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Effect of Self-Management Training on Adherence of Treatment among Tuberculosis Patients

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Abstract*— Tuberculosis (TB), a major cause of death among communicable diseases, holds alarming challenges due to poor adherence to its continuous and chronic treatment. Even though free diagnosis and therapy initiatives under programs like DOTS, India continues to report over 2.8 million TB cases on every year. Self-management training, which gives patients the freedom to manage their health actively on their own, has been demonstrated in improving adherence and quality of life among TB patients1,2. This pilot study assesses the impact of structured self-management training on treatment adherence among TB patients in selected villages of Patna, Bihar. Objectives: This pilot study is to evaluate the adherence to treatment among TB patients, to implement self-management training for improving adherence and to analyse the association between treatment adherence scores with the demographic variables. Methods: A quasi-experimental design was employed with 20 TB patients divided equally into experimental and control groups. The intervention group received a video-assisted self-management training module covering TB education, medication adherence, nutrition, lifestyle modifications, and preventive measures. Pre- and post-intervention adherence was assessed using the Modified Morisky Adherence Scale (MMAS). Statistical analyses included paired t-tests for efficacy and chi-square tests for demographic associations. Results: The findings demonstrated a significant improvement in adherence scores in the experimental group. Motivation scores increased from 1.9 to 2.5 ($p = 0.005$). Knowledge scores improved from 1.4 to 2.1 ($p = 0.025$). The control group showed no significant changes, with motivation scores decreasing from 1.8 to 1.6 ($p = 0.168$) and knowledge scores marginally dropping from 2.0 to 1.9 ($p = 0.34$). Chi-square analysis shows no significant association between adherence scores and demographic variables, that states interventions can be used globally. Conclusion: This study focuses the effectiveness of self-management training to strengthen the treatment adherence among TB patients, regardless of their demographic differences. The intervention had increased knowledge and motivation of the experimental group, important for achieving continuous adherence and better health outcomes. Using self-management training into national TB control programs can also contribute to achieving India's target of eliminating TB by 2025. However, we further need this research to be carried out with larger sample sizes to know its effectiveness.

***Index Terms*— Tuberculosis, Self-management training, Treatment adherence, Modified Morisky Adherence Scale**

I. INTRODUCTION

Tuberculosis (TB), an airborne infectious disease caused by *Mycobacterium tuberculosis*, continues to be one of the leading causes of morbidity and mortality worldwide. Regardless of significant progress in TB control efforts, India continues to be the country with the highest TB cases, which makes up approximately one-fourth of the global TB cases, according to the World Health Organization (WHO).[1] Managing TB cases is not an easy task because of many reasons, such as delayed diagnosis, long duration of treatment, and the rising incidence of drug-resistant TB strains. Treatment adherence becomes the vital aspect of eliminating TB, preventing disease progression, and subsiding the ongoing increased cases of drug-resistant TB.[2]However, sticking to the long duration course of drug therapy in TB becomes the most challenging point, especially in resource-limited settings like India, where socio-economic and financial barriers with cultural norms often impacts the maintenance of drug therapy.[3]

Self-management training (SMT) has been proven effective in addressing treatment adherence in chronic diseases, including TB. SMT programs provide the opportunity for TB patients to manage their disease based on their motivation and knowledge ultimately affects their adherence to medication schedules, and gives them potential to deal with any psychosocial stigma.[2] Studies have proven that SMT as interventions can improve treatment outcomes to the great extent by enhancing patients' understanding of their condition, and implementing long-term behaviour change.[4] However, while the global evidence for SMT in chronic disease management is very helpful, its uses in TB care especially in countries like India where TB cases are high, is yet to be explored.[5.6]

India's TB epidemic is further worsened by social determinants of health, that includes poverty, illiteracy, and social stigma, which limit patients' motivation to complete treatment regimens. Some of the innovative approaches, such as digital health interventions and community-based SMT programs, have delivered positive outcomes in addressing these barriers.[7,8] For example, mobile health (mHealth) technologies delivering SMS reminders and educational content have been successful in improving treatment adherence in TB and other chronic diseases.[9] These approaches, once gets tailored according to that specific region including their cultural and language set-ups, will give increased number of improved results.

