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Original Article

Epidemiology Section

A Study of Tuberculosis among Patients Visiting Regional Tuberculosis Centre in Central India- A Cross-sectional Study

VIKRANT SINGH CHAUHAN[1], MANOJ BANSAL[2], VIKASH SHARMA[3], RAJESH GUPTA[4]

ABSTRACT

Introduction: Number of Drug-Resistant Tuberculosis (DRTB) patients has increased. Determination of the causes of delay in timely diagnosis and treatment is one of the most important steps for complete cure. Delay in diagnosis and treatment of disease are important factors and these may arise from patients and by the healthcare system.

Aim: To study factors related to Tuberculosis (TB) patients visiting a regional DRTB centre in central India.

Materials and Methods: A cross-sectional study was conducted at DRTB centre, Lashkar, Gwalior, Madhya Pradesh, India, from January 2019 to June 2019. Purposive sampling technique was used for data collection. Patients who visited the centre were requested to fill the performa regarding their TB status. Total 371 patients, who visited and filled the form, participated in the study. Patients were divided into drug resistant and drug sensitive patients. For the significant independent variables adjusted odds ratio and p-values were calculated. The p-values <0.05 was considered to be significant.

Results: Total 227 (61.2%) drug-resistant and 144 (38.8%) drug-sensitive patients were included in the study. Education played a significant role with only 5.7% and 6.9% of drug resistant and sensitive patients, respectively, developed disease. Overall, 186 (81.9%) participants took more than six months of treatment prior to final initiation of Proper Anti-Tubercular Treatment (ATT) were DRTB cases.

Conclusion: Delay in proper diagnosis and multiple visits to health facility and further delay in initiation of definitive treatment poses threat for emergence of drug resistance.

Keywords: Delay, Drug-resistant tuberculosis, Drug-sensitive tuberculosis, Government, Private, Reporting centre, Symptoms

INTRODUCTION

Mankind has evolved with the development of latest technologies and has conquered many communicable diseases but is now facing epidemiological transition with the evolution of non communicable diseases. Mutations at genetic level are also responsible for drug resistance among mycobacterium like, *KatG* and *InhA* (genes determining isoniazid susceptibility) [1]. Among the total Tuberculosis (TB) cases, 10% develops clinical disease [2]. For the year 2017 World Health Organisation (WHO) report estimates that 1.3 million deaths have been reported from multiple Drug-Resistant Tuberculosis (DRTB) without Human Immunodeficiency Virus (HIV), while 3,00,000 deaths from TB with HIV/Acquired Immunodeficiency Syndrome (AIDS) cases [2].

If not totally missed, delayed identification and diagnosis of TB plays a vital role in the transmission of the disease in the community. Many people with active TB do not experience typical symptoms during the first stages of the disease and may not seek care early and tested for TB [3]. If the interval between presentation of the first symptoms of disease, diagnosis and treatment of disease is prolonged, the risk of TB transmission increases. With progression of pulmonary lesions, the likelihood of bacterial resistance and mortality is increased [4].

Determination of the causes of delay in timely diagnosis and treatment is one of the most important steps that must be taken for implementing the National TB Programme (NTP). Much of the delay in diagnosis and treatment of disease are due to two reasons, delays by the patients and delay by the health care system in proper initiation of treatment [5]. Hence, the present study was undertaken to find out the factors contributing to TB patients visiting Drug-Resistant Tuberculosis (DRTB) centre in district Gwalior, Madhya Pradesh, which is the biggest TB centre in central India.

MATERIALS AND METHODS

A cross-sectional, hospital-based study was conducted at Government DRTB centre, Lashkar, Gwalior, Madhya Pradesh, India, which caters patients from all the districts of Gwalior-Chambal division. Data was collected from January 2019 to June 2019. For data collection the primary researcher visited the DRTB centre three times a week from morning 10 am to 1 pm. Permission was granted from the Department of Community Medicine, Gajra Raja Medical College, Gwalior and District TB officer prior to conducting the study. Purposive sampling technique was used for data collection.

