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The impact of social determinants of health factors on tuberculosis prevalence in Timor-Leste

Marcos Carvalho[1*], Isabel Belo[2], Daniela Rolandia M. U. Fernandes[3], Aniceto da Conceição Pacheco[4], Elias Pereira Moniz[5]

[1,2,3,4] *Department of Public Health, Faculty of Public Health and Medical Sciences,Universidade da Paz(UNPAZ), CGPW+4J6, Rua Osindo I, Manleuana, Dili 00000, Timor-Leste*
[5] *Department of Environmental Health, Faculty of Public Health and Medical Sciences,Universidade da Paz(UNPAZ), CGPW+4J6, Rua Osindo I, Manleuana, Dili 00000, Timor-Leste*
[*] *Correspondence: marcosd4carvalho@gmail.com*

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ABSTRACT

Tuberculosis remained a major cause of illness and death in Timor-Leste. The research objective to examine the impact of social determinant of health on tuberculosis prevalence in Timor-Leste. A systematic review of available studies showed that poor housing conditions and an unhealthy living environment increased the risk of disease transmission. Limited access to high-quality health services affected the control of transmission and hindered the equitable distribution of care. Efforts to address social determinants of health, expand universal healthcare coverage and primary healthcare services, improve infrastructure, strengthen regulations, enhance public health education, and ensure adequate healthcare system planning and funding were essential. Collaboration between government, healthcare providers, and communities played a crucial role in improving service accessibility. The high prevalence of tuberculosis was also influenced by lack of human resources, lower public awareness, inadequate health facilities, and social stigma. Strengthening health education for vulnerable groups was particularly important.

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INTRODUCTION

Tuberculosis (TB) is an infectious disease that continues to affect populations worldwide. It is caused by Mycobacterium tuberculosis, a contagious pathogen that primarily attacks the lungs but can also involve other organs. (Utama et al., 2025; Zhang et al., 2024). Global evaluations of the progress towards the WHO End TB Strategy 2020 interim milestones on mortality (35% reduction) and incidence (20% reduction) have not been age-specific (Collaborators, 2024). In 2024, approximately 10 million people develop tuberculosis each year, leading to nearly 1.5 million deaths globally. (World Health Organization, 2024). Previous study introduced the International Consensus for Early Tuberculosis framework, which separates infection from illness based on the appearance of macroscopic pathology. This concept identifies two subclinical and two clinical tuberculosis states according to reported symptoms or clinical indicators, further separating them by the likelihood of

infectiousness. The presence of live M. tuberculosis and an associated host immune response is considered required for all stages of infection (Coussens et al., 2024).

Tuberculosis remains a major public health concern in the WHO-SEAR, which contributes nearly 45% of the global TB incidence and approximately half of all TB-related deaths. Within this region, several countries bear a particularly high burden of disease. India reports an estimated 2.8 million cases, representing 26% of the global total, followed by Indonesia with 1.1 million cases (10%). China and the Philippines each report approximately 730,000 cases (6.8%), while Pakistan reports 680,000 cases (6.3%) (World Health Organization, 2024).

According to the Global Tuberculosis Report 2024, Timor-Leste reported 6,171 tuberculosis cases in 2023. Although the number of detected cases has increased, the country has achieved substantial progress in tuberculosis control, with a 55% reduction in TB-related deaths between 2015 and 2023. The decline in mortality has accelerated in recent years, with a 48% reduction recorded between 2021 and 2022, followed by an additional 33% decrease between 2022 and 2023 (World Health Organization, 2024). Furthermore, findings by Lopes et al. (2024) indicated that tuberculosis remains a leading cause of morbidity and mortality in Timor-Leste and continues to be recognized as a priority area for health research.

According to the previous study found a 75.3% of people are aware of tuberculosis as a chronic infectious disease, and 76.0% believe that most TB patients may be cured. The awareness of important TB-related information was higher among those who had undergone TB health education. However, knowledge levels were lower among persons who were elderly, retired, or had just an elementary school education or below. Similarly, participants who were elderly, resided in urban areas, worked as equipment operators, or had poor educational levels were less likely to obtain TB health education. Television 44.6%, and the Internet 37.8% were the main sources of TB-related information, while preferred media included television, radio, or films 58.9%, and online advertisements 54.7%. Participants preferred graphical 46.2% and audiovisual 44.8% teaching materials. The most popular sources for answering health-related concerns online were social media platforms 48.3% and search engines 38.9%. Short-form movies 66.8% and visual graphics 53.1% were the most popular media for accessing health information, (Ni et al., 2024).

