

# Pathological Profile of Exudative Pleural Effusion using Pleural Biopsy by Abram's Needle: A Hospital-based Observational Study

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## Abstract

**Introduction:** Pleural effusion is one of the common lung disorders in medical practice. Nearly 10 lakh individuals are reported to develop pleural effusion globally every year, and the etiology of pleural effusion varies widely from one community to the other. The objective of the present study is to assess the etiology of exudative pleural effusions, using pleural biopsy by Abram's needle.

**Materials and Methods:** The study is a hospital-based prospective observational study undertaken in the Department of Pulmonary Medicine at S.V.S Medical College, Mahabubnagar, Telangana, India, from October 2013 to October 2015. Pleural tissue taken by the Abram's biopsy needle and sent for histopathology examination.

**Results and Conclusions:** A total of 100 participants were included in the final analysis. The most common cause was tuberculosis (TB) (58%) followed by chronic inflammation of non-specific origin (30%) and malignancy (12%) of whom equal proportion (5%) of them had adenocarcinoma and squamous cell carcinoma. There was no statistically significant association between age, gender, and TB. There was statistically highly significant ( $P < 0.001$ ) association between malignancy and increased age. However, there was no significant association ( $P = 0.85$ ) between gender and malignancy.

**Key words:** Abram's needle, Exudative effusion, Pleural Biopsy

## INTRODUCTION

Pleural effusion is one of the common lung disorders in medical practice. Nearly 10 lakh individuals are reported to develop pleural effusion globally every year.<sup>1</sup> The etiology of pleural effusion varies widely from one community to the other, frequently being a complication of an underlying illness. Commonly exudative pleural effusions of infective origin are observed in young patients while among elderly it is due to malignancy.<sup>2</sup> However, even after thorough investigations, identifying the exact cause for effective

management of the case can be often challenging for the pulmonologist.

The incidence of tuberculosis (TB) in a given region seems to influence the occurrence of pleural effusion more frequently. Valdes *et al.* have reported that in areas of high TB incidence, the most frequent cause of pleural effusion is TB (25%), followed by malignancy (23%), congestive cardiac failure (18%), and pneumonia in 14% of the cases.<sup>3</sup> In a retrospective study by Ngho, among 100 cases of pleural effusion, TB accounted for 49 cases, malignancy for 43 cases, and exudative pleural effusion accounted for most (94%) of the cases.<sup>4</sup>

Mycobacterium TB affects nearly one-third of world's population,<sup>5</sup> and pleural TB is found to be the common extrapulmonary TB, especially in HIV/AIDS patients.<sup>6</sup> The histological and/or microbiological examination of TB pleuritis, the gold standard test<sup>7,8</sup> of confirmation requires

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the pleural tissue extraction. Although such tissue can be obtained by thoracoscopy, open surgical procedures or closed biopsy.<sup>7,8</sup> The former two seem to be limited in the commonplace and the latter is, therefore, a sought after initial investigation across the world.

Various types of closed pleural biopsy needles are available since their introduction during the 1950s that comprise Abrams, Cope, and Vim-Silverman needles among others.<sup>9-11</sup> Studies have consistently shown that among these types, the Abram's needle owing to its high yield is the most commonly used one.<sup>12,13</sup> Hence, the objective of the present study is to assess the etiology of exudative pleural effusions, using pleural biopsy using Abram's needle.

### Objectives

1. To study the etiology of exudative pleural effusions, using pleural biopsy, presenting to a tertiary care hospital.

## MATERIALS AND METHODS

### Study Design

The study is a hospital-based prospective observational study.

### Study Setting

The study was undertaken in the Department of Pulmonary Medicine at S.V.S Medical College, Mahabubnagar, Telangana, India.

### Study Duration

The study was conducted from October 2013 to October 2015.

### Study Population

Patients presenting to the study setting, with exudative pleural effusion.

