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ROLE OF NURSE-DELIVERED COUNSELING IN ENHANCING TREATMENT ADHERENCE AND OUTCOMES IN PULMONARY TUBERCULOSIS

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Abstract

The aim of this study was to assess the role of nurse-delivered counseling in enhancing treatment adherence and clinical outcomes among patients with pulmonary tuberculosis. Pulmonary tuberculosis remains a significant global public health issue, particularly in developing countries, where poor adherence to long-term treatment contributes to continued transmission, relapse, and the emergence of drug-resistant strains. Despite the availability of effective therapy, multiple factors such as limited patient awareness, stigma, inadequate counseling, and socioeconomic constraints negatively affect adherence and treatment success. A quantitative cross-sectional research design was employed for this study. Data were collected from 54 pulmonary tuberculosis patients receiving treatment at a tertiary care hospital. The Morisky Medication Adherence Scale (MMAS-8) was used to assess adherence levels, while semi-structured interviews explored the role of nurses in providing counseling and support. Data were analysed using descriptive statistics and chi-square tests to determine associations between variables.The findings revealed that 57.41% of patients demonstrated moderate adherence, 38.89% had high adherence, and only 3.70% showed low adherence. Nurse-delivered counseling, particularly patient education ($p = 0.001$) and communication with family members ($p = 0.045$), showed a statistically significant association with

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improved adherence. Socioeconomic factors, including family support (p = 0.002), access to healthcare (p = 0.000), and stable economic conditions (p = 0.015), also significantly influenced treatment compliance.In conclusion, nurse-delivered counseling plays a crucial role in improving treatment adherence and clinical outcomes among pulmonary tuberculosis patients. Strengthening counseling practices and addressing socioeconomic barriers are essential for effective tuberculosis control and improved patient outcomes.

INTRODUCTION

1.1 Background of the Study

Pulmonary tuberculosis (PTB), caused by Mycobacterium tuberculosis, remains a major global public health concern despite decades of control efforts. It primarily affects the lungs and is the most infectious form of tuberculosis, transmitted through airborne droplet nuclei expelled when an infected individual coughs, sneezes, or speaks(Mejbel, Aljanaby et al. 2023). The persistence of pulmonary tuberculosis reflects complex interactions between biological vulnerability, socioeconomic determinants, and health system challenges. (Mirzayev, Viney et al. 2021). Although significant progress has been made in diagnosis and treatment, the global burden remains substantial, particularly in low- and middle-income countries. Pulmonary tuberculosis accounts for the majority of reported TB cases and is the principal driver of disease transmission within communities.

Epidemiology of Pulmonary Tuberculosis

The global epidemiology of pulmonary tuberculosis is characterized by marked geographic disparities. (Thin, Hlaing et al. 2025). Pakistan consistently ranks among the top countries with the highest TB incidence, with significant challenges related to case detection, treatment completion, and disease surveillance. The incidence and prevalence of PTB are strongly associated with socioeconomic conditions such as poverty, limited access to healthcare, rapid urbanization, and population overcrowding. In densely populated settings, the risk of airborne transmission increases substantially. Furthermore, the growing burden of multidrug-resistant tuberculosis (MDR-TB) poses an additional threat to global TB control efforts, often resulting from incomplete or irregular treatment. (Stoner, Maragh-Bass et al. 2022). These gaps are particularly evident in resource-constrained settings, where health systems face limitations in workforce capacity, patient follow-up, and health education services.

Risk Factors of Pulmonary Tuberculosis

The development and progression of pulmonary tuberculosis are influenced by a wide range of interrelated risk factors that can be broadly categorized into biological, behavioural, environmental, and health system-related determinants(Kabuya 2025).

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Biological and Clinical Factors:

Immunosuppression remains the most significant biological risk factor, particularly in individuals co-infected with HIV(Mwansumbule and Chuwa 2026). Other medical conditions such as diabetes mellitus, chronic kidney disease, and malignancies also increase susceptibility by impairing host immunity. (Ockenga, Fuhse et al. 2023).

Behavioural Factors:

Lifestyle behaviours such as tobacco smoking, alcohol consumption, and substance abuse contribute significantly to pulmonary vulnerability. Smoking damages lung architecture and reduces local immune defences, while alcohol and drug use are associated with poor health-seeking behaviour and reduced treatment adherence.

Environmental and Socioeconomic Factors:

Poverty is a central determinant of tuberculosis risk, influencing living conditions, nutrition, and access to healthcare. Overcrowded housing, poor ventilation, and exposure to indoor air pollution (e.g., biomass fuel smoke) facilitate transmission. Occupational exposure in healthcare settings, mining, and industrial environments further elevates risk.

Health System and Treatment-Related Factors:

Delayed diagnosis, inadequate patient education, and weak follow-up systems contribute to ongoing transmission and poor outcomes. (Kėvelaitienė, Davidavičienė et al. 2024). Factors contributing to non-adherence include long treatment duration, adverse drug effects, lack of patient counseling, stigma, and insufficient psychosocial support.

Within this context, patient-cantered interventions, particularly those led by nurses are increasingly recognized as essential components in improving adherence and treatment success

Role of Nurse-Delivered Counseling

Nurses are frontline healthcare providers who play a crucial role in tuberculosis care by delivering health education, providing counseling, monitoring treatment progress, and maintaining continuous patient engagement to improve treatment adherence and overall health outcomes. Nurse-delivered counseling refers to a structured and patient-centred communication process carried out by nurses to improve patients' knowledge, attitudes, and behaviours regarding their disease and treatment. It involves providing clear and accurate information about the illness, explaining the importance of treatment adherence, addressing patients' fears, myths, and misconceptions, and encouraging positive health-related behaviours. Through counseling, nurses help patients understand the causes, symptoms, prevention, and management of the disease while also offering emotional and psychological support. This process enhances patients' motivation, builds confidence in following medical advice, promotes behavioural change, and strengthens their ability to actively participate in their own care and recovery. Such interventions are particularly important in

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tuberculosis management due to the prolonged duration of therapy and the need for strict adherence(ALMUTAIRI, ALENAZI et al. 2025). Counseling can address psychological barriers, reduce stigma, and promote self-efficacy among patients. Evidence suggests that consistent nurse-patient interaction improves adherence rates, reduces default, and enhances overall treatment outcomes.

