



Nutritional Status and Pulmonary Tuberculosis: Clinical and Public Health Implications Based on a Review of the Literature Review

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KEYWORDS

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ABSTRACT

Tuberculosis (TB) and nutritional status share a complex, bidirectional relationship, where malnutrition can exacerbate TB progression and TB can worsen nutritional status through increased metabolic demands and nutrient malabsorption. This study aims to investigate the relationship between nutritional status and pulmonary tuberculosis by conducting a literature review. A systematic search was performed using PubMed and Google Scholar databases, resulting in the selection of five relevant articles—four national and one international—published between 2020 and 2024. The selected studies were evaluated for their methodological quality and relevance to the theme. The findings consistently demonstrate a significant association between poor nutritional status and increased TB severity or incidence (e.g., OR: 4.67; CI: 1.75–12.45), emphasizing the role of BMI, Protein-Nutritional Index (PNI), and immune indicators as both risk factors and protective elements. The review highlights that nutritional interventions, such as balanced diets, micronutrient supplementation, and adherence to TB medications, are crucial in managing TB effectively. It also identifies a need for future research focusing on the development and implementation of targeted nutritional programs across different stages of TB, as well as exploring demographic, socioeconomic, and regional variables influencing intervention outcomes. The implications of this research underscore the importance of integrating nutrition-based strategies into TB treatment frameworks to enhance patient recovery and public health effectiveness.

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INTRODUCTION

Tuberculosis is a disease caused by the bacterium *Mycobacterium tuberculosis* which is transmitted through the sputum of patients with pulmonary TB to vulnerable people (Girinaja et al., 2022; Wagnew et al., 2022; Xiong et al., 2020). Nutritional status is a very important factor in influencing the severity of tuberculosis, this is because nutritional needs that are not met for a long time can make a person vulnerable and make a disease severe severe, including tuberculosis. Tuberculosis and nutritional status have a very close relationship, on the other hand, pulmonary tuberculosis disease can cause sufferers to become malnourished and make the patient's immune system weak to the point of being susceptible to disease (Hermawati & Ayu Gustia, 2018; Lu et al., 2024b).

Pulmonary TB patients often experience a decrease in nutritional status, and can even become malnutrition if not balanced with the right diet. Some of the factors related to nutritional status in

pulmonary TB patients are the level of energy and protein adequacy, the patient's behavior towards food and health, and the length of time they have been suffering from pulmonary TB (Patiung et al., 2014; Wagnew et al., 2022). Research made by (Yuniar and Lestari, 2017) said that income and nutritional status are closely related to the occurrence of pulmonary TB.

Nutritional status greatly affects the cure or not of pulmonary TB treatment because nutritional status is categorized within normal limits to increase immunity so that a person can withstand pulmonary TB disease, in contrast to poor or poor nutritional status can complicate the healing process and can cause the return of pulmonary TB disease (Cho et al., 2022; Nguyen et al., 2023). According to (Puspitasari, Mudigdo and Adriani, 2017) based on his research, there is a dependence between nutritional status and treatment recovery suffered by pulmonary TB patients directly and based on calculations it is said to be significant. Good nutritional status makes it possible to recover (Dargie et al., 2016; Grobler et al., 2016).

Literature review is also considered important because literature review is the basis for why researchers decide to choose certain themes and titles (Ridwan et al., 2021). Based on the results of the previous research, the literature study is very important for the relationship between nutritional status in tuberculosis patients. Good nutritional status is very important for people with tuberculosis. A malnourished body has a harder time fighting infections, including TB. On the other hand, adequate nutritional intake helps speed healing, strengthen the immune system, and prevent complications (Gelaw et al., 2021).

This study aims to investigate the relationship between nutritional status and pulmonary tuberculosis by conducting a literature review. While previous studies such as those by Lu et al. (2024), Editia et al. (2023), Roswati et al. (2022b), and Konde et al. (2020a) have established the significant relationship between nutritional status and the incidence or severity of pulmonary tuberculosis, the novelty of this current research lies in its integrative synthesis that emphasizes not only the bidirectional relationship between malnutrition and TB but also strongly advocates for the integration of nutritional interventions as an essential component of TB therapy. Unlike earlier reviews that often focused on singular variables (e.g., BMI, compliance, or energy needs), this literature review consolidates evidence across multiple dimensions—such as immune response, socio-economic status, and therapeutic outcomes—offering a broader and more policy-oriented implication. It also identifies gaps in current intervention practices and explicitly calls for targeted, stage-specific nutritional programs supported by longitudinal studies, which has been minimally addressed in prior literature.

METHOD

The design or research design used in this writing is a literature review. Literature review is a method of writing by searching literature from national and international journals using databases. Systematic literature review or can be mentioned in Indonesian is a literature review that is compiled and includes a literature review method that analyzes, assesses, and explains all findings in a research theme, to answer research questions that have been predetermined.

