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Review Article

Factors associated with family adherence to tuberculosis preventive therapy based on the health belief model: A systematic review

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Abstract

Background: Family adherence to tuberculosis preventive therapy (TPT) plays an important role in preventing tuberculosis transmission and progression among household contacts. The Health Belief Model (HBM) provides a useful framework for explaining how families perceive risk, severity, benefits, and barriers related to preventive therapy. However, evidence on factors associated with family adherence to TPT based on the HBM remains scattered across studies and has not been synthesized comprehensively.
Objective: This systematic review aimed to identify and synthesize factors associated with family adherence to tuberculosis preventive therapy based on the constructs of the Health Belief Model.
Methods: This study used a systematic review design. Literature searches were conducted in Google Scholar, PubMed, ProQuest, and ScienceDirect for articles published between 2019 and 2025 in English or Indonesian. The review included empirical studies that examined family-related adherence to tuberculosis treatment or preventive therapy and studies that used or reflected HBM constructs. Data were extracted using a structured form and synthesized narratively according to HBM domains and family-related adherence factors.
Results: Eight studies were included in the final synthesis. The findings showed that family support consistently influenced adherence behavior in tuberculosis treatment and preventive therapy. Perceived benefits emerged as the strongest predictor of TPT acceptance, while perceived susceptibility, perceived severity, perceived barriers, and self-efficacy were also significantly associated with adherence-related behavior. Knowledge and attitudes contributed to treatment adherence, and HBM-based educational interventions improved medication adherence, nutritional practices, and transmission prevention behavior.
Conclusion: Family adherence to tuberculosis preventive therapy is a multidimensional behavioral outcome influenced by family support, HBM-related perceptions, knowledge, attitudes, and contextual barriers. The Health Belief Model provides a relevant theoretical basis for understanding and strengthening adherence in family and household contexts.

Background

Tuberculosis remains a major public health problem because the disease imposes a prolonged treatment burden, disrupts daily functioning, and creates psychological, social, and economic strain for affected individuals and households worldwide (Addo et al., 2022; Abdurahman et al., 2022). Patients with tuberculosis often experience stress, depression, and reduced quality of life during treatment, and these conditions can weaken treatment engagement and family participation in care over time (Febi et al., 2021; Mohammedhussein et al., 2023; Nurlaela et al., 2024). Families also encounter practical challenges when they supervise treatment, monitor symptoms, and maintain daily support in home settings, especially when respiratory problems and nutritional issues complicate the clinical condition of patients (KK et al., 2025; Sagala et al., 2024). Several studies have shown that adherence is not shaped by medication instructions alone, because patient knowledge, family involvement, and social context also influence treatment behavior in chronic disease management (Akbar et al., 2024; Alee et al., 2025; Aprita, 2024). This broader view places family adherence to tuberculosis preventive therapy within a complex behavioral context that requires conceptual and empirical clarification (Lisum et al., 2021; Craciun et al., 2023).

Tuberculosis prevention becomes more effective when household contacts participate in preventive therapy, yet adherence to preventive regimens often remains inconsistent across

communities and service settings (Fadhilah & Bowo, 2025; Gumara et al., 2025). Studies from Indonesia have reported that family support, self-motivation, medication supervision, and education affect adherence behavior among people living with pulmonary tuberculosis (Damanik et al., 2025; Ramadani et al., 2025; Maura et al., 2023). Other evidence has shown that treatment adherence is also influenced by smoking behavior, lifestyle risks, and general health practices that can aggravate tuberculosis outcomes and complicate long-term prevention efforts (Nisa & Sari, 2022; Alsharani et al., 2021; Nurhayati & Febrianti, 2024). Research on pulmonary tuberculosis in outpatient settings has further identified several adherence-related factors, including patient characteristics, treatment experiences, and service accessibility, which indicate that preventive therapy adherence should be examined from both individual and family perspectives (Evitasari et al., 2025; Media Febriana et al., 2025). Therefore, family adherence to tuberculosis preventive therapy deserves focused review because the family often functions as the immediate decision-making and support unit in household tuberculosis control (Ramadani et al., 2025; Aprita, 2024).

The Health Belief Model offers a relevant framework for explaining adherence because the model links health behavior with perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy (Handayani et al., 2024; Fadhilah & Bowo, 2025). In tuberculosis care, this model helps explain why some families accept preventive therapy and maintain supervision, while other families delay, refuse, or discontinue recommended actions despite available services (Wijaya et al., 2023; Sazali et al., 2023). Studies have suggested that HBM-based education and behavioral interventions can strengthen awareness and improve adherence-related responses among tuberculosis patients and families (Wijaya et al., 2023; Handayani et al., 2024).

Evidence from other chronic illness contexts has also shown that knowledge, beliefs, and perceived support shape adherence behavior, which strengthens the theoretical relevance of HBM for family-based tuberculosis prevention (Akbar et al., 2024; Alee et al., 2025; Aprita, 2024). Thus, an HBM-oriented review can organize scattered findings into a coherent explanation of why family adherence to tuberculosis preventive therapy succeeds or fails (Lisum et al., 2021; Craciun et al., 2023).

