



DETERMINING PREVALENCE AND EPIDEMIOLOGICAL CORRELATES OF DRUG-RESISTANT TUBERCULOSIS IN BAREILLY: A CROSS-SECTIONAL STUDY

Public Health

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ABSTRACT

Drug Resistant TB is emerging as a major public health threat. Identifying causes contributing to drug resistance, delay in treatment and noncompliance is one of the most important steps in TB control. The aim of this study to find epidemiological correlates for drug resistant tuberculosis in district Bareilly. Cross sectional study conducted from February 2021 to July 2022 at District Tuberculosis Centre, Bareilly among 1952 Pulmonary TB Patients registered at the DTC Bareilly. 183 patients from each group were randomly selected and contacted to be assessed by in-person interview. Total 349 TB patients were interviewed, among them 169 (48.42%) were drug-resistant cases while 180 (51.57%) were drug-sensitive. A statistically significant association of drug resistance was observed with age, educational status, occupational status, socio-economic status, type of family and overcrowding. Better strategies and concrete actions needed to be developed to combat the increase of MDR-TB.

KEYWORDS

Drug-resistant tuberculosis, Drug-sensitive tuberculosis, Epidemiology, Tuberculosis

INTRODUCTION

TB is a major global health problem and is leading cause of death.¹ In 2019, eight countries account for two thirds of the total, with India leading the count.² In 2021 India became the highest TB burden country in the world.³

A global total of 206030 people with MDR/RR-TB were detected and notified in 2019, a 10% increase from 186883 in 2018.²

Recent global estimates indicate that about a half million new cases of Rifampicin Resistant TB (RR-TB) occurred in 2019 with 78% of them having confirmed MDR-TB.⁴

In 2018, the first National anti-tuberculosis Drug Resistance Survey (NDRS) revealed that 28% of TB patients were resistant to any drugs (22% among new and 36.82% among previously treated) and 6.19% had MDR-TB (2.84% among new and 11.62% among Previously Treated (PT)).⁵

Risk factors for DR- TB include a history of treatment,^{6,7} human immunodeficiency virus (HIV) infection,^{8,9,10} age group,^{8,9,10} contact history with MDR-TB,¹¹ overcrowded residence.

The present study was conducted to study the epidemiological correlates of DR-TB which will help in identifying the factors that could have contributed in the development of drug resistance TB.

AIM:

To find epidemiological correlates for drug resistant tuberculosis in district Bareilly.

OBJECTIVES

1. To estimate the prevalence of drug resistant tuberculosis in district Bareilly.
2. To delineate epidemiological correlates for drug resistant tuberculosis among study participants.

MATERIALS & METHODS

This 18-month cross-sectional study, conducted in collaboration with the District Tuberculosis Centre (DTC) Bareilly, focused on drug-resistant and drug-sensitive pulmonary TB patients tested by CBNAAT between 1st January and 31st December 2020. The study included pulmonary TB patients of all ages who tested positive by CBNAAT, excluding those who refused consent, had extra-pulmonary TB, were unavailable, or died during the study. Ethical approval was obtained (ref. no. SRMSIMS/IEC/2020-21/07), and written consent

was secured. A sample size of 365 was determined using Yamane's formula, with stratified random sampling selecting 183 patients from both drug-sensitive and drug-resistant groups. Of 3981 CBNAAT tests, 1952 patients were diagnosed with TB (208 drug-resistant, 1744 drug-sensitive), and 349 participants were interviewed. Data was compiled in Microsoft Excel 2010 and analyzed with SPSS version 25, applying Chi-square tests to assess variable associations.

RESULTS

Among total of 349 TB patients interviewed in the study, 169 (48.42%) were drug-resistant cases while 180 (51.57%) were drug-sensitive. (Table I). Prevalence of different type of DR TB cases (n=208), MDR TB, RR TB, XDR TB and mono resistance TB was 38.9%, 42.8%, 11.6% and 6.7% cases respectively (Table II).

Table I Prevalence of DR TB

Type of TB	Formula and calculation	Result
DR TB	$\frac{\text{Total number of DR TB Patients (208)}}{\text{Total number of TB Patients (1952)}} \times 100$	10.6%
MDR TB	$\frac{\text{Total number of MDR TB patients (81)}}{\text{Total number of TB patients (1952)}} \times 100$	4.1%
RR TB	$\frac{\text{Total number of RR TB patients (89)}}{\text{Total number of TB patients (1952)}} \times 100$	4.5%
XDR TB	$\frac{\text{Total number of XDR patients (24)}}{\text{Total number of TB patients (1952)}} \times 100$	1.2%
MRTB	$\frac{\text{Total number of MR TB patients (14)}}{\text{Total number of TB patients (1952)}} \times 100$	0.7%

Table II Proportion Of Different Type Of DR TB

Type of TB	Formula and calculation	Result
MDR TB	$\frac{\text{Total number of MDR TB patients (81)}}{\text{Total number of DR TB patients (208)}} \times 100$	38.9%
RR TB	$\frac{\text{Total number of RR TB patients (89)}}{\text{Total number of DR TB patients (208)}} \times 100$	42.8%
XDR TB	$\frac{\text{Total number of XDR patients (24)}}{\text{Total number of DR TB patients (208)}} \times 100$	11.6%
MR TB	$\frac{\text{Total number of MR TB patients (14)}}{\text{Total number of DR TB patients (208)}} \times 100$	6.7%

The socio-demographic variables of the participants and their association with MDR-TB are presented in [Table III a]. In our study age, caste, educational status, occupation of the patients and socio-economic status, were significantly associated with DR TB. Living in nuclear family and overcrowding were also found highly associated. In our findings chronic respiratory disease was prevalent in 40.1%, T2DM was present in 26.6% patients and hypertension was present in 33.3% DR TB and was found statistically significant with DR TB.

