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Original Research Article

A STUDY OF PREVALENCE OF RIFAMPICIN MONO RESISTANCE IN PULMONARY AND EXTRA PULMONARY TUBERCULOSIS

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ABSTRACT

Background: In India, RNTCP recommends to perform DST to patients with previous history of TB treatment or those who are having risk factors of resistant TB like History of DM, HIV/AIDS, contact with DR-TB patients. However, realising the importance of DR-TB impact, under the National Strategic Programme for Tuberculosis 2017–2025 (NSP), the government recommends to perform DST by CB-NAAT to all suspects of TB so that prompt management can be initiated as early as possible. The objective is to identify rifampicin resistance tuberculosis as early as possible and initiate treatment accordingly and to portray the importance of CB-NAAT as an initial test. Materials and Methods: This was a cross-sectional study done among Pulmonary and Extra Pulmonary Tuberculosis patients for period of 18 months. The principal investigator used pre designed and pre-tested questionnaire to collect the data from patients.

Results: Total of 129 participants with clinical features of PTB i.e cough for more than 2 weeks, fever more than 2 weeks, history of weight loss and night sweats, & all newly diagnosed sputum positive cases. The Mean (Standard Deviation) age of participants were 35.2±13.2. Overall, 18% of Rifampicin Mono Resistance was detected by Cartridge- Based Nucleic Acid Amplification Test (CBNAAT) in which Pulmonary was 12% and Extra Pulmonary Tuberculosis was 6%

Conclusion: Prevention of MDR-TB/RR- TB is an effective measure done by prompt diagnosis and effective treatment of all TB cases to halt the emergence of XDR-TB. Due to simplicity and rapidity in diagnosis molecular methods and CBNAAT must be used at the earlier stages of the disease itself to detect drug-resistant TB.

Keywords: DR-TB, CB-NAAT, Rifampicin Mono resistant xiii.

INTRODUCTION

Tuberculosis (TB) is a communicable infectious disease caused by Mycobacterium Tuberculosis. Although it mainly affects the lungs (Pulmonary TB), it may also involve other parts of the body (Extra-pulmonary TB). The World Health Organization (WHO) estimates that approximately one-fourth of the world's population who are infected with Mycobacterium Tuberculosis can progress to Clinical Phase. It has been estimated that 10 million people across the globe were infected by MTB, however, the burden of disease is not uniformly distributed throughout the world.[1,2]

As per National TB Prevalence Survey India 2019-2021 report, the overall prevalence of microbiologically confirmed PTB in ≥ 15 years age was reported to be 316 per lakh population in which Delhi has higher prevalence of 534 per lakh population. As per the report, the co-factors attributed for higher prevalence of TB were males, older age group, smokers, malnourished, alcoholics and known diabetics.[3]

Patients who have previously been treated for TB, were declared cured or treatment completed at the end of their course of treatment and who were again found positive for TB are now diagnosed as recurrent episode of TB also known as Relapse TB. Recurrence of TB can be due to re-growth of same strain of Mycobacterium tuberculosis (MTB),poor adherence during treatment, use of fewer than three drugs in intensive phase, high bacterial load, and presence of risk factors. Recurrent TB poses significant threats, especially emergence of drug resistance which can pose challenges to TB control programs.[4]

In addition to the already existing TB burden in India, The COVID-19 pandemic imposed major burden to the management of TB including early screening, DOTS therapy, drug compliance and follow-up, which in turn attributes to the risk of increased Drug Resistant- Tuberculosis (DR-TB).Emergence and spread of DR-TB complicates the management. Worldwide, 3.6% of new TB cases and 20.2% of previously treated cases are estimated to have Multidrug-resistant (MDR)TB. India has one of the world's highest burdens of drug-resistant TB.[5]

As per National Anti-TB Drug Resistance Survey (NDRS) in India, prevalence of MDR-TB is 2.8% among new and 11.6% among previously treated TB patients. In addition, Isoniazid (H) resistance was found to be 11.6% in new and 25% among previously treated TB patients. H resistance was being driver for RR-TB which was supported by various studies conducted in India which report rifampicin resistance prevalence ranges from 4% to 25%.[6]

Apart from a genetic mutation that makes a drug ineffective against the mutant bacilli, Empirical treatment of TB without doing any primary drug susceptibility testing (DST), is a prevalent practice in many areas of India which predisposes the risk of transmission of drug resistant TB strains, and also usage of second line anti-TB drugs like fluroquinolones for respiratory ailments is leading to resistance as well. Therefore, there is a need of routine testing of all TB patients with drug resistant testing which is the most appropriate surveillance approach for monitoring trends in drug resistant TB irrespective of its site and categories of TB.