Inclusion criteria: All the diagnosed drug-resistant and drug-sensitive TB cases Cartridge Based Nucleic Acid Amplification Tests (CBNAAT)/Line Probe Assay (LPA), and who were willing to participate in the study were included.

Exclusion criteria: Those who were terminally ill and did not want to participate in the study, were extra pulmonary TB cases, and cured from TB were excluded from the study.

Study Procedure

Each CBNAAT/LPA report or report from other institutions of study participants were counter checked for verification of the drug-resistant/drug-sensitive TB status. A self-designed questionnaire was used to gather information from the study participants. The confidentiality of the study participants were maintained throughout the study. The first reporting centre was the centre which was visited by the TB patients for their symptoms for the first time, thereafter their second visit for his/her complaints either resolved or not at first reporting centre. For study purpose authors have divided Tuberculosis patients into drug resistant and drug sensitive cases on the basis of CBNAAT/LPA reports. Overcrowding was assessed using a simple ratio between numbers of people in the household and rooms-maximum persons recommended were one room two person (not overcrowded if they are in relationship), two rooms three persons,

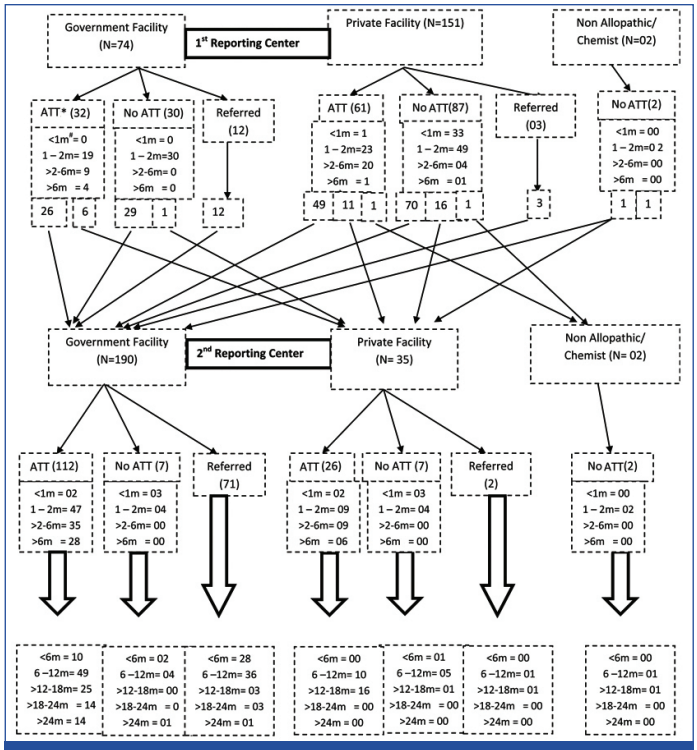
three rooms five persons, four rooms seven persons, five rooms ten persons. Above that was considered as overcrowding [6].

STATISTICAL ANALYSIS

Statistical analysis was performed with Statistical Package for the Social Sciences (SPSS) version 16.0. Simple frequency format was used for categorical variables. Standard deviation with 95% confidence interval was applied to percentages and quantitative and numerical variables. Proportions, Pearson Chi-square and p-values were calculated for the variable. Logistic regression analysis was used to describe the possible association between independent variables and the outcome variable as TB which is further divided into drug-resistant and drug-sensitive cases. For the significant independent variables adjusted Odds Ratio (OR) and p-values were calculated. The p-values <0.05 was considered to be significant.

RESULTS

A total of 371 TB patients were included in the study, among them 227 (61.2%) were drug-resistant cases while rest 144 (38.8%) were drug-sensitive. Postdetection of the initial symptoms, 74 patients visited government setup, where 32 (43.2%) patients diagnosed as TB and received ATT. While 151 visited private clinic/hospital, among them 61 (40.4%) diagnosed and initiated on ATT. Sequence of events, from initial symptoms to subsequent visit by the patients [Table/Fig-1,2].

