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Original Research Article

Enhancing Medication Adherence and Quality of Life Through Nurse-Led Education in Pulmonary Tuberculosis Patients

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Abstract: ***Background***: Tuberculosis (TB) is a major global public health problem, particularly in low- and middle-income countries. Poor medication adherence and a reduced quality of life are major challenges in TB management. ***Objective***: To evaluate the effectiveness of a nurse-led educational intervention on medication adherence and quality of life among pulmonary tuberculosis patients. Methodology: A quasi-experimental study with control and experimental groups was conducted at Christian Hospital Sahiwal over seven months. A total of 136 diagnosed pulmonary TB patients (68 per group) were selected using purposive sampling. The experimental group received structured nurse-led educational sessions based on the Health Belief Model, while the control group received routine care. Medication adherence was assessed using the Tuberculosis Medication Adherence Scale (TBMAS), and quality of life using the WHOQOL-BREF. Data were collected at baseline and one month post-intervention. Analysis was conducted using SPSS-25, applying the Wilcoxon Signed Rank Test with significance set at $p < 0.05$. ***Results:*** Post-intervention, the experimental group showed a significant increase in medication adherence (from 51.67% to 65.00%, $p < 0.001$) and quality of life (from 29.61% to 58.55%, $p < 0.001$). The control group demonstrated minimal change in adherence (55.00% to 56.67%, $p = 0.180$) and a small increase in quality of life (33.55% to 37.50%, $p = 0.011$). All WHOQOL-BREF domains improved significantly in the experimental group. ***Conclusion:*** Nurse-led educational intervention significantly enhanced both medication adherence and quality of life among pulmonary TB patients. Incorporating such interventions into routine TB care could strengthen treatment outcomes in resource-limited settings.

Keywords: Tuberculosis, Medication Adherence, Nurse-Led Intervention, Quality of Life, Health Education

INTRODUCTION

Tuberculosis (TB), caused by *Mycobacterium tuberculosis*, remains a leading infectious cause of morbidity and mortality worldwide (1). Although primarily a pulmonary disease, TB may also affect the brain, lymph nodes, kidneys, and spine (2). The disease is especially prevalent in low- and middle-income countries where poverty, overcrowding, malnutrition, and limited healthcare access persist (3). Immunocompromised individuals—such as those with HIV, diabetes, or chronic malnutrition—are at increased risk (4). Globally, approximately 10 million people develop TB annually, with the highest burden in India, Pakistan, Indonesia, and China (5). Pakistan alone reports more than 570,000 new TB cases each year, placing it among the top five high-burden countries worldwide (6).

Despite the availability of effective anti-TB drugs, poor adherence, long treatment duration, drug toxicity, and limited patient knowledge significantly reduce treatment success (7). Inadequate adherence contributes to relapse, transmission, and the development of multidrug-resistant (MDR) and extensively drug-resistant (XDR) TB (8), with global treatment success rates estimated at only 54% (9). The DOTS strategy was introduced to combat these

challenges (10), but its implementation faces barriers including workforce shortages (11), patient inconvenience, stigma (12), and frequent treatment interruptions (13). Consequently, there is a need for patient-centered and innovative strategies to improve adherence (14).

The WHO End TB Strategy emphasizes education, digital reminders, and supportive supervision as key approaches (15). Among these, nurse-led educational interventions are particularly promising (16). Nurses maintain continuous patient contact, enabling them to improve knowledge, address misconceptions, and strengthen motivation (17). Evidence suggests that educational interventions reduce stigma, enhance treatment adherence, and ultimately improve quality of life among TB patients (18).

Despite global recommendations, there is limited evidence from Pakistan regarding structured nurse-led educational programs targeting TB adherence and quality of life. This study aims to fill this gap by evaluating the impact of a nurse-led educational intervention on medication adherence and quality of life among pulmonary TB patients.

Methodology

Study Design and Setting

A quasi-experimental study with control and experimental groups was conducted at Christian Hospital Sahiwal, Pakistan, over a period of seven months (March–September 2025).

