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Evaluation of 'Non-compliance' as a Risk Factor of Developing MDR TB in Different Educational backgrounds among the Patients Undergoing Treatment in a Specialized Hospital in 50 cases

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Abstract: ***Background:*** Multidrug-resistant tuberculosis (MDR-TB) presents a significant global health challenge, with Bangladesh being no exception, experiencing a rise in drug-resistant cases. The study focuses on the correlation between drug non-compliance and patients' educational backgrounds as a contributing factor to the emergence of MDR-TB. ***Objective:*** This study aims to assess the impact of non-compliance with medication regimens on the development of MDR-TB among individuals from varying educational backgrounds. The goal is to increase awareness regarding this crucial issue among patients, families, healthcare providers, and policymakers. ***Methodology:*** A retrospective cross-sectional analysis of 50 MDR-TB patients who had received at least three months of treatment at Dhaka's National Institute of Disease of the Chest and Hospital between October 2011 and March 2012. ***Results:*** The results of the study revealed that 64% of MDR-TB patients had a history of drug non-compliance, with a majority of them (72%) being male. Drug non-compliance was more common among individuals with lower educational backgrounds, as 72% of non-compliant MDR-TB patients had completed only primary education or less. In contrast, among compliant MDR-TB patients, 70% had completed secondary education or higher. ***Conclusion:*** It highlights that individuals with higher educational backgrounds tend to be more health-conscious and adherent to their medication regimens, resulting in a lower incidence of MDR-TB among this group.

Keywords: Tuberculosis, Non-compliance, Educational background, Multidrug-resistant Tuberculosis (MDR-TB).

Original Researcher Article

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Article at a glance:

Study Purpose: *To examine drug non-compliance among MDR-TB patients and its association with educational backgrounds.*
Key findings: *64% MDR-TB non-compliance, males > females, lower education linked, 31-40 age group prone to non-compliance.*
Newer findings: *The study highlights MDR-TB challenge, urges region-specific interventions, emphasizes education, and targets compliance, especially among rural males.*
Abbreviations: *MDR-TB: Multidrug-resistant tuberculosis, DOTS: Directly Observed Treatment, Short-Course, TB: Tuberculosis, XDR-TB: Extensively Drug-Resistant Tuberculosis.*

INTRODUCTION

Tuberculosis (TB) remains a global health challenge, with multidrug-resistant tuberculosis (MDR-TB) emerging as a dire threat to international efforts for TB control.[1] MDR-TB, defined by its resistance to essential first-line TB medications such

as Isoniazid and Rifampicin, is progressively affecting both newly diagnosed TB cases and individuals with a history of prior TB treatment.[2] The increasing prevalence of MDR-TB necessitates a comprehensive understanding of the factors contributing to its development. While a prior history of TB treatment continues to be a significant risk factor for MDR-TB, it is imperative to recognize that treatment-naïve patients are also susceptible, either due to spontaneous mutations within Mycobacterium tuberculosis or through the transmission of drug-resistant strains.[3] Furthermore, the growing population of MDR-TB patients escalates the risk of resistant strain transmission, raising the possibility that cases initially diagnosed as drug-sensitive TB in treatment-naïve patients might indeed be MDR-TB from the outset.[4] Therefore, exploring the underlying risk factors for MDR-TB development is paramount.

One critical aspect that has garnered significant attention in numerous studies across various countries is the role of medication non-adherence, often influenced by the diverse educational backgrounds of patients, in the emergence of MDR-TB. [5] Interestingly, the correlation between educational backgrounds and medication adherence is not straightforward. While it is commonly assumed that well-educated individuals are more likely to adhere to their prescribed medication regimens and those with limited formal education are less likely to do so, the reality is more nuanced. Some well-educated individuals may fail to adhere, while some less educated individuals may successfully follow their treatment plans due to factors such as trust in healthcare providers or cost considerations.[6] This intricate landscape of MDR-TB is further compounded by its substantial challenges. MDR-TB necessitates considerably more complex and costly treatment regimens compared to fully susceptible TB, typically requiring the use of expensive second-line drugs for an extended duration [7]. The causes of MDR-TB are multifaceted, encompassing issues related to patient management, treatment adherence, and the overall effectiveness of national TB control programs [8]. Inadequate and incomplete adherence to treatment regimens has not only contributed to the rise of MDR-TB. Still, it has also led to the emergence of an even more formidable form known as extensively drug-resistant tuberculosis (XDR-TB). [9]

