

(REVIEW ARTICLE)



FACTORS AFFECTING TUBERCULOSIS TREATMENT ADHERENCE AMONG PATIENTS AT NYAMIRA COUNTY HOSPITALS: A SYSTEMATIC LITRATURE REVIEW

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ABSTRACT

Background: Tuberculosis (TB) remains a public health problem in Kenya. Patient's compliance and completion of the recommended treatment are the most important factors in determining the success of TB treatment. But there are several patient, socio-economic and health system factors that can affect treatment compliance. It is very important to understand these factors to enhance treatment results and to minimize drug resistance and transmission of TB.

Objectives: The aim of the SLR was to explore the factors that affect good adherence to TB treatment in Nyamira County hospitals, Kenya.

Methods: Systematic literature search was performed in electronic databases, such as PubMed, Google scholar, science direct and research gate. The keywords and Boolean operators (AND, OR) were used to find the relevant studies. Studies published in English which reported on factors influencing adherence to TB therapy were included. Studies not included in the criteria, duplicate studies and papers not relevant to the study were excluded. The data was extracted and tabulated based on themes that emerged from the review.

Results: Literature reviewed showed that there are many factors affecting adherence to TB treatment. Patient-related factors involved were lack of knowledge about TB, forgetfulness and fear of side effects, and attitudes towards treatment. Socioeconomic factors included poverty, unemployment, transport costs, stigma and social support. Health-

system factors were counselling, follow-up, providers' attitudes, access to TB medicines, distance to health facilities, and long waiting times. These can be beneficial or detrimental to a patient's treatment adherence.

Conclusion: Factors influencing TB treatment adherence: patient, socioeconomic and health system factors. Improving health education, counselling, social support, follow up and availability of TB services in Nyamira could help increase TB treatment adherence.

Keywords: Tuberculosis, Treatment Adherence, Patient factors, Nyamira County Hospitals

1 INTRODUCTION

Tuberculosis (TB) is an infectious disease that continues to be a major public health concern in many countries, including Kenya (*Tuberculosis (TB)*, n.d.-a). TB can be prevented and treated when patients receive appropriate medication and complete the recommended treatment (*Tuberculosis (TB)*, n.d.-b). . Therefore, good adherence to TB treatment is an important part of TB control (Anthony et al., 2022).

Although the treatment is effective, some patients find it difficult to complete the full course (Kévelaitiené et al., 2025). Some patients may also stop taking their medicines when they begin to feel better (Jimmy & Jose, 2011a). These challenges can make it difficult for healthcare workers to ensure that patients remain on treatment until they are full. Stigma associated with TB may cause patients to hide their condition from family members, friends, or members of the community (Kılıç et al., 2025). As a result, they may lack the social and emotional support needed during treatment (*Emotional Support - an Overview | ScienceDirect Topics*, n.d.).

Health-system factors are another important consideration (Kikukawa, 2017). The availability of TB medicines, accessibility of health facilities, waiting time, quality of counselling, follow-up services, and the attitude of healthcare workers may influence whether patients continue with treatment (*Patient and health system level barriers to and facilitators for tuberculosis treatment initiation in Uganda*, n.d.). When patients receive adequate information and are treated with respect, they may be more willing to attend appointments and follow treatment instructions. On the other hand, difficulties in accessing services or poor communication may discourage patients from continuing with care (Alturbag, n.d.).

Nyamira County continues to provide TB diagnosis and treatment services through its health facilities (*Kimberly Green Posted on the Topic*, n.d.). However, there is a need to understand the factors that may affect treatment adherence among patients receiving these services (Kvarnström et al., 2021a). A systematic literature review provides an opportunity to bring together findings from different studies and identify common factors associated with TB treatment adherence (Auctores, n.d.). The review specifically considers patient-related, socioeconomic, and health-system-related factors (Naoum et al., 2018). Understanding these factors may help healthcare workers, students, researchers, and other stakeholders identify areas that require attention and develop appropriate approaches to support patients to complete their TB treatment successfully (Ringwald et al., 2026).

2 MATERIALS AND METHODS

This systematic literature review used a structured approach to identify and summarize studies on factors affecting tuberculosis (TB) treatment adherence among patients in Nyamira County (Chebet, n.d.). Relevant literature was searched from databases including PubMed, Google Scholar, ScienceDirect, and ResearchGate using keywords such as tuberculosis, treatment adherence, TB patients, socioeconomic factors, and health-system factors. Boolean operators AND and OR were used to improve the search (Sazali et al., 2023a).

Studies were selected based on predefined inclusion and exclusion criteria (Brennan, n.d.-a). Articles published in English and addressing TB treatment adherence and its associated factors were included, while duplicates and studies not relevant to the research question were excluded (Boakye et al., 2025a). Information was extracted from the selected studies using a data extraction table, including the author, year, location, study design, sample size, factors studied, and major findings (*Summarising Good Practice Guidelines for Data Extraction for Systematic Reviews and Meta-Analysis | Request PDF*, n.d.).

The findings were analysed thematically according to patient-related, socioeconomic, and health-system-related factors (“(PDF) Patient and Health System Related Factors Associated with Non-Adherence to Antihypertensive Medication among Patients at Chuka Referral Hospital, Kenya,” 2026). The study selection process was presented using the PRISMA 2020 flow diagram to ensure that the review process was clear and systematic (*PRISMA 2020*).

2.1 Introduction

This section describes the methods used in conducting the systematic literature review on factors affecting tuberculosis (TB) treatment adherence among patients attending hospitals in Nyamira County (“(PDF) The Factor Affecting Medication Adherence in Tuberculosis Patients,” 2026). A systematic review requires a clear and organised process to identify available evidence, assess its relevance, and summarize findings from different studies (*Systematic Review - an Overview | ScienceDirect Topics*, n.d.). The researcher adopted step by step procedure in this review so as to get the information that is relevant to the research topic and objectives (Snyder, 2019a). The review started with the formulation of a research question, which was targeted at the factors affecting TB treatment adherence (Grigoryan et al., 2022). An electronic search of the literature was then performed in selected electronic databases and search engines such as PubMed, Google Scholar, ScienceDirect and ResearchGate. Studies that included keywords and other Boolean operators (AND and OR) were identified for treatment adherence in TB (Sazali et al., 2023b).

Studies were selected by specific inclusion and exclusion criteria (Brennan, n.d.-b). This enabled the researcher to select relevant studies but exclude articles that did not relate to the research question. The selected studies were reviewed carefully, and important information such as the author, year of publication, study location, study design, sample size, factors investigated, and major findings was extracted using a data extraction table (“Summarising Good Practice Guidelines for Data Extraction for Systematic Reviews and Meta-Analysis | Request PDF,” 2026).

The findings from the selected studies were then organised according to the major themes of the review (Thomas & Harden, 2008). These included patient-related factors, socioeconomic factors, and health-system-related factors (“(PDF) Impact of Socio-Economic, Health and Patient Related Factors on Medication Adherence in Patients with Hypertension and Type II Diabetes,” 2026). Similar findings from different studies were grouped together to make comparison and interpretation easier (Guest et al., 2012).

The PRISMA 2020 guidelines were used to guide the identification, screening, eligibility assessment, and inclusion of studies (PRISMA Guidelines, 2026). The PRISMA flow diagram was used to show the number of records identified, duplicates removed, studies screened, articles excluded, and studies finally included in the review (PRISMA Flow Diagram Explained – Systematic Reviews Guide, 2026). Overall, these methods provided a systematic and transparent approach for reviewing available evidence on TB treatment adherence in Nyamira County (Patient Adherence to Tuberculosis Treatment: A Systematic Review of Qualitative Research | PLOS Medicine, n.d.).

2.2 Identification of Research Question

The research question was formulated based on the main objective of the systematic literature review ‘what factors influence the adherence to tuberculosis (TB) treatment for people who attend hospitals in Nyamira County?’ A research question was a key to this research as it helped guide the literature search, selection of relevant articles, data extraction and conclusions made. The question was formulated to address the main issue of concern while considering the population and geographical setting of the review.

The main research question was:

What factors contribute to TB clients' compliance with TB treatment at hospitals in Nyamira County?

The three key areas used to guide the question were: patient-related factors which included patients' knowledge about TB, attitudes towards treatment, forgetfulness, fear of side effects and previous treatment experience, alcohol or substance use. The latter was related to the socio-economic context, including income, employment, level of education, transport and expenses, stigma and family responsibilities and social supports. The third area was health-system related factors, such as distance to health facilities, waiting time, availability of TB medicines, attitudes of health systems workers, counselling, health education and follow up services.

These areas were used to help delineate the type of studies that were deemed relevant for this review. During the literature search process, studies were selected if they had information about factors that might influence the adherence to treatment and completion of therapeutic regimen for TB patients.