Sample Size and Sampling Technique

A total of **136 diagnosed pulmonary TB patients** were enrolled using purposive sampling. Participants were divided into control (n = 68) and experimental (n = 68) groups.

Inclusion Criteria

- Diagnosed pulmonary TB patients
- Aged 18 years and older
- On anti-TB medication for at least two weeks
- Able to provide informed consent

Exclusion Criteria

- Patients with MDR-TB or XDR-TB
- Critically ill patients unable to participate
- Patients with known psychiatric illness

Intervention

The experimental group received structured nurse-led educational sessions based on the Health Belief Model. The intervention included:

- Education on TB transmission, prevention, and treatment
- Importance of medication adherence
- Management of side effects
- Use of medication diaries
- Daily and weekly SMS reminders
- Counseling on lifestyle and nutrition

Sessions were delivered once weekly for four weeks (45–60 minutes each).
The control group received routine TB care only.

Data Collection Instruments

1. **Tuberculosis Medication Adherence Scale (TBMAS)** – reliable and validated (α = 0.81) (19).
2. **WHOQOL-BREF Questionnaire** – assessing physical, psychological, social, and environmental domains (α = 0.87) (20).

Data were collected at baseline and one month after completion of the intervention.

Data Analysis

Data were analyzed using SPSS version 25. Since the data were non-parametric, the Wilcoxon Signed Rank Test was applied for pre- and post-intervention comparison within groups. A p-value < 0.05 was considered statistically significant.

Ethical Considerations

Ethical approval was obtained from the University of Lahore and hospital administration. Written informed consent was obtained from all participants, and confidentiality was maintained throughout.

RESULTS

4.1 Demographic Characteristics

Table 4.1 presents the demographic characteristics of the participants (n = 136) in both experimental and control groups. The majority of participants in the experimental group were aged 18–35 years (52.9%), whereas in the control group most were above 65 years (36.8%). Females were slightly more represented in both groups, with 61.8% in the experimental group and 52.9% in the control group. In terms of marital status, most participants were single in both groups (58.8% experimental, 61.8% control). Regarding education, a considerable proportion of participants had completed high school in the experimental group (29.4%), while the control group had a higher percentage of participants with intermediate or above education (32.4%). Occupation-wise, daily wage workers made up the largest group in both experimental (42.6%) and control (52.9%) categories. More participants in the experimental group resided in urban areas (64.7%), while the control group had a majority from rural areas (61.8%). For monthly household income, most participants reported earnings between PKR 20,001–40,000 in both groups (35.3% experimental, 30.9% control).

Table 4.1 ***Demographics characteristics of participants (n=136)***

Sr#	Demographic Variables	Category	Group	
			Experimental f (%)	Control f (%)
1	Age in Years	18-35 years	36(52.9%)	19(27.9%)
		36-50years	15(22.1%)	10(14.7%)
		51-65 years	15(22.1%)	14(20.6%)
		> 65 years	2(2.9%)	25(36.8%)
2	Gender	Male	26(38.2%)	32(47.1%)
		Female	42(61.8%)	36(52.9%)
3	Marital Status	Single	40(58.8%)	42(61.8%)
		Married	28(41.2%)	26(38.2%)
		Divorced	0(0%)	0(0%)
4	Education Level	Illiterate	16(23.5%)	12(17.6%)
		Primary school	15(22.1%)	20(29.4%)
		High school	20(29.4%)	14(20.6%)
		Intermediate & above	17(25.0%)	22(32.4%)
5	Occupation	Unemployed	12(17.6%)	7(10.3%)
		Daily wage worker	29(42.6%)	36(52.9%)
		Government/Private employee	8(11.8%)	4(5.9%)
		Skilled worker	19(27.9%)	21(30.9%)
6	Area of Residence	Urban	44(64.7%)	26(38.2%)
		Rural	24 (35.3%)	42(61.8%)
7	Monthly Household Income (in PKR)	< 20000	17(25.0%)	19(27.9%)
		20001-40000	24(35.3%)	21(30.9%)
		40,001 – 60,000	14(20.6%)	18(26.5%)
		> 60,000	13(19.1%)	10(14.7%)

n=number of participants, f=frequency,%=percentage

Table 4.2 ***Group wise Comparison of Pre and Post Intervention Score of medicine adherence and quality of life***