The development of drug resistance in Mycobacterium tuberculosis can be attributed to various factors, including genetic mutations within the bacterium itself [10]. Additionally, errors made by healthcare providers, such as incorrect drug selection, dosing intervals, and treatment durations, have also played a role in the creation of new MDR-TB cases each year [11]. Mismanagement of TB, such as the use of a single drug for treatment or adding a single drug to a failing regimen, can initiate inadequate regimens using first-line anti-TB drugs, increasing the risk of MDR-TB development. Shortages of essential drugs, particularly in resource-limited settings, have been a common cause of inadequacies in initial anti-TB treatment regimens. Moreover, the increased cost associated with managing MDR-TB presents yet another significant challenge. [12] In the study, the emergence and spread of MDR-TB pose a severe threat to global tuberculosis control efforts. Understanding the risk factors for MDR-TB development, including the role of drug non-compliance influenced by patients' diverse educational backgrounds, is crucial. It is essential to address the root causes of MDR-TB, which can be both a result of inadequate treatment of drug-sensitive TB and errors in TB management, including inadequate drug regimens and shortages. Combatting MDR-TB requires a comprehensive approach, encompassing improved patient education, healthcare system strengthening, and effective treatment strategies to ensure adherence and minimize the emergence of drug resistance.

OBJECTIVES

General Objective

- To investigate the role of 'Non-compliance' as a Risk Factor for the Development of Multidrug-Resistant Tuberculosis (MDR TB) among Patients undergoing treatment at a Specialized Hospital, with a specific focus on their educational backgrounds.

Specific Objectives

- To analyze the clinical and epidemiological aspects of the risk factors associated with the development of MDR TB in patients receiving treatment at a specialized hospital.

- To assess and establish the significance of educational background as a robust predictive factor for noncompliance, which, in turn, is identified as a risk factor for the development of MDR TB.
- To quantify and describe the strength of the association between educational background and noncompliance in the context of MDR TB development among patients undergoing treatment in a specialized hospital.

MATERIALS AND METHODS

Study Design

The study utilized a descriptive cross-sectional design to investigate drug non-compliance as a risk factor for MDR-TB development among a sample of 50 MDR-TB patients admitted to the National Institute of the Disease of Chest and Hospital in Dhaka over six months from October 2011 to March 2012.

Inclusion Criteria

- Patients diagnosed with multidrug-resistant tuberculosis (MDR-TB) based on a documented history of tuberculosis and its treatment.
- Patients with confirmed drug resistance, as determined by culture and sensitivity tests, display resistance to at least Rifampicin and Isoniazid.

Exclusion Criteria

- Individuals with known psychiatric disorders or alcoholism.
- Patients with extrapulmonary tuberculosis.
- Participants who did not provide informed consent.
- Individuals are unable to provide a medical history due to severe illness.

Data Collection

Data collection involved interviewing 50 eligible MDR-TB patients admitted to the National Institute of the Disease of Chest and Hospital in Dhaka. Clinical diagnosis, medical history, and sputum culture and sensitivity tests confirmed their MDR-TB status. Data, including educational background and drug compliance, were collected through individual case records, interviews with patients and their families, and examination of previous and recent medical reports. The interviews conducted by the investigator focused on assessing drug non-compliance with educational backgrounds. Written informed consent was obtained from each participant, and the investigator self-funded the study.

Data Analysis

Following data collection at the National Institute of the Disease of Chest and Hospital in Dhaka, all questionnaires underwent meticulous error identification and data processing, including scheduling registration, editing, coding, and computerization. The investigator oversaw the technical aspects of editing, encoding, and computerization. After data verification and consistency checks, coded data were entered into SPSS version 26 software for cleaning, validation, and analysis. Additionally, MS Excel was used for creating graphical representations. Results were presented in tables displaying mean, standard deviation, and percentages, with statistical significance set at a "P" value <0.05.

Ethical Considerations

Ethical approval was paramount throughout this study conducted at the National Institute of the Disease of Chest and Hospital in Dhaka. Informed consent was obtained from each participant, emphasizing their voluntary participation and the confidentiality of their information. Patients' autonomy and privacy were rigorously respected. The study adhered to ethical guidelines, ensuring the dignity and well-being of participants. Additionally, the study received approval from the relevant ethics committee. All research procedures complied with established ethical standards, fostering trust and ethical conduct in collecting and handling sensitive patient data.

RESULT

A total of 50 MDR-TB patients diagnosed through positive sputum culture sensitivity and receiving at least 3 months of treatment were studied. The patients had a median age of 26 (ranging from 12 to 60), with an equal gender distribution (25 males and 25 females). Notably, 64% of these patients reported a history of drug non-compliance.

