

Original Article

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Histomorphological Spectrum of Pleural Biopsy Specimen of Exudative Pleural Effusion in a Tertiary Care Hospital in Bangladesh.

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Abstract

Background: The commonest manifestation of pleural pathology is pleural effusion. Most of the time, in spite of routine biochemical and cytological examination of pleural fluid we can't evaluate the etiology of pleural effusion.

Aim: Aim of present study was to make an etiological diagnosis of exudative pleural effusion by pleural biopsy and histopathological examination.

Study design and setting: Fifty consecutive patients of pleural effusion were selected from the outpatient and indoor department of a tertiary medical college hospital in Sylhet. It was a prospective and observational study. It was conducted over a period of one and a half years.

Material and method: In all the cases, cytological examination of pleural fluid (for malignant cell) and pleural biopsy by Abram's needle were done. Subsequently, histopathological diagnoses were made to determine the etiology of effusion.

Results: Out of 50 subjects, males outnumbered females, Age is ranged between 19 and 85 years. According to the histopathological examination of the submitted pleural biopsy specimen, granulomatous inflammation is the most common etiology (40%) followed by chronic inflammation of non-specific origin (38%) and malignancy (22%).

Conclusion: This study represents the result of the experience acquired over one and half years in the histopathological interpretation of pleural biopsies and its correlation with cytology of the pleural fluid. Pleural biopsy is a useful, minimally invasive procedure with no or little complication and has more sensitivity and specificity than pleural fluid cytology smears.

Key words: Pleural biopsy, thoracentesis, exudative, transudative, TB, Abram's biopsy needle.

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Introduction

Pleural effusion is one of the common lung disorders in medical practice¹.

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Worldwide near about one million people develop pleural effusion each year². Among all the pleural effusion patients approximately 4% are attended to the general medical outpatient department³.

Pleural effusion is of two types transudative and exudative. Transudative pleural fluid is low in protein content and is usually found in some systemic diseases like hepatic, renal, or cardiac disorders. On the other hand, exudative pleural fluid is high in protein content and exudative effusion mostly occurs in pulmonary pathology like tuberculosis (TB), other infections, and malignancy. So, the etiological diagnosis of exudative pleural effusion is mandatory for proper management⁴.

From the ancient period, pleural fluid cytology was used to find out the etiology of pleural effusion as it was a simple and minimally invasive procedure⁵.

Till now, provisional diagnosis is usually made based on clinical features and pleural fluid analysis. However, definitive diagnosis is usually made either by thoracentesis with identification of malignant cells or a specific organism in pleural fluid or histopathological diagnosis of the pleural biopsy specimen.⁷

The diagnostic workup of exudative pleural effusions may require closed pleural biopsy for histopathological assessment to reach a diagnosis when the initial thoracentesis has been failed to give a specific clue⁸.

The thoroscopic evaluation and biopsy for histopathological diagnosis is the best choice for undiagnosed pleural effusion then the closed pleural biopsy. But the developing countries like India, Nepal, Pakistan, and Bangladesh hold a huge number of patients with TB and malignancy present with pleural effusion but still infrastructure and expertise for thoroscopic evaluation is very limited⁹.

Though, thoracoscopy admits the gold standard for etiological diagnoses of pleural effusion; but still closed pleural biopsy has an important role in the diagnosis of exudative pleural effusion owing to its practicability and safety in pleural diseases¹⁰.

Needle biopsy of pleura was first described in 1955 using Vim Silverman needle and later Abram, Cope, and Raja introduced different types of needles and were known by the inventors' name. Tru-cut biopsy needles are used infrequently for pleural biopsy¹¹.

It is established by different studies that among these types of needles, Abram's needle is mostly and randomly used one owing to its high advantage and reliability¹.

The aim of this study is to evaluate the etiological diagnosis of exudative pleural effusions by histopathological examination of pleural biopsy specimens in a tertiary care hospital.

Material and methods:

This cross-sectional observational study was performed from January 2019 to June 2020 in the department of pathology and accompanied by the department of medicine, MAG Osmani Medical College, Sylhet, Bangladesh which is a tertiary care hospital. Initially, fifty-four (54)

consecutive cases with pleural effusion were included in this study. After giving a full explanation regarding the study, written informed consent was taken from the patients. The detailed clinical history and physical examination of each patient were recorded. Ensuring the confirmation of pleural effusion by chest X-ray, diagnostic thoracentesis was performed to get the fluid for biochemical and cytological (cell type, cell count, and malignant cells with Papanicolaou stain) analysis. Then Pleural biopsy specimens are collected from all patients with exudative pleural effusion in the medicine department by Abram's biopsy needle. Pleural tissue was obtained, placed in a vial with 10% formalin for histopathological examination, and sent to the department of pathology for histopathological diagnosis. Out of these fifty-four (54) cases, four (4) cases were excluded from the study due to inadequate tissue sample. Tissue processing, sectioning, fixing, and staining with Haematoxylin & Eosin was done following the standard protocol. Microscopic examination was performed carefully to determine the histopathological diagnosis & noted properly. All the patients were closely followed up after pleural biopsy to observe for any complications and no significant complication was observed. SPSS software version 23.0 (Statistical Package for the Social Sciences Inc, Chicago, IL, USA) was used for statistical analysis.

