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Original Research Article

A Retrospective Study on the Evaluation of Pleural Effusion Cases in a Tertiary Care Centre

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Abstract:

Background: Pleural effusion is an occurrence of abnormal pleural fluid accumulation which is frequently seen in different pulmonary and systemic diseases including tuberculosis, malignancy, pneumonia, congestive heart failure, liver disease and renal disorders. Early diagnosis is important and evaluation is essential for appropriate management and prevention of complications.

Aim: To review the demographic profile, clinical presentation, etiological distribution, radiological findings and characteristics of the pleural fluid collected in a tertiary care centre for of patient diagnosed as having pleural effusion.

Methodology: The present retrospective observational study carried out at the Department of General Medicine, Lord Buddha Koshi Medical College and Hospital for a period of one year. The study consists of 150 patients with pleuritis effusion. The data comes from hospital medical records, laboratory reports and radiological investigations. Demographic profile, presenting symptoms, etiological diagnosis, type of pleural effusion, radiological findings and pleural fluid characteristics are analyzed by descriptive statistical methods like frequency and percentage distribution.

Results: Most patients fall in the 41–50 years age group and the study population was male predominant. The typical presenting symptoms are dyspnea, cough, and fever. Tuberculosis is identified as the leading cause of pleural effusion followed by parapneumonic effusion and malignancy. There is a higher incidence of exudative pleural effusion compared to transudative pleural effusion. The most common radiological appearance is the right-sided effusion and the most common appearance of the pleural effusion is straw colored.

Conclusion: Despite a variety of the etiologies, pleural effusion remains a very common clinical condition with a high morbidity. Tuberculous is still the most important cause of pleural effusion in developing countries. Thorough clinical assessment, radiologic evaluation and analysis of the pleural fluid are crucial for the early diagnosis and management of patients with pleural effusions.

Keywords: Pleural effusion, tuberculosis, exudative effusion, thoracentesis, respiratory diseases, tertiary care centre.

Introduction

Pleural effusion is one of the most frequent clinical syndromes that are encountered in respiratory and general medical practice and is the abnormal collection of fluid in the pleural space. Under normal physiological conditions, there is a small amount of pleural fluid which aids respiration by lubricating the visceral and parietal pleura. However, pathological causes of the disturbance in the formation and absorption of the pleural fluid can cause excessive accumulation, referred to as pleural effusion [1]. It is a highly morbid condition which can dramatically affect respiratory function and quality of life.

Pleural effusion does not constitute a disease itself, but a sign of various pulmonary and systemic diseases. Examples are tuberculosis, pneumonia, malignancy, congestive heart failure, liver cirrhosis, nephrotic syndrome, pulmonary embolism and connective tissue diseases [2]. Based on the underlying mechanism and biochemical properties, pleural effusions are divided into two categories: transudative and exudative. Exudative and transudative pleural effusions are generally caused by an inflammatory, infective or malignant process of the pleura and systemic disease, respectively [3].

Tuberculosis still remains one of the most common causes of pleural effusion in developing countries like India and among young and middle-aged adults. Although there have been advances in the

healthcare system and in the national TB control programme, tuberculous pleural effusion remains a significant cause of respiratory morbidity [4]. The latter, however, has been reported by studies from the developed countries as the major etiological factors, namely malignancy and congestive cardiac failure. Etiological patterns vary with respect to socioeconomic status, access to health care, nutrition and the presence of infectious diseases.

Pleural effusion can present in many different ways depending on the amount of fluid and the cause of the fluid. The most common symptoms include dyspnea, cough, chest pain, fever, and generalized weakness [5]. There can be significant respiratory distress with large pleural effusions because of the compression of the underlying lung. Other non-respiratory symptoms may be associated with chronic diseases like tuberculosis and malignancy, including loss of weight, loss of appetite and constitutional symptoms.

Radiological examination and analysis of pleural fluid is important in the diagnosis and assessment of pleural effusion. Common imaging techniques used to confirm the presence of pleural water and severity of involvement are chest X-ray and ultrasonography [6]. Thoracentesis followed by biochemical, microbiological and cytologic analysis of the pleural fluid gives useful information about the underlying etiology. The judgment between transudative and exudative effusions remains based on light's criteria, which are the most generally accepted [7].

