



## CYTOMORPHOLOGICAL SPECTRUM OF PLEURAL FLUIDS: A STUDY ON 150 CASES

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**ABSTRACT**

**Introduction:** Pleural fluid analysis plays an important role in investigations of pleural fluid. The present study was undertaken to highlight the cytomorphological spectrum of pleural fluid samples. **Materials and Methods:** This retrospective observational study was performed for the period of 2 years (October 2019 to September 2021). A total of 150 pleural fluid samples received during the study period in the Department of Pathology, Rajarajeswari Medical College and Hospital, Bengaluru, Karnataka were studied. **Results:** Most of the pleural fluid samples belonged to males (62%) and the male to female ratio was 2.44:1. The common age group of specimens received was 51 to 60 years (24.66%). Most of the malignant lesions belonged to females 68.75%. **Conclusions:** Pleural fluid is one of the major fluid samples to be received for evaluation. Due to its dynamic nature, the pleural cavity has a potential to be a haven to various pathologies. Most of the pleural fluid samples belonged to males. The frequency of malignancy in the population studies was 10.66% with adenocarcinoma being the common malignant lesion.

**KEYWORDS :** Pleural fluid, Malignancy, Cytomorphology.

**INTRODUCTION:**

Pleural effusion is an abnormal accumulation of fluid in the pleural cavity<sup>(1)</sup>. Pleural fluid analysis with cytological assessment is a fundamental part of the investigation of pleural effusions<sup>(2)</sup>. It is one of the oldest applications of cytological techniques<sup>(3)</sup>.

Identifying malignancy from pleural fluid cytology alone can spare patients from more invasive investigations, reduces healthcare costs, is important for staging and allows earlier progression to treatment<sup>(2)</sup>.

Cytological study of individual cells obtained can be done from either exfoliation or fine needle aspiration. The pleural cavity is a potential area of infections, benign and malignant tumours can arise. Individual cell characteristics can give a good idea regarding the underlying pathology<sup>(4)</sup>.

Infections, various tumours such as primary and secondary malignancies, benign tumours, liver failure, cardiac failures are few conditions associated with pleural effusion.

This study aims to assess the pleural fluids received in our department, with respect to demographic, clinical and cytological features.

**MATERIALS AND METHODS:**

The present study was conducted in the Department of Pathology, Rajarajeswari Medical College and Hospital, Bengaluru, Karnataka from October 2019 to September 2021.

**Study design-**

The study design was a hospital based retrospective observational study.

**Study period-**

The study was conducted for the period of two years from October 2019 to September 2021.

**Source of data-**

All the pleural fluid samples received during the study period in the Department of Pathology, Rajarajeswari Medical College and Hospital Bengaluru, Karnataka were studied.

**Sample size-** A total of 150 samples were included in the study.

**Selection Criteria:****INCLUSION CRITERIA-**

All pleural effusion samples received from either sex of any age group.

**EXCLUSION CRITERIA-**

Samples received from those patients who were already on treatment and scanty samples.

**Procedure-**

After receiving the fluid sample, details like clinical diagnosis, age and gender of the patient were noted. Gross description of fluid including volume, colour, turbidity, were noted. Cell count of the fluid was done in improved Neubauer's chamber. Wet mount was made and immediately the sample was centrifuged. Sediment /cytospin smears were prepared and stained with Haematoxylin & Eosin and Giemsa stain. Pap stain was done in case of presence of atypical cells. 100 cells were counted, and differential count was expressed in percentage. Cytomorphology of the cells was studied and documented paying attention to cellular arrangement, cytoplasmic features, and nuclear characteristics.

**STATISTICAL ANALYSIS-**

A descriptive statistical analysis was done on the data collected, frequency and distributions were tabulated as follows.

**RESULTS AND OBSERVATIONS:**

**Table 1- Distribution of Patients According to Age**

Age in years	Number of cases
0-10	0
11-20	9
21-30	16
31-40	26
41-50	23
51-60	37
61-70	29
71-80	3
81-90	7
Total	150

Most pleural fluid samples were referred from the patients who were aged between 51 to 60 years whereas there were no cases from patients below the age of 10 years.