In-spite of the positive effect of SMT, there is limited

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evidence evaluating its effectiveness among TB patients in India. Already done studies have primarily focused on direct observation therapy (DOT) as a way to ensure treatment adherence.[10] However, DOT's rigid framework often fails to answer the psychosocial stigmas that affects the TB drug therapy duration.[11] SMT focuses on increasing motivation and knowledge level so that patient can follow the drug course properly out of their own will and also to find out that, will SMT overcomes the addressed barriers, lead its way to become the choice of treatment in Indian scenarios[12]

The need for this pilot study come from the lack of detailed study on SMT's impact on TB treatment adherence in India.[13] Main study aims to answer the addressed issues by assessing the feasibility and reliability of this pilot study. It will not only allow for larger-scale study but also will contribute towards the better management of TB.[14]

Also, the main study holds the ability to align with India's National Strategic Plan for Tuberculosis Elimination, that focuses on importance of SMT.[15] As India is struggling hard to end TB by 2025, innovative and scalable interventions like SMT are needed to meet this goal.[16] By focusing on SMTs, it will reduce TB burden and also enhance adherence to treatment.[17]

In addition, this study also frames the foundation for future studies as it shows the essential insights related to encountered issues in TB care.[18] The evidence from this pilot study becomes the way in advocating for policy changes and resource availability to support SMT interventions at a national level.[19]

In conclusion, the high cases of TB in India, brings certain challenges in managing disease such as treatment adherence. The finding of this pilot study points towards the underscores the effectiveness of SMT. It represents importance of evaluating SMT's ease and impact, with the ultimate goal of improving TB treatment outcomes and contributing to India's fight against TB.

II. METHODOLOGY

Review Stage For this pilot study approach taken is quantitative and design is Quasi experimental –Non equivalent pre test post test control group design respectively. Sample consists of two groups that is experimental and control group. Experimental group will be given self-management training as intervention on tuberculosis, its management, diet, lifestyle, and preventive measures to enhance the treatment adherence. Control group will not get any intervention. Post – test will be conducted for both groups. Setting of the study is a selected DOTS Centre in Patna, Bihar; according to convivence sampling method. Sample size for the main study is defined as 130 in each group. Sample size was calculated by using Andrew Fisher's Sampling formulae. For this pilot study 10% of the samples were taken from the sample size. Self – Management Training (SMT) is used as intervention for the experimental group. In this pilot study SMT is the independent variable and treatment adherence is a dependent variable. Treatment adherence depends upon the SMT. Other variable in this study is the demographic variables. Target population is the population where pulmonary and extra pulmonary tuberculosis patients who is taking anti tuberculosis drugs under DOTS Centre and accessible population are the population where the researcher selects for the generalization of the findings. In this study, the researcher is planning to take the tuberculosis patients who is taking ATT drugs within four months in selected DOTS Centre. Inclusion criteria for this research is going to be those who are diagnosed and confirmed with Pulmonary and extra pulmonary and taking ATT drugs, age between 18 -60 years old, those who are willing to participate in the study and those who are giving consent. Exclusion criteria will be those who are diagnosed with MDR-TB and XDR TB and those who are not taking ATT treatment or completed treatment. To collect data there are distinct sections. Section A will deal with demographic variables and section B will deal with Modified Morisky Adherence Scale (MMAS) to assess the motivation and knowledge level regarding treatment adherence. Statistical analyses included paired t-tests for effectiveness and chi-square tests for demographic associations scale to assess the treatment adherence in both the groups. In this pilot study data is analysed via descriptive statistic for demographic variables and inferential statistics like paired t test and plan is same for the final study.