In 2021, before the implementation of a nationwide vulnerability assessment survey, a pilot study was conducted in selected geographic regions. Six risk factors were assessed in this pilot phase. Two were measured at the household level: a history of tuberculosis within the household and exposure to indoor air pollution. Four were assessed at the individual level: age over 60 years with undernutrition, current tobacco uses or smoking, and alcohol-use disorder. Tobacco use, both smoking and non-smoking forms, was found to be highly prevalent in Timor-Leste. In the Timor-Leste context around 60% of adults were current used tobacco, and identified active smokers is 48.6%. Comparison used tobacco by the sex men almost 60% compared with the female 28.9%. In addition, almost 60% of the population reported a lifetime history of alcohol consumption. Among current drinkers, 28.6% of men consumed alcohol almost daily and in high quantities, averaging 15 standard drinks per session. (Marcos Carvalho, Levi Anatolia S.M. Exposto, 2024).

The potential health and socioeconomic impact of new tuberculosis vaccines will largely depend on their ability to prevent both clinical and subclinical forms of the disease (Churchyard et al., 2024). One of the highest priorities in tuberculosis control is the development of a safe and effective vaccine for adults. A protein-adjuvant vaccine candidate has been designed to prevent tuberculosis in adults with a history of prior infection, as this

population remains at a markedly higher risk of disease recurrence even after completing treatment (Kerkhoff et al., 2024). Global tuberculosis prevention requires a comprehensive strategy that addresses social determinants of health, ensures equitable access to diagnostic services, and expands the availability of shorter preventive treatment regimens. Strong collaboration and innovative research are required to reduce the TB burden and develop effective diagnostic tools, vaccinations, and preventative medications for all populations and ages (Vasiliu et al., 2024).

This study demonstrated the potential effectiveness of bundled provider payments as a policy instrument for improving the quality of care and controlling healthcare costs. The intervention developed for the pilot program promoted low-cost tuberculosis treatment through outpatient services and showed promising outcomes, including a reduction in the financial burden on patients, increased financial stability for healthcare providers, and decreased financial risk to health insurance funds. (Xu et al., 2024). However, the situation in Timor-Leste differs from many other settings, as the government provides healthcare services free of charge to all citizens in accordance with the Constitution of the Democratic Republic of Timor-Leste, Section 57 (Health). This constitutional provision states that every individual has the right to health and medical care, as well as the responsibility to protect and promote health. It further mandates the establishment of a national health service that is universal and comprehensive, and that services shall be provided free of charge, within the capacity of the State and in accordance with the law. The research objective to examine the impact of social determinant of health on TB prevalence in Timor-Leste.

RESEARCH METHODS

Study Design

This study employed a systematic review design using a narrative synthesis approach to examine the impact of social determinants of health on tuberculosis (TB) prevalence in Timor-Leste. The review relied solely on secondary data extracted from published research articles between 2019 and 2025. To ensure scientific rigor, transparency, and reproducibility, the reporting procedure complied with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) criteria. The stages of the review, including identification, screening, eligibility assessment, and final inclusion of studies, were documented through a PRISMA flow diagram.

Population and Sample

The population for this review consisted of published studies investigating individuals or communities affected by TB within the context of social determinants of health in Timor-Leste. Articles were retrieved from PubMed, BMC, DOAJ, and Google Scholar using predefined search terms. A total of 67 articles were initially identified. Following PRISMA-based screening procedures—including title and abstract screening, full-text assessment, and application of inclusion and exclusion criteria—eight studies met the eligibility requirements and were included in the final synthesis.

Variables

Dependent Variable

Tuberculosis Prevalence: Defined as the proportion or number of TB cases reported within a population over a specified period, as documented in each included study.

Independent Variables

The independent variables comprised social determinants of health associated with TB prevalence in Timor-Leste:

1. Housing and Environmental Conditions
2. Access to Health Care Facilities
3. Socioeconomic Status
4. Comorbidities (e.g., HIV, diabetes)

These determinants were extracted and analysed based on how each study quantified or described their influence on TB distribution.

