients co-infected with Human Immunodeficiency Virus (HIV) are also more susceptible to TB due to immunosuppression.[9]

Nutritional status, assessed using the Body Mass Index (BMI), is an important indicator of a person's nutritional adequacy.[10] Poor or excessive nutritional intake can weaken immunity, increasing susceptibility to both infectious and non-communicable diseases such as TB, DM, and hypertension.[6]

Although some TB patients cite financial difficulties as a barrier to treatment, those from all income levels have equal access to TB therapy through the national TB control program.[8]

Clinical improvement, indicated by negative AFB smear conversion, weight gain, and symptom reduction at the end of the intensive phase, is one of the DOTS program's success indicators.[5] Evaluating clinical improvement is essential to enhance treatment outcomes and overall TB control effectiveness.[11] Therefore, this study aimed to determine the factors influencing clinical improvement among adult pulmonary TB patients at the end of the intensive phase.

METHODS

This study employed an observational analytic approach with a case–control design and used a convenience sampling method to select participants. The minimum sample size was determined using the Lemeshow formula, yielding 100 participants; however, a total of 281 patients met the study criteria. The data used were quantitative, derived from secondary sources in the Sistem Informasi Tuberkulosis (SITB) medical records.

Inclusion criteria included adult pulmonary TB patients aged 19–59 years who completed two months of treatment (the intensive phase), did not transfer to another facility, and had complete data recorded in SITB. The study was conducted across three Central Jakarta health centers Johar Baru, Tanah Abang, and Gambir.

Bivariate analysis was used to identify associations between independent variables (age, sex, comorbidities, initial nutritional status, and socioeconomic status) and the dependent variable (clinical improvement). Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS). A p-value <0.05 was considered statistically significant.

The study population was divided into two groups:

- Case group: Patients who did not achieve clinical improvement.
- Control group: Patients who achieved clinical improvement.

Clinical improvement was defined as negative results in Acid-Fast Bacilli (AFB) or Basil Tahan Asam (BTA) sputum tests, improved appetite leading to weight gain, and reduction in TB-related symptoms. Patients who continued to exhibit positive AFB/BTA results, experienced appetite loss with weight loss, and persistent TB symptoms were classified as not achieving clinical improvement.

RESULTS

Demographics

The demographic characteristics of adult pulmonary TB patients at the end of the intensive phase are shown in Table 1.

Table 1 Demographic of Adult Pulmonary TB Patients' at the End of the Intensive Phase

Factors		Frequency	Percentage (%)
Age	19-39 years	162	57.7%
	40-59 years	119	42.3%
Gender	Men	176	62.6%
	Women	105	37,4%
Comorbids	Have Comorbids	59	21.0%
	Doesn't Have Comorbids	222	79.0%
Initial Nutritional Status	Underweight (BMI <18,5)	129	45.9%
	Normoweight and Overweight (BMI >18,5)	152	54.1%
Socio-economic	PBI	185	65.8%
	Non PBI	96	34.2%

PBI: Penerima Bantuan Iuran or Contribution Assitance Beneficiary
Non PBI: Bukan Penerima Bantuan Iuran or Contribution Assitance Beneficiary

Table 2 Factors Associated with Clinical Improvement in Adult Pulmonary TB Patients

Factors		Didn't Achieved Clinical Improvement		Achieved Clinical Improvement		OR (95% CI)	p-value
		n	%	n	%		
Age	19-39 years	76	51.7%	86	64.2%	0.597 (0.370-0.964)	0.034
	40-59 years	71	48.3%	48	35.8%		
Gender	Men	91	61.9%	85	63.4%	0.937 (0.577-1.520)	0.791
	Women	56	38,1%	49	36.6%		
Comorbids	Have Comorbids	39	26.5%	20	14.9%	2.058 (1.130-3.750)	0.017
	Doesn't Have Comorbids	108	73.5%	114	85.1%		
Initial Nutritional Status	Underweight (BMI <18,5)	57	38.8%	72	53.7%	0.545 (0.339-0.877)	0.012
	Normoweight and Overweight (BMI >18,5)	90	61.2%	62	46.3%		
Socio-economic	PBI	100	68%	85	63.4%	1.227 (0.749-2.010)	0.417
	Non PBI	47	32%	49	36.6%		

Bivariate Analysis

Table 2 presents the bivariate analysis results on the clinical improvement of adult pulmonary TB patients at the end of the intensive phase.