The incidence of pleural effusion is a major cause of hospital admission and health care costs, especially in tertiary care. Untreated or improperly treated can lead to complications like empyema, pleural fibrosis, respiratory failure and long hospital stays [8]. Therefore early detection of the underlying cause as well as timely management are critical to enhance patients' outcome and lower morbidity.

Retrospective analysis of pleural effusion cases yields valuable data on the demographic distribution, clinical profile, etiological changes, and diagnostic trends over time in a population. These kinds of studies aid medical professionals know the frequency of a disease in an area, and it can lead to effective diagnostic and therapeutic procedures. Therefore, the present study is conducted to look back the cases of pleural effusion admitted in a tertiary care center with special focus on demographic profile, clinical presentation, etiological distribution, radiologic and characteristics of the pleural fluid.

Methodology

Research Design: The present study is carried out as a retrospective observational hospital-based study to assess the demographic profile, clinical presentation, etiological pattern, radiological findings and pleural fluid characteristics in patients with pleural effusion diagnosis. A retrospective study has the advantage of being able to investigate clinical and laboratory data that has been recorded in the past in detail in order to determine the trends in the disease and its outcomes.

Study Area: The study is carried out in the department of General Medicine in Lord Buddha Koshi Medical College and Hospital, Saharsa, Bihar, India.

Study Duration: This study is carried out on a 1-year period.

Study Population: The study population consists of patients with a confirmed diagnosis of PE on clinical examination, radiological investigations and analysis of the pleural fluid.

Sample Size: In the study, a total of 150 patients with pleural effusion, who met the inclusion criteria are included.

Inclusion Criteria

- Patients over 18 years old
- Patients diagnosed as having Pleural effusion
- Complete clinical and laboratory records should be provided to patients.
- Patients who have radiological and pleural fluid evaluation

Exclusion Criteria

- Patients with incomplete medical records
- Pediatric patients below 18 years of age
- Patients with traumatic Pleural effusion"
- Patients with recurrent pleural effusion who are on treatment.

Data Collection Procedure: The inpatient case records, laboratory registers, radiological reports, and the analysis report of the pleural fluid are all sources of data collected retrospectively from the medical records department.

The data collection format is structured and the following information is extracted:

- Demographic profile including age and gender
- Clinical presentation such as dyspnea, cough, fever, chest pain, and hemoptysis
- Etiological diagnosis of pleural effusion
- Type of pleural effusion
- Side of pleural involvement on radiological examination
- Pleural fluid appearance and biochemical findings

All information gathered is kept confidential and is only for educational and research purposes.

Study Variables

Independent Variables

- Age
- Gender
- Clinical symptoms
- Associated comorbidities
- Radiological findings

Dependent Variables

- Etiology of pleural effusion
- Type of pleural effusion
- Pleural fluid characteristics

Diagnostic Criteria: Pleural effusion is diagnosed by clinical examination and confirmed by chest X-ray and ultrasonography. Biochemical and cytological parameters are determined in the pleural fluid collected by thoracentesis. Pleural effusions can be exudative or transudative based on Light's criteria.

Statistical Analysis: The data collected are analyzed through descriptive statistical analysis in terms of frequency and percentage distribution and entered into the computer spreadsheet named Microsoft excel. The findings are presented in tables for easy interpretation and comparison.

Results

The results of the retrospective study of patients with pleural effusion are detailed below. The data are presented in tabular form to describe the demographic profile, clinical features, etiological pattern and radiological findings amongst the study population.

Table 1: Demographic Distribution of Patients

Variable	Category	Number of Patients	Percentage (%)
Age Group (Years)	18–30	24	16
	31–40	30	20
	41–50	42	28
	51–60	32	21.3
	>60	22	14.7
Gender	Male	96	64
	Female	54	36
Total		**150**	**100**

