



## Original Research Article

# Cytological approach for pleural fluid analysis – One year study

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### ABSTRACT

**Background:** Collection of an abnormal quality and quantity of fluid in the pleural cavity is called pleural effusion. Cytological analysis of pleural effusions plays an important role in the diagnosis of various lesions. The objective of the study is to evaluate the utility of pleural effusion cytology as an attempt to diagnose the underlying etiology.

**Materials and Methods:** A prospective study for one year duration from September 2018 - August 2019 was conducted in the Department of Pathology- S N M C and H.S.K hospital and Research Centre, Bagalkot. Pleural fluids received for cytological analysis from all the departments were included in the study. After a thorough physical examination, microscopic evaluation was done. The smears were stained with Giemsa, Papanicolaou stain and Hematoxylin and Eosin Stains. ZN stain was done in suspected cases of tuberculosis.

**Results:** 65 cases of pleural effusion were evaluated out of which 67% of patients were males and 33% were females. Out of 65 cases 53.8% showed right sided pleural effusion, 24.6% showed left sided pleural effusion and 21.5% showed bilateral pleural effusion. All the smears were screened for malignancy and resulted in 14% of positive cases. The 86% non-malignant cases were further classified based on the cytology findings; 46.1% lymphocytic predominant, 32.3% neutrophilic predominant, 4.6% reactive mesothelial cell predominant and 1.5% eosinophilic predominant.

**Conclusion:** This study showed that meticulous evaluation of the pleural fluids for their cytological properties will help the clinicians in pointing towards the underlying etiological factor and to choose an appropriate management.

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## 1. Introduction

The accumulation of fluid in the pleural cavity (potential space between the parietal and visceral pleura) is known as pleural effusion. Diagnosis of a pleural effusion begins with obtaining the patient's clinical history and doing a physical examination and is followed by chest radiography and biochemical and cytological analysis of pleural fluid. If necessary, the process continues with further investigative studies, such as computed tomography (CT) of the thorax, pleural biopsy, thoracoscopy, and, occasionally, bronchoscopy.<sup>1</sup>

Pleural fluid aspiration is a simple and minimally invasive technique. cytomorphological examination of effusion cell population can be used as a preliminary step for the diagnostic evaluation which can assist clinician in establishing differential diagnosis. The diagnostic yield of the cytological analysis may be attributable to the cell population present in the sediment that is representative of a much larger surface area than the pleural biopsy.<sup>2</sup> It is very useful and is the very first initial work up for the management of a case of pleural effusion. It may also provide crucial clues for the identification of both non-malignant pleural and malignant effusions. Sensitivity will be higher if the clinical, radiological and laboratory results are collaborated. This study was carried out to determine the diagnostic utility of pleural fluid cytology.

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## 2. Materials and Methods

The study was conducted in the Department of Pathology-S.N.M.C and H.S.K hospital and research centre, Navanagar, Bagalkot. It's a Prospective study All the cases of pleural fluid that were submitted between September 2018 - August 2019 were included. Pleural fluids which received for cytological analysis from the various departments of our institute were included in the study. Complete history and clinical brief are included in the study. Fluid samples were examined for physical properties like the volume, color, appearance, turbidity, presence of clot coagulum.

The fluid was divided into two parts, one part was used for cell count. One drop of fluid was mixed with a drop of toluidine blue and the cells were counted in an improved Neubauer counting chamber. The other part was poured into the centrifuge tubes and centrifuged for 10 minutes at 2000 rpm. The supernatant was poured off. Part of the sediment was transferred to a clean glass slide and mixed with a part of 1% toluidine blue. After placing the cover slip, the slide was observed under the microscope for immediate identification of cell morphology. With the remaining sediment three smears are made and stained with Giemsa, Hematoxylin&eosin and Papanicolaou stains respectively. ZN stain was done in the suspected of tuberculosis.

Smears were examined for the differential cell count, cell morphology and reported descriptively, final impression given as malignant or non-malignant pleural effusion. Malignant pleural effusions were further classified according to its morphology. Study results then analyzed with the help of tables and charts and discussed for its incidence rate.

## 3. Results

Total of 65 cases were collected. Out of which 44(68%) were males and 21(32%) were females. M:F : 2.1:1 (Chart 1). Age of the patients was ranging from 3 years to 80 years, but most of the cases are falling between the age group of 60-70 years (chart 2).