1.2 Problem Statement:

Despite the availability of effective and standardized anti-tuberculosis treatment regimens, Studies conducted in Pakistan have shown that inadequate counseling and poor patient awareness contribute to low tuberculosis treatment adherence and unfavourable outcomes. Similarly, international studies also report that nurse-delivered counseling improves patients' understanding, motivation, treatment adherence, and overall clinical outcomes in tuberculosis care. Non-adherence to TB treatment remains a critical challenge, contributing to prolonged disease transmission, increased morbidity and mortality, and the emergence of multidrug-resistant tuberculosis. Pakistan remains one of the high tuberculosis burden countries and continues to face challenges related to treatment completion and disease control. Poor treatment adherence may result in treatment failure, delayed recovery, relapse, and unfavourable clinical outcomes among pulmonary tuberculosis patients. Therefore, improving adherence remains an essential component of effective tuberculosis management. Multiple factors contribute to poor adherence, including lack of patient awareness, socioeconomic constraints, stigma, medication side effects, and insufficient counseling and follow-up by healthcare providers. While strategies such as directly observed therapy (DOTS) have been implemented, they often fail to address the behavioural and psychosocial dimensions influencing adherence. In many healthcare settings, the role of nurses in delivering structured counseling interventions is underutilized or inadequately integrated into TB care programs. There is limited empirical evidence, particularly in local contexts, regarding the effectiveness of nurse-delivered counseling in improving treatment adherence and clinical outcomes among patients with pulmonary tuberculosis. Therefore, this study seeks to investigate the role of nurse-delivered counseling in enhancing treatment adherence and outcomes in pulmonary tuberculosis, addressing a critical gap in patient-cantered TB care.

1.3 Research Hypotheses

Null Hypothesis (H_0):

There is no statistically significant relationship between nurse-delivered counseling and treatment adherence and clinical outcomes among patients with pulmonary tuberculosis.

Alternative Hypothesis (H_1):

There is a statistically significant relationship between nurse-delivered counseling and improved treatment adherence and clinical outcomes among patients with pulmonary tuberculosis.

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1.4 Objectives of the Study

General Objective:

To assess the role of nurse-delivered counseling in improving treatment adherence and clinical outcomes among patients with pulmonary tuberculosis.

Specific Objectives:

- To evaluate the level of treatment adherence among patients with pulmonary tuberculosis.
- To access the role of nurses in providing counseling and education to TB patients.
- To determine the relationship between nurse-delivered counseling and treatment adherence among pulmonary tuberculosis patients.
- To identify factors influencing treatment adherence among pulmonary tuberculosis patients.
- To determine the impact of counseling on improving clinical outcomes in TB patients.

1.5 Significance of the Study

This study is of considerable significance for clinical practice, public health, and healthcare policy. It contributes to the existing literature by emphasizing the importance of patient-centred care in tuberculosis management and highlighting the role of nurse-delivered counseling in improving treatment adherence and clinical outcomes among patients with pulmonary tuberculosis. The study further recognizes the expanding responsibilities of nurses, extending beyond routine clinical duties to include educational, motivational, and behavioural support interventions for patients undergoing tuberculosis treatment.

Moreover, improved treatment adherence may contribute to reducing disease transmission, relapse, and the emergence of drug-resistant tuberculosis, particularly in high-burden countries such as Pakistan, where healthcare resources remain limited. Cost-effective interventions, including structured counseling, may strengthen national tuberculosis control efforts and support the implementation of comprehensive patient care strategies. The findings of this study may also assist policymakers and healthcare institutions in developing structured counseling programs and enhancing nurses' communication and counseling competencies through professional training initiatives.

Furthermore, this research may provide a foundation for future studies focusing on psychosocial and patient-support interventions in tuberculosis care. Ultimately, the study may contribute to improved patient outcomes and support global efforts toward tuberculosis prevention and control in accordance with the objectives established by the World Health Organization.

1.6 Scope of the Study

This study focuses on patients diagnosed with pulmonary tuberculosis and examines the impact of nurse-delivered counseling on treatment adherence and clinical outcomes. The study primarily considers factors such as patient awareness, socioeconomic conditions, behavioural aspects, and health system-related influences affecting adherence.

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The research is limited to a specific healthcare setting and a defined sample population, which may restrict the generalizability of the findings to other regions or populations. Additionally, the study emphasizes the role of nurses in counseling interventions and does not extensively explore the contributions of other healthcare professionals.

CHAPTER 2: LITERATURE REVIEW

2.1 Overview of Pulmonary Tuberculosis

A comprehensive literature search was conducted using Google Scholar to identify relevant studies on the impact of nurse-delivered counselling on treatment adherence and clinical outcomes among patients with pulmonary tuberculosis. Keywords and combinations used during the search included "pulmonary tuberculosis," "nurse counselling," "treatment adherence," "counselling intervention," "clinical outcomes," and "TB management." The search was limited to articles published in English language journals.

The study selection process followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) approach. A total of 29 records were identified through Google Scholar searching. After removing 4 duplicate records, 25 records remained for title and abstract screening. During the screening stage, 9 records were excluded because they did not meet the inclusion criteria or were not directly related to the study objectives.