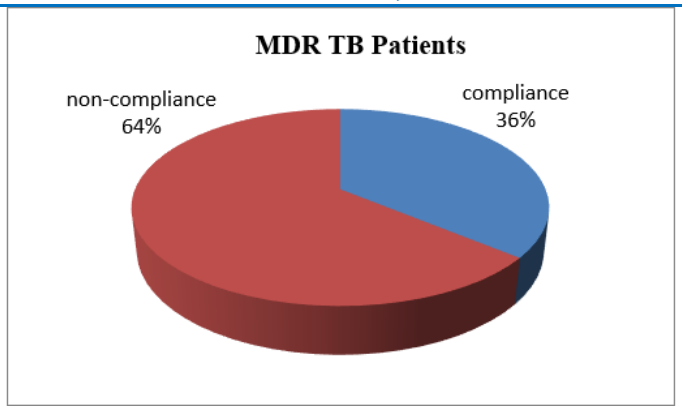

Figure 1: Shows that only 36% of patients with MDR TB had drug compliance

Among the patients who reported non-compliance with treatment, 72% were male, while 28% were female.

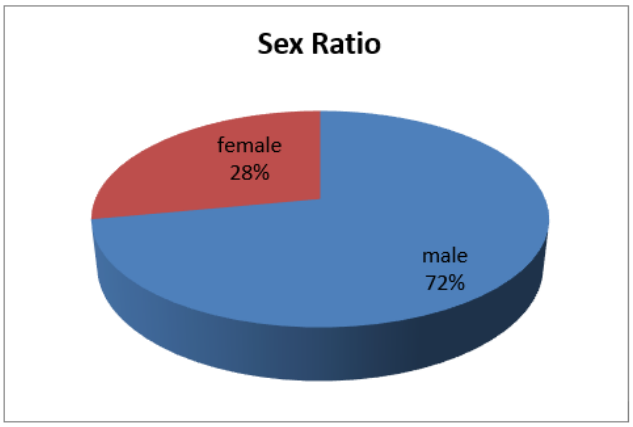

Figure 2: Shows the male predominance regarding non-compliance among MDR TB patients

Table 1: Percentage of drug non-compliant MDR TB patients according to different age groups

Age Group (Years)	Non-Compliant Patients (N=32)	Compliant Patients(N=18)
11-20	10%	3%
21-30	16%	25%
31-40	44%	48%
41-50	24%	19%
51-60	6%	5%

Among the non-compliant MDR TB patients, 60% were married, and 40% were unmarried

Table 2: Educational background of the drug non-compliant MDR TB patients (n=50)

Educational Background	Number of Patients (n=50)	Percentage
Even Cannot Sign	6	12%
No Primary Education but Can Sign	10	20%
Primary Education	20	40%
Secondary Education	7	14%
Higher Secondary Education	4	8%
Graduate	2	4%
Post-graduate	1	2%

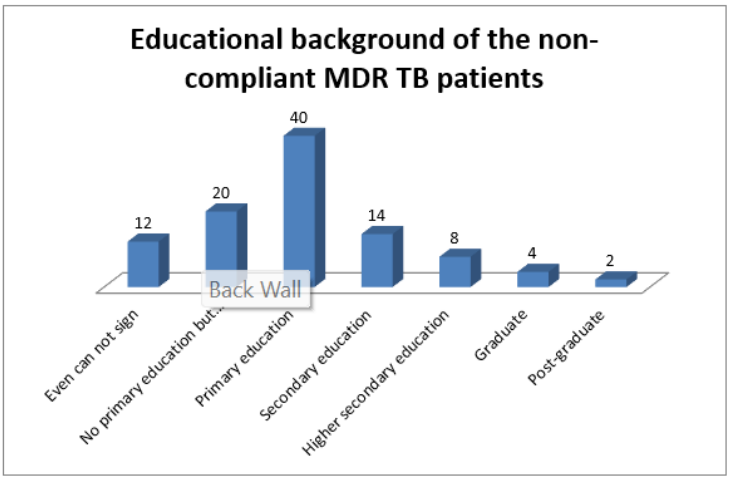

Figure 3: shows the graphical presentation of educational background of the non-compliant MDR TB patients

In a study of 50 drug non-compliant MDR TB patients, 40% had primary education, 20% had no primary education but could sign, and 12% couldn't sign. Higher education levels were less represented, with 4% being graduates and 2% post-graduates. This diversity emphasizes educational disparities within the non-compliant group.