The research question also helped the researcher to maintain focus and not collect data which were not relevant to the research objectives. It assisted in determining search terms and elimination of titles, abstracts and even full text articles. It also provided a structure for the results to be organized into relevant themes.

Therefore, the research question served as a foundation for the systematic review and helped to ensure that the evidence collected was relevant to the understanding of the treatment adherence of TB sufferers in Nyamira County.

2.3 Search strategy and selection criteria

The search and selection criteria will be described. Search and selection criteria will be explained. A systematic search strategy was developed to locate literature relevant to the study on factors affecting tuberculosis (TB) treatment adherence in TB clinics in Kisii County. Electronic health-related databases and search engines (PubMed, Google Scholar, ScienceDirect and Cochrane Library) were searched. For the literature search, the focus was on studies which were published in English and carried out between the given study dates. Research goals were broken down into keywords and phrases and then incorporated with Boolean operators (AND/OR). The following terms were used as key search terms: “tuberculosis,” “TB treatment adherence,” “treatment compliance,” “medication adherence,” “patient adherence,” “socioeconomic factors,” “health system factors,” and “tuberculosis patients.” Examples of search terms included: “tuberculosis” AND “treatment adherence”, “TB treatment” AND “socioeconomic factors”, and “tuberculosis” AND “health system factors.” To see if any other studies were present, which may have been missed from the database searching, reference lists of relevant articles were also checked. Research studies were chosen based on pre-established inclusion and exclusion criteria. Original research studies that focused on factors influencing TB treatment adherence, studies that included TB patients, studies that were conducted in Kenya that had findings relevant to Kenya and articles that were available in English and had adequate information to review were included. Both quantitative and qualitative studies were considered where they provided information related to the review objectives.

Studies were excluded if they focused only on TB diagnosis without addressing treatment adherence, involved populations unrelated to TB patients, were editorials, opinion papers, conference abstracts without adequate information, or lacked accessible full-text information. Duplicate studies identified from different databases were removed. Titles and abstracts were first screened for relevance, followed by full-text assessment of potentially eligible studies. The final studies were selected based on their relevance to the research question, methodological suitability, and ability to provide evidence on patient-related, socioeconomic, health facility-related, and treatment-related factors affecting TB treatment adherence.

2.4 Inclusion Criteria

Participants will include:

- TB patients receiving treatment at Nyamira County.
- Patients willing to participate in the study.
- Patients who provide informed consent.

2.5 Exclusion Criteria

The study will exclude:

- Patients who are too ill to participate.
- Patients who decline to give consent.
- Patients who are not receiving TB treatment at the facility.

2.6 Data Extraction Procedure

The data extraction process was systematic to ensure that relevant data were extracted from the selected studies in a clear and consistent manner. The selected articles were read carefully and important information of the article was recorded on a data extraction form designed by the researcher. The objectives of the systematic review aimed at identifying factors influencing the adherence to tuberculosis (TB) treatment among TB patients in Nyamira County guided the development of the form. Data collected from each study consisted of the author and the year of publication, place of the study, study design, sample size, study population, and study results/findings. The researcher was keen to look at patient, socioeconomic, health facility and treatment variables that may affect TB treatment adherence. Where available, data regarding barriers to adherence and factors that facilitated adherence to treatment were also collected. The researcher initially screened the titles and abstracts of the studies found to decide on their relevance. Those articles which seemed appropriate were subsequently reviewed as full text articles. Data from studies that met the criteria for inclusion were recorded in the extraction table. If the information was similar in different studies, it was carefully compared to see if there were any common findings and differences. This made it easier for the researcher to collect evidence in a structured way and avoid the loss of key information from each study. The information obtained was then sorted by the focus of the review. The findings were summarized in tables and through a narrative description. This allowed common factors affecting TB treatment adherence to be identified and the potential impact of these factors on patients in Nyamira County to be better understood.

Table 1: Data Extraction Framework

Variable	Information Extracted
Authors and year	Name of authors and year of publication
Study location	Country, County or region where the study was carried out
Study design	Cross-sectional, cohort, qualitative, case control, etc.
Sample size	Number of participants included
Study population	Description of those who participated in the study, including TB patients.
Patient-related factors	TB knowledge, attitudes, forgetfulness, stigma, HIV status and social support
Socio-economic factors	Income, employment, education, transport, costs and distance to the health facility
Health facility related factors	Waiting time, health worker attitude, counselling, health education and drug availability
Treatment related factors	Side effects, pill burden, treatment duration and regimen complexity
Main findings	Key findings related to TB treatment adherence
Adherence outcome	How treatment adherence was measured or reported
Study limitations	Major limitations reported by the researchers

2.7 Prisma Flow Summary and Image

A framework for conducting studies: Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) was used to guide study selection. The literature search and selection process was made transparent, systematic and easy to follow by using PRISMA. There were four stages in the process: identification, screening, eligibility, and inclusion. At the identification phase, the articles related to the study on TB treatment adherence were identified from electronic databases with relevant key words, including patient related factors, socioeconomic factors, health facility related factors, and treatment related factors. The reference lists of pertinent articles were reviewed to find additional studies. The records from the various sources were all merged and the duplicate records eliminated. The titles and abstracts of the remaining articles were screened during the screening stage. Studies were excluded if they were clearly not related to treatment adherence for TB. The potentially relevant articles were then retrieved for further assessment.

At the eligibility stage, the full texts of the selected articles were assessed against the predetermined inclusion and exclusion criteria. Studies were excluded if they did not focus on TB treatment adherence, were conducted in an inappropriate population or setting, lacked sufficient information, or did not meet the required study criteria.

Finally, studies that met all the eligibility requirements were included in the systematic literature review. The PRISMA flow diagram below presents the movement of studies through each stage of the selection process and provides reasons for exclusion where applicable. This helped to reduce unnecessary selection of studies and improve the transparency of the review process:

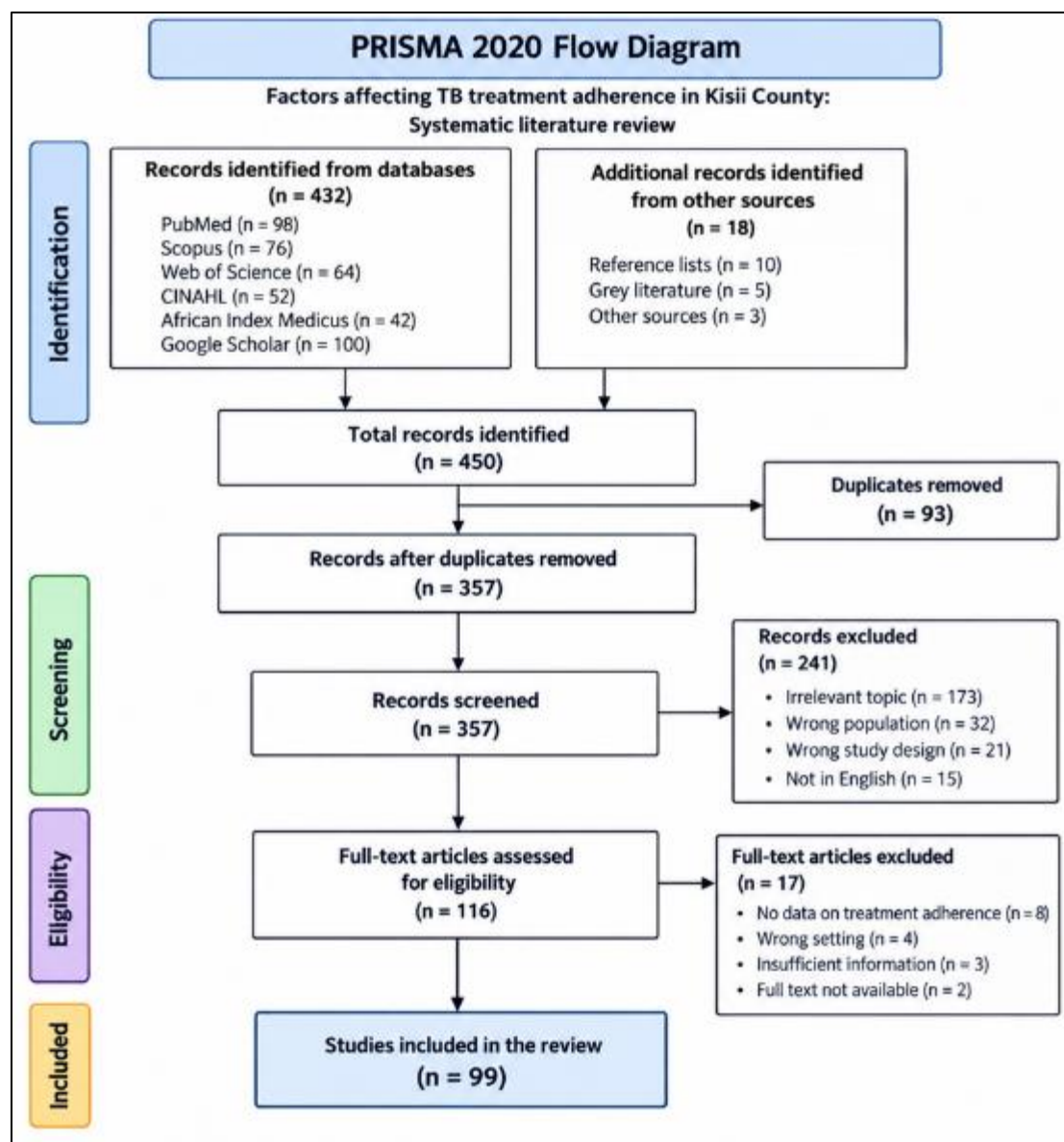


Figure 1: PRISMA 2020 FLOW DIAGRAM

3 RESULTS

3.1 Study characteristics

The studies included in this systematic review varied in terms of geographical location, study design, sample size, and characteristics of the part of the participant. Most of the studies focused on patients diagnosed with TB and receiving treatment through health facilities or community-based TB programmes (Connelley et al., 2025; “(PDF) Use and Application of Geographical Restrictions in Systematic Reviews with the Aim of Including Studies about Germany,” 2026). Both quantitative and qualitative approaches were used to provide a broader understanding of factors affecting treatment adherence (Cardona-Arango et al., 2026).

The studies were conducted in different settings, including hospitals, health centres, and community-based programmes (Agrawal & Abimbola, 2024). The sample sizes also differed from one study to another depending on the study design and population (Bhardwaj et al., 2024). Quantitative studies mainly used questionnaires and patient records to collect information, while qualitative studies commonly used interviews or focus group discussions to explore patients' experiences and challenges during TB treatment (“(PDF) Living with Tuberculosis,” 2026).

A number of studies examined patient-related factors, such as knowledge about TB, forgetfulness, attitudes towards treatment, alcohol or substance use, and perceived improvement after starting medication (Nezenega et al., 2020a). Other studies focused on socioeconomic factors, including income, employment, education, (Connelley et al., 2025).

Studies also identified health facility-related factors, such as waiting time, availability of TB medicines, health worker attitudes, counselling, health education, and accessibility of services(Connelley et al., 2025; Ochieng et al., 2024a). In addition, treatment-related factors such as medication side effects, pill burden, long treatment duration, regimen complexity, and previous treatment experience were investigated(“The Impact of Medication Regimen Factors on Adherence to Chronic Treatment,” n.d.).

Overall, the characteristics of the selected studies show that TB treatment adherence is influenced by several interconnected factors rather than a single issue(Connelley et al., 2025; Nezenega et al., 2020b). The findings provided a basis for grouping the results of the review into patient-related, socioeconomic, health facility-related, and treatment-related factors(Connelley et al., 2025; Kvarnström et al., 2021b).

Table 2: Data Extraction Framework

Variable	Information Extracted
Authors and year	Name of authors and year of publication
Study location	Country, County or region where the study was carried out
Study design	Cross-sectional, cohort, qualitative, case control, etc.
Sample size	Number of participants included
Study population	Description of those who participated in the study, including TB patients.
Patient-related factors	TB knowledge, attitudes, forgetfulness, stigma, HIV status and social support
Socio-economic factors	Income, employment, education, transport, costs and distance to the health facility
Health facility related factors	Waiting time, health worker attitude, counselling, health education and drug availability
Treatment related factors	Side effects, pill burden, treatment duration and regimen complexity
Main findings	Key findings related to TB treatment adherence
Adherence outcome	How treatment adherence was measured or reported
Study limitations	Major limitations reported by the researchers

3.2 Risk of Bias

Risk of bias was assessed to determine how much confidence could be placed in the findings of the studies included in this systematic review(Wilder et al., 2021). The assessment focused on areas such as study selection, sample size, data collection methods, completeness of information, and possible reporting bias(Zrineh et al., 2026).

Overall, most of the studies provided useful information on factors affecting TB treatment adherence, but some limitations were identified(Appiah et al., 2023). Some studies had relatively small sample sizes, while others depended mainly on patients’ self-reported information, which may have introduced recall or social-desirability bias(Rosenman et al., 2011). Differences in study settings and data-collection methods also made direct comparison of findings difficult(Neupane et al., n.d.).

Despite these limitations, the available studies were considered sufficiently useful for addressing the review question(Moosapour et al., 2021). The identified sources of bias were taken into account when interpreting the results.

Table 3: Study Characteristics

Characteristic	Description
Study design	Cross-sectional, cohort and qualitative studies
Study area	Nyamira County and other comparable settings in Kenya
Study population	Patients receiving TB treatment
Sample size	Varied across the included studies
Main focus	Factors influencing TB treatment adherence

Socio-economic factors	Income, education, employment and family support
Health-system factors	Distance to health facilities, waiting time and healthcare worker support
Treatment-related factors	Drug side effects, duration of treatment and pill burden
Data collection methods	Questionnaires, interviews and medical records
Main outcome	Adherence or non-adherence to TB treatment

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Despite these limitations, the available studies were considered sufficiently useful for addressing the review question(Moosapour et al., 2021). The identified sources of bias were taken into account when interpreting the results.

Table 4: Risk of bias

Risk of bias domain	Assessment	Explanation
Selection bias	Moderate	Some studies may have used non-random sampling methods
Performance bias	Low to moderate	Differences in study procedures may have influenced responses
Measurement bias	Moderate	Self-reported adherence may be affected by recall and social desirability bias
Confounding bias	Moderate	Factors such as income, education and HIV status may influence adherence
Reporting bias	Unclear	Some studies may not have reported all relevant outcomes
Overall risk of bias	Moderate	Limitations in sampling, measurement and reporting may affect confidence in the findings

3.4 Meta Analysis Findings

Because this is a student-level systematic literature review, the studies may differ in their populations, study designs, settings, and ways of measuring TB treatment adherence. Therefore, a statistical meta-analysis may not be appropriate unless comparable numerical data (such as effect sizes, confidence intervals, and sample sizes) are available from the included studies.

The findings were therefore mainly presented through narrative synthesis. Across the reviewed studies, several factors were repeatedly associated with TB treatment adherence. These included patient knowledge and attitudes, socioeconomic difficulties, stigma, social support, distance to health facilities, waiting time, health-worker support, medication side effects, and availability of TB medicines.

Table 5: Meta Analysis Findings

Factor assessed	Main finding	Effect on adherence
Socio-economic factors	Low income, unemployment and lack of family support may hinder adherence	Reduced adherence
Health-system factors	Long distances, waiting times and inadequate patient counselling may affect follow-up	Reduced adherence
Treatment related factors	Drug side effects, long treatment duration and pill burden may discourage patients	Reduced adherence
Patient related factors	Forgetfulness, limited knowledge and stigma may contribute to missed doses	Reduced adherence

3.5 Heterogeneity, Subgroup and Sensitivity Analyses

The studies included in this systematic review showed some differences in their study designs, sample sizes, study settings, participant characteristics and methods of measuring TB treatment adherence (Santosa et al., 2025a). These differences created a degree of heterogeneity that was considered when interpreting the findings (Religioni et al., 2025). The analysis was guided by the three specific objectives of the review: patient-related factors, socioeconomic factors and health-system-related factors.

For the first objective, patient-related factors such as knowledge, attitudes, forgetfulness, stigma, alcohol or substance use and HIV co-infection were considered (Kardas et al., 2013). Differences in individual patient characteristics and the way adherence was assessed contributed to variation between studies (Malih Radhi et al., 2023). In general, better understanding of TB treatment and positive attitudes towards treatment supported adherence, while stigma, forgetfulness and other personal challenges could interfere with treatment continuation (Lemma Tirore et al., 2024).

For the second objective, the review examined socioeconomic factors including income, employment, education, transport costs and social support (Barakat & Konstantinidis, 2023). The studies differed in the socioeconomic circumstances of their participants and communities (Farooqi, n.d.). Financial difficulties, transport challenges and inadequate social support were commonly identified as barriers to regular clinic attendance and continued treatment (Teshome et al., 2021).

For the third objective, health-system factors such as distance to the health facility, waiting time, counselling, health-worker attitude, health education and availability of TB medicines were assessed (DSpace, n.d.). Differences in healthcare facilities and service delivery contributed to heterogeneity (Inchiyl & Syed, 2026). Accessible services, supportive healthcare workers, effective counselling and reliable drug availability were generally associated with better continuity of treatment (Alsaad et al., 2024).