Digital and person-centered approaches have emerged as promising strategies to support tuberculosis adherence, because reminder systems, mobile applications, and treatment support tools can improve monitoring, communication, and continuity of care (Bala et al., 2023; Iribarren et al., 2022; Oeser et al., 2023). Randomized and implementation studies have reported that digital adherence technologies can improve treatment success, reduce inequity, and increase the acceptability of adherence support when the intervention matches user needs and local contexts (Boutilier et al., 2022; Jerene et al., 2025; Guzman et al., 2023).

Reviews in digital health have also shown that mobile applications can improve disease management in chronic conditions, but digital transformation can simultaneously increase treatment burden when systems are not aligned with patient capacity and family realities (de Souza Ferreira et al., 2023; Iribarren et al., 2021; Mair et al., 2021). Patient-centered digital primary healthcare requires usability, feasibility, and relational responsiveness, because technology alone does not guarantee adherence without meaningful engagement from patients and families (Leonardsen et al., 2023; Chilala et al., 2025; Madden et al., 2025). These findings indicate that family adherence to preventive therapy should be understood not only through access to interventions but also through beliefs, capabilities, and contextual barriers that shape technology use and treatment behavior (Iribarren et al., 2021; Iribarren et al., 2022; Sazali et al., 2023).

Despite growing evidence on treatment adherence, several important gaps remain in the literature on family adherence to tuberculosis preventive therapy (Lisum et al., 2021; Oeser et al., 2023). Many studies have focused on active tuberculosis treatment outcomes, depression, smoking, nutritional status, or patient-centered medication adherence, while fewer reviews have synthesized family-level determinants of preventive therapy using an explicit behavioral framework (Rouf et al., 2021; Pratiwi, 2024; Nisa & Sari, 2022; Sagala et al., 2024). Existing knowledge-practice reviews have described tuberculosis literacy and public attitudes in low-

and middle-income countries, yet these reviews have not specifically integrated family adherence factors within the HBM domains relevant to preventive therapy decisions (Craciun et al., 2023; Fadhilah & Bowo, 2025). Evidence synthesis in healthcare also benefits from structured interpretation, stakeholder relevance, and transparent methodological reasoning when researchers seek to translate diverse findings into practice-oriented recommendations (Mikdashi, 2022; Nasa et al., 2021; Ismail & Taliep, 2023). Therefore, a systematic review that focuses specifically on factors associated with family adherence to tuberculosis preventive therapy based on the HBM can address an important conceptual and practical gap in tuberculosis prevention research (Sazali et al., 2023; Gumara et al., 2025).

A clearer synthesis of these factors can support family-centered interventions, guide nursing and public health education, and strengthen preventive tuberculosis services at community and primary care levels (Erawati & Andriany, 2022; Damanik et al., 2025). Such synthesis can also help clinicians and program planners identify modifiable beliefs, family barriers, and supportive cues that influence preventive therapy uptake and completion in households at risk (Fadhilah & Bowo, 2025; Gumara et al., 2025; Ramadani et al., 2025). The findings may inform educational, behavioral, and digital strategies that are more responsive to the real experiences of families who live with tuberculosis exposure and treatment demands (Addo et al., 2022; Iribarren et al., 2021; Jerene et al., 2025).

The present study therefore aims to systematically review the factors associated with family adherence to tuberculosis preventive therapy based on the Health Belief Model.

Methods

Study Design

This study employed a systematic literature review design to identify, evaluate, and synthesize empirical evidence on factors associated with family adherence to tuberculosis preventive therapy (TPT) based on the Health Belief Model (HBM) framework. The systematic review approach was selected because the topic involves a multidimensional behavioral phenomenon that cannot be adequately explained through a single primary study. Family adherence to TPT is influenced by perceptions, beliefs, support systems, and contextual barriers, and these factors are often reported across heterogeneous study designs and settings. Therefore, a systematic review was considered the most appropriate design to integrate available evidence in a transparent, reproducible, and methodologically rigorous manner.

This review was conducted and reported in accordance with the PRISMA 2020 guideline, which is recommended by the EQUATOR Network for improving the completeness, transparency, and quality of reporting in systematic reviews and meta-analyses.

Research Question

The research question in this review was developed to guide the identification and synthesis of evidence related to family adherence to tuberculosis preventive therapy within the conceptual lens of the Health Belief Model. The formulation of the research question was based on the need to clarify which belief-related and contextual factors have been reported to influence adherence behavior among families or household contacts involved in tuberculosis prevention. The question was intentionally framed in an exploratory and explanatory manner because the available literature was expected to include variation in study design, population characteristics, measurement approaches, and terminology related to adherence.

The review specifically addressed the following question: “What factors are associated with family adherence to tuberculosis preventive therapy based on the constructs of the Health Belief Model?” This question was justified by the practical and theoretical importance of understanding adherence not only as an individual patient behavior but also as a family-mediated process. In the context of tuberculosis prevention, family members often participate in decision-making, treatment supervision, emotional support, risk interpretation, and healthcare access facilitation. Therefore, the

research question was designed to capture both direct HBM constructs and family-related influences that interact with those constructs in shaping TPT adherence.

