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Original Article

Assessment of Factors affecting Patients Compliance in Tuberculosis Therapy in Pakistan

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ABSTRACT

Background: Tuberculosis (TB) remains a significant public health challenge globally, with a particularly high burden in countries like Pakistan. Despite advances in treatment, patient compliance with TB therapy remains a critical issue. This study focuses on assessing the factors affecting patient compliance with TB therapy in the Pakistani cities of Rawalpindi and Islamabad.

Methods: A descriptive cross-sectional study was conducted at a public-sector hospital in Rawalpindi. Data was collected through a comprehensive, validated questionnaire administered to 423 TB patients at the Begum Jan Hospital, Islamabad. The study employed systematic random sampling and was completed over a six-month period. The questionnaire was refined based on a pilot study and covered various aspects of the patients' experiences and knowledge about TB.

Results: The study population comprised 44.92% males and 55.08% females, with a broad age distribution. A majority of participants were literate (60.05%) and had a low income. A significant number (66.67%) reported previous contact with TB. Awareness of TB transmission, prevention, and treatment varied, with a notable lack of knowledge about the risk of resistance development from improper treatment adherence. Most participants (91.49%) expressed satisfaction with their TB treatment, and a large majority informed family and friends about their illness. However, concerns about social isolation, financial burdens, and difficulty accessing healthcare facilities were prevalent. Counseling on medication intake and side effects was provided to most patients, but gaps in knowledge and support remained evident.

Conclusion: This study highlights the importance of addressing treatment compliance in Tuberculosis (TB) management. Key factors impacting compliance include limited awareness about TB, unsupervised medication intake, social stigma, and inadequate counseling. Enhancing health education for patients, the public, and healthcare providers is crucial for improving treatment adherence and reducing TB's overall burden.

Keywords: Tuberculosis, Treatment Compliance, Health Education, Social Stigma, Medication Adherence, Patient Counseling, Public Health.

INTRODUCTION

Globally amongst 2-3 billion people infected with mycobacterium tuberculosis, only 5-15 % are supposed to develop TB disease during their lifetime and this probability is far increased in HIV carriers. According to global TB report 2016, the statistics of 2015 reveal the incidence of 10.4 million worldwide, of which 5.9 million were men, 3.5 million women and 1.0 million children. People living with HIV contributed 1.2 million of all new TB cases. 60% of the new cases were attributed to six counties: India, Indonesia, China, Nigeria, Pakistan and South Africa(1). Globally, the rate of decline in TB incidence was only 1.5% from 2014 to 2015. 480 000 new cases of multidrug-resistant TB (MDR-TB) existed in 2015 with 100 000 more patients with rifampicin-resistant TB (RR-TB). 45% of the total 580 000 cases were from India, China and Russia. TB contributed 1.4 million deaths in 2015 with 0.4 million additional deaths due to Tuberculosis in HIV positive cases. TB remains one of the top 10 causes of death globally in 2015 despite the decline of 22% in TB related mortalities from 2000 to 2015(2, 3).

Mortality of HIV plus TB patients is 0.83 per 100,000 population in Pakistan with HIV negative ones contributing 23 per 100,000 of mortality while India has rate of 36 amongst HIV negative and 2.8 per hundred thousand amongst HIV positive tuberculosis cases. Pakistan being a high TB burden country had variable statistics during last fifteen years. Being a country fifth in ranking amongst

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twenty-two high TB burden countries, the mortality [rate per hundred thousand] excluding the HIV+TB patients exhibited a declining trend since 2000 whereas incidence [rate per hundred thousand] in case of new and relapse cases depicted gradual rise from 2000 till 2007 afterwards which it becomes steady(1, 3, 4). The overall incidence has been fairly static since last fifteen years i.e. around 270 per hundred thousand population with prevalence rate of 350 cases per 100,000 population. The treatment success rate for new and relapse cases has been static for last eight to nine years but for MDR/RR-TB it improved for the years 2008 and 2009 and onwards it also became static. The treatment success rate for XDR TB has been exhibiting declining trend since 2010(2, 3).