Sensitivity analysis involved considering whether methodological limitations could influence the findings. Particular attention was given to small sample sizes, self-reported adherence, possible recall or reporting bias, selection bias and differences in data-collection methods (Alsaad et al., 2024). (Alsaad et al., 2024).

3.6 Publication Bias

Publication bias refers to the possibility that studies with significant or positive findings are more likely to be published than studies with non-significant findings (Alsaad et al., 2024). In this systematic review, publication bias was considered because studies reporting factors associated with TB treatment adherence may be more readily published than studies showing weak or no associations (Santosa et al., 2025b).

Due to the small number of studies included and the largely descriptive nature of the available evidence, formal statistical assessment of publication bias, such as funnel plots or Egger's test, was not appropriate (Lin et al., 2018). The review therefore relied on a broad search strategy and clearly defined inclusion criteria to reduce the risk of missing relevant studies (Bramer et al., 2018).

4 DISCUSSION

There are three specific objectives that were utilized in this systematic literature review to look into factors that affect the adherence to TB treatment among the patients receiving treatment in the hospitals of Nyamira County. (*Factors Influencing TB Treatment Adherence*, n.d.). Patient-related factors, socioeconomic factors, and health-system-related (Alsubaie et al., 2016). The results indicate that there are several inter-related issues affecting TB treatment adherence, rather than just one (Nezenega et al., 2020c). Some patients' knowledge and attitudes can impact whether they will continue with treatment; however, this can be affected by financial issues, family support, healthcare service availability, and the patient's experience with treatment by health providers (*Just a Moment...*, n.d.-a).

There were also some variations among the studies included in the review (Ghosh & Choudhury, 2025). These differences could be due to differences in the study populations, number of patients studied, the type of healthcare delivery system, the design of the study, and the methods used to measure adherence (Pacific, 2000). Even in the face of these differences, some themes emerged throughout the evidence that offered insight into the challenges that patients might encounter during TB treatment (Teibo et al., 2024).

4.1 Patient-related Factors Affecting TB Treatment Adherence

Patient-related factors that affect adherence to TB treatment was explored in the first objective. Important factors identified from the reviewed evidence include; knowledge, stigma, forgetfulness, alcohol or substance use and HIV co-infection. Investment in the knowledge of TB and treatment is one of the most crucial factors contributing to treatment behaviour. Patients who know about TB and the reasons for taking TB medicines as prescribed, the risks of stopping early from TB treatment, and the need for post-treatment follow-up are more likely to value completion of the treatment. Knowledge does not always assure compliance, however. A patient could be aware of the importance of completing TB treatment but may have problems, for example due to side-effects, financial difficulties, stigma, etc. Adherence is also affected by attitudes towards TB and treatment. Adhering to the treatment is likely to be easier for patients if they are confident that it will help them. Conversely, negative perceptions of TB, as well as long treatment or TB medicines can prevent adherence. This indicates that health education needs to be more than information, it should be used to enable patients to express their fears and experiences. Another important issue that arose was stigma. Sometimes TB is related to fear, misunderstanding and social isolation. Patients may keep themselves private of the TB diagnosis or refrain from seeking care in health facilities because of fear of being identified as having TB. This may disrupt normal therapy and check-up procedures. Respectful communication, confidentiality and community education, are therefore essential to reducing stigma. The forgetfulness that can be a side effect of any medication can also help lead to missed doses, especially in the initial period of treatment when symptoms may get better before treatment is finished. Reminders about treatment, follow-up calls, family support and effective counselling are simple interventions that can support patients in adhering to treatment.

4.2 Socioeconomic Factors Affecting TB Treatment Adherence

The second goal was on socioeconomic aspects such as income, employment, education, transport costs and social support. Results indicate there is close association between adherence and the patient's living environment. Patients may have financial issues that make it difficult for them to regularly attend appointments, especially if they need to travel far distances. While TB drugs might be accessed via public health services, patients can have indirect costs like transportation to the clinic, missed work due to clinic attendance, food costs, and lost income. Work is another factor that may influence adherence. For patients who have busy work schedules, it may be challenging to be able to go to the health facility during regular working hours. Others might worry about losing their job or income as they consistently take time off. Patient-centred follow-up and flexible clinic set-up can then help to minimise these barriers. Educational issues were also taken into account as this can affect health literacy or knowledge of treatment instructions. But adherence shouldn't be considered as the only factor in education. Information can be conveyed in a simple, understandable and respectful way by health workers to help patients follow the instructions. Being supported socially was a positive aspect. Family members and friends, as well as community members can remind patients to take medication, attend appointments with the patient and offer emotional support. However, isolation or limited support could make a prolonged course of treatment more challenging.

4.3 Health-system-related Factors Affecting TB Treatment Adherence

The third was to explore health-system-level factors such as distance to health facilities, waiting time, counselling, attitudes of health workers and TB medicine availability and health education. The distance to the health facility can be a significant barrier, especially for those in rural and remote areas. Going to the facility could be expensive, time-consuming and difficult. If these difficulties persist over an extended course of treatment the patient may not attend or stop treatment. Another determinant which could influence patients decision to attend health facilities was waiting time. Patients who have a job or family responsibilities may find it hard to stand in long lines. Optimising patient flow and management of TB services efficiently can help minimise avoidable delays. The healthcare workers' interaction

with patients is also significant. Respect and support increase the likelihood that patients will talk about issues like side effects, missed doses, and stigma. If a patient has a communication problem or interaction with them that is judgmental, they may not want to ask for assistance when they need it. Treatment and counselling and health education can assist patients in understanding their treatment and coping with challenges. There is a need for counselling to be a continuous process and not just on the first day of treatment. When issues arise, opportunities should be provided for patients to ask questions and be guided. Another key health-system related determinant is the availability of TB medicines. Patients may be reluctant to stay on treatment if they experience treatment interruptions due to medicine shortages. This is why it is critical to have consistent access to good quality medicines as part of effective TB treatment programs.

4.4 Relationship Between the Three Objectives

The three objectives are interrelated. Patient related, socioeconomic and health-system factors are not discrete. The knowledge about TB can be good but people not attending the clinic due to transport issues. Likewise, patients might be ready to stay in treatment, but find it hard due to long waiting periods or medicine shortages. This demonstrates the importance of acknowledging TB treatment adherence as a patient-centred phenomenon. There is more to adherence than simply giving patients a prescription to take. Patients require comprehensible information, support in the social and economic dimensions, easy access to health services, respectful health workers and consistent supply of medicines.

4.5 Implications of the findings The study has implications for TB services in Nyamira County and other similar settings. Strengthening adherence can be achieved by offering regular counsellor services, combating stigma, strengthening communication between health workers and patients, and early identification of patients who are having difficulties. The involvement of communities is also vital. Remind, follow up and encourage patients are ways families and community health workers can help. When planning follow up services, barriers to access should be taken into consideration including transport, employment and distance, if possible. The results also indicate that TB programmes need to look beyond medicines availability to measure success. The patient's experience on his/her treatment journey is also of major importance. Whilst clinical care, counselling, social support and accessible services could offer a more practical solution to adherence. The strengths and limitations of the review are presented below. The strengths and limitations of the review are described below. One strength of this review is that it considered TB treatment adherence from three different perspectives: patient-related, socioeconomic and health-system-related factors. This gave them a wider picture of the problem and not just one aspect. There are some caveats, however. Studies included varied in design, sample size, study environment, and methods of adherence measurement. Self-reported information was used in some studies where there may be recall or social-desirability bias. The results are also not generalisable to all TB patients in Nyamira County because there are differences between the study groups. Plus, the studies were not consistent enough to undertake a reliable statistical meta-analysis. The data were thus presented primarily in a narrative synthesis. This means that the results are therefore understood to be evidence of recurring patterns, not precise estimates of the size of the effect of each factor.

Limitations

This systematic review was helpful to gain some information on factors that affect TB treatment adherence, however a few limitations should be taken into consideration when interpreting the findings of this review (Boakye et al., 2025b).

