SOCIOCLINICAL CORRELATES AND RISK FACTORS ASSOCIATED WITH MULTIDRUG-RESISTANT TUBERCULOSIS IN A TERTIARY CARE CENTER IN GANJAM, ODISHA

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ABSTRACT

Objectives: The purpose of the study is to assess the socioclinical profile of multidrug-resistant tuberculosis (MDR-TB) cases admitted to a tertiary care hospital in Ganjam.

Methods: A cross-sectional study was conducted among the MDR-TB patients admitted to the indoor DR-TB ward of the Department of Pulmonary Medicine of MKCG Medical College and Hospital, Berhampur, from October 2023 to October 2024. Data were collected with the help of a questionnaire, which comprised information on socioclinical characteristics of the study participants. The data were tabulated by MS-Excel v.21 and then analyzed using statistical software like JAMOVI v.2.6.13.

Results: Among 103 MDR-TB patients who consented to participate in the study, the majority were males of 20–40 years. Mostly, study participants were educated in primary school, belonged to the lower-middle class, and engaged in semi-skilled occupations. 93% of the patients admitted presented with cough followed by expectoration (69%), fever (68%), vomiting (67%), hemoptysis (35%), etc. Among the co-morbidities reported, the majority were chronic obstructive pulmonary disease (COPD), followed by diabetes mellitus, hypertension, and HIV/AIDS, respectively.

Conclusion: MDR-TB remains a major health problem in Ganjam, which is mainly influenced by low socioeconomic status, conditions like overcrowding, and various clinical conditions such as COPD, hypertension, HIV, and diabetes mellitus. These comorbidities complicate the clinical management of MDR-TB and may influence treatment outcomes. A comprehensive, patient-centered approach involving the diagnosis and management of coexisting illnesses is essential for achieving better therapeutic results.

Keywords: Multidrug-resistant tuberculosis, Socioclinical profile, Ganjam, Tuberculosis, Drug resistance, Public Health.

INTRODUCTION

Tuberculosis (TB) persists as a major global public health problem. While the disease entity has been recognized since ancient times, its infectious nature, caused by *Mycobacterium tuberculosis*, was scientifically established by Robert Koch in 1882 [1]. Despite the availability of the Bacillus Calmette–Guerin vaccine since 1921, TB remains a leading infectious cause of mortality worldwide, prompting the World Health Organization to declare it a global public health emergency in 1993 [2]. Transmitted through droplet nuclei, TB requires prolonged multidrug therapy, creating challenges in patient adherence and reflecting broader social development issues, with the vast majority of cases and deaths occurring in developing nations.

A significant challenge to TB control is the emergence of multidrug-resistant TB (MDR-TB), defined as resistance to at least isoniazid and rifampicin, the two most potent anti-TB drugs [3,4]. Drug resistance in TB is largely a man-made problem, typically resulting from inadequate chemotherapy, irregular drug supply, poor drug quality, inappropriate prescriptions, or poor patient adherence, which allows for the selection and multiplication of drug-resistant bacilli [3,4]. Furthermore, non-adherence to anti-TB treatment might lead to an increased risk of drug resistance and prolonged infectiousness, in addition to relapse and death [5]. The emergence of MDR-TB and extensively drug-resistant TB has posed a major challenge to TB control programs. In 2015, around 480,000 new MDR-TB cases were reported globally, with India accounting for approximately 130,000 of them [6].

Technological advancements have facilitated early and accurate TB diagnosis, ranging from Ziehl–Neelsen smear microscopy to molecular diagnostic methods. However, challenges remain in effectively diagnosing and treating MDR-TB cases, particularly in resource-limited settings [7].

Globally, MDR/RR-TB caused an estimated 150,000 (95% CI: 94,000–210,000) deaths in 2023 [8]. MDR-TB remains a public health crisis and a health security threat. Only about 2 in 5 people with drug-resistant TB accessed treatment in 2023 [9].

