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Original research article

A study on role of cartridge based nucleic acid amplification test, ADA, pleural fluid cytology and analysis in exudative pleural effusions

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Abstract

Background: Pleural effusions contribute to a significant proportion of cases coming to pulmonary medicine OPD or casualty. Pleural effusion constitutes an important differential diagnosis of any abnormal chest radiograph. Homogenous opacities on chest radiograph with or without parenchymal infiltrates, mass lesions represent pleural fluid.

Objectives

1. To study the role of biochemical analysis in cases with exudative pleural effusion.
2. To study the role of cytology in exudative pleural effusions.
3. To study the role of ADA in exudative pleural effusion cases.
4. To study the role of CBNAAT in exudative pleural effusion cases.

Material and Methods

Study Design: Prospective hospital based observational study.

Study Area: The study was carried out in the Department of Pulmonary Medicine, Government Medical College & Government General Hospital, Kadapa, Andhra Pradesh.

Study Period: June 2022 to November 2022.

Study population: The study was carried out in 100 consecutive patients with exudative pleural effusions.

Sample Size: Study consisted of 100 subjects.

Sampling Method: Simple random Sampling Technique.

Study tools and Data collection procedure: A complete clinical, general and physical examination was done on all patients. A chest radiograph Postero-anterior view was taken andeffusion amount was estimated. Effusion occupying 1/3rd of volume – mild effusion**.** Effusion occupying more than 1/3rd and less than 2/3rd of volume –moderate effusion Effusion occupying more than 2/3rd of volume – massive effusion Patient is subjected to other investigations like CBP, RFT, LFT, serum electrolytes, total leukocyte count (TLC), differential count (DC), viral markers, RBS, Serum proteins, sputum CBNAAT, pleural fluid CBNAAT, pleural fluid ADA, pleural fluid cytology, biochemical analysis and cell block for malignant cells. An informed consent was taken from patients in their native language regarding thoracocentesis.

Results: There were 52 tubercular effusion cases in our study. Among them, 6 cases had raised ADA above 40 and pleural fluid CBNAAT detection for mycobacterium. 40 of them had ADA above cut off value but mycobacterium was not detected. Mycobacterium was detected among 3cases who had borderline raised ADA but less than 40 IU/L.

Conclusion: Pleural effusions are more commonly encountered in pulmonary and medical practices in our country. The most common is tubercular effusions as shown in our study. All cases should undergo ultrasonography of chest along with routine chest x-ray. Fluid has to be aspirated under sonography guidance.

Keywords: Pleural effusions, CBNAAT, pleural fluid cytology

Introduction

Pleural effusions contribute to a significant proportion of cases coming to pulmonary medicine OPD or casualty. Pleural effusion constitutes an important differential diagnosis of any abnormal chest radiograph. Homogenous opacities on chest radiograph with or without parenchymal infiltrates, mass

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lesions represent pleural fluid.
Pleural effusions are a complication of many other diseases. Exudative pleural effusions pose a great diagnostic problem in clinical practice, as causes are quite exhaustive [1] even if they can intervene with other clinical pictures. Exudative effusions are separated into infectious causes, non-infectious causes, and malignancy. Commonest among them are infections and malignancy.
In India infections -Tubercular effusions are common followed by malignant effusions [2] while in the west, Infections-Para pneumonic effusions are more common next comes malignancy [1].
India has the greatest prevalence of tuberculous disease in the world. The World Health Organization (WHO) TB statistics for India for 2019 (the latest available) give an estimated incidence figure of 2.64 million cases. This is a rate of 193 per 100,000 populations. Incidence of MDR/RR-TB was 1,24,000. In 2020 total TB cases notified are 1725920. 78% are pulmonary cases[3]. Among extra pulmonary cases after tubercular lymphadenitis, pleural tuberculosis ranks second. Both malignant and effusions of tubercular etiology are exudative and lymphocytic predominate. Hence challenging in diagnosing and treatment. Investigations like Adenosine deaminase, gene Xpert, gamma interferon assay, polymerase chain reaction, lysozyme measurement, pleural fluid tubercular protein antibodies and many tumor markers like squamous cell carcinoma antigen, CA 15-3 help in differentiating TB from non-TB effusions4 to arrive at a diagnosis. Other invasive diagnostic tools like biopsy of pleura or thoracoscopy are at times needed.

Objectives
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Material and Methods
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Study Period: June -2022 to November-2022.

Study population: The study was carried out in 100 consecutive patients with exudative pleural effusions.

