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NON-ADHERENCE TO ANTI TUBERCULOSIS TREATMENT, REASON AND ASSOCIATED FACTOR AMONG PULMONARY TUBERCULOSIS PATIENTS

Parsa Majeed[1], Nasim Rafiq[2], Kalsoom Arif[3], Mehr-Un-Nisa[4], Amjad Ali[*5], Samra Hafeez[6], Asia[7]

[1,3,4,6,7]RN, Student, Shalamar Nursing College, Lahore
[2]PhD in Nursing, Principal, Shalamar College of Nursing, Lahore
[5]MSN, Assistant Professor, Shalamar College of Nursing, Lahore

[1]Passmajeed1020@gmail.com, [2]nasimtarik@yahoo.com, [3]Qalsoom007@gmail.com, [4]mehrunisamansha598@gmail.com, [*5]amjadalikmu233@gmail.com, [6]samrahafeez9942@gmail.com, [7]asiaishaq03@gmail.com

ABSTRACT

Background: *Non-adherence to tuberculosis (TB) treatment remains a critical public health challenge, impacting treatment success rates and facilitating the disease's spread. Pakistan ranks fifth among the 22 countries with the highest TB burden.*

Objective: *To identify factors associated with non-adherence to TB treatment among patients with pulmonary tuberculosis.*

Method: *This descriptive cross-sectional study was conducted at a tertiary care facility, Services Hospital Lahore. Data were collected from TB patients using a structured questionnaire, and analysis was performed in SPSS with chi-square tests applied (significance set at $p < 0.05$).*

Results: *The study showed that 56% of participants were female, with 52% aged 18 to 25 years. Among them, 61% were married, 61% lived in urban areas, and 44% were illiterate. Around 26% of female participants were housewives. The study identified a positive association between age and non-adherence to medication, while illiteracy and low-income status showed a negative association with non-adherence ($p < 0.05$).*

Conclusion: *Addressing socio-economic factors related to non-adherence to TB treatment is essential to improve treatment outcomes and decrease TB's impact. By tailoring support based on patients' age, literacy, and income, healthcare providers can enhance adherence and contribute to more effective TB management strategies.*

Keywords: *Non-Adherence, Tuberculosis, Treatment and Patients*

INTRODUCTION

Tuberculosis (TB) is an infectious disease caused by the bacillus Mycobacterium tuberculosis. (1) It typically affects the lungs (pulmonary TB) but can also affect other sites (extra pulmonary TB) (2). Broadly classified there are two types of tuberculosis infection. ln latent tuberculosis, the individual carries the bacteria but does not exhibit any symptoms whatsoever. This is because immunity fights the infection and is able to suppress it to an extent. Individuals suffering from latent tuberculosis cannot transmit the illness to others. However, at some point in their life, the bacteria can get reactivated and the infection can become active tuberculosis (3). Tuberculosis can also affect the skin, brain and even the heart (4). Sometimes, tuberculosis infections are not caused by

Mycobacterium tuberculosis. Instead, they are caused by organisms called atypical Mycobacterium. These include the Mycobacterium avium complex, Mycobacterium kansasii and Mycobacterium fortiutum (5).

It is one of the ten top causes of death worldwide from curable infectious diseases. Globally there were estimated 10.4 million new TB cases 2018, TB caused an estimated 1.2 million deaths in the African and South-East Asia Region. Ethiopia is in the list of 30 high burden countries (HBCs), with an estimated total incidence of TB 165 per 100,000 populations (6). It is a well-known fact that TB demonstrates seasonality. Seasonality of TB has been reported in many studies, such as in Kuwait, where the peak of case notification is in summer, in India with summer as the peak season, and in China where summer is the peak season. In Iran, a high number of TB cases were observed in spring and summer. The review of various studies has shown a rise in TB case notification at the end of the winter and the start of summer (7).Pakistan is ranked fifth among the 22 high TB burden countries. In 2012, nearly 2.6 million new cases of TB were notified of which 1.1 million (42%) were sputum smear-positive. The incidence and prevalence rates of Pakistan in 2012 inclusive of HIV were 231/100,000 population and 376/100,000 population(8).

