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Original Article

RAPID DIAGNOSIS OF TUBERCULAR LYMHADENITIS-ROLE AND UTILITY OF FNAC AND CBNAAT

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ABSTRACT

Introduction: Tuberculosis is one of the leading infectious causes of death worldwide wherein lymphadenopathy is the most frequent presentation of extra pulmonary tuberculosis. The usual site of presentation for Extra pulmonary tubercular lymphadenopathy is cervical region. Among various methods used to diagnose EPTB, conventional methods used are FNAC, ZN staining and culture. The advanced methods used are molecular tests CBNAAT, Truenat etc.

Aims and Objective: To assess the role and utility of Fine Needle Aspiration Cytology (FNAC) and Cartridge Based Nucleic Acid Amplification Test (CBNAAT) for the Rapid diagnosis of Tuberculous lymphadenopathy(EPTB).

Material and Methods: The present study was a six years prospective observational study conducted in the department of Pathology and department of Chest Medicine Govt Medical College Baramulla and comprised all cases of clinically suspected tuberculous lymphadenopathy regardless of age between July 2019 and July 2025. Data pertaining to FNAC, CBNAAT reports, and clinico-radiological information was recorded. Cases already on treatment and cases without either FNAC or CBNAAT report were excluded from the study. FNAC procedure was performed with 20-22 gauge needles and fine needle aspirate was sent for CBNAAT test in all 128 cases and in all cases smears prepared on glass slides were examined under microscope after proper fixation and staining as per the standard protocol and cytomorphological features were recorded.

Results: 128 cases in total with both FNAC and CBNAAT reports were analyzed, out of which 44 cases in FNAC were reported as Tuberculous Lymphadenitis. 47 cases in CBNAAT were positive for tuberculosis and 03 cases showed Rifampicin resistance. Keeping CBNAAT as Gold standard FNAC showed sensitivity of 93.33%, Specificity of 97.59%, Positive predictive value of 95.45%, Negative predictive value of 96.42% and Diagnostic accuracy of 96.09%.

Conclusion: FNAC can be used as a primary diagnostic tool for diagnosis of EPTB in areas where advanced techniques such as CBNAAT(GeneXpert) are not readily available. In centers with advanced diagnostic facilities like CBNAAT, FNAC must be combined with CBNAAT(GeneXpert) for rapid diagnosis of EPTB cases, identify Rifampicin resistance at the earliest and avoid false negative and false positive cases. Combined use of FNAC and CBNAAT offers more accurate and more rapid diagnosis for EPTB compared to using either test alone.

Keywords: *FNAC, CBNAAT, Tuberculous Lymphadenitis, EPTB.*

INTRODUCTION

Tuberculosis is a serious and ancient epidemic that humans have known since time immemorial. As per the global TB report 2023, 10.6 million people fell ill with the disease worldwide in 2022. The incidence rate of disease was estimated to be increased by 1.9% between 2020-2021 and 2021- 2022 [1]. Tuberculosis can affect people of all ages, and it has been

rapidly escalating in developing countries like India in the past few decades [3]. According to India TB report 2023, in the year 2022, there was an increase of over 13% of TB case notifications [2]. Extra pulmonary tuberculosis (EPTB) is defined as per the World Health Organization as an infection by Mycobacterium tuberculosis that affects tissues and organs outside pulmonary parenchyma [4]. There are variable presentations for EPTB clinically, with lymphadenopathy being the most frequent one. The usual site of presentation for EPTB lymphadenopathy is cervical region. [5,6]. Due to the low bacterial count in the extra pulmonary manifestations of Tuberculosis, it is necessary to conduct careful examination both clinically and microscopically along with ancillary techniques wherever available for the early diagnosis and treatment. EPTB is challenging to diagnose due to nonspecific/vague clinical symptoms. Routine investigations like chest radiography and sputum examination are not useful in these cases because of probable lack of pulmonary infection. Conventional methods used for the diagnosis of EPTB are FNAC, AFB staining and culture. Despite being cost effective and more efficient, the lack of detection of rifampicin resistance by FNAC smear examination and the long duration of culture results make these investigations less preferred. WHO recommends technique of CBNAAT as a more sensitive and rapid diagnostic test for specimens from non-pulmonary sites [7] for the diagnosis of tuberculosis. Lack of access to advanced diagnostic tests in small health centers and false positive/negative results from those advanced techniques due to many reasons like previous BCG vaccination, insufficient sampling etc. requires conventional methods like Fine needle aspiration cytology for better evaluation of the EPTB cases along with CBNAAT.