Sample size: study consisted of 100 subjects.

Sampling method: Simple random Sampling Technique.

Inclusion criteria
1. Patients diagnosed based on clinical features, imaging
2. Patients of exudative pleural effusions as per lights criteria.
3. Patient age >12 years.

Exclusion criteria
1. Transudative pleural effusions.
2. Empyema
3. Patients refusing for pleural fluid aspiration.
4. Hemothorax following trauma to the chest
5. Patients well documented with chronic history of heart failure, renal failure, liver cirrhosis.
6. Contraindications to thoracocentesis procedure like bleeding diathesis, local cutaneous conditions like herpes zoster infection, pyoderma.
7. Patients already on anti-tuberculosis treatment as there can be a false positive PCR finding because of a past healed tuberculosis infection.
8. Patients who are not giving consent.

Ethical consideration: Institutional Ethical committee permission was taken prior to the commencement of the study.
Study tools and Data collection procedure
A complete clinical, general and physical examination was done on all patients. A chest radiograph Postero-anterior view was taken and effusion amount was estimated. Effusion occupying 1/3rd of volume – mild effusion

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Effusion occupying more than 1/3rd and less than 2/3rd of volume –moderate effusion Effusion occupying more than 2/3rd of volume – massive effusion Patient is subjected to other investigations like CBP, RFT, LFT, serum electrolytes, total leukocyte count (TLC), differential count (DC), viral markers, RBS, Serum proteins, sputum CBNAAT, pleural fluid CBNAAT, pleural fluid ADA, pleural fluid cytology, biochemical analysis and cell block for malignant cells. An informed consent was taken from patients in their native language regarding thoracocentesis.

Investigations

A diagnostic thoracocentesis was done on all patients. Patients were made to sit in position recommended by R.W. Light77 The patient is made to sit by the side of a bed with arms and head resting on one or more pillows by bedside table, with foot stool under. Back should be vertical. In this position, fluid was aspirated from mid axillary line, one interspace below the dull tactile fremitus and also confirming the exact location with the help of chest radiograph. Ultrasound chest done in small effusions, those difficult to diagnosed by percussion.

Materials needed

For therapeutic aspiration lignocaine 1% or 2%, povidone iodine solution, surgical spirit, sterile gloves, gauze pads and cotton, sterile drape, adhesive tape, one 5ml syringe, one 50ml/20ml syringe, two no.18 needles, sterile bottle/cups for pleural fluid collection, a 3-way cannula, IV set. The site of thoracocentesis was identified and marked with a pen. Sterilize the area with povidone iodine and spirit all around. Sterile drape was placed on bed. Skin, periosteum, and parietal pleura were pierced with 25 gauze needle and anaesthetized with lignocaine. 50 ml syringe was used with 22-guage needle and fluid was aspirated with 1ml of heparin in it to prevent clotting of fluid. Ultrasound guided thoracocentesis was done if needed.

Fluid processing and testing

Biochemistry	5 ml	Protein, glucose lactate dehydrogenase, adenosine deaminase, amylase if needed.
Hematology	5 ml	Total white cell count, Differential count
Microbiological	5 ml	CBNAAT
Cytology	20 ml	Cytology and cell block analysis for malignant cells

Therapeutic thoracocentesis was completed and patient is kept for observation for any evidence of iatrogenic pneumothorax. Repeat chest radiographs to be done to see if any pneumothorax occurred and to see if any residual fluid is there.

Other investigations

- CT CHEST- CT is done in cases with any mass lesions on x-ray
- USG chest- It is mandatorily done to mark the area in case of loculated effusion or there is a minimal effusion.
- Other enzymes- In view of suspected pancreatic effusions pleural fluid amylase and lipase levels were tested.

Statistical analysis

For statistical calculations, data is spread in excel sheet descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean ± SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5% level of significance. Chi-square/Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups. A p value ≤ 0.05 was considered statistically significant. The Statistical software namely SPSS 21.0 was used for the analysis of the data.

Observations and Results

Table 1: Showing age and sex distribution

Age	Sex			
	Male		Female	
	Frequency	Percent	Frequency	Percent
11-20	1	14.29	6	85.71
21-30	10	66.67	5	33.33
31-40	11	61.11	7	38.89
41-50	14	56	11	44
51-60	14	73.68	5	26.32
61-70	4	57.14	3	42.86

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71-80	5	83.33	1	16.67
Above 80	0	0	3	100
Total	59	59	41	100

100 patients with pleural effusions were studied. We observed 59 males and 41 females. The mean age group was 44.82±16.69. The men to women ratio was 1.4:1.