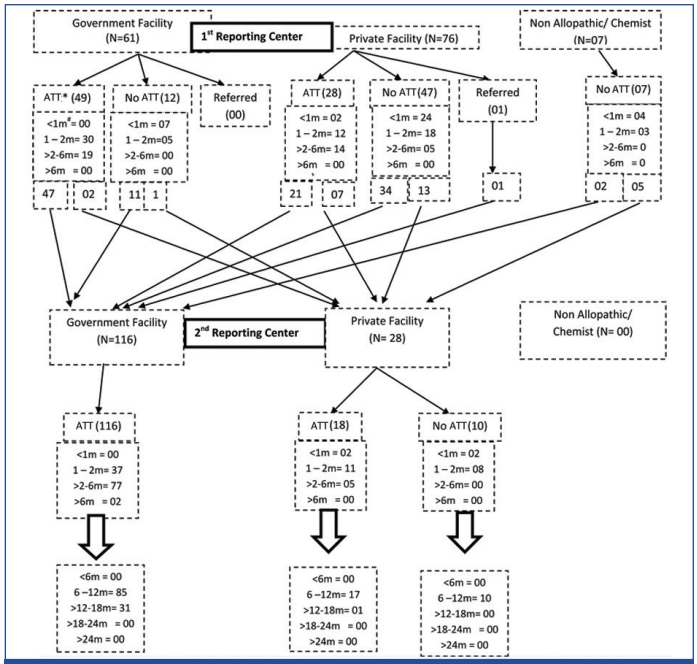


[Table/Fig-1]: The sequence of events covered prior to reaching the final DRTB centre among drug-resistant TB (DRTB) patients (n=227).

Mean age of the participants was 35.7±15.1 years for DRTB patients, while for drug-sensitive cases it was 37.4±17.6. Mean Body Mass Index (BMI) of the participants was 15.91, which is in underweight category. After the onset of symptoms, DRTB patients took mean 2.6±4.2 months of treatment at the 1st reporting centre, while for drug-sensitive cases it was 1.8±1.5 months. DRTB patients took mean 12.8±9.7 months of treatment, while for drug-sensitive patients it was 10.6±2.3.The socio-demographic variables of the participants are presented in [Table/Fig-3].

Majority 96 (66.7%) of the drug-sensitive patients had no history of TB, while 82 (36.1%) DRTB cases were drug defaulters as shown in [Table/Fig-4]. Overall, 137 (60.4%) of the DRTB patients had taken more than six months of treatment with rifampicin/isoniazid in past. A 105 (72.9%) drug-sensitive TB patients were living in overcrowded places.

Fever with cough was the initial symptoms among 116 (51.1%) of the DRTB patients. Total 151 (66.5%) visited the private centre and



[Table/Fig-2]: The sequence of events covered prior to reaching the final DRTB centre among drug-sensitive TB patients (n=144).
Total Duration of Treatment Received Prior to Reaching the Final DRTB centre (In Months).
*Anti-Tubercular Treatment. # months of treatment

