Boosting Treatment Adherence Among Tuberculosis Patients: Evaluating The Efficacy Of Self-Management Training Program

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Abstract

Introduction: *Tuberculosis (TB) remains a pressing global health challenge, with India bearing the highest burden. Although anti-tuberculosis treatment (ATT) is available under the National Tuberculosis Elimination Program (NTEP), adherence remains suboptimal due to socioeconomic barriers, stigma, and limited patient support. Effective self-management is crucial for treatment adherence and successful TB control. This study aimed to evaluate the effectiveness of a structured self-management training program in improving motivation and knowledge related to treatment adherence among TB patients in India.*

Methods: *A quasi-experimental, non-equivalent pretest-posttest control group design was employed. A total of 260 TB patients receiving treatment under DOTS at two centers in Patna, Bihar, were selected using purposive sampling. Participants were divided into experimental (n=130) and control (n=130) groups. The experimental group received a six-week structured self-management training program, while the control group received standard care. The Modified Morisky Scale (MMS) was used to measure motivation and knowledge related to adherence. Data were analyzed using non-parametric tests due to lack of normality.*

Results: *At baseline, both groups showed no significant differences in motivation and knowledge (p>0.05). Post-intervention analysis revealed a significant increase in the experimental group's motivation (mean: 2.73) and knowledge (mean: 2.92) compared to pretest scores (0.51 and 0.78 respectively), with p-values <0.01. The control group showed no significant change (motivation: p=0.46; knowledge: p=0.66).*

Discussion: *The findings demonstrate that structured self-management training significantly enhances motivation and knowledge regarding TB treatment adherence. This approach is especially valuable in resource-constrained settings where traditional methods like DOT have limitations.*

Keywords: *Tuberculosis, Self-management, Adherence, Anti-tuberculosis treatment, Community.*

INTRODUCTION:

Tuberculosis (TB), caused by *Mycobacterium tuberculosis*, continues to be a major global health concern, affecting around 10 million people annually[1,2] and ranking among the top ten causes of death worldwide. Although TB treatment is effective, it is often prolonged—typically 6 months for drug-susceptible TB, at least 3 months for latent TB infection (LTBI), and up to 24 months for multi-drug resistant TB (MDR-TB) and is frequently accompanied by side effects, making adherence difficult[3,4].

Poor adherence can lead to treatment failure, relapse, drug resistance, and increased morbidity and mortality[5,6,7]. Adherence is influenced by multiple factors, including socio-economic status, healthcare access, disease severity, therapy complexity, and patient beliefs[8,9,10]. Studies from both high- and low-income settings have highlighted these determinants[11,12,13,14], while various interventions such as directly observed therapy (DOT)[15], video observed therapy (VOT)[16], financial incentives, patient education, reminder systems (e.g., SMS, calls, electronic pillboxes), and psychosocial support have been employed to improve adherence[17].

Effective self-management plays a crucial role in TB control, requiring patients to adhere to medication regimens, maintain proper nutrition, engage in physical activity, and manage their mental well-being. Strengthening these behaviors not only enhances individual recovery but also helps curb the spread of TB in communities. However, many patients struggle with consistent self-management due to socioeconomic barriers, stigma, or lack of support, highlighting the need for innovative approaches to

patient care

Self-management refers to the individual's ability to manage symptoms, treatment, physical and psychosocial consequences, and lifestyle changes inherent in living with a chronic condition. In the context of TB, self-management encompasses a range of behaviors, including consistent medication adherence, symptom monitoring, maintaining proper nutrition, and addressing psychological challenges. Effective self-management empowers patients, fosters autonomy, and promotes sustained engagement with treatment protocols[18].

Recent research has explored various self-management interventions aimed at enhancing TB treatment adherence. For instance, a study evaluating an mHealth intervention based on the Integrated Theory of Health Behavior Change (ITHBC) demonstrated improved self-care management among pulmonary TB patients[19]. Another study highlighted the effectiveness of self-management counseling in increasing self-efficacy related to health-seeking behavior and treatment adherence in pulmonary TB patients. Additionally, digital health technologies, such as mobile applications and electronic reminders, have shown promise in supporting self-management behaviors and improving adherence rates.[20]

However, many of these strategies focus on structural aspects, often overlooking the patient's personal and social experiences. Given TB's close link to social determinants of health, understanding these individual perspectives is essential for designing more effective and realistic adherence interventions, especially in resource-limited settings. Enhancing TB treatment adherence through self-management training represents a vital component of comprehensive TB care. By addressing individual behavioral and psychosocial factors, self-management interventions can empower patients, improve adherence, and ultimately contribute to better health outcomes. Continued research and implementation of evidence-based self-management strategies are essential to advancing TB control efforts globally.