Poor housing, poverty, malnutrition and sanitation, inadequate health care facilities, population migration and urbanization, political instability and refugee influx have all continued to aggravate the problem of TB and DR-TB. Towards the end century it was realized with consternation by the healthcare professionals that there is a rising incidence of TB, and in 1994 TB was declared a Global Emergency by WHO resulting in the formation of the STOP TB partnership. The aspects of poor or unknown drug quality, inadequate regimens, poor availability of drugs with interrupted supplies, lacking health education, inadequate patient follow-up, poverty and malnutrition, and a lack of a political commitment and resource mobilization have all contributed to the emergence of drug resistant strains of Mycobacteria leading to treatment failures(5).

The SDG no. 3 is to ensure healthy lives and promote well-being for all at all ages, with one of the targets being to end the global TB epidemic by at least 2025. The aim of this study is to assess the factors affecting the compliance in tuberculosis patients in Rawalpindi and Islamabad.

MATERIAL AND METHODS

The design of study was descriptive cross sectional and study was carried out in the public-sector hospital of Rawalpindi. The quantitative research method was used to collect the data from participants of the study. For the current study, comprehensive data set was collected from Begum Jan Hospital Lethrar road Islamabad. The current study was completed in six-month duration. The study population consisted of patients of tuberculosis. Systematic random sampling methods were used for data collection with a sample size of 423.Questionnaire was used as data collection tool from the study population at TB center. The study was based on well-structured, comprehensive and validated questionnaire. The validity of questionnaire was based on pilot study conducted on ten individuals from sample population. The preliminary questionnaire was modified in light of pilot study and then data was collected from TB patients(6).

RESULTS

Males constitute 44.92% (190 individuals) and females 55.08% (233 individuals). Age-wise, 13.24% are under 20 years, 41.84% under 40 years, 36.64% under 60 years, and 8.27% under 80 years. Regarding marital status, 51.77% are married (219 individuals) and 48.23% are unmarried (204 individuals). For educational status, 60.05% are literate (254 individuals) and 39.95% are illiterate (169 individuals). In terms of income, 62.88% earn under 10,000, 20.09% earn between 10,000 and 30,000, and 17.02% earn over 30,000.

Demographic	Category	Frequency	Percent
Gender	Male	190	44.92%
	Female	233	55.08%
	Total	423	100%
Age	<20	56	13.24%
	<40	177	41.84%
	<60	155	36.64%
	<80	35	8.27%
	Total	423	100%
Marital Status	Married	219	51.77%
	Unmarried	204	48.23%
	Total	423	100%
Educational Status	Literate	254	60.05%
	Illiterate	169	39.95%
	Total	423	100%
Income	<10000	266	62.88%
	10000-30000	85	20.09%
	>30000	72	17.02%

	Total	423	100%

History of TB Contact, 66.67% (282 individuals) reported having had contact with TB, while 33.33% (141 individuals) reported no such contact. The second category, "History of Previous Tuberculosis," shows that 23.40% (99 individuals) had a history of tuberculosis, whereas 76.60% (324 individuals) did not. Finally, in the "Knowledge about Common Symptoms of TB" category, 58.39% (247 individuals) were aware of the common symptoms of TB, contrasting with 41.61% (176 individuals) who lacked this knowledge. Each category sums up to the total of 423 participants, representing 100%.

Category	Response	Frequency	Percent
History of TB Contact	Yes	282	66.67%
	No	141	33.33%
	Total	423	100%
History of Previous Tuberculosis	Yes	99	23.40%
	No	324	76.60%
	Total	423	100%
Knowledge about Common Symptoms of TB	Yes	247	58.39%
	No	176	41.61%
	Total	423	100%

53.43% know TB is transmissible, 4.96% do not, and 41.61% are unsure. Regarding TB as preventable, 95.98% are aware, 4.02% are not. For TB being treatable, 83.69% are informed, 9.93% are not, and 6.38% are unsure. Concerning complete recovery after antituberculosis treatment (ATT), 85.11% are aware, 6.62% are not, and 8.27% are unsure. About coughing, sneezing, shouting, and spitting as transmission routes, 36.88% are aware, 38.30% are not, and 24.82% are unsure. Finally, 85.11% know TB transmission is preventable, 10.17% do not, and 4.73% are unsure.