Result:

After fulfilling the inclusion and exclusion criteria, A total of fifty (50) participants were included in the final analysis.

The age of the study patients ranged from 19 to 85 years with a mean of 52.22 ± 18.29 . Age-wise distribution (Table-1) showed a majority of cases 12 (24%) belonged to the age group of 41 - 50 years, followed by 10 (20%) belonged to the age group of 61 - 70 years; whereas 6 (12%) were aged over 71 years and only 2 (4%) of them were belong to the age group of 11-20 years.

Table-1: Age distribution of the patients (n=50)

Age Group (Yrs)	Frequency	Percentage (%)
11-20	2	4.0
21-30	7	14.0
31-40	6	12.0
41-50	12	24.0
51-60	7	14.0
61-70	10	20.0
>71	6	12.0
Total	50	100.0

Among the fifty (50) cases, males were 37 (74%) and females were 13 (26%) in number and the male-female ratio is 2.85:1.00

Of the 50 cases, the majority 32 (64%) were tobacco users.

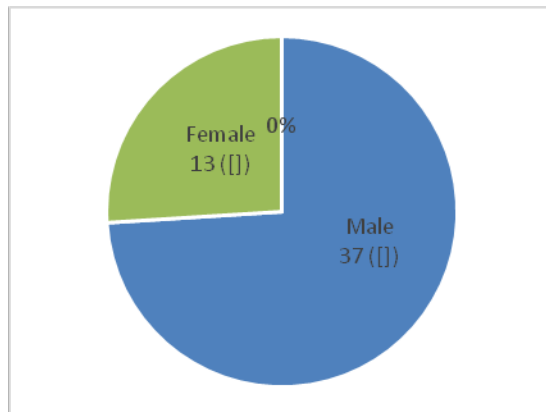


Fig-1: Pie-chart showing the gender of the cases

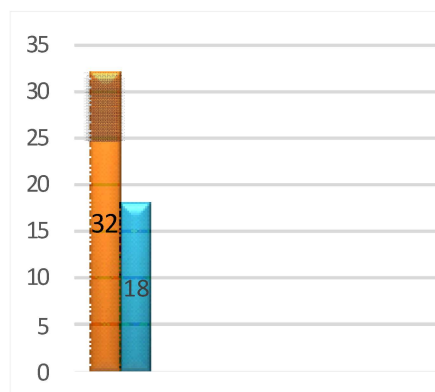


Fig 2: Bar Diagram showing the use of tobacco among the cases

Among the 50 cases, cytology of pleural fluid revealed suspicious for malignancy in only 4(8%) whereas 46 (92%) were negative for malignant cells.

Table-2: Cytological findings of pleural fluid (n=50)

Cytology	Frequency	Percentage (%)
Negative	46	92.0
Suspicious	4	8.0
Total	50	100.0

Regarding the histopathological examination of submitted pleural biopsy specimen, the most common cause was granulomatous 20 (40%) followed by chronic inflammation of non-specific origin 19 (38%) and malignancy were 11 (22%); among the malignancies squamous cell carcinoma was 6 (12%) and adenocarcinoma were 5 (10%).

Table-3: Histopathological findings of the pleural biopsy specimen

Histopathological Findings	Frequency	Percentage (%)
Granulomatous inflammation	20	40.0
Chronic nonspecific inflammation	19	38.0
Squamous cell carcinoma	6	12.0
Adenocarcinoma	5	10.0
Total	50	100.0

Table-4: Cytopathological & Histopathological findings of the cases (n=50)

Cytopathological Findings	Histopathological Findings			
	Granulomatous	Chr. Nonspecific Inflammation	SCC	Adenocarcinoma
Negative	20	19	4	3
Suspicious	0	0	2	2
Total	20	19	6	5

All of the suspicious cases were diagnosed as malignancy in histopathology and 7 (15.2%) out of 46 negative cases were diagnosed as malignancy in histopathology.

Table-5: Histopathological diagnosis and age distribution of the cases.