Subsequently, 16 full-text articles were assessed for eligibility. No full-text articles were excluded at this stage, as all met the predefined inclusion criteria. Therefore, 16 studies were finally included in the literature review. The PRISMA flow diagram illustrating the study selection process is presented in Figure 1;

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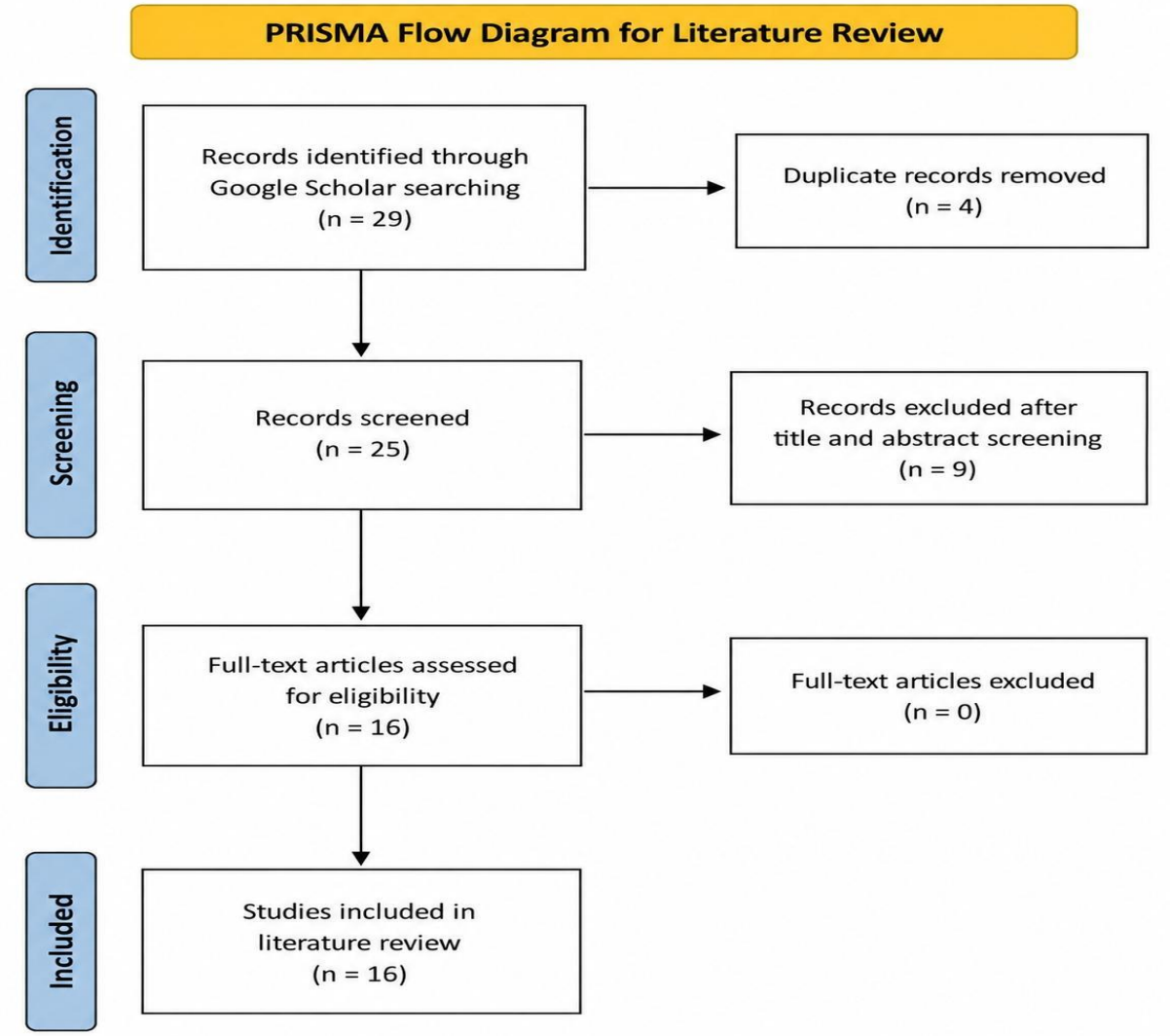

Figure 1: PRISMA FLOW CHART

Pulmonary tuberculosis (TB) is a chronic infectious disease caused by Mycobacterium tuberculosis, primarily affecting the lungs. It spreads through airborne droplets when infected individuals cough, sneeze, or speak(Swalehe and Obeagu 2024). Despite advancements in medical science, TB remains a major global health concern, particularly in low- and middle-income countries. TB continues to be one of the leading causes of death from infectious diseases worldwide. The persistence of TB highlights the need for effective intervention strategies, especially those targeting treatment adherence and patient-centered care.

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2.2 Global Burden and Epidemiology of Tuberculosis

Tuberculosis affects millions annually, an estimated 10.7 million new cases and 1.3–1.6 million deaths annually, with the highest burden in developing regions(Ammari, Berriche et al. 2022). It disproportionately impacts economically productive age groups, resulting in significant socioeconomic consequences. The disease is closely associated with HIV/AIDS, malnutrition and other chronic conditions that weaken immunity. The emergence of multidrug-resistant TB (MDR-TB) has further complicated global control efforts, requiring prolonged treatment and reducing success rates(Dheda, Mirzayev et al. 2024). These challenges emphasize the importance of adherence-focused interventions including counseling provided by healthcare professionals such as nurses.

2.3 Risk Factors of Pulmonary Tuberculosis

The transmission and progression of TB are influenced by multiple factors. Demographic variables such as age increase vulnerability, particularly among children and the elderly.

Socioeconomic factors including poverty, poor nutrition and limited healthcare access, significantly increase TB risk. Environmental conditions such as overcrowding and poor ventilation facilitate transmission.

Behavioral factors like smoking and delayed healthcare seeking also contribute to disease spread. Additionally, close contact with infected individuals and weakened immunity due to HIV or chronic illness are major determinants(Wood, Harrison et al. 2021).

Understanding these factors is essential for designing counseling interventions that address patient behaviors and improve adherence.

2.4 Strategies for Prevention and Control of Tuberculosis

Effective TB control requires a comprehensive approach combining medical and social strategies. Early detection and diagnosis are critical to reducing transmission. Standard treatment involves long-term antibiotic therapy making adherence essential for successful outcomes.

The Directly Observed Treatment Short-course (DOTS) strategy has been widely implemented to improve adherence and treatment success. However, adherence challenges persist due to side effects, long treatment duration and stigma(Thomas and Summers 2022).

Health education and counseling are key strategies that address these challenges by improving patient understanding and motivation. Family and community support also play a vital role in enhancing treatment compliance.