**Table 2- Sex Wise Ratio in General:**

Sex	Number of cases	Percentage (%)
Males	93	62
Female	57	38

In our study most of the pleura fluid samples belonged to males 62% and 38% of the samples belonged to females. The male to female ratio was 2.44:1.

**Table 3- Distribution of Cases According To The Diagnosis And Nature Of Effusions:**

Etiological factors	Transudates (54 cases)	Exudates (96 cases)	Total (150 cases)
CCF	28	-	28

Cirrhosis	16	-	16
Tuberculosis	-	49	49
Pneumonia	-	23	23
Other infections/causes	6	7	13
Suspicious of malignancy	1	4	5
Malignancy	3	13	16

Various etiologies were encountered in our study, leading to transudative and exudative effusions. Non-malignant conditions comprised most cases 129 (92.4%). Malignancies comprised of 16 cases (10.66%).

Amongst the non-malignant causes, tuberculosis was the predominant aetiology with 49 cases (32.66%). These 49 cases were strongly clinically suspected to be tuberculosis and most of them had high ADA value (>40 U/L) and turned out to be tuberculosis on CBNAAT, which was advised after cytology reporting. Few patients on whom workup wasn't feasible due to cost constraints, ATT was started, and they responded to it. Hence, Koch's aetiology was confirmed in such cases too. All exudates on cytology revealed leucocytosis with increased lymphocytes. Increased polymorphonuclear cell count was noted in pneumonia. Amongst all these cases, few cases showed reactive mesothelial cells.

Amongst the malignant causes, lung adenocarcinoma stood as the major contributory cause with 8 cases, followed by small cell carcinoma with 2 cases, squamous cell carcinoma of lung with 1 case, metastatic carcinoma in 1 case, malignant lymphoma in 1 case and 3 cases with unknown primary.

**Table 4- Gross Appearance of Pleural Fluid Samples :**

Appearance	Number of cases	Percentage (%)
Clear/Straw coloured	57	38
Turbid	72	48
Haemorrhagic	21	14

On gross appearance, 72 cases (48%) were turbid, 57 cases (38%) were clear/straw coloured, and 21 cases (14%) were haemorrhagic.

**Table 5- Sex Wise Distribution of Cytological Diagnosis Of Malignant, Benign And Suspicious Cases In Pleural Fluid Analysis In Males And Females:**

Gender		Benign	Suspicious of malignancy	Malignant	Total
Male	Number	86	2	5	93
	Percentage (%)	92.4%	2.15%	5.37%	100
Female	Number	43	3	11	57
	Percentage (%)	75.4%	5.26%	19.29%	100
Total	Number	129	5	16	150
	Percentage (%)	86%	3.33%	10.66%	100

Pleural Fluid analysis in males and females shows that malignant cases are high in females (11) as compared to males (5), and for benign cases the distribution is 92.4% in males and 75.4% cases in females. Number of Suspicious Cases in males were 2 and 3 in females.

**DISCUSSION:**

The cytological examination of pleural fluid is a long-established and precise method of detecting malignancy and has immensely gained acceptance in clinical medicine, to such an extent that a positive diagnosis is often considered the distinctive test and averts explorative surgery<sup>(5)</sup>.

Exfoliative cytological evaluation of the pleural cavity can help in the diagnosis of various etiologies like bacterial, fungal, viral and mycobacterium infections. Not just infectious causes, even malignancies such as primary or secondary adenocarcinoma, squamous cell carcinoma or haematological neoplasms can lead to pleural effusion<sup>(6)</sup>.

Massive bilateral pulmonary effusions are more commonly seen with malignancies or constrictive pericarditis. However, predominantly bilateral effusion is seen in heart failure<sup>(6)</sup>.

According to Kushwaha et.al the age group affected most was the 6th decade<sup>(9)</sup>. Daglia et al. showed mean age of 58.4 years<sup>(10)</sup>. Our study was in concordance with the above-mentioned studies with the most common age group affected being 51-60 years.