Operational Definitions

Operationally, tuberculosis (TB) prevalence in this review refers to the number, proportion, or rate of TB cases reported within the study populations during a defined period, as documented by the included studies. Housing and environmental conditions are defined as the physical characteristics of the living environment—such as ventilation quality, overcrowding, sanitation, and structural conditions—that contribute to the risk of TB transmission. Access to health care facilities is understood as the degree to which individuals or communities can obtain timely and adequate TB-related services, encompassing distance to facilities, availability of diagnostic and treatment services, and the overall functionality of health systems. Socioeconomic status is defined as a composite of income level, education, employment status, and economic stability, which collectively shape exposure to TB risk factors and influence the ability to utilize health services. Comorbidities, particularly HIV and diabetes, are defined as coexisting medical conditions that compromise immune function and biologically increase susceptibility to TB infection or active disease. These operational definitions guided data extraction and synthesis to ensure consistency in interpreting how each determinant contributes to TB prevalence in Timor-Leste.

Instruments

The review utilized several methodological instruments to guide data collection and appraisal: Electronic Databases: PubMed, BMC, DOAJ, and Google Scholar served as primary sources for literature retrieval.

1. PRISMA Flow Diagram: Used to document the systematic selection process.
2. Critical Appraisal Tools: Such as the STROBE checklist for observational studies and the CASP or JBI appraisal tools, applied to assess methodological quality and risk of bias.
3. Search Strings: Structured keyword combinations including “Tuberculosis,” “Housing and Environment,” “Access to Health Care Facilities,” “Impact of Socioeconomic Status on TB Prevalence,” “Impact of Comorbidities on TB Prevalence,” and “TB Prevalence.”

Protocols

A structured protocol guided the review process from April 1 to May 15, 2025. The protocol involved:

1. Systematic searching of multiple databases
2. Removal of duplicates
3. Title and abstract screening
4. Full-text evaluation
5. Data extraction using a standardized extraction sheet
6. Critical appraisal of study quality
7. Thematic classification of findings into major social determinant categories
8. Additional studies were identified through expert consultations. All protocol steps were undertaken in accordance with PRISMA guidelines.

Statistical Analysis

Due to heterogeneity in study designs, populations, and measurement approaches across the included articles, a meta-analysis was not conducted. Instead, a narrative synthesis method was applied to:

1. Organize findings into thematic categories
2. Compare and contrast relationships between social determinants and TB prevalence
3. Identify consistent patterns and contextual factors influencing TB burden in Timor-Leste
4. The synthesized results were derived from qualitative and quantitative data reported by the included studies.

Inclusion and Exclusion Criteria

The inclusion and exclusion criteria (Table 1.) were constructed using the PICOS framework:

a. Population: The target population was identified based on the focus of the systematic review, specifically individuals and communities affected by tuberculosis in Timor-Leste.
b. Intervention: Interventions included actions or strategies implemented to manage individual or community cases, as well as descriptions of management approaches relevant to the topic of the systematic review.
c. Comparison: The comparison consisted of alternative interventions or management strategies. If a control group was not available, other relevant comparators used in the selected studies were considered.
d. Outcome: Outcomes referred to the results reported in the included studies that aligned with the theme of the systematic review, particularly tuberculosis prevalence and associated social determinants of health.
e. Study Design: Eligible study designs were those that provided empirical data relevant to the review objective, including observational or interventional research articles.

Table 1. Inclusion and Exclusion Criteria

Critria	Inclusion	Exclusion
Population	The International publications relevant to the impact of social determinants of health on tuberculosis prevalence in the Timor-Leste setting.	International articles not related to the impact of social determinants of health on tuberculosis prevalence.
Intervention	Not applicable (no intervention required).	Not applicable (no intervention required).
Comparison	Not applicable.	Not applicable.
Outcome	Studies that examine and report the impact of social determinants of health on tuberculosis prevalence.	Studies that do not address or report the impact of social determinants of health on tuberculosis prevalence.
Study design	All types of research publications, including open-access research articles.	Articles without a research-based design.
Year Publication	2019–2025	Published before 2019.
Language	English	Non-English languages.

Article Selection

This systematic review included studies published in English and conducted in both community-based and institution-based settings across various regions. Articles were eligible if they focused on participants of any age, gender, or occupation and reported tuberculosis prevalence between 2019 and 2025. The selection process followed the PRISMA guidelines. Relevant studies were identified from the PubMed, BMC, and Google Scholar databases. The search strategy used the following keywords: “Tuberculosis,” “Housing and Environment,” “Access to Health Care Facilities,” “Impact of Socioeconomic Status on TB Prevalence,” “Impact of Comorbidities on TB Prevalence,” and “TB Prevalence.” A total of 67 articles were initially retrieved. The PRISMA flowchart (Figure 1.) was used to screen and select studies

based on predefined inclusion and exclusion criteria, ensuring that only relevant and high-quality publications were included in the analysis.