The data used in this study are taken from the results of research that have been made and published in online journals, namely 4 national journals and 1 international journal. In doing this research, the researcher searched research journals published in electronic media, namely the internet by using PubMed, and Google Scholar with the keywords: Nutritional Status, Tuberculosis, Malnutrition, Risk Factors and Immune System. The results of 5 national and international articles from the range of 2020 to 2024 were obtained in accordance with the inclusion and exclusion criteria.

The determination of a journal that is discussed is a research journal that uses Indonesian and English, a research journal model in addition to literature review with the theme of the relationship between nutritional status and pulmonary tuberculosis. Journals that are in line with inclusion criteria and have a relationship between nutritional status and pulmonary tuberculosis, are then done by way of review.

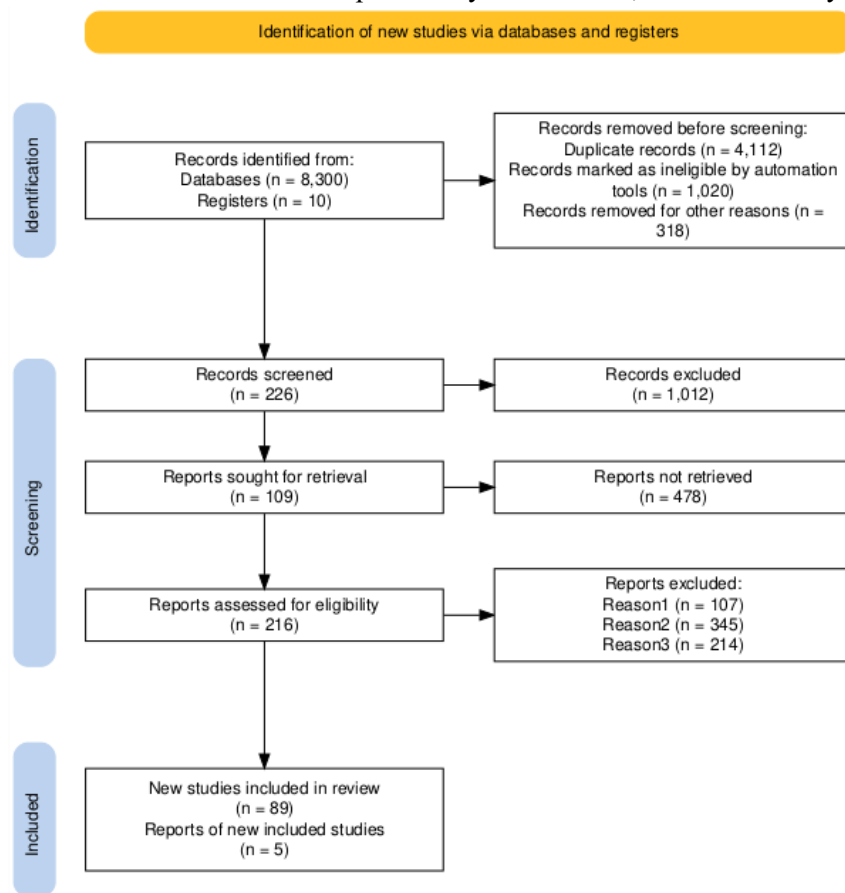


Figure 1. PRISMA Diagram of Literature Selection Process

RESULT AND DISCUSSION

Based on the search of data sources, information was obtained about several nutritional status relationships with pulmonary tuberculosis. Shown in Table.1

Table 1.

No.	Author Name & Year	Heading	Method	Result
1.	(Lu et al., 2024a)	Nutritional status affects immune function and exacerbates the severity of pulmonary tuberculosis	Descriptive studies	Nutritional risks higher proportions of immune dysfunction, and lower lymphocyte counts observed in severe groups. BMI and PNI were found to be protective factors, while PLR identified as a risk factor for disease severity.

2.	(Y. V. Editia et al., 2023)	The Relationship of Nutritional Status With Tuberculosis: <i>Systematic Review & Meta - Analysis</i>	<i>Systematic review and meta analysis</i>	Nutritional status has a significant relationship with tuberculosis. Low nutritional status will not occur if patients routinely consume anti-tuberculosis drugs until they recover to maintain immunity. Therefore, it is necessary to monitor the compliance of taking tuberculosis drugs and balanced nutritional consumption so that malnutrition does not occur in tuberculosis patients.
3.	(Roswati et al., 2022a)	<i>Literature Review Article</i> : Factors Relating to Nutritional Status in Tuberculosis Patients	<i>Litelature Review</i>	There is a relationship between nutritional status and Tuberculosis that tuberculosis infection causes an increase in energy requirements and metabolic changes that can worsen nutritional status so that malnutrition eventually occurs. Therefore, Nutritional support is part of therapy for the patient's recovery.
4.	(Konde et al., 2020b)	The Relationship Between Age, Nutritional Status and Housing Density and Pulmonary Tuberculosis at the Tuminting Health Center, Manado City	Research design of control case study	The results of this study found a relationship between age, nutritional status, and Housing Density with Pulmonary Tuberculosis.
5.	(Fatriyani & Nunung, 2020)	The Relationship between Nutritional Status and the Incidence of Pulmonary Tuberculosis in Health Centers: <i>Literature Review</i>	<i>Litelature Review</i>	Nutritional status with sub-normal categories greatly affects the incidence of pulmonary TB. The increase in pulmonary TB is closely related to low nutritional status.