2.5 Role of Nurses in Tuberculosis Management

Nurses play a central role in TB management, particularly in implementing adherence strategies and providing continuous patient care(Chen, Xie et al. 2024). They are responsible for supervising treatment, monitoring side effects and ensuring continuity of care. Through their close interaction with patients, nurses act as a bridge between the healthcare system and the community. Their

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involvement in patient education and counseling significantly improves treatment adherence and outcomes.

2.6 Nurse-Delivered Counseling in Tuberculosis Care

Nurse-delivered counseling is a structured, patient-centered approach aimed at improving adherence and treatment outcomes. It involves educating patients addressing misconceptions and providing emotional and psychological support.

Unlike general health education counseling focuses on individual patient needs and behavioral change. It is particularly important in TB care due to the prolonged treatment duration and high risk of non-adherence(Adeyemi, Ajayi et al. 2023).

2.7 Types of Counseling Provided by Nurses

Nurses contributing in delivering various forms of counseling that are tailored to the individual needs of patients undergoing treatment for tuberculosis (TB). These counseling approaches are essential components of patient-centered care and contribute significantly to treatment success.

Educational counseling is one of the primary forms provided by nurses. This type of counseling focuses on enhancing patients' knowledge and understanding of tuberculosis, including its causes, modes of transmission, treatment regimen and the importance of completing the full course of therapy. Through clear and structured information nurses help patients understand the necessity of strict adherence to medication schedules and the potential consequences of incomplete treatment(Ayakaka, Armstrong-Hough et al. 2022). This improved awareness enables patients to make informed decisions regarding their health and encourages active participation in their treatment process.

Behavioral counseling is another critical aspect of nursing care. It aims to promote positive health behaviors and encourage lifestyle modifications that support recovery. Nurses guide patients in developing routines that facilitate consistent medication intake and emphasize the importance of hygiene practices to prevent the spread of infection. Behavioral counseling also addresses habits that may interfere with treatment such as substance use or irregular daily routines. By fostering healthier behaviors, nurses help patients build sustainable practices that enhance treatment adherence(ZHANG, LOU et al. 2021).

Psychological counseling addresses the emotional and mental health challenges faced by TB patients. A diagnosis of tuberculosis is often associated with stigma, fear, anxiety, and social isolation. Nurses provide emotional support by creating a safe and empathetic environment where patients can express their concerns and fears. This form of counseling helps reduce psychological distress and improves patients' overall well-being(Febi, Manu et al. 2021). By addressing emotional barriers, nurses contribute to improved motivation and engagement in treatment.

Adherence counseling specifically focuses on identifying and overcoming barriers to treatment completion. Patients may face various challenges such as forgetfulness side effects of medication, lack of social support or financial constraints. Nurses assess these barriers and provide individualized

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strategies to address them. For example, they may suggest reminders for medication, provide education about managing side effects or connect patients with community resources. This targeted approach ensures that patients are better equipped to follow their treatment plans consistently. These counseling approaches collectively contribute to improving treatment adherence(Konstantinou, Kassianos et al. 2020).

2.8 Impact of Nurse-Delivered Counseling on Treatment Adherence

A growing body of evidence highlights the significant impact of nurses delivered counseling on improving treatment adherence among tuberculosis patients. Counseling interventions provided by nurses contribute to better patient understanding, increased motivation and stronger trust in healthcare system.

One of the primary benefits of counseling is the enhancement of patient knowledge. When patients fully understand their disease and its treatment then they are more likely to adhere to prescribed regimens(Panda, Ra et al. 2024). Counseling helps dispel myths and misconceptions about tuberculosis which are often barriers to adherence. For instance, some patients may discontinue medication once symptoms improve due to a lack of understanding about the disease process. Through consistent counseling, nurses reinforce the importance of completing the full course of treatment.

Additionally, nurse-delivered counseling fosters a trusting relationship between patients and healthcare providers. Trust is a crucial factor in adherence, as patients are more likely to follow medical advice when they feel supported and respected. Nurses, due to their frequent and direct interactions with patients are uniquely positioned to build this rapport(Nasrin and Chowdhury 2021). This relationship encourages open communication allowing patients to discuss challenges and seek guidance without hesitation. Regular counseling sessions also provide opportunities for continuous monitoring and reinforcement. Patients who receive consistent counseling are more likely to attend follow-up appointments and remain engaged in their treatment plans. This continuity of care reduces the likelihood of treatment interruption and default. As a result, counseling plays a role in maintaining long-term adherence.

2.9 Impact on Treatment Outcomes

Improved adherence resulting from nurse-delivered counseling has a direct and positive impact on treatment outcomes in tuberculosis care(Bergman, Relf et al. 2025). Patients who adhere to their treatment regimens are more likely to achieve successful recovery which includes higher cure rates and a lower risk of relapse. One of the most significant outcomes of effective counseling is the prevention of drug resistance. Incomplete or irregular treatment can lead to the development of drug-resistant strains of tuberculosis, which are more difficult and costly to treat. By ensuring that patients complete their prescribed therapy, nurses help reduce the emergence of resistance and contribute to broader public health efforts. Furthermore, patients who receive structured and consistent counseling often experience improved overall health and quality of life. Counseling

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addresses not only the physical aspects of the disease but also the psychological and social dimensions(Furin, Loveday et al. 2020). As a result, patients are better equipped to manage their condition and reintegrate into their daily lives.

In comparison to patients who do not receive adequate counseling, those who benefit from nurse led interventions demonstrate higher levels of treatment success and satisfaction with care. This highlights the critical role of nurses in delivering comprehensive counseling services that support both adherence and recovery.

2.10 Barriers to Effective Nurse-Delivered Counseling

Despite its benefits, several barriers affect counseling effectiveness. High workload and limited time reduce nurse's ability to provide detailed counseling.

Lack of training in communication skills, cultural differences, and stigma further complicate counseling efforts. These barriers highlight the need for improved training and system support.

2.11 Strategies to Enhance Nurse-Delivered Counseling

Improving counseling requires targeted interventions such as training programs for nurses in communication and behavioral techniques.

Standardized guidelines can improve consistency. While digital tools like mobile reminders can support adherence(Agarwal, Glenton et al. 2021). Community involvement also strengthens patient support systems and enhances treatment outcomes.

