IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 17, Issue 6 Ver. 13 (June. 2018), PP 51-55
www.iosrjournals.org

Role and Efficiency Cbnaat in Diagnosis of Pulmonary Tuberculosis in RNTCP

Dr.S.Subbarao[1], Dr.K.Siva Prasad[2], Dr.G. Aruna[3], Dr.Neetichandra[4]
[1]*md.(Chest),Associate Professor,Department Of Pulmonarymedicine, S.V Medical College, Svrrggh , Tirupathi.*
[2]*dnb (Respiratory Dieases), Senior Resident, Department Of Pulmonarymedicine, S.V Medical College, Svrrggh, Tirupathi.*
[3]*md.(Chest), Professor, Department Of Pulmonarymedicine, S.V Medical College, Svrrggh , Tirupathi.*
[4]*dch, Md.(Chest), Assistant Professor, Department Of Pulmonarymedicine, S.V Medical College, Svrrggh , Tirupath.*
Corresponding Author: Dr.K.Siva Prasad

Abstract:
BACK GROUND
Pulmonary tuberculosis is still one of the commonest cause of infectious disease related morbidity and mortality in the developing countries.[1] Global TB burden. Diagnosis of pulmonary tuberculosis (PTB) mostly relies on identification of acid-fast bacilli (AFB) in sputum smear, but its limitation is low sensitivity. Chest x-ray is neither sensitive nor specific for diagnosis of PTB. WHO endorsed CBNAAT as diagnostic tool for diagnosis of Pulmonary and extrapulmonary Tuberculosis. WHO developed End TB strategy to control TB. CBNAAT more sensitive for early detection of TB and it also detects Rifampicin resistance within 2 hours.
The aim is to study the diagnostic yield of the CBNAAT in Pulmonary tuberculosis and asses the efficacy in detecting Mycobacterium Tuberculosis in various groups of pulmonary tuberculosis, New cases, previously treated cases, PLHIV, DM and Drug resistance.
Materials and methods
A retrospective observational study of presumptive adult Pulmonary tuberculosis above age of 12yrs, whose sputum samples subjected for CBNAAT including pulmonary new and previously treated ,PLHIV, with Diabetes mellitus patient attended OPD of Pulmonary Medicine SVRRGGH Tirupati from April 2017 to Nov 2017.
RESULTS
During above period 664 cases with high clinicoradiological presumption subjected to CBNAAT examination of them 215 were confirmed positive microbiologically with diagnostic yield of 32.3%. The mean age was 45 years, 32% are females and 68% are males. Overall sensitivity of CBNAAT was 32.3%. Specificity and Sensitivity of CBNAAT was 100% for sputum positive cases and sensitivity was 73% and specificity was 100% for sputum negative cases. Sensitivity of CBNAAT for PTB-HIV co-infection was (54) 28%. Overall Rifampicin resistance was (18) 2.7% in our study.
CONCLUSION
CBNAAT is a rapid and significantly useful in diagnosis of PTB when compared to sputum smear examination. Sensitivity and specificity is high compared to sputum smear examination and has significant effect on detecting undiagnosed presumptive cases. This will help in improving the TB control measures.
Detection of Rifampicin resistance one additional advantage for CBNAAT to screen for MDRTB and to decrease the spread MDRTB in community.
The routine use of CBNAAT will improve detection drug sensitive and drug resistance TB and will have significant effect on TB control.
CBNAAT Should use in special group of patient with presumptive PTB in sputum negative, all retreatment cases, PLHIV and Diabetes mellitus.
Key words: *pulmonary tuberculosis, Rifampicin resistance, PLHIV, CBNAAT, Sputum smear.*

Date of Submission: 12-06-2018 Date Of Acceptance: 27-06-2018

I. Background

Pulmonary tuberculosis is still one of the commonest cause of infectious disease related morbidity and mortality in the developing countries[1].
TB constitutes a major health problem world widewith an 8.8% incidence (poojan et al)[2]. Global TB burden, Annually 4,80000 deaths and 1,400 every day. More than 1 million missing cases every year that are not

notified due to undiagnosed, in adequately diagnosed and treated in private sector. The undiagnosed or inadequate diagnosis may be due to use of less sensitive diagnostic modalities(3).