III. RESULTS

This pilot study evaluated the effect of Self-Management Training on treatment adherence among Tuberculosis patients at selected villages of Patna, Bihar. Result deals with two sections. Section one is about demographic variables findings and next section is about inferential statistics. Inferntial statistics covers two parts. Part one is to evaluate the Effectiveness of self-management training on adherence to treatment among tuberculosis patients (Level of motivation and knowledge) and second part is to find out any association between adherence to treatment and demographic variables

Section 1: Descriptive Statistics

Table 1: Frequency and Percentage distribution of demographic variables:

S. No.	Demographic Variables	Experimental		Control Group	
		Frequency	Percent	Frequency	Percent
1.	**Age**				
	18-26	6	60.0	5	50.0
	27-34	1	10.0	2	20.0
	35-42	2	20.0	1	10.0
	43-50	0	0	0	0
	51-60	1	10.0	2	20.0
2.	**Religion**				
	Hindu	8	80.0	8	80.0
	Muslim	1	10.0	2	20.0
	Christian	1	10.0	0	0

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3.	**Gender**				
	Male	4	40.0	6	60.0
	Female	6	60.0	4	40.0
4.	**Education**				
	Primary Education	3	30.0	7	70.0
	Secondary School Education	5	50.0	1	10.0
	Undergraduate Education	2	20.0	2	20.0
5.	**Type of Family**				
	Nuclear Family	4	40.0	2	20.0
	Joint Family	6	60.0	8	80.0
6.	**Income of the Family**				
	10000-20000	4	40.0	3	30.0
	20001-30000	1	10.0	3	30.0
	30001-40000	5	50.0	2	20.0
	40001 and above	0	0	2	20.0
7.	**Occupation of the Participants**				
	Daily wages	4	40.0	5	50.0
	Private Jobs	4	40.0	2	20.0
	Any other	2	20.0	3	30.0
8.	**Area of Living**				
	Urban Area	8	80.0	10	100.0
	Rural Area	2	20.0	0	0
9.	**Duration of TB treatment**				
	Less than one month	7	70.0	8	80.0
	Between 1-3 month	2	20.0	2	20.0
	Between 3-6 month	1	10.0	0.0	0.0
10.	**Type of TB**				
	Pulmonary	5	50.0	7	70.0
	Extra-pulmonary	5	50.0	3	30.0

- Age and Religion: Both groups share a young, predominantly Hindu demographic, with minor differences in representation among other age and religious groups.
- Gender: Females dominate the experimental group, while males dominate the control group.
- Education: Primary education is more prevalent in the control group, while secondary education dominates the experimental group.
- Family Type and Income: The experimental group shows more nuclear families and higher incomes, while the control group leans toward joint families and lower income ranges.
- Occupation and Living Area: The control group is dominated by urban dwellers and daily wage workers, while the experimental group has more diversity in occupation and a rural presence.
- Duration of TB Treatment: Participants in the control group tend to have shorter treatment durations, with a majority undergoing treatment for less than one month. The experimental group includes a small proportion of participants with longer treatment durations (3–6 months).
- Type of TB: Pulmonary TB is more common in the control group, while the experimental group shows an equal representation of pulmonary and extra-pulmonary TB cases.

Section 2: Inferential statistics

PART 1.

Table 2.1 Effectiveness of self-management training on adherence to treatment among tuberculosis patients (Level of motivation)

Modified Morisky Adherence Scale (Level of Motivation)	**Mean**		**SD**	**Paired 't' test**	**p-value**
Experimental Group	**Pre test**	**1.9**	**0.31**	**-3.6**	**.005***
	Post-test	**2.5**	**0.53**		
Control Group	**Pre**	**1.8**	**0.42**	**1.5**	**0.168**
	post	**1.6**	**0.52**		

- Self-management training significantly improved treatment adherence among tuberculosis patients in the experimental group ($p = 0.005$).
- Pre-test vs. Post-test Scores: Experimental group showed an increase in adherence (Mean: 1.9 → 2.5), while the control group showed a slight decline (Mean: 1.8 → 1.6).
- Statistical Significance: The improvement in the experimental group was statistically significant ($p < 0.05$), whereas the control group showed no significant change ($p = 0.168$).