In view of early detection of DR-TB, WHO endorsed the rapid and automated molecular system i.e Xpert MTB/ RIF assay to detect MTB and Rifampicin resistance simultaneously. Various research supports that RR was the surrogate marker for MDR-TB and other resistant TB. Hence WHO recommends to screen all the patients who are TB suspects with Xpert MTB/ RIF assay using CBNAAT for early identification and management of DR TB. DR-TB are more difficult to treat than drug-susceptible ones, and threaten global progress towards the targets set by the End TB Strategy of the World Health Organization (WHO). There is thus a critical need for evidence-based policy recommendations on the treatment and care of patients with DR-TB, based on the most recent and comprehensive evidence available. In this regard, the WHO consolidated guidelines on drug-resistant tuberculosis treatment and to fulfill the mandate of WHO to inform health professionals in Member States on how to improve treatment and care for patients with DR- TB.[3]

In India, The Revised National Tuberculosis Control Programme (RNTCP) recommended to perform DST to patients with previous history of TB treatment or those who having risk factors of resistant TB like History of DM, HIV/AIDS, contact with DR-TB patients. However, realising the importance of DR-TB impact, under the National Strategic Programme for Tuberculosis 2017–2025 (NSP), the government recommends to perform DST to all suspects of TB. Though culture and drug susceptibility testing are gold standards for diagnosing DR-TB, but newer molecular methods like Xpert MTB/ RIF assay using CBNAAT helps in rapid diagnosis.[6] Once diagnosed, prompt treatment can be started, preferably under direct observation and treatment can be standardized or individualized in order to manage DR-TB at early. With this background the present study was conducted to identify rifampicin resistance tuberculosis as soon as possible and initiate treatment accordingly and to portray the importance of CB-NAAT as an initial test.

MATERIALS AND METHODS

This was a cross sectional study done to estimate the prevalence of Rifampicin Mono Resistance in Pulmonary and Extra Pulmonary Tuberculosis patients at Government Hospitals in Mizoram. The study was conducted over the period of 18 months from November 2020 to April 2022. This study was conducted in Government Hospital, Aizawl, Mizoram and government of India recognized DTC, Falkawn, Mizoram. The present study was conducted after getting clearance from Scientific Research Committee and Institutional Human Ethics Committee.

A Total Population of 129 people were taken as study population. This study includes patients above 15 years of age and newly diagnosed PTB as well as EPTB patients along with other eligibility criterias.

Inclusion criteria:

1. All smear positive cases of Pulmonary and Extra pulmonary TB via AFB and CBNAAT.
2. All Cases of High Clinical Suspicion even if smear is negative.
3. All Cases of TB associated with HIV.

Exclusion criteria:

1. Patients below 15 years of age
2. Moribund and severely ill patient.
3. Patients who are diagnosed with any other associated lung conditions like Lung Abscess, Ca Lung.

Sample size: The sample size was calculated based on the literature of Singhal et al,[7] which was done in North- Eastern States. Considering the 95% confidence interval with 5% margin of error, below

mentioned formula was applied to calculate the sample size for the present study.

Sample size (n) $=Z(1-\alpha/2)2pq\ d2$

Where n = Desired sample size; Z (1−α/2) = Critical value and a standard value for the corresponding level of confidence. (At 95% CI or 5% level of significance (type-I error) it is 1.96); p = Expected prevalence or based on previous research; d = Margin of error or precision. The calculated sample size was 117 by considering 10% dropout the sample size was finalized to be 129.

Study participants were included by convenient sampling method. Those samples satisfying eligibility criteria which collected in Civil Hospital in Mizoram and DTC, Falkawn recognized by the Government of India was included for the study after getting their informed written consent.

The principal investigator used pre designed and pre-tested questionnaire to collect the data from patients. Investigator requires 15 to 20 minutes from each participant to collect the required data for the study.

Part 1: Pre designed and pre-tested semi-structured questionnaire was used. The questionnaire consists of baseline characteristics, symptoms, Diabetic and clinical history

Part 2: General Examination and Respiratory system were examined for the patients. All the patients were examined for pallor, signs of malnutrition and respiratory system was examined for crepitation's and bronchial breath sounds.

