Implementation of Tuberculosis Preventive Therapy: A Scoping Review

Dina Apriana[1*], *Sri Achadi* Nugraheni[2], *Antono* Suryoputro[3]

[1]Master Program of Public Health, Faculty of Public Health, Universitas Diponegoro, Semarang, Central Java, Indonesia
[2]Department of Public Health Nutrition, Faculty of Public Health, Universitas Diponegoro, Semarang, Central Java, Indonesia
[3]Department of Administration and Health Policy, Faculty of Public Health, Universitas Diponegoro, Semarang, Central Java, Indonesia

Abstract. This scoping review aims to map the evidence on the implementation of tuberculosis preventive therapy (TPT) in global TB elimination efforts, focusing on barriers, enablers, and practical strategies. A systematic search of Scopus, PubMed, and ScienceDirect yielded 919 studies, 20 of which met the inclusion criteria. The findings highlight persistent barriers across multiple levels. Issues pertaining to patients include stigma, low risk perception, and concerns about side effect. Limited human resources, disjointed TB/HIV services, medication stock-outs, and brittle supply chains are some of the obstacles faced by the health system. Insufficient funding and weak political commitment are indicators of policy gaps. Enablers include shorter regimens, integration into HIV or primary care programs, engagement of community health workers, and socioeconomic support. Practical strategies include the "test and treat" model, strengthened logistics systems, and caregiver empowerment for child contacts. Effective TPT implementation requires systemic action. Policymakers need to integrate TPT into universal health coverage (UHC), ensure sustainable financing, and secure reliable supply chains. Practitioners should prioritize short-course regimens, strengthen contact tracing, and provide structured patient support. Scaling up TPT depends on aligning regimen optimization, community engagement, workforce training, and political commitment to accelerate progress toward TB elimination.

1 Introduction

Tuberculosis (TB) is a preventable and curable infectious disease [1]. However, according to the Global Tuberculosis Report, the incidence of TB continues to increase annually, with more than 10 million people affected by the disease [1]. In 2023, TB became the leading cause of death globally, responsible for approximately 1.25 million deaths, surpassing COVID-19 and nearly twice as many as HIV/AIDS [1].

Although shorter and effective TB treatments are available, the persistently high incidence and mortality indicate that treatment alone cannot achieve elimination [2,3]. Preventive strategies, particularly TB preventive therapy (TPT), are therefore crucial to stop the progression of latent TB infection (LTBI) into active disease, especially among high-risk groups such as people living with HIV, household contacts, and other vulnerable populations [4,5,6]. TPT effectively reduces the incidence of active TB among high-risk groups and is

* Correspondence: dinaapri92@gmail.com

recommended in the World Health Organization (WHO) guidelines to support global elimination efforts [1,4,6,7].

The implementation of TPT in high-burden countries remains limited due to health system, service delivery, and patient-related challenges [2,8,9]. Several studies have examined specific aspects of TPT implementation, such as barriers, effectiveness, and healthcare provider perspectives [5,10,11,12]. However, there is no comprehensive synthesis that captures the full scope of evidence on how TPT is being implemented, what strategies are employed, and what challenges persist.

This gap is critical as TB burden remains high despite therapeutic advances, and the WHO's updated guidelines set ambitious TPT coverage targets requiring urgent evidence-based action. A scoping review is therefore both timely and necessary to map the breadth of available evidence, identify strategies, challenges, and enabling factors in TPT implementation, and highlight knowledge gaps that require further investigation. The findings will provide actionable insights to strengthen policies and practices, particularly in high-burden settings and contribute to progress toward TB elimination.

2 Methods

This scoping review was neither conducted following the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) guidelines nor pre-registered in PROSPERO or OSF. However, the scope, eligibility criteria, and procedures were defined a priori to minimize bias. Screening and data extraction were conducted independently by two reviewers, with discrepancies resolved through discussion.

A systematic search was conducted in PubMed, Scopus, and ScienceDirect using the terms "implementation" AND "tuberculosis preventive treatment" OR "tuberculosis preventive therapy," limited to studies published between 2016 and March 2025. Eligible studies were peer-reviewed, available in full text, open access, written in English, and employed qualitative, quantitative, or mixed-methods designs focusing on TPT implementation in the context of TB elimination. Studies on active TB, laboratory research, cost analyses, or those conducted during the COVID-19 pandemic were excluded. We acknowledge that restricting the search to English-language publications may have excluded potentially relevant publications in other languages, thereby introducing language bias.

