Original Article

Role of CBNAAT in Diagnosing of Extra-Pulmonary Tuberculosis at a Tertiary Care Centre in a City of Karnataka: A Cross Sectional Study

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Abstract

Background: Cartridge based nucleic acid amplification test(CBNAAT) detects the presence of TB bacilli and also Rifampicin susceptibility.This test is currentlyrecommended as a ''first line'' fast diagnostic test inhigh TB burden countries like India.

Aim & Objective: 1. To assess the yield of CBNAAT in detecting extra-pulmonary tuberculosis for patient attending S.S.I.M.S & RC, Davanagere.

2. To assess the Rifampicin susceptibility in samples of presumptive extra-pulmonary TB patients using CBNAAT.

Settings and Design: Cross sectional study was conducted among the patients after screening them with symptoms suggestive of extra-pulmonary TB coming to S. S.I.M.S & RC. Davangere.

Methods and Material: 107 samples were collected and subjected to CBNAAT for detection of Mycobacterium tuberculosis and Rifampicin Susceptibility.

Statistical analysis used: chi square test was applied to find out the association between Extra-pulmonary Tuberculosis with demographiccharacteristics and to find out the association between CBNAAT with demographic characteristics.

Results: The yield of CBNAAT was of sensitivity of 100%, specificity of 98.7%, Positive predictive value (PPV) of 96.9%, Negative predictive value(NPV) was 100% and Accuracy was 99.1%.

Conclusions: This study reinforces the importance of CBNAAT which has an impact on early detection, treatment and outcome of Extra-pulmonary Tuberculosis.

Keywords: Extra-pulmonary Tuberculosis, CBNAAT, Davanagere.

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Introduction

Tuberculosis is one of the dreaded diseases which accounts for 9.6 million cases globally as per the WHO Global TB Report 2015. India contributes to 2.2 million incidence cases. It has high morbidity and mortality with 0.22 million deaths in India in 2015.[1] pulmonary involvement is the most common presentation, it can potentially affect any organ or system of the body.[2] TB affecting other sites-known as extra-pulmonary TB is rarely smear positive. It is generally accepted that the contagious potential of this form is negligible, and it has, therefore, never been a priority in the campaigns undertaken by national TB control programs.[3, 4] Extra-pulmonary tuberculosis forms a significant proportion of the total TB cases and is a major health problem in both developing and developed countries. Diagnosing EPTB is challenging due to its varied clinical presentations and pauci-bacillary nature of the disease.[5] CBNAAT is cartridge-based nucleic acid amplification test which detects the presence of TB bacilli and tests for resistance to Rifampicin also. CBNAAT i as it is a very cost-effective and rapid test. Hence our study aimed to define the role and Yield of CBNAAT in clinical decision-making in suspected EPTB cases.

Objectives:

1. To assess the yield of CBNAAT in detecting extra-pulmonary tuberculosis for patient attending S.S.I.M.S & RC, Davanagere
2. To assess Rifampicin susceptibility in samples of presumptive extra-pulmonary TB patients using CBNAAT

Materials and Methods

A cross sectional study was conducted among the patients after screening them with symptoms suggestive of extra-pulmonary TB coming to S. S. Institute of medical sciences and research centre, Davangere during 1st April 2019 to 31st July 2020. Ethical clearance was taken from institutional ethical committee. Patients aged above 18 years and patients with clinical history and physical findings or chest X-ray lesions suggestive of extra-pulmonary tuberculosis were included in study. Patients who were not given consent and those on anti-tubercular treatment were excluded from the study. Ethical clearance was obtained from Institutional Ethical Review Board. Informed consent was obtained from each respondent prior to the interview. Details of the patients like name, age, sex, HIV status and previous history of Pulmonary TB were taken. 107 samples from the patients were collected depending on clinical suspicions the samples were collected which includes Pleural fluid, CSF, Lymph node, Pus, synovial fluid, Ascitic fluid, endometrial tissue, urine and Laryngeal mucous. The collected samples were subjected to CBNAAT(which is at Chigateri district Hospital, Davanagere) for detection of Extra-pulmonary Tuberculosis and Rifampicin Susceptibility.

Data was entered in MS EXCEL and statistical analysis was done using SPSS version 20 and results were expressed in terms of percentages and proportions. Analysis was carried out by chi square test to find out the association between Extra-pulmonary Tuberculosis and demographic characteristics and also to find out association between CBNAAT test with demographic characteristics, Rifampicin susceptibility, samples and type of extra-pulmonary Tuberculosis. Yield of the CBNAAT test was assessed by calculating Sensitivity, Specificity, Positive predictive value, Negative predictive value and Accuracy.

Results

In this study, majority of the patients were in the age group of 31-50 years(36.4%), males were more in number(59.8%), HIV status of the all the patients was Non reactive and majority of the patients were not had the History of Previous Pulmonary Tuberculosis and 24.3% had history of Previous Pulmonary Tuberculosis. Socio-demographic features of the patients are explained in Table 1.

In this study 31(28.9%) of the patients samples subjected to CBNAAT were found to be positive for Extra- Pulmonary Tuberculosis and all samples were found to be Rifampicin sensitive. MTB detected in different samples received from the patients were explained in Table 2.

In this study no significant association was found between CBNAAT results with risk sex, age, religion and previous history of Tuberculosis but significant association was found between Rifampicin susceptibility and CBNAAT results. The association of CBNAAT results with risk factors are explained in Table 3.

In this study the yield of CBNAAT as follows which includes sensitivity of 100%, specificity of 98.7%, Positive predictive value(PPV) of CBNAAT test was 96.9%, Negative predictive value(NPV) was 100% and Accuracy was 99.1%. the yield of the CBNAAT is explained in Table 4.

