Original Article

Factors affecting Non-Adherence to Pulmonary Tuberculosis Treatment Among Patients at the Institute of Chest Diseases Kotri

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Abstract

Objective: This study aimed to assess Factors Affecting Non-Adherence to Pulmonary Tuberculosis Treatment Among Patients at the Institute of Chest Diseases, Kotri.

Study Design: : An analytical cross-sectional study was conducted.

Place and duration of study: An analytical cross-sectional study was conducted using a quantitative approach among 212 TB patients registered at a Directly Observed Treatment.

Material and Methods: An analytical cross-sectional study was conducted using a quantitative approach among 212 TB patients registered at a Directly Observed Treatment, Short-course (DOTS) center in Kotri, Sindh, Pakistan. Data were collected on demographics, socio-economic status, knowledge about TB, and self-reported adherence levels. Statistical analyses, including Chi-square tests, were applied to assess associations between adherence and selected variables.

Results: The majority of participants (86.8%) demonstrated low (44.3%) or medium (42.5%) adherence, while only 13.2% achieved high adherence. The mean age of participants was 43.69 ± 10.2years. Age did not show a significant relationship with adherence; however, non-adherence was strongly associated ($p < 0.001$) with male gender, marital status, low education, reduced family income, and rural occupation. Additionally, systemic barriers such as inadequate follow-up and lack of counseling significantly contributed to poor adherence.

Conclusion: The findings highlight that socio-demographic, economic, knowledge-related, and systemic challenges are strongly linked to poor TB treatment adherence. Addressing these through community-based, patient-centered interventions focusing on financial support, improved access to care, and enhanced health education is essential to improve adherence and reduce TB-related morbidity and mortality in high-burden regions such as Kotri, Sindh, Pakistan.

Keywords: Tuberculosis, Treatment Non-Adherence, Factors, Adherence ,knowledge

1. Introduction

Tuberculosis (TB) remains a leading global health concern. In 2025, an estimated 10.8 million people developed TB worldwide, corresponding to 134 cases per 100,000 population, with 1.25 million deaths reported in 2023. [(1)] Pulmonary TB, caused by Mycobacterium tuberculosis, primarily affects the lungs but can spread systemically. [(2)] Non-adherence to anti-TB treatment is a critical challenge, leading to treatment failure, higher mortality, ongoing transmission, and the emergence of drug-resistant TB strains. [(3)] Effective management requires adherence rates above 90%. TB transmission occurs through airborne droplets, highlighting the urgency of early diagnosis and strict treatment adherence. [(4)] Since 2000, global efforts have saved an estimated 79 million lives, though TB eradication by 2030 remains a key WHO and UN Sustainable Development Goal. Non-compliance, whether through irregular dosing, early discontinuation, or refusal of therapy, is influenced by demographic, socioeconomic, psychological, and cultural factors, with consequences including multidrug-resistant (MDR-TB)and extensively drug resistant TB

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(XDR-TB). [5] Following COVID-19, TB has re-emerged as the deadliest infectious disease globally. [6] The WHO South-East Asia Region accounted for 45% by Africa (24%) and the Western Pacific (17%). Twelve countries, including India, Indonesia, China, Pakistan, and Nigeria, represented 87% of the global burden.[12] Risk factors such as undernutrition (0.96 million cases), alcohol use (0.75 million), smoking (0.70 million), HIV (0.61 million), and diabetes (0.38 million) further complicate outcomes. **(7)** Nearly half of TB-affected households face catastrophic costs, exceeding 20% of annual income. **(8)** Drug-susceptible TB is treated with a 6-month regimen of first-line drugs, while drug-resistant TB requires longer, more toxic, and costlier regimens. **(9)** New shorter regimens, such as 4-month moxifloxacin-based and 6-month BPaL protocols, show promise but face implementation barriers.[18] Adherence is hindered by side effects, pill burden, poor health literacy, mental health disorders, and substance use. **(10)** In Pakistan, stigma significantly impedes treatment, with many concealing diagnoses due to fear of rejection or job loss. **(11)** Logistical barriers, such as long travel distances, healthcare staff shortages, and drug stock-outs, further compromise adherence. **(12)** Although Directly Observed Treatment Short-Course (DOTS) remains central, real-world challenges limit its acceptability. Digital adherence tools show potential but require technological access. **(13)** Adherence is also shaped by poverty, unemployment, and housing instability, with adverse drug reactions frequently prompting treatment discontinuation. Despite extensive research, gaps remain in context-specific data from high-burden areas like Sindh. **(14)** Pakistan ranks among the top 30 high-burden countries, contributing 6% of the global TB burden, with 611,000 new cases reported in 2021. **(15)** Non-compliance persists due to poverty, malnutrition, low literacy, stigma, side effects, and systemic healthcare deficiencies. **(16)** In 2022, undernutrition caused 2.2 million new TB cases globally, while HIV, smoking, alcohol, and diabetes further undermined treatment outcomes. **(17)** Addressing these multifactorial barriers is essential to improve adherence and reduce TB morbidity and mortality.