All references were managed in Mendeley for duplicate removal and no automation tools were used for screening. Screening was conducted in two stages (title/abstract and full text) independently by two reviewers, with disagreements resolved through discussion. Data were extracted using a predefined form and synthesized narratively into thematic categories. The study selection process is summarized in Figure 1.

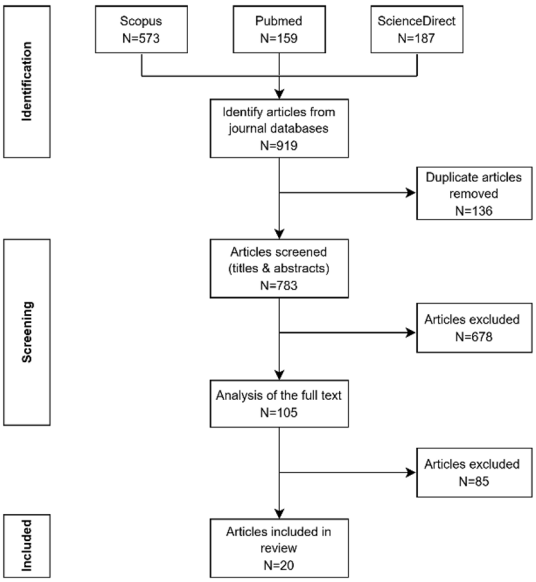

Fig. 1. PRISMA Flow Chart

3 Results And Discussion

The search strategy yielded a total of 919 articles. Articles were screened and duplicates were removed. Subsequently, selection was carried out based on the inclusion and exclusion criteria, resulting in 20 articles being included in the review. Table 1 presents a summary of the findings from each included article.

Table 1. Literature Review

Author/Year	Country	Study Design/ Population	TPT Strategy	Key Findings
Giridharan et al., 2024 [1]	SEAR (8 countries)	Qualitative/high-risk populations	TPT	Challenges: supply chain issues, low demand, limited provider willingness
Reddy et al., 2019 [2]	India	Quantitative and qualitative/PLHIV	INH	Stock outs and adverse effects hinder initiation/completion
Mahajan et al., 2024 [3]	India	Quantitative and qualitative/household contacts	Test and treat	Challenges: follow up, TPT supply, testing, X-ray, human resources, awareness
Boyd et al., 2020 [4]	South Sudan	Quantitative and qualitative/PLHIV	INH	Guidance, training, and community health workers are essential; reliable supply needed
Samudyatha et al., 2023 [5]	India	Quantitative and qualitative/household contacts	INH	Barriers: IGRA logistics, stigma, unclear contact definitions

Poku et al., 2024 [6]	Ghana	Quantitative/PLHIV	INH	Systematic screening and TPT provide advantages for high-risk patients receiving ARV
Apriani et al., 2022 [7]	Indonesia	Quantitative/children and adults	4R and 9H	4R is more effective, safer, cost effective than 9H
Chandra et al., 2022 [8]	South Africa	Quantitative/primary care patients	TPT	Barriers: knowledge gaps, staff shortages, non-integrated services
Russom et al., 2022 [9]	Eritrea	Qualitative/PLHIV	INH	Barriers: laboratory constraints, inadequate planning, provider knowledge gaps
Sharma et al., 2023 [10]	India	Quantitative/household contacts	3HP	High adherence; refusal due to low perceived risk
Goroh et al., 2023 [11]	Malaysia	Qualitative/children	INH	Side effects, guardian cooperation, child friendly formulations
Ghimire et al., 2022 [12]	Nepal	Quantitative and qualitative/children	INH	Influencing factors: treatment, awareness, contact tracing, partnerships
Zegarra-Chapoñan et al., 2021 [13]	Peru	Quantitative/household contacts	IPT	Gaps in TPT initiation and completion by age and sex
Bedoya et al., 2023 [14]	Colombia	Quantitative/child contacts	Integrated care and TPT	Transport and food support improved adherence
Alvi et al., 2024 [15]	India	Quantitative and qualitative/household contacts	INH	Enablers: NGO collaboration, awareness, short regimens Barriers: supply, private sector reluctance, workload
Christian et al., 2024 [16]	Uganda	Qualitative/PLHIV	INH	Barriers: political support, motivation, limited authority, funding
An et al., 2023 [17]	Cambodia	Qualitative/children	INH	Barriers: supply chain, caregiver understanding, side effects, adherence
Takamiya et al., 2021 [18]	Zimbabwe	Quantitative/PLHIV	INH	Factors: sex, age, alcohol use, rural residence, TB screening
Odume et al., 2020 [19]	Nigeria	Quantitative/PLHIV	INH	TPT coverage expanded through integration into ARV logistics
Water et al., 2023 [20]	South Africa	Quantitative/rural communities	INH	Barriers: resource limits, documentation, provider knowledge Enablers: motivation, training

