

## Research Article

## Evaluation of pleural effusion in Minia Cardiothoracic University Hospital, Egypt : two year study



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DOI: 10.21608/mjmr.2023.231814.1511

### Abstract

**Background:** A pleural effusion is an abnormal buildup of fluid in the pleural space. It is a frequent clinical issue that can present as a manifestation of a number of diseases. **Objective:** The purpose of this study was to evaluate the patient characteristics, clinical symptoms, and causes of pleural effusion over a two-year period in the chest department at Minia University Hospital. **Methods:** Patients with pleural effusion who were admitted to the Minia Cardiothoracic University Hospital's chest department between January 2021 and January 2023 were included in this prospective study. Each patient had a thorough medical history taken, a clinical examination, common laboratory testing, pleural fluid analysis, and, if necessary, a fiberoptic bronchoscopy or medical thoracoscopy. **Results:** Of the 164 patients included in the study, 48.8% of those were over 60 years old, and 61.6% of them were men. 86% of the patients had exudative pleural effusion, while 23 (14%) had transudative pleural effusion. As regard the etiology, malignant pleural effusion, was noted in 51.8% of cases. In 47.1% of patients, the main tumor causing pleural effusion was lung cancer. **Conclusion:** Medical professionals frequently deal with pleural effusion. Our cohort of patients frequently had malignant pleural effusions; hence thorough and thorough pleural effusion work-up is necessary.

**Key words:** pleural effusion, medical thoracoscopy, lung cancer.

### Introduction

The parietal and visceral pleurae surround the pleural space. Respiration depends heavily on the pleural space. Under normal conditions, a tiny amount of pleural fluid acts as a lubricant to assist the pleural surfaces with moving against each other during breath [1].

Although pleural effusion is typically a symptom of many diseases, it is not thought of as a distinct disease entity. Patients who present with respiratory symptoms frequently have pleural effusion, but there is little data to support the accuracy and reliability of symptoms and signs used to diagnose pleural effusion. [2].

One of the most challenging and complex duties in respiratory medicine are the diagnosis of pleural effusion with undefined cause.

Thoracentesis, percutaneous pleural biopsy, imaging techniques, clinical history, and physical examination were once the main methods used to diagnose pleural effusion. However, these methods occasionally failed to identify the underlying cause of the effusion in a significant proportion of patients [3, 4]. Thoracoscopy is used clinically to diagnose pleural effusions that have not yet been identified, increasing the success rate of pleural illness diagnosis. According to certain reports, thoracoscopy may have an overall positive diagnosis rate of 71–100% [5, 6]. The purpose of this study was to evaluate patients' characteristics, clinical manifestations, and causes of pleural effusion in the Minia University Hospital Chest Department over a two-year period.

**Patients and Methods:**

The purpose of this prospective cross-sectional observational study was to conduct a case series investigation. It comprised all patients with pleural effusion who were admitted to the Chest Department at Minia Cardiothoracic University Hospital between January 2021 and January 2023.

Minia University hospital research ethics board approved the research. After meeting the inclusion criteria, the patient provided informed consent.

**Inclusion criteria**

- Patients of both sex who presented with pleural effusion and ultimately confirmed by thoracentesis.
- Patients who had given willingness to be included in the study

**Exclusion criteria**

- The patient does not want to give proper consent.
- Hemodynamically unstable patients.

**The following procedures were performed on all patients:**

- Full medical history taking, Clinical examination and assessment of blood pressure, pulse rate and oxygen saturation.
- Chest X-ray, recent Computed Tomography (CT) of the chest with contrast and chest Ultrasound with color Doppler.
- Full routine laboratory investigations: full blood count, liver function tests, renal function tests, ESR, coagulation profile.
- Thoracentesis for chemical (Sugar, total protein, LDH. Adenosine deaminase (ADA) if indicated), Bacteriological examination (AFB, Gram stain, culture and sensitivity) and cytological examination (predominate cells).
- Fiberoptic bronchoscopy specimens were sent for microbiological, cytological and histopathological analysis when indicated
- Echocardiography, breast ultrasound, gynaecological examination, endoscopy of the digestive tract, abdominal ultrasonography, abdominal computerised tomography (CT) scan, bone scan, bone-marrow biopsy, fine-needle aspiration of the pulmonary

lesion, liver, or lymph nodes were all performed based on the clinical findings.

- Thoracoscopic pleural biopsy sent for histopathological examination if no obvious cause after all those investigations.

All of the patients were thoroughly examined. A proper etiological diagnosis was made in a methodical manner.

**Statistical analysis:**

Data were collected, and analyzed via SPSS program (Statistical Package for Social Sciences) version 24. Mean and standard deviation were used to express quantitative data, while percentage and number were used to express the categorical data.

