

COMPARISON OF TCM RESULTS BASED ON NUTRITIONAL STATUS IN PEDIATRIC PULMONARY TB PATIENTS AT BBKPM DURING THE 2023–2024 PERIOD

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ABSTRAK

Hipertensi adalah masalah kesehatan global dengan prevalensi tinggi dan risiko komplikasi serius, terutama pada lansia (34,1% di Indonesia). Penelitian cross-sectional pada 382 lansia hipertensi di Puskesmas Grogol menganalisis hubungan pengetahuan dengan self-management. Instrumen penelitian valid dan reliabel (Alpha Cronbach 0,807 untuk pengetahuan; 0,817 untuk self-management). Hasil menunjukkan pengetahuan baik 16,2%, cukup 51,0%, kurang 32,7%; sedangkan self-management baik 4,7%, cukup 77,2%, buruk 18,1%. Uji Chi-Square menemukan hubungan signifikan ($\chi^2 = 40,251$; $p = 0,001$) dengan kekuatan lemah–sedang (Cramer's $V = 0,229$). Temuan menegaskan perlunya edukasi kesehatan berkelanjutan dan dukungan keluarga maupun tenaga kesehatan agar pengelolaan hipertensi pada lansia lebih optimal dan kualitas hidup meningkat.

ABSTRACT

Hypertension Knowledge and Self-Management Among Older Adults at Grogol Community Health Center. Hypertension is a global health problem with a high prevalence and risk of serious complications, especially in the elderly (34.1% in Indonesia). A cross-sectional study of 382 elderly people with hypertension at the Grogol Community Health Center analyzed the relationship between knowledge and self-management. The research instrument was valid and reliable (Cronbach's Alpha 0.807 for knowledge; 0.817 for self-management). The results showed that 16.2% had good knowledge, 51.0% had sufficient knowledge, and 32.7% had poor knowledge; while 4.7% had good self-management, 77.2% had sufficient knowledge, and 18.1% had poor self-management. A chi-square test found a significant relationship ($\chi^2 = 40.251$; $p = 0.001$) with weak-moderate strength (Cramer's $V = 0.229$). The findings emphasize the need for ongoing health education and support from family and health workers to optimize hypertension management in the elderly and improve quality of life.

INTRODUCTION

Pulmonary tuberculosis (pulmonary TB) is an infectious disease caused by *Mycobacterium tuberculosis*, an acid-fast bacillus (AFB) that predominantly affects the lungs, although it may also

involve other organs such as the skin, urinary tract, and gastrointestinal tract. Transmission occurs mainly through airborne droplets expelled when an infected individual coughs or sneezes, which are then inhaled by people nearby¹⁻⁶.

Indonesia remains one of the countries with the highest TB burden in the world. According to WHO data, an estimated 969,000 TB cases occur annually in Indonesia. The disease also affects a large number of children; globally, WHO estimates that more than 1.15 million children are diagnosed with TB each year^{7,8}.

Nutritional status is one of the key factors influencing the risk of developing TB. Children who are undernourished or malnourished have weaker immune systems, making them more susceptible to infection. The relationship between nutritional status and TB is bidirectional: malnutrition increases vulnerability to TB, while TB can further worsen nutritional status through metabolic disturbances and loss of appetite. Apart from nutritional factors, HIV/AIDS infection also plays a significant role due to its suppressive effect on the immune system⁹.

TB is closely associated with low socioeconomic conditions and vulnerable populations. Most TB-related deaths occur in developing countries that continue to experience social inequality and inadequate nutrition. Malnutrition is known to increase the risk of contracting TB as well as experiencing more severe disease progression¹⁰.

Advances in diagnostic technology now allow rapid identification of *Mycobacterium tuberculosis* through the Molecular Rapid Test (TCM/GeneXpert MTB-RIF). This method can detect bacterial DNA and rifampicin resistance with high accuracy. The availability of TCM has increased the speed of TB diagnosis, including in children, enabling earlier treatment initiation and helping reduce transmission and overall TB incidence. However, in children with poor nutritional status, the sensitivity of TB diagnostic tests often decreases due to low bacterial loads (pauci-bacillary). This raises the question of whether nutritional status influences TCM positivity in pediatric TB cases¹¹.

Although several studies highlight the role of nutritional status in TB susceptibility and disease progression, very few have specifically examined whether nutritional status affects TCM positivity in children. Particularly in regional healthcare settings such as BBKPM Makassar, no available data compare TCM results based on nutritional status among pediatric pulmonary TB patients. Filling this knowledge gap is crucial, given that TCM has become the primary diagnostic tool and malnutrition is commonly encountered in childhood TB cases.