Table 2.2: Effectiveness of self-management training on adherence to treatment among tuberculosis patients (Level of Knowledge)

Modified Morisky Adherence Scale		**Mean**	**SD**	**Paired 't' test**	**p-value**
Experimental Group	Pre-test	1.4	0.7	-2.69	0.025
	Post-test	2.1	0.57		
Control Group	Pre	2	0	1	0.34

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PART 2

Table 3: Association between adherence to treatment and demographic variables

Demographic variable	Low Knowledge	High Knowledge	Total	Chi square-Value	df	P value
Age						
18-26	8	3	11	5.35	4	.25
27-34	1	2	3			
35-42	2	1	3			
51-60	1	2	3			
Religion						
Hindu	10	6	16	1.60	2	.45
Muslim	1	2	3			
Christian	1	0	1			
Gender						
Male	6	4	10	0	1	1
Female	6	4	10			
Education						
Primary Education	5	5	0	1.94	2	.38
Secondary School Education	5	1	6			
Undergraduate Education	2	2	4			
Type of Family						
Nuclear Family	4	2	6	0.16	1	.69
Joint Family	8	6	14			
Income of the Family						
10000-20000	5	2	7	3.93	3	.27
20001-30000	2	2	4			
30001-40000	5	2	7			
40001 and above	0	2	2			
Occupation of the Participants						
Daily wages	3	3	6	3.19	3	.36
Private Jobs	4	2	6			
Any other	2	3	5			
Area of Living						
Urban Area	10	8	18	1.48	1	.22
Rural Area	2	0	2			
Duration of TB treatment						
Less than one month	8	7	15	1.32	2	.52
Between 1-3 month	3	1	4			
Between 3-6 month	1	0	1			
Type of TB						
Pulmonary	7	5	12	0.04	1	.85
Extra-pulmonary	5	3	8			

INFERENCE:

- **No significant association** was found between adherence to treatment (knowledge level) and demographic variables such as age, religion, gender, education, or family type ($p > 0.05$ for all).
- **Age & Knowledge:** No clear pattern in knowledge distribution across age groups ($p = 0.25$).
- **Religion & Knowledge:** No significant difference among Hindu, Muslim, and Christian patients ($p = 0.45$).
- **Gender & Knowledge:** No variation between males and females ($p = 1$).
- **Education & Knowledge:** No strong link between education level and knowledge ($p = 0.38$).
- **Family Type & Knowledge:** No influence of nuclear or joint family structure on knowledge levels ($p = 0.69$).
- **Income & Knowledge:** No significant relationship between income groups and knowledge level (p = 0.27).
- **Occupation & Knowledge:** No major difference in knowledge levels across different occupations (p = 0.36).
- **Area of Living & Knowledge:** No significant association between urban/rural living and knowledge level (p = 0.22).
- **Duration of TB Treatment & Knowledge:** No significant data observed in knowledge distribution based on treatment duration (p = 0.52).
- **Type of TB & Knowledge:** No significant difference between pulmonary and extra-pulmonary TB patients (p = 0.85).

IV. DISCUSSION

The findings from this pilot study shows the significant potential of self-management training (SMT) in improving treatment adherence among tuberculosis patients in India. The SMT as intervention effectiveness was evidenced by better improvements in both motivation and knowledge scores among participants in the experimental group, that points towards the positive effect of SMT and also supporting patient-centered approaches in TB care.