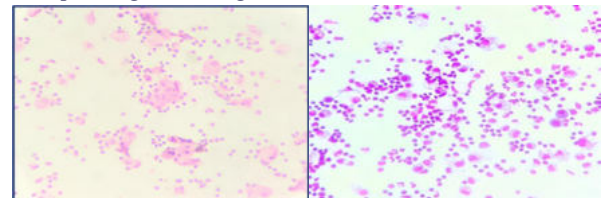
Our study reported male preponderance overall, but in malignant cases females' preponderance was noted. Among 16 malignant cases, 11 were females and 5 were males. Similar studies done by Sears et.al showed malignant pleural effusion to be found in females predominantly than male<sup>(7)</sup>.

Our study reported 96 (64%) cases of exudates and 54 (36%) cases of transudates, which is similar to the study conducted by Khatib et.al.,<sup>(11)</sup>. In our study, tuberculosis was the most common pathology to be noted (32.66%) followed by congestive cardiac failure (18.66%), pneumonia (15.33%) and cases of various malignancies (10.66%). Other causes encountered were cirrhosis, and other infections/causes like emphysema, chronic kidney disease, trauma (jejunal perforation), mixed connective tissue disorder and hepatic abscess. Our study was in concordance with study done by Alusi, et.al.,<sup>(8)</sup>.

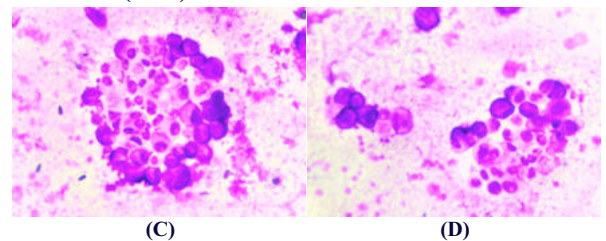
Gross morphology of pleural effusion in our revealed haemorrhagic appearance to be the predominant type in malignant cases thus supporting the dictum that bloody fluid is a strong predictor of malignancy<sup>(8)</sup>.

The most common cause of malignant effusion was lung adenocarcinoma, which is similar to the study done by Gaur DS et.al.,<sup>(1)</sup> and Khatib et.al.,<sup>(11)</sup>.

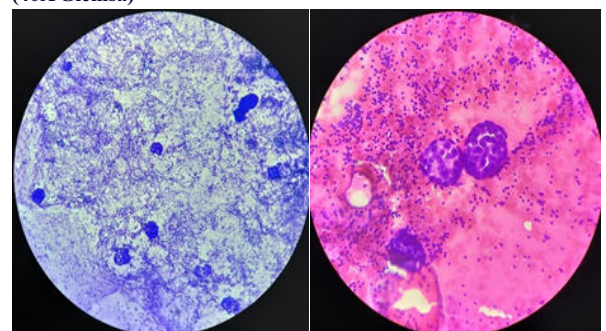
**Histopathological Findings:**



**Image A and B- Shows epithelioid cells, mesothelial cells, and lymphocytes in Pleural fluid from a case of tuberculous pleural effusion 40X(H&E)**



**Image C and D- Show atypical cells in 3-D clusters, groups and scattered singly. The individual cells are large, round to oval with moderate to abundant amount of cytoplasm, high N:C ratio and hyperchromatic nucleus. Few multinucleate and binucleate cells are also seen in this pleural fluid. This was from a right sided pleural effusion case and was reported as positive for malignancy. (40X Giemsa)**



**Image E and F: Show atypical cells giving rise to cannon ball appearance. (Left- 10X Giemsa, Right -40X H&E)**

**CONCLUSION:**

Effusion cytology is a simple and safe diagnostic procedure.

Cytological examination of pleural fluids in adults has been widely known and documented in various pathological conditions. The study of pleural fluid cytology has paramount importance in identifying atypical cells in effusions which in turn helps to know the advancement of the disease process in the body. Also, the smear prepared from the cell population present in the fluid sediment is much more representative and has higher sensitivity and specificity than that obtained by needle biopsy. Pleural fluid analysis although is not a substitute for conventional histopathology but can be complementary to it in diagnosing malignant conditions. Cytological examination of pleural fluids along with physical examination is an asset to both the pathologists and clinicians to identify specific etiologic agents, to follow the natural process of disease to plan the treatment and monitor the response to therapy in a cost-effective manner.

#### **Conflict of Interest:**

The Authors does not declare any competing conflict of interest

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