Tuberculosis non-adherence is the major challenge in TB treatment which leads multidrug as well as extended drug-resistant TB(9). The prevalence of nonadherence to anti-tuberculosis treatment is 50% India, 15.5% Thailand, 24.7% and 24.5 South Ethiopia(10). The prevalence and factors associated for anti-tuberculosis treatment non-adherence among pulmonary tuberculosis patients in public health care facilities in South Ethiopia: a cross sectional study. BMC Public Health(11) However, with the emergence of pulmonary TB multidrug-resistant (MDR) or extensively drug-resistant strains (XDR), treatment outcome of the disease is getting increasingly worse, contributing to prolonged duration of infectiousness and continued transmission(12).

Determining the risk factors for the emergence of multidrug-resistant tuberculosis (MDR-TB) is crucial for improving its management. Studies indicate that poor patient adherence to anti-TB treatment is a primary risk factor, as many patients fail to complete the six-month course of medications and do not understand the importance of sputum re-examinations. This non-adherence increases their risk of developing multidrug-resistant and extensively drug-resistant forms of tuberculosis, as well as experiencing relapse (13). According to the WHO, adherence to Tuberclosis treatment is the extent to which a patient's medication-taking coincides with the prescribed treatment. Those who have completed treatment (directly observed therapy strategy, DOTS) or are cured correspond to adherents, and the patients who do not complete treatment correspond to non-adherents(14). Non-adherence to TB treatment threatens the success of treatment, increases the risk of TB spread, causes drug resistance, and increases morbidity and mortality. Many quantitative studies have investigated risk factors associated with poor adherence to anti-TB treatment (13).The main reasons for non-adherence in anti-tuberculosis treatment are drug side effects, forgetting to take medication, be away from home, missing date of' appointment, lack of transportation cost, lack of social support, poor communication between patient and healthcare providers, and stock out of medicines (13).

Methodology:

The study used a descriptive cross-sectional design to provide a comprehensive understanding of tuberculosis patients' characteristics and behaviors at Sir Ganga Ram Hospital, Lahore, over a four-month period. The sample consisted of 100 newly diagnosed tuberculosis patients, aged 20 to 60, selected through purposive sampling from the Pulmonology OPD. Inclusion criteria required regular follow-ups and both genders, while patients with comorbidities, psychiatric disorders, or substance abuse were excluded. Data was collected using a seven-part adopted questionnaire addressing socio-demographics, knowledge and attitudes towards tuberculosis and treatment, treatment adherence, and behavioral factors. After obtaining ethical approval and written consent, participants completed the questionnaire in 25 minutes. The data was digitized and analyzed using SPSS Version 21 and MS Excel, employing descriptive statistics for frequency and percentages, and inferential statistics, including Chi-square tests, to assess associated factors with significance set at $p < 0.05$. In this study, non-adherence refers to interruptions in medication due to reasons such as ineffective treatment, the belief that treatment isn't needed, inconvenient schedules, fear of side effects, or other factors like comorbidities or migration. Non-adherence will be assessed using a 13-question questionnaire with yes/no responses, where scores range from 0 to 13. A score of 0 to 7 (less than 60%) indicates non-adherence, while a score above 7 (greater than

60%) indicates adherence. Factors determining adherence include socio-demographic details, knowledge of tuberculosis and its treatment, treatment characteristics, behavioral factors, patient-care relationships, and attitudes towards tuberculosis and treatment.

Results:

Table No1: Demographic Data Gender, Age, and Marital Status

		Frequency	Percent
What is you gender?	Male	44	44.0
	Female	56	56.0
What is your age range?	18-25	24	24.0
	26-35	52	52.0
	36-45	12	12.0
	46-60	12	12.0
What is your marital status?	Single	34	34.0
	Married	61	61.0
	Divorced	3	3.0
	Widowed	2	2.0
	Total	100	100.0

Analyzed by Frequency and Percentage

The data presented in table no 01 show the demographics of the respondents across three key variables. Firstly, regarding gender distribution, 44 individuals (44.0%) identify as male, while 56 (56.0%) identify as female. Secondly, the age range of the participants reveals a varied distribution, with 24 respondents (24.0%) falling within the 18-25 bracket, 52 (52.0%) within 26-35, and 12 (12.0%) each within the 36-45 and 46-60 categories. Lastly, marital status demonstrates a diverse representation among the participants: 34 individuals (34.0%) are single, 61 (61.0%) are married, while 3 (3.0%) are divorced, and 2 (2.0%) are widowed, summing up to a total of 100 respondents (100.0%). These statistics provide insights into the gender distribution, age ranges, and marital statuses of the surveyed population. Table no 01 concluded that 44% individuals were male, 56% were female ,24% fall in age range (18-25), 52% fall in (26-35) ,12 % fall in (36-45) , 12 % fall in (46-60) and marital status showed 61% were married ,3% were divorced and 2% widowed.