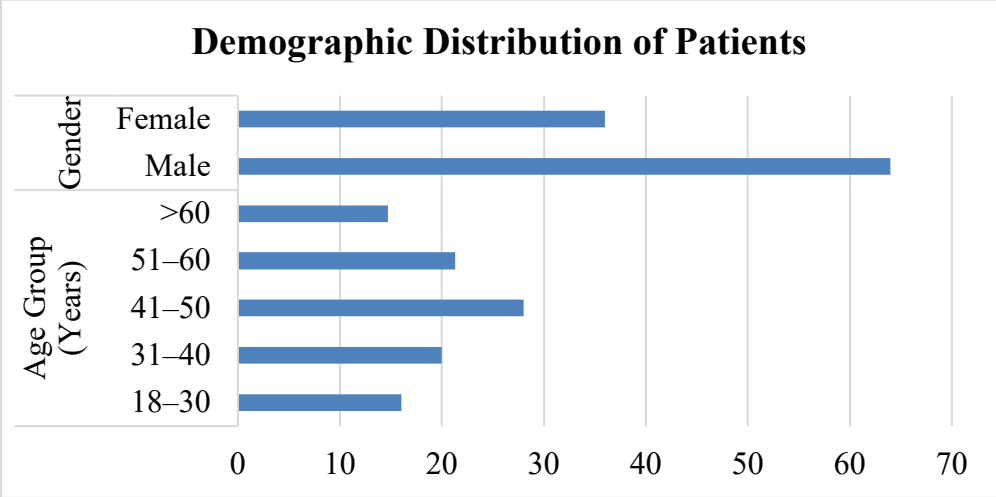

Figure 1: Demographic Distribution

The demographic distribution of patients with pleural effusion is shown in table 1. The results showed that the age group of 41-50 years old had the highest number of patients, 28%, and the second age group was 51-60 years old with 21.3% of the total patients. This indicates that the older age group (middle and elderly age) were found to have pleural effusion more frequently. The youngest age group (18-30 years) was the smallest group of cases. On gender distribution there was a definite male predominance with 64% male and 36% female. The higher prevalence among males may be related to higher exposure to the risk factors, including smoking, occupational risk factors, respiratory infections and tuberculosis. In general, the table shows that men represent the main part of the group of patients affected by pleural effusion and that the age group of middle age is most common.

Table 2: Presenting Symptoms of Patients		
Presenting Symptom	**Number of Patients**	**Percentage (%)**
Dyspnea	118	78.7
Cough	104	69.3
Fever	86	57.3
Chest Pain	72	48
Weight Loss	40	26.7
Hemoptysis	18	12

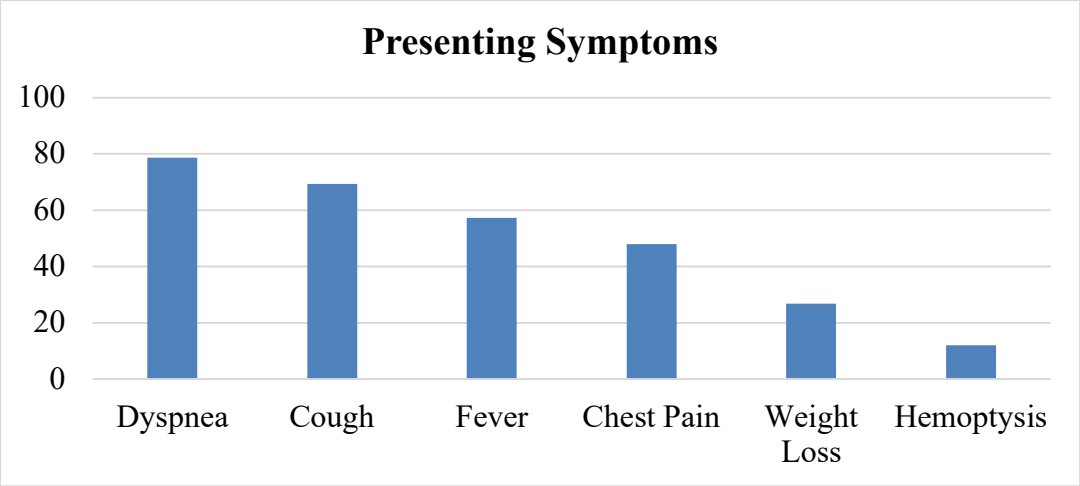

Figure 2: Presenting Symptoms of Patients

The presenting symptoms of patients with a diagnosis of pleural effusion are presented in Table 2. The results demonstrate that dyspnea was the most common symptom, seen in 118 patients (78.7%) which suggest that the most common clinical symptom associated with the accumulation of pleural fluid is dyspnea. The second most common symptom was cough (104 patients, 69.3%) followed by fever (86 patients, 57.3%) and these were associated with high levels of TB and pneumonia respectively, indicating an important association with infective causes. Pleural irritation and inflammation is manifested by 72 patients (48%) who complained of chest pain. Weight loss was found in 40 patients (26.7%) and this could be a sign of a chronic disease such as tuberculosis or malignancy. The least common symptom was hemoptysis, in 18 patients (12%). The overall data presented in the table indicates that the respiratory and constitutional symptoms were very common among the patients of pleural effusion and dyspnea was the most predominant symptom.