Out of 65 cases right sided effusion was seen in 35(53.8%) cases, 16(24.6%) on the left side and 14(21.5%) cases showed bilateral pleural effusion. About 86% of the cases were non-malignant and 14% of the cases are malignant(Chart 3). Among the non-malignant majority of the cases showed predominance of lymphocytes i.e., 30 cases (46.1%), 21 cases (32.3%) showed acute neutrophilic effusion, 03 cases(4.6%) comprised mostly of reactive mesothelial cells, and 01 case (1.5%) was showing predominance of eosinophils. In one of the case the sample was inadequate for interpretation. Among the 30 cases of lymphocytic predominant effusion 3 cases were positive for acid fast bacilli. Among the malignant cases metastatic adenocarcinoma cases were most common 8(12.3%) we have also come across a case of lymphoma effusion

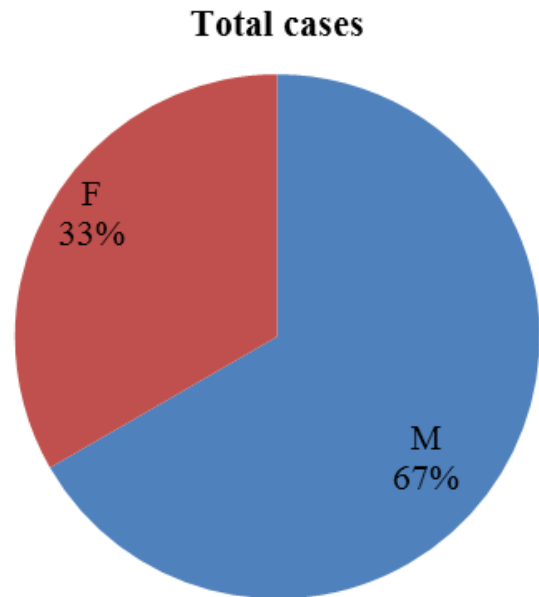


Chart 1: Sex distribution

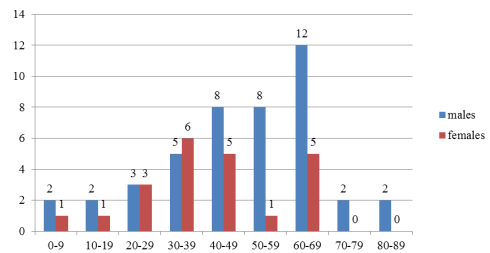


Chart 2: Age distribution

1(1.5%).

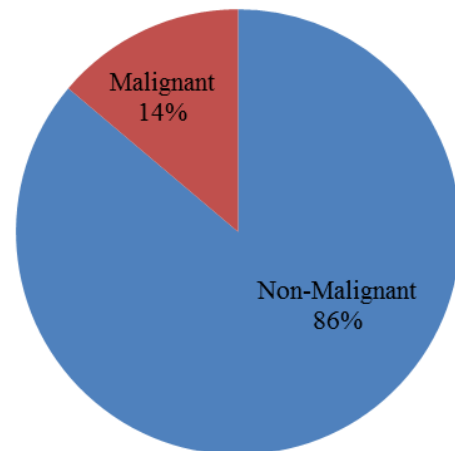
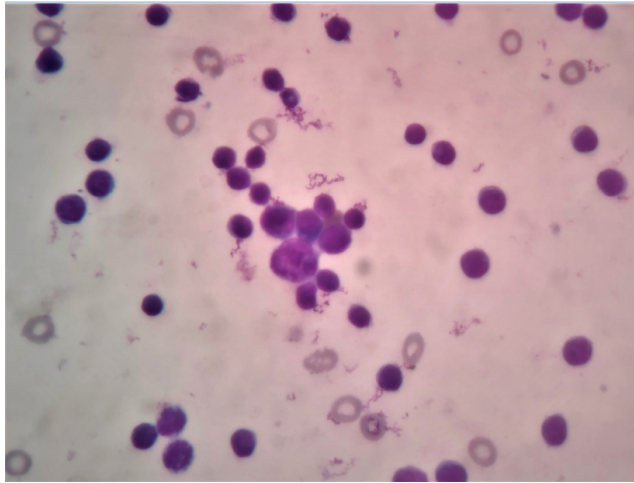