The analysis demonstrated that age**,** comorbidities, and initial nutritional status were significantly associated with clinical improvement ($p<0.05$). Conversely, gender and socioeconomic status were not significantly associated ($p>0.05$), suggesting that these factors did not meaningfully influence treatment outcomes in this cohort.

DISCUSSIONS

The demographic data indicated that the majority of pulmonary TB patients in this study were men aged 19–39 years, without comorbidities, having normal or overweight nutritional status, and classified as Contribution Assistance Beneficiaries (PBI). This trend corresponds to individuals in the productive age group who spend most of their time outside their homes for work. When physical fitness is compromised, exposure to infectious agents such as *Mycobacterium tuberculosis* can more easily result in infection. Environmental conditions, such as living environments and economic capability, may also contribute to disease susceptibility.

The bivariate analysis revealed a significant association between age and clinical improvement among adult pulmonary TB patients. A study in Klaten, Central Java, found that as age

increases, the body's metabolism tends to decline. Patients with TB infection must simultaneously combat *Mycobacterium tuberculosis* and metabolize anti-tuberculosis drugs (OAT).[6] Furthermore, a study in Yogyakarta reported that individuals aged above 50 years were more likely to experience failure in AFB conversion after the intensive treatment phase.[12]

Regarding gender, the present study showed no significant association with clinical improvement. Research conducted in Kendari suggested that women visit healthcare facilities less frequently due to limited accessibility and social stigma associated with TB.[13] However, in the present study, the absence of a significant relationship between gender and clinical improvement could be attributed to easier access to healthcare services and the strong motivation among patients to recover, regardless of gender-related stigma.

Comorbidities were found to significantly affect clinical improvement in pulmonary TB patients. This finding aligns with a study in Surabaya reporting that comorbid conditions increase the number and severity of symptoms experienced by TB patients.[14] Diseases such as Diabetes Mellitus (DM) and Human Immunodeficiency Virus (HIV) infection can interfere with TB treatment response and delay recovery. A study in Semarang found that the presence of comorbidities was associated with delayed sputum conversion after the intensive phase.[15]

Initial nutritional status was also significantly associated with clinical improvement (p=0.042). Research in Semarang indicated that TB treatment can influence an individual's nutritional status, which may improve or deteriorate over time.[16,18] This finding is consistent with studies in Surakarta reporting a strong relationship between treatment phase and nutritional status, where patients in the early phase of TB treatment were 3.246 times more likely to have underweight nutritional status.[17,18]

In contrast, socioeconomic status did not show a significant relationship with clinical improvement. Although previous studies have suggested that income level may influence treatment adherence and recovery duration due to transportation and medication costs,[19] other studies in Semarang reported no such association.[16] This study's findings may be explained by Indonesia's National TB Control Program, which provides free treatment to both PBI and non-PBI patients. Therefore, socioeconomic disparities may have a limited impact on treatment outcomes. Furthermore, patients who fail treatment must restart therapy, thereby increasing their overall costs an additional motivation to adhere to treatment regardless of economic status.

The strength of this study lies in the relatively large sample size obtained through convenience sampling. However, it is important to acknowledge several limitations. Some patient data in the SITB database were incomplete, preventing the inclusion of all eligible patients from the three health centers in Central Jakarta. Additionally, since this was an observational study using secondary data, potential confounding variables could not be entirely controlled.

CONCLUSION

Based on the bivariate analysis of 281 patients, three of the five independent variables age, comorbidities, and initial nutritional status were significantly associated with clinical improvement in pulmonary TB patients after completing the intensive phase of treatment. Patients aged 40–59 years, those with comorbidities, and those with a BMI below 18.5 (underweight) were more likely to experience delayed or incomplete clinical improvement.

These findings emphasize the importance of monitoring comorbid conditions and nutritional status during treatment and providing additional support to older patients to enhance treatment outcomes. Greater efforts are needed to ensure that all influencing factors are addressed effectively to achieve national TB treatment success targets.

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