Part 3: Anthropometry Examination: Height (Cms) and Weight (kgs) were measured.

Height was measured using an inch tape. The patient was instructed to stand straight with the back against the wall in bare foot and asked to focus the area at eye level. Cardboard was placed over the head in horizontal position and height was marked in the wall. Inch tape was used to measure the height in the wall and nearest 0.1 cm was measured.

Weight was measured with a dial type weighing scale. Before measuring weight zero correction of the scale was done. Weighing scale was kept on a firm horizontal surface. Patient was instructed to stand still on the scale with both feet even and uphold the head straight and weight with the nearest 0.1 Kg was measured.

Body Mass Index (BMI) was calculated using the formula Weight (Kg)/ Height (m2).

WHO Body Mass Index criteria

Category	Body Mass Index Values
Underweight	< 18.5
Normal or desirable weight	18.5-24.9
Overweight	25.0-29.9
Obese	≥30.0
Obese-Class I	30.0-34.9
Obese-Class II	35.0-39.9
Obese-Class III	≥ 40.0

Part 4: Blood investigation and CBNAAT: Venous blood sample (5 ml) was collected from the participants for assessing ESR, Total count, Blood Urea, S. Creatinine, Bilirubin, Serum Glutamic-Oxaloacetic Transaminase (SGOT) and Serum Glutamic Pyruvic Transaminase (SGPT).

Early morning sputum sample was collected from the PTB study participants and Site- specific specimen from Extra-Pulmonary TB patients. All the specimens were prepared for AFB staining and PCR based identification by using CBNAAT technology. DST was done to detect the drug resistant gene for Rifampicin by Cartridge Based Nucleic Acid Amplification Test (CB-NAAT) [GeneXpert]. This diagnostic process was recommended by WHO since 2010 December for early detection of resistance.

After obtaining permission from Scientific Research Committee and Institutional Human Ethics Committee, the present study was conducted in Government Hospital, Aizwal, Mizoram and DTC, Falkawn. Convenient sampling technique was used and 129 patients were included for the study.

After explaining the purpose of the study, written consent was obtained from all the study participants. Timeline about 15 to 20 minutes requires to collect the questions on proforma. Information regarding baseline characteristics, symptoms, Diabetic and clinical history were obtained using pre-designed and pre-tested semi structured questionnaire. General Examination and Respiratory system were examined for the patients. All the patients were examined for pallor, signs of malnutrition and respiratory system were examined for crepitation's and bronchial breath sounds. Study participants Height (cms) and weight (kgs) were measured. Diagnosis of TB was confirmed as per National Tuberculosis elimination programmer guidelines. DST was done for detecting the drug resistant gene for Rifampicin by Cartridge Based Nucleic Acid Amplification Test (CB-NAAT) [GeneXpert] and AFB TEST, at Civil Hospital in Mizoram. Additional Samples will also be collected from DTC, Falkawn which is also recognized by the Government of India. The information obtained from the study participants were kept confidential. Participants who are found sick during the study were given appropriate management and counselling.

Statistical analysis: Data entered in Microsoft Excel was analyzed using SPSS version 20.0 (Armonk, NY: IBM Corp). Quantitative variables like age, height, weight, biochemical parameters were expressed in Mean and standard deviation. Qualitative variables like gender, symptoms, clinical examination, respiratory system findings, diabetes status, site of disease, CBNAAT resistance and CBNAAT interpretation were expressed in frequency and proportion. Prevalence of Rifampicin Mono Resistance in Pulmonary and Extra Pulmonary Tuberculosis were expressed in proportion. Chi-square test was done to calculate the association between rifampicin mono resistant and other significant variables. p-value less than 0.05 will be consider as statistically significant.

RESULTS

The present study was done to estimate the prevalence of rifampicin mono resistance in pulmonary and extra pulmonary tuberculosis patients at government hospitals in Mizoram. Total of 129 participants with clinical features of PTB ie cough for more than 2 weeks and with previous treatment history of PTB were included in the study.

The Mean (Standard Deviation) age of participants were 35.2±13.2. Maximum of the participants were belonging to age group between 21 and 40 with 60%. About 40% of the participants were underweight and nearly 10.9% and 4% were belongs to Obese I and II category respectively. Female TB patients (31) were reported to have increased number of underweight than male TB patients (21). There was no significance difference found between the groups. The mean (SD) height of participants was 160.95±9.68 and BMI was 20.55±4.65.