2. Materials & Methods

The WHO South-East Asia Region accounted for 45% Study Design: An analytical cross-sectional study was conducted at the study at the Institute of Chest Diseases Hospital Kotri, Sindh. A non-probability purposive sampling technique was used. Sample size: The sample size was calculated using a formula, 95% confidence level, a 5% margin of error, alpha 0.05, and P=16.5% from a previous study a sample of 212 considered.Duration of the Study: The study was conducted March to August 2025. Patients aged 18 years and above.All Tuberculosis Patients who took anti TB medication at least for one month.Willing to participate and provide informed consent Exclusion Criteria atients aged below 18 years.TB Patients who were seriously ill and or unable to hear and speak will excluded.Those unwilling to provide informed consent.

3. Results

TABLE 1. SOCIO-DEMOGRAPHIC PROFILE OF THE STUDY PARTICIPANTS (n=212)

Variables	Frequency	Percentage
Age of Participants		
18-24 years	39	18.4%
25-31 years	21	9.9%
32-38 years	25	11.8%
39 > above	127	59.9%
Total	212	100.0%
Gender of Participants		
Male	148	69.8 %
Female	64	30.2 %
Total	212	100.0 %
Marital Status of Participants		
Un-married	42	19.8 %
Married	152	71.7 %
Divorced	5	2.4 %
Widow	13	6.1 %

Total	212	100.0 %
Educational Status		
Illiterate	128	60.4 %
Literate	84	39.6 %
Total	212	100.0 %
Family Income		
10k-15k	110	51.9 %
16k-25k	52	24.5%
26k-35k	50	23.6%
Total	212	100.0%
Residence		
Rural	160	75.5%
Urban	52	24.5%
Total	212	100.0%
Distance from Residence to Health Facility		
5-10 km	51	24.1 %
11-20 km	34	16.0 %
21-30 km	28	13.2 %
>30 km	99	46.7%
Total	212	100.0%
Cost of Travel		
100-300 rupees	52	24.5%
400-600 rupees	51	24.1%
>1000 rupees	109	51.4%
Totals	212	100.0%

Table 1 presents participants' socio-demographic characteristics. Most were above 39 years (59.9%), male (69.8%), and married (71.7%). A majority were illiterate (60.4%), and over half reported low family income of PKR 10,000–15,000 (51.9%). Most resided in rural areas (75.5%). Nearly half (46.7%) lived more than 30 km from a health facility, and more than half (51.4%) incurred travel costs exceeding PKR 1000.

Figure 1. Education status of the Participants (n=212)

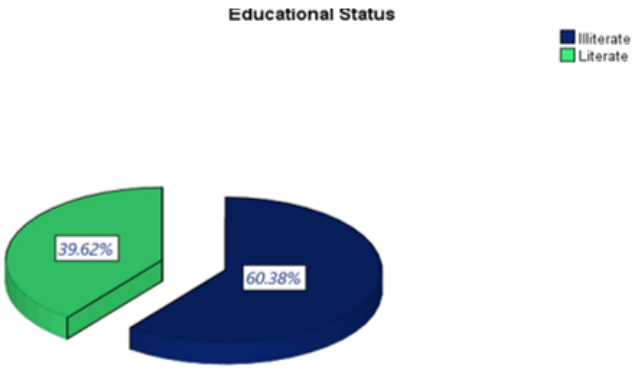

Figure 1. shows that most participants (60.38%) were illiterate, while 39.62% were literate. Education significantly influences health behaviors; illiteracy may limit understanding of illness and treatment, leading to non-compliance, whereas literate individuals are more likely to follow medical advice and adhere to prescribed regimens.

TABLE 2: KNOWLEDGE ABOUT TUBERCULOSIS (n=212)

S.No	Questions	Response	Frequency(n)	Percentage(%)
01	Does a virus cause tuberculosis?	Yes	82	38.7%
		No	130	61.3 %
02	Is it possible to have TB without showing any symptoms?	Yes	106	50.0%
		Yes	106	50.0%
03	Is TB typically treated with a single antibiotic?	Yes	78	36.8%
		No	134	63.2%
04	Can someone with latent TB spread the disease to others?	Yes	118	55.7%
		No	94	44.3%
05	Is a persistent cough one of the common symptoms of active TB?	Yes	94	44.3%
		No	118	55.7%

Table 2 shows mixed knowledge about TB. While 61.3% knew it is not viral and 63.2% knew it requires more than one antibiotic, only 50% recognized asymptomatic cases and 44.3% identified persistent cough as a symptom. Moreover, 55.7% incorrectly believed latent TB is transmissible, indicating substantial gaps in awareness of transmission, symptoms, and disease forms.

