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THE PREVALENCE OF RIFAMPICIN RESISTANCE IN MYCOBACTERIUM TUBERCULOSIS PATIENTS USING GENEXPERT

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ABSTRACT

Background: Multidrug-resistant tuberculosis (MDR-TB), which is defined as resistance to at least rifampicin and isoniazid, and rifampicin-resistant tuberculosis (RR-TB) have emerged as a significant barrier to TB control across the world. **Objective:** In this study our main goal is to evaluate rifampicin resistance in mycobacterium tuberculosis using GeneXpert in tertiary Medical College and Hospital. **Method:** This cross-sectional study was done at tertiary medical college and hospital at Dhaka from April 2021 to April 2022, where 60 clinically suspected or documented tuberculosis cases were selected as a sample population. **Results:** More than half of the study's patients were men, and most (52%) were in their 20s and 30s. There was a significant history of smoking in almost 40% of the patients. Thirteen percent of patients started therapy more than 30 days late, and in eight percent of instances, the treatment was not completed. Results reveal that 5 percent of Rifampicin (RIF) resistant cases discovered by GeneXpert MTB/RIF were phenotypically validated as DR strains, indicating that drug resistance is rather common. Not only that, but 66.7% of the resistant instances were discovered to be male. **Conclusion:** Our research shows that the spread of medication resistance across TB strains is a major problem for global TB elimination efforts. The excellent sensitivity and specificity of Xpert MTB/high RIF for the identification of RIF resistance validate its use as a screening tool for RIF resistance. Therefore, it would greatly benefit treatment regimen adjustments and DR TB containment if labs routinely tested for DRTB using molecular techniques.

KEYWORDS: Drug resistance (DR), tuberculosis (TB), multiple drug resistance (MDR).

INTRODUCTION

Bangladesh is continuously struggling with a major public health issue: tuberculosis (TB).[1]

One person becomes sick every two minutes, and ten minutes later, another one dies. There are around 300,000 new TB cases and 70,000 TB-related deaths expected in Bangladesh each year, placing the country in the fifth position among high TB burden nations worldwide.[1,2]

Drug resistance, the decreased efficacy of a medicine such an anti-microbial in treating illness, is another hurdle that arises in severe TB circumstances that causes further worry.[3] For infections, the word refers to the process through which resistance "acquires" new forms. Clinical treatment and research are being pushed forward by the issue of antimicrobial resistance. A drug-resistant organism is one that has developed resistance to more than one therapeutic agent.[4]

New cases of MDR-TB are reported annually at a rate of around 400 thousand globally.[3] Prevalence estimates for multidrug-resistant tuberculosis in South East Asia range from 2.8% (95% CI: 1.9% to 3.6%) among newly diagnosed cases to 18.8% (95% CI: 13.3% to 24.3%) among previously treated cases, with estimates for India and Pakistan ranging from 1.6% to 5.2% and 0% to 21.6%, respectively.[4-5] Resistance to the anti-tuberculosis medicine rifampicin (RIF) is a major indicator of DR-TB, which is on the rise.

Multidrug-resistant tuberculosis (MDR-TB) is a global health crisis, yet at now, fewer than 10% of cases are identified.[6]

In order to effectively treat TB patients, early diagnosis of the infection is crucial. Over the last several years, molecular techniques have been refined to detect mutations in genes that result in drug resistance.[7-8]

GeneXpert MTB/RIF is one of the newest methods, and it has been utilized to identify MDR TB patients because of the strong correlation between RIF resistance and multidrug-resistant tuberculosis.[9]

The method has undergone extensive analysis and is already in widespread usage around the globe. In terms of accuracy, it is 90.4% sensitive and 98.4% specific.[10-11]

OBJECTIVE
- In this study our main goal is to evaluate rifampicin resistance in mycobacterium tuberculosis patients using GeneXpert in tertiary Medical College and Hospital.

METHODOLOGY
This cross-sectional descriptive type studywas carried out at Medicine departments of Tertiary medical college and hospital at Dhaka from April 2021 to April 2022. 60 clinically suspected or documented TB cases were selected as a sample population. An absolute confidentiality of the patient's vital information was maintained for ethical purposes and an ethical approval was obtained from the institution in which the study was carried out.

The following variables were collected through an administered questionnaire during sample collection: sex, age, treatment history (new or previously treated).