Independent t-test was used to describe the parametric quantitative data between the groups.

Chi square test was used for analyzing the quantitative data; (if less than 20% of cells have expected count less than 5), also we can use Fisher's Exact test ;(if more than 20% of cells have expected count less than 5).

**Results:**

In our current study, the maximum incidence of pleural effusion (48.8%) was observed in the age group above 60 years; 60% of this group were malignant cases, 13.8% presented with post-pneumonic effusion, and 13.8% were cardiac patients. The lowest incidence of pleural effusion was seen in cases aged between 21 and 40 years (22.6%); about half of them had post-pneumonic pleural effusion. It was observed that male patients (61.6%) are more predominant than female patients (38.4%). In malignant effusion, males were about 49 cases (48.5%), in post-pneumonic pleural effusion, about 26 cases (25.7%), while female patients were 36 cases (57.1%) with malignant effusion, 10 cases (15.9%) with post-pneumonic effusion, and 10 cases (15.9%) had other causes, as shown by table 1.

The major presentations were dyspnea (86% of cases), dry cough (70% of cases), and pleuritic chest pain (59% of cases), followed by toxic manifestations (40% of cases) and hemoptysis (11.5% of cases) as in table (2).

There were 74 (45.1%) patients with right-sided pleural effusion, 59 (36%), left-sided pleural effusion, and 31 (18.9%) bilateral pleural effusion. Exudative pleural effusion was found

in 141 (86%) of the patients, while transudative pleural effusion was seen in 23 (14%). There was moderate pleural effusion in 86 (52.4%) of the cases, massive pleural effusion in 59 (36%), and mild pleural effusion in 19 (11.6%) of the cases. As regards the pleural fluid aspect, there were 66 (40.2%) serosanguinous, 42 (25.6%) hemorrhagic, 34 (20.7%) straw, and 22 (13.4%) purulent pleural fluids, as demonstrated by table 3. The most common cause was malignant pleural effusion in 85 patients (51.8%), post

-pneumonic effusion was the second cause in about 36 patients (22%), and cardiac failure pleural effusion was the third cause in about 14 patients (8.5%), as shown in Table (4).

Regarding primary tumors associated with malignant effusion, there were 40 (47.1%) patients with lung cancer, 10 (11.7%) mesothelioma, 8 (9.5%) breast cancer, and 4 (4.7%) lymphomas, as shown in Table (5).

**Table 1: Age and gender distribution in relation to pleural effusion etiology**

	<b>Malignant</b>	<b>Post-pneumonic</b>	<b>T.B</b>	<b>Cardiac failure</b>	<b>Others</b>
<b>Age (years)</b>					
21-40	8(21.6%)	19(51.4%)	8(21.6%)	0 (0%)	2(5.4%)
41-60	29(61.7%)	6(12.8%)	4(8.5%)	3(6.4%)	5(10.6%)
>60	48(60%)	11(13.8%)	0 (0%)	11(13.8%)	10(12.5%)
Total	85(51.8)	36(22%)	12(7.3%)	14(8.5%)	17(10.4%)
<b>Sex</b>					
Male	49(48.5%)	26(25.7%)	9(8.9%)	10(9.9%)	7(6.9%)
Female	36(57.1%)	10(15.9%)	3(4.8%)	4(6.3%)	10(15.9%)

**Table 2: Clinical manifestations in patients with pleural effusion**

<b>Clinical manifestations</b>	<b>No.</b>	<b>%</b>
<b>Cough</b>	115	70.1
<b>Dyspnea</b>	141	86
<b>Chest pain</b>	97	59.1
<b>Hemoptysis</b>	11	6.7
<b>Toxic manifestations</b>	66	40.2
<b>Clubbing</b>	19	11.6
<b>L.N</b>	16	9.8

**Table 3: Characteristics of pleural effusion**

		<b>No. (%)</b>
<b>Site</b>	Right side	74(45.1%)
	Left side	59(36%)
	Bilateral	31(18.9%)
<b>Type</b>	Transudate	23(14%)
	Exudative	141(86%)
<b>Extent</b>	Mild	19(11.6%)
	Moderate	86(52.4%)
	Large to massive	59(36%)
<b>Aspect</b>	straw	34(20.7%)
	purulent	22(13.4%)
	hemorrhagic	42(25.6%)
	serosanguinous	66(40.2%)

**Table 4: Distribution of cases according to etiology (N =164)**

Etiology	Number	Percentage
<b>Exudative</b>		
Malignancy	85	(51.8%)
Tuberculosis	12	(7.3%)
Post-pneumonic	36	(22%)
autoimmune	3	(1.8%)
Undiagnosed	5	(3%)
<b>Transudative</b>		
Cardiac failure	14	(8.5%)
Liver failure	5	(3.1%)
Hypoalbuminemia	4	(2.5%)