Based on research conducted by (Lu et al., 2024b) nutritional status is significantly related to the severity of tuberculosis, the importance of paying attention to nutritional status in the diagnosis and treatment of patients with tuberculosis and that proactive nutritional therapy can help improve the prognosis and severity of tuberculosis infection in patients. At the same time, indicators of nutritional and immune status are expected to be an early diagnostic marker for tuberculosis severity. According to (Y. V Editia et al., 2023) a study using systematic review and meta-analysis showed a Pooled OR result of 0.66 (95% CI 0.45-0.95), meaning that nutritional status can increase the risk of pulmonary tuberculosis 0.66 times higher. Nutritional status has a reciprocal relationship with Tuberculosis. Poor

nutritional status makes the body susceptible to infectious diseases which can be supported by other factors such as the environment. On the other hand, tuberculosis patients can suffer from malnutrition if they do not take medication regularly.

In the study conducted by (Roswati et al., 2022b) using a systematic review of 5 articles that have been reviewed, it was found that there is a relationship between nutritional status and Tuberculosis that tuberculosis infection causes an increase in energy requirements and metabolic changes that can worsen nutritional status so that malnutrition eventually occurs. Therefore, Nutritional support is part of therapy for the patient's recovery (Konde et al., 2020a).

obtained the result of a p value = $0.003 < \alpha (0.05)$ statistically meaning that H_0 is rejected or there is a relationship between nutritional status and Pulmonary Tuberculosis with a value of $OR = 4.675$ with $CI = 1.755-12.453$ which means that nutritional status is a risk factor for the occurrence of Pulmonary Tuberculosis. Research by (Fatriyani & Nunung, 2020) using systematic review showed that nutritional status with sub-normal categories greatly affected the incidence of pulmonary TB. The increase in pulmonary TB is closely related to low nutritional status. However, not only nutritional status, many other factors also affect socioeconomic status, environment, and comorbidities. Balanced nutrition can help maintain the body's immunity and prevent avoiding various diseases, especially pulmonary TB. There is a relationship between nutritional status and the incidence rate of Pulmonary TB.

CONCLUSION

The majority of studies confirm a significant relationship between nutritional status and tuberculosis (TB), highlighting the importance of integrating nutritional interventions into TB treatment. Poor nutrition can exacerbate TB by weakening the immune system and reducing therapy effectiveness, while TB can worsen nutritional status through increased metabolic demands, appetite loss, and impaired nutrient absorption. Therefore, future research should examine the effectiveness of specific nutritional programs—such as micronutrient supplementation, protein-energy-rich diets, or therapeutic foods—on TB outcomes across various disease stages. Longitudinal studies are needed to better understand the dynamic interaction between nutrition and TB, alongside investigations into socio-economic, demographic, and regional factors that influence the success of nutrition-based interventions, to support more targeted and equitable public health strategies.