In India, socioeconomic factors such as poverty, overcrowding, malnutrition, poor hygiene, lack of education, and substance abuse contribute to the high burden of TB. Despite advancements in treatment, MDR-TB continues to be a major public health issue. Although the Directly Observed Treatment, Short-course (DOTS) strategy, introduced in the mid-1990s, has significantly improved TB control, MDR-TB persists due to inadequate treatment adherence and the emergence of resistant bacterial strains. In India, from an average of 2% in the "0–14-year age group," the infection rate climbs to about 20% in the 15–24-year age group, commonly affecting males. Poverty plays an important role. The relationship between TB and poverty is compelling and confounds almost any other risk factor [10].

Understanding the specific socioclinical profile of MDR-TB patients in high-burden settings is crucial for developing targeted interventions and strengthening control programs. This study, therefore, aims to assess these characteristics among MDR-TB cases in the Ganjam district of Odisha.

Objectives

The objectives of the study are to assess the socioclinical profile of MDR-TB cases admitted to a tertiary care hospital in Ganjam.

METHODS

A hospital-based cross-sectional study was conducted among 103 MDR-TB cases admitted in the indoor drug-resistant TB ward of the Pulmonary Medicine department of MKCG Medical College and Hospital, Berhampur, Ganjam, Odisha, from October 2023 to October 2024. A universal sampling technique included all the patients admitted between October 12th, 2023, and October 11th, 2024.

Before initiating the study, ethical clearance was obtained from the Institutional Ethical Committee of M.K.C.G Medical College and Hospital bearing Letter No: 504. Proper care was taken not to harm the patients' psychological or emotional sentiments and to maintain privacy, self-respect, and confidentiality.

Inclusion criteria

All patients or their caregivers (in case of pediatric MDR-TB) willing to participate and gave consent were included as study participants.

Exclusion criteria

i. Moribund patient
ii. Not gave consent.

The data were collected using a pre-designed, pre-tested semi-structured questionnaire from the patients.

After the IEC approval, the study instrument was pretested with 20 samples, and necessary modifications were made before final data collection. The questionnaire used had information on the sociodemographic and clinical profile of the patients. The cases were followed up for 7 days from the day of admission of the patient to the drug-resistant TB ward or till they were discharged. At discharge, their names are registered in the notification register. They are provided with the DOTS-IV regimen as per their weight bandwidth a treatment card and referral slip. They may also collect the DOTS-IV regimen from their nearest TUs of the respective districts.

The data collected was tabulated in MS Excel v.2021 and analyzed using JAMOVI v.2.6.13 in the Department of Community Medicine of MKCG Medical College.

RESULTS

Among the 103 MDR-TB cases interviewed, 64 (62.1%) were in the 14–45-year age group, 34 (33%) were older than 45 years, and 5 (4.9%) were younger than 14 years. Most of them (73.8%) were male (Table 1).

The majority of participants resided in rural areas 82%, while 18% were from urban areas. Most (72.8%) belonged to the below poverty line (BPL) category, with 27.2 % in the above poverty line group (Table 2).

A significant proportion of patients had addictions: 29.1% consumed all three (smoking, tobacco, and alcohol), while 27.2% had both smoking and alcohol habits. Only 1% had no addictions, indicating substance abuse as a potential contributing factor in MDR-TB (Fig. 1).

Our study showed that hypertension (38.5%) is the most prevalent condition, followed by diabetes (19.2%) and HIV (15.4%). Comorbidities such as diabetes + HIV (2.6%) and hypertension + HIV (3.8%) are less common (Fig. 2).

In a study conducted by Wijayanto *et al.*, diabetes mellitus (DM) was identified in 22.2% of the case group, and further statistical analysis found a significant association of this risk factor with the development of MDR-TB [11].

