Section: Community Medicine

Original Research Article

FACTORS AFFECTING TREATMENT OUTCOMES IN MDR-TB PATIENTS IN WESTERN MAHARASHTRA (INDIA)

Wagh Yogesh K.[1], Kale Kalpana M.[2], Deshmukh Kattyayani P.[3], Aswar Nandkeshav R[4]

[1]*Associate Professor Department of Respiratory Medicine, India.*
Associate Professor, Department of Community Medicine, Government Medical College, Miraj, India.
Assistant Professor Department of Community Medicine, Government Medical College, Miraj, India.
Professor Department of Community Medicine, Government Medical College, Miraj India.

Received *: 03/08/2025*
Received in revised form *: 17/09/2025*
Accepted *: 04/10/2025*

Corresponding Author:
Dr. Wagh Yogesh K.,
Associate Professor Department of Respiratory Medicine, India.
Email: yogeshwagh12345@gmail.com

DOI: 10.70034/ijmedph.2025.4.250

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2025; 15 (4); 1402-1406

ABSTRACT

Background: Multidrug-resistant tuberculosis (MDR-TB) poses significant treatment challenges, particularly in rural settings. This study evaluates factors influencing MDR-TB treatment outcomes in Western Maharashtra, India.

Materials and Methods: A retrospective cohort study analysed 127 patients at Nodal DRTB Centre, GMC, Miraj, from January 2021 to September 2024. Data on demographic and clinical characteristics, including tobacco addiction, were collected from treatment cards. Study participants included MDR-TB (n=120), Pre-XDR-TB (n=4), and HR-resistant TB (n=3). Treatment outcomes (successful-cured or completed; non-successful- death, loss to follow-up, regimen change, or failure) were assessed using Chi-square and Fisher's Exact Tests ($P < 0.05$).

Results: Out of 127 patients, 98 (77.2%) achieved successful outcomes (77 cured, 21 completed), surpassing the global MDR-TB success rate of 63%. Non-successful outcomes (22.8%) included 12 deaths, 3 losses to follow-up, 12 regimen changes, and 2 failures. Occupation was significantly associated with outcomes ($P = 0.002$), with professional occupation showing the highest non-successful rate (60.0%) and skilled occupation the lowest (10.8%). Alcohol addiction was significant ($P = 0.02$), with 35.7% non-successful outcomes. Tobacco addiction ($P = 0.49$), sex ($P = 0.80$), diabetes ($P = 0.33$), previous treatment ($P = 0.81$), and resistance pattern ($P = 0.33$) showed no significant associations.

Conclusion: In the present study, occupational status and alcohol addiction significantly influence MDR-TB treatment outcomes, highlighting the need for targeted interventions for high-risk groups to enhance adherence and success rates in rural India.

Keywords: MDR-TB, treatment outcomes, occupational status, alcohol addiction, pre-XDR TB.

INTRODUCTION

Multidrug-resistant tuberculosis (MDR-TB), defined as resistance to at least isoniazid and rifampicin, remains a global public health crisis, with an estimated 410,000 new cases annually and a treatment success rate of only 63%.[1] The World Health Organization (WHO) highlights prolonged treatment, high costs, and socioeconomic barriers as key challenges.[1] In India, which accounts for 27% of global TB cases, MDR-TB affects approximately 130,000 individuals yearly, driven by delayed diagnosis, poor treatment adherence, and limited access to quality care.[2] The National TB Elimination Programme (NTEP) has scaled up programmatic management of drug-resistant TB (PMDT), yet challenges persist, particularly in rural areas.[2]

Maharashtra, a high-burden state, reports significant MDR-TB prevalence, with urban centres like Mumbai showing a 68% treatment success rate in private sector settings.[3] Mumbai also faces conditions like repeated exposure because of

overcrowding.[4] Rural areas, in Western Maharashtra, face unique challenges, including limited diagnostic facilities and socioeconomic stressors.[4,5] TB treatment outcome also depends on the socioeconomic status of the patients. Studies in Maharashtra underscore the role of social determinants, such as occupation, in treatment outcomes, with unskilled workers and unemployed individuals at higher risk of non-successful outcomes.[3,5] Occupational factors, including irregular income and workplace exposures, exacerbate TB treatment barriers in India.[2]

This study investigates the impact of demographic and clinical factors on MDR-TB treatment outcomes at Nodal DRTB Centre, GMC, Miraj, in Western Maharashtra, analysing 127 patients from 2021 to 2024.