The majority of the studies were conducted in Southeast Asia, Latin America, and other regions, with the highest concentrations found in Africa (n = 7, including four from South Africa) and India (n = 5). The majority of studies used quantitative methods (n = 11),

followed by mixed methods (n = 4) and qualitative methods (n = 6). Household contacts (n = 8), HIV positive individuals (n = 6), children (n = 3), and other high-risk groups were the primary target populations.

Drug stock-outs, supply chain problems, limited provider capacity, and patient-level obstacles such as stigma and noncompliance were found to be common issues across studies. Shorter regimens, community and caregiver involvement, and integration with pre-existing HIV or primary care services were identified as enabling factors. Evidence on long-term results and large-scale programmatic implementation remains limited, which emphasizes the need for further research to inform sustainable national policies.

3.1 Barriers of TPT Implementation

3.1.1 Sociodemographic

The evidence suggests that demographic characteristics, particularly gender and age, play a decisive role in shaping both the initiation and completion of TPT. These factors appear to influence not only the likelihood of starting therapy but also adherence and follow-up evaluation [13]. Contextual conditions such as place of residence may further interact with demographic variables, adding complexity to the decision-making processes surrounding TPT implementation [18].

Previous studies have shown that age and gender also affect treatment adherence, with older patients and females tending to show higher levels of adherence compared to younger and male patients [5,18]. Low socioeconomic status was identified as a significant barrier, as individuals with limited income had reduced access to healthcare services, which negatively affected their adherence to therapy [2,8,19]. Educational attainment and health awareness also played crucial roles individuals with a better understanding of TB and the benefits of treatment were more likely to adhere to TPT [9,12,17].

3.1.2 Individual and Community

Low risk perception consistently emerges as a critical barrier undermining both the uptake and adherence to TPT [11,17]. When individuals perceive their susceptibility to TB as minimal, they are less motivated to accept screening or preventive therapy, regardless of availability [1,5]. This limited risk awareness often interacts with other psychosocial factors, such as fear of stigma and concerns about side effects, which further discourage participation in household contact management programs [10].

According to prior research, improving community knowledge about TPT significantly contributes to greater acceptance and adherence to treatment. Studies show that good community-level understanding of TB facilitates early detection and more effective TB treatment [1,11]. Positive attitudes toward treatment and belief in the effectiveness of TPT are also known to enhance patient adherence. Community trust in the benefits of preventive therapy has been shown to increase acceptance and the successful completion of therapy [2,17].

3.1.3 Healthcare Workers

Limited knowledge regarding the effectiveness of TPT, low adherence to clinical guidelines among healthcare workers, insufficient training, and high workloads are major barriers to the successful implementation of TPT programs [1,8,9]. Evidence from earlier studies shows that many healthcare workers still lack adequate understanding of TB and its preventive

strategies. Although most demonstrate positive attitudes toward TB infection control, low levels of knowledge can hinder optimal implementation of TPT [7,9,20].

Strengthening healthcare workers' knowledge, attitudes, and practices in TB control requires ongoing, organized training. Interventions may increase adherence to established protocols [1,16]. Excessive workloads frequently cause stress and burnout among healthcare professionals, eventually reducing the quality of care provided [2,8]. Therefore, it is essential to improve the performance and sustainability of TPT implementation by strengthening the capacity of the health workforce through supportive training, workload management, and institutional support.