2.12 Summary of the Literature

Pulmonary tuberculosis remains a significant global health problem, particularly in developing countries where socioeconomic and environmental factors increase its spread. Despite the availability of effective treatment strategies, tuberculosis continues to affect millions of people each year. A major challenge identified throughout the review is poor treatment adherence, as patients often fail to complete the long duration of therapy due to factors such as side effects, lack of awareness, stigma, and limited support systems. This non-adherence not only reduces treatment success but also contributes to the emergence of drug-resistant forms of tuberculosis. The review highlights that nurse-delivered counseling plays a critical role in addressing these challenges. Nurses, through their close and continuous interaction with patients, are in a unique position to provide education, emotional support, and individualized guidance. Counseling improves patients' understanding of the disease and its treatment, corrects misconceptions, and motivates them to follow their prescribed regimens. It also helps patients cope with psychological issues such as fear, anxiety, and social stigma, thereby enhancing their overall engagement in the treatment process.

Furthermore, improved adherence resulting from effective counseling leads to better treatment outcomes, including higher cure rates, reduced risk of relapse, and prevention of drug resistance. Patients who receive consistent counseling are more likely to complete their treatment and

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experience improved quality of life. However, the effectiveness of counseling can be limited by factors such as high workload, insufficient training, and communication barriers among nurses.

Despite extensive literature on tuberculosis management and the recognized importance of treatment adherence, there remains a notable gap in empirical evidence examining the combined effect of nurse-delivered counseling on both treatment adherence and clinical outcomes in pulmonary tuberculosis patients. Most existing studies primarily focus on adherence as an isolated factor, with limited attention to how structured counseling interventions influence broader outcomes such as recovery rates, relapse prevention, and overall patient well-being. Furthermore, there is insufficient exploration of the comparative effectiveness of different types of nurse-delivered counseling, particularly within resource-limited settings. Therefore, this study seeks to address these gaps by evaluating the role of nurse-delivered counseling in enhancing both adherence and treatment outcomes among patients with pulmonary tuberculosis.

Chapter 3: Methodology

3.1 Study Design

This study used a quantitative cross-sectional research design. A cross-sectional design means that data were collected at a single point in time to examine the relationship between variables. A quantitative cross-sectional study design was selected because it is appropriate for assessing the relationship between nurse-delivered counseling and treatment adherence among pulmonary tuberculosis patients at a single point in time. This design enables to collect data from participants simultaneously without the need for long-term follow-up. It is considered cost-effective, time-efficient, and suitable for healthcare-based research where the objective is to examine existing conditions and associated factors. Furthermore, the cross-sectional approach allows to evaluate adherence levels and counseling practices within the available study period and resources while providing valuable evidence regarding the association between nursing interventions and patient outcomes.

3.2 Study Area / Setting

The study was conducted at Nishtar Hospital Multan. This healthcare facility provides treatment and follow-up services for TB patients. The study was conducted at the Tuberculosis (TB) Clinic and Directly Observed Treatment Short-course (DOTS) Center of Nishtar Hospital Multan. The hospital is a tertiary care healthcare institution that provides diagnostic, treatment, counseling, and follow-up services for patients suffering from pulmonary tuberculosis. The TB clinic receives a large number of patients from both urban and rural areas, making it an appropriate setting for investigating treatment adherence and counseling practices. Additionally, nurses working in the TB clinic and DOTS center are actively involved in patient education, medication supervision, counseling, and follow-up activities, which aligns with the objectives of the present study.

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3.3 Population and Sample Size

The study population consisted of pulmonary tuberculosis patients undergoing treatment and nurses involved in TB patient management at Nishtar Hospital Multan. The sample size was calculated using the Daniel Formula ($n=Z^2\ P(1-P)/d^2$) for cross-sectional studies. Based on the estimated prevalence, 95% confidence level, and 5% margin of error, the calculated sample size was 54 participants. The selected participants met the inclusion criteria and were recruited through purposive sampling.

3.4 Sampling Technique

Inclusion criteria:

The study used a purposive sampling technique. This method involves selecting participants based on specific characteristics relevant to the study. The study included adult patients diagnosed with pulmonary tuberculosis who were receiving anti-tuberculosis treatment at the TB Clinic and DOTS Center of Nishtar Hospital Multan. Patients aged 18 years and above, who had been undergoing treatment for at least two months and were able to communicate effectively, were considered eligible for participation. Only those patients who willingly agreed to participate and provided informed consent were included in the study. These criteria were established to ensure that participants possessed sufficient treatment experience to provide reliable information regarding adherence and counseling received during their treatment period. Nurses working in the TB Clinic and DOTS Center of Nishtar Hospital Multan were included in the study. Eligible nurses were those directly involved in tuberculosis patient care, counseling, health education, medication supervision, and follow-up activities. Participants were required to have a minimum of one year of professional experience in tuberculosis management to ensure adequate exposure to counseling practices and patient interactions. Nurses who voluntarily agreed to participate and provided informed consent were included in the study.

Exclusion Criteria:

Patients diagnosed with extra pulmonary tuberculosis, critically ill individuals, patients with severe mental or cognitive impairments, and those unwilling to participate were excluded from the study. Similarly, patients who were unable to communicate effectively or had incomplete treatment records were not considered eligible. Among nurses, those with less than one year of experience in tuberculosis care, nurses not directly involved in patient counseling, and those unwilling to participate were excluded. These exclusion criteria were applied to ensure the collection of accurate, reliable, and relevant data aligned with the study objectives.

3.5 Data Collection Tool

Data were collected using two main tools: the Morisky Medication Adherence Scale (MMAS-8), a standardized questionnaire used to measure patients adherence to medication, and semi-structured interviews used to explore the role of nurses in educating and motivating TB patients(Ochieng

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2025).The MMAS-8 is a widely recognized and validated instrument used internationally to assess medication adherence among patients with chronic illnesses.

3.6 Data Collection Procedure

Data collection was conducted over a period of 4 weeks after obtaining ethical approval and permission from the hospital administration. Patients meeting the inclusion criteria were approached during their follow-up visits to the tb clinic. The mmas-8 questionnaire was administered individually to assess treatment adherence, requiring approximately 10–15 minutes for completion. Semi-structured interviews with nurses were conducted face-to-face to obtain information regarding counseling practices, patient education, motivation strategies, follow-up procedures, and frequency of counseling sessions. Each interview lasted approximately 15–20 minutes.