Based on this gap, the present study was conducted to examine how children's nutritional status may influence TCM results among pulmonary TB patients. Specifically, this study aims to compare the results of the Molecular Rapid Test between children with normal nutritional status and those who are undernourished or malnourished, and to analyze whether a significant association exists between nutritional status and TCM positivity among pediatric pulmonary TB patients at BBKPM Makassar during the 2023–2024 period. Therefore, the findings of this study are expected to contribute to evaluating the reliability of TCM as a primary diagnostic tool in children with varying nutritional conditions.

METHODS

This study is a comparative quantitative research employing a cross-sectional design. Through this design, the researcher compared the results of the Molecular Rapid Test (TCM) in children with pulmonary tuberculosis based on their nutritional status within the same period. The study was conducted at BBKPM Makassar, with data collection planned for July to August 2025. The

study population included all children diagnosed with pulmonary TB who underwent TCM examination at BBKPM Makassar. From this population, samples were selected using purposive sampling, consisting of children who met the inclusion criteria: diagnosed with pulmonary TB during the 2023–2024 period, had completed TCM testing, and possessed complete medical records, particularly regarding nutritional status and TCM results.

The primary instrument used in this study was a medical record review form designed to record and extract essential information related to pulmonary TB diagnosis, TCM examination results, and nutritional status. Nutritional status was obtained from anthropometric data documented in the medical records and determined based on the WHO Growth Standards using z-scores, then categorized into normal nutritional status and malnutrition according to the guidelines of the Indonesian Ministry of Health. TCM results were obtained from laboratory reports of BBKPM Makassar, which utilized a semi-quantitative RT-PCR method¹² to detect the presence of the *rpoB* gene of *Mycobacterium tuberculosis*.

The collected data were analyzed using bivariate analysis to determine the association between nutritional status and TCM results. Data analysis was performed using SPSS software. The Chi-Square test was selected as the statistical test because both variables in this study are categorical, and this test is appropriate for assessing associations between two nominal variables. Furthermore, the use of the Chi-Square test aligns with the characteristics of a cross-sectional design, in which variable associations are examined based on frequency distribution at a single point in time.

RESULTS

This study was conducted from July to August 2025 and included 80 pediatric pulmonary TB patients who met the research criteria. The study examined the comparison of Molecular Rapid Test (TCM) results among children with pulmonary TB based on nutritional status at BBKPM during the 2023–2024 period. The findings are presented through one analytical process—bivariate analysis—to identify differences in TCM results according to nutritional status.

1. Patient Characteristics Based on TCM Results

Table 1. Distribution of Patients According to TCM Results

TCM Results	Frequency (n)	Percentage (%)
TCM Negative	76	95.0
TCM Positif	4	5.0
Total	80	100.0

Based on Table 1, 76 patients (95.0%) had negative TCM results, while 4 patients (5.0%) had positive results. These findings indicate that the majority of patients showed negative TCM results. Descriptively, the data demonstrate that the proportion of positive cases is considerably lower than that of negative cases.

2. Patient Characteristics Based on Nutritional Status

Table 2. Distribution of Patients According to Nutritional Status

Nutritional Status	Frequency (n)	Percentage (%)
Normal	30	37.5
Malnutrition	50	62.5
Total	80	100.0

Table 2 shows that 30 patients (37.5%) had normal nutritional status, whereas 50 patients (62.5%) were categorized as malnourished. This indicates that the majority of respondents in this study fell into the malnutrition category.

3. Crosstabulation Between TCM Results and Nutritional Status

Table 3. Crosstabulation of TCM Results by Nutritional Status

		Nutritional TCM			P-Value
		TCM Negative	TCM Positive	Total	
Nutritional Status	Normal (n)	30	0	30	0,046
	%	37.5%	0.0%	37.5%	
	Malnutrition (n)	46	4	50	
	%	57.5%	5.0%	62.5 %	
		(n)	4	80	
Total		%	95.5%	5.0%	100.0%

Based on Table 3, a total of 80 pediatric pulmonary TB patients underwent TCM examination. The normal nutritional status group consisted of 30 children (37.5%), all of whom had negative TCM results. In contrast, the malnutrition group consisted of 50 children (62.5%), with 46 (57.5%) showing negative TCM results and 4 (5.0%) showing positive results. The largest proportion was found in the malnutrition group with negative TCM results (62.5% of the total sample). The Chi-Square statistical test yielded a p-value > 0.05, indicating that there is no significant association between nutritional status and TCM results among pediatric pulmonary TB patients at BBKPM Makassar.