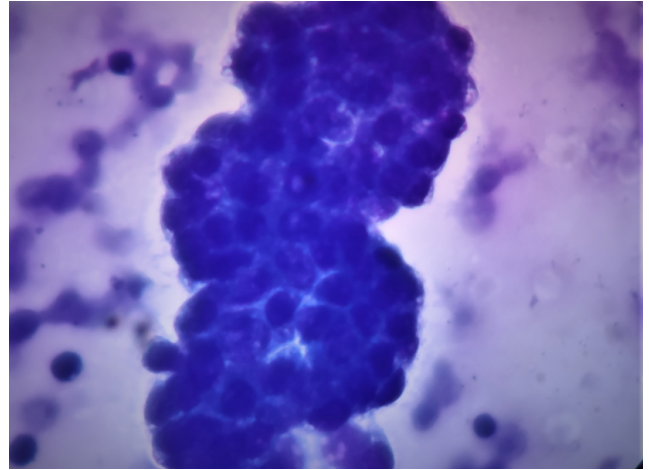
Chart 3: Malignant effusion vs. Non malignant effusions

**Table 1:** Cytological distribution of cases

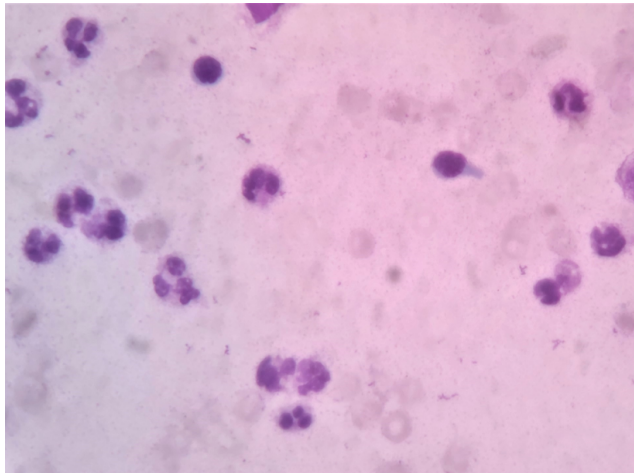
	<b>Cytological impression</b>	<b>Number of cases</b>
Malignant (14%)	Metastatic Adenocarcinoma	08(12.3%)
	Lymphoma	01(1.5%)
	Neutrophilic effusion	21(32.3%)
Non-Malignant (86%)	Lymphocytic effusion	30(46.1%)
	Mesothelial effusion	03(4.6%)
	Eosinophilic effusion	01(1.5%)
	Inadequate specimen	01(1.5%)
Total No. of cases		65(100%)



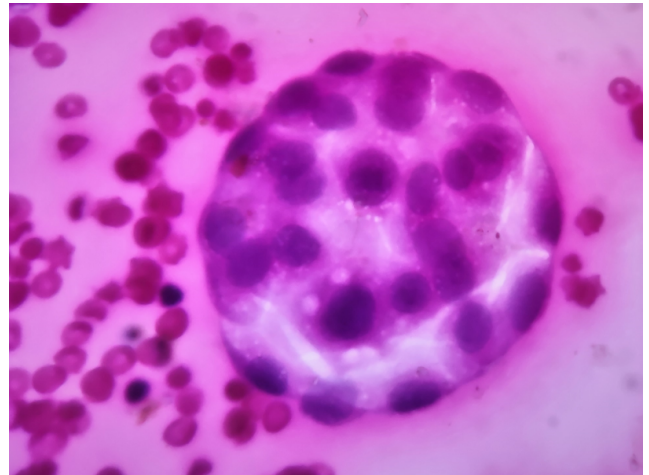
**Fig. 1:** Lymphocytic Effusion (Giemsa40X)



**Fig. 3:** Adenoca mets (Giemsa 40X)



**Fig. 2:** Neutrophilic Effusion (Giemsa40X)



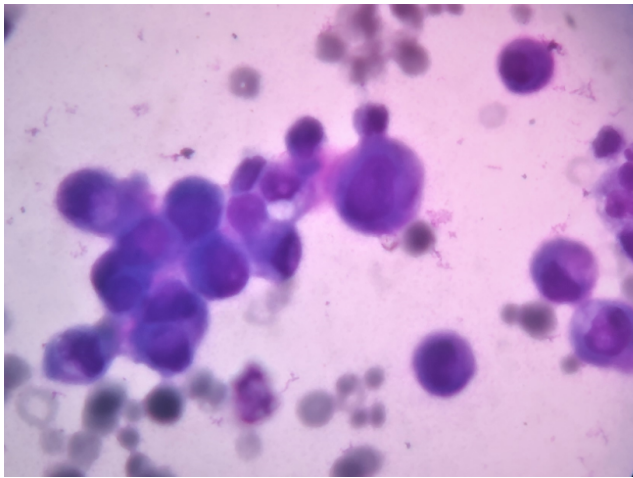
**Fig. 4:** Adenoca mets (H&E 40X)