Table 2: Showing distribution of clinical features

Symptom	Malignant	Tubercular	Pancreatic	Pulmonary embolism	Para pneumonic	Undiagnosed
Cough	5	28	2	0	18	3
	8.93%	50%	3.57%	0	32.14%	5.36%
SOB	9	24	9	1	9	1
	16.98%	45.28%	16.98%	1.89%	16.98%	1.89%
Fever	0	29	0	0	16	0
	0	64.44%	0	0	35.56%	0
Chest pain	7	23	0	2	8	0
	17.5%	57.5%	0	5%	20%	0
Weight Loss	5	16	0	0	7	0
	17.86%	57.14%	0	0	25%	0
Loss of Appetite	2	16	0	0	2	0
	10%	80%	0	0	10%	0
Haemoptysis	5	1	0	0	1	0
	71.43%	14.29%	0	0	14.29%	0

Patients having tubercular effusion had complaints of loss of appetite (80%), cough (50%) and fever (64.44%). Patients with malignancy presented mostly with weight loss (17.5%) and shortness of breath (16.98%). Patients with parapneumonic effusions mostly had fever (35.56%) and cough (32.14%).
Left sided pathology was slightly more (52%) compared to right (48%) here. Tubercular effusions in my study were more on left side (53.85%), right side (46.15%). Malignant effusions were more on right (53.85%), left (46.15%).
Out of 100 cases 25 patients had massive effusion among them 8(32%) were due to malignancy, 9(36%) were due to tuberculosis, 7 (28%) were cause of pancreatic pathology and 1 remained undiagnosed. 45 cases were moderate, among them 35(81.39%) were due to tuberculosis, 2(4.65%) were due to malignancy, 3(6.97%) were cause of bacterial infection. The remaining were minimal effusions, among them 8 (25%) were due to tuberculosis and 17 (53.13%) were due to parapneumonic effusions.

Table 3: Etiological distribution in exudative pleural effusions

Etiology	Frequency	Percent
Tubercular effusion	52	52
Parapneumonic effusion	20	20
Malignant effusion	13	13
Pulmonary embolism	2	2
Pancreatic effusion	9	9
Undiagnosed	4	4
Total	100	100

In our study, we divided patients into tubercular effusions in those who had sputum CBNAAT positive or pleural fluid CBNAAT positive or those who had lymphocyte predominate effusion or biochemical measures meeting Light's criteria. The majority were tubercular effusion (52%). There were parapneumonic effusions (20%), malignant effusions (13%), pancreatic effusions (9%), pulmonary embolism (2%) and undiagnosed (4%).
Patients with tubercular effusions had a mean age group of (40.36±2.16), malignant effusions were (66.3±4.04), parapneumonic effusions were (41.25±3.37), pancreatic effusions were (43.11±1.67).
59 males and 41 females were studied here. Among the male population, 30 were tubercular group, 6 malignant group, 9 among pancreatic group, 11 among parapneumonic group. Among female population, 22 were tubercular, 9 parapneumonic, 7 were malignant and rest others.

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Table 4: Gross appearance in fluid in various causes

Diagnosis	Pleural fluid appearance			
	Straw	Hemorrhagic	Thinpus	Total
malignant	5 38.46%	8 61.54%	0 0.00%	13 100
tubercular	42 80.77%	9 17.31%	1 1.92%	52 100
pancreatic	0 0.00%	9 100.00%	0 0.00%	9 100
pulmonaryembolism	0 0.00%	2 100.00%	0 0.00%	2 100
parapneumonic	10 50.00%	10 50.00%	0 0.00%	20 100
undiagnosed	4 100.00%	0 0.00	0 0.00%	4 100
Total	61 61.00%	38 38.00%	1 1.00%	100 100

61.54% of malignant effusions were hemorrhagic, 80.77% of tubercular effusions were hemorrhagic in appearance. All pulmonary embolism cases were hemorrhagic in appearance.

Pleural fluid of all 100 cases was examined for total cellular count and differential count was done, 49 among 52 (94.23%) of tubercular effusion cases had lymphocyte predominance. 11 out of 13(84.61%) of malignant effusions was lymphocyte predominate.17 out of 20 (80%) of parapneumonic effusions were neutrophil predominant.