### Inclusion Criteria

- Age above 11 years
- Moderate (25-75% of hemithorax) and massive (>75% of the hemithorax) pleural effusions had been taken into the study by clinical, radiological examination, and by pleural fluid analysis.

### Exclusion Criteria

- Patients with bleeding disorders
- Patients with local skin infections
- Patients with very low platelet count
- Pleural effusions secondary to well documented the chronic history of heart failure, Eritinis syndrome, cirrhosis of liver, and other transudate pleural effusions.

### Sample Size and Sampling Methods

A total of 100 subjects were recruited sequentially into the study after screening for compliance with inclusion and exclusion criteria, hence no sampling was done.

### Ethical Issues

Approval of the Institute Human Ethics Committee was obtained. Informed written consent was obtained from all the participants after explaining the objectives of the study, risks, and benefits involved. The personal details of the patients were kept confidential throughout the study.

### Study Procedure

After obtaining the informed written consent, socio-demographic, past, and current medical history was collected from each participant, using structured pro forma. After general physical examination and systemic examination, the following investigations were done in all patients.

- Routine investigations: Hemoglobin (Hb), total count, differential count (DC), erythrocyte sedimentation rate, blood sugar, blood urea, serum creatinine bleeding time, and clotting time
- Chest X-ray posteroanterior view
- Ultrasound abdomen and chest
- Electrocardiogram
- Sputum for acid-fast bacilli (AFB) staining
- HIV, hepatitis B surface antigen
- Pleural fluid analysis (50 ml):
  - Cytological: Total leukocyte court, DC, and cytology for malignant cells
  - Biochemical: Protein and sugar
  - Adenosine deaminase
  - Lactate dehydrogenase
  - Bacteriological: (a) AFB stain, (b) Gram's stain
  - Culture for pyogenic organisms
- Pleural tissue taken by the Abram's biopsy needle and sent for histopathology examination.

### Statistical Analysis

Age, gender, disease-related parameters were considered as explanatory variables. Etiology of the disease as diagnosed by histopathological examination was the primary outcome variable. Descriptive analysis of the data was done using frequency and percentage for categorical variables, mean and standard deviation for quantitative variables. The association between the explanatory and outcome variables was assessed by calculating the odds ratio and 95% confidence interval. Chi-square test was used to test the statistical significance of the association.  $P = 0.05$  was considered as statistically significant. IBM SPSS version 21 was used for statistical analysis.

## RESULTS

A total of 100 participants were included in the final analysis. Age-wise distribution (Table 1) showed a majority of subjects belonged to the age group of 26-45 years, whereas 23% were aged below 25 years and only 7% of them were above 60 years. On the whole, males (69%) outnumbered females (31%).

Regarding the etiological profile of pleural effusion (Table 2), the most common cause was TB (58%) followed by chronic inflammation of non-specific origin (30%) and malignancy (12%) of whom equal proportion (5%) of them had adenocarcinoma and squamous cell carcinoma.

Assessing the association between TB and age (Table 3) showed that though, subjects with TB outnumbered those without TB in all the age groups except among 46-60 years (46.16%:53.84%), there was no significant association found ( $P = 0.449$ ) was found. Among all age groups, majority of TB cases were found above 60 years (71.42%) and in below 25 years age group (60.8%). Gender-wise assessment also showed non-significant association ( $P = 0.18$ ) among males (53.62%:46.37%) and females (67.74%:32.25%).

Regarding the association between malignancy and age (Table 4), there was a statistically highly significant ( $P < 0.001$ ) association across the age groups. Majority of malignancy positive cases were present in above 60 years age group (64.28%) and in below 25 years, 26 to 45 years age group (64.28%). However in 46-60 years age

**Table 1: Age and gender distribution of study participants**

Parameter	Frequency (%)
Age group	
Below 25	23 (23)
26 to 45	37 (44)
46 to 60	26 (28)
Above 60	14 (7)
Gender	
Males	69 (69)
Females	31 (31)

**Table 2: Etiological profile of pleural effusion (n=100)**

Etiology	Frequency (%)
Tuberculosis	58 (58)
Chronic non-specific inflammation	30 (30)
Malignancy	12 (12)
Adenocarcinoma	5 (5)
Squamous cell carcinoma	5 (5)
Others	2 (2)

group, only 11.53% have malignancy, while malignancy was completely absent in below 25 years and 26-45 years age group (0%). However, gender-wise, there was no significant association ( $P = 0.85$ ) either among males or females. In both genders, nearly 88% was malignancy negative.