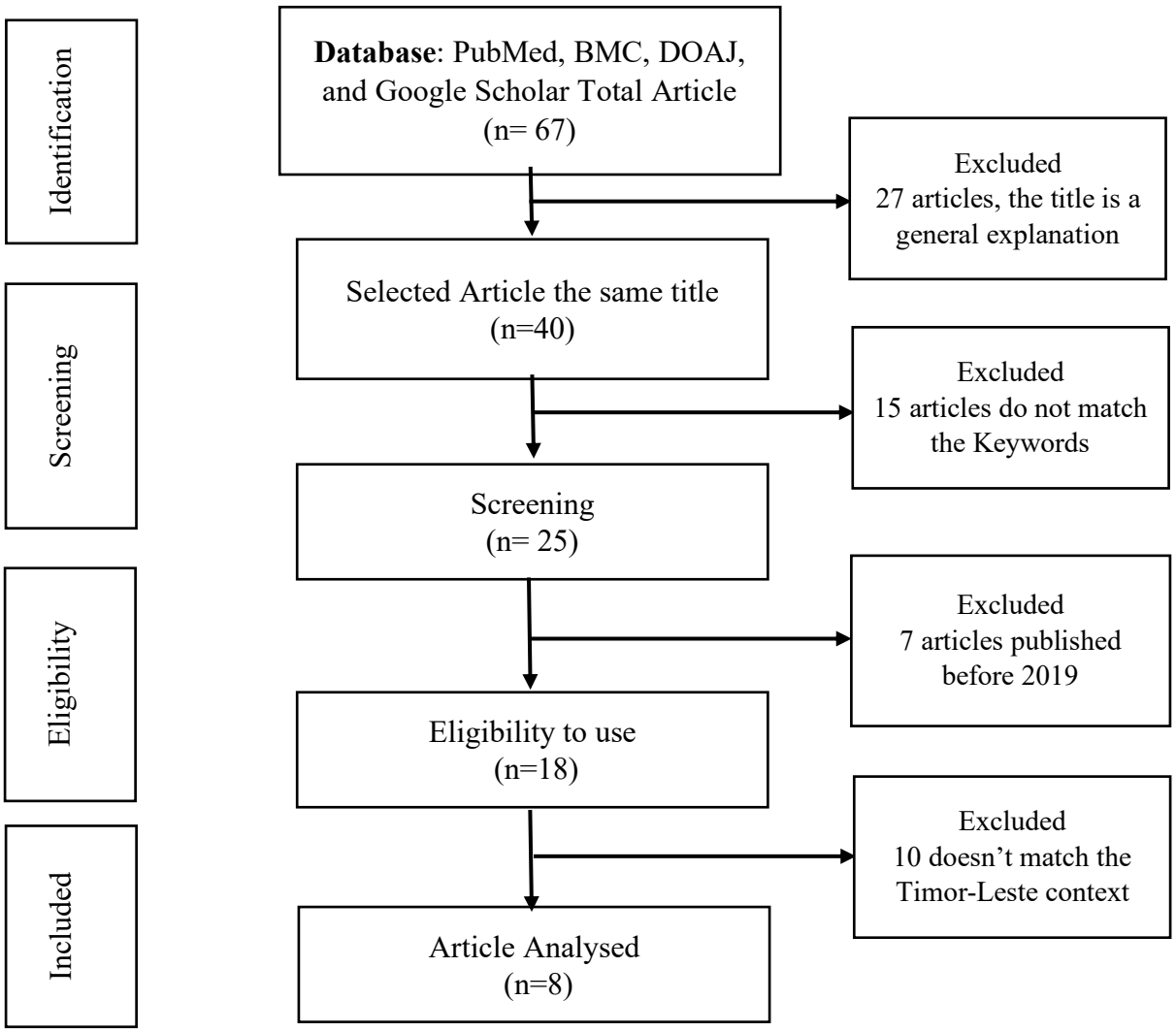

Figure 1. PRISMA Flow Chart

Relevance of the Study

The relevance of the research was ensured by conducting a comprehensive search across multiple databases to evaluate the quality and applicability of the available evidence. A systematic approach was used to identify, critically appraise, integrate, and synthesize data from multiple studies related to the research question. This method enabled a more complete and accurate understanding of the social determinants associated with tuberculosis prevalence.

Quality of the Study

The study employing predefined inclusion and exclusion criteria, all retrieved articles were evaluated to establish eligibility. Initially, PubMed, BMC, DOAJ, and Google Scholar were used to identify 76 English-language papers published between 2019 and 2025. Six studies were included for synthesis and additional analysis after the PRISMA flowchart was used for systematic screening.