Table1: Sociodemographic distribution(n=103)

Parameters	No.	%
Age group		
Mean age 38.9±11.89		
<14years	5	4.9
14–45years	64	62.1
>45years	34	33
Sex		
Male	76	73.8
Female	27	26.2
Marital status		
Married	77	74.8
Unmarried	26	25.2
Type of family		
Nuclear	67	65
Joint	36	35
Religion		
Hindu	93	90.4
Muslim	5	4.8
Christian	3	2.9
Others	2	1.9

Table2: Socioeconomic profile of cases(n=103)

Parameters	No.	%
Residence		
Urban	19	18
Rural	84	82
Education		
Illiterate	10	9.7
Primary	46	44.7
Secondary	40	38.8
Graduate	7	6.8
Occupation		
Unemployed	30	29.1
Unskilled	43	41.8
Semiskilled	14	13.6
Skilled	16	15.5
Economic status		
APL	28	27.2
BPL	75	72.8

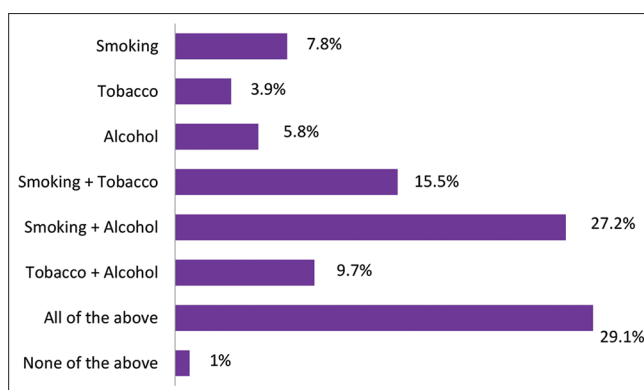BPL: Below poverty line, APL: Above poverty line

Fig. 1: Type of addictions among patients (n=103)

From the symptoms presented by 103 MDR-TB cases, cough was the most common presenting symptom in 96 (93.2%), followed by expectoration in 69.9%, fever in 68%, vomiting in 67%, and shortness of breath in 46.6% (Fig. 3).

This table presents treatment outcomes among TB-affected family members. The highest mortality rate (57.2%) was among those with TB alone. Co-infections such as TB+HIV and TB+Diabetes also had

poor outcomes, with low cure rates and high non-cure or death rates (Table 3).

DISCUSSION

Sociodemographic profile of cases
The study included 103 MDR-TB patients, with the majority (62.1%) belonging to the 14–45-year age group, highlighting the significant burden of TB among the economically productive population. A male predominance (73.8%) was observed, suggesting a higher exposure risk among men due to occupational and lifestyle factors. Most patients were Hindu (90.4%). A significant proportion (74.8%) was married, and the majority (82.5%) resided in rural areas, mainly in nuclear families (65%). The findings were consistent with previous studies, such as those by Wijayanto *et al.* [11], Bhatt *et al.* [12], and Workicho *et al.* [13].

Socioeconomic profile of cases
The study found that 72.8% of the patients belonged to the BPL category, and 51.5% were in the lower-middle-income group. In the study by Gaude *et al.*, 79.2% belonged to the low socioeconomic class and 20.8% to the lower middle class [14]. Educational attainment was low, with 44.7% having only primary education, and a large proportion (41.8%)

Fig. 2: Co-morbid conditions affecting the patients (n=103)

Fig. 3: Symptoms of the patients (n=103)

Table3: Contact history of TB among family members(n=38)

Risk factors	Outcome						Chi-square test p-value
	Cured		Not-cured		Death		
	No.	%	No.	%	No.	%	
TB alone	2	25	3	33.4	12	57.2	5.29
TB+HIV	1	12.5	2	22.2	4	19.1	0.507
TB+Diabetes	2	25	2	22.2	1	4.6	
All of these	3	37.5	2	22.2	4	19.1	
Total	8	21.1	9	23.6	21	55.3	