Category	Response	Frequency	Percent
Knowledge about TB Being a Transmissible Disease	Yes	226	53.43%
	No	21	4.96%
	Do Not Know	176	41.61%
	Total	423	100%
Knowledge about TB Being a Preventable Disease	Yes	406	95.98%
	No	17	4.02%
	Do Not Know	0	0%
	Total	423	100%
Knowledge about TB Being a Treatable Disease	Yes	354	83.69%
	No	42	9.93%
	Do Not Know	27	6.38%
	Total	423	100%
Knowledge about Complete Recovery after ATT	Yes	360	85.11%
	No	28	6.62%
	Do Not Know	35	8.27%
	Total	423	100%
Knowledge about Coughing/Sneezing/Shouting/Spitting as TB Transmission Routes	Yes	156	36.88%
	No	162	38.30%
	Do Not Know	105	24.82%
	Total	423	100%
Knowledge of TB Transmission Being Preventable	Yes	360	85.11%
	No	43	10.17%
	Do Not Know	20	4.73%
	Total	423	100%

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Firstly, 91.49% (387 individuals) expressed satisfaction with their TB treatment, while 8.51% (36 individuals) did not. Regarding adherence to medication, 46.57% (197 individuals) admitted to missing doses of ATT, whereas 53.43% (226 individuals) did not. When asked about the knowledge of resistance development if treatment is not properly followed, only 7.33% (31 individuals) were aware of this risk, while a significant majority, 92.67% (392 individuals), were not aware. Lastly, a large majority, 95.04% (402 individuals), understood that leaving therapy during its course could result in lifelong complications, compared to 4.96% (21 individuals) who did not hold this understanding. Each category sums up to the total participant count of 423, representing 100%.

Category	Response	Frequency	Percent
Participant's Satisfaction with the Treatment	Yes	387	91.49%
	No	36	8.51%
	Total	423	100%
Did Participants Ever Miss Their Dose of ATT	Yes	197	46.57%
	No	226	53.43%
	Total	423	100%
Participant's Knowledge of Resistance Development if Treatment Not Followed Properly	Yes	31	7.33%
	No	392	92.67%
	Total	423	100%
Leaving Therapy During Its Time Course Will Result in Life Long Complications	Yes	402	95.04%
	No	21	4.96%
	Total	423	100%

A vast majority, 98.11%, informed their family members about their illness, while only 1.89% did not. About 22.22% experienced a change in behavior from family members due to their illness, whereas 77.78% did not notice any change. In terms of informing friends or co-workers, 82.98% did so, while 17.02% chose not to. The same percentage, 82.98%, also received visits from friends or co-workers during their illness. A significant 95.98% noticed a change in attitude from friends or co-workers during their illness, with only 4.02% not observing any change. Regarding social aspects, 65.01% feared social isolation due to their illness, while 34.99% did not share this fear. Additionally, 34.99% found it difficult to travel to healthcare facilities, in contrast to 65.01% who did not find it challenging. Financial burden due to health issues was a concern for 61.70%, whereas 38.30% did not consider it a burden. In terms of healthcare support, 98.35% received counseling regarding proper medication intake, and 1.65% did not. Counseling about the side effects of antituberculosis treatment (ATT) was provided to 61.70%, while 38.30% did not receive such counseling.

Category	Response	Frequency	Percent
Family Members Informed of Illness	Yes	415	98.11%
	No	8	1.89%
	Total	423	100%
Change in Behavior of Family Members Due to Illness	Yes	94	22.22%
	No	329	77.78%
	Total	423	100%
Friends/Co-Workers Informed of Illness	Yes	351	82.98%
	No	72	17.02%
	Total	423	100%
Visits by Friends or Co-Workers	Yes	351	82.98%
	No	72	17.02%
	Total	423	100%
Change in Attitude of Friends or Co-Workers During Illness	Yes	406	95.98%
	No	17	4.02%
	Total	423	100%
Fear of Social Isolation Due to Illness	Yes	275	65.01%
	No	148	34.99%
	Total	423	100%
Difficulty in Travelling to Healthcare Facility	Yes	148	34.99%
	No	275	65.01%

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	Total	423	100%
Health Being a Financial Burden	Yes	261	61.70%
	No	162	38.30%
	Total	423	100%
Counseling Regarding Proper Medication Intake	Yes	416	98.35%
	No	7	1.65%
	Total	423	100%
Counseling Regarding Side Effects of ATT	Yes	261	61.70%
	No	162	38.30%
	Total	423	100%

DISCUSSION

The factors affecting the compliance of TB patients on ATT can largely be classified in four major areas that can be named as health facility related, personal, social, and demographic features. As highlighted in study conducted by Salla a Munro(7), the eight features are more pronounced in determining the compliance include health care system, personal knowledge of disease, financial features of treatment, treatment knowledge and beliefs, immigration and laws, personal adherence pattern to treatment, therapeutic adverse reactions and domestic support.