Table No 2: Demographic Data Residence, Education Status and Occupation

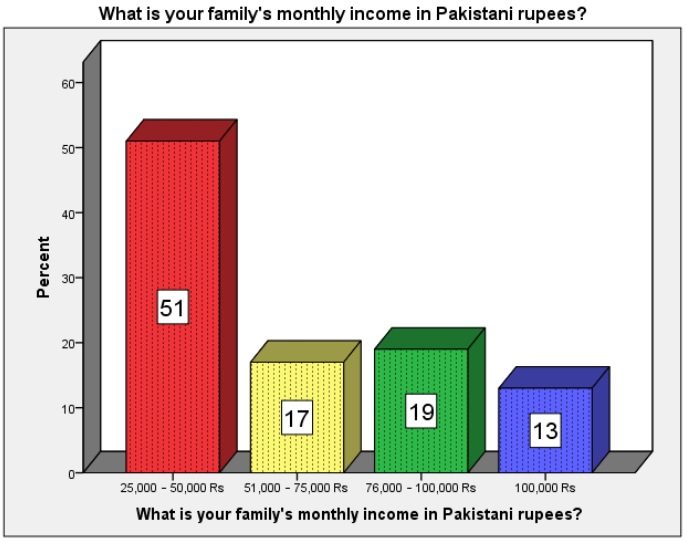
		Frequency	Percent
Where do you live?	Urban area	61	61.0
	Rural area	39	39.0
What is your education status?	Unable to read and write	30	30.0
	Able to read and write	44	44.0
	Certificate	4	4.0
	Diploma	9	9.0
	Degree and above	13	13.0
What is your occupation?	Housewife	26	26.0
	Student	19	19.0
	Employed	39	39.0
	Non-Employed	13	13.0
	Businessman	3	3.0
	Total	100	100.0

Analyzed by Frequency and Percentages

The data presented in table no 02 apprehend the demographics of the respondents across three key variables. Firstly, regarding residence, 61 individuals (61.0%) identified resident of urban area, while 39 (39.0%) identify as resident of rural area. Secondly, the education status of the participants reveals a varied distribution, with 30

respondents (30.0%), are falling under the response of unable to read and write 44 (44.0%) within able to read and write, 4 (4.0%) having certificates ,9(9.0%) are diploma holder and 13(13.0%) within the education status of degree and above categories. Lastly, occupation demonstrates a diverse representation among the participants: 26 individuals (26.0%) are house wives, 19 (19.0%) are student, while 39 (39.0%) are employed, and 13 (13.0%) are unemployed, and 3 individuals (3.0%) are businessman summing up to a total of 100 respondents (100.0%). These statistics provide insights into the residence, education status, and occupation statuses of the surveyed population. Data in table no 02 concluded 61% individuals were living in urban areas ,39% were in rural areas and education status shows 30% were unable to read and write, 44% were able to read and write,4% were certified ,9% were diploma holder ,13% were degree holder ,26% were house wives and according to occupation 19 % were students ,32% were employed ,13 % were non-employed and 3%were business man.

Figure 1 Graphical representation of family's monthly income in Pakistan Rupees



The data presented in Figure No. 01 apprehend the demographics of the respondents across one key variable of monthly income of the family.51 individual's (51.0%) having monthly family income under response 25000-50000 Rs ,17 individuals (17.0%) 51000-75000 Rs, 19 individual (19.0%) 76000-100000 Rs and 13 individuals (13. %) 100000 above categories respectively. The Figure No.01 concluded that the different family income 51 % falls in (25000-50000), 17 % were (51000-75000), 19% were in (76000-100000) and 13 % were fall in 100000.

Table No 3: Assessment of Non-Adherence towards Treatment

	Frequency	Percent	Mean	Standard Deviation
< 8 score: Non-Adherence	69	69.0	5.69	4.062
≥ 8 score Adherence	31	31.0		
Total	100	100.0	100.0	

Data analyzed by frequency, percentages mean, and standard deviation.