3.7 Data Analysis

The collected data were entered, coded, and analyzed using Statistical Package for Social Sciences (SPSS). Descriptive statistics, including frequencies and percentages, were used to summarize the socio-demographic characteristics of participants and study variables. Inferential statistics were applied to examine the relationship between nurses' roles and tuberculosis (TB) patient treatment adherence. The Chi-square test was used to assess associations between categorical variables. A p-value of less than 0.05 ($p < 0.05$) was considered statistically significant.

3.8 Ethical Considerations

Ethical principles were followed throughout the study. Participants were informed about the purpose of the study and gave informed consent before participation. Their confidentiality and privacy were maintained by not disclosing personal information. Ethical approval was obtained from the relevant authority before conducting the study.

Chapter 4 : Results

This chapter presents the findings of the study conducted to assess the role of nurse-delivered counseling in improving treatment adherence and clinical outcomes among patients with pulmonary tuberculosis. The collected data are presented through tables and descriptive analysis based on respondents' characteristics, treatment adherence, the role of nurses in counseling, and the relationship between nurse-delivered counseling and patient outcomes.

Table 1: Characteristics of Respondents

The characteristics of respondents consisting of age, gender, education, employment status, length of treatment, and family support are presented in Table 1 as follow

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Age

Category	Frequency	Percentage
< 30 years	40	74.07%
30–50 years	13	24.07%
> 50 years	1	1.85%

Gender

Category	Frequency	Percentage
Female	40	74.07%
Male	14	25.93%

Education

Category	Frequency	Percentage
Higher Education	39	72.22%
Middle	6	11.11%
Elementary	6	11.11%
High School	3	5.56%

Employment Status

Category	Frequency	Percentage
Employed	38	70.37%
Unemployed	16	29.63%

Duration of Treatment

Category	Frequency	Percentage
5–6 months	46	85.19%
2–4 months	8	14.81%

Table 2: TB Patient Adherence Level

Measurement of patient adherence to treatment was conducted using the Morisky Medication Adherence Scale (MMAS-8) questionnaire. The results of the distribution of TB patient compliance are as follows:

Compliance	Frequency	Percentage
Medium	31	57.41%
High	21	38.89%
Low	2	3.70%

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Table 3: Nurses Role in Educating and Motivating TB Patients

The role of nurses in providing education and motivation to TB patients was also explored through semi-structured interviews. The following are the results:

Nurse's Role	Frequency	Percentage
Provide active education	37	68.52%
Communicate with family	7	12.96%
Conduct home visits	5	9.26%
Remind patients	5	9.26%

Table 4: Relation Between Nurses and Patients Compliance

To determine the relationship between the role of nurses and TB patient compliance, Bivariate analysis was conducted using the chi-square test. The results are as follows:

Role of Nurses	High Compliance	Medium Compliance	Low Compliance	P Value
Active in education	34	18	2	0.001
Reminding patients regularly	27	24	3	0.120
Communicating with family	27	22	5	0.045
Making home visits	28	22	4	0.060

Table 5: Other Factors Affecting Patients Compliance

In addition to the role of nurses, this study also explored external factors that may influence patient adherence to TB therapy. The following are the main findings

Role of Nurses	High compliance	Medium compliance	Low compliance	P Value
Good family support	35	14	5	0.002
Access to good health facilities	40	14	-	0.000
Stable economic conditions	31	21	2	0.015

CHAPTER 5: DISCUSSION

This study was conducted to assess the role of nurse-delivered counseling in enhancing treatment adherence and outcomes among patients with pulmonary tuberculosis. The findings provide a comprehensive understanding of how nursing interventions and socioeconomic factors influence patient compliance in a clinical setting.

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The results of this study revealed that the majority of respondents demonstrated moderate adherence (57.41%), followed by high adherence (38.89%), while only a small proportion had low adherence (3.70%). This pattern suggests that although most patients are somewhat compliant with treatment, optimal adherence is not fully achieved. These findings are consistent with previous studies, which have reported moderate adherence levels among TB patients due to challenges such as long treatment duration, medication side effects, and lack of continuous patient support. Research indicates that without effective counseling and follow-up, patients are more likely to default during the continuation phase of treatment.

The present study also highlighted the critical role of nurses in infl8uencing treatment adherence. Among the various nursing interventions, active education showed a highly significant association with patient compliance ($p = 0.001$). This finding emphasizes that educating patients about the disease, treatment regimen, and consequences of non-adherence significantly improves their willingness to follow prescribed therapy. Similar findings have been reported in earlier studies, where patient education was identified as a key determinant of adherence (Munro et al., 2023). Education helps to eliminate misconceptions, increase awareness, and empower patients to take responsibility for their health.

Furthermore, communication with family members ($p = 0.045$) was also found to have a statistically significant relationship with patient compliance. This suggests that involving family in the treatment process provides emotional, psychological, and practical support to patients, thereby enhancing adherence. Previous literature supports this finding, indicating that family involvement reduces stigma, improves patient morale, and ensures supervision of medication intake. Although reminding patients regularly ($p = 0.120$) did not show statistical significance, it still demonstrated a positive association with adherence. This may be due to variability in how reminders are delivered or differences in patient responsiveness. Some studies have shown that reminders alone may not be sufficient unless combined with counseling and education. Similarly, home visits ($p = 0.060$) showed a borderline association with compliance. While home visits provide an opportunity for personalized care and monitoring, their effectiveness may depend on frequency, quality of interaction, and available resources.

In addition to nursing interventions, this study identified several socioeconomic factors that significantly influence treatment adherence. Good family support ($p = 0.002$) was strongly associated with higher compliance levels. Patients with supportive families are more likely to adhere to treatment due to encouragement, supervision, and assistance in managing daily challenges. This finding aligns with previous research, which highlights social support as a major determinant of treatment success.