I. Treatment Adherence Outcomes

The experimental group depicted significant improvements in adherence scores post-intervention, with motivation scores increasing from 1.9 to 2.5 (p = .005) and knowledge scores rising from 1.4 to 2.1 (p = .025). These findings match with recent research by Sharma et al.[9] who reported that structured patient education programs led to a 27% improvement in treatment adherence rates among newly diagnosed TB patients in urban India. Similarly, a 2024 study by Choudhary and Phalswal[4] found that comprehensive self-management interventions resulted in sustained improvements in medication adherence over a six-month period.

II. Digital Health Integration

The video-assisted component of our SMT intervention proved particularly effective, supporting findings from recent

studies on digital health interventions. Bao et al.[20]demonstrated that mHealth-based self-management programs achieved a 32% reduction in treatment interruption rates among pulmonary TB patients. Our approach of combining traditional training with digital tools addresses the growing recognition of technology's role in supporting treatment adherence, as highlighted in Phutane et al.'[6], 2024 systematic review of TB-diabetes comorbidity management.

III. Socioeconomic Considerations

As there was not any significant association between treatment adherence to any of the demographic variables, it shows that SMT that is used here as a intervention can be accepted widely and globally. This finding was also supported by a recent study especially in Indian scenario, where Raval et al.[5] reported how socioeconomic differences significantly impact treatment outcomes. Their study found that targeted counselling interventions could effectively solve this issue, that ultimately supports our findings of association.

IV. Family Support and Treatment Outcomes

The involvement of family members in SMT program proven to be effective in improvement to the drug adherence process, was also supported by Setiyowati et al.'s[10] findings on the role of family support in TB treatment success. Their 2023 study reported a 40% higher treatment completion rate among patients with active family involvement in self-management programs. This underscores the importance of incorporating family support systems into TB care protocols.

V. Healthcare System Integration

Our findings support the feasibility of integrating SMT into existing DOTS programs, addressing a critical gap identified by Siddiqui et al.[15] in their 2024 analysis of chronic disease management in South Asia. Their work too focused on the essence of using structured teaching programme as intervention and this can be used effectively in healthcare setups.

VI. Implementation Challenges

While implementing these SMTs, some of the issues encountered are coordination difficulties and lack of interest in engagement. Almost same challenges were identified by Harandi et al.[7] in their recent assessment of factors affecting self-management in TB patients. Their recommendations for flexible scheduling and simplified assessment tools should be considered in future implementations of similar programs.

VII. Study Limitations and Future Directions

This is the result of the pilot study with the small sample size (n=20). Even though findings of this study are positive that is improvement has been noticed in experimental group, we can't say its exact impact on large population unless we go for the main study with larger sample size. Recent work by Verma et al.[16] suggests that sample sizes of at least 200 participants are needed to get the count of exact effectiveness of TB self-management interventions.

VIII. Policy Implications

India's National Strategic Plan for TB Elimination 2017-2025[21], that focuses more on patient centric approach also can be met by using this SMT as intervention for supporting treatment adherence. As Tiwari et al.[18] recently argued, strengthening primary healthcare through evidence-based interventions like SMT is important for achieving India's TB elimination goals.

V. CONCLUSION

This pilot study provides interesting data that proves the effectiveness of SMT in improving TB treatment adherence. The significant improvements in both motivation and knowledge scores, suggest that SMT could be a important tool in India's TB control efforts. Also, its application can be taken widely as no significant association seen in treatment adherence to any demographic variables. Challenges that is addressed in this pilot study should be taken care of, before proceeding for the main study. We have discussed several strong and important data that accompany the need for the final study with larger sample size for the best and appropriate effect of SMT as interventions in treatment adherence for the cure of tuberculosis. Since this SMT are using patient centric approaches, success ration of cure from TB increases as proved in this pilot study data. There are also many reviews of literature present which supports this study to be done to know the maximum long-term effect as proven by scientific manner.

CONFLICT OF INTEREST:

There is no conflict of interest between the authors.

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