This study also exposed and enunciated the similar areas as under

1. Demographic features like age, gender, marital status, education or literacy level and income.
2. Personal features like history of TB contact, past history, TB being a preventable, transmissible, and treatable disease, awareness about mode of transmission, transmission being preventable, knowledge about common symptoms, duration of treatment, complete recovery after treatment, satisfaction with treatment, lifelong complications in case of leaving therapy in its time course, development of resistance in case of not following the therapy properly, missing of dose, causes of missing the dose, how patients take medication.
3. Social features like family members and co-workers being informed, change of behavior of family members and co-workers, colleague's attendance during illness, fear of loss of employment, isolation stigma.
4. Health care facility related features like time and cost to reach the facility, financial attributes of treatment, counselling regarding medication way, counselling regarding side effects of att.

Demographic features:

The study population predominantly consisted of females, diverging from Rituparna Das et al. (2015), which linked males with higher compliance(6). Bashour, H. (2003) and Brudney, K and Dobkin, J. (1992) found females more likely to comply with treatment and males more prone to non-compliance, respectively(8, 9). The majority of participants were middle-aged, aligning with Brasil P, et al. (2008)(10). Most were married and literate, contrasting with Sudore, Rebecca L., et al. (2006)(11), which associated limited health literacy with lower socioeconomic status. Liam, C.K. et al. (1999) indicated that literacy influences TB knowledge(12). Mushtaq (2010) suggested that improved educational and financial status correlates with better disease understanding(13). Over 63% of participants earned less than 10,000 Rupees monthly, highlighting the group's low-income status. This is significant, as Tanimura, T., et al. noted the financial risks for TB patients, underscoring the need for social protection interventions(14).

Personal features:

In a study examining tuberculosis (TB) treatment and compliance, key findings emerged regarding patient history, knowledge, and behavior. Over 66% of the population had a history of TB contact, emphasizing the importance of understanding disease infectivity. O'Boyle, S. et al. (2002) found that TB patients with an infected family member were more likely to discontinue treatment after symptom relief, suggesting a need for better patient education(15). Only 23% had a personal history of TB, indicating a risk of recurrence due to factors like inadequate prescriptions, partial treatment (Khan, 2003)(16), or inappropriate treatment (Liang, 2012)(17), potentially leading to multi-drug resistant TB (MDR-TB). Amir Khan (2000) noted that misconceptions about TB being incurable and stigmatization contribute to non-compliance(18). Regarding symptom awareness, 58% were knowledgeable about common TB symptoms, but 42% lacked this knowledge. Most participants understood TB's infectious nature, and almost all recognized it as a preventable and treatable disease, underlining the importance of education in treatment adherence. Less than half knew the standard treatment duration was six months, with only 18% thinking it lasted a year. Nuwaha et al. (1997) highlighted that patients on shorter treatments adhered better, suggesting the need for educating patients about treatment duration(19). Liam,

C.K. et al. (1999) also emphasized educating patients and families about the disease course and treatment length to improve compliance(12). Regarding transmission, 37% believed TB spread through coughing, sneezing, and spitting, while 38% disagreed, showing gaps in understanding transmission modes. The majority, however, knew that TB's spread is preventable. Most participants were confident in full recovery after treatment, and the majority were taking medication under family supervision, with 40% unsupervised. Rituparna Das (2015) found that supervised treatment improves compliance, indicating the need to focus on those unsupervised(6). About half occasionally missed doses, with nausea, abdominal pain, and vomiting being common reasons. This highlights the need to address the causes of missed doses to prevent habit formation and treatment discontinuation. Only 7.3% were aware of the risk of developing drug resistance, despite 92% knowing the dangers of premature treatment cessation. Kaona, F.A. et al. (2004) identified factors leading to non-compliance, such as feeling better after starting treatment, lack of awareness of the benefits of completing treatment, running out of medication, and the potency of TB drugs(20).