Inclusion and Exclusion Criteria

The eligibility criteria were established a priori to ensure methodological consistency and relevance of the included studies to the review objective. The inclusion criteria comprised empirical research articles with quantitative, qualitative, or mixed-methods designs. Quantitative studies included observational designs such as cross-sectional, cohort, and case-control studies, while qualitative and mixed-methods studies were included when they provided relevant evidence regarding beliefs, perceptions, support systems, or family-related determinants of adherence. This broad inclusion of study designs was justified because family adherence is a complex behavioral phenomenon that may be measured statistically, explored experientially, or explained through integrated approaches. Limiting the review only to one type of design would risk excluding important dimensions of adherence behavior.

Studies were included if they discussed family adherence, family-related adherence behavior, or adherence to tuberculosis treatment or tuberculosis preventive therapy in a way that was relevant to household or family support. Studies were also eligible if they explicitly used the Health Belief Model or examined variables that corresponded to HBM constructs in explaining health behavior related to tuberculosis. Only articles available in full text were included, because full methodological and results sections were required for quality appraisal and detailed data extraction. The review included studies published in English or Indonesian, as these were the languages accessible to the review team and relevant to the regional and international literature on tuberculosis prevention. To ensure academic credibility and retrievability, included studies had to be published in scientific journals indexed in academic databases such as Google Scholar, PubMed, ProQuest, and ScienceDirect.

The exclusion criteria were defined to remove studies that did not provide suitable empirical evidence for answering the research question. Editorials, opinion pieces, commentaries, case reports, conference proceedings, and other non-empirical publications were excluded because they do not provide systematic primary data that can be critically appraised and synthesized. Studies were also excluded if they did not directly address adherence to tuberculosis therapy or tuberculosis preventive therapy within a family or household support context. Articles that discussed tuberculosis in general terms without linking the findings to adherence behavior were not considered relevant to the objective of this review. In addition, studies were excluded if they did not relate the variables examined to the HBM framework, either explicitly or conceptually. Articles with unclear methodology, insufficient reporting of study procedures, or inadequate information for critical appraisal were also excluded because their scientific credibility and interpretability could not be adequately assessed.

Search Strategy

The literature search was conducted systematically across four major electronic databases, namely Google Scholar, PubMed, ProQuest, and ScienceDirect. These databases were selected because they provide broad coverage of biomedical, nursing, public health, and interdisciplinary literature relevant to tuberculosis, adherence behavior, family support, and behavioral theory. The use of multiple databases was justified to maximize retrieval sensitivity and reduce the likelihood of missing potentially relevant studies. PubMed was particularly important for biomedical and public health articles, ProQuest contributed multidisciplinary coverage including theses-derived journal literature, ScienceDirect captured peer-reviewed health science publications, and Google Scholar enhanced retrieval of regionally indexed and less easily discoverable journal articles.

The search was limited to articles published between 2019 and 2025. This time restriction was applied to ensure that the review reflected recent evidence relevant to current tuberculosis preventive therapy practices, family engagement strategies, and contemporary use

of behavioral frameworks such as the HBM. The period also captured recent developments in adherence support, including digital and person-centered approaches that may influence family behavior in TB prevention. Only studies published in English or Indonesian and available in full-text format were considered. This decision was justified by feasibility of analysis, accuracy of interpretation, and the need for full methodological access during appraisal and extraction.

The search strategy was developed based on the core concepts of the review: tuberculosis, tuberculosis preventive therapy, adherence, family support, and Health Belief Model. Keywords and controlled vocabulary terms were identified and combined using Boolean operators AND and OR to optimize both sensitivity and specificity. Synonyms and related expressions were used to capture terminological variation across databases. The final search syntax was structured as follows:

("Tuberculosis"[Mesh] OR tuberculosis OR TB) AND ("Tuberculosis, Multidrug-Resistant, Preventive Therapy" OR "tuberculosis preventive therapy" OR "TB preventive therapy" OR "tuberculosis prevention") AND ("Medication Adherence"[Mesh] OR "Patient Compliance"[Mesh] OR "treatment adherence" OR "treatment compliance" OR "medication adherence") AND ("Family"[Mesh] OR "Social Support"[Mesh] OR "family support" OR "family role" OR "family involvement") AND ("Health Belief Model" OR "health belief model").

The search process was completed on 31 January 2025, and all identified records were exported to a reference management application for organization and duplicate removal. The use of a reference manager was justified because it improved the efficiency and accuracy of record handling during the early stages of review. In addition, exporting records before screening allowed the review team to maintain an auditable search trail and reduced the risk of manual errors in sorting and deduplication. The search process was designed to be comprehensive yet focused, so that the final pool of studies would remain directly relevant to the review objective.

Study Selection Process

The study selection process followed the PRISMA 2020 flow structure, which includes the stages of identification, screening, eligibility assessment, and inclusion. After all records were retrieved from the selected databases, the references were compiled in a reference manager to identify and remove duplicate articles before screening began. This deduplication step was necessary because the same article could appear in multiple databases, and retaining duplicates would distort the selection process and artificially inflate the number of records considered. After duplicate removal, the remaining records were screened based on title and abstract.