Variables (N)	Drug-resistant tuberculosis (227)	Drug-sensitive tuberculosis (144)	Statistics
Age range (years)			
≤10 (9)	1 (0.4%)	8 (5.6%)	χ^2=22.84 p-value= 0.00036
11-20 (51)	31 (13.7%)	20 (13.9%)	
21-30 (112)	78 (34.4%)	34 (23.6%)	
31-40 (67)	49 (21.6%)	18 (12.5%)	
41-50 (59)	28 (12.3%)	31 (21.5%)	
>50 (73)	40 (17.6%)	33 (22.9%)	
Gender			
Male (261)	153 (67.4%)	108 (75.0%)	χ^2=2.43 p-value=0.118
Female (110)	74 (32.6%)	36 (25.0%)	
Caste of participants			
General (150)	105 (46.3%)	45 (31.3%)	χ^2=8.55 p-value=0.014
Other backward class (105)	60 (26.4%)	45 (31.3%)	
Scheduled cast/Scheduled tribe (116)	62 (27.3%)	54 (37.5%)	
Marital status			
Married (274)	172 (75.8%)	102 (70.8%)	χ^2=1.11 p-value=0.29
Unmarried (97)	55 (24.2%)	42 (29.2%)	
Educational status attained			
Illiterate (150)	80 (35.2%)	70 (48.6%)	χ^2=7.62 p-value=0.022
Upto high school (198)	134 (59.0%)	64 (44.4%)	
Above high school (23)	13 (5.7%)	10 (6.9%)	

[Table/Fig-3]: Socio-demographic factors of drug-resistant and drug-sensitive TB Patients (N=371).
p-values <0.05 was considered to be significant

Variables (N)	Drug-resistant tuberculosis (n=227)	Drug-sensitive tuberculosis (n=144)	Statistics
History of TB and ATT course			
No history of TB/ATT* (181)	85 (37.4%)	96 (66.7%)	χ^2=36.43 p-value >0.001
ATT completed (75)	48 (21.1%)	27 (18.8%)	
Defaulter (101)	82 (36.1%)	19 (13.2%)	
Failure of ATT (12)	10 (4.4%)	2 (1.4%)	
Relapse of TB (2)	2 (0.9%)	0	

History of Rifampicin/±Isoniazid intake (Months)			
< 6 (49)	5 (2.2%)	44 (30.6%)	χ^2=145.64 p-value >0.001
≥6 (141)	137 (60.4%)	4 (2.8%)	
History of contact with TB patient			
No (78)	12 (5.3%)	66 (45.8%)	χ^2=128.49 p-value >0.001
Yes (103)	50 (22.0%)	53 (36.8%)	
Don't know (190)	165 (72.7%)	25 (17.4%)	
No (151)	112 (49.3%)	39 (27.1%)	χ^2=18.09 p-value >0.001
Yes (220)	115 (50.7%)	105 (72.9%)	

[Table/Fig-4]: Past/family history of TB and contacts for drug-resistant and drug-sensitive TB patients (N=371).
*Anti-tuberculosis treatment; p-values <0.05 was considered to be significant

190 (80%) patients subsequently visited the Government centre for further treatment [Table/Fig-5,6]. Contributing factors for TB, like diabetes mellitus, smoking, alcohol intake, HIV status are presented in [Table/Fig-7].

Variables (N)	Drug-resistant tuberculosis (n=227)	Drug-sensitive tuberculosis (n=144)	Statistics
1st Symptom reported			
Cough (79)	27 (11.9%)	52 (36.1%)	χ^2=48.67 p-value >0.001
Fever (127)	70 (30.8%)	57 (39.6%)	
Both cough and fever (146)	116 (51.1%)	30 (20.8%)	
Hemoptysis (12)	8 (3.5%)	4 (2.8%)	
Shortness of breath (7)	6 (2.6%)	1 (0.7%)	
1st Reporting centre			
Government centre (135)	74 (32.6%)	61 (42.4%)	χ^2=10.78 p-value=0.005
Private centre (227)	151 (66.5%)	76 (52.8%)	
Non allopathic (9)	2 (0.9%)	7 (4.9%)	
Duration of treatment in 1st reporting centre (Month)			
Referred to higher centre (16)	15 (6.6%)	1 (0.7%)	χ^2=28.78 p-value >0.001
<1 (83)	46 (20.3%)	37 (25.7%)	
1-2 (179)	111 (48.9%)	68 (47.2%)	
>2-6 (71)	33 (14.5%)	38 (26.4%)	
>6 (22)	22 (9.7%)	0	
Referred (16)	15 (6.6%)	1 (0.7%)	χ^2=10.91 p-value=0.004
ATT not received (185)	119 (52.4%)	66 (45.8%)	
ATT received (170)	93 (41.0%)	77 (53.5%)	