Table 3: Etiological Distribution of Pleural Effusion		
Etiology	**Number of Patients**	**Percentage (%)**
Tuberculosis	56	37.3
Parapneumonic Effusion	34	22.7
Malignancy	24	16
Congestive Heart Failure	18	12
Liver Disease	10	6.7
Renal Disease	8	5.3

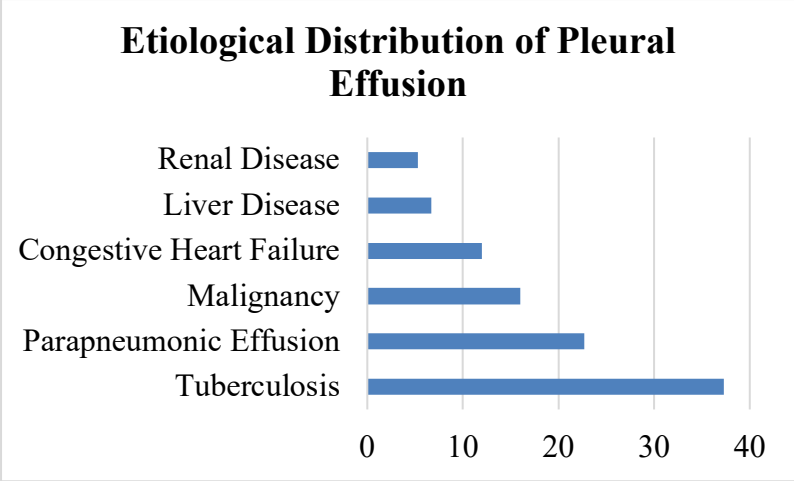

Figure 3: Etiological Distribution of Pleural Effusion

The distribution of the etiology of pleural effusion was shown in Table 3. The most frequent cause was tuberculosis (37.3%), reflecting its importance as one of the major health issues. Parapneumonic effusion was the second most common etiology with 22.7% of cases, reflecting the impact of respiratory infections. 16% were due to malignancy, mostly older patients. CHF was the most common systemic cause of PE, accounting for 12% of cases. The second lower incidences were liver disease (6.7%) and renal disease (5.3%). However, in the present study, infectious causes were the most common causes of pleural effusion.

Table 4: Type of Pleural Effusion

Type of Pleural Effusion	Number of Patients	Percentage (%)
Exudative	108	72
Transudative	42	28

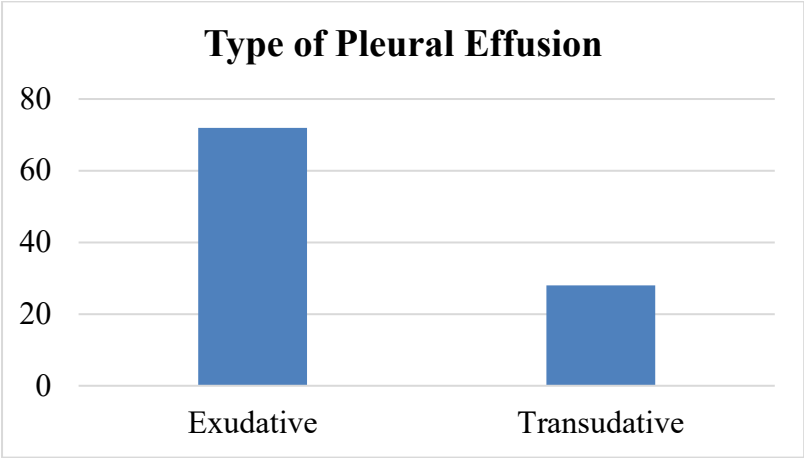

Figure 4: Type of Pleural Effusion

The distribution of pleural effusion according to type among the study population is presented in table 4. The most prevalent type of pleural effusion was exudative having been seen in 72% of patients (108 patients). This increased prevalence could be explained by infection or inflammation (e.g. tuberculosis, pneumonia, malignancy) which were frequent causes of patients. Transudative PE was found in 42 patients (28%) and was primarily related to systemic diseases such as congestive heart failure, liver diseases, and renal disorders. In general, the results show that exudative pleural effusion was significantly more prevalent than transudative pleural effusion in the population studied.