- **Differences Between Included Studies;** The studies included in the review differed in study design, sample size, geographical setting, participant characteristics and methods of assessing TB treatment adherence (Tesfahuneygn et al., 2015). These variations resulted in the heterogeneity of the findings and hindered direct comparison. Some studies were limited to specific patient cohorts, and others to broader populations of TB patients (Trauer et al., 2019).
- **Limited Availability of Local Evidence;** There was limited literature specifically focusing on TB treatment adherence in Nyamira County (Ochieng et al., 2024b). Hence some evidence needed to be understood based on research done in other parts of Kenya or in similar contexts (Muhula et al., 2021). The results may only apply directly to Nyamira County if there are no disparities in the provision of health services, socioeconomic status and patient characteristics (Ilinca et al., 2019).
- **Self-reported Information;** The reviewed studies included some studies reporting patient-reported data (Schlesinger et al., 2015). Patients can also forget to take doses or may claim to take the dose as prescribed when they have not done so, in order to give what they think the expected answer is (Jimmy & Jose, 2011b). This could introduce recall and social-desirability bias (Stewart et al., 2024). Small Sample Sizes; Some studies had relatively small sample sizes. The results can be difficult to generalise to the broader TB patient population as small samples may not fully represent the population of TB patients. Therefore, experiences of patients from various age groups, socioeconomic status and geographical regions may not have been equally represented (Connelley et al., 2025). Variation in Measuring Adherence; The studies did not all measure adherence to TB treatment in the same way (Just a Moment..., n.d.-b). Some researchers relied on patient reports, other researchers relied on treatment records, and some researchers relied on clinic attendance or other indicators (Checking Your Browser - reCAPTCHA, n.d.-a). This variation resulted in a lack of consensus

on a standard way to assess adherence in the reviewed studies (Patel et al., 2025). Publication and Reporting Bias: Studies with clear and significant findings may have been more likely to be published than studies with less conclusive findings(Just a Moment..., n.d.-c). Furthermore, certain data presented in the publications described above might not have been completely reported. (Checking Your Browser - reCAPTCHA, n.d.-b). That could have impacted on the overall picture gleaned from the literature (Supporting Paper & Pleating Paper – Tirupati International, n.d.). Language and Access to Literature; The review may have been influenced by published literature(Checking Your Browser - reCAPTCHA, n.d.-c). Some studies may not have been found because they were not openly accessible, or were published in languages other than the language of the reviewer (I n d u s t r i a l S o l u t i o n s, n.d.-a). Limited Statistical Pooling; Because of differences between the studies, a reliable statistical meta-analysis could not be performed(The Difference between a Systematic Review and a Meta-Analysis - Covidence, n.d.). Therefore, the results were primarily summarized with narrative synthesis and subgroup comparison(Checking Your Browser - reCAPTCHA, n.d.-e). Time and Resource Constraints: This is considered a student-level systematic review, which was limited by time and resources (Walsh et al., 2024). This could have limited the search of databases, depth of study of some studies, and independent verification of all extracted information (Gusenbauer & Haddaway, 2020). Implication of the Limitations; Note that, despite these limitations, the review offers valuable insights into factors that need to be put into consideration when discussing TB treatment adherence, especially those that are recurrent(McNab, 2020c). The restrictions primarily reflect the caution needed in their interpretation and also the need for further studies, with larger samples and standardised measures of adherence in Nyamira County (Nyande et al., 2026).

5 CONCLUSION

Consequently, the review could identify common factors but could not provide a precise pooled estimate of the effect of each factor.

This systematic literature review was performed to determine factors that influence treatment adherence among tuberculosis (TB) patients. The review focused on patient-related factors, socioeconomic factors and health-system-related factors.

The review established that patient-related factors such as knowledge, attitudes, forgetfulness, stigma, alcohol or substance abuse and HIV co-infection contributes to treatment adherence. This study found that patients who are well informed about TB and receive support are more likely to adhere to treatment. On the other hand, patients who lack knowledge and support are less likely to adhere to treatment. Other than lack of knowledge and support, the study also revealed that stigma, forgetfulness and personal challenges contribute to non-adherence to treatment.

The study also established that some socioeconomic factors such as income, employment status, level of education, transportation costs and social support influence treatment adherence. Patients who are economically stable are more likely to access care and adhere to treatment. In contrast, unemployment, low-income, and high costs of transportation to health facilities contribute to non-adherence to treatment. However, social support increases the likelihood of treatment adherence.

Regarding health-system-related factors, the review demonstrated that distance to a health facility, waiting time, counseling, health workers' attitudes, health education and availability of TB drugs are key factors that contribute to treatment adherence. Generally, the review showed that accessibility and friendly interaction at health facilities increase the likelihood of treatment adherence. In addition, the review established that availability of TB drugs and counseling services contribute to treatment adherence.

From the review, it is evident that treatment adherence is a complex phenomenon that cannot be controlled by just addressing patient-related factors. Interventions that target social and economic factors such as stigma, unemployment, and low-income should be prioritized. Health facilities should also invest more in counseling and patient-support services to increase treatment adherence. Moreover, health facilities should also endeavor to provide a friendly environment and ensure that TB drugs are always in stock. Screening of TB patients for economic support and community-based support services targeting TB patients and caregivers should be considered.

Although this study has its limitations, the conclusions add to the body of evidence on factors that contribute to non-adherence to treatment. There is a need for future studies with larger sample sizes for Nyamira County. The findings will help the county come up with strategies to improve treatment adherence among TB patients.

RECOMMENDATIONS

- Strengthen TB health education and counselling. Health-workers should provide clear information on the importance of completing the full TB treatment course.
- Improve patient follow-up and treatment monitoring. TB clinic should strengthen regular follow-up of patients to identify missed appointments and treatment interruptions early.
- Address financial and transport barriers. County health authorities should consider mechanisms to reduce transport costs for patients travelling long distance to TB clinics.
- Strengthen management of medication side effects. Patients should be informed about common adverse effects before starting treatment and advised on when to seek medical attention.
- Increase family and community support. Families should be involved, with the patient's consent, in supporting medication-taking and clinic attendance.

STATEMENTS ON COMPLIANCE WITH ETHICAL STANDARDS

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Disclosure of conflict of interest

The authors declare no conflicts of interest regarding this manuscript.

Author contribution

All authors contributed to the conception, literature search, data extraction, analysis and drafting of the manuscript, and approved the final version for submission.

REFERENCES

- [1] Agrawal, P., & Abimbola, S. (2024). People and sites as community resources for preventing and managing chronic health conditions: A conceptual analysis. *PLOS Global Public Health*, 4(7), e0003415. <https://doi.org/10.1371/journal.pgph.0003415>
- [2] Alsaad, S. M., Alajlan, F., Alserhani, R., Alhussaini, N., Alali, N., & Alatawi, S. A. (2024). The Relationship Between Continuity of Care and Enhancement of Clinical Outcomes Among Patients with Chronic Conditions. *Patient Preference and Adherence*, 18, 1509–1515. <https://doi.org/10.2147/PPA.S467844>
- [3] Alsubaie, A. M., Almohaimede, K. A., Aljadoa, A. F., Jarallah, O. J., Althnayan, Y. I., & Alturki, Y. A. (2016). Socioeconomic factors affecting patients' utilization of primary care services at a Tertiary Teaching Hospital in Riyadh, Saudi Arabia. *Journal of Family & Community Medicine*, 23(1), 6–11. <https://doi.org/10.4103/2230-8229.172223>
- [4] Alturbag, M. (n.d.). Factors and Reasons Associated With Appointment Non-attendance in Hospitals: A Narrative Review. *Cureus*, 16(4), e58594. <https://doi.org/10.7759/cureus.58594>
- [5] Anthony, K., Mathieu, D., Hillary, K., & Idah, O. (2022). Retrospective Analysis of Drug Resistant Tuberculosis and the Associated Treatment Outcomes in Kenya. *Mutabari David*. <https://doi.org/10.36959/317/682>
- [6] Appiah, M. A., Arthur, J. A., Gborgblorvor, D., Asampong, E., Kye-Duodu, G., Kamau, E. M., & Dako-Gyeke, P. (2023). Barriers to tuberculosis treatment adherence in high-burden tuberculosis settings in Ashanti region, Ghana: A qualitative study from patient's perspective. *BMC Public Health*, 23, 1317. <https://doi.org/10.1186/s12889-023-16259-6>

