Universe International Journal of Interdisciplinary Research
(Peer Reviewed Refereed Journal)

© UIJIR | ISSN (O) – 2582-6417
JULY 2022 | Vol. 3 Issue 2
www.uijir.com

STUDY OF EFFICIENCY OF DETECTING M. TUBERCULOSIS BY AFB MICROSCOPY AND CBNAAT IN VARIOUS TISSUE/FLUIDS AND ITS IMPACT ON DIAGNOSIS OF TUBERCULOSIS

Author's Name: [1]Shital Bhadane, [2] Dhruvi Patel

Affiliation: [1]Assistant Professor Department of Paramedical and Health sciences, Parul University, Vadodara, India

[2]Student, Department of Paramedical and Health Sciences, Parul University, Vadodara, India.

E-Mail: salunke.shital88@gmail.com

DOI No. – **08.2020-25662434**

Abstract

The objective of this study to compare the result of AFB microscopy and CBNAAT test and determine the efficiency of detecting M. Tuberculosis by AFB microscopy and CBNAAT test and its impact on diagnosis of tuberculosis. The retrospective study conducted in Parul Sevashram Hospital. The total 50 sample collected for this study. Data on suspected extra pulmonary tuberculosis TB patients is collected from January 2021 to October 2021. This sample includes Lymph node, Plural fluid, Bald fluid, Pus, Tissue, abscess, synovial fluid, Ascitic fluid, CSF, Pleural effusion, Pericardial fluid. Out of 50 sample, 6 sample found AFB positive and 44 sample found negative. CBNAAT test conducted for same 50 sample, we found 20 out of 50 sample found CBNAAT positive and 30 sample found CBNAAT negative. After comparing AFB result with CBNAAT it is observe that total 14 AFB negative sample turn into positive in CBNAAT. The conclusion of this study is that CBNAAT is more effective and accurate than the AFB microscopy test for diagnosis of extra-pulmonary tuberculosis.

Keywords*: CBNAAT, AFB microscopy, Extra pulmonary tuberculosis, tissue, fluid.*

INTRODUCTION

Tuberculosis has now become a major burden for the health care system; there is an urgent requirement for effective diagnosis and treatment to overcome the worldwide problem of Tuberculosis. Mycobacterium tuberculosis is thought to be latently present in one-third of the world's population [(1)]. From 16 percent in 1991 to 20 percent in 2001, the percentage of TB cases in the United States with extrapulmonary involvement has steadily grown [(1)].

Tuberculosis is a major communicable disease-causing significant mortality and morbidity worldwide especially in India. TB is the ninth leading cause of death worldwide [(6)]. Effective diagnosis will allow for the fast identification of patients and the provision of appropriate treatment on a priority basis. The goal of this study was to determine diagnostic efficiency by comparing the results of AFB microscopy with CBNAAT. CBNAAT is a cartridge-based nucleic acid amplification test which detects the presence of TB bacilli [(2)]. It is simple, rapid, cost effective and does not require technical expertise. It can diagnose TB within 2hours and gives accurate results [(2)]. The sensitivity and specificity of CBNAAT was at par in comparison to mycobacterial culture [(5)].

LITERATURE REVIEW

Shivprasad Kasat, Mahendra Biradar, et al conducted research of **Effectiveness of CBNAAT in the diagnosis of extrapulmonary tuberculosis in MGM hospital.** [(2)] that included 166 patients. All patients were required to meet the age criteria. 18 years. 17 of the 166 patient samples were determined to be AFB positive, and the same sample was tested for CBNAAT, with 25 of the 166 samples being CBNAAT positive [(2)]. After comparing the results of the AFB and CBNAAT tests, it was

discovered that a total of 8 samples tested positive in CBNAAT but were declared negative in the AFB smear.