MATERIALS AND METHODS

Study Design: This was a retrospective cohort study conducted at Nodal DRTB Centre, GMC Miraj, Western Maharashtra, India. The study aimed to investigate the factors influencing treatment outcomes among patients diagnosed with multidrug-resistant tuberculosis (MDR-TB) and pre-extensively drug-resistant TB (Pre-XDR-TB) from January 2021 to September 2024.

Study Population and Sampling: The study included all 127 patients diagnosed with MDR-TB (n=120), Pre-XDR-TB (n=4), or HR-resistant TB (n=3) at Nodal DRTB Centre, GMC Miraj, during the study period. No sampling was performed, as the entire eligible population was enrolled. Patients were diagnosed based on drug sensitivity testing (DST) conducted as per NTEP guidelines, confirming resistance to at least isoniazid and rifampicin for MDR-TB, with additional resistance to fluoroquinolones for Pre-XDR-TB.[1] Patients with incomplete treatment records or those transferred to other facilities were excluded.

Data Collection: Data were collected retrospectively from January 2021 to September 2024 using treatment cards and patient interviews. Treatment cards provided clinical and demographic information, including diagnosis, treatment regimen, and outcome. Structured interviews with 127 patients during follow-up visits gathered data on occupational status, residence, and addiction history. For deceased patients, information was obtained from close relatives. Trained healthcare staff administered interviews to ensure consistency, and data were cross-verified with treatment cards to minimize errors.

Statistical Analysis: Descriptive statistics summarized patient characteristics, with frequencies and percentages reported for categorical variables. Cross-tabulations examined the distribution of treatment outcomes across independent variables. Associations between treatment outcomes and each independent variable were assessed using the Chi-square test or Fisher's Exact Test when expected cell counts were less than 5. A P-value < 0.05 was considered statistically significant. Statistical analysis was performed using SPSS version 25 (IBM Corp., Armonk, NY, USA).

Operational Definitions:

- Successful Outcome: Cured or treatment completed, as per NTEP definitions.
- Non-Successful Outcome: Regimen change, loss to follow-up, death, or treatment failure.
- MDR-TB: Confirmed resistance to at least isoniazid and rifampicin.
- Pre-XDR-TB: MDR-TB with additional resistance to fluoroquinolones.
- HR-resistant TB: Resistance to isoniazid and rifampicin without additional fluoroquinolone resistance.
- Occupational Status: Classified as Professional, Arithmetic Skills, Skilled, Semi-Skilled, Unskilled, House Wife, or Unemployed, adapted from the Modified Kuppuswamy Socioeconomic Status Scale.[6]

Ethical Considerations: The study was approved by the Institutional Ethics Committee of the DOTS Centre, Miraj, and adhered to the Declaration of Helsinki. Informed consent was obtained from patients or their relatives (for deceased patients) during interviews. Data were anonymized to protect patient confidentiality, with access restricted to the research team.