The title and abstract screening stage was conducted independently by two reviewers using the predetermined inclusion and exclusion criteria. Independent screening was used to improve objectivity and reduce the influence of individual judgment bias in deciding study relevance. At this stage, articles that were clearly unrelated to tuberculosis adherence, family involvement, preventive therapy, or the Health Belief Model were excluded. Studies that appeared potentially relevant or that lacked sufficient detail in the abstract were retained for full-text assessment. This cautious approach was justified because excluding studies too early based only on limited abstract information could lead to the loss of valuable evidence.

The next stage involved full-text eligibility assessment of all studies that passed initial screening. In this stage, the reviewers examined the complete articles to confirm their relevance to the review objective, the appropriateness of the study design, the presence of family-related adherence content, and the applicability of HBM constructs. Full-text review also allowed the reviewers to verify whether the study provided sufficient methodological detail for critical appraisal. When disagreements occurred between the two reviewers regarding study eligibility, the issue was resolved through discussion until consensus was achieved. If consensus could not be reached, a third reviewer was consulted to make the final

determination. This consensus-based process was justified because it strengthens the credibility and transparency of the final study set.

Based on the selection process described in the PRISMA flow diagram, 20 articles met the inclusion criteria and were assessed in full. Of these, 8 studies were ultimately included in the final synthesis because they demonstrated the strongest relevance to the focus of the review and met the required methodological quality threshold. The decision to synthesize a smaller subset of studies was justified by the need to prioritize conceptual relevance and methodological robustness over numerical quantity. In systematic reviews addressing behavioral determinants, inclusion of only the most directly relevant and adequately reported studies can improve the validity and interpretability of the synthesis.

In this review, the study selection process followed the PRISMA 2020 flow framework, and the detailed screening results are presented in Figure 1.

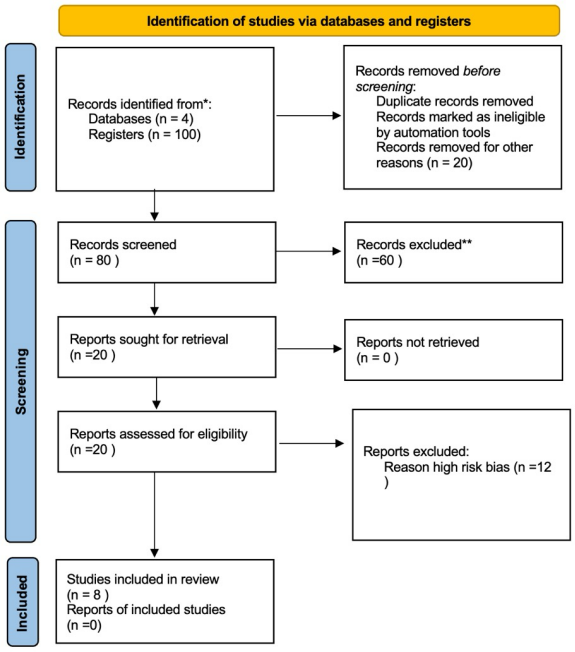

Figure 1. PRISMA 2020 flow diagram of study identification, screening, eligibility assessment, and inclusion

Quality Appraisal

The methodological quality of the included studies was assessed through a formal critical appraisal process to determine the trustworthiness of the evidence and to identify potential sources of bias. Quality appraisal was considered essential because the review included studies with potentially different designs, methods, and levels of rigor. Without systematic appraisal, the synthesis could be influenced by studies with weak design, unclear measurement, inadequate sampling, or poor analytical transparency. Therefore, critical appraisal was used not only as a descriptive exercise but also as a decision-support process for determining which studies were sufficiently robust for inclusion in the final synthesis.

For quantitative observational studies, the review used the Joanna Briggs Institute (JBI) Critical Appraisal Checklist appropriate to the study design. The JBI checklist was selected because it is widely used in evidence synthesis and provides structured criteria for assessing sampling methods, exposure and outcome measurement, confounding factors, statistical analysis, and internal validity. For qualitative studies, the review applied the Critical Appraisal Skills Programme (CASP) checklist, which is designed to assess methodological congruence, recruitment appropriateness, data collection rigor, reflexivity, ethical considerations, analytical clarity, and the value of findings. The selection of these tools was justified by their strong methodological reputation and their suitability for appraising different forms of evidence within a single systematic review.

Quality appraisal was performed independently by two reviewers to enhance consistency and reduce subjective bias in scoring and interpretation. Each reviewer completed the appraisal using the relevant checklist for each study, after which the results were compared. Discrepancies in judgment were discussed item by item until agreement was reached. This process ensured that the final appraisal reflected a shared methodological interpretation rather than an individual opinion. Studies judged to have major methodological limitations, unclear reporting,

or high risk of bias were not prioritized for the final synthesis. In the PRISMA flow presented for this review, 12 reports were excluded at the eligibility stage due to high risk of bias, leaving only studies with sufficient methodological adequacy for inclusion.