Analysis Technique

The final selection of publications was determined through reviewer consensus, which found the eighth (8) article TB conducted in Timor-Leste. Subthemes within the studies were analyzed to classify findings accurately. Although topics such as case detection and notification appeared frequently, some articles were categorized under different themes due to extensive discussion of underlying factors or interventions. Therefore, a thorough evaluation of each article title and content was necessary to ensure relevance to the research objective. Analysis was conducted only on studies that met the inclusion criteria (2019–2025) to draw meaningful conclusions.

Ethics Statement

This review exclusively used secondary data from publicly accessible published literature. As no human participants or identifiable private information were involved, ethical approval was not required. All included data were used responsibly and in accordance with academic integrity standards.

RESULTS AND DISCUSSION

Characteristics of the Study

This systematic review was conducted (Figure 2.)by searching for relevant information and publications through online databases. Article retrieval involved the use of electronic platforms, including PubMed, BMC, DOAJ, and Google Scholar. After the initial collection of articles, each publication was assessed for relevance and methodological quality. The PRISMA flow diagram was applied to guide the screening and selection process, ensuring that only studies meeting the inclusion criteria were advanced to the subsequent stages of analysis.

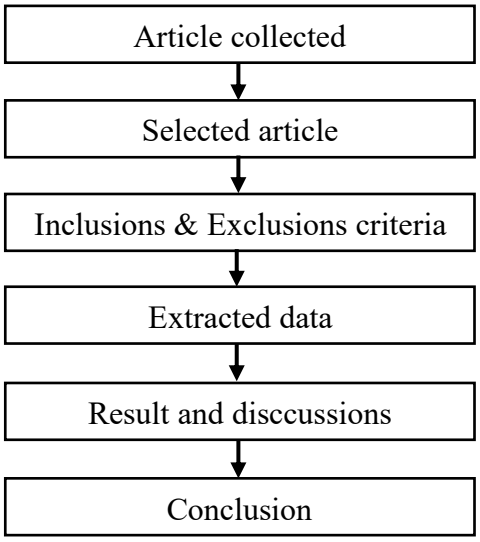

Figure 2. The characteristics of the study

Search Process

This systematic review offered a detailed evaluation of studies evaluating the impact of social determinants of health on tuberculosis prevalence. The article search was conducted from April to May 2025, resulting in the identification of 67 relevant publications.

Data Extraction

Data were extracted (Table 2.) from each selected article following a standardized procedure, which included information on the authors, year of publication, study title, methodology, and key findings. Only articles published between 2019 and 2025 were included. Data extraction played a crucial role in ensuring that the included studies could be critically appraised and used to inform future research. All extracted information was organized into a structured data extraction form presented in tabular format.

Table 2. Data extraction

Authors and Years	Title	Methods	Results
(Amaral et al., 2022)	Analysis of Factors Affecting the Incidence of Pulmonary Tuberculosis in Lautem City – Timor Leste	Analytic Observational	The study found that the incidence of pulmonary tuberculosis in the Municipality of Lautem, Timor-Leste, was predominantly impacted by intimate contact with individuals with TB and alcohol drinking.
(Correia et al., 2025)	Relationship between the behaviour and Physical condition on house and occurrence of Pulmonary Tuberculosis (TB) in the village of Mauluro, Viqueque Villa Post Administrative, Viqueque Municipality, 2024	A quantitative cross-sectional study	The study validates Gordon's theory about the influence of environmental factors on TB transmission and emphasizes the significance of including environmental determinants into TB control methods. Improving poor housing conditions and addressing limited healthcare access are critical priority to lower TB incidence in Maluro Village, Viqueque Municipality.
(Fontes et al., 2023)	Analysis of Availability and Condition of Basic Sanitation Facilities in Hato-Luli Hamlet	Cross-sectional study	The study in Hato-Luli Hamlet, Maubisse Kota Village, Maubisse District, Ainaro Regency shows that poor environmental sanitation—including inadequate latrines, wastewater drainage, waste disposal, and substandard housing conditions—significantly contributes to the incidence of diseases such as diarrhoea, dengue fever, and pulmonary tuberculosis.
(Sarmento et al., 2022)	Mycobacterium tuberculosis Genotypes and Drug Susceptibility Test	A Pilot Study	The results of this study provide a small snapshot of MTB diversity and resistance in an undersampled region with very high TB incidence.