[Table/Fig-5]: First reporting centre and their outcome for drug-resistant and drug-sensitive TB Patients (N=371).
p-values <0.05 was considered to be significant

Variables (N)	Drug-resistant tuberculosis (n=227)	Drug-sensitive tuberculosis (n=144)	Statistics
Second reporting centre			
Government centre (306)	190 (83.7%)	116 (80.6%)	χ^2=2.21 p-value=0.33
Private centre (63)	35 (15.4%)	28 (19.4%)	
Non allopathic (2)	2 (0.9%)	0	
Duration of treatment in second reporting centre (Months)			
Referred to higher centre (77)	77 (33.9%)	0	χ^2=104.8 p-value >0.001
<1 (10)	6 (2.6%)	4 (2.8%)	
1-2 (132)	66 (29.1%)	56 (38.9%)	
>2-6 (126)	44 (19.4%)	82 (56.9%)	
>6 (36)	34 (15.0%)	2 (1.4%)	
ATT included in second reporting centre			
Referred to higher centre (73)	73 (32.2%)	0	χ^2=58.82 p-value >0.001
ATT not received (26)	16 (7.0%)	10 (6.9%)	
ATT received (272)	138 (60.8%)	134 (93.1%)	

Total duration of treatment prior to Final/Regional TB centre (Months)			
<6 (41)	41 (18.1%)	0	χ^2=69.43 p-value >0.001
6-12 (218)	106 (46.7%)	112 (77.8%)	
>12-18 (69)	37 (16.3%)	32 (22.2%)	
>18-24 (24)	24 (10.6%)	0	
>24 (19)	19 (8.4%)	0	

[Table/Fig-6]: Second reporting centre and their outcome for drug-resistant and drug-sensitive TB patients (N=371).
p-values <0.05 was considered to be significant

Variables (N)	Drug-resistant tuberculosis (227)	Drug-sensitive tuberculosis (144)	Statistics
Diabetes mellitus			
Absent (346)	216 (95.2%)	130 (90.3%)	χ^2=3.34 p-value=0.068
Present (25)	11 (4.8%)	14 (9.7%)	
HIV status			
Absent (344)	210 (92.5%)	134 (93.1%)	χ^2=0.039 p-value=0.84
Present (27)	17 (7.5%)	10 (6.9%)	
Smoking (per day)			
No smoking (223)	149 (65.6%)	74 (51.4%)	χ^2=48.11 p-value >0.001
≤10 per day (80)	61 (26.9%)	19 (13.2%)	
>10 per day (68)	17 (7.5%)	51 (35.4%)	
Alcohol intake (years)			
No alcohol (268)	177 (78.0%)	91 (63.2%)	χ^2=15.1 p-value=0.001
<10 (76)	42 (18.5%)	34 (23.6%)	
≥10 (27)	8 (3.5%)	19 (13.2%)	

[Table/Fig-7]: Contributing factors for TB for drug-resistant and drug-sensitive TB Patients (N=371).
p-values <0.05 was considered to be significant

Logistic regression analysis of the independent variables was performed for the outcome variable as a case of drug-resistant DRTB or drug-sensitive TB patients. Forward stepwise (likelihood ratio) was used for regression model. Hosmen Lemeshow test was conducted to check the p-value, which was 0.72, which was non significant hence the adequacy of regression model was accepted and is fit. Negelkerkes R^2 was 0.574 which suggests that 57.4% of the variance can be explained by the independent variables. Significant findings from regression model are presented in [Table/Fig-8].