RESULTS

Table 1: Demographic Characteristics of MDR-TB Patients (N=127)

Variable	Category	Frequency	Percentage
Sex	Male	80	63.0
	female	47	37.0
Age in years	< 20	01	00.80
	21-30	15	11.80
	31-40	58	45.70
	41-50	37	29.10
	>50	16	12.60
Occupation	Professional	05	03.90
	Arithmetic Skills	07	05.50
	Skilled	37	29.10
	Semi-Skilled	11	08.70
	Unskilled	02	01.60

	House Wife	33	26.00
	unemployed	32	24.40
Residence	Urban	08	06.30
	Rural	119	93.70

The cohort comprised 80 males (63.0%) and 47 females (37.0%), with a median age group of 31–40 years (45.7%) (Table 1). Patients residing in rural areas accounted for 119 (93.7%). Occupational distribution showed Skilled (n=37, 29.1%), House Wife (n=33, 26.0%), and Unemployed (n=31, 24.4%) as the largest groups. Alcohol addiction was reported by 28 patients (22.0%), tobacco addiction by 16 (12.6%), and diabetes by 21 (16.5%) (Table 2). Previous TB treatment was reported by 39 patients (30.7%), predominantly through government care.

Table 2: Clinical Characteristics of MDR-TB Patients (N=127)

Variable	Category	Frequency	Percentage
Tobacco Addiction	Yes	16	12.6
	No	111	87.4
Alcohol Addiction	Yes	28	22
	No	99	78
Diabetes	Yes	21	16.5
	No	106	83.5
Previous Treatment	Yes	39	30.7
	No	88	69.3
Outcome	Successful	98	77.2
	Cured	77	60.6
	Treatment Completed	21	16.5
	Non-Successful	29	22.8
	Death	12	9.4
	Loss to Follow-up	3	2.4
	Regimen Change	12	9.4
	Treatment Failure	2	1.6

Overall, 98 patients (77.2%) achieved successful outcomes (Cured n=77, Treatment Completed n=21), while 29 (22.8%) had non-successful outcomes (Death n=12, Loss to Follow-up n=3, Regimen Change n=12, Treatment Failure n=2). [Table 2]

Table 3: Treatment Outcomes by Key Variables (N=127)

Variable	Category	Successful(n=98) (Percentage)	Non successful (n=29) (Percentage)	p value
Sex	Male	63 (64.29)	17 (58.62)	0.80
	Female	35 (35.71)	12 (41.38)	
Occupation	Professional	02(02.04)	03 (10.34)	0.002*
	Arithmetic Skills	06 (06.12)	01 (03.45)	
	Skilled	33 (33.67)	04 (13.79)	
	Semi-skilled	09 (09.18)	02 (06.90)	
	Unskilled	02 (02.04)	00 (00.00)	
	House Wife	23 (23.47)	10 (34.48)	
	Unemployed	23 (23.47)	09 (31.03)	
Tobacco Addiction	Yes	12 (12.24)	04 (13.79)	0.49
	No	86 (87.76)	25 (86.21)	
Alcohol Addiction	Yes	18 (18.37)	10 (34.48)	0.02*
	No	80 (81.63)	19 (65.52)	
Diabetes	Yes	15 (15.31)	06 (20.69)	0.33
	No	83 (84.69)	23 (79.31)	
Previous Treatment	Yes	30 (30.61)	09 (31.03)	0.81
	No	68 (69.39)	20 (68.97)	

Table 3 presents associations between treatment outcomes and key variables, tested using Chi-square or Fisher's Exact Tests ($P < 0.05$ for significance). Occupation was significantly associated with treatment outcomes ($P = 0.002$). Patients with Professional occupation had the highest non-successful rate (3/5, 60.0%), followed by House Wife (10/33, 30.3%) and Unemployed (9/31, 29.0%). Skilled patients had the lowest non-successful rate (4/37, 10.8%). Alcohol addiction was significant ($P = 0.02$), with 10/28 (35.7%) non-successful outcomes compared to 19/99 (19.2%) for non-addicted patients. Alcohol addiction was linked to death (7/12) and loss to follow-up (2/3). No significant associations were found for sex ($P = 0.80$), tobacco addiction ($P = 0.49$), diabetes ($P = 0.33$), or resistance pattern ($P = 0.33$).