Data Extraction and Synthesis

Data extraction was conducted using a structured data extraction form that had been developed before the analysis process began. The use of a predefined extraction form was justified because it ensured consistency in the information collected from each study and minimized the risk of selectively recording results that supported only certain interpretations. The extraction form included bibliographic and methodological variables as well as conceptual variables relevant to the review question. Specifically, the extracted data included the author name, year of publication, country of study, study design, sample or participant characteristics, research variables, measurement instruments, and main findings related to family adherence to tuberculosis preventive therapy based on Health Belief Model constructs.

The extraction process was performed independently by two reviewers to ensure accuracy, completeness, and reproducibility. Each reviewer extracted data from the included studies, and the extracted forms were then compared. Differences in extracted information were resolved through rechecking the original articles and discussing the interpretation of study content until consensus was reached. This double-extraction procedure was justified because it reduces transcription errors, minimizes data omission, and improves reliability in evidence synthesis. It also strengthens confidence that the synthesized findings truly reflect the contents of the primary studies.

Results

The literature search identified records from four electronic sources, namely Google Scholar, PubMed, ProQuest, and ScienceDirect. After the removal of duplicate and irrelevant records, 80 articles proceeded to the screening stage. During title and abstract screening, 60 records were excluded because they did not match the review objective. A total of 20 full-text articles were then assessed for eligibility. Of these, 12 reports were excluded due to high risk of bias and limited methodological suitability. Finally, 8 studies were included in the review and were synthesized narratively according to the constructs of the Health Belief Model and family-related adherence factors.

Characteristics of included studies

This review included 8 studies published between 2023 and 2025. Most studies were conducted in Indonesia and examined adherence-related behavior in tuberculosis treatment or tuberculosis preventive therapy within clinical, community, or primary healthcare settings. The included evidence consisted of five quantitative cross-sectional studies, one quasi-experimental study, one community-based educational study, and two review-based studies. The populations represented in the included studies comprised patients with pulmonary tuberculosis, household contacts, families of tuberculosis patients, and literature-based evidence relevant to adherence and Health Belief Model constructs.

In terms of setting, the studies were conducted in outpatient pulmonary clinics, primary health centers, and community environments. The sample sizes varied across studies, ranging from 28 family participants in the educational study to 308 respondents in the cross-sectional study on tuberculosis preventive therapy acceptance. Most quantitative studies used questionnaires as the primary data collection instrument, while one study combined questionnaire data with secondary data from hospital and tuberculosis information systems. The studies commonly measured adherence behavior, acceptance of preventive therapy, family support, knowledge, attitudes, and Health Belief Model domains such as perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and self-efficacy.

Summary of methodological approaches

Among the 8 included studies, cross-sectional quantitative designs were the most frequently used methodological approach. These studies generally applied chi-square analysis to determine associations between explanatory variables and adherence-related outcomes. One study used multivariable logistic regression to identify dominant predictors of tuberculosis preventive therapy acceptance. One quasi-experimental study examined the effect of audiovisual health education based on the Health Belief Model using paired t-test and MANOVA. One community-based educational study evaluated changes in family knowledge after a health education program. Two additional studies synthesized previous literature and contributed supporting evidence regarding adherence determinants and the role of Health Belief Model-based approaches in tuberculosis care.

Overall, the included studies showed methodological variation but converged on a common focus, namely the determinants of adherence behavior in tuberculosis treatment and prevention. This variation supported a narrative synthesis rather than a quantitative meta-analysis, because the included studies differed in design, target population, intervention characteristics, and measured outcomes.

Table 1. Characteristics of studies included in the review

Author(s), Year	Country/ Setting	Study Design	Sample/ Participants	Variables	Main Findings
Evitasari et al., 2025	Indonesia, Outpatient pulmonary clinic, RSUP Dr. Sitanala Tangerang	Quantitative analytic study with cross-sectional design	70 patients with drug-sensitive pulmonary tuberculosis selected using purposive sampling	Independent variables: knowledge, attitude, family support, and access to health services. Outcome variable: tuberculosis treatment adherence.	Knowledge, attitude, and family support were significantly associated with tuberculosis treatment adherence, with p-values of 0.012, 0.008, and 0.004, respectively. Access to health services was not significantly associated with adherence, with a p-value of 0.498.
Fadhilah and Bowo, 2025	Indonesia, 9 primary health centers	Observational study with cross-sectional design	308 household contacts/respondents	Independent variables: Health Belief Model constructs, including perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and other HBM-related domains. Outcome variable: acceptance of tuberculosis preventive therapy.	All HBM constructs were significantly associated with acceptance of tuberculosis preventive therapy, with p-values below 0.001. Perceived benefits emerged as the dominant predictor, with OR = 3.208 and 95% CI = 1.762–5.842.
Ramadani et al., 2025	Indonesia, Working area of Puskesmas Kauko Gunungsitoli	Quantitative study with cross-sectional design	72 patients with tuberculosis	Independent variables: self-motivation and family support. Outcome variable: medication adherence.	Family support had a significant relationship with medication adherence among tuberculosis patients, with a p-value of 0.000. Patients who received better family support were more likely to adhere to treatment.