Independent variables (N)	AOR*	p-value	CI† (95%)
1st Symptom reported			
Cough (79)	Reference=1		
Fever (127)	2.3	0.005	1.32-4.25
Both cough and fever (146)	4.16	<0.001	2.64-6.54
Heamoptysis (12)	4.12	0.066	2.86-6.54
Shortness of breath (7)	4.32	0.22	2.87-6.59
1st Reporting centre			
Government centre (135)	Reference=1		
Private centre (227)	1.63	0.034	1.05-2.57
Non allopathic (9)	1.34	0.12	0.89-2.13
Duration of treatment at 1st reporting centre (Month)			
Referred to higher centre (16)	Reference=1		
<1 (83)	0.08	0.009	0.01-0.65
1-2 (179)	0.11	0.023	0.01-0.84
2-6 (71)	0.05	0.001	0.007-0.46
>6 (22)	0.18	0.87	0.00-0.31
ATT given at 1st reporting centre			
Referred (16)	Reference=1		
Not received (185)	0.12	0.03	0.01-0.93
Received (170)	0.08	0.005	0.01-0.62

History of TB and ATT# course			
No (181)	Reference=1		
ATT completed (75)	2.01	0.018	1.15-3.45
Defaulter (101)	3.13	<0.001	2.08-4.78
Failure of ATT (12)	3.26	0.032	2.21-4.89
Relapse of TB (2)	3.26	0.87	2.25-1.81
History of contact with TB patient			
No (78)	Reference=1		
Yes (103)	5.18	<0.001	2.51-10.72
Don't know (190)	15.88	<0.001	9.15-28.66

[Table/Fig-8]: Logistic regression analysis for drug-resistant and drug-sensitive TB patients (N=371).
*Adjusted ODDs Ratio, †95% confidence interval, #Anti-Tubercular Treatment; p-values <0.05 was considered to be significant

DISCUSSION

As per the present study, majority of the participants were of age group 21-30 years i.e., 78 (34.6%) for drug-resistant, while 34 (23.6%) for sensitive cases. Similar finding was reported by Kanungo S et al., and Shiferaw MB and Zegeye AM, [7,8]. The study by Rizvi SMS et al., from Bangladesh has shown that 22.2% of the drug-sensitive and 39.5% of drug-resistant cases were 21-30 years age group [9]. A 51% of DRTB patients in study by Venkatesh U et al., from Gorakhur were of age range 21-30 years [5]. It was found that 153 (67.4%) for drug resistant and 108 (75.0%) for drug sensitive patients were male. In Ernakulum study by Nirupa C et al., had 68.0% males among DRTB cases [10]. The study by Rizvi SMS et al., in Bangladesh has shown that 55.6% were male in drug-sensitive category while 81.6% in drug-resistant patients [9]. This shows that prevalence was higher among younger male participants.

Overall, 172 (75.8%) of drug-resistant and 102 (70.8) sensitive participants were married. Similar were the findings by Sajith M et al., Bhawalkar J et al., while more than 90.0% were married as per study done by Sairam A et al., [11-13]. Venkatesh U et al., in Gorakhpur had 55.4% married participants among DRTB cases [5]. If a marital partner contracts TB, there are higher chances of the counterpart to get infected which shows the heightened risk of transmission of TB among married individuals.

Illiteracy was seen in 80 (35.2%) of the drug-resistant cases, while it was among 70 (48.6%) for drug-sensitive patients. Almost similar was the findings in the studies by Raza AKMM et al., and Chakraborty AK [14,15]. The study by Sidharta SD et al., in Mayanmar found a lower literacy rate of 17% and is contradictory to the present study [16]. Lower education status is also a significant factor for spread of TB, as is reflected in the current study.

There was a substantial positive history of TB among the drug-resistant and drug-sensitive patients (62.6% and 33.3%, respectively). Rizvi SMS et al., in their study from Bangladesh, found that 16.7% drug-sensitive patients had history of TB, while it was 7.9% for drug-resistant cases [9]. Study in Ethiopia by Awoke N et al., found 8.5% patients with history of TB [17]. A study in Patna by Mistry N et al., has shown that 23% patients had history of TB [18]. Sinha R and Umashankar H in Bareilly have shown that 23.3% patients were defaulters for past TB treatment [19]. Inappropriately, treated TB patients in past contributes in the development of drug-resistant cases. High number of cases in the present study may be because the study centre caters to an overall larger number of cases from Gwalior-Chambal division, with adjoining districts of UP and Rajasthan.