Diagnosis of pulmonary tuberculosis (PTB) mostly relies on identification of acid-fast bacilli (AFB) in sputum smear, but its limitation is low sensitivity[4,5]. Conventional mycobacterial cultures (Solid culture in Lowenstein-Jensen medium) takes about 6-8 weeks' time newer liquid culture methods like BACTEC or Mycobacterial growth indicator tube (MGIT) gives relatively rapid results but is costly[6,7]. Chest x-ray is neither sensitive nor specific for diagnosis of PTB[8]. The Xpert test was first endorsed by WHO in 2010. WHO endorsed CBNAAT as diagnostic tool for diagnosis of Pulmonary and extrapulmonary Tuberculosis. WHO developed End TB strategy to control TB. India developed National Strategic Plan to achieve ENDTB goals(9). The four pillars of NSP are "DETECT TREAT PREVENT BUILD".

The detection is first step in control. The tools available are sputum microscopy which is specific but less sensitive. CBNAAT more sensitive and specific test now available. India introduced CBNAAT as diagnostic tool in RNTCP since 2012 gradually increasing phase wise now 628 centres having CBNAAT facilities under RNTCP. Early detection of Drug sensitive and Drug resistance is essential to reduce the mortality and morbidity and to cut the chain of disease transmission in the community. This can be achieve through availability of high sensitive diagnostic tests (CBNAAT) in public and private sector at free of cost, Universal testing for drug resistance and screening of high risk population. The CBNAAT now available under RNTCP is more sensitive for early detection of TB and it also detects Rifampicin resistance with in 2 hours. This will help in detection of missing cases and improve TB control to NSP and END TB goals. Although, sputum for CBNAAT is very good in rapidly identifying Rifampicin resistance in PTB patients.

AIM:

To study the diagnostic yield of the CBNAAT in Pulmonary tuberculosis and asses the efficacy in detecting Mycobacterium Tuberculosis in various groups of pulmonary tuberculosis, New cases, previously treated cases, PLHIV, DM and Drug resistance.

II. Materials and Methods

A retrospective observational study of presumptive adult Pulmonary tuberculosis above age of 12yrs, whose sputum samples subjected for CBNAAT including pulmonary new and previously treated ,PLHIV, with Diabetes mellitus patient attended OPD of Pulmonary Medicine SVRRGGH Tirupati from April 2017 to Nov 2017.

Presumptive Pulmonary tuberculosis: Refers to a person with any of the symptoms suggestive of PTB including cough more than 2 weeks fever >2 weeks, significant weight loss, hemoptysis, abnormalities in chest radiograph.

Microbiologically confirmed Pulmonary tuberculosis:. refers to a presumptive Pulmonary tuberculosis patient with sputum smear positivefor acid fast bacilli or positive for mycobacterium tuberculosis on culture,or positive for tuberculosis on quality assured rapid molecular diagnostic tests

Clinically diagnosed TB case:

Refers to a presumptive Pulmonary tuberculosis patient who is not confirmed microbiologically but has been diagnosed with active TB by clinician on the basis of clinical findings and having radiological lesions consistent with active Pulmonary tuberculosis on chest x-ray/CT Scan of thorax (Nodular consolidations with or without cavity in apex or tree in bud appearance.

Inclusion criteria:

1. All cases of presumptive new Pulmonary tuberculosis subjected to CBNAAT.
2. All previously treated case subjected to CBNAAT.
3. All cases of presumptive Pulmonary tuberculosis with HIV co infection subjected to CBNAAT.
4. All presumptive Pulmonary tuberculosis patients with Diabetes mellitus subjected to CBNAAT.

Exclusion criteria:

1 Age less than 12 years.
2 All Extrapulmonary cases

III. Results

During the study period the total no presumptive PTB sputum smear for diagnosis are 3779 of them 759 positive cases detected by LED microscope with auramine staining. with diagnostic yield of 20.8%. During above period 664 cases with high clinicoradiological presumption subjected to CBNAAT examination of them

215 were confirmed positive microbiologically with diagnostic yield of 32.3%.The 215 microbiologically confirmed PTB, 52 were positive by sputum smear microscopy,163 smear negative cases positive by CBNAAT among them 128 are new cases, 35 are previously treated. Among the 35previously treated 3 are relapses 16 are last for follow up 16 others cases. 47 are PLHIV,10 are diabetics.

Table 1: Demographic characters

	Sputum positive	Sputum negative
Age in years(mean±SD)	46±17	43±20
Male female ratio	4: 1	2.5:1
DM	10	10
PLHIV	7	47

Total of 664 cases were recruited in the study, the mean age was 45 years, 32% are females and 68% are males. Diabetes was seen 20% of patients and PLHIV 54 patients.

Table 2: Overall Sputum smear positive versus CBNAAT positives

	No cases examined	No of cases diagnosed	Diagnostic yield
Smear microscopy	3779	759	20.08%
CBNAAT	664	215	32.3%

Table 3: Sputum smear positive versus CBNAAT positives in all CBNAAT tested cases.