	Results from Timor-Leste: A Pilot Study		
(Fernandes et al., 2024)	Adherence to Pulmonary Tuberculosis Medication and Associated Factors Among Adults: A Cross-Sectional Study in the Metinaro and Becora Sub-Districts, Dili, Timor-Leste	A descriptive analytical cross-sectional study	Healthcare service quality and individual factors, including lifestyle behaviors and social stigmas, significantly predict TB treatment adherence. Enhancing healthcare infrastructure, employing multisectoral behavior change strategies, and minimizing societal stigma are crucial for improvement.
(Tilman et al., 2024)	Link To fit the horizontality of science and Attitude of transmission TB Pulmonary in Isolation Room at HNGV Dili Timor-Leste (2024)	a quantitative study	According to the respondents' transmission of pulmonary tuberculosis, individuals in the good category account for almost 49% of the total (81.7%).
(Tilman et al., 2025)	About Changes in the Nutritional Status of Pulmonary Tuberculosis Patients Previously and Afterward Treatment at Bairo Pite Clinic, Dili, Timor Leste (2025)	A quantitative study	Logistic regression was employed to analyze clinical outcomes and levels of complementary therapy in a study focused on malnutrition among junior secondary school pupils. The Kaplan-Meier survival estimates indicated a correlation between the date of mortality and the interventions provided. Following therapy, the nutritional status of pulmonary tuberculosis patients at the Bairo Pite Clinic in Dili showed improvement; a Paired Samples Test recorded a mean paired change score of 2.123.
(Ximenes, 2024)	Analysis of the screening process for TB case detection in Gleno, Letefoho, and Railako Health Centre in 2022	Analytic Observational method with	The study found a strong correlation between tuberculosis screening procedures in the community and laboratory settings at both Gleno and Letefoho Community Health Centers, indicating high efficacy in identifying TB cases before and after screening.

DISCUSSION

Housing and Environment

Housing conditions and the surrounding environment play a crucial role in human health. Fontes et al., (2023) Highlight that environmental sanitation is essential for achieving optimal health status. Consistently, Correia et al., (2025) Emphasize the need to address environmental determinants in tuberculosis (TB) control strategies, supporting Gordon's theory on the significant role of environmental factors in TB transmission. Inadequate housing infrastructure is identified as a key contributor to TB incidence, while limited access to healthcare in Maluro Village, Viqueque Municipality, underscores the urgency for targeted interventions and improved service delivery. Similarly, (Pacheco, 2025) Report that although some housing components are functioning—such as window ventilation (77.9%), clean home environment (66.3%), chimneys (70.5%), effective sewage drainage (71%), and trash bins (76.8%)—overall housing conditions remain below health standards. Such suboptimal conditions may increase the risk of TB transmission. According to the study conducted by Tilman et al., (2024) Show that respondents' transmission of pulmonary tuberculosis, individuals in the good category account for almost 49% of the total (81.7%). The study conducted by Ximenes, (2024) Found a strong correlation between tuberculosis screening procedures in the community and laboratory settings at both Gleno and Letefoho Community Health Centers, indicating high efficacy in identifying TB cases before and after screening.

Housing conditions and the living environment play a crucial role in the transmission of tuberculosis (TB) among people living in the same household. Poor housing, particularly overcrowding and inadequate ventilation, significantly raises the risk of community transmission. Additionally, access to high-quality health services—such as timely diagnosis and effective treatment—is essential for reducing TB transmission and enhancing disease control.

Access to Health Care Facilities

According to the previous study in the Metinaro and Becora Sub-Districts, Dili, Timor-Leste, found that quality of health service in Healthcare and individual factors such as lifestyle, behaviors and social stigmas, significantly predict TB treatment adherence. Enhancing healthcare infrastructure, employing multisectoral behavior change strategies, and minimizing societal stigma are crucial for improvement. (Fernandes et al., 2024)

Barriers within the health system—such as limited diagnostic laboratory availability, fear of infection, and poor adherence to clinical protocols—contribute to low tuberculosis (TB) case detection rates. To improve detection, patient-centered measures are required, such as better TB symptom screening and the development of an effective sputum route to strengthen the link between rural health care facilities and laboratories. (Der et al., 2022).