OBJECTIVE:

To assess the role and utility of Fine Needle Aspiration Cytology (FNAC) and Cartridge Based Nucleic Acid Amplification Test (CBNAAT) for the Rapid diagnosis of Tuberculous lymphadenopathy (EPTB).

MATERIALS AND METHODS

The present study was a six years prospective observational study conducted in the department of Pathology and department of Chest Medicine Govt Medical College Baramulla and comprised all cases of clinically suspected tuberculous lymphadenopathy regardless of age between July 2019 and July 2025. Data pertaining to FNAC, CBNAAT reports, and clinico-radiological information were collected. Cases already on treatment and cases without either FNAC or CBNAAT report were excluded from the study. FNAC procedure was performed with 20-22 gauge needles and fine needle aspirate was sent for CBNAAT test in all 128 cases and in all cases smears prepared on glass slides were examined under the microscope after proper fixation and staining as per the standard protocol and cytomorphological features were recorded. On FNAC positive cases were reported as Tubercular Lymphadenitis while on CBNAAT cases were reported as positive for TB and negative for TB. Positive cases were further reported as Rifampicin sensitive and Rifampicin resistant.

RESULTS

A total of 128 suspected tuberculous lymphadenopathy cases were studied for which both FNAC and CBNAAT findings were recorded. Clinical presentation in all the above cases except for the feature of lymphadenopathy was very vague with only few cases presenting with symptoms like evening rise of temperature, weight loss etc. 20 to 30 years age group was most commonly involved in our study. The youngest patient was 4 years old female child and the eldes patient was was 58 years old male. Females were found to be dominant in the current study with male to female ratio being 1:1.24 (Table 2). Among various sites of presentation, cervical region was most commonly involved accounting for 85.93% of cases, followed by supraclavicular region with 6.25%, axillary region 5.46% and inguinal region 2.34 % respectively (Table 4). 94 cases showed solitary swelling whereas the remaining cases showed multiple lymphadenopathies. Cytological patterns encountered in the FNAC were Granulomatous lymphadenitis with or without necrosis, occasional epithelioid cells with necrosi , only necrosis, reactive lymphadenitis, suppurative lymphadenitis. Out of 128 suspected cases 44 cases were reported as Tubercular Lymphadenitis on FNAC and remaining 84 cases were reported as Non specific reactive lymphadenitis, acute suppurative lymphadenitis and necrosis only. Fine needle aspirate from all 128 cases were sent for CBNAAT in which 47 cases were found to be positive for tuberculosis and 03 cases were Rifampicin resistant. Among 44 reported positive on FNAC, CBNAAT showed positivity for 44 cases only and 02 cases were negative on CBNAAT. Among 84 cases reported negative on FNAC 03 cases were positive on CBNAAT for tuberculosis. Out of 47 positive cases 03 cases showed Rifampicin resistance on CBNAAT. Keeping CBNAAT as the Gold standard FNAC data was compared with CBNAAT, result showed Sensitivity of 93.33%, Specificity of 97.59%, Positive predictive value of 95.45%, Negative predictive value of 96.42% and Diagnostic accuracy of 96.09% for FNAC.

Table 1: List of Abbreviations used

Serial no.	Abbreviation	Full form
1	FNAC	Fine Needle Aspiration Cytology
2	TB	Tuberculosis
3	EPTB	Extra Pulmonary Tuberculosis
4	CBNAAT	Cartridge Based Nucleic Acid Amplification Test
5	AFB	Acid Fast Bacilli
6	PPV	Positive Predictive Value
7	NPV	Negative Predictive Value

Table 2: Sex wise distribution of cases

Serial No.	sex	No. of cases	percentage
1	Male	57	44.5%
2	Female	71	55.46%
3	Total	128	100%

Table 3: Site wise distribution of suspected cases

Serial	Site	No. of cases	Percentage (%)
1	Cervical Lymph Nodes	110	85.93%
2	Supra clavicular Lymph Nodes	08	6.25%
3	Axillary Lymph Nodes	07	5.46%
4	Inguinal Nodes	03	2.34%
5	Total	128	100%

Table 4: Cytomorphological Pattern of all 128 cases

Serial number	FNAC pattern	No. of case	Percentage (%)
1	Well defined granulomas with necrosis	21	16.40%
2	Well defined granulomas without necrosis	38	29.68%
3	Occasional epitheloid cells with necrosis	06	4.68%
4	Only necrosis	12	9.37%
5	Reactive lymphadenitis	36	28.16%
6	Suppurative lymphadenitis	15	11.71%
7	Total	128	100%