## DISCUSSION

About four decades after thoracoscopy was established by Jacobaeus, the era of closed pleural biopsy needles began and soon gained considerable acceptance as well.<sup>13</sup> Such procedures are supposed to be painless and necessitate the use of local anesthesia, and their main complication is pneumothorax. Owing to the larger caliber of the Abram's needle along with the respiratory movements of patients increase the risk of entry of outside air into the pleural space unless the device is kept closed. However, a very few of them require intervention though pneumothorax may be seen in about 15% of the cases.<sup>14</sup>

The study findings reveal that TB accounted for the most common reason for pleural effusion in the study subjects followed by non-specific chronic inflammation and malignancy. Similar findings were reported by Ngoh (49% cases of TB and 43% that of malignancy), whereas Lad *et al.*<sup>15</sup> reported that 37.6% of the cases to be TB, 30.5% of malignancy, and 29.5% of them having non-specific

**Table 3: Association tuberculosis with age and gender of study population**

Parameter	Tuberculosis		Chi-square value	P
	Present (%)	Absent (%)		
Age group				
Below 25	14 (60.8)	9 (39.13)	2.64	0.449
26-45	22 (59.45)	15 (40.54)		
46-60	12 (46.15)	14 (53.84)		
Above 60	10 (71.42)	4 (28.57)		
Gender				
Male	37 (53.62)	32 (46.37)	1.75	0.18
Female	21 (67.74)	10 (32.25)		

**Table 4: Association of malignant pleural effusion with age and gender**

Parameter	Malignancy		Chi-square value	P
	Present (%)	Absent (%)		
Age group				
Below 25	0 (0)	23 (100)	44.43	<0.001
26-45	0 (0)	37 (100)		
46-60	3 (11.53)	23 (88.46)		
Above 60	9 (64.28)	5 (35.71)		
Gender				
Male	8 (11.59)	61 (88.40)	0.034	0.85
Female	4 (12.90)	27 (87.09)		

inflammation and Maji *et al.* found TB in 54.5% of cases and malignancy in 28.1% of them.<sup>16</sup> Contrasting with our study findings, How *et al.* found that malignancy was the most common (34.2%) cause of pleural effusion while TB accounted for 22.5% of the cases.<sup>17</sup>

Regarding the age-wise distribution of subjects, we found that most of TB cases (36 out of 58) were aged 45 years and below, while all the cases of malignancy belonged to the age group of 46-60 years and above 60 years (12:10). The study by Lad *et al.* found the mean age of patient with TB was 49 years while for malignant patients was 63 years.<sup>15</sup>

The overall diagnostic yield of Abram's needle biopsies for TB pleuritis in a population with a high pretest probability for the disease was found to be 81.8%. In one of the largest prospectives and the first randomized study performed to compare the US-assisted Abram's needle biopsies with US-assisted Tru-Cut needle biopsies with regard to the diagnostic yield for pleural TB<sup>18</sup> concluded that the use of Abram's needle are more likely to extract the pleural and have a significantly higher diagnostic sensitivity for pleural TB. It further opined that Abram's needle should be the choice for closed pleural biopsies, especially in areas where the prevalence of TB is high.

## CONCLUSION

To conclude the study findings reveal that Abram's needle can be a useful aid in identifying exudative pleural effusion, especially in subjects with TB employing closed pleural biopsy method. However, owing to the small sample size, a definitive conclusion of it can be obtained when different needles are compared with a larger sample specially in Indian population.

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