- [7] Barakat, C., & Konstantinidis, T. (2023). A Review of the Relationship between Socioeconomic Status Change and Health. *International Journal of Environmental Research and Public Health*, 20(13), 6249. <https://doi.org/10.3390/ijerph20136249>
- [8] Bhardwaj, R., Agrawal, U., Vashist, P., & Manna, S. (2024). Determination of sample size for various study designs in medical research: A practical primer. *Journal of Family Medicine and Primary Care*, 13(7), 2555–2561. https://doi.org/10.4103/jfmpc.jfmpc_1675_23
- [9] Boakye, A. E., Health, D. of, Recreation, P. E. and, Coast, U. of C., Coast, C., & Ghana. (2025a). Factors Influencing Patients' Adherence to Tuberculosis Treatment Before and During COVID 19 Era in the Hohoe Municipality, Ghana. *Cardiology Research and Reports*, 7(2). <https://doi.org/10.31579/2692-9759/154>
- [10] Boakye, A. E., Health, D. of, Recreation, P. E. and, Coast, U. of C., Coast, C., & Ghana. (2025b). Factors Influencing Patients' Adherence to Tuberculosis Treatment Before and During COVID 19 Era in the Hohoe Municipality, Ghana. *Cardiology Research and Reports*, 7(2). <https://doi.org/10.31579/2692-9759/154>
- [11] Bramer, W. M., de Jonge, G. B., Rethlefsen, M. L., Mast, F., & Kleijnen, J. (2018). A systematic approach to searching: An efficient and complete method to develop literature searches. *Journal of the Medical Library Association : JMLA*, 106(4), 531–541. <https://doi.org/10.5195/jmla.2018.283>
- [12] Brennan, E. (n.d.-a). *Guides: Systematic Reviews: Inclusion/Exclusion Criteria*. Retrieved September 27, 2026, from <https://musclibguides.com/systematicreviews/eligibilitycriteria>
- [13] Brennan, E. (n.d.-b). *Guides: Systematic Reviews: Inclusion/Exclusion Criteria*. Retrieved September 27, 2026, from <https://musclibguides.com/systematicreviews/eligibilitycriteria>
- [14] Cardona-Arango, D., Santacruz-Restrepo, V., Rendón-Montoya, A., Madrigal-Cadavid, J., Segura-Cardona, A., & Estrada-Acevedo, J. I. (2026). Medication adherence in older adults with chronic diseases: A scoping review of barriers, facilitators, and effective interventions. *Frontiers in Aging*, 7. <https://doi.org/10.3389/fragi.2026.1642652>
- [15] Chebet, N. A. (n.d.). *TUBERCULOSIS TREATMENT ADHERENCE AMONG PATIENTS TAKING ANTI-TB DRUGS IN KILIFI COUNTY, KENYA*.
- [16] *Checking your browser—reCAPTCHA*. (n.d.-a). Retrieved September 28, 2026, from <https://pmc.ncbi.nlm.nih.gov/articles/PMC4816216/>
- [17] *Checking your browser—reCAPTCHA*. (n.d.-b). Retrieved September 28, 2026, from <https://pmc.ncbi.nlm.nih.gov/articles/PMC9129017/>
- [18] *Checking your browser—reCAPTCHA*. (n.d.-c). Retrieved September 28, 2026, from <https://pmc.ncbi.nlm.nih.gov/articles/PMC4936839/>
- [19] *Checking your browser—reCAPTCHA*. (n.d.-d). Retrieved September 28, 2026, from <https://pmc.ncbi.nlm.nih.gov/articles/PMC12604074/>
- [20] *Checking your browser—reCAPTCHA*. (n.d.-e). Retrieved September 28, 2026, from <https://pmc.ncbi.nlm.nih.gov/articles/PMC7746489/>
- [21] Connelley, A., Young, A., Lee, J. T., Miller, M., Spring, E., Hao, W., Wolfson, J. A., Cohen, A. J., Patel, M. R., & Leung, C. W. (2025). Understanding the Reasons Why Patients With Food Insecurity Decline Social Assistance at a Large Academic Medical Center. *AJPM Focus*, 4(2), 100320. <https://doi.org/10.1016/j.focus.2025.100320>
- [22] *DSpace*. (n.d.). Retrieved September 28, 2026, from <https://iris.who.int/bitstreams/fc180f19-740e-4df1-ad72-90baf74b3df/download>
- [23] *Emotional Support—An overview | ScienceDirect Topics*. (n.d.). Retrieved September 27, 2026, from <https://www.sciencedirect.com/topics/psychology/emotional-support>
- [24] *Factors Influencing Patients' Adherence to Tuberculosis Treatment Before and During COVID 19 Era in the Hohoe Municipality, Ghana | Auctores*. (n.d.). Retrieved September 27, 2026, from <https://auctoresonline.org/article/factors-influencing-patients-adherence-to-tuberculosis-treatment-before-and-during-covid-19-era-in-the-hohoe-municipality-ghana>
- [25] *Factors Influencing TB Treatment Adherence: A Study at Port Reitz Hospital - D/UPHRIFT/20011/*. (n.d.). Studocu. Retrieved September 29, 2026, from <https://www.studocu.com/row/document/university-of-nairobi/business-communication/verah-gesare-nyaenya-good/67465236>
- [26] Farooqi, S. A. (n.d.). *The Impact of Socioeconomic Status on College Students' Experiences*.

- [27] *Fig. 1. Study selection process using the PRISMA 2020 flow diagram.* (n.d.). ResearchGate. Retrieved September 27, 2026, from https://www.researchgate.net/figure/Study-selection-process-using-the-PRISMA-2020-flow-diagram_fig1_358799875
- [28] Ghosh, A., & Choudhury, S. (2025). Understanding different types of review articles: A primer for early career researchers. *Indian Journal of Psychiatry*, 67(5), 535–541. https://doi.org/10.4103/indianjpsychiatry.indianjpsychiatry_373_25
- [29] Grigoryan, Z., McPherson, R., Harutyunyan, T., Truzyan, N., & Sahakyan, S. (2022). Factors Influencing Treatment Adherence Among Drug-Sensitive Tuberculosis (DS-TB) Patients in Armenia: A Qualitative Study. *Patient Preference and Adherence*, 16, 2399–2408. <https://doi.org/10.2147/PPA.S370520>
- [30] Guest, G., M. MacQueen, K., & E. Namey, E. (2012). Comparing Thematic Data. In *Applied Thematic Analysis* (pp. 161–186). SAGE Publications, Inc. <https://doi.org/10.4135/9781483384436>
- [31] Gusenbauer, M., & Haddaway, N. R. (2020). Which academic search systems are suitable for systematic reviews or meta-analyses? Evaluating retrieval qualities of Google Scholar, PubMed, and 26 other resources. *Research Synthesis Methods*, 11(2), 181–217. <https://doi.org/10.1002/jrsm.1378>
- [32] Ilinca, S., Di Giorgio, L., Salari, P., & Chuma, J. (2019). Socio-economic inequality and inequity in use of health care services in Kenya: Evidence from the fourth Kenya household health expenditure and utilization survey. *International Journal for Equity in Health*, 18, 196. <https://doi.org/10.1186/s12939-019-1106-z>
- [33] Inchiyil, V. S., & Syed, A. F. (2026). Exploring Patient Heterogeneity in Service Quality Gaps and Satisfaction: Insights from Outpatient Care. *Journal of Patient Experience*, 13, 23743735261437458. <https://doi.org/10.1177/23743735261437458>
- [34] Jimmy, B., & Jose, J. (2011a). Patient Medication Adherence: Measures in Daily Practice. *Oman Medical Journal*, 26(3), 155–159. <https://doi.org/10.5001/omj.2011.38>
- [35] Jimmy, B., & Jose, J. (2011b). Patient Medication Adherence: Measures in Daily Practice. *Oman Medical Journal*, 26(3), 155–159. <https://doi.org/10.5001/omj.2011.38>
- [36] *Just a moment...* (n.d.-a). Retrieved September 29, 2026, from <https://www.sciencedirect.com/science/article/pii/S0022480426002088>
- [37] *Just a moment...* (n.d.-b). Retrieved September 28, 2026, from <https://www.sciencedirect.com/science/article/pii/S0167629622000844>
- [38] *Just a moment...* (n.d.-c). Retrieved September 28, 2026, from <https://www.sciencedirect.com/science/article/pii/S0022202X16323569>
- [39] Kardas, P., Lewek, P., & Matyjaszyk, M. (2013). Determinants of patient adherence: A review of systematic reviews. *Frontiers in Pharmacology*, 4, 91. <https://doi.org/10.3389/fphar.2013.00091>
- [40] *Kenya's Community Health Promoters Improve TB Access in Nyamira County | Kimberly Green posted on the topic.* (n.d.). LinkedIn. Retrieved September 27, 2026, from https://www.linkedin.com/posts/kimberly-green-4429104_how-community-health-promoters-are-transforming-activity-7442295378063933441-j0j5
- [41] Kėvelaitienė, K., Davidavičienė, V. E., & Danila, E. (2025). Tuberculosis treatment failure: What are the risk factors? A comprehensive literature review. *Multidisciplinary Respiratory Medicine*, 20(1), 1030. <https://doi.org/10.5826/mrm.2025.1030>
- [42] Kikukawa, L. (2017). Important Factors To Consider When Developing Rural Healthcare Systems: Suggestions From A Moloka'i Native. *Hawai'i Journal of Medicine & Public Health*, 76(3 Suppl 1), 47–48.
- [43] Kılıç, A., Zhou, X., Moon, Z., Hamada, Y., Duong, T., Layton, C., Jhuree, S., Abubakar, I., Rangaka, M. X., & Horne, R. (2025). A systematic review exploring the role of tuberculosis stigma on test and treatment uptake for tuberculosis infection. *BMC Public Health*, 25(1), 628. <https://doi.org/10.1186/s12889-024-20868-0>
- [44] Kvarnström, K., Westerholm, A., Airaksinen, M., & Liira, H. (2021a). Factors Contributing to Medication Adherence in Patients with a Chronic Condition: A Scoping Review of Qualitative Research. *Pharmaceutics*, 13(7), 1100. <https://doi.org/10.3390/pharmaceutics13071100>
- [45] Kvarnström, K., Westerholm, A., Airaksinen, M., & Liira, H. (2021b). Factors Contributing to Medication Adherence in Patients with a Chronic Condition: A Scoping Review of Qualitative Research. *Pharmaceutics*, 13(7), 1100. <https://doi.org/10.3390/pharmaceutics13071100>
- [46] Lemma Tirere, L., Ersido, T., Beyene Handiso, T., & Shiferaw Areba, A. (2024). Non-adherence to anti-tuberculosis treatment and associated factors among TB patients in public health facilities of Hossana town, Southern Ethiopia, 2022. *Frontiers in Medicine*, 11, 1360351. <https://doi.org/10.3389/fmed.2024.1360351>