India bears the highest burden of tuberculosis (TB) globally. Despite the availability of free treatment under the National Tuberculosis Elimination Program (NTEP), adherence to therapy remains a major challenge due to socioeconomic barriers, stigma, medication side effects, and limited patient-centered support. Traditional approaches like Directly Observed Therapy (DOT) have shown limitations in addressing these complex, multifactorial issues. Recent studies emphasize the need for self-management training to empower patients in managing their treatment more effectively. However, there is a lack of research evaluating the effectiveness of such interventions within the Indian context, where health behaviors are deeply influenced by cultural, social, and economic factors.

The aim of this study is to evaluate the effectiveness of self-management training program in improving TB treatment adherence among Indian patients. Specifically, the study seeks to assess the impact of self-management training on adherence, identify its most effective components, and explore the barriers and facilitators affecting its implementation. Ultimately, this study aims to offer evidence-based recommendations for integrating self-management training into existing TB control programs in India, thereby enhancing treatment outcomes and supporting the nation's TB elimination goals.

MATERIAL AND METHODS:
Design
This study employed a quantitative research approach using a quasi-experimental, non-equivalent pretest-posttest control group design. The study included two groups experimental and control comprising men and women with tuberculosis in a community setting. The experimental group received a structured self-management training intervention focused on education about TB, medication adherence, adverse drug reactions, diet, healthy lifestyle, and preventive measures. The control group received standard care. A post-test was conducted for both groups to evaluate the effectiveness of the intervention. The eligibility criteria for the study included adults aged 18–60 years who were diagnosed with either pulmonary or extrapulmonary tuberculosis and were currently receiving anti-tuberculosis treatment (ATT) under the DOTS program, with a willingness to participate and provide informed consent. Patients were excluded if they were diagnosed with multidrug-resistant (MDR) or extensively drug-resistant (XDR) TB, or if they were not undergoing treatment or had already completed their treatment regimen. The data collection was carried between June to December 2024. The ethical approval was obtained from the Kurji Holy Family Hospital (Ref. QM.5.1/KHFH/32?2023) and Written Informed consent was Taken from the Participants after explain the research outcome.

Sample technique and Sample Size
The study setting was selected using convenient sampling, wherein two DOTS centers in Patna, Bihar, were chosen based on accessibility and feasibility for the researcher. Within these centers, participants

were selected using purposive sampling, ensuring that only eligible TB patients meeting the inclusion criteria such as age range, type of TB, and current treatment status were included in the study.

The total sample size was 260 participants, with 130 each in the experimental and control groups. The sample size was calculated based on the TB prevalence rate (22) in Bihar[21] using the formula:

$$n = Z^2 \times P(1-P) / d^2$$

Where:

- $Z = 1.96$ (95% confidence interval)
- $P = 0.22$ (prevalence rate)
- $d = 0.05$ (margin of error)

$$n = 3.84 \times 0.22(1 - 0.22) / 0.0025 = 263.1 \approx 260$$

Hence, 130 participants were allocated to each group.

ariables:

The study included three categories of variables. The independent variable was the self-management training, which comprised education on tuberculosis, adherence to treatment, diet, lifestyle modifications, counseling, and preventive strategies. The dependent variables were treatment adherence and the quality of life of TB patients. The demographic variables considered in the study included age, gender, educational status, monthly income, religion, occupation, type of family, area of residence, duration of anti-tuberculosis treatment (ATT), type of tuberculosis, and family history of TB.

Data collection Tool:

The data collection instruments consisted of two main sections. The demographic profile of participants, including 12 items such as age, gender, marital status, occupation, monthly income, type of family, area of residence, type of tuberculosis, and duration of anti-tuberculosis treatment. The Modified Morisky Scale (MMS), a 6-item questionnaire designed to assess treatment adherence by evaluating two key domains called motivation and knowledge each with a maximum score of 3, providing a structured measure of the participants' adherence behavior.

Self-Management Training Program

To address gaps in treatment adherence, a six-week structured self-management training program was developed specifically for TB patients. The program aimed to enhance treatment adherence and improve quality of life by equipping participants with essential knowledge and skills for managing their condition. The training was delivered through weekly sessions lasting 30 minutes for 4 weeks, focusing on key areas such as the etiology and transmission of TB, treatment protocols under the DOTS strategy, managing medication side effects, maintaining adequate nutrition and hygiene, and strategies to support consistent medication adherence. Educational materials included flex charts, informative pamphlets, and an instructional video that was reviewed and approved by subject matter experts.