**Table 5: Primary tumor associated with malignant effusion (N=85)**

Primary tumor	No	%
<b>Lung Cancer</b>	40	47.1
<b>breast Cancer</b>	8	9.5
<b>Mesothelioma</b>	10	11.7
<b>Lymphoma</b>	4	4.7
<b>Others</b>	11	13
<b>Unknown</b>	12	14.1

## Discussion

In the present study, the incidence of pleural effusion was highest among patients more than 60 years old (48.8%), as consistent with Ibrahim et al., who discovered that the majority (68.7%) of their sample consisted of seniors who were older than 60 [7], while Maikap et al. reported that patients aged between 21 and 30 represented the largest age group (25.6%) [8]. In another research, it was reported that about (29.6%) of cases were below 20 years of age [9]. This difference may be explained by variable causes of pleural effusion, as tuberculosis is more common among young people, while we found that 60% of patients aged more than 60 years had malignant pleural effusion in our study, which is known to be common in older people. Another explanation is that the majority of pleural effusions in older age groups are challenging to diagnose or go undiagnosed in a primary or secondary healthcare facility, which leads to them being referred to higher levels of care, such as our hospital, for further workup. Males were more likely than females to have pleural effusion (61.6% versus 38.4%) in this study. This is in agreement with many previous studies [10–13].

In the current study, a greater number of males had malignant and cardiac diseases (49, 10 male cases, respectively) than females (36, 4 female cases, respectively). Also, another explanation may be due to the nature of the patient's selection. The major symptoms found in our patients were dyspnea (86% of cases), followed by dry cough (70% of cases), and pleuritic chest pain (59% of cases). This was in accordance with Adeoye et al. and Eaid et al. [12, 13]. Pleural fluid was more common on the right side (45.1%), followed by 36% on the left side, and 18.9% bilateral. These results were similar to those in previous studies [8, 11, 12]. Moderate (52.4%) and massive (36%) pleural effusions were more common than the mild form (11.6%). These data are consistent with Liu et al.'s study [6]. Farrag et al. found that the majority of their cases had mild pleural effusion. That may be explained as a large portion of their patients presented with parapneumonic effusion [14]. By chemical analysis, we found that there were 86% exudative and 14% transudative pleural effusion cases. We conducted our study in the pulmonary medicine department of a teaching

hospital, where most cases of cardiac failure, liver cirrhosis, and nephrotic syndrome may be treated in the respective department after triage from the emergency department, and some transudative cases of mild effusion may be missed because they did not have chest X-rays prior to diuretic therapy. This may explain why there was a lower incidence of transudative effusion in our study. This was in agreement with other studies performed in Egypt [14] and other developing countries such as Qatar, Lebanon, and Saudi Arabia [7, 15, 16]. The most common etiology of pleural effusion in our study was malignancy (51.8%), followed by post-pneumonic (22%) and cardiac failure (8.5%). Surprisingly, TB was diagnosed in only 7.3% of cases. This was in disagreement with many previous studies from other developing countries, such as Iraq [17], Qatar [16], and Nigeria [13], which found that tuberculosis was the leading cause in the majority of cases [17]. This may be explained as most of our patients were more than 60 years old and had a positive smoking history. Previously, when thoracoscopy was not available, the diagnosis of malignant effusion was reported to be very low, and usually patients with unexplained pleural effusion were advised to take an anti-TB drug in a therapeutic trial. Only a small portion (8.5%) of patients had cardiac failure in this present study, which is compatible with other studies done in Qatar and Saudi Arabia [15, 16]. Contrarily, Marel et al.'s study found that cardiac failure accounted for nearly 50 percent of pleural effusion [18], and these results could be explained by their wide selection of patients from a well-defined region. The majority of patients with metastatic carcinomas may have pleural effusion which is the most prevalent sign of pleural involvement in advanced malignancy. Malignant pleural effusions (MPE) are secondary to lung, breast, and lymphoma cancers in about two-thirds of cases. Ovarian cancer comes next to these locations, then other cancers [19]. As regards primary tumours associated with malignant effusion, we found that 47.1% of cases were due to lung cancer, 11.7% mesothelioma, 9.5% breast cancer, and 4.7% lymphomas. These findings were in line with numerous earlier studies showing that lung cancer metastatic carcinomas were the most frequent causes of malignant pleural effusion. [11, 20–22].

### Conclusion:

Pleural effusion is a common clinical issue that doctors deal with. We noticed an increased predominance of neoplastic etiology in our cases that required finding a way for early diagnosis of malignancy. We recommend meticulous and complete workups for pleural effusion to define the etiology.

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