Sunil Kumar Komanapalli et al. did another study at Andhra Medical College on the **role of CBNAAT in the diagnosis of extrapulmonary TB.** [3] In this study, 289 patients were given FNAC, LED, and CBNAAT. [3] Out of 289 patients, 51.04 percent had cytomorphological characteristics compatible with Tb (FNAC), 49.1% had CBNAAT diagnosis, and only 39.7% had LED detection. Most of the cases are in the 11–30-year age range, with a female preponderance, and the majority of the CBNAAT cases are in the 11–30-year age group, with a female preponderance in this study. Out of 142 CBNAAT positive cases compared to CRS (composite reference standard), 138 (FNA, LED +/) were positive for Tb, whereas four (FNA/LED -) were both negative. According to CRS (FNA+/LED-), 23 of the 147 CBNAAT negative patients were positive. All 124 instances tested negative for reactive and acute lymphadenitis, abscess, squamous cell carcinoma deposits, Hodgkin's lymphoma, fungal infection, neurofibroma, infected epidermal cyst, and branchial cyst (FNA/LED/CBNAAT). The diagnostic performance of the CBNAAT was tested using the Composite Reference Standard (CRS) (n=289). CBNAAT has 85.71 percent sensitivity, 96.87 percent specificity, 21.21 percent positive likely hood ratio, and 0.15 percent negative likely hood ratio, respectively. The CBNAAT and LED were compared to the FNAC for diagnostic purposes. (n=146) When compared to LED versus FNAC, CBNAAT has a higher sensitivity. The CBNAAT and LED vs FNAC diagnostic accuracy in HIV (n=21) were tested. When compared to LED against FNA, CBNAAT has a higher sensitivity but a lower specificity [3].

S.Abhimanyu et al. did another study on the subject **The Role of Cartridge-Based Nucleic Acid Amplification Test (CBNAAT)** [4]**.** In this study, 77 patients were divided into two groups. There were 65 instances in Group A and 12 cases in Group B, respectively [4]. In group A, the diagnostic accuracy for tuberculosis was 84.62 percent for CBNAAT, 70.77 percent for LPA, 86.15 percent for molecular tests (combined), 47.69 percent for AFB smear, 50.77 percent for liquid culture, and 87.69 percent for histology, and 91.67 percent for CBNAAT, 83.33 percent for LPA, 91.67 percent for molecular tests (combined). In group A, the drug resistance detection rate was 4.62% on CBNAAT, 3.08% on LPA, 6.15% on molecular tests (combined), [4]. and 1.54% on DST, whereas it was 33.33% on CBNAAT, 58.33% on LPA, 58.33% on molecular tests (combined), and 16.67% on DST. In comparison to histology, both groups obtained similar sensitivity rates for the various assays (taken as denominator). The addition of molecular approaches improved overall diagnosis accuracy (all tests together) from 93.8 to 100% in group A patients and from 83.3 to 100% in group B cases. Because no one test can identify TB in all instances, samples should be examined concurrently by molecular assays (CBNAAT and LPA), AFB smear, culture, and histological exams. Drug resistance in mycobacterial culture is best demonstrated by molecular testing [4].

MATERIAL AND METHODS

The Retrospective study, conducted at PARUL SEVASHRAM Hospital. We collected data from the RNTCP Department of PARUL Sevashram. RNTCP stands for Revised National Tuberculosis Control Program, and it is based on the globally recommended Directly Observed Treatment Short Course (DOTS) strategy, which was introduced in 1997 and has since been phased-in across the nation with assistance from the World Bank and other development partners [3]. In March 2006, full national exposure was achieved. In terms of patient treatment, RNTCP is recognized as the world's largest and fastest expanding TB control program [3].

Data on suspected extrapulmonary TB patients were collected from January 2021 to October 2021. Age criteria for suspected extra pulmonary TB patient must be at least 18 years and above, however patients under the age of 18 are excluded in this study. Data include both male and female patients.

Total 50 suspected of extra pulmonary tuberculosis patient included in this study who visited Parul Sevashram Hospital & ready for AFB & CBNAAT test. The CBNAAT facility is not available at our premises, so we send samples to a District TB Centre (DTC) and State TB Training and Demonstration Centre (New Civil Hospital, Ahmedabad) for testing. CBNAAT is a cartridge-based nucleic acid amplification test which detects the presence of TB bacilli and tests for resistance to Rifampicin [2]. It is simple, rapid, cost effective and does not require technical expertise. It can diagnose TB within 2hours and gives accurate results [2]. We collected a total of 50 samples suspected of extra pulmonary tuberculosis(n=50) and all 50 sample are sent for both AFB and CBNAAT testing. It includes Lymph node, pleural fluid, Bald fluid, Pus, Tissue, abscess, Synovial fluid, Acetic Fluid, CSF, pleural effusion, Pericardial Fluid. This Study Conducted after getting permission from the ethical committee of Parul University. Data Analysis done through the Microsoft excel.