Table 5: Pleural fluid serum protein ratio in different etiologies

P/S Protein Ratio							
P/S Protein Ratio	Diagnosis						
	Malignant	Tubercular	Pancreatic	pulmonary embolism	Para pneumonic	Undiagnosed	Total
<0.5	0.	1	1	0	3	0	5
	0.00	20.00	20.00	0.00	60.00	0.00	100
0.51-0.7	8	24	8	2	10	3	55
	14.55	43.64	14.55	3.64	18.18	5.45	100
>0.7	5	27	0	0	7	1	40
	12.50	67.50	0.00	0.00	17.5	2.50	100
Total	13	52	9	2	20	4	100
	13.00	52.00	9.00	2.00	20.00	4.00	100

Among 52 tubercular pleural effusion cases 43.64% had pleural fluid/serum protein ratio above 0.5, 67.5% had ratio above 0.7. 14.55% among malignant related effusions has ratio above 0.5 and 12.5% cases had ratio above 0.7. Among parapneumonic effusions 18.18% cases had ratio above 0.5, 17.5% had ratio above 0.7.

Mean glucose level among tubercular effusion in my study is 71.75±2.7, tubercular effusions is 71.15±7.1, and among pancreatic effusions have 98.4±2.4.

Among 52 tubercular effusions about 24 had ratio of pleural fluid to serum LDH between 0.5-1, 19 cases ratio is above 2, rest of the 9 had ratio between 1-2. Among 13 malignant cases, 8 had ratio more than 2, 3 had ratio between 1-2.

Table 6: ADA levels in different etiologies

ADA Value	Malignant	Tubercular	Pancreatic	Pulmonary embolism	Para pneumonic	Undiagnosed	Total
0-30	10 20.00	6 12.00	9 18.00	2 4.00	19 38.00	4 8.00	50 100
31-40	0 0.00	3 75.00	0 0.00	0 0.00	1 25.00	0 0.00	4 100
41-70	3 10.00	27 90.00	0 0.00	0 0.00	0 0.00	0 0.00	30 100
>70	0 0.00	16 100	0 0.00	0 0.00	0 0.00	0 0.00	16 100
Total	13 13.00	52 52.00	9 9.00	2 2.00	20 20.00	4 4.00	100 100
chi2=68.25 Df=43.55 p-value=0							

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75% of tubercular effusions in my study showed ADA levels above 30, 90% had value above 40. 20% malignant effusions had ADA value <30.

Table 7: CBNAAT in sputum and pleural fluid in tuberculous effusion

Sputum CBNAAT	Pleural fluid CBNAAT		
	Positive	Negative	Total
Positive	5	4	9
Negative	4	39	43
Total	9	43	52

In our study among 52 tubercular pleural effusion cases, 9 (17.3%) had sputum positive for mycobacterium. Among these 9, 5 had pleural fluid CBNAAT too positive. The rest 43 cases (82.69%) had negative sputum for mycobacterium. 4 cases had pleural fluid CBNAAT detected.

Table 8: ADA and CBNAAT in pleural fluid in tuberculous effusion

ADA	Pleural Fluid CBNAAT	
	Positive	Negative
>40IU/L	6	40
<40IU/L	3	3
TOTAL	9	43

There were 52 tubercular effusion cases in our study. Among them, 6 cases had raised ADA above 40 and pleural fluid CBNAAT detection for mycobacterium. 40 of them had ADA above cut off value but mycobacterium was not detected. Mycobacterium was detected among 3cases who had borderline raised ADA but less than 40 IU/L.

Discussion

This study included 100 patients having pleural effusions. Among them52 were due to tuberculosis and 48 were non-tuberculous effusions. In my study out of 100 cases of pleural effusion, we classified them as 52 tuberculous, remaining 48 cases were non- tuberculous. 20 from parapneumonic effusions, 13 malignant, 2 pulmonary emboli, 9 from pancreatic and 4 are undiagnosed. Among malignant causes, 5 were lung masses, 2 had previous breast carcinoma, 3 were lymphomas, 1 ovarian tumor suspected, 2 unknown primaries.