After identifying suspected or documented cases, samples were referred to the laboratory for GeneXpert MTB/RIF for diagnosis. GeneXpert MTB/RIF positives were repeated.

Data entry, quality control and data cleaning had been done following standard method. All data forms and questionnaires had been checked for errors and necessary correction had been made before data entry. Data had been entered using data entry program with built in range and consistency checks (SPSS-23). The prevalence rate had been determined by simple percentages.

RESULTS
In table-1 shows distribution of the patients according to age and gender where more than fifty percent of the patients were in the age group 20-40 years and 32% of the patients were in age group 20 and below while only 15% of the patients were in the age group above 40 years. Also, male (55%) and female (45%) ratio of the patients was almost equal. The following table is given below in detail:

Table 1: Distribution of the patients according to age and gender.

Age group, years	%
20 and below	32%
20-40 years	53%
above 40 years	15%
Gender	**%**
Male	55%
Female	45%

In figure-1 shows distribution of respondents by residence. 60% of the respondents resided in the urban area and 40% were in the rural. The following figure is given below in detail:
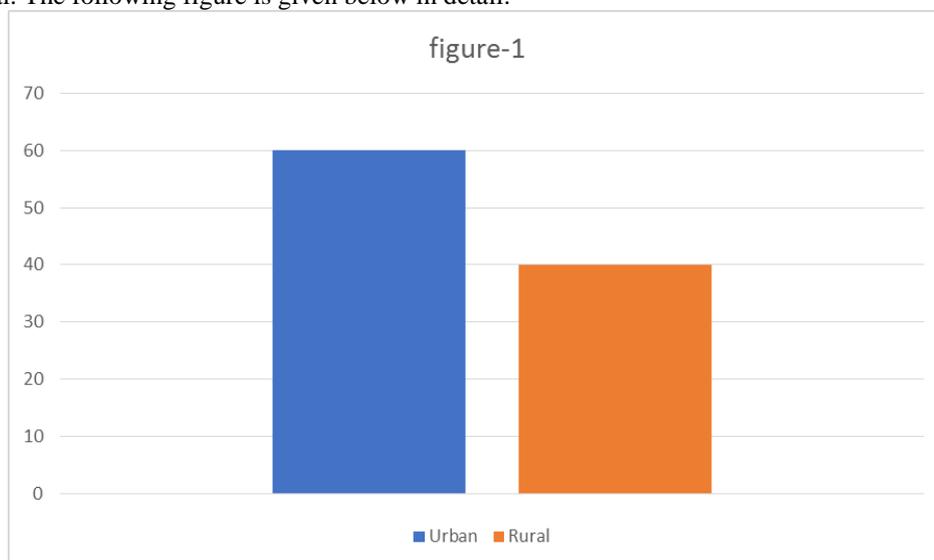
Figure 1: Distribution of respondents by residence.

In table-2 shows distribution of respondents by smoking history and diabetic status. About 40% of the patients had history of smoking and 46% had diabetic. The following table is given below in detail:

Table 2: Distribution of respondents by smoking history and diabetes mellitus.

Smoking history	Percentage
Yes	40%
No	60%
Diabetes Mellitus	Percentage
Yes	46%
No	54%

In table-3 shows distribution of the patients according to status of TB where 44% treated TB in the past followed by 53% patients delayed their treatment to initiate greater than 60 days and 55% cases treatment was incomplete. The following table is given below in detail:

Table 4: Distribution of the patients according to status of TB.

Patients status	%
Treated for TB in the past	
Yes	13%
No	87%
Delay in initiating TB treatment	
<30 days	87%
>30 days	13%
TB in organs other than lungs	
Yes	6%
No	94%
Treatment incomplete	
Yes	8%
No	92%

In figure-2 shows distribution of the patients according to prevalence of drug resistance. Results show that 5% Rifampicin (RIF) resistant cases detected by GeneXpert MTB/RIF were phenotypically confirmed as DR strains. The following figure is given below:
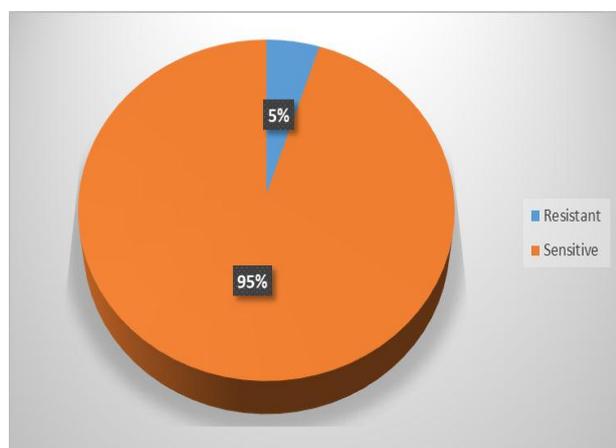

Figure 2: Distribution of the patients according to prevalence of drug resistance.