Author(s), Year	Country/ Setting	Study Design	Sample/ Participants	Variables	Main Findings
Damanik et al., 2025	Indonesia, Kelurahan Bahkapul, Kota Pematangsiantar	Community-based educational study	28 families of patients with pulmonary tuberculosis	Main variable: family knowledge regarding medication supervision for tuberculosis treatment. Intervention: health education through lectures and discussion using educational media	Family knowledge improved after the educational intervention. The proportion of participants with adequate knowledge increased from 46% before education to 82% with good knowledge after education. The findings indicate that educational support strengthened family readiness to accompany tuberculosis treatment.
Wijaya et al., 2023	Indonesia, Kota Kendari	Quasi-experimental study with pre–post control group design	Patients with tuberculosis	Independent variable: audiovisual health education based on the Health Belief Model. Outcome variables: medication adherence, nutritional fulfillment, and tuberculosis transmission prevention behaviors.	HBM-based audiovisual health education significantly improved medication adherence, nutritional behavior, and transmission prevention behavior among tuberculosis patients, with p-values below 0.05.
Gumara et al., 2025	Indonesia, Working area of Puskesmas Putri Ayu, Kota Jambi	Quantitative study with cross-sectional design	78 household contacts of tuberculosis patients selected using purposive sampling	Independent variables: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and self-efficacy. Outcome variable: tuberculosis preventive therapy medication-taking behavior.	Perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and self-efficacy were significantly associated with adherence to tuberculosis preventive therapy, with p-values of 0.001, 0.000, 0.000, 0.000, and 0.009, respectively.
Handayani et al., 2024	Literature from Google Scholar, PubMed, and Springer	Literature review	Articles published between 2020 and 2024	Main concepts: HBM components, self-awareness, and treatment adherence among tuberculosis patients with lost to follow-up history	The review found that perceived severity, family support, and health education influenced patient self-awareness in undergoing tuberculosis treatment. The findings suggested that an HBM approach may help improve treatment adherence.
Maura et al., 2023	Literature from Google Scholar, PubMed, and ScienceDirect	Systematic review	Studies selected using PICO approach	Main concepts: factors influencing medication adherence among patients with pulmonary tuberculosis	The review identified family support, knowledge, community stigma, relationship with health workers, and

Author(s), Year	Country/ Setting	Study Design	Sample/ Participants	Variables	Main Findings
					duration of treatment as major factors influencing tuberculosis medication adherence.

Findings related to family support and adherence

Family support emerged as one of the most consistent factors associated with adherence behavior across the included studies. In the study by Evitasari et al., family support showed a significant relationship with tuberculosis treatment adherence. In the study by Ramadani et al., family support was also significantly associated with medication adherence, and patients who received stronger family support were more likely to comply with treatment. The educational study by Damanik et al. further showed that family knowledge regarding treatment accompaniment improved substantially after health education, suggesting that family readiness and understanding may strengthen adherence support in daily practice.

Review-based evidence also reinforced the importance of family involvement. Handayani et al. reported that family support influenced self-awareness in tuberculosis patients with lost to follow-up history. Maura et al. identified family support as one of the principal factors influencing medication adherence among people with pulmonary tuberculosis. Taken together, these findings indicate that family support functions not only as an emotional resource but also as a practical and behavioral mechanism that can facilitate treatment continuation and preventive therapy engagement.

Findings related to Health Belief Model constructs

The results of this review showed that the Health Belief Model provided an important explanatory framework for understanding adherence to tuberculosis preventive therapy. The study by Fadhilah and Bowo demonstrated that all measured Health Belief Model constructs were significantly associated with acceptance of tuberculosis preventive therapy. Among these constructs, perceived benefits emerged as the strongest predictor, indicating that individuals and families were more likely to accept preventive therapy when they believed that the therapy would provide meaningful protection or health gain.

The study by Gumara et al. extended this finding by showing that perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and self-efficacy were all significantly associated with tuberculosis preventive therapy adherence behavior. These findings suggest that adherence was more likely when families perceived themselves to be at risk, recognized the seriousness of tuberculosis, understood the value of preventive therapy, experienced fewer barriers, and felt confident in carrying out the treatment process. The review by Handayani et al. also highlighted the relevance of perceived severity and HBM-based health education in shaping treatment awareness. Overall, the findings consistently support the conceptual relevance of Health Belief Model constructs in explaining family-related adherence behavior in tuberculosis prevention.

Findings related to knowledge, attitudes, and health education

Knowledge and attitude were also identified as significant determinants of adherence. Evitasari et al. found that both knowledge and attitude were significantly associated with treatment adherence among patients with drug-sensitive pulmonary tuberculosis. This finding suggests that adherence is strengthened when patients and families understand the disease, recognize the importance of treatment, and develop favorable attitudes toward therapy. The review by Maura et al. similarly identified knowledge as a key determinant of medication adherence, alongside family support and social factors.