Table 5: Side of Pleural Effusion

Side of Pleural Effusion	Number of Patients	Percentage (%)
Right-sided	72	48
Left-sided	48	32
Bilateral	30	20

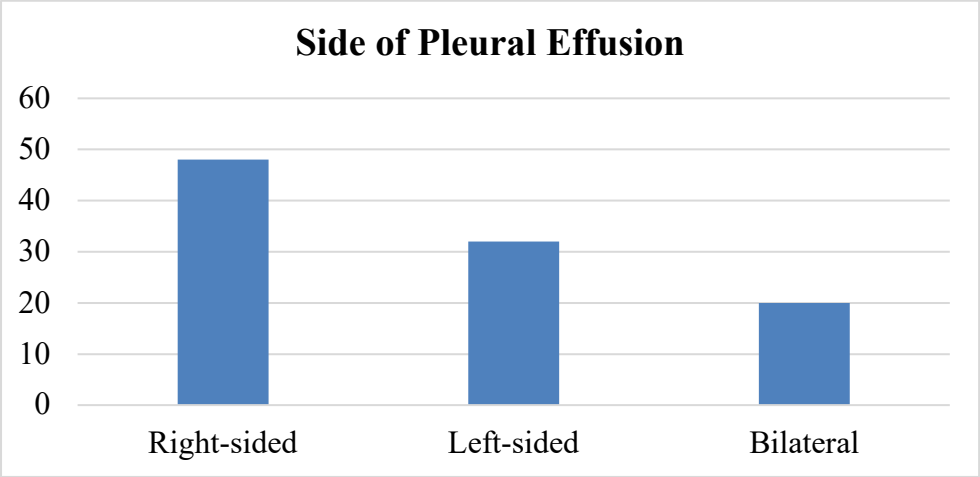

Figure 5: Side of Pleural Effusion

The distribution of pleural effusion in relation to side of involvement, as seen on radiology is shown in Table 5. The most common condition was right sided pleural effusion (48%), followed by left sided pleural effusion (48%). In 30 patients (20%) of the study population, bilateral pleural effusion was found. Right-sided pleural effusions may be due to anatomical, physiological and also to the underlying disease processes. Systemic diseases including congestive heart failure, liver diseases and renal diseases were more likely to be associated with bilateral pleural effusions. It was seen overall that unilateral pleural effusion was more common in the patients with right sided involvement.

Table 6: Pleural Fluid Appearance

Pleural Fluid Appearance	Number of Patients	Percentage (%)
Straw Colored	72	48
Hemorrhagic	30	20
Purulent	24	16
Clear Fluid	18	12
Chylous	6	4

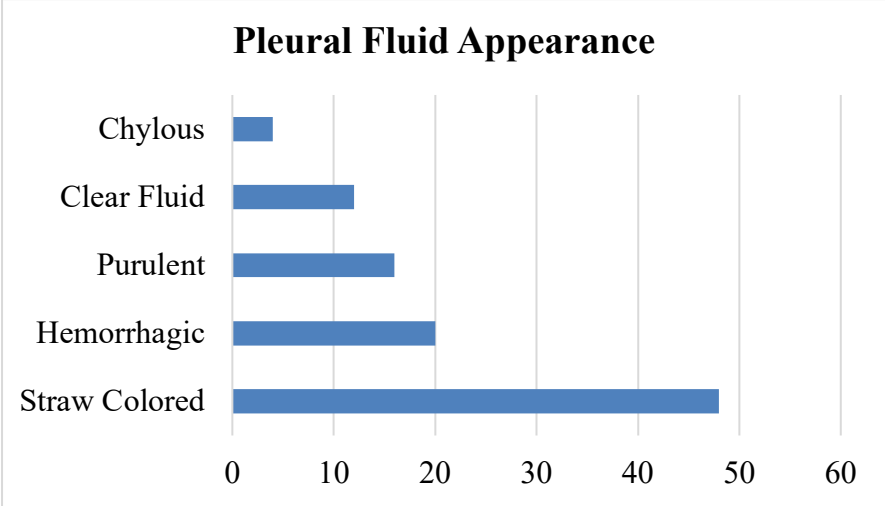

Figure 6: Pleural Fluid Appearance

The results of the appearance of pleural fluid among the study population are presented in Table 6. The most frequent finding was straw-colored pleural fluid (72 patients or 48%), indicative of tuberculous and non-specific exudative pleural effusions. A total of 30 patients (20%) had blood in the pleura. Blood was usually found in the pleura in patients with malignancy or severe inflammatory diseases. Empyema and parapneumonic infections were noted in 24 patients (16%) who had purulent fluid. In 18 cases (12%), the effusion was clear and predominantly due to cardiac and renal diseases, which are transudative processes. The least common finding was chylous pleural fluid, which was seen in 6 patients (4%). In general, the results show

that there are different physical properties of pleural fluid based on etiology.