Table 3 : Treatment Adherence Category of the study participants (n=212)

Adherence Category	Frequency	Percent
Low	94	44.3 %
Medium	90	42.5 %
High	28	13.2 %
Total	212	100.0 %

Table 3 shows treatment adherence levels: 44.3% had low adherence, 42.5% medium, and only 13.2% high. This indicates substantial non-compliance, raising risks of treatment failure and drug resistance.

Table 4: Association Between Reasons for Non-Compliance and Treatment Adherence (n=212)

S.No	Items	Adherence Category			Total	P-Value
		Low	Medium	High		
01	Adverse drug side effects	7	14	8	29	< 0.000
02	Perceived improvement in symptoms before completion	9	29	7	45	
03	Treatment is not necessary as I am so old	25	30	4	59	
04	Appetite is influenced after taking drugs	28	10	9	47	
05	Forgetfulness or lack of treatment literacy	25	7	0	32	
Total		94	90	28	212	

Table 4: shows a significant association between reasons for non-compliance and treatment adherence (p = 0.000). Adverse drug effects were common across all groups, especially medium adherence (48.3%). Symptom improvement (64.4%) and old age beliefs (50.8%) were also frequent in medium adherence patients, while appetite loss (59.6%) and forgetfulness (78.1%) were predominant in low adherence. These factors strongly influence adherence, particularly among low and medium groups.

4. Discussion

Pulmonary tuberculosis (TB) remains a global health challenge, largely due to non-adherence to multidrug regimens. This study examined socio-demographic, knowledge-related, and systemic predictors of adherence in a low-income, rural population. The mean participant age was 43.7±10.2 years, with findings showing that 86.8% demonstrated low (44.3%) or medium (42.5%) adherence, and only 13.2% achieved high adherence similar to results from Ethiopia (2019). [18]Age showed no significant association with adherence (p=0.073), contrasting with findings from Indonesia (2023). [19] However, gender, marital status, and education were significantly associated with adherence, consistent with a Ghanaian study (2024). Men had higher rates of low adherence, possibly due to work-related pressures in patriarchal settings. Marital status showed an inverse relationship, with married participants reporting lower adherence, echoing findings by Nasrullah et al. (2023). [20] This may reflect competing financial and familial responsibilities that limit treatment compliance. Educational status also demonstrated a strong association (p<0.001). Illiterate participants were concentrated in low- and medium-adherence groups, underscoring the role of poor health literacy. This aligns with knowledge assessments showing that 66.5% had inadequate understanding of TB symptoms and transmission. Family income and residence were likewise significant, with low-income and rural participants disproportionately represented in low adherence, reflecting travel costs (over PKR 1000 for half the sample) and high unemployment (53.8%). These findings support previous evidence from Lakara et al. (2025) and Tadesse et al. (2024), linking poverty, low education, and high travel costs with poor adherence. [21] Systemic and psychosocial barriers also played a decisive role. Inadequate counseling, limited follow-up, and weak patient–provider communication were significantly associated with low adherence. Self-reported reasons included forgetfulness, adverse side effects, and premature treatment cessation due to perceived recovery. Cultural factors such as stigma and behavioral risks like smoking further compounded non-compliance. This study contributes original insights by highlighting context-specific patterns, particularly the unexpected inverse relationship between marital status and adherence, and the nuanced role of gender in a rural, low-income setting. By integrating socio-demographic, systemic, and cultural determinants, it

presents a comprehensive understanding of adherence barriers. The findings point to clear policy implications. TB control programs must expand beyond biomedical approaches toward patient-centered, community-based models. Priorities should include financial and logistical support for low-income and rural patients, reliable medication supply, and tailored health education to improve literacy and correct misconceptions. Such interventions are essential to improve adherence and curb the risks of treatment failure and drug resistance in high-burden regions

Conclusion:

This study highlights that 86.8% of participants had low or medium adherence to TB treatment, driven by socio-demographic, economic, systemic, and psychosocial factors. Male gender, marital status, low income, illiteracy, rural residence, unemployment, and high travel costs were key determinants, compounded by inadequate follow-up, limited counseling, drug side effects, stigma, and misconceptions. These findings stress the need for patient-centered, community-based strategies that address financial and geographic barriers while improving health literacy and continuous support to enhance adherence and reduce TB-related morbidity and mortality

Limitations

One of the drawback was the limited duration, size of sample and only target two surgical infirmaries so that were we not generalized our results to the whole targeted population. Due to the above-mentioned limitations we used convenience sampling technique that may have led to selection bias.Differences in postoperative care standards recognizing differences in pain management, rehabilitation techniques, and follow-up policies could have impacted both the outcome for patients and the reported incidence of kinesiophobia and dissatisfaction. Since the current study had a cross-sectional design, it only offered a point-time measurement of kinesiophobia and dissatisfaction, without observing changes in them following the postoperative recovery phase**.**

Disclosure /Conflict of interest:

Authors declare no conflict of interest.

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