- [47] Lin, L., Chu, H., Murad, M. H., Hong, C., Qu, Z., Cole, S. R., & Chen, Y. (2018). Empirical Comparison of Publication Bias Tests in Meta-Analysis. *Journal of General Internal Medicine*, 33(8), 1260–1267. <https://doi.org/10.1007/s11606-018-4425-7>
- [48] Malih Radhi, M., Niazy, S. M., & Naser Abed, S. (2023). Individual-related factors associated with treatment adherence among hypertensive patients. *Journal of Public Health in Africa*, 14(6), 2466. <https://doi.org/10.4081/jphia.2023.2466>
- [49] Moosapour, H., Saeidifard, F., Aalaa, M., Soltani, A., & Larijani, B. (2021). The rationale behind systematic reviews in clinical medicine: A conceptual framework. *Journal of Diabetes and Metabolic Disorders*, 20(1), 919–929. <https://doi.org/10.1007/s40200-021-00773-8>
- [50] Muhula, S., Mveyange, A., Oti, S. O., Bande, M., Kayiaa, H., Leshore, C., Kawai, D., Opanga, Y., Marita, E., Karanja, S., Smet, E., & Conradi, H. (2021). The impact of community led alternative rite of passage on eradication of female genital mutilation/cutting in Kajiado County, Kenya: A quasi-experimental study. *PLoS ONE*, 16(4), e0249662. <https://doi.org/10.1371/journal.pone.0249662>
- [51] Naoum, V., Naoum, P., Athanasakis, K., Pavi, E., & Kyriopoulos, J. (2018). PMU82—SOCIOECONOMIC AND HEALTH-RELATED FACTORS ASSOCIATED WITH ADHERENCE TO CHRONIC MEDICATION IN GREECE. *Value in Health*, 21, S321–S322. <https://doi.org/10.1016/j.jval.2018.09.1918>
- [52] Neupane, B. P., Dahal, N., Dhakal, R. K., Hasan, Md. K., Villarama, J. A., & Fabros, B. G. (n.d.). Data collection methods in qualitative research: Researchers' reflections. *Frontiers in Research Metrics and Analytics*, 11, 1778160. <https://doi.org/10.3389/frma.2026.1778160>
- [53] Nezenega, Z. S., Perimal-Lewis, L., & Maeder, A. J. (2020a). Factors Influencing Patient Adherence to Tuberculosis Treatment in Ethiopia: A Literature Review. *International Journal of Environmental Research and Public Health*, 17(15), 5626. <https://doi.org/10.3390/ijerph17155626>
- [54] Nezenega, Z. S., Perimal-Lewis, L., & Maeder, A. J. (2020b). Factors Influencing Patient Adherence to Tuberculosis Treatment in Ethiopia: A Literature Review. *International Journal of Environmental Research and Public Health*, 17(15), 5626. <https://doi.org/10.3390/ijerph17155626>
- [55] Nezenega, Z. S., Perimal-Lewis, L., & Maeder, A. J. (2020c). Factors Influencing Patient Adherence to Tuberculosis Treatment in Ethiopia: A Literature Review. *International Journal of Environmental Research and Public Health*, 17(15), 5626. <https://doi.org/10.3390/ijerph17155626>
- [56] Nyande, F. K., Konlan, K. D., Asiamah, L. S., Boateng, V., Gbeamir, J., Dankwah, V., Quaicoe, R., & Adedia, D. (2026). The predictors of treatment adherence among hypertensive patients with cost-free access. *Scientific Reports*, 16, 6658. <https://doi.org/10.1038/s41598-026-36702-z>
- [57] Ochieng, M., Nyaberi, J., Mambo, S., & Wafula, C. (2024a). Healthcare Worker-Related Factors Contributing to Tuberculosis Treatment Non-Adherence among Patients in Kisumu East Sub-County. *Journal of Tuberculosis Research*, 12(1), 13–33. <https://doi.org/10.4236/jtr.2024.121002>
- [58] Ochieng, M., Nyaberi, J., Mambo, S., & Wafula, C. (2024b). Healthcare Worker-Related Factors Contributing to Tuberculosis Treatment Non-Adherence among Patients in Kisumu East Sub-County. *Journal of Tuberculosis Research*, 12(1), 13–33. <https://doi.org/10.4236/jtr.2024.121002>
- [59] Pacific, W. R. O. for the W. (2000). *Health Research Methodology: A Guide for Training in Research Methods: WHO Pacific Regional Office, Education in Action Series, Number 5* (2nd ed). WHO Regional Office for the Western Pacific.
- [60] Patel, S., Huang, M., & Miliara, S. (2025). Understanding Treatment Adherence in Chronic Diseases: Challenges, Consequences, and Strategies for Improvement. *Journal of Clinical Medicine*, 14(17), 6034. <https://doi.org/10.3390/jcm14176034>
- [61] *Patient Adherence to Tuberculosis Treatment: A Systematic Review of Qualitative Research* | *PLOS Medicine*. (n.d.). Retrieved September 27, 2026, from <https://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.0040238>
- [62] *Patient and health system level barriers to and facilitators for tuberculosis treatment initiation in Uganda: A qualitative study* | *springermedizin.de*. (n.d.). Retrieved September 27, 2026, from <https://www.springermedicine.com/link?doi=10.1186/s12913-022-08213-w>
- [63] (PDF) Impact of Socio-Economic, Health and Patient Related Factors on Medication Adherence in Patients with Hypertension and Type II Diabetes. (2026). *ResearchGate*. <https://doi.org/10.9734/jpri/2021/v33i51B35575>
- [64] (PDF) Living with Tuberculosis: A Qualitative Study of Patients' Experiences with Disease and Treatment at the Tamale Teaching Hospital. (2026). *ResearchGate*. <https://doi.org/10.11648/j.ijsqa.20251101.14>