Facilitators who delivered the training had undergone specialized TB training certified by the Centers for Disease Control and Prevention (CDC), ensuring content accuracy and adherence to global best practices. Prior to full-scale implementation, the training program was reviewed by healthcare professionals and piloted on a small group of patients to refine content and delivery methods. This ensured that the intervention was contextually appropriate and aligned with patient needs and healthcare system capabilities.

The implementation of the self-management training followed a six-phase process. The first phase involved assessing each patient's treatment history and understanding of TB through medical record reviews and brief interviews. In the second phase, individualized management goals were developed collaboratively with patients. The third phase focused on engaging participants, securing informed consent, and building rapport. In the fourth phase, the training sessions were delivered weekly, incorporating interactive discussions and visual aids to enhance understanding and retention. The fifth phase involved monitoring patients' adherence behavior using the Modified Morisky Scale to track improvements over time. Finally, in the sixth phase, the program concluded with a review of key messages, reinforcement of treatment goals, and strategies for sustaining adherence beyond the program period.

RESULTS:

The demographic characteristics of the experimental and control groups showed both similarities and differences. A higher proportion of participants in the 18–27 age group were in the experimental group (69.2%) compared to the control group (54.6%), while the control group had more participants aged 28–37 (22.3% vs. 11.5%). Income levels and occupational distribution were similar, with 40.8% in both

groups earning below ₹15,000 and equal representation (39.2%) in unspecified occupations. Most participants resided in rural areas (83.8% experimental, 82.3% control). Both groups had comparable ATT durations, with around 39% having less than one month and about 31% between 1–3 months. Pulmonary TB was the most common type in both groups (72.3% experimental, 70.8% control).

Table 1 Homogeneity comparison of Level of Motivation and Knowledge between the Experimental and Control group   **(N=260)**

Outcome Measure	Experimental group (n=130)		Control Group (n=130)		Z	p
	Mean	SD	Mean	SD		
Modified Morisky Scale						
Level of Motivation	0.52	0.50	0.47	0.50	-0.74	0.46
Level of Knowledge	0.78	0.41	0.76	0.43	-0.44	0.66

The table (1) presents the mean, standard deviation (SD), and homogeneity comparison of outcome variables between the experimental and control groups. The Modified Morisky Scale results show similar means for both groups in motivation and knowledge levels, with Z values of -0.74 (p = 0.46) for motivation and -0.44 (p = 0.66) for knowledge, indicating no significant difference.

Table 2 Effectiveness of self management training on Motivation and Knowledge in experimental and control groups.   **(N=260)**

Modified Morisky Scale	Pre-Mean (SD)	Post Mean (SD)	Z value	P Value
Level of Motivation				
Experimental group	0.51 (0.50)	2.73 (0.70)	-10.09	<0.01
Control group	0.46 (0.50)	0.49 (0.50)	-0.74	0.46
Level of Knowledge				
Experimental group	0.78 (0.41)	2.92 (0.38)	-10.46	<0.01
Control group	0.76 (0.42)	0.75 (0.43)	-0.44	0.66

The table (2) demonstrates the effectiveness of the intervention on motivation and knowledge in both the experimental and control groups, based on the Modified Morisky Scale. For Level of Motivation, the experimental group showed a significant increase in the post-intervention mean score (2.73) compared to the pre-intervention mean score (0.51), with a Z value of -10.09 and a p-value of <0.01, indicating a statistically significant improvement. In contrast, the control group had only a slight change from 0.46 to 0.49, with a Z value of -0.74 and a p-value of 0.46, indicating no significant change. Regarding Level of Knowledge, the experimental group also showed a significant improvement, with a pre-intervention mean of 0.78 and a post-intervention mean of 2.92, resulting in a Z value of -10.46 and a p-value of <0.01. The control group, however, had little to no change, with the pre-intervention mean of 0.76 and post-intervention mean of 0.75, leading to a Z value of -0.44 and a p-value of 0.66, indicating no significant change. These results suggest that the intervention had a significant impact on both motivation and knowledge in the experimental group, while no significant changes were observed in the control group.

DISCUSSION

This study aimed to evaluate the effectiveness of self-management training in improving treatment adherence among tuberculosis (TB) patients in a community setting. The results indicate that self-management training significantly enhanced the motivation and knowledge of TB patients regarding their treatment and care, as evidenced by the substantial improvements in the experimental group compared to the control group.