3.1.4 Health System

System-level constraints emerge as persistent barriers to effective TPT implementation. Weaknesses in supply chain management not only disrupt drug and diagnostic availability but also undermine confidence in program continuity [1,15]. These structural gaps extend across the entire care cascade, where insufficient human resources, fragmented follow-up mechanisms, and poor documentation flow contribute to loss of patients at multiple stages [3,20].

The design of diagnostic procedures, such as the time-consuming administration and interpretation of TST, further complicates service delivery in primary healthcare contexts [11]. The lack of integration between TB and HIV programs, especially in rural areas with limited workforce capacity, exacerbates inequities in access and continuity of care [8]. Inadequate planning at the early stages of program roll-out highlights the need for structured and well-prepared implementation frameworks to ensure sustainability [9,16].

Research to date suggests that consistent and reliable drug availability is a key element for the successful implementation of TPT [1,7]. On the other hand, shortages in healthcare personnel can increase workloads and reduce the effectiveness of the program. The presence of well-trained, adequately staffed, and highly committed healthcare workers is essential to ensure the success of TPT interventions across all levels of care [2,4,20].

3.1.5 Policy and Political Commitment

Limited authority of local officials in decision-making and fund management, along with minimal political support and budget allocation, have been identified as significant barriers to TPT implementation [1,19]. As reported in previous studies, strong political commitment is a key prerequisite for positioning TB elimination as a public health priority. Such commitment entails the provision of adequate resources, including funding, healthcare personnel, and infrastructure, as well as the active involvement of political actors in advocating for TB control and enacting policies or regulations that support the sustainable implementation of the program [1,4,16].

3.2 Enablers of TPT Implementation

3.2.1 Regimen Selection

Evidence indicates that regimen choice is a critical determinant of both adherence and program efficiency. Short-course options such as 4R and 3HP demonstrate advantages in terms of safety, cost-effectiveness, and patient acceptability, suggesting that optimizing TPT regimens can directly enhance treatment completion and overall program impact [7,10]. These findings provide strong evidence to support the optimization of TPT regimen choices.

3.2.2 *Community-Based Approaches*

The involvement of community health workers, home visits, as well as the provision of transportation and food support, have been shown to improve treatment adherence [4,14]. The effectiveness of these strategies depends on their integration with systematic contact tracing and comprehensive health education, which are essential for ensuring both uptake and sustained participation in preventive therapy [11,12]. According to prior research, active community participation in health promotion and education plays a crucial role in increasing public awareness and understanding of TB [1,17]. Support from community members including public health workers and treatment adherence supporters, greatly contributes to ensuring that patients initiate and complete TPT as prescribed. This engagement not only enhances treatment success rates but also plays a vital role in preventing further transmission and reducing the overall burden of disease at the population level [4,19].

3.2.3 *Cross-Sector Collaboration*

Collaboration between non governmental organization (NGOs) and healthcare facilities is also a critical factor in supporting the implementation of TPT [15]. Strong collaborations between stakeholders, such as government agencies, civil society groups, and healthcare providers, have been shown to facilitate the development of strategies that are more sensitive to the needs and circumstances of local communities. One important element in improving the effectiveness of interventions is the adaptability of programs to particular regional contexts [1,15].

Community health workers need to be adequately supported and given continuous training in order to boost the capacity of frontline implementers. In order to reach vulnerable populations, increase community acceptance, and guarantee the continuation of TPT services at the community level, well-trained and motivated community health workers are essential [4,12,20].

3.2.4 Health Worker Motivation

Health workers have demonstrated a strong interest in enhancing their understanding of TPT and a firm commitment to the goal of TB elimination [20]. This enthusiasm represents a valuable potential that should be harnessed through structured capacity-building interventions. Research to date suggests that high-quality and continuous training plays a vital role in improving knowledge, attitudes, and skills related to TPT implementation [9]. Effective training not only strengthens understanding of clinical guidelines but also encourages active engagement in program delivery. Additionally, providing incentives and recognition for good service practices can further boost health worker motivation [16].