Around 72 (55.8%) TB patients reported with the symptoms of cough and expectorations respectively followed by fever (41.8%) and hemoptysis (12.4%). Almost 93% of the participants were accounts for non-Diabetic group and only 2% of them were diabetic. About 24% of the participants had Pallor as the common clinical finding and Crepitation and Bronchial breath sound as a respiratory finding with 08% and 15%. Among the study participants, 40% of them were found to be malnourished.

Table 1: Frequency distribution of study participants (n=129)

Age (in years)	Frequency (%)
≤20	19 (17)
21-40	106 (60)
41-60	36 (15)
>60	09 (08)
BMI Classification	
Underweight (<18.5)	52 (40.3)
Normal (18.5-22.9)	50 (38.8)
Overweight (23-24.9)	08 (6.2)
Obese I (25-29.9)	14 (10.9)
Obese II (>30)	05 (3.9)
Clinical features	
Cough	72 (55.8%)
Fever	54(41.8%)
Hemoptysis	16(12.4%).
H/O Diabetic	
Non-Diabetic group	120(93%)
Diabetic group	2(9%)

Table 2: Frequency distribution of Study participants Age with Gender (n=129)

Age	Male (%)	Female (%)
≤20	05 (04)	07 (05)
21-40	44 (34)	39 (30)
41-60	15 (12)	14 (11)
>60	05 (04)	00 (00)

Around 44 (34%) males and 39 (30%) female participants were between age group of 21 and 40 years and 4% of the males were belongs to age more than 60 years. There is no significance difference between the groups.

Table 3: Mean (SD) of study participants clinical parameters

Parameters	Mean (SD)
Erythrocyte Sedimentation Rate (ESR)	84.40±18.44
Total count	7523.76±4118.18
Blood Urea	27.79±11.47
Serum Creatinine	0.95±0.45
Bilirubin	0.78±0.70
Serum Glutamic-Oxaloacetic Transaminase (SGOT)	58.15±20.88
Serum Glutamic Pyruvic Transaminase (SGPT)	56.27±21.01

Average Erythrocyte Sedimentation Rate (ESR) were 84.40±18.44, Total count were 7523.76±4118.18, Serum Glutamic-Oxaloacetic Transaminase (SGOT) were 58.15±20.88 and Serum Glutamic Pyruvic Transaminase (SGPT) were 56.27±21.01. Among 129 participants 54% of the participants had pulmonary tuberculosis and 46% had extra pulmonary tuberculosis.

Table 4: Frequency distribution of Cartridge- Based Nucleic Acid Amplification Test (CBNAAT) results (n=129)

Status	Frequency (%)
Rifampicin Mono Resistance detected	24 (18.6)
Rifampicin Mono Resistance Not- detected	105 (81.4)

Out of 129 patients, 18.6% of the participants had detected with Rifampicin Mono Resistance. Rif Resistance was distributed with prevalence of 12% were observed among pulmonary tuberculosis cases and 6% were observed among extra pulmonary tuberculosis.

Table 5: Association between Rifampicin Mono Resistance and site of Tuberculosis (n=129)

Site of disease	M.Tb. detected, Rif resistance detected	M.Tb. detected, Rif resistance not detected	p-value
Extra Pulmonary	08 (13.5)	51 (86.5)	0.17
Pulmonary	16 (22.8)	54 (77.2)	

Rifampicin Mono Resistance detected by Cartridge-Based Nucleic Acid Amplification Test (CBNAAT) shows, the prevalence of Rifampicin Mono Resistance in Pulmonary was 22.8% and Extra Pulmonary Tuberculosis was 13.5%. There was no significant association found between Rifampicin Mono Resistance and site of disease.

Table 6: Association of Baseline characteristics with Rifampicin Mono Resistance.

Variables	M.Tb. detected, Rif resistance detected	M.Tb. detected, Rif resistance not detected	p- value
Age ≤20 21-40 41-60 >60	04 (33.3) 15 (18) 03 (10.3) 02 (40)	08 (66.7) 68 (82) 26 (89.7) 03 (60)	0.20
Gender Male Female	 12 (17.3) 12 (20)	 57 (82.7) 48 (80)	0.92
BMI Underweight (<18.5) Normal (18.5-22.9) Overweight (23- 24.9) Obese I (25-29.9) Obese II (>30)	08 (15.4) 12 (24) 02 (25) 01 (7) 01 (20)	44 (84.6) 38 (76) 06 (75) 13 (93) 04 (80)	0.85

[Table 8], shows the association of baseline characteristics with Rifampicin Mono Resistance. There was no significant association found between the baseline characters with Rifampicin Mono Resistance (p>0.05).