	Smear positive (52)	Smear negative (612)
CBNAAT positive(215)	52	163
CBNAAT negative (449)	0	449

Among the 664 cases subjected to CBNAAT, 612 are sputum smear negative,163 are CBNAAT positive, 52 are sputum smear positive and all these are positive in CBNAAT also.

Table 4: Diagnostic sensitivity and specificity of sputum CBNAAT

	Sensitivity	Specificity	Positive predictive value	Negative predictive value
Sputum positive PTB	100% (93% -100%)	100% (92%-100%)	100%	100%
Sputum negative PTB	73% (69%-76%)	100% (94%-100%)	100%	24% (19%-30%)

Among 664 cases overall sensitivity of sputum CBNAAT was 32.6%, with specificity of 100%. Sensitivity of CBNAAT was 100% for sputum positive cases and was 73% for sputum negative cases. Specificity was 100% for both sputum positive and Negative cases.

Table 5: Diagnostic yield in previously treated cases sputum smear versus CBNAAT

	Sputum positive	Sputum negative
CBNAAT positive	33	35
CBNAAT negative	0	102

Of 170 previously treated cases 68 (40%) are microbiologically confirmed, 33(19.42) by microscopy 35(20.58)by CBNAAT contributed to 51% in this group. all 33 sputum smear positive cases are positive by CBNAAT also with 100% specificity for both tests. CBNAAT also detected Rifampicin resistance in 16 (9.4%) cases in this group.

Table 6: Diagnostic yield in PLHIV sputum smear versus CBNAAT

	Sputum positive	Sputum negative
CBNAAT positive	7	47
CBNAAT negative	0	137

Of 191 PLHIV patients 57 are microbiologically 7 are confirmed by both tests, 47 are confirmed by CBNAAT with diagnostic yield of 3.66% for sputum smear microscopy and 28.2% with CBNAAT, significantly lower diagnostic yield with smear microscopy.

Table7: Rifampicin resistance detected

	Total cases (664)	Rifampicin Resistance	%of detected Rifampicin Resistance
Previously treated	170	16	9.4
New cases	474	2	0.42

OF 664 cases subjected for CBNAAT 18 are found to be Rifampicin Resistance among them 16(9.4%) are previously treated 2 (0.42%) are from new PTB cases both are smear Negative cases.

Table 8: Diagnostic yield in New cases Sputum smear negative

	Total	CBNAAT Positive	CBNAAT negative
Sputum negative New cases	303	74	346

Of 303 new smear Negative immunocompetent cases 74 positive by CBNAAT with diagnostic yield of 24.42% and 47 of 186 immunocompromised case with diagnostic yield of 25.26%.

Table 9: Sensitivity and specificity of CBNAAT- results of different studies

Name of the study	Overall PTB		Sputum positive PTB		Sputum negative PTB	
	sensitivity	specificity	sensitivity	specificity	sensitivity	specificity
Dewan R et al	40%	100%	100%	100%	32.3%	100%
Theron et al	78.7%	94.4%	94.7%	95%	46.8%	94.4%
Geleta et al	65.5%	96.3%	95.2%	96.3%	48.6%	96.3%
Agarwal M et al	86.8%	93.1%	100%	90%	79.1%	93.1%
Sharma SK et al	95.7%	99.6%	99.2%	99.6%	77.7%	99.6%
Sowjanya DS et al	70.24%	100%	99.08%	100%	37.5%	100%
Boehme CC et al	92.2%	99.2%	98.2%	99.2%	72.5%	99.2%

IV. Discussion

Pulmonary tuberculosis is the leading cause for mortality and morbidity due to infectious disease in India inimmunocompromised and immunocompetent individuals India accounts for around one-fourth of the global tuberculosis cases(10). For long time sputum microscopy is the only rapid, simple, specific, cost effective, can be done in all levels of health care system with minimal facilities and training. The early specific diagnosis is essential step in reducing the mortality morbidity and in preventing spread of the disease in community.

WHO endorsed CBNAAT as diagnostic tool for pulmonary and extrapulmonary tuberculosis which has higher specificity and sensitivity when compared to sputum microscopy(11). India introduced CBNAAT under RNTCP for the diagnosis of Pulmonary and extrapulmonary TB With special reference to all previously treated, PLHIV, Pediatric, close contacts of MDR TB.

In this study mean age of PTB patients was 45 Yrs with male preponderance. mean age in males is 46yrs. mean age in females was 42Yrs. Diabetes (20 patients) was the common Comorbidity.