To strengthen overall capacity, the implementation of peer-based training approaches and mentoring systems is essential. These strategies foster a collaborative learning environment and enhance team-based support in service delivery. The provision of comprehensive and accessible educational materials is also necessary to ensure that health workers are equipped with reliable references to deliver consistent and evidence-based practices within TPT programs [20].

3.3 Implementation Strategies

One of the proven approaches to improving TPT coverage is the integrative approach. This approach emphasizes the provision of comprehensive healthcare services, particularly for vulnerable groups such as children, alongside additional support such as transportation and

food assistance to improve adherence to treatment [14]. For example, the integration of isoniazid distribution into the antiretroviral (ARV) logistics system has successfully enhanced the efficiency and coverage of TPT implementation [19].

The "test and treat" model is another promising implementation strategy. This approach combines early detection of latent TB infection with the immediate initiation of therapy for household contacts of pulmonary TB patients. Studies have shown a significant reduction in patient loss during the care cascade and improved success in TPT program implementation [3].

Caregiver empowerment also plays a vital role in supporting the success of TPT in children. This effort includes education on the importance of TB prevention, the provision of child-friendly drug formulations, and the monitoring of side effects to increase comfort and adherence during the course of treatment [11,17].

Strengthening the capacity of health workers through structured and continuous training is essential to improve the quality of TPT services. This should be accompanied by the establishment of a systematic and accessible documentation and reporting system, which can enhance the consistency of record-keeping and facilitate the ongoing evaluation of TPT program implementation [9,20].

3.4 Gaps in Policy, Practice and Health System Readiness

Although TPT has been widely endorsed at the global level, the translation of policy into effective practice remains uneven. The adoption of updated WHO recommendations such as shorter regimens and expanded eligibility criteria has been slow, with national guidelines still relying on older approaches like isoniazid monotherapy [7,10]. This reflects not only policy inertia but also limited budget allocations and the absence of clear integration of TPT into UHC schemes, raising concerns about long-term sustainability [1,16].

At the practice level, implementation is frequently undermined by inadequate provider training and ambiguous operational guidance. Health workers often lack the technical support needed to follow standardized protocols, resulting in variable screening, inconsistent patient follow-up, and uneven quality of service delivery [8,9,20]. Furthermore, weak engagement with communities contributes to low risk perception, persistent stigma, and insufficient patient counselling, which are factors that continue to discourage uptake and adherence despite the availability of effective regimens [1,5,11].

From a health system perspective, readiness for large-scale TPT delivery is compromised by structural weaknesses. Fragmented TB and HIV services hinder coordination, while fragile supply chains are unable to guarantee consistent access to diagnostics and medications. Frequent drug stock-outs, coupled with delays in laboratory testing, diminish patient and provider confidence in the program. The lack of integrated monitoring and reporting systems restricts the ability to track progress, identify bottlenecks, and implement timely corrective measures [2,3,20]. Chronic shortages of human resources, particularly in rural and underserved areas, further exacerbate these challenges by increasing workloads and reducing the quality of care [8,16].

These gaps underscore that clinical efficacy and regimen availability are important factors in TPT scale-up, but so is the ability of the larger health system to support consistent implementation. Unless political commitment, financing, supply chain management, and workforce development are simultaneously strengthened, ambitious global and national targets for TPT coverage will remain out of reach.

3.5 Policy Implications

This review highlights that scaling up TPT requires more than technical solutions; it demands systemic policy action. Governments should strengthen political commitment and financing, integrate TPT into UHC packages, and ensure reliable drug and diagnostic supply chains. Investment in the health workforce through continuous training, workload management, and task shifting, support for community-based approaches, and NGO partnerships that address stigma and socioeconomic barriers is essential. Strengthened monitoring systems and implementation research are needed to inform adaptive learning and accountability, while multisectoral strategies addressing poverty, awareness, and governance will be critical to achieving the WHO's ambitious TB elimination targets.

4 Conclusion

Systemic action is necessary for the successful implementation of TPT. Policymakers should prioritize integrating TPT into UHC programs, ensuring sustainable funding, and building reliable supply chains. Practitioners should use shorter regimens, enhance contact tracing, and provide structured patient support in order to improve adherence. In addition to active community engagement, health workers must receive continuous training and incentives to overcome stigma, low risk perception, and service delivery gaps.

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