Similarly, access to healthcare facilities ($p = 0.000$) demonstrated a highly significant relationship with adherence. Patients who have easy access to healthcare services are more likely to attend follow-up visits, obtain medications on time, and receive continuous counseling. Limited access, on the other hand, can lead to missed doses and treatment interruption. This finding is consistent with global studies emphasizing the importance of healthcare accessibility in TB control programs.

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Moreover, stable economic conditions (p = 0.015) were also significantly associated with patient compliance. Financial stability enables patients to afford transportation, maintain proper nutrition, and manage other indirect costs associated with treatment. In contrast, economic hardship often leads to treatment discontinuation. Previous studies have similarly identified poverty as a major barrier to adherence, particularly in developing countries.

Overall, the findings of this study demonstrate that treatment adherence in pulmonary tuberculosis is influenced by a combination of nursing interventions and socioeconomic factors. While nurse-delivered counseling particularly education and family involvement plays a central role, external factors such as financial stability and healthcare access are equally important. These results support the alternative hypothesis that nurse-delivered counseling is associated with improved treatment adherence and outcomes. However, it is important to note that not all interventions showed statistical significance, indicating that adherence is a complex, multifactorial issue requiring a comprehensive approach.

In comparison with previous studies, the findings of this research are largely consistent, reinforcing the importance of patient-centred care in TB management. However, this study contributes additional insight by providing row-wise statistical evidence, highlighting which specific interventions and factors have the strongest impact. Despite these important findings, the study has some limitations. The use of a cross-sectional design limits the ability to establish causality. The sample size was relatively small (n = 54), which may affect the generalizability of the results. Additionally, the study was conducted in a single healthcare setting, which may not represent other regions or populations.

The findings of the present study demonstrated that nurse-delivered counseling plays a significant role in improving treatment adherence and clinical outcomes among patients with pulmonary tuberculosis. Patients who received proper education, motivation, and continuous counseling from nurses showed better adherence to anti-tuberculosis therapy and improved treatment-related behaviours. The current study revealed that nurse education and communication with family members had a statistically significant association with treatment adherence, indicating the importance of patient-centred counseling interventions in tuberculosis management.

These findings are supported by the systematic review and meta-analysis titled “The Impact of Digital Adherence Technologies on Treatment Outcomes, Adherence, and Patient-Reported Outcomes in Tuberculosis” conducted by Mohamed et al. (2025). The study reported that adherence-support interventions such as video-observed therapy, smartphone applications, SMS reminders, and digital monitoring systems contributed to improved treatment adherence and treatment success among tuberculosis patients. The authors emphasized that continuous patient engagement and supportive communication positively influenced patient compliance and satisfaction. This is consistent with the present study, where regular counseling and continuous nurse-patient interaction improved adherence behaviours and treatment outcomes.

Similarly, the findings of the present study are supported by the meta-analysis titled “A Meta-analysis of Technology-Based Interventions on Treatment Adherence and Treatment Success among TBC

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Patients" conducted by Huda et al. (2024). The study concluded that communication-based and technology-supported interventions significantly improved treatment adherence, treatment completion, and treatment success among tuberculosis patients. The researchers highlighted that regular follow-up, patient reminders, and supportive communication increased patient motivation and encouraged continuation of therapy. These observations are in line with the current study, which demonstrated that counseling provided by nurses enhanced patient understanding, strengthened treatment commitment, and promoted adherence to anti-tuberculosis medication.

Furthermore, the present study findings are also supported by the systematic review titled "Determinants of Medication Adherence in Pulmonary Tuberculosis: A Systematic Review" conducted by Siti Rahmah et al. (2025). The review identified several important factors affecting medication adherence among pulmonary tuberculosis patients, including patient education, healthcare provider communication, family support, motivation, accessibility to healthcare services, and socioeconomic conditions. The study emphasized that effective communication between healthcare providers and patients plays a major role in improving adherence behaviours and treatment outcomes. These findings strongly support the present study, where nurse-delivered counseling, family communication, and patient education showed a significant positive relationship with treatment adherence and clinical improvement.

In addition, the present study identified that socioeconomic factors such as family support, stable economic conditions, and access to healthcare services significantly influenced treatment adherence. Similar findings were reported by Siti Rahmah et al. (2025), who concluded that social support systems, healthcare accessibility, and patient awareness are important determinants of successful tuberculosis treatment adherence. Likewise, Mohamed et al. (2025) reported that patient-centred adherence interventions improved treatment engagement and patient satisfaction, while Huda et al. (2024) highlighted the importance of continuous support and monitoring in reducing treatment interruption and improving therapeutic outcomes.

Therefore, the findings of the current study are strongly supported by previous literature, which confirms that counseling-based interventions, continuous patient education, family involvement, and supportive healthcare communication are essential for improving treatment adherence and clinical outcomes among pulmonary tuberculosis patients. Nurse-delivered counseling remains a valuable patient-centred strategy that can strengthen tuberculosis control programs by reducing treatment default, improving adherence, and enhancing overall patient recovery.

The findings of the present study demonstrated that nurse-delivered counseling significantly improved treatment adherence and clinical outcomes among patients with pulmonary tuberculosis. Patients who received proper education, motivation, regular follow-up, and communication from nurses showed improved adherence to anti-tuberculosis therapy. The study further identified that nurse education and family communication had a statistically significant association with treatment adherence, indicating the importance of patient-centred counseling interventions in tuberculosis management.

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However, some previous studies reported findings that were partially contradictory to the current study. A systematic review conducted by James Machoki M'Imunya, Kredo, and Volmink evaluated the effectiveness of patient education and counseling interventions on tuberculosis treatment adherence. The review concluded that evidence regarding counseling effectiveness remained inconsistent and insufficient across different settings. Although a few interventions showed improvement in treatment completion, the authors emphasized that overall evidence quality was low and outcomes varied considerably among studies. Some counseling interventions failed to produce statistically significant improvement in adherence rates. This finding partially contradicts the present study, where nurse-delivered counseling showed a clear statistically significant positive association with treatment adherence and clinical improvement.