RESULT

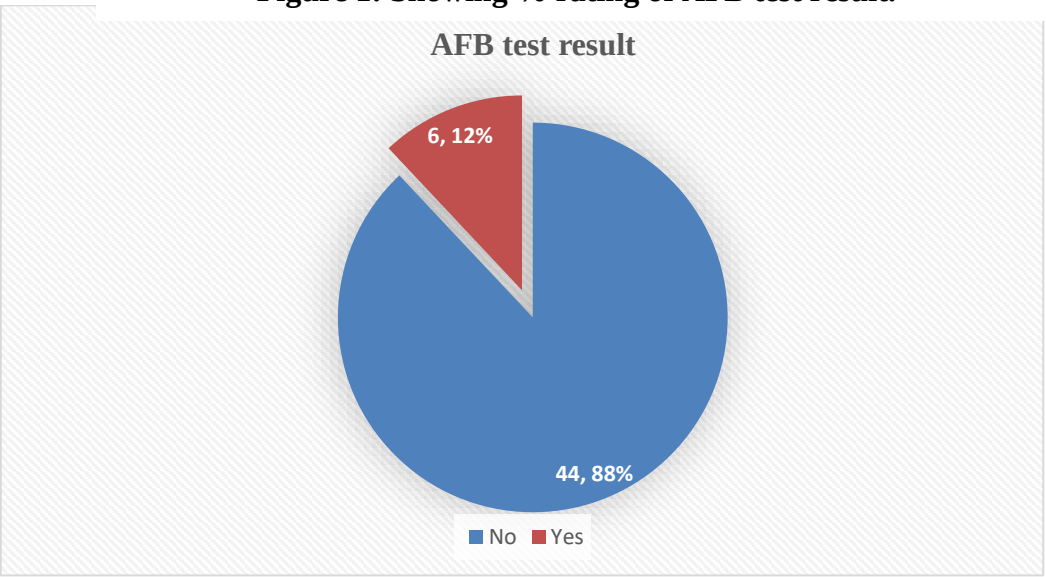
Total 50 samples include abscess 1(2%), Acetic Fluid 2(2%), Bald fluid 5(10%), CSF 1(2%), Lymph node 8(16%), Pericardial Fluid 2(4%), pleural infusions 1(2%), pleural fluid 26(52%), Pus 1(2%), Synovial fluid 2(4%), Tissue 1(2%).

Table: 1 Showing percentage rating of Positive and negative result of AFB & CBNAAT test

Sample	Number of samples	Sample collection in % (number)	AFB Positive % (number)	CBNAAT positive % (number)	AFB Negative % (number)	CBNAAT Negative % (number)
abscess	1	2%	0% (0)	2% (1)	2% (1)	4% (2)
CSF	1	2%	0% (0)	0% (0)	2% (1)	2% (1)
pleural infusion	1	2%	0% (0)	0% (0)	2% (1)	2% (1)
Pus	1	2%	0% (0)	2% (1)	2% (1)	0% (0)
Tissue	1	2%	0% (0)	2% (1)	2% (1)	0% (0)
Acetic Fluid	2	4%	0% (0)	0% (0)	4% (2)	0% (0)
Pericardial Fluid	2	4%	0% (0)	0% (0)	4% (2)	4% (2)
Synovial fluid	2	4%	0% (0)	2% (1)	4% (2)	2% (1)
Bald fluid	5	10%	2% (1)	10% (5)	8% (4)	0% (0)
Lymph node	8	16%	10% (5)	12% (6)	6% (3)	4% (2)
pleural fluid	26	52%	0% (0)	10% (5)	52% (26)	42% (21)
Grand Total	**N=50**	**100%**	**12% (6)**	**40% (20)**	**88% (44)**	**60% (30)**

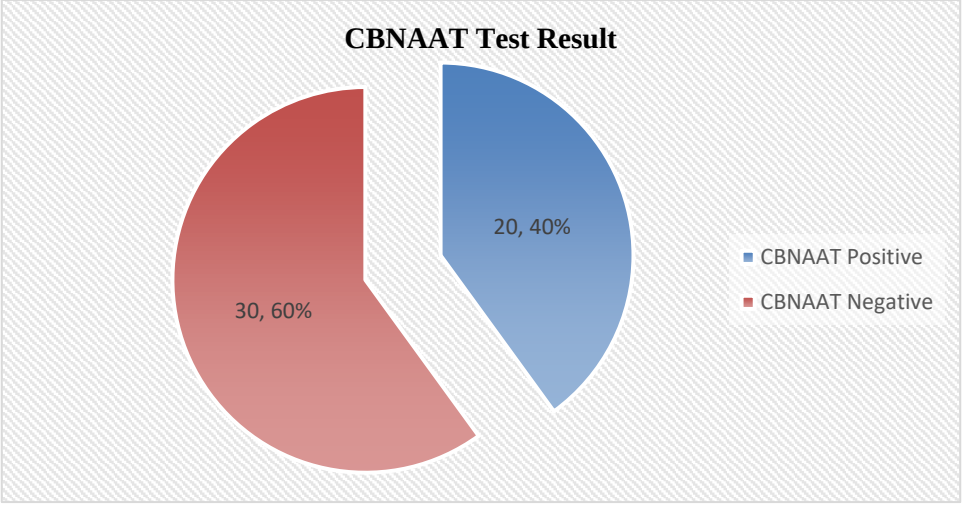
AFB test result for all 50 suspected sample is 6 samples are found AFB positive & 46 samples were found AFB negative. In 6 positive sample Balt 1(2%) and lymph node is 5(10%). Shown in Figure 2.

