The Study of the Possible Program-related Factors Contributing to Drug Resistance in Tuberculosis Patients

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ARTICLE INFO

ABSTRACT

Background and aim: The prolonged duration of treatment, the need for multiple drugs, adverse drug reactions, and socioeconomic factors are the main reasons for non-adherence to treatment for tuberculosis which can lead to drug resistance, risk of transmission, and death. Understanding the factors for drug resistance in tuberculosis (TB) patients is essential. This study assesses the factors contributing to drug resistance in tuberculosis patients.

Material and methods: This is a cross-sectional study done on 198 patients diagnosed with drug-resistance tuberculosis (DRTB) at the Department of Respiratory Medicine, Gandhi Medical College, Bhopal were included.

Results: In this study, 71.7% of study participants were male; the majority of patients were of age group 30-40 years (36.4%) and of BMI<18.5 (59.6%), and 37.9% were educated up to middle school. In this study, inadequate training of health care workers, no direct benefit transfer to the patient, and improper counseling were found statistically significant (p value<0.05) as possible factors leading to DRTB. In contrast, the increased distance of residence from the drug distribution center and the non-availability of drugs had no significant correlation (p-value>0.05).

Conclusions: The study concludes that the above possible factors contributing to drug resistance should be considered in high-risk group TB patients. It can be done through proper training of health care workers, transferring the direct benefits entitled to the TB patients on time, and ensuring the availability of drugs around the year.
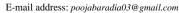
1. Introduction

The incidence of tuberculosis globally is 10 million, of which India amounts to 2.64 million, around 26% of the total incidence.[1, 2] Drug-resistant tuberculosis (DRTB) has an incidence of 0.5 million globally, of which India conceives 124,000 cases, making it 27%. Although TB is curable, DRTB is more challenging to treat than drug-susceptible TB because it requires less effective second-line anti-TB drugs, which are also associated with major side effects.[3] DRTB is associated with a two to four-fold treatment duration compared to drug-sensitive TB, improper counseling, non-availability of drugs, long travel time for procurement of drugs, economic problems, and poor treatment adherence, consequently leading to treatment failure.[4] It is also conventionally associated with higher case fatality rates (40-60%).[5] Most DRTB cases are due to poor adherence to TB medication, irregular use of drugs, interrupted drug supplies, physician error, and accessibility of drugs without a prescription.[4] The prolonged duration of treatment, the need for multiple drugs, and socio-economic factors are the main reasons for non-adherence to treatment.[5] This can lead to drug resistance, prolonged infectiousness, and death; hence understanding the determinants of drug resistance in TB patients is essential.[6] Program-related factors like inadequate training of health care workers, no direct benefit transfer to patient, improper counseling, long distance for patients for collection of drugs, and non-availability of drugs in the middle of the course of the treatment play a significant role in the development of drug resistance in TB patients.[7, 9] This study aims to assess the program-related factors possibly contributing to drug resistance patterns in tuberculosis patients. Also, to provide insight into the barriers to the ongoing program for control of DR-TB and help strengthen the program and the betterment of the patient.

2. Material and methods

This cross-sectional observational study was conducted in Nodal DOTS plus the site of Gandhi Medical College, Bhopal, in the Department of respiratory medicine from January 2020 to June 2021. Institute's Ethics Committee (IEC) clearance was taken, ethical committee registration number ECR/1055/Inst/MP/2018, and written informed consent was obtained from all patients. During this study, we took 198 Patients with microbiologically confirmed DRTB. At baseline Patient's perspective was assessed based on the

pre-designed questionnaire. Those patients who were not giving consent & severely ill to answer the questionnaire were excluded from the study. SPSS software is used for statistical analysis.

3. Results

Most study participants comprised males 142(71.7%) and females participants 56 (28.3%). The Male-Female ratio was 2.5:1. Maximum number of patients (65) were seen in the age group of 30-40 years (median 36.4 years).

Most patients belonged to a lower socio-economic class (35.4%) & studied up to middle school (33.3%). Detailed analysis is mentioned in Table 1. In our study, inadequate training of health care workers, no direct benefit transfer to patients, and improper counseling were statistically significant (<0.05) factors in developing drug resistance regarding program-related factors. On the other hand, factors like the increased distance of residence from the drug distribution center and non-availability of drugs were found to be statistically insignificant >0.05.

Table 1. Association between Program-related factors and drug-resistant tuberculosis.