Total 137 (60.4%) drug-resistant cases received more than 6 months of ATT/rifampicin for history of TB, while it was 4 (2.8%) for drug-sensitive cases. Total 38.9% drug-sensitive and 10.5% drug-resistant patients in a Bangladesh-based [8] study had received ATT in past. A study in Gorakhpur by Venkatesh U et al., has shown that 74.5% of DRTB patients had received insufficient duration of ATT in past [5]. This concludes that history of ATT intake significantly affects TB drug status. Investigation of drug resistance status is utmost important for appropriate TB diagnosis and treatment initiation.

Total 116 (51.1%) DRTB cases visited health facility for cough and fever as 1st symptoms. Djouma FN et al., had 96.5% patients with cough as 1st symptom [20]. Paramasivam S et al., Sahu R et al., and Saha RK had reported cough in almost 93% patients, and 98% drug-resistant cases reported fever in another study from Bangladesh [21-23]. The difference might be due to segregation of symptoms in the index study as cough, fever separately and cough+fever together as 1st reporting symptoms.

Patients visiting government facilities for initial symptoms were reported by 74 (32.6%) and 61 (42.4%) among the drug-resistant and sensitive patients respectively. Overall, 23.8% visited a public facility as reported by a study in Cameroon [20]. A 60-70% patients from study by Nair N et al., had patients visiting private health clinic for their symptoms [24]. This reflects that majority of the patients prefer a private health facility for the initial symptoms. That might be due to easy availability of doctors in private sector.

In the current study, 93 (41%) and 77 (53.3%) received ATT at the 1st reporting centre itself for drug-resistant and drug-sensitive cases respectively. Paramasivam S et al., reported that 18.5% were started on ATT at the 1st visit [21]. A study from Jabalpur by Sahu R et al., revealed that 86.7% visited private facility but 25.0% were diagnosed as TB and given ATT at 1st visit, while13.3% visited government facility and among them 74.0% were diagnosed and initiated on ATT [22]. A study on MDR from coastal southern India found that 57.5% of the total patients, who visited a health facility, were diagnosed and initiated on ATT [25]. A study in Surat by Yadav SK et al., has revealed that 76.1% of DRTB cases were put on ATT at 1st visit as compared to 81.6% of drug sensitive cases [26]. This suggests that there is lack in proper and timely diagnosis of TB in India whether they visit government sector or private sector, and is one of a bigger reason for emergence of DRTB apart from other factors. Drug sensitivity testing should be done on every high-risk patient of TB.

Total 6-12 months of ATT was received by 106 (46.7%) drug-resistant patients prior to final definitive diagnosis as drug resistant cases, while it was 112 (77.8%) for drug-sensitive cases. Almost similar was the findings of study by Venkatesh U et al., in Gorakhpur MDR-TB patients. These drug sensitive patients later, converted into drug resistant cases as 77.8% patients received delayed treatment as per the current study [5]. If drug sensitivity testing is done at early stages rather than 6-12 months later, patients will get definitive treatment at the start of disease. This will reduce the further spread of drug resistant mycobacterium to most of his contacts. The burden of DRTB in society will reduce in a significant way.

Diabetes was among 11 (4.8%) and 14 (9.7%) drug-resistant and sensitive patients, respectively, while a study in Bangladesh by Rizvi SMS et al., has shown Diabetes among 15% of drug resistant and 17% among drug sensitive TB patients [9]. Mistry N et al., has revealed 7.8% diabetic patients [18]. A 7% were diabetic among DRTB patients in Gorakhpur study by Venkatesh U et al., [5]. Diabetes hampers the immunity of the patients which in turn increase the susceptibility for TB. Patients with TB and DM come with atypical features with increased lower lung field cavities, lymphadenopathy, pleural effusion, segmental and lobar consolidation, and the presence of multiple cavities. Diabetic patients with poor glycaemic control exhibit lower interaction between *Mycobacterium Tuberculosis (M.TB)* and monocytes resulting in a heightened susceptibility to infection [27].