REFERENCES

- Cho, S. H., Lee, H., Kwon, H., Shin, D. W., Joh, H. K., Han, K., Park, J. H., & Cho, B. (2022). Association of underweight status with the risk of tuberculosis: A nationwide population-based cohort study. *Scientific Reports*, *12*, 20550. <https://doi.org/https://doi.org/10.1038/s41598-022-20550-8>
- Dargie, B., Tesfaye, G., & Worku, A. (2016). Prevalence and associated factors of undernutrition among adult tuberculosis patients in some selected public health facilities of Addis Ababa, Ethiopia: A cross-sectional study. *BMC Nutrition*, *2*, 46. <https://doi.org/https://doi.org/10.1186/s40795-016-0046-x>
- Editia, Y. V., Nugroho, G. S., & Yunritati, E. (2023). Hubungan Status Gizi Dengan Tuberkulosis: Systematic Review & Meta-Analisis. *Prepotif: Jurnal Kesehatan Masyarakat*, *7*(1), 149–157.
- Editia, Y. V., Nugroho, G. S., & Yunritati, E. (2023). Hubungan Status Gizi Dengan Tuberkulosis : Systematic Review & Meta - Analisis. *Prepotif: Jurnal Kesehatan Masyarakat*, *7*(April), 149–157.
- Fatriyani, E., & Nunung, H. (2020). Hubungan antara Status Gizi dengan Kejadian Tuberkulosis Paru di Puskesmas : Literature Review. *Borneo Student Research*, *2*(1), 158–165.
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- Gelaw, Y., Getaneh, Z., & Melku, M. (2021). Anemia as a risk factor for tuberculosis: A systematic review and meta-analysis. *Environmental Health and Preventive Medicine*, 26, 13. <https://doi.org/https://doi.org/10.1186/s12199-020-00931-z>
- Girinaja, I. P. P., Yekti, R., & Kusumo, P. D. (2022). Intake of macromolecular nutrition status in pulmonary tuberculosis subjects at the Seputih Raman Health Center, Central Lampung. *Health Science Journal of Indonesia*, 13(1), 1–7. <https://doi.org/https://doi.org/10.22435/hsji.v13i1.6454>
- Grobler, L., Nagpal, S., Sudarsanam, T. D., & Sinclair, D. (2016). Nutritional supplements for people being treated for active tuberculosis. *Cochrane Database of Systematic Reviews*, 2016(6), CD006086. <https://doi.org/https://doi.org/10.1002/14651858.CD006086.pub4>
- Hermawati, N., & Ayu Gustia, Y. D. (2018). Hubungan Status Gizi Dengan Kejadian Tb Paru. *Jurnal Kesehatan Sainatika Meditory*, 1, 79–88. <http://jurnal.syedzasainatika.ac.id/index.php/meditory/article/view/244>
- Konde, C. P., Asrifuddin, A., & Langi, F. L. F. G. (2020a). Hubungan antara umur, status gizi dan kepadatan hunian dengan tuberkulosis paru di Puskesmas Tuminting Kota Manado. *KESMAS: Jurnal Kesehatan Masyarakat Universitas Sam Ratulangi*, 9(1).
- Konde, C. P., Asrifuddin, A., & Langi, F. L. F. G. (2020b). Hubungan antara Umur, Status Gizi dan Kepadatan Hunian dengan Tuberkulosis Paru di Puskesmas Tuminting Kota Manado. *Jurnal Kesmas*, 9(1), 106–113.
- Lu, C., Xu, Y., Li, X., Wang, M., Xie, B., Huang, Y., Li, Y., & Fan, J. (2024a). Nutritional status affects immune function and exacerbates the severity of pulmonary tuberculosis. *Frontiers in Immunology*, 15(July), 1–12. <https://doi.org/10.3389/fimmu.2024.1407813>
- Lu, C., Xu, Y., Li, X., Wang, M., Xie, B., Huang, Y., Li, Y., & Fan, J. (2024b). Nutritional status affects immune function and exacerbates the severity of pulmonary tuberculosis. *Front Immunol*, 15, 1407813. <https://doi.org/10.3389/fimmu.2024.1407813>
- Nguyen, T. H., Nguyen, T. H. N., Le Xuan, H., Nguyen, P. T., Nguyen, K. C., & Le Thi, T. N. (2023). Nutritional status and dietary intake before hospital admission of pulmonary tuberculosis patients. *AIMS Public Health*, 10(2), 443–455. <https://doi.org/https://doi.org/10.3934/publichealth.2023031>
- Patiung, F., Wongkar, M. C. P., & Mandang, V. (2014). Hubungan Status Gizi dengan CD4 Pasien Tuberkulosis Paru. *Jurnal e-CliniC*, 2(2).
- Roswati, R., Ruhdiana, T., Satrio, & Arfania, M. (2022a). Literature review article: Faktor hubungan status gizi pada penderita tuberkulosis. *Jurnal Pendidikan dan Konseling*, 4(6), 11050–11056.
- Roswati, R., Ruhdiana, T., Satrio, S., & Arfania, M. (2022b). Literature review article: Faktor hubungan status gizi pada penderita tuberkulosis. *Jurnal Pendidikan dan Konseling (JPDK)*, 4(6), 11050–11056.
- Wagnew, F., Alene, K. A., Eshetie, S., Wingfield, T., Kelly, M., & Gray, D. (2022). Effects of zinc and vitamin A supplementation on prognostic markers and treatment outcomes of adults with pulmonary tuberculosis: A systematic review and meta-analysis. *BMJ Global Health*, 7, e008625. <https://doi.org/https://doi.org/10.1136/bmjgh-2022-008625>
- Xiong, K., Wang, J., Zhang, J., Hao, H., & Wang, Q. (2020). Association of dietary micronutrient intake with pulmonary tuberculosis treatment failure rate: A cohort study. *Nutrients*, 12(9), 2491. <https://doi.org/https://doi.org/10.3390/nu12092491>



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