Effectiveness of Self-Management Training: The findings from the pre-test and post-test scores on the Modified Morisky Scale (MMS) clearly demonstrate that the self-management training intervention had a profound impact on both the motivation and knowledge levels of the experimental group. Participants

in the experimental group showed a marked increase in motivation and knowledge, with mean scores rising from 0.51 to 2.73 for motivation and from 2.73 to 2.92 for knowledge. These changes were statistically significant ($p < 0.01$), indicating that the intervention was highly effective in enhancing the patients' understanding of their treatment and their commitment to adhering to it.

In contrast, the control group, which did not receive the self-management training, showed minimal changes in their motivation (0.46 to 0.49) and knowledge (0.76 to 0.75), suggesting that standard care alone was insufficient to bring about significant improvements in adherence behaviors. This underscores the importance of targeted interventions, such as self-management training, which address both the cognitive and emotional aspects of treatment adherence.

Several studies supported the effectiveness of self-management interventions in improving tuberculosis (TB) treatment adherence. A study in India demonstrated that mobile health tools providing reminders and educational content significantly enhanced adherence[22]. Similarly, a South African program combining TB education, stress management, and medication adherence improved patients' quality of life and treatment outcomes[23]. A systematic review further highlighted the role of digital technologies such as mobile apps and electronic pillboxes in boosting adherence, especially in low-resource settings[24]. Additionally, a Nigerian study showed that targeted patient education on TB awareness and treatment completion led to significantly higher adherence rates than standard care[25]. Collectively, these findings underscore the value of self-management training, education, and digital tools in empowering TB patients and improving adherence to treatment.

Impact on Adherence to Treatment: Although the study focused primarily on the impact of self-management training on motivation and knowledge, it is well-established that improvements in these areas can directly influence treatment adherence. TB treatment adherence is a multifaceted issue, influenced by a variety of factors including socio-economic conditions, the complexity of the treatment regimen, and the psychological challenges associated with a long and often arduous treatment process. By improving patients' understanding of their condition and the importance of consistent treatment, self-management training empowers patients to better manage their own care, leading to improved adherence rates.

Furthermore, the intervention's success in increasing motivation and knowledge highlights the potential for similar programs to be integrated into TB control strategies globally, particularly in resource-limited settings where challenges such as stigma, lack of healthcare infrastructure, and medication side effects are prevalent.

Barriers and Facilitators to Effective Implementation: The study also suggests that while self-management training is an effective intervention, its success is contingent upon several factors. Socioeconomic barriers, including poverty and limited access to healthcare resources, continue to pose significant challenges to treatment adherence. These barriers can be mitigated through a more holistic approach to TB care, which incorporates not just medical treatment, but also social support and education on managing the disease within the home and community.

Contextual Factors and Implications for India: The results of this study are particularly relevant for India, which bears the highest burden of TB globally. Despite the availability of free treatment through the National Tuberculosis Elimination Program (NTEP), adherence to therapy remains a significant challenge. Socioeconomic factors, cultural beliefs, and the stigma associated with TB contribute to patients' reluctance to adhere to the prescribed treatment. The self-management training intervention in this study provides a promising strategy to address these issues, particularly in rural areas where healthcare access is often limited.

By incorporating self-management training into existing TB care programs, healthcare providers can empower patients to take control of their health, leading to improved adherence and better health outcomes. This approach could also support India's ambitious TB elimination goals by reducing treatment interruptions, preventing drug resistance, and ultimately lowering TB-related morbidity and mortality.

CONCLUSION: In conclusion, this study demonstrates that self-management training is an effective intervention for improving treatment adherence among TB patients. By enhancing patients' motivation and knowledge, this approach empowers individuals to take greater responsibility for their health and treatment outcomes. The success of this intervention has significant implications for TB control strategies in India and other countries with high TB burdens, offering a scalable, patient-centered solution to one

of the most pressing global health challenges. Future research should continue to refine self-management strategies and explore ways to integrate them into existing TB care frameworks to improve patient outcomes and support global TB elimination efforts.

Limitations and Future Research: While the findings from this study are promising, there are several limitations that should be considered. First, the study was conducted at two DOTS centers in Patna, Bihar, which may limit the generalizability of the results to other regions of India or to countries with different healthcare systems. Future studies could expand the sample size and include multiple locations to provide a broader understanding of the intervention's impact across diverse settings. Second, while the study focused on the short-term effects of the self-management training, long-term follow-up is essential to determine whether the improvements in motivation and knowledge are sustained and lead to enduring changes in treatment adherence. Further research could explore the sustainability of these interventions and examine whether periodic reinforcement or booster sessions are necessary to maintain adherence.

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