On comparing with previous studies, the distributions are as follows– Prabhu desai [5] have shown 64% of infective cases are tuberculous. In patients aged above 40, malignant related effusions were more common. KZ mamum [6] showed tuberculosis (66.7%) and parapneumonic (12.2%) as major causes and malignancy was (7.8%) among hundred cases with 90 exudative causes. Maldhure *et al*., [2] conducted a study among 100 cases with 90 exudates which showed that tubercular effusions constitute 66%, malignancy 15%, parapneumonic effusions 4.8% of the pleural effusions. In a study conducted by Al quatrain [7] tubercular effusions were 37%, neoplasm was 8%, parapneumonic were 14%. In Valdes L *et al*., 47 study 642 effusions were studied in a five-year period showed 25% tuberculosis effusion, 22.9% neo plastic cause, and 7.5% remained undiagnosed. Among neoplasm, lung was the most common primary origin in 32.6%, breast accounted for 11.5%, lymphomas in 10.8%, ovary being the primary source in 7.5% and in 21 cases 14.3% of the neo plastic group, primary remained unidentified

Table 9: Percentage of three most common effusions in different studies

Study	Tubercular effusions	Malignant effusions	parapneumonic effusions
Present study	52%	13%	20%
KZ Mamum79	66.7%	7.8%	12.2%
Maldhure *et al*, [2]	66%	15%	4.8%
AL quatrain80	37%	8%	14%

There are 59 male cases and 41 females in this study. Among the male population, 30 belonged to tubercular group, 6 to malignant group, 9 to among pancreatic group, 11 among parapneumonic group. Among female population, 22 were tubercular, 9 parapneumonic, 7 were malignant and rest others.

In various studies the following results were noted- Subhakar. K [8] -77.5% men and 22.5% women. Leesly J. Burgess [9] – 58% men and 42% women. AL quatrain [7] study- out of 101 cases 56 were females and 44 were males.

Out of 100 cases with pleural effusion in my study 48 were right sided and 52 were left sided whereas study conducted by Al quatrain[7] pleuraleffusions were 55% on right side than on the left; In Folindor [10] both right and left side effusions were equally distributed. According to Berger HW *et al*., [11] 28 in fifty cases were right sided, 20 in fifty had effusion on left and rest 2 had bilateral effusions.

All cases had their sputum examined for Xpert. Out of 52 cases of tubercular effusions in my study, 9

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cases (17.3%) had sputum CBNAAT showing MTB detected. In other studies: Subhakar.K [8] – 7 out of 62 patients (11%) with tuberculous effusion showed mycobacterium detection in sputum. Pleural fluid culture and AFB staining was not done in my study.

We observed 61 patients with straw colored fluid, 38 with bloody appearance, one had thin pus. 61.54% of hemorrhagic fluids were because of malignancy, 80.77% of straw-colored fluids are due to tuberculosis. In my study 15.94% of lymphocytosis is seen in malignant cases and 49% of lymphocytosis is seen in tubercular effusions. 6.45%of malignant effusion cases had neutrophil predominance and 9.68% of tubercular effusion cases had neutrophil predominance. Cytology for malignant cells was found positive in 72.72% cases. According to books cytology is more sensitive test to identify malignancy compared to biopsy.

Valdes L *et al*., [12] study for a five year period among 642 cases including both transudates and exudates showed neutrophil predominance in tubercular effusions is 6.7%. Malignant cells were seen in 72.72% of malignant effusions. Folindor86 showed abundance of lymphocytes and few mesothelial cells in tubercular pathology; Nance KV [13] cytology was diagnostic in 71% for cancers; Light RW [14] neutrophilia in effusion indicates bacterial pneumonia and Lymphocytes direct towards tubercular effusions. Positive cytology observed in 33-87%.

Proteins in fluid in our study ranged from 2.5 to 7.2 gm/dl. In 4 among 100 cases, protein count was less in malnourished cases but as serum proteins were also low ratio for exudative effusion matched the criteria. Pleural fluid to serum protein ratio in my study has a mean of 0.742 which is significant. P-value was 0.073. As per literature and light's criteria to label as exudative pleural effusion the protein ratio has to be greater than 0.5.

The mean pleural fluid by serum protein ratio among tubercular effusions is 0.82±0.08, among malignant effusions is 0.68±0.025, among parapneumonic effusions is 0.67±0.03, among pancreatic effusion 0.58±0.02, pulmonary embolisms is 0.63.

A study conducted by Bernard J Roth and Thomas J *et al*., [15] out of 59 cases 41 cases (69.49%) had pleural fluid by serum protein ratio above 0.5. Alternative tests with higher specificity have been proposed pleural- to-serum albumin gradient, pleural- to-serum protein gradient. But the ability of Light's criteria to rule out exudates has been higher consistently [16, 17]. In scenario of CHF if effusion is drained after giving diuretics, it misleads as an exudate as protein ratio become less than 0.65. then we consider pleural fluid-serum protein gradient. If greater than 3gm/dl then the fluid is transudate.