TB: Tuberculosis

were unskilled workers, while 29.1% were unemployed. In the study by Bhatt *et al.*, 53.1% had primary education (literacy rate 86.4%), 25.9% had secondary education, 14.8% were illiterate, 3.7% were graduates, and 2.5% had higher secondary education [12]. Workicho *et al.*, found that 87.8% of cases were literate and 12.2% were illiterate [13]. In the study conducted by Bhatt *et al.*, 55.6% were unemployed and 44.4% were employed [12]. Workicho *et al.*, in their study, found that 82.2% of cases were unemployed and 17.8% of cases were employed [13]. Among the employed patients (n=73), 63% worked in urban settings, while 37% worked in rural areas. These findings underscore the association between low socioeconomic status and MDR-TB, as poverty, poor literacy, and lack of employment opportunities contribute to delayed diagnosis and inadequate treatment adherence.

Addictions and substance abuse
A significant proportion of patients had addictions, with 29.1% consuming all three substances (smoking, tobacco, and alcohol), and 27.2% reporting both smoking and alcohol use. Only 1% of the study population reported no addiction, highlighting substance abuse as a potential contributing factor to MDR-TB development. In the study conducted by Workicho *et al.*, 14.4% were smoking, 4.4% were using illicit drugs, 18.9% had a history of alcohol intake, and 87.8% had a history of traditional treatment [13]. In a study by Atre *et al.*, 17.9% were addicted to smoking and 15.1% consumed alcohol [15]. Smoking and alcohol consumption have been linked to increased TB severity and poor treatment outcomes.

Contact history among family members
Among the family members of MDR-TB patients (n=38), 44.7% had TB alone, 18.4% had TB with HIV, and 13.2% had TB with diabetes. Notably, 52.6% of these family members had discontinued treatment, indicating a high risk of MDR-TB transmission. In the study by Bhatt *et al.*, 48% of patients gave a history of contact with a confirmed case of TB before they got affected by TB [12]. In about 85% of cases, family members were followed by neighbors, colleagues at the workplace, and from the occupation (DOT Provider). Workicho *et al.*, found that the history of contact with TB was present in 25.6% of cases [13]. Mulu *et al.*, family members of 28.8% of cases were suffering from TB [16]. Treatment non-adherence among close contacts increases the likelihood of household transmission and contributes to disease progression.

Treatment outcomes in family members
Analysis of treatment outcomes among TB-affected family members revealed that the highest mortality rate (57.2%) was among those with TB alone. In addition, co-infections such as TB+HIV and TB+Diabetes had poor outcomes, with low cure rates and high non-cure or death rates. In a similar study conducted by Bhatt *et al.* in 59% of cases, the treatment outcome was death, followed by cure in 25.6%, not known in 12.8%, and still on treatment in 2.6% of cases [12]. Gaude *et al.* found 19.4% having a contact history of TB [14]. This underscores the need for integrated healthcare approaches to manage TB and associated comorbidities.

Limitations of the study
While this study provides valuable insights into the socioclinical profile of MDR-TB patients, it has certain limitations:
- The study is hospital-based, which may not fully represent community-level data
- Limited sample size may affect the generalizability of findings.