**4. Discussion**

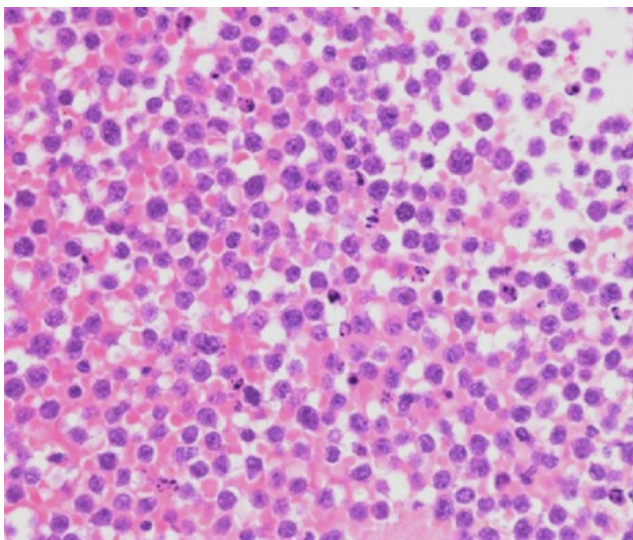
Pleural effusion is one of the most common pleural disease affecting many number of the patients in india. Etiology may lie within pleura, lung parenchyma, or it may be due to systemic disease.<sup>3</sup> The effusion may develop secondary to other factors such as infection,

pulmonary emboli or lymphatic blockade. Even after thoracoscopy, 10% of the pleural effusions may remain undiagnosed.<sup>4,5</sup> The simplicity of pleural fluid aspiration, analysis and cytological examination has made it initial diagnostic step in finding out cause of effusion.

Pleural fluid cytology may also help in ruling out of primary or metastatic malignancy. Almost all



**Fig. 5:** Reactive mesothelial cells (Giemsa40X)



**Fig. 6:** Lymphoma Effusion (H&E)20X

adenocarcinomas (Fig 3&4) were diagnosed with cytology as the cell population is abundant, but the yield is less in cases of squamous cell carcinomas, Hodgkin's disease and sarcomas.<sup>2</sup> This may be due to the fact that the adenocarcinoma cells are more easily identified cytologically. In cases of lymphoma and tissue biopsies are usually needed for the diagnosis.

A tuberculous pleural effusion is frequently a diagnostic challenge for the pulmonary clinician. It is difficult to differentiate a tuberculous effusion from a malignant pleural effusion on clinical grounds alone and usually more invasive diagnostic interventions are needed. As the results of our study suggests, the absence or the scarcity of mesothelial cells along with the presence of more than 50% small lymphocytes (Fig:1) should be regarded as a strong evidence for tuberculosis. The absence of mesothelial cells is

attributed to the deposition of fibrin on the pleural surface, either sealing off the mesothelial cells, destroying them or both.<sup>6</sup> The presence of predominantly polymorphonuclear cells (Fig:2) in pleural fluid indicates that the fluid is the result of acute pleural inflammation, hence raising the probability of pneumonia with effusion.

Although the mechanism of eosinophil accumulation in the pleural space is unknown, eosinophils play an important role in idiopathic, allergic diseases, trauma cases or drug reactions. The presence of air in the pleural space may also cause eosinophilia. It is well known that tuberculous pleural effusions rarely contain more than 10% eosinophils. The presence of numerous mesothelial cells or eosinophils was useful to exclude tuberculosis in the differential diagnosis of exudative pleural effusions.<sup>7–9</sup>

As the results of our study suggests, cytology of the pleural fluid is the most informative and definitive initial diagnostic step in pathologic states involving the pleura. This simple and minimally invasive technique may be considered as the best initial diagnostic tool in the hands of an experienced cytologist. Examination of the pleural fluid can narrow the differential diagnosis considerably. Cytology can be the key to direct diagnosis or can indicate the next step leading the clinician in the correct pathway for final diagnosis even when not diagnostic on its own, and thus precluding unnecessary invasive interventions. In most diseases related to pleural effusion, the pleural fluid analysis yields important diagnostic information and in certain cases it provides the final diagnosis.

### **5. Source of Funding**

None.

### **6. Conflict of Interest**

None.

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