The mean ADA value in different etiologies was measured. The mean ADA value for tubercular effusions was 59.63±2.64, a malignant effusion was 30.15±5.49, parapneumonic effusions was 20.35±1.34. In my study we have taken 40 as cut off value of ADA [18] for tuberculosis. Sensitivity of ADA in detecting tubercular effusions was 93.48% and specificity was 83.33%.

This was similar to study done by Shargan, Smitha, Nair *et al*., [19] The mean ADA value was 60.09±38.36 IU/L among the cases with tuberculosis and 21.01±22.82 IU/L in the other group. At a cut-off value of 38.3 IU/L for tuberculosis, pleural fluid ADA showed a sensitivity of 93% and a specificity of 97% in diagnosing tuberculosis etiology. Books say that pleural fluid "ADA has a good differentiating property in differentiating malignant and tubercular effusions" Many studies have considered cut off ADA values between 40 and 70 IU/L.

In our study ADA was done in all cases and out of 52 tubercular effusion cases 43 cases (82.6%) had ADA above 40 and only 17.4% had ADA below 40 IU/L. Adenosine deaminase maynot be raised in patients with concomitant HIV infection [20].

In study conducted by Valdes *et al*., [21] and Burgess *et al*., 54 demonstrated pleural fluid ADA more than 70IU/L. The mean of ADA was high is 2 Indian studies one performed by Rajendra prasad *et al*., [22] and Gilhotra *et al*., [23] withthe mean ADA level ranging between 76.8± 23.8 to 95.8 ±57.5.

All our study samples were sent for CBNAAT for detection of mycobacterium along with sputum samples. In my study out of 52 tubercular effusion cases 9 cases (17.3%) showed mycobacterium in sputum CBNAAT and among them 5 cases had mycobacterium detected in their pleural fluid sample. The remaining 43 cases had sputum mycobacterium not detected and among them 4 cases (9.30%) had showed pleural fluid mycobacterium detection in CBNAAT. So, sensitivity is only 19.57% and specificity 85.19%.

In comparison to otherstudies done by Patil shital *et al*., [24] in 2013, hundred cases aged more than 12 were subjected to pleural fluid CBNAAT in comparison with other conventional tests like pleural fluid biochemical parameters, cellular analysis, ADA in and among them 54% cases had pleural fluid detected. The sensitivity was 33.33% and specificity was 92.86%.

Reechaipichitkul *et al*., [25] study in 98 subjects comparing pleural fluid AFB staining, culture and PCR showed pleural fluid CBNAAT sensitivity of50% and specificity of 61%. Handojo *et al*., [26] in 2019 conducted a study in 220 patients in extra pulmonary cases which 184 among them were pleural effusions 57 showed detected mycobacterium by CBNAAT and showed CBNAAT sensitivity of 53.35% and specificity of 93.75% for pleural fluid samples.

Chakraborty *et al*., [27] in 2019 observed positive Pleural fluid CBNAAT for MTB in 24 patients (32%) among 75 patients while sputum was positive in 8(10.16%) cases. There was no significant association

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between ADA levels and CBNAAT as in my study suggesting a low sensitivity rate.
The chance of detecting mycobacterium becomes higher with a bigger sample volume. AS I have taken only sent 5ml of pleural fluid for PCR, I might have got few false negative results. In view of the fact that delayed hypersensitivity is the under lying immune response in tubercular pleurisy, the pauci-bacillary state could be accounted for the false-negative results to some degree. However, whenever the result was positive, the mycobacterial load must have been sufficiently high.
Hasaneen *et al*., [28] have reported that 93% sensitivity of PCR for pleural biopsy samples but the underlying invasiveprocedure makes it intricate to comply with. To further enhance sensitivity of PCRMPB64 together with the IS6110 targeted primers in a multiplex PCR- possibly will be the answer, where 100% sensitivity and specificity could be accomplished [29].

Conclusion

Pleural effusions are more commonly encounted in Pulmonary and Medical practices in our country. Our study is a prospective hospital based observational study. In our study more commonly exudative effusions are detected. For further detection of cases other investigations Pleural Biopsy, Ultrasonography, Radiological examination, Bio chemical analysis of pleural fluid, cytology and Enzymatic analysis and Gene-Xpert method were also important for diagnosis Exudative Pleural Effusion.

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