Social features:

In a study on tuberculosis (TB) treatment, it was found that almost all participants informed their families about their illness, with 22% noticing altered behavior from relatives. Most also told their co-workers, observing changed behavior from them as well. Over 60% feared losing their job, while more than 65% were concerned about social isolation. The study by R. Leifooghe and A. D. Muynck (2001) emphasized the role of the 'biradari' system (extended family and kinship) in therapy completion, noting that early treatment defaulters often lack motivation and belief in recovery, whereas late defaulters suffer from inadequate family support(21). Meulemans et al. (2002) and R Liefoogh et al. (1995) showed that social stigma around TB can lead to non-compliance, loss of relationships, and increased dependence on family(22, 23). J Rubel and L C Garro (1992) found that health culture and societal stigma significantly influence patient compliance(24).

Healthcare facility related features:

In the study, 35% of participants acknowledged the long distance to healthcare facilities as a barrier, aligning with Naing, N N et al. (2001), who found non-compliance higher among those living far from medical centers(25). Brasil, P.E.A.A.D. and Braga (2008) also identified difficult access as a key factor in non-compliance(10). M. A. Khan et al. (2005) noted that time, financial costs, and provider attitudes adversely affect attendance to DOTS (Directly Observed Treatment, Short-course)(26). While nearly all participants received counseling on medication adherence, only 62% were counseled about side effects. Liefooghe et al. (1999) suggested counseling boosts compliance(27). Amir Khan (2000) pointed out that factors like lack of disease knowledge, inadequate prescriptions, repeated visits to various healthcare providers, and financial and time constraints contribute to non-compliance(18).

Factors accounting to make participant to think to leave the treatment:

Nearly half of them recognized side effects of drugs may convince them to leave treatment whereas 11% agreed to hold non-cooperative family members responsible to make them think to leave treatment. Argari Pachi et al (2013) studied the relationship of side effects of ATT with development of psychiatric co-morbidities like depression leading to non-compliance(28). Some voted for long travelling distance and inadequate knowledge and very few regarded doctor’s availability and staff's behavior compelling them to leave treatment. Skeptical thinking about disease, diagnosis and treatment; economics related issues, personal job or study related factors, drug side effects, psychiatric and health facility related factors play vital role in determining the compliance according to Ito K et al (2008)(29). Lack of health insurance, homelessness, physical barriers to medicine use and drug adverse reactions determine non-compliance according to study by Gillian M. Craig and Alimuddin (2015)(30).

CONCLUSION

Tuberculosis (TB) remains a significant global health challenge, primarily due to issues surrounding treatment compliance. Understanding the demographics and personal factors associated with TB is crucial for conceptualizing its dynamics and emphasizing the importance of the treatment's duration. A lack of knowledge about treatment strategies, therapy duration, common symptoms, and modes of transmission contributes to a more abstract understanding of the disease. This is exacerbated by a substantial number of patients who are unsupervised during medication intake, creating a large group vulnerable to adopting non-compliant strategies. The identification of cases with positive TB contact history, including macroscopic cases with a past positive history of TB, underscores the need to explore the TB-affected population more thoroughly. Key factors that need attention include the side effects of TB drugs, the social stigma associated with the disease, and the need for effective counseling regarding therapy and treatment strategies. Addressing these aspects is essential to reduce the prevalence and burden of TB.

1. Health education related to TB disease transmissibility, modes of transmission, importance of long duration of therapy and importance of completing the course of treatment are in need to be implemented to expedite the compliance at patient’s level.
2. Health advocacy of preventive measures to reduce the disease spread and measures to reduce side effects and strategies to cope with side effects should be highlighted at patient’s and general population level both

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3. Health education of general population to raise an awareness of tuberculosis and to remove the social odium of disease with measures to help and accept the tuberculosis patient can help to increase the compliance.

4. Health education at healthcare provider level to stick to treatment guidelines and to provide adequate counseling and knowledge of disease to patient and patient's relatives can positively impact the compliance.

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