Factors/resistance Pattern		HR	RR	MDR	Pre XDR	Pre XDR + SLI	P-value
Inadequate training in health care (Requires Retraining)	Yes	19	30	38	35	7	-----
	No	10	19	18	20	2	-----
	Total	29 (15.21)	49 (24.78)	56 (28.04)	55 (27.8)	9 (4.17)	**<0.05**
		HR	RR	MDR	Pre XDR	Pre XDR + SLI	P-value
Direct benefit transfer to patient	Yes	7	14	20	15	3	-----
	No	22	35	36	40	6	-----
	Total	29 (15.21)	49 (24.78)	56 (28.04)	55 (27.8)	9 (4.17)	**<0.05**
		HR	RR	MDR	Pre XDR	Pre XDR + SLI	P-value
Improper counseling	Yes	20	39	40	30	5	-----
	No	9	10	16	25	4	-----
	Total	29 (15.21)	49 (24.78)	56 (28.04)	55 (27.8)	9 (4.17)	**<0.05**
		HR	RR	MDR	Pre XDR	Pre XDR + SLI	P-value
More distance from home to drug distribution center (> 1 hour / > 50 km)	Yes	11	19	21	15	2	-----
	No	18	30	35	40	7	-----
	Total	29 (15.21)	49 (24.78)	56 (28.04)	55 (27.8)	9 (4.17)	>0.05
		HR	RR	MDR	Pre XDR	Pre XDR+SLI	P-value

Non-availability of drugs	Yes	8	10	16	13	3	-----
	No	21	39	40	42	6	-----
	Total	29 (15.21)	49 (24.78)	56 (28.04)	55 (27.8)	9 (4.17)	>0.05

*p-value <0.05 is statistically significant.
IR: Isoniazid resistance, RR: Rifampicin resistance, MDR: Multidrug resistance, Pre XDR: Pre extensively drug resistance, SLI: Second line injectable.

4. Discussion

The non-availability of drugs can lead to drug default. The proper availability of drugs should be ensured in the sub-centers and lowest levels of distribution points. Patients stop treatment in the middle of the treatment regimen leading to the development of resistance. Initially, patients are aware and motivated to take medicines from the DOTS center; however, later on, the distance from home arises a significant hindrance. Studies like Fikre A et al. 2019[9] have shown that 65.7% of patients had to travel for more than 3 hours, while 34.3% took less than 3 hours to reach health facilities. The patients who had to travel far developed drug resistance (68.2%). Proper counseling and follow-up are important factors that develop patient confidence and assure proper treatment protocol adherence. Otherwise, patients interrupt the treatment and may stop at any time. This is seen in studies like Fikre A et al. 2019[9], where a healthcare worker counseled 77.6% of patients, and in the study by Hirpa S et al. 2013[8], HCW also counseled 67.2%. In our study, inadequate training of health care workers, no direct benefit transfer to patients, and improper counseling were found to be statistically significant (<0.05) factors in the development of drug resistance in terms of program-related factors indicating that if these factors prevail than the chances are high for the development of resistance.

On the other hand, factors like the increased distance of residence from the drug distribution center and the non-availability of drugs were found to be statistically insignificant (>0.05). However, these factors also indirectly play a significant role in developing resistance, which cannot be ignored. Strategies should include increasing public health education awareness and reducing treatment interruptions to avoid drug resistance, as also concluded in a study by Fantahun et al.[10] It is a social problem in which barriers must be solved at the provider and patient level.[11] According to a study by Chowdhury et al., drug resistance is caused by incorrect prescribing, irregular drug supply, patient non-adherence, and low-grade quality of drugs.[12] Strengthening TB control efforts, expanding access to rapid diagnosis, and providing efficient treatment are all essential for worldwide TB control. To stop the spread of tuberculosis, political and financial commitment is required. There is a compelling need for comprehensive monitoring of ongoing TB treatment in the private sector to shed light on the true scope of the problem and to track the progress of present measures to address it.

Limitations

It was a single-center study with a low sample size, and aspects such as the treatment outcome and adverse reactions of drugs used to treat patients with MDR-TB were out of the range of this study; future studies will be undertaken to explore this aspect further.

5. Conclusion

The Indian government is working frivolously to eliminate tuberculosis from India, but some lacunae in the program need to be improvised. Special attention needs to the proper training of health care workers and better counseling of the patients along with transferring the direct benefits entitled to the TB patients on time by ensuring that the drugs are available around the year for the patient and are in their minimum possible reach. This may help reduce drug-resistant patients, their overall betterment, and the building up of a healthy society.

Conflict of Interest

The authors declared that there is no conflict of interest.

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