Score	Control Group		p-value	Experimental Group		p-value
	Pre	Post		Pre	Post	
Medicine Adherence (%)	55.00 (50.83-60.00)	56.67 (51.88-67.50)	0.180	51.67 (45.83-62.92)	65.00 (58.54-74.17)	<0.001*
Quality of life (%)	33.55 (24.01-45.72)	37.50 (29.28-49.67)	0.011*	29.61 (20.07-40.79)	58.55 (42.44-68.42)	<0.001*
Overall Quality of Life and General Health	3.5 (3-5)	4 (3-5)	0.063	3 (2-4)	6 (4-8.75)	<0.001*
Physical Health	13 (10.25-15)	14 (11-17)	0.524	12 (10-14)	19 (14-23)	<0.001*
Psychological	7 (5-8)	7 (6-8)	<0.001*	7 (5-8)	11 (9.25-12)	<0.001*
Social relationships	8 (3.75-15)	8.5 (6-12)	<0.001*	6 (3-9)	10.5 (8-12)	<0.001*
Environment	12.5 (10.25-17.75)	16 (12.25-19)	<0.001*	12 (9.25-15)	16 (14-21.75)	<0.001*

Wilcoxon Signed Ranks Test

In control group, median medicine adherence score was 55.00 (50.83-60.00) at the time of baseline and after nurse led teaching was 56.67 (51.88-67.50). The pre and post score was not statistically significant (p-value 0.180). On the

other hand, in experimental group medicine adherence score was increased after nurse led intervention 51.67 (45.83-62.92) to 65.00 (58.54-74.17). This difference was statistically significant (p-value <0.001)

DISCUSSION

This study examined the effectiveness of nurse-led educational intervention on medication adherence and quality of life among pulmonary TB patients. Findings revealed that adherence was initially low across both groups, consistent with global patterns (27). After the intervention, the experimental group demonstrated a significant improvement, aligning with previous studies by Khamis et al. (2022) (16) and Onorikpori et al. (2022) (11), which reported that structured health education enhances adherence by addressing fear, stigma, and misconceptions.

Demographic differences such as age, gender, and socioeconomic status influenced baseline adherence levels. The greater representation of younger participants in the experimental group is in line with Hyvert et al. (2023) (21), who found that younger individuals face increased exposure and mobility-related risks. The predominance of daily wage workers indicates financial instability, which Chebet et al. (2022) (25) identified as a major barrier to adherence.

Quality of life improved significantly in the experimental group across physical, psychological, social, and environmental domains. This is consistent with studies by Chen et al. (2020) (28) and Sunarya & Pujasari (2024) (29), who reported low baseline QOL among TB patients due to stigma, isolation, and prolonged treatment. Nurse-led education contributed to improved coping mechanisms, self-confidence, and emotional support, leading to enhanced overall well-being. These findings agree with Dhiman et al. (2023) (30) and Waheed et al. (2021) (32).

Strengths

Use of validated tools
Structured and theory-based intervention
Statistically significant outcomes

Limitations

Non-probability sampling may limit generalizability
Short follow-up period (one month)
Single-center study
Self-reported adherence may be subject to bias

Conclusion

The nurse-led educational intervention significantly improved medication adherence and quality of life among pulmonary tuberculosis patients. The intervention proved effective in enhancing knowledge, motivation, and treatment compliance. These findings support integrating nurse-led educational programs into routine TB care, especially in resource-constrained settings. Future studies should explore long-term effects and multi-center implementation.

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