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Original Research Article

Prevalence of MDR TB in North Bihar

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Abstract

Background: MDR tuberculosis (MDR TB) is a major public health concern in India, however there is a scarcity of data on the prevalence of MDR TB in the country. The objective of this study is to use a molecular diagnostic method to establish the prevalence of MDR TB in North Bihar and to facilitate early diagnosis and treatment. Also, to determine the number of diagnosed cases that were successfully started on treatment at the MDR TB Centre of Shri Krishna Medical College.

Methods: This six-month observational study was conducted at Shri Krishna Medical College's DR TB centre in Bihar, India. 256 sputum samples were collected from suspected cases of multidrug resistant tuberculosis in 6 districts of North Bihar near Muzaffarpur between March and August 2022. To detect Mycobacterium tuberculosis, these samples were treated to normal microscopy and culture. Positive cases were subjected to drug sensitivity test using a molecular diagnostic approach, Using Genotype MTBDR plus kit.

Result: Microscopy confirmed tuberculosis in 122 of 256 sputum samples from probable MDR TB individuals. In 114 of the 122 cases, TB was verified by PCR. Finally, using the Line Probe Assay (LPA), 39 (15%) of the samples were found to be resistant to both INH and Rifampicin. Male female ratio was 4:1.

Conclusion: North Bihar has a 15% prevalence of multidrug resistant pulmonary TB. To decrease the spread of MDR TB cases, early diagnosis using molecular diagnostic methods and timely treatment are required.

Keywords: DR TB (Drug Resistant Tuberculosis), INH (Isoniazide), IRL (Intermediate referral laboratory), LPA (Line Probe Assay), Programmatic management of Drug Resistant TB (PMDT)

Introduction

Tuberculosis is the biggest cause of death in the globe and one of the main causes of death in the developing world. According to the WHO 2017 report, 18% of previously treated cases and 3.5% of new cases had multidrug-resistant tuberculosis [1,2]. MDR-TB is caused by infection with Mycobacterium tuberculosis that is resistant to rifampicin and isoniazid, with or without resistance to other antitubercular medicines. MDR-TB treatment is complicated, requiring prolonged therapy and toxic medicines. Furthermore, diagnostic facilities for MDR-TB are scarce in low- and middle-income countries [3]. MDR-TB treatment has a substantially lower success rate than drug-sensitive TB.

In 2007, the worldwide burden of tuberculosis was assessed, and it was discovered that 500000 cases of MDR TB had been recorded from high burden nations [4]. Among these instances of MDR TB, 131,000 were reported from India, 112,000 from China, 43000 from Russia, 16000 from South Africa, and 15000 from Bangladesh [3, 4]. MDR TB cases in India were estimated in three separate states. MDR TB patients were discovered in 35.7% of cases in Varanasi, Uttar Pradesh, 66.6% in Sawai Madhopur, Rajasthan, and 43.8% in Buxar, Bihar [5]. PMDT (Programmatic management of drug-resistant TB) has been phased-in in India since 2006. RNTCP began detecting and treating MDR-TB in more than 30,000 individuals in 2016 [6]. Nonetheless, completion of treatment and cure from MDR-TB continue remain a challenge in India.

The purpose of this study is to use a molecular diagnostic approach to determine the prevalence of MDR TB in North Bihar in order to facilitate early diagnosis and treatment. Also, to determine the number of diagnosed cases that were successfully started on treatment at the MDR TB Centre of Shri Krishna Medical College.

Methodology

This six-month observational study (March-August 2022) was conducted at Shri Krishna Medical College's DR TB centre in Muzaffarpur, Bihar. The SKMC ethical committee approved the project. Informed consent was taken. All treatment failures of new cases with smear positive treated patients who remain smear positive after 4 months, as well as all pulmonary TB cases who are contacts of known MDR TB cases. Total 256 sputum samples were received from suspected cases of MDR TB according to the above criteria. Sputum samples were obtained from patients in six North Bihar districts: Muzaffarpur, Madhubani, Madhepura, Saharsa, Samastipur, and Supaul.

Zeihl Neelsen (Z-N) reagents were used to spread, air-dry, fix, and stain each sample. All sputum microscopy positive samples were tested using the Genotype MTBDR plus kit's Line Probe Assay (LPA), whereas microscopy negative samples were cultured using LJ medium. For eight weeks, culture was observed, and weekly reading was completed. If the culture was positive, they were treated to LPA to determine their drug sensitivity using the Genotype MTBDR plus kit [9]. Then resistance to INH or Rifampicin or both could be evaluated by comparing the strip delivered along with the diagnostic kit. The flow chart in Table 1 depicts the entire protocol of the diagnostic process used at SKMC.