Figure 1: Showing % rating of AFB test result.



As all 50 sample are suspected of extra pulmonary TB, we conducted CBNAAT test for all 50 suspected sample and result for CBNAAT test is 20 out of 50 suspected sample is found CBNAAT positive and 30 sample find CBNAAT negative.

Figure 2: Showing CBNAAT test result % rating



In 20 Positive sample further classified as abscess 1(2%), Balt fluid 5(10%), Lymph node 6(12%), pleural fluid 5(10%), Pus 1(2%), Synovial fluid 1(2%), Tissue 1(2%).

We also compare CBNAAT test on 44 sample of AFB microscopy negative samples and discovered that 14 samples (32% were positive) and 30 samples (68% were negative). This means that 14 samples were positive in CBNAAT but were negative in AFB microscopy. That indicate high diagnostic efficacy of CBNAAT.

CONCLUSION

Extrapulmonary TB generates a considerable burden of death and sickness because to its complicated activities, leading in a delay in identification. Traditional techniques of diagnosis, such as culture drug susceptibility testing (DST), take time. It also required the employment of skilled laboratory personnel. The CBNAAT is a cartridge-based nucleic acid amplification test for TB bacilli detection. [2] The CBNAAT test offers the following benefits: faster treatment initiation, better patient outcomes, prevention of transmission by early diagnosis, respiratory isolation, and appropriate treatment, and more effective public health initiatives. 20 out of the 50 samples were positive for tuberculosis, while the other 30 tested negative. Males account for 65 percent of TB cases, while females account for 35 percent. Check for positive patients by sample. Lymph nodes account for 30%, Pleural fluid 25%, Bald fluid 25%, Tissue 5%, Synovial Fluid 5%, pus 5%, and abuse 5% of the total. According to the AFB microscopy result, 6 samples were AFB positive, and 44 samples were AFB negative. We performed a CBNAAT test on AFB 44 negative AFB microscopy samples and discovered that 14 samples (32% were positive) and 30 samples (68% were negative). In AFB microscopy, 14 of 44 samples were discovered positive, while the remaining 44 were found negative. The CBNAAT was shown to be far more effective than AFB microscopy in this study.

REFERENCES

[1] Yang Z, Kong Y, Wilson F, Foxman B, Fowler AH, Marrs CF, Cave MD, Bates JH. Identification of risk factors for extrapulmonary tuberculosis. Clin Infect Dis. 2004 Jan 15;38(2):199-205. doi: 10.1086/380644. Epub 2003 Dec 19. PMID: 14699451.2.

[2] Kasat S, Biradar M, Deshmukh A, Jadhav S, Deshmukh H. Effectiveness of CBNAAT in the diagnosis of extrapulmonary tuberculosis. Int J Res Med Sci. 2018 Dec;6(12):3925-8.

[3] Komanapalli SK, Prasad AB, Vasundhara N, Yendluri D. Role of CB-NAAT in diagnosing extra pulmonary tuberculosis in correlation with FNA in a tertiary care center. Int J Res Med Sci. 2018 Dec;6(12):4039-45.

[4] Abhimanyu S, Jain AK, Myneedu VP, Arora VK, Chadha M, Sarin R. The Role of Cartridge-Based Nucleic Acid Amplification Test (CBNAAT), Line Probe Assay (LPA), Liquid Culture, Acid-Fast Bacilli (AFB) Smear and Histopathology in the Diagnosis of Osteoarticular Tuberculosis. Indian Journal of Orthopaedics. 2021 May;55(1):157-66.

[5] H. Alwani (Bhubaneswar, India), S. Subhankar (Bhubaneswar, India), C. Rao (Bhubaneswar, India), D. Dash (Bhubaneswar, India). Role of CBNAAT in Extrapulmonary Tuberculosis- An ongoing pilot study. 3007.

[6] Virupakshappa V, Ranganath M, Manjunath M P, Mahendra M, Utility of CBNAAT in diagnosis of mycobacterium tuberculosis in a tertiary care teaching hospital in South India. *IP Indian J Immunol Respir Med* 2018;3(1):3-6.