DISCUSSION

1. Patient Characteristics Based on TCM Results

The study showed that among 80 children with pulmonary TB who underwent the Molecular Rapid Test (TCM), only 4 children (5%) tested positive, while 76 children (95%) tested negative. These findings are consistent with a previous study conducted at BBKPM Makassar by Naim & Dewi (2018), which reported that approximately 73% of children with clinical symptoms of TB still tested negative by TCM¹³. This consistency can be explained biologically, as the sensitivity of TCM in detecting *Mycobacterium tuberculosis* in children is lower than in adults. According to WHO (2021), the sensitivity of TCM in children is around 66%¹⁴, whereas in adults it can exceed 90%. This reduced sensitivity is mainly due to the paucibacillary nature of TB in children, in which the bacterial load is

very low and therefore difficult to detect using molecular methods. Additionally, children often face challenges in producing quality sputum samples, which further decreases detection success.

2. Patient Characteristics Based on Nutritional Status

Nutritional analysis showed that 30 children (37.5%) had normal nutritional status, while 50 children (62.5%) were malnourished. This finding aligns with a study by Apsari et al. (2020)¹⁵ in North Lombok, which reported that 63.1% of pediatric TB patients were undernourished and 29.2% were severely malnourished. The results also agree with Franco JVA et al. (2024), who emphasized that undernutrition is a major global risk factor for the development of active TB¹⁰. Biologically, poor nutritional status weakens cellular immunity, particularly T-lymphocyte and macrophage function¹⁶, both of which play a crucial role in controlling *Mycobacterium tuberculosis* infection. This reinforces the evidence that malnutrition is not only a risk factor for TB infection but can also worsen the course of the disease in children.

3. Relationship Between Nutritional Status and TCM Results

Bivariate analysis revealed that among 30 children with normal nutritional status, 28 (35%) had negative TCM results and 2 (2.5%) were positive. Meanwhile, among 50 malnourished children, all (100%) tested negative. Statistically, the Chi-Square test showed no significant association between nutritional status and TCM results. These findings are consistent with a 2023 study in Surabaya¹⁷, which reported that approximately 70% of TB-infected toddlers had negative GeneXpert results despite most being malnourished. A study in Malawi also found that¹⁸ in children with severe malnutrition, Xpert MTB/RIF detection rates remained low, even under optimal laboratory conditions. From a biological perspective, this weak association may be explained by the fact that malnutrition does not necessarily increase the number of detectable bacilli in specimens. In children with Severe Acute Malnutrition (SAM), impaired immunity, low bacillary load, and limited specimen volume may reduce TCM sensitivity (WHO, 2021). These findings indicate that TCM alone cannot serve as the sole diagnostic basis for TB in malnourished children. A comprehensive evaluation—including clinical assessment, contact history, radiology, and alternative specimen collection such as gastric washing—is necessary to improve diagnostic accuracy^{14,19,20}.

Strengths and Limitations of the Study

The strength of this study lies in its use of medical record data from BBKPM Makassar with a sufficient sample size to observe trends in malnutrition prevalence and TCM results. The study also compared its findings with recent literature and discussed biological mechanisms influencing TCM sensitivity in children. However, the limitations include the use of a cross-sectional design, which only establishes associations rather than causal relationships. In addition, the data relied on medical records, making it prone to documentation bias and variation in specimen quality. Other potential confounders, such as HIV status or comorbid conditions, were not analyzed, although they may influence TCM outcomes.

CONCLUSION

Based on the results and discussion of this study, the following conclusions can be drawn:

1. Pediatric pulmonary TB cases were more prevalent among children with poor nutritional status

than those with normal nutrition, reinforcing the theory that malnutrition is a major risk factor for TB in children.

2. Among 80 pediatric pulmonary TB patients tested using TCM, 76 children (95%) showed negative results and 4 children (5%) showed positive results. The predominance of negative results is likely due to the paucibacillary nature of childhood TB and challenges in obtaining adequate sputum samples, both of which affect TCM sensitivity.
3. Poor nutritional status was associated with increased vulnerability to TB infection but not directly correlated with TCM positivity, as TCM results depend heavily on the bacterial load in the specimen.
4. These findings suggest that TCM should not be used as the sole diagnostic tool for pediatric TB, particularly in malnourished children. Clinical evaluation, radiological assessment, and alternative sample collection methods such as gastric lavage should be considered to improve diagnostic accuracy.

RECOMMENDATION

Clinically, physicians should combine TCM results with clinical evaluation, contact history, radiological findings, and alternative specimen collection in malnourished children to ensure accurate TB diagnosis. Future research should employ longitudinal or interventional designs to explore the relationship between nutritional status, bacterial load, and molecular test results with larger sample sizes, while also considering comorbid factors such as HIV infection or other chronic conditions.

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