Table 5: comparison of cytomorphological pattern with other studies:

Serial	Pattern	Present study	Adhikary et al (17)	Shilpa G et al (14)	Chaudhari et al (19)	Dhote et al (20)
1	Granulomas without necrosis	29.68%	15.2%	51.2%	48.8%	25%
2	Granulomas with necrosis	16.40%	38%	34.2%	59%	29%
3	Occasional epithelioid cells with necrosis	4.68%	-	-	-	3.4%
4	Only caseous necrosis	9.37%	17.7%	14.6%	37.5%	16%

Table 6: Predictive validity of FNAC keeping CBNAAT as Gold standard

Serial no.	Parameter	Present study	Chaudhari et al (19)	Siddegouda et al (16)	Sellami M et al (21)	Manju et al (10)
1	Sensitivity	93.33%	94.3%	85.75	83.3%	53.85%
2	Specificity	97.59%	87.1%	73.8%	83.3%	90.48%
3	PPV	95.45%	18.3%	63.8%	78.9%	91.3%
4	NPV	96.42%	99.8%	90.5%	86.9%	51.35%
6	Diagnostic accuracy	96.09%	87.3%	78%	-	-

Equipment used for CBNAAT test of samples aspirated by FNA technique

Cartridge used for CBNAAT test of FNA samples

DISCUSSION

India accounted for 27% of global burden with 2.8 million cases reported in the year 2022(1). Although lungs are the most typically affected site in TB (pulmonary TB), organ systems other than the lungs can also be affected. According to The Global TB Report 2020, extra pulmonary tuberculosis (EPTB) constituted 16% of the 7.5 million reported TB cases globally and 19% in South-East Asia [1,2,15,16]. However, these estimates may be the tip of the iceberg, as a considerable proportion remains undiagnosed or not notified hence there is a need for diagnostic progress along with the therapeutic development. In the Present study the most commonly involved age group was 20 to 30 years which is concordant with studies by Manju et al [10] and Kalyani Gouda et al [13]. Female predominance in the current study is in concordance with the study by Chaudhari et al [19], Kalyani Gouda et al [13]. Unilateral lymph node presentation was the most common presentation in the present study, which is consistent with Shilpa g et al [14]. cervical lymph nodes region was the most common region involved in our study which is concordant with Shilpa et al [14]. Cytomorphological criteria taken into consideration for the diagnosis of tuberculosis in the current study were Epithelioid Granulomas, Langhans giant cells with or without caseous necrosis and ZN staining positivity in the absence of necrosis similar to other studies [8,9,11]. Comparing the cytomorphological pattern with other studies, present study showed granulomas without necrosis in 29.68% which is concordant with Dhote et al [20]. Pattern showing occasional epithelioid cells was seen in 4.68% in the present study which is concordant with Dhote et al [20]., Percentage of cases showing only necrosis in the present study was 9.37% which is almost concordant with all the compared studies (Table 5). Improper collection and transportation may result in false results of CBNAAT (Massoud et al [30]). Predictive validity of FNAC in our study showed sensitivity of 93.33%, concordant with Chaudhary et al [19], Siddegouda et al [16] and Sellami M et al [21] but Manju et al [10] showed sensitivity of 53.85%. Specificity of 97.59% was seen in the current study, which was concordant with Chaudhari et al and Sellami M et al [21]. PPV of 95.45% seen in the current study was concordant with Manju et al [10] and NPV of 96.42% was concordant with study by Siddegouda et al [16] (Table 6). Out of 47 positive cases 03 cases showed Rifampicin resistance on CBNAAT.

CONCLUSION

FNAC is an inexpensive, easily accessible, nonhazardous, and reliable investigation in the diagnosis of tuberculous lymphadenopathy. CBNAAT is a rapid investigation which not only helps in rapid diagnosis of EPTB but helps in the early detection of Rifampicin resistance which helps in guiding the treatment. Combined use of FNAC and CBNAAT (GeneXpert) can help in the rapid diagnosis of Tubercular Lymphadenitis (EPTB) and early detection of Rifampicin resistance, hence combined use of FNAC and CBNAAT will be an effective diagnostic tool in rapid diagnosis of EPTB and may be game changer in tuberculosis elimination.

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