The study by (Cabañero-Garcia et al., 2025; Chelak & Chakole, 2023) It is important to address social determinants of health and ensure universal healthcare coverage. This includes expanding primary care services, improving infrastructure, implementing effective regulations, and enhancing public health education. Additionally, there is a need to redesign health system funding. Collaboration among governments, healthcare providers, and communities is crucial to increase accessibility and promote policies that protect vulnerable people. Notably, there was a considerable reduction in tuberculosis (TB) case detection coverage, dropping from 91.76% in 2023 to 40.78% in 2024. In the Timor-Leste context according to the study conducted by Carvalho et al., (2025) emphasize that timely and appropriate care, aligned with available resources and patient survival prospects, strongly influences patient perceptions of the healthcare system. Suppoted by Exposto et al., (2023)

further note that improving hospital service quality and facility standards is critical to achieving patient satisfaction. However, several barriers persist, including limited human resources, low public awareness, insufficient supporting infrastructure, and suboptimal program management. According to Utama et al., (2025) concurrent job responsibilities among health workers and a shortage of tracing cadres reduce the effectiveness of case finding. In addition, TB-related social stigma hampers early detection and treatment. To improve tuberculosis care, the World Health Organization emphasizes the importance of considering a TB patient's journey across a variety of connected settings and facilities. (Sejie & Mahomed, 2023)

This study highlights the importance of addressing the social determinants of health, ensuring universal healthcare coverage, expanding primary healthcare services, improving infrastructure, enforcing regulations, strengthening public health education, and optimizing the design and funding of healthcare systems. Collaboration among governments, healthcare providers, and communities is essential for enhancing healthcare accessibility and informing policy development. However, declining case detection coverage has negatively impacted patient satisfaction. Improving hospital service quality and adherence to standards is therefore necessary. Key barriers include insufficient human resources, low public awareness, inadequate supporting facilities, and ineffective program management. Additionally, social stigma toward tuberculosis continues to hinder early detection and timely treatment.

Impact of Socioeconomic Status on TB Prevalence

There is a growing consensus that tuberculosis (TB) control efforts in low- and middle-income countries must involve not only investment in diagnostic and treatment services but also targeted action on the socioeconomic determinants of TB. The disease disproportionately affects disadvantaged populations, including the poor, ethnic minorities, and individuals experiencing food insecurity. (Balwan et al., 2024). The link between poverty and tuberculosis (TB) has been well documented, as socio-economic deprivation is a risk factor that drives TB transmission and progression while also hindering treatment adherence. (Cintron et al., 2025).

According to Bio et al. (2024), the estimated costs and coping mechanisms required to support TB patients during treatment are substantial and may further worsen the socioeconomic status and well-being of caregivers. (Bio et al., 2024). Individuals with lower socioeconomic status often experience delayed diagnosis, leading to ongoing community transmission. (Sukuru Chinna Reddy, Gijith Mohan K.M., 2025). Similarly, reported that low socioeconomic status is associated with longer waiting times and limited access to care, resulting in poorer health-related quality of life. Financial instability and increasing healthcare costs further hinder access to services, particularly among older adults. Socioeconomic status plays a critical role in TB risk. Individuals with lower socioeconomic status frequently live in overcrowded and poorly ventilated housing, increasing exposure to TB. Limited access to healthcare contributes to diagnostic delays and inadequate treatment, exacerbating transmission in marginalized communities. Addressing these socioeconomic determinants is essential to reducing TB prevalence and improving population health outcome. Furthermore, (G. Hamsaveni et al., 2024) found that TB has significant health, social, psychological, and economic impacts on patients. Poor access to health services, low socioeconomic status, and poor mental health contribute to reduced quality of life. Horton et al. (2022) emphasized that the potential costs of failing to diagnose and treat a single case of active TB—or to prevent progression from infection to disease—are far greater than current cost models suggest, underscoring the importance of considering airborne transmission in economic and policy planning. (Horton et al., 2022).

This study highlights the significant financial burden and coping strategies needed to support tuberculosis (TB) patients during their treatment. These factors can negatively impact the socioeconomic status and well-being of caregivers. Individuals with lower socioeconomic status often face delays in diagnosis, which contributes to ongoing community transmission of TB. Furthermore, financial instability and rising healthcare costs restrict access to care, especially for older adults. Therefore, it is crucial to address socioeconomic determinants to reduce the prevalence of TB and enhance overall public health.