Health education appeared to be an important strategy for influencing these determinants. Damanik et al. showed that educational intervention improved family knowledge regarding medication supervision. Wijaya et al. reported that audiovisual health education based on the Health Belief Model significantly improved medication adherence, nutritional behavior, and tuberculosis transmission prevention behavior. These results indicate that education does not act only as information transfer, but also as a mechanism for modifying beliefs, strengthening motivation, and supporting sustained adherence behavior. The educational findings in this review therefore suggest that structured, theory-based education may enhance both family capacity and treatment compliance.

Findings related to barriers and contextual influences

Although adherence was positively associated with knowledge, family support, and HBM-related perceptions, the included studies also pointed to the role of contextual barriers. Gumara et al. found that perceived barriers significantly influenced tuberculosis preventive therapy adherence, which indicates that practical, psychological, or social obstacles remain important determinants of treatment behavior. Maura et al. identified community stigma, relationship with health workers, and treatment duration as additional factors that may hinder or shape adherence. These findings suggest that adherence is not solely a matter of individual willingness, but also depends on how families experience the treatment context.

Interestingly, Evitasari et al. found that access to health services was not significantly associated with treatment adherence in their study population. This finding may indicate that service access alone does not guarantee adherence when other belief-related and social determinants remain unresolved. Instead, the combined evidence suggests that adherence behavior is shaped by an interaction between cognitive perceptions, family support, educational exposure, and contextual demands. Thus, barriers should be understood broadly, including logistical barriers, emotional burden, stigma, and limitations in communication or support systems

Discussion

This review found that family support, Health Belief Model constructs, knowledge, and health education consistently influenced adherence to tuberculosis preventive therapy and tuberculosis treatment-related behavior. The review also found that perceived benefits, perceived susceptibility, perceived severity, perceived barriers, and self-efficacy played important roles in shaping acceptance and continuation of preventive therapy. In addition, the review showed that educational approaches based on behavioral theory strengthened awareness, treatment understanding, and adherence-related practices. Another important finding indicated that family involvement functioned not only as emotional support but also as a practical resource for treatment supervision and decision-making. The review further revealed that contextual challenges such as stigma, long treatment duration, and limitations in support systems could weaken adherence behavior. Overall, these findings indicate that family adherence to tuberculosis preventive therapy is a multidimensional process shaped by cognitive, relational, and contextual influences.

The first important point in this review concerns the central role of family support in adherence behavior. This review showed that family support was consistently associated with treatment adherence and preventive therapy acceptance across the included studies. Family support influences adherence because relatives often provide reminders, supervision, encouragement, and direct assistance during the treatment process (Aprita, 2024; Ramadani et al., 2025). A family that understands the importance of treatment can strengthen the patient's motivation and reduce the likelihood of treatment interruption in long-term disease management (Damanik et al., 2025; Maura et al., 2023). This explanation is consistent with broader evidence showing that social support and family involvement improve adherence behavior in chronic illness by sustaining daily routines and emotional stability (Akbar et al.,

2024; Alee et al., 2025). In tuberculosis care, this supportive role becomes more important because patients frequently face psychological strain, stigma, and uncertainty during treatment, which can be reduced through close family engagement (Addo et al., 2022; Febi et al., 2021; Mohammedhussein et al., 2023).

The second major point concerns the usefulness of the Health Belief Model as an explanatory framework for family adherence to preventive therapy. This review found that perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and self-efficacy were all relevant in explaining adherence-related behavior. The Health Belief Model explains that a person is more likely to perform a health behavior when the person perceives a real threat, recognizes the seriousness of the condition, and believes that the recommended action provides meaningful benefit (Sazali et al., 2023; Handayani et al., 2024). The dominant role of perceived benefits in this review suggests that families tend to accept preventive therapy when they believe that the treatment can protect household members from future tuberculosis transmission or progression (Fadhilah & Bowo, 2025; Gumara et al., 2025). This interpretation aligns with evidence from tuberculosis knowledge, attitude, and practice studies showing that beliefs and perceptions strongly shape preventive decisions in low- and middle-income settings (Craciun et al., 2023). Therefore, family adherence should not be interpreted as a passive response to medical advice alone, because the behavior is closely linked to how families interpret risk, severity, and expected outcomes of therapy (Wijaya et al., 2023; Sazali et al., 2023).

The third point concerns the contribution of knowledge and attitudes to adherence behavior. This review showed that knowledge and attitudes were significant determinants of adherence in studies involving tuberculosis patients and families. Knowledge influences adherence because understanding the disease, treatment duration, benefits of prevention, and consequences of nonadherence helps families make informed decisions about continued therapy (Evitasari et al., 2025; Maura et al., 2023). Positive attitudes also support adherence because favorable beliefs toward treatment often translate into stronger willingness to complete medication and follow health recommendations (Akbar et al., 2024; Evitasari et al., 2025). This pattern is supported by evidence from other chronic disease contexts in which higher levels of knowledge are associated with better compliance and stronger engagement with treatment plans (Akbar et al., 2024; Aprita, 2024). In tuberculosis, knowledge is especially important because misconceptions about infection, treatment burden, and prevention can reduce adherence and reinforce fear, stigma, or delay in accepting preventive therapy (Craciun et al., 2023; Nurhayati & Febrianti, 2024).