The data presented in table No 3 captures the demographics of the respondents across two key variables. Firstly, level of non-adherence towards treatment,69 individuals (69.0%) scoring <8 showing the level of non-adherence towards treatment with the mean of 5.69 and standard deviation of 4.062. Secondly, level of adherence towards treatment ,31 individuals (31.0%) with scoring >8 with the mean of 5.69 and standard deviation of 4.062, summing up a total of 100 (100%) respondents. These statistics provide insights into the level of non-adherence and level of adherence of the surveyed population. The table No 3 concluded that 69% individuals showed non-adherence and 31% showed adherence towards treatment.

Table No: 04 Behavioral Factors regarding smoking, Drinking alcohol, use of facemask, isolation, spit on floor

		Frequency	Percent
Do you smoke?	No	67	67.0
	Yes	33	33.0
Do you drink alcohol?	No	65	65.0
	Yes	35	35.0
Do you use facemask in crowded area?	No	20	20.0
	Yes	80	80.0
Do you isolate yourself?	No	32	32.0
	No	68	68.0
	Yes	65	65.0
Do you spit on floor?	Yes	35	35.0
	Total	100	100.0

Data analyzed by frequency and percentages

The data presented in table no 04 grab the behavioral factors of the respondents across five key variables. Firstly ,33individual (33.0%) used to smoke, secondaly,35 individuals (35.0%),80 individuals (80.0%) use face mask in the crowded area, 68 individuals (68.0%) isolate themselves and 35 individuals (35.0%) used to spit on the floor. These statistics provide insights into the behavioral factors of the respondents suffering from tuberculosis of the surveyed population. The table no 04 concluded that 33% individuals were smoker, 35% were alcohol abuser, 80% used face mask in crowded areas, 68% isolate themselves and 35% were those who spit on the floor.

Table No: 05 Regarding Patient Care Relationship

		n	%
Are care providers greets you well?	No	27	27.0
	Yes	73	73.0
Are they giving you adequate contact time?	No	32	32.0
	Yes	68	68.0
Are they treating you equally?	No	29	29.0
	Yes	71	71.0
Are they motivating or encourages you in the treatment activities?	No	28	28.0
	Yes	72	72.0
Are they kept confidentiality regarding all the information that you shared to providers?	No	26	26.0
	Yes	74	74.0
Do you get the necessary respect from care providers?	No	24	24.0
	Yes	76	76.0
	Total	100	100.0

Analyzed by Frequency (n) and Percentages (%)

The data presented in table No 05 grab the important variables of patient care relationship .73 individuals (73.0 %) responded yes in the response of 'Are care providers greets you well?' 68 individuals (68%) responded yes in response of 'Are they giving you adequate contact time?' 71 individuals (71%) responded yes in response of 'Are they treating you equally?'72 individuals (72%) responded yes in the response of 'Are they motivating or encourages you in the treatment activities?' 74 individuals (74%) responded yes in the response of 'Are they kept confidentiality regarding all the information that you shared to provider?'76 individuals (76%) responded yes in response of 'Do you get the necessary respect from care providers? ' These statics provide insight into the patient care relationship of surveyed population. The table No 05 concluded that 73% care providers greet well to patient, 68% are giving adequate contact time, 71% are treating equally, 72.0% are motivating in treatment activates, 74.0% are keeping important information confidential, 76.0% are receiving respect from care provider.

Table No 06: Factor for non-adherence

		df	Mean Square	F	Sig.
Female	Non-Adherence	14	0.389	1.768	0.065
Old age	Non-Adherence	14	1.707	2.794	0.003
Live urban & Rural area	Non-Adherence	14	0.165	0.680	0.784
Illiterate	Non-Adherence	14	5.006	3.601	0.000
Low income <50000	Non-Adherence	14	2.299	2.168	0.020
Person smoke	Non-Adherence	14	0.169	1.142	0.343
Person drink	Non-Adherence	14	0.151	1.258	0.260

Analyzed by chi –square test with p less than 0.05

Table 06 illustrates factors contributing to non-adherence, analyzed through various statistical measures. The table outlines the sum of squares, degrees of freedom (df), mean square, F-values, and significance levels (Sig.) for different variables. Female non-adherence yields a sum of squares of 5.450 with 14 degrees of freedom, resulting in a mean square of .389 and an F-value of 1.768, with a significance level of .065. Similarly, factors such as old age, living in urban or rural areas, being illiterate, having a low income (<50000), smoking, and drinking are examined for their contribution to non-adherence. The analysis, conducted using the chi-square test at a significance value of 0.05, aims to identify associations between these variables and non-adherence behaviors. Notably, variables such as old age, illiteracy, and low income exhibit significant associations with non-adherence, as indicated by their low p-values ($p < .05$), suggesting potential areas for intervention and further investigation. The data concluded that presented in Table No.08 the factors affecting non-adherence are old age, illiteracy and low income. There is a positive association between old age and non-adherence and there is negative association of illiteracy and low income among non-adherence.