DISCUSSION

In the present study, the treatment success rate of 77.2% (98/127) surpasses the global MDR-TB success rate of 63%.[1] and aligns with regional

findings, such as a 68% success rate in Mumbai's private sector.[3] This high success rate reflects the effectiveness of India's PMDT in rural settings, despite challenges like limited diagnostic access.[2]

The significant association between occupation and treatment outcomes ($P = 0.002$) underscores the role of socioeconomic factors. Skilled patients had the lowest non-successful rate (10.8%), suggesting that stable employment facilitates treatment compliance, consistent with studies linking economic stability to TB outcome.[7] House Wife patients (30.3%) and Unemployed patients (29.0%) faced barriers, potentially due to household responsibilities or limited social support, as noted in Maharashtra-based research.[8]

Alcohol addiction's association with non-successful outcomes ($P = 0.02$) corroborates global evidence linking substance misuse to treatment failure and death.[9,10] Alcohol-addicted patients accounted for over half of deaths and two-thirds of losses to follow-up (2/3), highlighting the need for integrated addiction management in MDR-TB programs.[11] The lack of association with tobacco addiction ($P = 0.49$) contrasts with some studies[12], possibly due to the low prevalence (12.6%) in this cohort, which limits statistical power.

Non-significant associations for sex, diabetes, and resistance pattern suggest these factors may be less critical in this rural context, though small sample sizes for some categories (e.g., HR-resistant TB n=3) may mask effects.[13] The rural predominance (93.7%) aligns with Maharashtra's TB epidemiology, where rural areas bear a disproportionate burden.[4,14] Future research should explore urban-rural disparities and longitudinal occupational impacts using larger cohorts to strengthen these findings.[15,16]

CONCLUSION

This study demonstrates that occupational status and alcohol addiction significantly influence MDR-TB treatment outcomes. With a treatment success rate of 77.2% (98/127), surpassing the global average of 63%, the findings underscore the effectiveness of India's PMDT in rural settings. However, the 22.8% non-successful outcome rate, including 12 deaths and 12 regimen changes, highlights persistent challenges. The significant association of occupation ($P = 0.002$) reveals that Professional (60.0% non-successful) and House Wife (*10/33*, 30.3%) patients face higher risks, likely due to work-related stress or household responsibilities, while Skilled patients (10.8%) benefit from stable employment. Alcohol addiction ($P = 0.02$), linked to over half of deaths (7/12) and most losses to follow-up (2/3), exacerbates poor outcomes. Targeted interventions, including flexible DOTS schedules, community-based support for House Wife patients, and integrated addiction management, are critical to improving adherence and outcomes.

Limitations: The cohort of 127 patients was sufficient to detect significant associations (e.g., occupation $P = 0.002$) but underpowered for low-prevalence variables, such as tobacco addiction (n=16, $P = 0.49$) and rare resistance patterns (e.g., HR-resistant TB n=3). With 93.7% rural patients, findings may not generalize to urban settings, where MDR-TB dynamics differ due to enhanced diagnostic access and private sector involvement. Reliance on treatment cards may introduce inaccuracies, particularly for self-reported variables like alcohol and tobacco addiction.

Acknowledgments:

The authors thank the staff of the Nodal DRTB Centre, GMC Miraj, for their support in data collection and patient care.