In table-5 shows distribution of gender according to Rifampicin (RIF) resistant where majority resistance cases were found in male, 66.7%. The following table is given below in detail:

Table-5: Distribution of gender according to Rifampicin (RIF) resistant, n=3

Gender	Rifampicin (RIF) resistant, n (%)
Male	2(66.7%)
Female	1(33.3%)

In figure-3 shows pattern of DR-TB among different category of Tuberculosis patients. 100% cases were DR-TB in category re-treatment failureand it was 0% in new cases. The following figure is given below in detail:
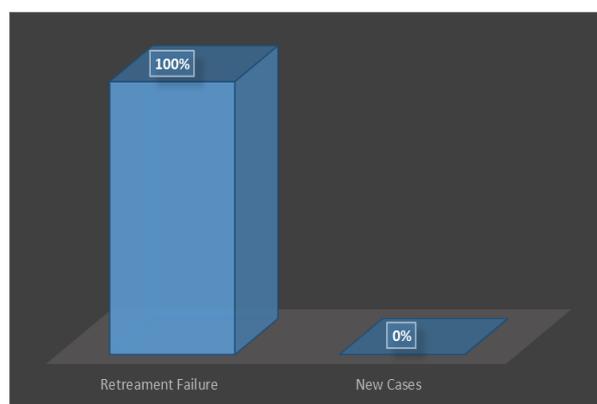
Figure 3: Pattern of DR-TB among different category of Tuberculosis patients.

DISCUSSION
Mutation ability and virulence variation associated service patterns have a substantial influence on the development of MDR-TB, in addition to the key biological variables contributing to the predominance of DR-TB, such as the fitness of drug-resistant mycobacterium TB strains.[7]

Consistent with earlier research, re-treatment was shown to have the greatest connection with DR-TB.[3,8,9,10]

The high incidence of multidrug-resistant tuberculosis (MDR-TB) may be attributable, in part, to the failure of prior therapies and the subsequent return of TB.

The recurrence rate for tuberculosis in China is relatively high. Patients in Shanghai had a recurrence incidence of 61.5% for tuberculosis. Longer treatment times and a higher risk of multidrug-resistant tuberculosis would result.[11]

Twenty-one (42%) of the subjects in the Marlowe et al. research showed resistance to RIF, whereas 29 (58%) were sensitive.[12] This is in line with findings from Barnard M. et al. and Chang K. et al., where 37.3 and 37.47% of isolates were resistant to RIF, respectively, but lower than those from the research by Zakham F. et al., which found a relatively high rate of RIF resistance of 66.8%.[13] In contrast, our analysis showed that 5% of the isolates were resistant to RIF, which is consistent with the findings of Wasihun, A.G. et al.[14]

The gender breakdown of RIF-resistant patients showed a greater proportion of males (66.7%) compared to females (28.57%), consistent with the findings of the research by Helb D et al.[15]

The research by David H. et al. also found that males were more likely to have TB that was resistant to treatment. This discrepancy could be because male individuals were more likely to be exposed to TB infection risk factors.[16]

The majority of patients with RIF resistance in the current research were between the ages of 31 and 40 (n=10; 47.62%), with a smaller proportion in the younger age range (n=4; 19.04%) and the older age range (n=10; 47.62%). According to the same Mehari K et al. research, 70% of drug-resistant patients were male, with a mean age of 37.[17]

Maximum number of patients with RIF resistance were male and in the age category of 21-30 years (26.53%), followed by 31-40 years (22.44%), as described in a research by Sinshaw W et al.[18]

CONCLUSION
Our research shows that the spread of medication resistance across TB strains is a major problem for global TB elimination efforts. The excellent sensitivity and specificity of Xpert MTB/high RIF for the identification of RIF resistance validate its use as a screening tool for RIF resistance. Therefore, it would greatly benefit treatment regimen adjustments and DR TB containment if labs routinely tested for DRTB using molecular techniques.

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