Table 7: Association of Symptoms, Clinical and Respiratory findings with Rifampicin Mono Resistance.

Variables	M.Tb. detected, Rif resistance detected	M.Tb. detected, Rif resistance not detected	p- value
Cough Yes No	15 (20.5) 09 (16.07)	58 (79.5) 47 (83.93)	0.22
Expectoration Yes No	15 (20.8) 09 (15.7)	57 (79.2) 48 (84.3)	0.22
Hemoptysis Yes No	04 (25) 20 (17.6)	12 (75) 93 (82.4)	0.69
Fever Yes No	11 (20.3) 13 (17.3)	43 (79.7) 62 (82.7)	0.45
Pallor Yes No	06 (20) 18 (18.1)	24 (80) 81 (81.9)	0.67
Malnutrition Yes No	10 (19.2) 14 (18.1)	42 (80.8) 63 (81.9)	0.43
Crepitation Yes No	03 (30) 21 (17.6)	07 (70) 98 (82.4)	0.59
Bronchial breath sound Yes No	05 (26.3) 19 (17.2)	14 (73.7) 91 (82.8)	0.55

Was no significant association found between Symptoms, Clinical, Respiratory findings and malnutrition with rifampicin mono resistance with p value >0.05.

Table 8: Mean difference of clinical parameters with Rifampicin Mono Resistance.

Variables	M.Tb. detected, Rif resistance detected	M.Tb. detected, Rif resistance not detected	p- value
Erythrocyte Sedimentation Rate (ESR)	88.08±16.99	83.56±18.73	0.14
Total count	7537.75±4677.64	7520.57±4004.27	0.49
Blood Urea	29.58±10.70	27.39±11.64	0.20
Serum Creatinine	0.92±0.51	0.96±0.43	0.34
Bilirubin	0.76±0.73	0.78±0.70	0.46
Serum Glutamic- Oxaloacetic Transaminase (SGOT)	57.70±21.10	58.25±20.93	0.45
Serum Glutamic Pyruvic Transaminase (SGPT)	52.75±22.40	57.08±20.71	0.18

*Unpaired t-test

There was no significance difference found between the groups (p>0.05).

DISCUSSION

The present study was conducted with the aim to estimate the prevalence of rifampicin mono resistance among tuberculosis patients at early with the help of CBNAAT for both pulmonary and extra pulmonary patients. So that patients with rifampicin mono resistance can be treated at early to halt the severity of the disease in the later stage.

In the present study, the Mean (Standard Deviation) age of the study participants were 35.2±13.2 and around 60 % of the participants were belongs to 21 to 40 years followed by ≤ 20 years with 17%. Our study findings were also supported by Gupta R et al,[8] Sharma et al,[9] Kumar V et al,[10] with the mean (SD) age of the TB patients ranges from 35±5 years. This shows the active age group more commonly susceptible for Tuberculosis is 20 to 30 years.

The current study observed that around 53% of the study participants were male, whereas 47% of them were female. Similar to our findings, study conducted by Gupta R et al,[8] Sharma et al,[9] Kumar V et al,[10] reported higher males than females. Male and female distribution were little higher in male than female in the present study, which shows that apart from exposure to tuberculosis diseases, other factors like smoking, alcoholism were also contribute for the increased susceptibility in males.

There was a log linear relationship exists between impact of nutrition and tuberculosis. In the current study reports that around 40% of the study participants were underweight and higher in females compared to males. Our study findings were consistent with the study conducted by Lonnroth K et al,[11] Whitlock G et al,[12] and Casha AR et al,[13] this shows that there is a vicious cycle exists between nutrition and tuberculosis irrespective of the region.

As per RNTCP guidelines, patients with cough and expectoration more than 2 weeks, unexpected weight loss, fever should be considered for TB suspects. Similarly in the current study, around 55% of the participants reported with cough with expectoration followed by fever (41.8%) and hemoptysis (12%). Our findings were consistent with the study conducted by Gupta R et al,[8] whereas Sharma et al,[9] and Kumar V et al,[10] reported similar pattern of symptoms with higher percentages. This shows that the clinical symptoms percentages of tuberculosis may vary based on the site of tuberculosis but the pattern follows the same in all regions.