HIV co-infection was seen in 54 Cases. Sputum smear microscopy sensitivity was 20.08% in PTB. CBNAAT diagnosed 32.3% cases in addition to the sputum smear microscopy.

CBNAAT in overall sputum smear negative cases has the sensitivity of 26.6% for all smear negative cases. It has sensitivity of24.4% for all new immunocompetent cases 74 of 303, 25.5% for negative previously treated cases 35 of 137 contributing to 51.4 of diagnosed cases in this group.

In PLHIV cases sensitivity of 25.26%for negative 47 of 186.In patients diagnosed as Rifampicin resistance 8 of 18 are negative cases of them 2 are new cases,1 was relapse,2 are lost follow up,3are from others group. Among patients having Diabetes mellitus as Comorbidity in 20cases .10 smear negative cases become positive by CBNAAT. In 52 sputum smear positive cases in all groups of patients are positive by CBNAAT 100% specificity.

This shows that significant number of symptomatic patients with smear negative status are misdiagnosed leading to progression and spread of the disease, challenging the control measures.

This reveals the urgent need to use the utility of various methods like Induced sputum, BAL fluid collection, pooled sputum for CBNAAT examination and TrueNAAT at the level of peripheral health facilities for effective control of TB and to prevent mortality and morbidity and to achieve end TB target

V. Conclusion

CBNAAT is a rapid and significantly useful in diagnosis of PTB when compared to sputum smear examination. Sensitivity and specificity is high compared to sputum smear examination and has significant effect on detecting undiagnosed presumptive cases. This will help in improving the TB control measures.

Detection of Rifampicin resistance one additional advantage for CBNAAT to screen for MDRTB and to decrease the spread MDRTB in community.

The routine use of CBNAAT will improve detection drug sensitive and drug resistance TB and will have significant effect on TB control.

CBNAAT Should use in special group of patient with presumptive PTB in sputum negative, all retreatment cases, PLHIV and Diabetes mellitus.

References

[1]. World Health Organization. Global tuberculosis report Geneva: WHO, 2014. http://apps.who.int/iris/ bitstream/10665/137094/1/9789 241564809_eng. pdf?ua=1.

[2]. Shrestha P, Arjyal A, Caws M, et al. The application of GeneXpert MTB/RIF for smear negative TB diagnosis as a Fee-paying service at a south Asian general hospital. Tuberculosis Research and Treatment Article ID 102430, 2015;2015:1-6.

[3]. NATIONAL STRATEGIC PLAN FOR TUBERCULOSIS ELIMINATION 2017–2025, Revised National Tuberculosis Control Programme, 3 Mar. 2017, tbcindia.gov.in/WriteReadData/NSP%20Draft%2020.02.2017%201.pdf.

[4]. Hopewell PC, Pai M, Maher D, et al. International standards for tuberculosis care. Lancet Infect Dis 2006;6(11):710-25.

[5]. Getahun H, Harrington M, O'Brien R, et al. Diagnosis of smear negative pulmonary tuberculosis in people with HIV infection or AIDS in resource-constrained settings: informing urgent policy changes. Lancet 2007;369(9578):2042-9.

[6]. Moore DF, Guzman JA, Mikhail LT. Reduction in turnaround time for laboratory diagnosis of pulmonary tuberculosis by routine use of a nucleic acid amplification test. Diagn Microbiol Infect Dis 2005;52(3):247-54.

[7]. Pai M, Kalantri S, Dheda K. New tools and emerging technologies for the diagnosis of tuberculosis: part II. Active tuberculosis and drug resistance. Expert Rev Mol Diagn 2006;6(3):423-32.

[8]. Central TB Division (India). Revised National Tuberculosis Control Programme. Training Course for Program Manager (Modules1-4). April, 2011.

[9]. The End TB Strategy." World Health Organization, World Health Organization, 2 May 2017, www.who.int/tb/strategy/end-tb/en/

[10]. Annual Status Report. Central TB Division. Official website of the Revised National TB Control Programme, Directorate General of Health Services, Ministry of Health & Family Welfare Government of India. 2015. http://www.tbcindia.org.

[11]. Mukherjee S, Biswas D, Begum S, et al. Evaluation of cartridge based nucleic acid amplification test in diagnosis of pulmonary tuberculosis. J. Evolution Med. Dent. Sci. 2017;6(74):5281-5286, DOI: 10.14260/Jemds/2017/1147

Dr.S.Subbarao "Role and Efficiency Cbnaat in Diagnosis of Pulmonary Tuberculosis in Rntcp."IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 17, no. 3, 2018, pp 51-55.