Table 1: Age and sex distribution of MDR TB cases

Age	Number	Percent	Female	Percent	Male	Percent
0-15	3	8	2	25	1	3
16-30	23	59	1	12	22	71
31-45	10	26	3	38	7	23
46-60	2	5	2	25	0	0
61-75	1	2	0	0	1	3
Total	39	100	8	100	31	100

The technique was broken down into three stages: (a) DNA extraction, (b) PCR amplification, and (c) hybridization. For the current investigation, we used the MTBDR plus kit and followed the manufacturer's recommendations when executing each of the aforementioned procedures. To diagnose MDR TB, two sputum samples, one early morning and one spot sputum sample, were collected in

Falcon tubes at the district level and sent to the TBDC Centre of SKMC by human carriers, from which samples were brought to the DR TB Centre of SKMC for detection and confirmation of MTB and drug sensitivity using the process outlined above. Finally, cases of Rifampicin or INH resistance, or both, were identified. Reports were provided to concerned district level. The patients were then transferred from other districts to SKMC for treatment in the MDR TB Ward, which was overseen by a senior medical official from the DRTB centre.

Results

In this study, 256 sputum samples were received in DR TB facility of SKMC from suspected cases of MDR from six districts of north Bihar, including Muzaffarpur district, throughout 6 months period from March- August 2022. The patients ranged in age from 7 to 68 years old, with a male-female ratio of 4:1. MDR Tuberculosis was identified in 39 (15%) of 256 sputum samples, indicating resistance to both INH and Rifampicin. The bulk of patients in the 39 cases of MDR TB (85%) are between the ages of 16 and 45, which is the most productive era for a human being. Out of these 33 cases, maximum patients 23 (59%) were in the age group of 16-30 years. Three patients (8%) were aged 0 to 15, and only one (3%) was over the age of 60.

When the sex distribution was examined, there were 31 (79%) men and 8 (21%) females with MDR TB. As a result, the male-female ratio was roughly 4:1. The majority of the 31 male patients (22%) were between the ages of 16 and 30. Three (38%) of the eight females were between the ages of 31 and 45.

In the current investigation, 122 sputum samples were microscopically positive for tuberculosis. In 114 of the 122 cases, TB was verified by PCR. As a result, the number and percentage of patients that underwent molecular diagnostic methods for drug resistance were 114 and 45%, respectively. Finally, drug sensitivity testing using the Genotype MTBDR plus kit revealed that 39 samples were resistant to both INH and Rifampicin.

Out of 256 samples, the greatest number of sputum samples (83%) were received in July 2022, however the greatest number of MDR TB samples (18%) were obtained in August 2022. When we looked at the distribution of patients by district, we discovered that Muzaffarpur had the most MDRTB cases (19 (49%) and Madhubani had 15 (38%). 4 cases (10%) were from Samastipur and only 1 case (3%) was from Saharsa. No samples from Supaul or Madhepura contained multidrug resistant TB. Percentage wise distribution of cases in different district. When mono-drug resistance was investigated, it was discovered that 27 (24%) of 114 tuberculosis cases had resistance to a single drug. Out of the 27 cases with mono resistance, 16 (59%) were resistant to INH and 11 (41%) were exclusively resistant to Rifampicin.

Discussion

According to the current study conducted in the DR TB centre of SKMC, Bihar, the prevalence of MDR TB in North Bihar in and around Muzaffarpur is 15%. Ramachandran's study discovered that the incidence of MDR TB in Gujarat was 17.4% in previously treated individuals and only 2.4% in new cases [7]. As a result, our findings are comparable to those of Ramachandran et al. [7]. In a study conducted in Tamilnadu [8], 162 of 782 cases evaluated were found to be bacteriologically positive. Thirty-three (20.3%) of the 162 patients tested positive for isoniazid and rifampicin resistance.

In North India, Delhi, prevalence of MDR TB is 33.7% whereas in South India it is 23.3% [9]. According to the current study, prevalence is higher in both places than in North Bihar. Difference in prevalence of MDR TB in urban/rural environment has

been documented by various authors. According to Almeida D et al. [10], a larger percentage (51%) of MDR TB was identified in an urban region (Mumbai) than in a rural area, i.e., 2% in Sakawar. Similar results were reported in the present study, in Muzaffarpur MDR TB cases were higher (49%) in contrast to 3% in Saharsa (rural) [11]. According to the findings of the current study, 16 (59.25%) cases were resistant to INH, while 11 (40.74%) cases were solely resistant to Rifampicin. INH resistance was found in 37% of the patients, according to Ramachandran et al. [7]. They have not documented any resistance to Rifampicin alone. In the current study, over 71% of MDR TB cases were between the ages of 16 and 30. Dholakia et al. [12], conducted a study in Mumbai where 67% of MDR TB cases were young (15-35 years) contrasted to Andhra Pradesh where 44% of suspected cases were young patients.

MDRTB is becoming more common as a result of improved disease knowledge, the availability of diagnostic methods such as culture and drug sensitivity testing, and earlier suspicion of MDR tuberculosis in previously treated patients [13].

The current study also revealed that the number of sputum samples from probable MDR TB cases received at the TBDC Centre increased from 17 in March 2022 to 63 in August 2022. Similarly, the number of MDR TB patients detected in March 2022 grew to 18 in August 2022, most likely due to increasing awareness among practitioners in these areas and paramedical staffs posted in DOTS Centers at various district levels [14]. As a result, they are sending more cases to SKMC for early diagnosis using molecular diagnostic methods.