Financial support and sponsorship: Nil

Conflicts of Interest: Nil

REFERENCES

1. World Health Organization. Global tuberculosis report 2022. Geneva: WHO; 2022.
2. Park K. Park's textbook of preventive and social medicine. 28th ed. Jabalpur: M/s Banarsidas Bhanot; 2023.
3. Udwadia ZF, Moharil G. Multidrug-resistant tuberculosis treatment in the Indian private sector: results from a tertiary referral private hospital in Mumbai. Lung India. 2014;31(4):336-41.doi:10.4103/0970-2113.142103 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4220315/
4. Mistry N, Tolani M, Osrin D. Drug-resistant tuberculosis in Mumbai, India: an agenda for operations research. Oper Res Health Care. 2012;1(2-3):45-53. doi:10.1016/j.orhc.2012.06.001 https://www.sciencedirect.com/science/article/abs/pii/S2211692312000083
5. Dalal A, Pawaskar A, Das M, Desai R, Prabhudesai P, Chhajed P, et al. Resistance patterns among multidrug-resistant tuberculosis patients in greater metropolitan Mumbai: trends over time. PLoS One. 2015;10(1):e0116798. doi:10.1371/journal.pone.0116798 https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0116798
6. Jabeen R, Kumar P. Updated socioeconomic classification: revised modified B. G. Prasad and modified Kuppuswamy scales for January 2025. Int J Community Med Public Health. 2025;12(5):2103–7.
7. Wingfield T, Boccia D, Tovar M, Gavino A, Zevallos K, Montoya R, et al. Defining catastrophic costs and comparing their importance for adverse tuberculosis outcome with multi-drug resistance: a prospective cohort study, Peru. PLoS Med. 2014;11(7):e1001675. doi:10.1371/journal.pmed.1001675 https://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1001675
8. Dhamnetiya D, Patel P, Jha RP, Shri N, Singh M, Bhattacharyya K. Trends in incidence and mortality of tuberculosis in India over past three decades: a joinpoint and age-period-cohort analysis. BMC Pulm Med. 2021;21(1):375. doi:10.1186/s12890-021-01736-y
9. Samuels JP, Sood A, Campbell JR, Ahmad Khan F, Johnston JC. Comorbidities and treatment outcomes in multidrug resistant tuberculosis: a systematic review and meta-analysis. Sci Rep. 2018;8(1):4980. doi:10.1038/s41598-018-23344-z https://www.nature.com/articles/s41598-018-23344-z
10. Duraisamy K, Mrithyunjayan S, Ghosh S, Nair SA, Balasubramanian R, Oeltmann JE, et al. Does alcohol consumption during multidrug-resistant tuberculosis treatment affect outcome? A population-based study in Kerala, India. Ann Am Thorac Soc. 2014;11(5):712-8. doi:10.1513/AnnalsATS.201312-447OC https://www.atsjournals.org/doi/10.1513/AnnalsATS.201312-447OC

11. Thomas BE, Kumar JV, Periyasamy M, Khandewale AS, Mercy H, Raj EM, et al. Acceptability of the Medication Event Reminder Monitor for Promoting Adherence to Multidrug-Resistant Tuberculosis Therapy in Two Indian Cities: Qualitative Study of Patients and Health Care Providers. Journal of Medical Internet Research 2021 June 10;23(6):e23294.
12. Wang MG, Huang WW, Wang Y, Zhang YX, Zhang MM, Wu SQ, et al. Association between tobacco smoking and drug-resistant tuberculosis. Infect Drug Resist. 2018;11:873–87.
13. Shewade HD, Nair D, Klinton JS, Parmar M, Lavanya J, Joshi D, et al. Low pre-diagnosis attrition but high pre-treatment attrition among patients with MDR-TB: an operational research from Chennai, India. J Epidemiol Glob Health. 2017;7(4):227–33.
14. Central TB Division, Ministry of Health and Family Welfare. India TB report 2023. New Delhi: Government of India; 2023.
15. Isaakidis P, Das M, Kumar AM, Peskett C, Khetarpal M, Bamne A, et al. Alarming levels of drug-resistant tuberculosis in HIV-infected patients in metropolitan Mumbai, India. PLoS One. 2014;9(10):e110461. https://doi.org/10.1371/journal.pone.0110461
16. Parmar MM, Sachdeva KS, Dewan PK, Rade K, Nair SA, Pant R, et al. Unacceptable treatment outcomes and associated factors among India's initial cohorts of multidrug-resistant tuberculosis (MDR-TB) patients under the revised national TB control programme (2007–2011): evidence leading to policy enhancement. PLoS One. 2018;13(4):1-24. e0193903. https://doi.org/10.1371/journal.pone.0193903.