Table 1: Socio-demographic features of study participants

Age (Years)	No. of Cases	Percentage
<=30	33	30.8
31-50	39	36.4
51-70	26	24.3
>70	9	8.4
Sex		
Male	64	59.8
Female	43	40.2
HIV Status		
Non Reactive	107	100
Reactive	0	0
Total	107	100

Table 2: MTB detected in different samples received from the patients

Samples	Total no of sample received	Positive by CBNAAT
Pleural Fluid	46	11
CSF	15	2
Ascitic Fluid	12	0
PUS	6	2
Urine	6	2
Lymph node	16	11
Mucous	1	1
Synovial Fluid of Knee	2	1
Endometrial Curratage	3	1
Total	107	31

Table 3: Association of CBNAAT results with risk factors.

Variables		CBNAAT Results		Total(122)	$\chi 2$ Value	P value
		Positive	Negative			
Sex	Male	16(25%)	48(75%)	64(100%)	1.221	0.269
	Female	15(34.8%)	28(53.2%)	43(100%)		
Age	<= 30	12(36.3%)	21(63.7%)	33(100%)	1.526	0.676
	31-50	11(28.2%)	28(71.8%)	39(100%)		
	51-70	6(23.1%)	20(76.9%)	26(100%)		
	>70	2(22.2%)	7(77.8%)	9(100%)		
Religion	Hindu	25(26.3%)	70(73.7%)	95(100%)	0.412	0.521
	Muslim	6(50%)	6(50%)	12(100%)		
Previous H/O Pulmonary TB	History of Pulmonary Tuberculosis	9(34.7%)	17(65.3%)	26(100%)	0.532	0.466
	No history of previous pulmonary tuberculosis	22(27.2%)	59(72.7%)	81(100%)		
Rifampicin Susceptibility	Resistant	0(0%)	76(100%)	76(100%)	102.29	0.000
	Sensitive	31(100%)	0(0%)	31(100%)		
	Total	31(29%)	76(71%)	107(100%)		

Table 4: Yield of CBNAAT test

Yield	Percentages
Sensitivity	100%
Specificity	98.7%
Positive Predictive Value(PPV)	96.9%
Negative Predictive Value(NPV)	100%
Accuracy	99.1%

Discussion

This study which was conducted on patients after the screening with symptoms suggestive of extra-pulmonary TB coming to S.S.I.M.S & RC, Davanagere. In this study 107 samples of presumptive extra- Pulmonary Tuberculosis cases were collected and subjected to CBNAAT for detection of Extra-

Pulmonary Tuberculosis and to assess the Rifampicin Susceptibility. Total of 107 samples were received among them 31(29%) of samples were positive for extra-pulmonary Tuberculosis and all samples were sensitive for Rifampicin Susceptibility. In this study the HIstatus of the all the patients was non reactive. In contrast to this a study done by Yadav k et al[6] showed that 8.54% of the patients were HIV positive and a study done by Gaur PS et al [7] showed that 4.7% of the patients were HIV positive. In present study among different samples received, maximum number of samples were of pleural fluid(43.0%). Similar results were found by Yadav k et al [6], Bankar s et al [8] Mathur RB et al[9]and Kumar R[10] et al. In contrast to this a study conducted by Ulla et al [11] showed that maximum number of pus samples were received. A study done by Uria GA et al [12]showed that maximum samples were from CSF. In this study 29% of the samples were positive for extra-pulmonary Tuberculosis which was subjected to CBNAAT. A study conducted by Yadav K [6] et al showed that 23.8% were positive for extra-pulmonary Tuberculosis. In this study no significant association was found between CBNAAT results with age, sex, previous History of pulmonary Tuberculosis but significant association was found between CBNAAT result and Rifampicin susceptibility.

In this study the yield of CBNAAT as follows which includes sensitivity of 100%, specificity of 98.7%, Positive predictive value(PPV) of CBNAAT test was 96.9%, Negative predictive value(NPV) was 100% and Accuracy was 99.1%. A study conducted by Komanapalli SK et al[13] showed that the sensitivity 85.71%, specificity 96.8%). A study conducted by Bankar S et al [8] showed that the sensitivity and specificity Xpert MTB/RIF assay was 84.91% and 86.72%. A study conducted by Rao CM et al [14] Showed that overall CBNAAT sensitivity was 100% and specificity was 87.5%. A study conducted by Lawn et al [15] showed that sensitivity of CBNAAT was 81.3% and specificity was 99.8%.

Conclusion

CBNAAT is a rapid test to confirm presence of MTB with simultaneous detection of rifampicin resistance in EPTB. Introduction of CBNAAT for EPTB, plays important role on early detection, treatment and outcome as most presumptive cases have a confirmed diagnosis. This test has not only yields good sensitivity but also specificity ,Positive predictive value(PPV), Negative predictive value(NPV), and Accuracy was 99.1%.

Recommendation CBNAAT test is a better for early diagnosis, early detection of Rifampicin resistance and gives good yield.

Limitation of the study

1. Sample size was small. Larger the number of cases to undergo CBNAAT test for better diagnostic predictability.
2. This study had no clinical follow-up of the patients which does not give a clinical reference for the samples tested by CBNAAT.
3. In this study yield of CBNAAT was not compared with AFB Smear, culture and LED microscopy.

Relevance of the study: CBNAAT is a good diagnostic test which early detects extra-pulmonary TB ,its drugs sensitivity and yield.

Ethical clearance: Institutional Ethics Review Board, SSIMS & RC, Davanagere, Approval date; 02/04/2019, Approval number: IERB No : 338-2019. Written Informed was consent taken prior to start study.

Conflict of interest: None

Source of funding: Self

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