Impact of Co-morbidities on TB Prevalence

In Timor-Leste, antimicrobial resistance to TB drugs has emerged due to poor adherence to treatment regimens. Many patients fail to take their medications as prescribed, leading to treatment failure and resistance development. According to (Goletti et al., 2025)The mortality rate of untreated TB is approximately 50%, while comprehensive anti-TB therapy can achieve cure rates of up to 85% in individuals without rifampicin resistance. Effective anti-TB therapy is the cornerstone of TB control, reducing morbidity, mortality, and transmission. A study identified close contact with TB patients and alcohol consumption as key risk factors for pulmonary TB in the Municipality of Lautem, Timor-Leste. Furthermore, emphasized that addressing the programmatic and socioeconomic determinants of TB in men results in population-wide benefits. Future interventions should prioritize active case finding, reducing tobacco use, and limiting harmful alcohol consumption, while still considering women, to effectively lower TB morbidity and mortality across all age groups. The previous study in Timor-Leste to analyze clinical outcomes and levels of complementary therapy in a study focused on malnutrition among junior secondary school pupils. The Kaplan-Meier survival estimates indicated a correlation between the date of mortality and the interventions provided. Following therapy, the nutritional status of pulmonary tuberculosis patients at the Bairo Pite Clinic in Dili showed improvement; a Paired Samples Test recorded a mean paired change score of 2.123.(Tilman et al., 2025)

According to Dashuki et al. (2025), Treatment success rates for TB patients with comorbidities remain below the established target. Inadequate management of these cases may result in prolonged transmission, increased mortality, and higher healthcare costs. Identifying treatment success rates and their determinants is critical to understanding the disease burden and assisting public health authorities and medical professionals in designing integrated and collaborative strategies to improve care for TB patients with comorbidities.

Timor-Leste faces increasing antimicrobial resistance to anti-TB drugs primarily due to poor treatment adherence. Key variables increasing pulmonary TB incidence include intimate contact with TB patients and alcohol use. Treatment outcomes for TB patients with comorbidities remain below target, which may result in prolonged transmission, increased mortality, and higher healthcare costs. Identifying treatment success rates and their causes is critical to enhancing local integration and collaborative care delivery for TB patients with comorbidities.

CONCLUSION

The study highlights the need for novel approaches to stop the spread of tuberculosis (TB) and cites a number of factors that contribute to the high prevalence of TB in Timor-Leste. The increasing resistance to anti-TB drugs underscores the urgency for innovative approaches. While health promotion efforts have seen some success, awareness of TB as a chronic infectious disease remains low. The essential strengthening health education, particularly high-risk groups such as the elderly, individuals with limited educational

backgrounds, retirees, urban dwellers, and equipment operators. To improve awareness, TB-related health education should be delivered through digital platforms, using audio-visual materials and illustrations. Short videos and visual content shared on social media and search engines can effectively enhance public understanding of TB and related information. The study recommends that the government strengthen health education for vulnerable groups, such as individuals with low socioeconomic status or limited health literacy, to increase the effectiveness of prevention strategies. Additionally, it calls for global and regional discussions to address the underlying causes of TB prevalence in middle- and low-income countries to help strengthen health systems.

Author Contributions

This study was conducted through a collaborative effort among all listed authors, each of whom made meaningful and substantial contributions at different stages of the research process. Authorship was strictly limited to individuals directly involved in the conception, design, data generation, interpretation, and manuscript development. Responsibilities were assigned transparently and consistently throughout the study as follows: *Conceptualization* was led by M.C. and E.P.M. Methodology development and software application* were carried out by A.C.P. *Validation* was jointly performed by M.C., I.B., D.M.U.F., A.C.P., and E.P.M. *Formal analysis and core investigative work* were undertaken by M.C. *Resources and project administration* were managed by G.T. *Data curation and supervision* were handled by X.W. *Original draft writing* was completed by D.M.U.F., while A.C.P. contributed to the review and editing of the manuscript. *Visualization* was overseen by M.C. All authors reviewed and approved the final version of the manuscript and collectively affirm their responsibility for the accuracy, integrity, and originality of its content. Roles were assigned with academic clarity and ethical accountability in mind, ensuring that each contribution was meaningful and appropriately credited.

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Conflicts of Interest

The authors declare no conflict of interest. No financial relationships, institutional affiliations, or personal circumstances influenced the design, analysis, interpretation, or publication of this study.

Abbreviations

The abbreviations in this manuscript are as follows. Each abbreviation is defined at its first mention within the main text to ensure clarity and reader comprehension:

- TB – Tuberculosis
- MTB – Mycobacterium Tuberculosis
- BMC – BioMed Central
- DOAJ – Directory of Open Access Journals
- PICOSa – Population, Intervention, Comparison, Outcome, Study Design
- CASP – Critical Appraisal Skills Programme
- JBI – Joanna Briggs Institute
- STROBE – Strengthening the Reporting of Observational Studies in Epidemiology
- HIV – Human Immunodeficiency Syndrome
- ICE-TB - International Consensus for Early Tuberculosis
- UNPAZ – Universidade da Paz

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