The fourth point concerns the role of education as a strategy for modifying behavior and strengthening adherence. This review showed that educational interventions improved family knowledge and promoted better adherence-related behavior when the content was delivered in a structured and theory-based way. Health education works by transforming abstract information into practical understanding that families can apply during medication supervision and treatment decision-making (Damanik et al., 2025; Wijaya et al., 2023). When education is based on the Health Belief Model, the intervention can directly address perceptions of risk, seriousness, benefits, and barriers, which makes the message more behaviorally relevant (Wijaya et al., 2023; Handayani et al., 2024). This explanation is in line with evidence showing that patient-centered educational tools and supportive communication improve treatment engagement and strengthen self-management capacity in chronic and infectious diseases (Iribarren et al., 2022; Leonardsen et al., 2023). Educational reinforcement may therefore help families move from general awareness to sustained action, particularly when treatment requires long-term commitment and regular behavioral monitoring (Damanik et al., 2025; Sazali et al., 2023).

The fifth point concerns the influence of barriers and contextual burdens on adherence. This review found that perceived barriers remained a strong determinant of preventive therapy adherence, which indicates that

families often face obstacles beyond simple lack of knowledge. Such barriers may include fear of side effects, treatment fatigue, stigma, transportation demands, competing domestic responsibilities, and limited confidence in sustaining long-term preventive action (Gumara et al., 2025; Maura et al., 2023). This interpretation is supported by studies showing that tuberculosis patients often experience depression, stress, and poor quality of life, all of which can weaken adherence behavior and household treatment support (Abdurahman et al., 2022; Rouf et al., 2021; Nurlaela et al., 2024). Contextual lifestyle factors such as smoking and other health risks may also complicate treatment outcomes and interfere with preventive efforts in tuberculosis care (Nisa & Sari, 2022; Alsharani et al., 2021). Therefore, effective adherence programs should address both cognitive beliefs and real-world barriers, because families cannot maintain preventive behavior when structural, emotional, and social burdens remain unresolved (Mair et al., 2021; Oeser et al., 2023).

The sixth point concerns the growing relevance of digital and person-centered support in strengthening adherence. This review showed that education and support mechanisms were more effective when they responded to user needs and treatment realities. Digital adherence technologies can improve reminders, monitoring, and continuity of communication, and such functions may be helpful for families who supervise preventive therapy at home (Bala et al., 2023; Iribarren et al., 2021). Trials and implementation studies have shown that digital tools can improve treatment success and reduce inequity when the tools are acceptable, feasible, and adapted to the context of users (Boutilier et al., 2022; Jerene et al., 2025; Chilala et al., 2025). At the same time, digital transformation can also increase treatment burden when systems are complicated, poorly integrated, or disconnected from family capacity and daily routines (Mair et al., 2021; Guzman et al., 2023). For that reason, future family-centered tuberculosis prevention strategies should combine behavioral education, family support, and carefully designed digital assistance rather than rely on technology alone (de Souza Ferreira et al., 2023; Leonardsen et al., 2023; Madden et al., 2025).

The final point concerns the implications of this review for nursing practice, public health programming, and future research. This review indicates that adherence to tuberculosis preventive therapy should be approached as a family-centered behavioral outcome rather than only as an individual compliance issue. Nurses and primary care providers need to assess family beliefs, readiness, barriers, and support capacity, because these dimensions strongly influence preventive therapy uptake and continuation (Erawati & Andriany, 2022; Lisum et al., 2021). Public health programs should also integrate HBM-based counseling, family education, and community stigma reduction in order to strengthen preventive therapy adherence at the household level (Fadhilah & Bowo, 2025; Maura et al., 2023). The inclusion of family-oriented strategies is justified because patients and contacts living with tuberculosis often experience psychosocial strain that extends beyond the individual and affects the entire household treatment environment (Addo et al., 2022; Mohammedhussein et al., 2023; Pratiwi, 2024). Future studies should develop stronger empirical models that examine family adherence longitudinally, test theory-based interventions, and explore how emotional burden, stigma, and digital support interact with Health Belief Model constructs in tuberculosis prevention (Ismail & Taliep, 2023; Nasa et al., 2021; Mikdashi, 2022).

Conclusion and Recommendation

This systematic review concludes that family adherence to tuberculosis preventive therapy is influenced by an interaction of family support, knowledge, attitudes, Health Belief Model constructs, and contextual barriers. Perceived benefits emerged as a particularly strong factor, while perceived susceptibility, perceived severity, perceived barriers, and self-efficacy also shaped preventive therapy behavior. Family support functioned as a practical and emotional foundation that strengthened treatment supervision and continuity. Health education, especially when based on behavioral theory, improved understanding and adherence-related behavior and therefore should become a routine

component of family-centered tuberculosis services. Programs for tuberculosis prevention should integrate family assessment, structured counseling, barrier reduction, and person-centered support, including appropriate digital reinforcement where feasible. Future research should use stronger primary designs to examine family adherence over time and to test interventions that combine HBM-based education with sustained family engagement in community and primary care settings.

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