[Table III a]: Socio-demographic Factors Of Drug-resistant And Drug-sensitive TB Patients (N=349)

Variables	Drug-resistant tuberculosis (169)	Drug-sensitive tuberculosis (180)	Statistics
Age range (years)			
≥18 (39)	13 (7.7)	26 (14.4)	x ² =10.759 p-value= 0.05
19-29 (120)	56 (33.1)	64 (35.6)	
30-39 (45)	24 (14.2)	21 (11.7)	
40-49 (48)	30 (17.8)	18 (10.0)	
50-59 (68)	36 (21.3)	32 (17.8)	
>60 (29)	10 (5.9)	19 (10.6)	
Gender			
Male (194)	97 (57.4)	97 (53.9)	x ² =20.434 p-value=0.51
Female (155)	72 (42.6)	83 (46.1)	
Area of residence			
Urban (60)	25 (14.8)	35 (19.4)	χ ² =1.32588 p value= 0.25
Rural (289)	144 (85.2)	145 (80.6)	
Caste of participants			
General (147)	85 (50.3)	62 (34.4)	x ² =10.638 P value=0.01
Other backward class (172)	71 (42.0)	101 (56.1)	
Scheduled cast (30)	13 (7.7)	17 (9.4)	
Religion			
Hindu (220)	06 (62.7)	114 (63.3)	x ² =0/948 p-value=0.623
Muslim (129)	63 (37.3)	66 (36.7)	
Marital status			
Married (215)	103 (60.9)	112 (62.2)	x ² =2.155 P value=0.70
Unmarried (134)	66 (39.0)	68 (37.7)	

Majority of DR TB patients (64.5%) were non-smokers, 20% are ex-smokers and 14.79% were actively smoking beedi, as it is readily available at cheap cost as compared to cigarettes, and most of the participants were from low socioeconomic status. In our study, majority of the DR TB patients (84.6%) were not using any tobacco product this is attributed to the fact that those who had TB were well aware of the risk of using tobacco in any form on their disease conditions. Contributing factors for TB, like, alcohol intake and HIV status had no significant association with DR TB.

DISCUSSION

This study, the first in the region to examine the epidemiological correlates of DR-TB, found an overall prevalence of DR-TB at 10.6%, with MDR-TB, RR-TB, XDR-TB, and mono-resistance TB at 4.1%, 4.5%, 1.2%, and 0.7%, respectively. Similar findings were reported by Shivekar et al. (2020) in South India, Mishra G et al. (2018), and Kulkarni GS et al. (2020) in their respective regions.^{15,16,17} The study found no significant association between DR-TB and residential locality, similar to findings by Yadav SK et al. (2016), though a significant association was found between age and DR-TB, as reported in studies by Venkatesh U et al. (2018) and Yadav SK et al. (2016).^{8,18} No significant association was found between DR-TB and religion, consistent with Yadav SK et al.'s findings.⁸

Regarding gender, more than half of the DR-TB patients were male, a trend observed by Venkatesh U et al. (2018), Khurram M et al. (2012), and Jitmuang A et al. (2015).^{10,12} However, Law et al. (2008) and Anupurba S et al. (2017) found higher prevalence in females.^{11,19} The study also found no significant association between marital status and DR-TB, similar to Yadav SK et al. (2016),⁸ though contradictory findings were noted by Soedarsono et al. (2021) and Sharma P et al. (2019).^{20,21} A significant association was observed between DR-TB and education, with most DR-TB patients having low educational levels, corroborated by previous studies.^{8,21,22}

Occupational status was also significant, with most DR-TB patients being unskilled workers, consistent with Sharma P et al. (2019) and

Yadav SK et al. (2016).^{8,22} Socioeconomic status showed a strong association, with most DR-TB patients belonging to lower economic classes, in line with studies in Delhi and Surat.^{8,23} Living in nuclear families and overcrowding were also significant factors, with overcrowding strongly associated with DR-TB, consistent with Yadav SK et al. (2016).⁸ Most DR-TB patients lived in semi-pucca or kutcha houses, unlike Venkatesh U et al.'s (2018) findings.¹⁸

A significant association was found between DR-TB and tobacco use, though 84.6% of DR-TB patients did not use tobacco. Alcohol consumption was also significantly linked to DR-TB, as supported by studies from Yadav SK et al. (2016) and Wang EY et al. (2021).^{6,8,24}

CONCLUSION

This study identifies DR TB as a major public health threat in Bareilly district. There is evident progressive DR-TB transmission in the population, especially in the productive age group of the population. Occupational status, socio-economic status and leaving in overcrowding area is a major factor of transmission of MDR-TB. To control its transmission, we recommended that improving the social support and living standards should become a priority.

Recommendation

Continuous monitoring of drug resistance trends is essential. Effective control of MDR-TB requires community awareness, targeted education, integration of TB services with addiction and chronic illness treatments, use of incentives, enhanced contact tracing, and improved sputum disposal practices. The associations identified in this study should be further investigated through multi-centre case-control studies to better understand risk factors.

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