The HIV positive patients were 17 (7.5) among DRTB cases, while 10 (6.9%) among drug-sensitive patients. Bhawalkar J et al., had

15.2% patients with TB and HIV [12]. This relatively number may be because Maharashtra has a high prevalence of HIV. Study in Gorakhpur by Venkatesh U et al., reported a relatively low rate of 3.8% HIV positive patient among DRTB [5]. The increased incidence of active TB in HIV-infected individuals can be attributed to at least two mechanisms: the increased reactivation of latent TB or increased susceptibility to M.TB infection [28]. In India, a TB-endemic country, most recurrences after successful treatment of TB are attributable to exogenous re-infection in HIV infected persons but endogenous reactivation in HIV uninfected persons [29].

As per current study, 78 (34.4%) drug-resistant patients were smokers at any time and 70 (48.6%) were from drug-sensitive patients. Rizvi SMS et al., (Bangladesh) reported that 52.6% were smokers among drug-resistant patients, while it was 16.7% for drug-sensitive cases [9]. A study from Gorakhpur reported 43.3% smokers among DRTB patients [5]. Smoking damages the lungs and impacts the body's immune system, making smokers more susceptible to TB infection. The occurrence of TB has been shown to be linked to altered immune response and multiple defects in immune cells such as macrophages, monocytes and CD4 lymphocytes. Other mechanisms, such as mechanical disruption of cilia function and hormonal effects [30].

Total 50 (22.0%) drug-resistant and 53 (36.8%) drug-sensitive patients had the habit of drinking alcohol. This data was 41.4% in another study by Venkatesh U et al., and 42.8% in a study conducted by Bhawalkar J et al., [5,12]. Consuming alcohol causes essential vitamin deficiency which in turn hampers the immunity and subsequently TB. Heavy alcohol use strongly influences both the incidence and the outcome of the disease, and was found to be linked to altered pharmacokinetics of medicines used in treatment of TB, social marginalisation and drift, higher rate of re-infection, higher rate of treatment defaults and development of drug-resistant forms of TB [31].

Limitation(s)

The familial, social and regional stigmas associated with TB were not covered in the study.

CONCLUSION(S)

Initial symptom with fever and cough and inappropriate investigations and delayed diagnosis plays a significant role for the emergence of DRTB. Multiple visits to health facility and delay in proper diagnosis with further delay in initiation of definitive treatment are very important factors. All patients who came with a suspicion of TB should undergo drug-sensitivity testing and treatment should be initiated accordingly. The management aspect of anti-TB drive should include social and behavioural changes of treatment seeking patients and person providing treatment at every level apart from only treatment regime protocol as was accepted earlier. Further study needs to be done comparing normal cases with drug-resistant and drug sensitive pulmonary TB cases taking more subjects.

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PARTICULARS OF CONTRIBUTORS:
1. Medical Officer, Department of Community Medicine, Gajra Raja Medical College, Gwalior, Madhya Pradesh, India.
2. Associate Professor, Department of Community Medicine, Gajra Raja Medical College, Gwalior, Madhya Pradesh, India.
3. Demonstrator, Department of Community Medicine, Government Medical College, Ratlam, Madhya Pradesh, India.
4. District Health Officer, Department of Community Medicine, Gajra Raja Medical College, Shivpuri, Madhya Pradesh, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Vikrant Singh Chauhan,
No. 3, Ladanbagh, Near Maharshi School, Balakot Road,
Gwalior, Madhya Pradesh, India.
E-mail: drvikrantsinghc@gmail.com

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