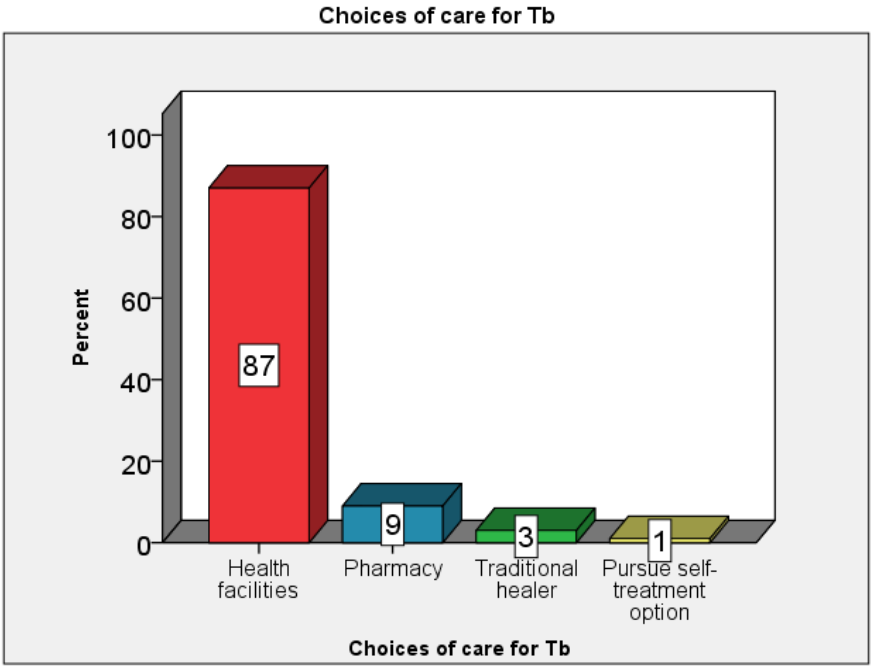
Table No 7: Assessment of Non-Adherence towards Treatment

	Frequency	Percent	Mean	Standard Deviation
< 8 score: Non-Adherence	69	69.0	5.69	4.062
≥ 8 score Adherence	31	31.0		
Total	100	100.0		

Data analyzed by frequency, percentages mean, and standard deviation.

The data presented in table No 7 captures the demographics of the respondents across two key variables. Firstly, level of non-adherence towards treatment, 69 individuals (69.0%) scoring <8 showing the level of non-adherence towards treatment with the mean of 5.69 and standard deviation of 4.062. Secondly, level of adherence towards treatment, 31 individuals (31.0%) with scoring >8 with the mean of 5.69 and standard deviation of 4.062, summing up a total of 100 (100%) respondents. These statistics provide insights into the level of non-adherence and level of adherence of the surveyed population. The table No 7 concluded that 69% individuals showed non-adherence and 31% showed adherence towards treatment.

Figure No.02 graphical representation of choices of care for TB



The data presented in Figure No.02 grabs the information about choices of TB 87 individuals (87.0%) have choice for care is Health care facilities, 9 individuals (9.0%) use pharmacy,3 individuals (3.0%) goes to traditional healer, and 01 individual (1.0%) goes to pursue self-treatment options. The data presets in Figure No.02 concluded that 87.0% have choice for care is Health care facilities,9% use pharmacy, 3.0% goes to traditional healer, and 1.0% goes to pursue self-treatment options.

Discussion:

The present study showed that 56% were female with an age between 18 and 25 year (52%), 61% were married, 61% individuals were living in urban areas, 44% of the study participants unable to read and write, most of the female about 26% were house wives. However, the report of Widjanarko, Bagoes (2019) showed that most of the study participants were males (55%), with average age 42 years and on base of educational level 48% were with matriculation.

According to family income 51 % were with a monthly income of 25000-50000, 33% individuals were smoker, 35% were alcohol abuser, 80% used face mask in crowded areas, 68% isolate themselves and 35% were those who spit on the floor and 69% individuals showed non-adherence towards tuberculosis treatment.