The contradiction may be explained by differences in study populations and intervention methods. The review by M'Imunya et al. Included adolescents, prisoners, and children from different countries, while the current study focused specifically on pulmonary tuberculosis patients receiving continuous nurse-delivered counseling in a clinical setting. In the contradictory review, one study involving adolescents showed no significant improvement because adherence rates were already high in the control group. In contrast, the present study demonstrated that continuous counseling, education, and family communication significantly strengthened patient commitment to treatment and reduced non-adherence behaviours.

Similarly, the systematic review by Ivan S. Pradipta reported that educational and behavioral interventions did not consistently improve tuberculosis medication adherence. The authors concluded that counseling interventions alone were sometimes insufficient because treatment adherence is also influenced by socioeconomic barriers, healthcare accessibility, stigma, and behavioural factors. Some interventions showed only minimal improvement in treatment completion rates despite patient education efforts. These findings partially contradict the present study, where counseling interventions delivered by nurses were highly effective in improving adherence behaviours and treatment continuation among pulmonary tuberculosis patients.

The contradiction between the studies may be due to variations in healthcare systems and counseling quality. In the present study, counseling was delivered continuously by nurses who maintained regular communication and patient follow-up throughout treatment. However, in the contradictory studies, some interventions were limited to short educational sessions or indirect behavioral support, which may have reduced their effectiveness in influencing long-term adherence behaviour.

Furthermore, the scoping review conducted by Isabel Foster et al. Reported limited empirical evidence regarding the direct effectiveness of counseling on tuberculosis treatment outcomes. The authors stated that many studies lacked strong methodological designs and sufficient comparator groups to confirm whether counseling alone significantly improved adherence or clinical recovery. They emphasized that evidence-based counseling strategies in tuberculosis care still require further investigation and standardization. This finding differs from the present study, which demonstrated a direct and statistically significant relationship between nurse-delivered counseling and improved treatment adherence. The contradiction may also be related to contextual and environmental

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differences. The present study emphasized continuous patient-centred counseling, family involvement, and nurse-patient interaction, which may have enhanced patient trust, motivation, and treatment commitment. Conversely, the contradictory studies highlighted methodological limitations, inconsistent intervention delivery, and variations in patient support systems that may have weakened the observed effectiveness of counseling interventions.

Therefore, although previous literature reported inconsistent or insufficient evidence regarding counseling effectiveness in tuberculosis care, the present study demonstrated that structured nurse-delivered counseling, patient education, and family communication significantly improved treatment adherence and clinical outcomes among pulmonary tuberculosis patients. These differences suggest that the effectiveness of counseling interventions may depend on the continuity of support, quality of healthcare communication, patient engagement, and the clinical setting in which counseling is delivered.

5.1 Conclusion

This study was conducted to assess the role of nurse-delivered counseling in enhancing treatment adherence and outcomes among patients with pulmonary tuberculosis. Based on the findings, it can be concluded that treatment adherence among TB patients is influenced by both healthcare-related interventions and socioeconomic factors.

The results indicated that the majority of patients demonstrated moderate adherence, highlighting that while patients are partially compliant, there is still a need for improvement to achieve optimal treatment outcomes. Nurse-delivered counseling emerged as a critical factor in improving adherence. In particular, educational interventions and communication with family members showed a statistically significant impact on patient compliance, emphasizing the importance of patient awareness and social support in treatment success. Although some nursing strategies such as reminders and home visits did not show strong statistical significance, they still contributed positively to adherence and should not be overlooked. These interventions may be more effective when implemented consistently and in combination with other counseling approaches.

Furthermore, the study identified key socioeconomic factors influencing adherence. Family support, access to healthcare facilities, and stable economic conditions were all significantly associated with improved compliance. This demonstrates that adherence is not solely dependent on medical interventions but is also shaped by the patient's social and economic environment. Overall, the study concludes that nurse-delivered counseling plays a vital and effective role in improving treatment adherence and outcomes in pulmonary tuberculosis, particularly when combined with supportive socioeconomic conditions. Strengthening these aspects can contribute significantly to better patient outcomes and effective tuberculosis control.

5.2 Recommendations

Based on the findings of the study, the following recommendations are proposed to improve treatment adherence and outcomes among TB patients:

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1. **Strengthening Nurse-Delivered Counseling:**
Nurses should provide structured, continuous, and patient-centred counseling, focusing on education about the disease, treatment importance, and consequences of non-adherence.

2. **Enhancing Patient Education Programs:**
Healthcare institutions should implement regular educational sessions to improve patient awareness and understanding of tuberculosis and its treatment.

3. **Promoting Family Involvement:**
Family members should be actively engaged in the treatment process, as their support significantly enhances patient adherence and motivation.

4. **Improving Access to Healthcare Services:**
Efforts should be made to ensure easy and timely access to healthcare facilities, especially for patients living in remote or underserved areas.

5. **Providing Economic Support:**
Financial assistance programs should be introduced to reduce the economic burden on TB patients, enabling them to complete their treatment without interruption.

6. **Training and Capacity Building for Nurses:**
Nurses should receive specialized training in counseling, communication skills, and behavioural change techniques to enhance the effectiveness of their interventions.

7. **Integration of Counseling into TB Programs:**
Structured counseling should be formally integrated into national and institutional tuberculosis control programs

5.3 Future Research Suggestions
To build upon the findings of this study, the following areas are recommended for future research:

1. **Larger and Diverse Sample Studies:**
Future studies should include larger sample sizes and multiple healthcare settings to improve the generalizability of findings.

2. **Longitudinal Research Designs:**
Long-term studies are needed to evaluate the sustained impact of nurse-delivered counseling on treatment adherence and clinical outcomes.

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3. Comparative Studies of Counseling Interventions:
Research comparing different types of counseling approaches (educational, psychological, digital-based) would help identify the most effective strategies.

4. Use of Digital Health Technologies:
Future research should explore the role of mobile health interventions, such as SMS reminders and tele-counseling, in improving adherence.

5. Multidisciplinary Approach:
Studies should examine the combined role of nurses, doctors, and community health workers in improving patient outcomes.

6. Exploration of Psychological and Cultural Factors:
Further research is needed to understand how stigma, beliefs, and cultural practices influence treatment adherence.

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