WHO has identified DM as an important, neglected and re-emerging risk factor for TB. Immunological impairment in DM patients plays a major role in TB susceptibility.[14] In the present study, around 2% of the susceptible TB patients has history of diabetes, in contrast to our findings, studies conducted by Datta BS et al,[15] Dave P et al,[16] Viswanathan V et al,[17] reported higher prevalence of DM.27,34,35 This variation may be due to difference with additional host factors (age, gender, diet pattern, physical activity, BMI) that can collectively influence the prevalence of DM.

Our study finds that 19% of the TB patients reports with bronchial breath sounds and around 31% of them were having pallor which was supported by Gupta S et al.8 Nutrition plays a vital role in TB prevalence and management, in the present study around 52% of the TB patients found to be malnourished which was similar to the study conducted by Hochberg NS et al,[18] and Gosai DK et al.[19] This shows that there was a link exists between nutrition and TB disease outcome.

In this study, we tried to evaluate the significance of clinical parameters in the work- up procedure of diagnosing TB. In the present study, average Erythrocyte Sedimentation Rate (ESR) were 84.40±18.44, Total count were 7523.76±4118.18, Serum Glutamic-Oxaloacetic Transaminase (SGOT) were 58.15±20.88 and Serum Glutamic Pyruvic Transaminase (SGPT) were 56.27±21.01. Studies conducted by Kulkarani S et al,[20] Palanisawamy et al,[21] and Sorsa et al,[22] reported higher ESR among TB patients which was similar to our study findings.

In the current study, among 129 participants 54% of the participants had pulmonary tuberculosis and 46% had extra pulmonary tuberculosis. Whereas study conducted by Bilagi RB et al,[23] reported higher prevalence of ETB.

Early screening of all TB suspects both PTB and EPTB with CBNAAT helps in diagnosing resistance at early to provide appropriate treatment. CBNAAT is a robust and important investigation in early diagnosis of resistance among PTB and EPTB patients. Similarly in the present study, to find the prevalence of rifampicin mono resistant, all the TB patients were subjected to CBNAAT. Out of 129

patients, 18.6% of the participants had detected with Rifampicin Mono Resistance. the Prevalence of Rifampicin Mono Resistance in Pulmonary was 12% and Extra Pulmonary Tuberculosis was 6%. There was no significant association found between Rifampicin Mono Resistance and site of disease.

In the current study, there was no significant association found between the baseline characters, symptoms, Clinical, Respiratory findings and malnutrition with Rifampicin Mono Resistance ($p>0.05$). Similarly, no difference was found between clinical parameters with Rifampicin Mono Resistance ($p>0.05$).

CONCLUSION

The study aimed to identify Rifampicin resistance tuberculosis among 129 smear positive cases of Pulmonary and Extra pulmonary TB cases by CB-NAAT as an initial test at Government Hospital, Aizawl, Mizoram. The study findings states that among the 129 participants majority are aged between 20-41 years with almost equal gender distribution. Majority of the study participants are underweight. Cough with expectoration was the most commonly reported symptom among the participants and majority of them were malnourished. Rifampicin mono-resistance was detected among 18.6% of the participants.

Even though India is marching towards Tuberculosis elimination, the challenges posed by TB control measures are complex primarily because of the emergence of drug resistance. Treatment of MDR-TB/RR-TB is difficult, complicated, costlier, challenging and needs experience and skills. Prevention of MDR-TB/RR- TB is an effective measure done by prompt diagnosis and effective treatment of all TB cases to halt the emergence of XDR-TB. Due to simplicity and rapidity in diagnosis molecular methods and CBNAAT must be used at the earlier stages of the disease itself to detect drug-resistant TB.

Strength & Limitations

Strengths: This study estimates the prevalence of Rifampicin Resistance in the study area and highlights the importance of early screening of all TB patients by Xpert MTB/RIF to identify MTB and resistance pattern of TB simultaneously for early management of DR-TB patients.

Limitations: We have included small sample size and selection is based on hospital so there is possibility of selection bias in the study. Purposive sampling was done and also conducted in only two centres. Different clinical settings may have difference in TB resistant pattern as per geographical location. If study finding is collaborated with multiple centres, it may yield a better picture of the DR-TB resistant pattern in the study area. Only few attributing variables were seen, need to explore more attributing factors to have a clear picture on the risk factors of DR-TB. Certain additional care was taken in not disclosing the identity of immunocompromised individuals and also certain limitations were found in taking exact data for PLHA individuals due to non-voluntary participation of patients for getting tested.

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