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DETECTION OF RIFAMPICIN RESISTANCE BY CBNAAT AND MGIT LIQUID CULTURE IN PREVIOUSLY TREATED PULMONARY TUBERCULOSIS PATIENTS

Respiratory Medicine

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ABSTRACT

Tuberculosis remains a major public health problem worldwide, particularly with the emergence of drug-resistant strains. Rapid and accurate detection of rifampicin resistance is essential for timely initiation of appropriate therapy. This study aimed to evaluate the diagnostic performance of CBNAAT (XPERT MTB/RIF assay) in detecting rifampicin resistance among previously treated pulmonary tuberculosis patients, using MGIT liquid culture drug susceptibility testing (DST) as the reference standard. A total of 50 previously treated pulmonary tuberculosis patients were included in the study. CBNAAT detected 37 rifampicin-resistant and 13 rifampicin-sensitive cases, while MGIT DST detected 35 rifampicin-resistant and 15 rifampicin-sensitive cases. The sensitivity, specificity, positive predictive value, and negative predictive value of CBNAAT were 100%, 92.8%, 95.03%, and 100%, respectively, with an overall diagnostic accuracy of 99.02%. The findings indicate that CBNAAT is a highly reliable and rapid diagnostic tool for detecting rifampicin resistance and can be effectively used for early diagnosis and management of drug-resistant tuberculosis.

KEYWORDS

CBNAAT, XPERT MTB/RIF, Rifampicin resistance, Tuberculosis, MGIT culture, Drug susceptibility testing

INTRODUCTION

Tuberculosis (TB) continues to be one of the leading infectious causes of morbidity and mortality worldwide. The emergence of multidrug-resistant tuberculosis (MDR-TB), particularly resistance to rifampicin, poses a significant challenge to TB control programs. Rifampicin resistance is considered a reliable indicator of multidrug-resistant tuberculosis and requires early detection for effective management.

Conventional culture-based drug susceptibility testing methods, such as MGIT liquid culture, are considered the gold standard for detecting drug resistance. However, these methods are time-consuming and may delay the initiation of appropriate treatment.

Cartridge-Based Nucleic Acid Amplification Test (CBNAAT), also known as XPERT MTB/RIF assay, is a rapid molecular diagnostic technique that simultaneously detects Mycobacterium tuberculosis and rifampicin resistance within a short period. This rapid detection helps in early diagnosis and timely initiation of appropriate therapy, reducing disease transmission and improving patient outcomes.

This study was conducted to evaluate the diagnostic accuracy of CBNAAT in detecting rifampicin resistance among previously treated pulmonary tuberculosis patients, using MGIT liquid culture as the reference standard.

MATERIALS AND METHODS

This cross-sectional study was conducted in the Department of Respiratory medicine, Bangalore medical college. A total of 50 previously treated pulmonary tuberculosis patients were included in the study.

Sputum samples were collected from all patients under aseptic conditions. Each sample was subjected to CBNAAT testing for detection of Mycobacterium tuberculosis and rifampicin resistance. The same samples were also processed for MGIT liquid culture and drug susceptibility testing.

CBNAAT results were compared with MGIT DST results to determine sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy.

RESULTS

Among the 50 study participants, 33 (66%) were female and 17 (34%) were male. Most patients belonged to the age group of 35–54 years.

CBNAAT detected rifampicin resistance in 37 cases and sensitivity in 13 cases. MGIT DST detected rifampicin resistance in 35 cases and sensitivity in 15 cases.

The diagnostic performance of CBNAAT showed:

- Sensitivity: 100%
- Specificity: 92.8%
- Positive Predictive Value: 95.03%
- Negative Predictive Value: 100%
- Diagnostic Accuracy: 99.02%

The difference was statistically significant ($p < 0.05$).

DISCUSSION

Early detection of rifampicin resistance is essential for effective tuberculosis control. CBNAAT offers rapid detection compared to conventional culture-based methods.

In the present study, CBNAAT demonstrated excellent sensitivity and high specificity, indicating its reliability as a diagnostic tool. The findings are consistent with previous studies that reported high diagnostic accuracy of CBNAAT in detecting rifampicin resistance.

The rapid turnaround time of CBNAAT allows early initiation of appropriate treatment, reducing transmission and improving patient outcomes.

CONCLUSION

CBNAAT is a highly sensitive and specific diagnostic tool for detecting rifampicin resistance in previously treated pulmonary tuberculosis patients. It provides rapid and accurate results and shows strong agreement with MGIT liquid culture drug susceptibility testing. CBNAAT can be effectively used as an initial diagnostic method for early detection of rifampicin-resistant tuberculosis and plays an important role in improving patient management and tuberculosis control programs.

Table 1. Research subjects' attributes

Variables	Values
Gender, n (%)	
Female	33 (66%)
Male	17 (34%)
Age,n(%)	
21-34 years	18 (36%)
35-54 years	19 (38%)
55-69 years	12 (24%)
>70 years	1 (2%)
Occupation, n (%)	
Unskilled worker	21(42%)
Skilled Worker	9(18%)
Housewife	9(18%)
Student	6(12%)
Staff	5(10%)

Subjects by PTB history,n (%)

Drug defaulter	33(66%)
Treatment failure	17(34%)

Table 2) Rifampicin Resistance By CBNAAT And DST

Type of test	Rif Resistant by DST	Rif Sensitive by DST	Total
Rif Resistant by CBNAAT	35	2	37
Rif Sensitive by CBNAAT	0	13	13
Total	35	15	50

Table 3) Diagnostic Accuracy Of CBNAAT (Culture As Reference Standard)

Total patients n=50	Sensitivity	Specificity	Positive predicted value	Negative predicted value	Acu	P value
	100	92.8	95.03	100	99.02	<0.05

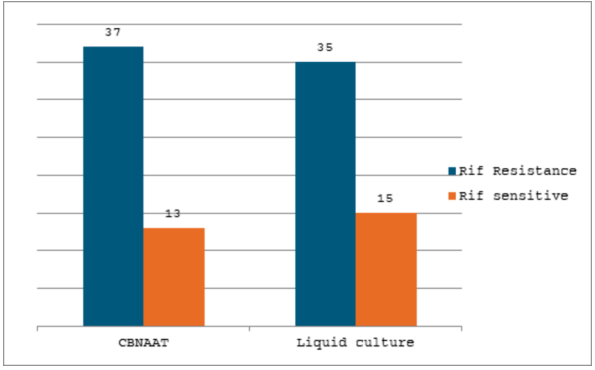

Fig 1. Detection Of Rif Resistance By XPERT And MGIT Liquid Culture

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