- [65] (PDF) Patient and Health System Related Factors Associated with Non-Adherence to Antihypertensive Medication among Patients at Chuka Referral Hospital, Kenya. (2026). *ResearchGate*. <https://doi.org/10.4236/ojcd.2021.112002>
- [66] (PDF) The Factor Affecting Medication Adherence in Tuberculosis Patients: A Literature Review. (2026). *ResearchGate*. <https://doi.org/10.59188/eduvest.v5i1.1541>
- [67] (PDF) The Role of Socioeconomic Factors in Shaping Health Outcomes among Vulnerable Populations. (2026). *ResearchGate*. <https://doi.org/10.70135/seejph.vi.2086>
- [68] (PDF) Use and application of geographical restrictions in systematic reviews with the aim of including studies about Germany: An update of a methodological review. (2026). *ResearchGate*. <https://doi.org/10.1111/hir.12555>
- [69] *PRISMA Flow Diagram Explained – Systematic Reviews Guide*. (2026, June 20). Gatsbi Research Hub. <https://blog.gatsbi.com/wordsmith/prisma-flow-diagram-guide/>
- [70] *PRISMA Guidelines: Step-by-Step Workflow + Examples*. (2026, April 16). Paperguide Blog. <https://paperguide.ai/blog/prisma-guidelines/>
- [71] Religioni, U., Barrios-Rodríguez, R., Requena, P., Borowska, M., & Ostrowski, J. (2025). Enhancing Therapy Adherence: Impact on Clinical Outcomes, Healthcare Costs, and Patient Quality of Life. *Medicina*, 61(1), 153. <https://doi.org/10.3390/medicina61010153>
- [72] Ringwald, B., Sakwa, E., Karisa, R. P., Okoth, C., Mwanja, V., Thomson, R., Millington, K., Mungai, B., Zulu, E. M., & Abdullahi, L. H. (2026). Providing person-centred TB care: A participatory study with healthcare workers in Nairobi, Kenya. *BMJ Open*, 16(7), e116365. <https://doi.org/10.1136/bmjopen-2026-116365>
- [73] Rosenman, R., Tennekoon, V., & Hill, L. G. (2011). Measuring bias in self-reported data. *International Journal of Behavioural & Healthcare Research*, 2(4), 320–332. <https://doi.org/10.1504/IJBHR.2011.043414>
- [74] Santosa, A., Juniarti, N., Pahria, T., & Susanti, R. D. (2025a). Digital adherence technology to improve medication adherence in tuberculosis patients: A systematic review and meta-analysis randomized control trials. *NPJ Primary Care Respiratory Medicine*, 35, 52. <https://doi.org/10.1038/s41533-025-00457-3>
- [75] Santosa, A., Juniarti, N., Pahria, T., & Susanti, R. D. (2025b). Digital adherence technology to improve medication adherence in tuberculosis patients: A systematic review and meta-analysis randomized control trials. *Npj Primary Care Respiratory Medicine*, 35(1), 52. <https://doi.org/10.1038/s41533-025-00457-3>
- [76] Sazali, M. F., Rahim, S. S. S. A., Mohammad, A. H., Kadir, F., Payus, A. O., Avoi, R., Jeffree, M. S., Omar, A., Ibrahim, M. Y., Atil, A., Tuah, N. M., Dapari, R., Lansing, M. G., Rahim, A. A. A., & Azhar, Z. I. (2023a). Improving Tuberculosis Medication Adherence: The Potential of Integrating Digital Technology and Health Belief Model. *Tuberculosis and Respiratory Diseases*, 86(2), 82–93. <https://doi.org/10.4046/trd.2022.0148>
- [77] Sazali, M. F., Rahim, S. S. S. A., Mohammad, A. H., Kadir, F., Payus, A. O., Avoi, R., Jeffree, M. S., Omar, A., Ibrahim, M. Y., Atil, A., Tuah, N. M., Dapari, R., Lansing, M. G., Rahim, A. A. A., & Azhar, Z. I. (2023b). Improving Tuberculosis Medication Adherence: The Potential of Integrating Digital Technology and Health Belief Model. *Tuberculosis and Respiratory Diseases*, 86(2), 82–93. <https://doi.org/10.4046/trd.2022.0148>
- [78] Sazali, M. F., Rahim, S. S. S. A., Mohammad, A. H., Kadir, F., Payus, A. O., Avoi, R., Jeffree, M. S., Omar, A., Ibrahim, M. Y., Atil, A., Tuah, N. M., Dapari, R., Lansing, M. G., Rahim, A. A. A., & Azhar, Z. I. (2023c). Improving Tuberculosis Medication Adherence: The Potential of Integrating Digital Technology and Health Belief Model. *Tuberculosis and Respiratory Diseases*, 86(2), 82–93. <https://doi.org/10.4046/trd.2022.0148>
- [79] Schlesinger, M., Grob, R., & Shaller, D. (2015). Using Patient-Reported Information to Improve Clinical Practice. *Health Services Research*, 50(Suppl 2), 2116–2154. <https://doi.org/10.1111/1475-6773.12420>
- [80] Snyder, H. (2019a). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research*, 104, 333–339. <https://doi.org/10.1016/j.jbusres.2019.07.039>
- [81] Snyder, H. (2019b). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research*, 104, 333–339. <https://doi.org/10.1016/j.jbusres.2019.07.039>
- [82] Stewart, C. P., Arnold, C. D., Williams, A. M., Arnold, B. F., Pickering, A. J., Dentz, H., Kiprotich, M., Lin, A., Null, C., Colford, J. M., & Dewey, K. G. (2024). Social Desirability Bias in a Randomized Controlled Trial That Included Breastfeeding Promotion in Western Kenya. *Current Developments in Nutrition*, 9(Suppl 1), 103779. <https://doi.org/10.1016/j.cdnut.2024.103779>
- [83] *Summarising good practice guidelines for data extraction for systematic reviews and meta-analysis / Request PDF*. (n.d.). Retrieved September 27, 2026, from

https://www.researchgate.net/publication/349635518_Summarising_good_practice_guidelines_for_data_extraction_for_systematic_reviews_and_meta-analysis

- [84] Summarising good practice guidelines for data extraction for systematic reviews and meta-analysis | Request PDF. (2026). *ResearchGate*. <https://doi.org/10.1136/bmjebm-2020-111651>
- [85] *Supporting Paper & Pleating Paper – Tirupati International*. (n.d.). Retrieved September 28, 2026, from <https://tpaper.in/service/supporting-paper-pleating-paper/>
- [86] *Systematic Review—An overview | ScienceDirect Topics*. (n.d.). Retrieved September 27, 2026, from <https://www.sciencedirect.com/topics/medicine-and-dentistry/systematic-review>
- [87] Teibo, T. K. A., Andrade, R. L. de P., Rosa, R. J., de Abreu, P. D., Olayemi, O. A., Alves, Y. M., Vaz Tavares, R. B., da Costa, F. B. P., Dias Moura, H. S., Ferezin, L. P., Tártaro, A. F., de Campos, M. C. T., Ribeiro, N. M., Berra, T. Z., & Arcêncio, R. A. (2024). Barriers That Interfere with Access to Tuberculosis Diagnosis and Treatment across Countries Globally: A Systematic Review. *ACS Infectious Diseases*, 10(8), 2600–2614. <https://doi.org/10.1021/acsinfecdis.4c00466>
- [88] Tesfahuneygn, G., Medhin, G., & Legesse, M. (2015). Adherence to Anti-tuberculosis treatment and treatment outcomes among tuberculosis patients in Alamata District, northeast Ethiopia. *BMC Research Notes*, 8, 503. <https://doi.org/10.1186/s13104-015-1452-x>
- [89] Teshome, B., Trabitzzsch, J., Afework, T., Addissie, A., Kaba, M., Kantelhardt, E. J., & Getachew, S. (2021). Perceived barriers to timely treatment initiation and social support status among women with breast cancer in Ethiopia. *PLoS ONE*, 16(9), e0257163. <https://doi.org/10.1371/journal.pone.0257163>
- [90] *The difference between a systematic review and a meta-analysis—Covidence*. (n.d.). Retrieved September 28, 2026, from <https://www.covidence.org/blog/the-difference-between-a-systematic-review-and-a-meta-analysis/>
- [91] The impact of medication regimen factors on adherence to chronic treatment: A review of literature | Request PDF. (n.d.). *ResearchGate*. <https://doi.org/10.1007/s10865-007-9147-y>
- [92] Thomas, J., & Harden, A. (2008). Methods for the thematic synthesis of qualitative research in systematic reviews. *BMC Medical Research Methodology*, 8, 45. <https://doi.org/10.1186/1471-2288-8-45>
- [93] Trauer, J. M., Dodd, P. J., Gomes, M. G. M., Gomez, G. B., Houben, R. M. G. J., McBryde, E. S., Melsew, Y. A., Menzies, N. A., Arinaminpathy, N., Shrestha, S., & Dowdy, D. W. (2019). The Importance of Heterogeneity to the Epidemiology of Tuberculosis. *Clinical Infectious Diseases: An Official Publication of the Infectious Diseases Society of America*, 69(1), 159–166. <https://doi.org/10.1093/cid/ciy938>
- [94] *Tuberculosis (TB)*. (n.d.-a). Retrieved September 27, 2026, from <https://www.who.int/news-room/fact-sheets/detail/tuberculosis>
- [95] *Tuberculosis (TB)*. (n.d.-b). Retrieved September 27, 2026, from <https://www.who.int/news-room/fact-sheets/detail/tuberculosis>
- [96] Walsh, C., Bragg, L., Heyres, M., Yap, A., & Ratcliff, M. (2024). A systematic literature review of online academic student support in higher education. *Online Learning*, 28(2). <https://doi.org/10.24059/olj.v28i2.3954>
- [97] *What Is a PRISMA Flow Diagram? Purpose, Phases and Benefits*. (2026, September 16). Paperguide Blog. <https://paperguide.ai/blog/prisma-flow-diagram/>
- [98] Wilder, M. E., Kulie, P., Jensen, C., Levett, P., Blanchard, J., Dominguez, L. W., Portela, M., Srivastava, A., Li, Y., & McCarthy, M. L. (2021). The Impact of Social Determinants of Health on Medication Adherence: A Systematic Review and Meta-analysis. *Journal of General Internal Medicine*, 36(5), 1359–1370. <https://doi.org/10.1007/s11606-020-06447-0>
- [99] Zrineh, A., Al-Usta, M., & Alwawi, A. (2026). Sampling Methods and Sample Size Determination in Clinical Research: An Educational Review. *Journal of General and Family Medicine*, 27(1), e70096. <https://doi.org/10.1002/jgf2.70096>