Histopathology	Age group (Yrs)							Total
	11-20	21-30	31-40	41-50	51-60	61-70	>71	
Granulomatous	1	3	2	5	4	4	1	20
Non-specific Pleuritis	1	3	4	4	2	4	1	19
SCC	0	0	0	1	0	1	4	6
Adenocarcinoma	0	1	0	2	1	1	0	5
Total	2	7	6	12	7	10	6	50

Age-wise distribution reveals, most of the granulomatous inflammation (15 out of 20) belongs below 60 yrs and malignant cases (6 out of 11) belong above 60 yrs.

Discussion

The mean age was 52.22 ± 18.29 and the age range were in between 19 and 85 years in our study. The mean age was 52.7 ± 16.0 in the study performed by Jamal Uddin et al⁴ and the mean age was 52.12 ± 16.42 in the study performed by Rajawat GS et al⁹. The age range was in between 14 to 85 years in the study performed by Reddy SL et al⁶ and Solooki M & Miri M¹² observed an age range between 15 to 85 years in their studies. Mean age and the age range were almost the same in different studies with our one.

A total of 50 participants were included in the final analysis, among them, 37 (74%) are male and 13 (26%) are female, almost comparable with the study performed by Jamal Uddin et al⁴ where males were 74.5% and females were 25.5%; Solooki M & Miri M¹² observed males 70% and females 30% in their study. Another study performed by Khattak MI et al³ showed 66% males and 34% females in their study. In most of the studies, males outnumbered females. Our observation is also the same. The reasons may be that in our settings, males more commonly come for medical help, and smoking-related lung diseases are more common in males as observed in another study in our country by Jamal Uddin et al⁴.

Out of fifty patients, 46 (92%) were diagnosed as negative for malignant cell in cytological examination and 4 (8%) patients were reported as suspicious cytology. None was reported as positive for malignancy but among them, 11 (22%) patients were confirmed as malignancy by histopathology. All the 20 (40%) patients who are confirmed as tuberculosis had negative cytology. Zuberi et al¹³ observed in their study that out of 28 confirmed malignancies by pleural biopsy, only 8 (28.6%) were positive for malignant cells on pleural fluid cytology, and the rest 20 (71.4%) were negative in cytology; all the patients diagnosed on histopathology as having pleural tuberculosis were cytologically negative as well.

Rial MB et al¹⁴ and some other authors observed that pleural fluid cytology was very low inaccuracy to diagnose a malignancy as that it depends on various factors such as specimen preparation, the experience of the cytologist, and the type of malignancy. James P et al⁷ demonstrated that repeated cytological examination of the pleural fluid sample is helpful to establish malignancy. In our study, a small number of participants and submission of only one pleural fluid sample may be a reason for negative pleural fluid cytology.

Regarding histopathologically confirmed diagnoses, our study findings reveal that granulomatous inflammation consistent with TB 20 (40%) accounted for the most common reason for pleural effusion in the study subjects, followed by non-specific chronic inflammation 19 (38%) and malignancy 11 (22%). The almost same result was observed by Reddy SL et al⁶ in their studies; where TB was 58%, non-specific inflammations were 30% & malignancy was 12%. Our study result is also comparable with another study of our country by Jamal Uddin et al⁴ where TB was 29.4%, malignancy 19.6%, chronic non-specific inflammation 17.6% & inconclusive were 33.3%. Zuberiet al¹³ observed in their study TB 48.9%, Malignancy 29.8%, chronic inflammation 6.4% & inconclusive 14.9%. Saha K et al¹⁵ found in their studies TB 60.98%, malignancy 21.95% & non-specific inflammation 17.07%. Khattak MI et al³ observed in their studies TB 67.5%, malignancy 25.0% & non-specific inflammation 7.5%. Solooki M & Miri M¹² observed in their studies malignancy 58.6%, TB 38.4% & nonspecific inflammation 5.0%. All of the above studies showed that epithelioid granuloma outnumbered malignancy histopathologically; except in the study performed by Solooki M & Miri M¹², where malignancy dominated the TB. The reasons may be due to the high prevalence of TB in our country and also in India & Pakistan making the frequency of malignancy relatively low in exudative pleural effusion.

Regarding the age-wise distribution of subjects according to histopathological diagnosis, we found that most of TB cases (15 out of 20) were below 60 years, while most of the cases of malignancy belonged to the age group of 61 -70 and years and above 71 years. Jamal Uddin et al⁴ showed a similar observation that the mean age of the TB cases was 45.0 ± 17.9 years and malignancy cases were 61.8 ± 13.0 years. Reddy KS et al¹ found a little bit different observation in their studies; they found that most of the TB cases (62%) were aged below 45 years while most of the malignancies (75%) belonged to the age group of above 60 years.

We carried out our study in a tertiary center and most of the pleural effusions in the older age group that were difficult to diagnose or remain

undiagnosed in a primary or secondary health center and were subsequently sent to a higher referral center for further workup. That may be the cause of the difference with other studies.