This study discovered that the majority of MDRTB cases (48.7%) were from Muzaffarpur district, where early diagnostic facilities are accessible, and 38% were from Madhubani, with significantly less, i.e., 10% and 2% cases from Samastipur and Saharsa, respectively. The explanation for this could be that the IRL's molecular diagnostic method is located in Muzaffarpur, which is closer to patients and human carriers from Muzaffarpur and Madhubani who bring samples from various district levels than those appointed in Saharsa and Samastipur. Therefore, it demands speedy diagnosis by molecular approach in other regions of Bihar also, to promote early treatment and to avoid the spread of multi drug resistance pulmonary tuberculosis [15, 16]. Previously, MDR TB cases were sent to Delhi for treatment; however, a DRTB ward has been built at Shri Krishna Medical College. As a result, all cases (100%) of multidrug-resistant tuberculosis detected at SKMC were treated exclusively here. [17]

Conclusion

North Bihar has a 15% prevalence of multidrug resistant TB. All (100%) MDR TB cases diagnosed were treated in Shri Krishna Medical College's DR TB ward. To prevent the development of MDRTB, modern laboratories with molecular diagnostic capabilities should be established in each district.

References

1. Organization WH. Global tuberculosis report 2018. Geneva: World Health Organization; 2018 [cited 2022 October 18]; Available from: https://www.who.int/tb/publications/global_report/en/
2. Sharma SK, Mohan A. Multidrug-resistant tuberculosis. Indian J Med Res. 2004; 120:354-76.
3. Andrews JR, Gandhi NR, Moodley P, Shah NS, Sturm AW, et al. Exogenous Reinfection as a Cause of Multidrug-Resistant and Extensively Drug-Resistant Tuberculosis in Rural South Africa. The Journal of Infectious Diseases. 2008;198(11):1582-89.
4. Sharma SK, Kumar S, Saha PK, George N, Arora SK, Gupta D, et al.

Prevalence of multidrug-resistant tuberculosis among Category II pulmonary tuberculosis patients. Indian J Med Res. 2011; 133:312-15.
5. Donald PR, Van Helden PD. The Global Burden of Tuberculosis — Combating Drug Resistance in Difficult. Times N Engl J Med. 2009; 360:2393-95.
6. Mathuria JP, Samaria JK, Srivastava GN, Mathuria BL, Ojha SK, Anupurba S, et al. Primary and acquired drug resistance patterns of Mycobacterium tuberculosis isolates in India: a multicenter study. J Infect Public Health. 2013; 6:456-64.
7. Ramachandran R, Nalini S, Chandrasekar V, Dave PV, Sanghvi AS, Wares F, et al. Surveillance of drug-resistant tuberculosis in the state of Gujarat, India. Int J Tuberc Lung Dis. 2009;13(9):1154-60.
8. TB India 2011 Revised National TB Control Program Annual Status Report. From: http://www.tbcindia nic .in/pdfs/RNTCP%20TB%20India%20 2011.
9. David HL. Probability distribution of drug-resistant mutants in unselected populations of Mycobacterium tuberculosis. Appl Microbiol. 1970;20 :810-14. Barnard M, Parsons L, Miotto P, Cirillo D, Feldmann K, Gutierrez C, et al. Molecular Detection of Drug-Resistant Tuberculosis by Line Probe Assay. Foundation for New Diagnostics (FIND). 2012; 1:6-10.
10. Almeida D, Rodrigues C, Udwadia ZF, Lalvani A, Gothi GD, Mehta P, et al. Incidence of Multidrug-Resistant Tuberculosis in Urban and Rural India and Implications for Prevention. Clinical Infectious Diseases. 2003;36: e152–54.
11. Pablos MA, Raviglione MC, Laszlo A, Binkin N, Rieder HL, Bustreo F, et al. Global surveillance for antituber culosis-drug resistance. New Engl J Med. 1998; 338:1641-49.
12. Dholakia YN, Shah DP. Clinical profile and treatment outcomes of drug-resistant tuberculosis before directly observed treatment strategy plus: Lessons for the program. Lung India. 2013;30(4):316-20.
13. Jain A, Diwakar P, Singh U. Declining trend of resistance to first-line antitubercular drugs in clinical isolates of Mycobacterium tuberculosis in a tertiary care north Indian hospital after implementation of revised national Tuberculosis control programme. Indian J Med Microbiol. 2014; 32:43 0-3.
14. Hanif M, Malik S, Dhingra VK. Acquired drug resistance pattern in tuberculosis cases at the State Tuberculosis Centre, Delhi, India. Int J Tuberc Lung Dis. 2009; 13:74-8.
15. Kumar P, Balooni V, Singh S. Genetic mutations associated with rifampicin and isoniazid resistance in MDR-TB patients in North-West India. Int J Tuberc Lung Dis. 2015; 19:434-9.
16. Jain Y. India should introduce daily drug treatment for tuberculosis. BMJ. 2013; 347: f6769.
17. Khan A., Tidman D. M. M., Shakir D. S., & Darmal D. I. Breast Cancer in Afghanistan: Issues, Barriers, and Incidence. Journal of Medical Research and Health Sciences. 2022; 5(8): 2125–2134.