In similar context another study conducted by Mekonnen and Azagew, 2018 showed that result of the study showed that 21.2% patients were non-adherent to anti-TB treatment, 95% were poor knowledge about TB and anti-TB therapy poor patient care provider relationship 95% and alcohol intake 95% were significantly associated with non-adherence. Forgetting was about 23.1% Being busy with other work was 20.2% and being out of home/town 13.9% were the major reasons of participants for interruption of taking anti-TB medications.

Its means that in the present study the relatively high non-adherence rate of tuberculosis treatment are due to low family income, female gender, old age , most were live crowd area , unable to read and write, house wives, smoker, alcohol abuser. Similarly the report of Mekonnen and Azagew (9) showed that alcohol intake 95% were significantly associated with non-adherence. However the report Ajema, Shibru (6) showed that smoking cigarette was 95%. This study showed that 73% care providers greet well to patient, 68% are giving adequate contact time, 71% are treating equally, 72.0% are motivating in treatment activates, 74.0% are keeping important information confidential, 76.0% are receiving respect from care provider and no evidence is found in previous studies.

This study present that 6% individuals were not concerned about contacting Tb, 7% individuals belief treatment for Tb is not important, 59% were responded feel ashamed about the treatment for TB, 10% individuals were

responded NO. However the result of the study Ajema, Shibru (6) that were 95%, Failure to disclose one's TB status to his or her family. These factors were found to be associated with a higher odd of being non-adherent to anti-TB treatment.

This study showed that 24.0% individual responded No about length of waiting time. And 20.0% individuals responded as No of the about distance OTC center. 87.0% have choice for care is Health care facilities, 9% use pharmacy, 3.0% goes to traditional healer, and 1.0% goes to pursue self-treatment options. However the result of the study Mekonnen and Azagew (9) showed that the factors were; beliefs in traditional healing system, unavailability of the Directly Observed Treatment Schedule (DOTS) service in nearby health facilities, side-effect and pill burden of the drugs, stigma and discrimination were factors that contributed to poor TB treatment adherence in the study area. The findings of this study shed light on the significant factors influencing non-adherence to treatment among individuals with tuberculosis (TB), particularly emphasizing the roles of age, literacy level, and income status. The analysis revealed a compelling association between these socio-demographic variables and treatment non-adherence, as evidenced by statistical significance with a p-value less than 0.05.

Firstly, advancing age emerged as a notable predictor of non-adherence to TB treatment regimens. This observation aligns with existing literature suggesting that older individuals may face unique challenges in adhering to medication schedules due to factors such as comorbidities, cognitive decline, and social isolation (15). The positive association between old age and non-adherence underscores the importance of tailored interventions that address the specific needs and barriers faced by elderly TB patients (16). Conversely, the study identified a negative association between illiteracy and low-income status with non-adherence to TB treatment. This finding implies that individuals with higher levels of literacy and income are less likely to experience treatment non-adherence (17). Illiteracy can serve as a barrier to understanding treatment instructions, accessing healthcare resources, and making informed decisions about health-related behaviors. Similarly, individuals with low income may encounter financial constraints that impede their ability to adhere to treatment regimens, including the cost of medications, transportation to healthcare facilities, and other related expenses (18).

The significance of these findings underscores the need for targeted interventions aimed at addressing the socio-economic determinants of non-adherence among TB patients. Efforts to enhance health literacy, promote economic empowerment, and provide financial support mechanisms can play a pivotal role in mitigating the impact of illiteracy and low income on treatment adherence (19). Furthermore, healthcare providers should adopt patient-centered approaches that recognize and accommodate the diverse needs and challenges faced by individuals across different socio-demographic groups.

Conclusion:

The study found that 56% of the participants were female, mostly between 18 and 25 years old (52%). Additionally, 61% were married, 61% lived in cities, and 44% couldn't read or write. Among females, about 26% were housewives. The study identifies advancing age as a significant predictor of non-adherence to TB treatment. Older individuals may encounter unique challenges such as comorbidities, cognitive decline, and social isolation, which can impede their ability to adhere to medication schedules. Furthermore, this study reveals a negative association between illiteracy and low-income status with non-adherence to TB treatment. Illiteracy can hinder individuals' understanding of treatment instructions and access to healthcare resources, while financial constraints may impede their ability to afford medications and transportation to healthcare facilities.

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