CONCLUSION

The present study highlighted that a majority of MDR-TB cases were males in the productive age group, primarily from rural areas and low socioeconomic backgrounds, with minimal or no formal education. These findings underscore the critical role of social determinants in the epidemiology of MDR-TB. Enhancing community awareness regarding TB symptoms, coupled with effective case detection and treatment completion, is essential to prevent relapse, transmission, and emergence of drug resistance. Substance abuse, particularly tobacco and alcohol use, was common among study participants. These factors
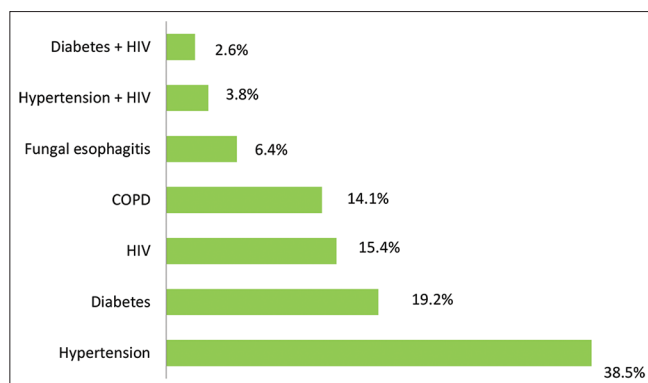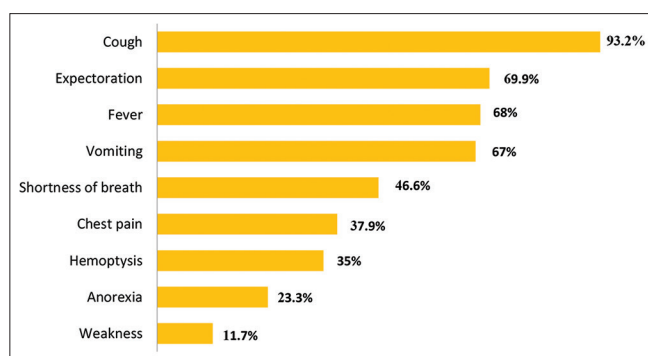
are known to compromise immunity and contribute to treatment non-adherence. Therefore, integrating counselling and de-addiction services into TB care is vital for improving treatment outcomes.

A notable proportion of patients had a history of close contact with TB cases within their households. Contributing factors such as poverty, overcrowding, and poor ventilation facilitate household transmission. Contact tracing, early screening, and prophylactic interventions among family members should be prioritized to limit disease spread.

Low body mass index was another prominent finding among MDR-TB patients, pointing to the role of undernutrition as both a risk factor and a barrier to recovery. Nutritional supplementation should be incorporated into treatment regimens to support immune function and enhance treatment efficacy.

Furthermore, the presence of comorbid conditions such as DM, hypertension, and HIV infection was observed. These comorbidities complicate the clinical management of MDR-TB and may influence treatment outcomes. A comprehensive, patient-centered approach involving the diagnosis and management of coexisting illnesses is essential for achieving better therapeutic results.

Recommendations

The present study reveals that multidrug-resistant TB poses a serious threat to the community. Therefore, for its prevention and control, the following recommendations at various levels are suggested:

1. Awareness generation activity at community level: Steps should be taken to generate awareness among the community regarding the symptoms and need for complete treatment, so that not only early diagnosis and treatment can be initiated, but the intake of a complete course of drugs will prevent the emergence of drug-resistant mycobacteria
2. Counselling among the diagnosed cases for avoiding substance abuse, especially tobacco and alcohol, should be undertaken, which will also be helpful in better treatment adherence
3. Supplementary nutrition, especially in the form of take-home rations or supply of cooked foods at each DOTS center, can be undertaken, which will not only help in the improvement in nutritional status of cases but may also help in preventing default in patients
4. Treatment of co-morbidities must be undertaken among all the newly diagnosed TB cases
5. Monitoring and supervision of the program will be useful for achieving the END TB strategy.

AUTHOR CONTRIBUTIONS

Conceptualization: Dr Debasish Sethy, Dr Durga Madhab Satapathy Methodology: Dr Durga Madhab Satapathy, Dr Sanjaya Kumar Sahoo Data Collection: Dr Debasish Sethy, Dr. Anand Kumar Sahu, Dr. Rudra NarayanData Analysis: Dr Sanjaya Kumar Sahoo Writing – Original Draft: Dr Durga Madhab Satapathy, Dr Sanjaya Kumar Sahoo

CONFLICTS OF INTEREST

The authors declare no conflict of interest in conducting or publishing this research paper.

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