This study has some limitations with a small sample size, all the participants included were from a single-center, and single sample for cytological and histopathological evaluation, etc. So, a bigger multicenter study with repeated cytology and histopathological examination can minimize the study limitations.

Conclusion:

Pleural biopsy is a very important diagnostic tool in the diagnosis of undiagnosed exudative pleural effusion by the gross appearance pleural fluid as well as biochemistry and cytology. The role of closed pleural biopsy in cases of exudative pleural effusion is still pivotal as it yields a specific diagnosis in a significant number of cases. In the diagnostic workup of pleural effusion, cytology followed by pleural biopsy provides a very high efficacy in the diagnosis of tuberculosis and malignancy, the two most important causes of exudative pleural effusion in our settings. So, in developing countries with limited medical resources where facilities of thoracoscopy and imaging guided cutting needle biopsies are not easily available, blind pleural biopsy could be considered as a supplementary in the diagnostic workup of exudative pleural effusion.

References

1. Reddy KS, Sowmya J, Rao VC, Waghay P. Pathological Profile of Exudative Pleural Effusion using Pleural Biopsy by Abram's Needle: A Hospital-based Observational Study. *Int J Sci Stud* 2016;4(3):56-59.
2. Maji A, Maikap MK, Jash D, Saha K, Kundu A, Saha D, Banerjee S, Patra A. Role of Common Investigations in Aetiological Evaluation of Exudative Pleural Effusions. *Journal of Clinical and Diagnostic Research* 2013; 7(10): 2223-2226.
3. Khattak MI, Amin S, Shabbier G, Rehman SU. Diagnostic Value of Pleural Biopsy in Exudative Pleural Effusion. *Gomal Journal of Medical Sciences* 2011; 9 (2):156-158
4. Ahmed JU, Hossain MD, Afroz F, Rahim MA, Musa AKM. Role of Pleural Biopsy in the Etiological Diagnosis of Exudative Pleural

- Effusion. *Bangladesh Crit Care J* 2017; 5 (1): 33-36
5. Bhattacharya S, Bairagya TD, Das A, Mandal A, Das SK. Closed pleural biopsy is still useful in the evaluation of malignant pleural effusion. *J Lab Physicians* 2012; 4(1):35-38.
 6. Reddy SL, Varaprasad K, Narahari N, Bhaskar K, Varma GR, Paramjyothi GK. Clinical and etiological profile of an exudative pleural effusion in a tertiary care center. *Indian J Respir Care* 2019; 8(1):22-26.
 7. James P, Gupta R, Christopher DJ and Balamugesh T. Evaluation of the diagnostic yield and safety of closed pleural biopsy in the diagnosis of pleural effusion. *Indian J Tuberc* 2010; 57:19-24.
 8. Edgar JR, Wong ML, Hale M, Menezes CN. Histopathological diagnoses on pleural biopsy specimens over a 15-year period at Chris Hani Baragwanath Academic Hospital, Johannesburg, South Africa: A retrospective review. *SAfr Med J* 2019; 109(1):53-57.
 9. Rajawat GS, Batra S, Takhar RP, Rath L, Bhandari C, Gupta ML. Diagnostic yield and safety of closed needle pleural biopsy in exudative pleural effusion. *Avicenna J Med* 2017; 7(3):121-124.
 10. Zhang T, Wan B, Wang L, Li C, Xu Y, Wang X, Liu H, Song Y, Lin D, Zhan P, Lv T. The diagnostic yield of closed needle pleural biopsy in exudative pleural effusion: a retrospective 10-year study. *Ann Transl Med* 2020; 8(7):491(1-8).
 11. Hira HS, Ranjan R. Role of percutaneous closed needle pleural biopsy among patients of undiagnosed exudative pleural effusion. *Lung India* 2011; 28(2):101-104.
 12. Solooki M, Miri M. Approach to undiagnosed exudative pleural effusion: the diagnostic yield of blind pleural biopsy. *Caspian J Intern Med* 2013; 4(2): 642-647.
 13. Zuberi FF, Zuberi BF, Ali SK, Hussain S, Mumtaz F. Yield of closed pleural biopsy and cytology in exudative pleural effusion. *Pak J Med Sci.* 2016; 32(2):356-360.
 14. Rial MB, Gomez AB, Gabarda JRF, Ruiz JFC, Corredor MJG, Frach NM, Viedmab EC. Tru-Cut Needle Pleural Biopsy and Cytology as the Initial Procedure in the Evaluation of Pleural Effusion. *Arch Bronconeumol* 2014;50(8):313–317.
 15. Saha K, Maji A, Bandyopadhyay A, Jash D. Diagnostic Yield of Closed Pleural Biopsy in Undiagnosed Exudative Pleural Effusions. *A Journal of Clinical Medicine*, Volume 2021; 16(1):34-40.