Table 3: Comparison of Educational background between Drug compliance and Drug non-compliance in MDR TB

Educational Level	% of Drug Compliant	% of Drug Non-Compliant	P Value
Even Cannot Sign	12%	4%	0.31
Can Only Sign	20%	10%	0.5
Primary Education	40%	16%	0.28
Secondary Education	14%	44%	0.32
Higher Secondary Education	8%	18%	0.08
Graduate	4%	6%	0.08
Post-graduate	2%	2%	0.12

The comparison of educational levels between drug-compliant and non-compliant MDR TB patients revealed significant differences. Non-compliant patients exhibited lower educational attainment, particularly in primary (16%) and secondary (44%) education levels, suggesting a potential correlation between educational background and drug non-compliance in MDR TB cases. The p-values further emphasize the statistical significance of these disparities.

DISCUSSION

This study aimed to explore the relationship between drug non-compliance and the educational backgrounds of MDR-TB patients and shed light on the factors contributing to MDR-TB development. The findings revealed that a significant portion of MDR-TB patients had a history of non-compliance, emphasizing the critical role of health consciousness and educational background. A study in Brazil highlighted inadequate adherence to guidelines for MDR-TB screening, reinforcing the importance of alternative surveillance strategies.[13] The study also found similarities with our results, indicating that drug non-compliance is a global concern. However, it's essential to consider regional variations and healthcare systems when interpreting these findings. Interestingly, female MDR-TB patients exhibited higher drug compliance than males. This difference may be attributed to the integrated healthcare system in Bangladesh, where mothers, often responsible for childcare, have more interactions with healthcare facilities.[8] In contrast, male patients, preoccupied with livelihood, may prioritize medication less. This observation aligns with a study in South Africa, where the majority of MDR-TB patients were male. [14] The relationship

between marital status and non-compliance warrants further investigation, as it was noted that most non-compliant patients were married. Understanding the influence of marital status on treatment adherence can guide future interventions.

One of the study's significant findings was the strong association between educational background and drug non-compliance. Patients with lower educational levels were more likely to exhibit non-compliance, while those with higher education showed better adherence [6]. This highlights the importance of educational interventions in improving treatment compliance. A similar study in Brazil also reported a lower completion rate of school education among MDR-TB patients.[15] The study identified the age group of 31-40 as being particularly prone to non-compliance, likely due to their busy lifestyles and multiple responsibilities. This observation is consistent with findings from South Africa, which showed that this age group was highly active in various aspects of life.[16] The geographical distribution of non-compliant MDR-TB patients pointed to a higher prevalence in rural areas. This finding suggests that poor educational backgrounds in rural regions may contribute to non-compliance and the higher prevalence of MDR-TB. However, more research is needed to establish a direct link between geographic location, educational levels, and non-compliance.

Although not directly related to drug non-compliance, the study identified a concerning issue of anemia among female patients of reproductive age, particularly those aged 13-30. This health concern may have broader implications for public health, highlighting the need for interventions to address anemia in this demographic group. This study underscores the complex interplay between educational backgrounds, gender, marital status, age, and drug non-compliance among MDR-TB patients. It reaffirms the global challenge of MDR-TB and emphasizes the need for region-specific interventions to improve treatment adherence. Strategies should include educational campaigns targeting individuals with lower educational backgrounds, especially in rural areas. Addressing anemia among reproductive-age females is essential to enhance overall public health in Bangladesh. Further research is warranted to delve deeper into the relationships identified in this study and develop more targeted interventions for MDR-TB prevention and treatment compliance.

CONCLUSION

The study underscores that non-compliance remains a substantial barrier to effective treatment outcomes. Tailored educational interventions and targeted support programs should be harnessed to bridge the gap, particularly among the male population in the 31-40 age group residing in rural areas. Furthermore, adopting cutting-edge therapeutic approaches, alongside proactive monitoring, can enhance treatment adherence and reduce the prevalence of MDR-TB, ultimately paving the way for a healthier, more resilient population.

Recommendations

- Prioritize and strengthen Directly Observed Treatment, Short-course (DOTS) for TB patients.
- Implement rigorous monitoring throughout the treatment of MDR-TB patients.
- To improve patient understanding and adherence, focus on enhancing educational opportunities, especially in rural areas.
- Ensure the protection of healthcare workers, such as providing masks and proper protective measures.

Limitations

The study's limitations include a relatively small sample size of only 50 patients, which may affect the generalizability of the findings. Furthermore, the exclusion of patients with co-morbid conditions such as diabetes, HIV, or Hepatitis B/C could have provided additional valuable insights. Additionally, the research was conducted solely within a single institute, potentially limiting its applicability to broader populations. Lastly, resource constraints prevented the comprehensive screening and evaluation of all patients for the mentioned conditions, potentially resulting in an underestimation of the prevalence of certain side effects in the study.

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