Discussion

The present retrospective study examines clinical profile, etiological distribution and characteristics of pleural effusion in the patients attending tertiary care centre for diagnosis of pleural effusion, which gives significant information compatible with various previous hospital-based studies. The results of the study bring attention to the differences in the distribution of demographics, clinical presentation, and etiological distribution of pleural effusion, which can be attributed to the prevalence of disease in the region, socioeconomic status, and access to healthcare.

As noted above, the age distribution of the present study suggests that middle-aged and elderly dogs are more likely to have a PE. The same observation was made by Manu Mohan and Ravindran in 2012 [12] who found that the prevalence of pleural effusion was higher in adults more than 40 years of age in South India. Similarly, Adeoye et al. 2017 [13] noted that the predominant age group with pleural effusion were economically active and elderly. The prevalence of these age groups could be linked with greater frequency of tuberculosis, cancer or chronic systemic disease.

From the present study, it is proved that there is a clear male predominance in the patients with pleural effusion. Similar results were observed by Khan et al. (2011) [15] who found more cases of pleural effusion in males in Qatar. Likewise, in Nigeria, Mbata et al. 2015 [20] reported higher rate of male involvement in the cases of pleural effusion. This pattern could be due to higher exposure of males to smoking, occupation exposure, respiratory infection, and TB.

The clinical symptoms seen in the current study are similar to what has been reported previously, with dyspnea, cough, fever and chest pain being the most frequent symptoms. Dyspnea and cough were also found to be the predominant symptoms in patients admitted with pleural effusion in respiratory intensive care units (ICUs). Karmakar et al. (2017) [9] also noted that respiratory distress, fever, and chest pain are common symptoms that occur in patients with thoracic empyema and pleural infection.

In the current study, tuberculosis was the most frequent condition of origin. The results are consistent with the studies of Khan et al. 2013 [16] which highlighted the continued burden of tuberculous pleurisy in developing countries. Prasad et al. also reported that there was high prevalence of TB related complications in tertiary care centres of North India [19]. In the current study, tuberculosis was the predominant disease, highlighting the continuing challenge of pulmonary or extrapulmonary tuberculosis in India despite being a public health problem.

The present study also noted that the presence of parapneumonic effusion and malignancy were important causes of pleural effusion. Both Adeoye et al. 2017 [13] and Reuss et al. 2012 [14] reported that malignant pleural effusion was one of the major causes of morbidity amongst in-patients. Moreover, Nattusamy et al. (2015) [10] and Patil et al. (2016) [11] have performed thoracoscopic analysis and concluded that tuberculosis and malignancy are common causes of undiagnosed exudative pleural effusions.

Exudative pleural effusion was more common than transudative effusion in the present study. This is in keeping with the report of Thomas et al., 2017 [7] that reported predominance of exudative pleural effusions in tertiary care hospital. Systemic disorders, like congestive heart failure, liver disease, and renal disorders are usually associated with transudative effusions, while infectious and malignant conditions are known to contribute significantly to exudative effusions.

The high prevalence of right sided PE found in the present study is also reported by some previous studies. Abu-Daff et al. 2013 [17] reported that unilateral pleural effusion, particularly of the right pleural cavity is a usual finding in inflammatory and infectious diseases. In the present study, the characteristics of the pleural effusions also varied significantly depending on the etiology. Malignancy was frequently associated with hemorrhagic effusion while empyema and severe parapneumonic infections were associated with purulent effusion.

Pleural effusion remains an important cause of morbidity, hospitalization and healthcare burden worldwide. Increased mortality has been reported in patients with pleuritis who received thoracentesis for the diagnosis and management of pleural effusion [18]. The present study also confirms the importance of a detailed clinical examination, imaging and fluid analysis in the correct diagnosis and therapeutic management of patients with pleural effusion.

Conclusion

It is concluded from the present work that the pleural effusions are an important clinical problem with a wide spectrum of pulmonary and systemic diseases. The results of this study showed that pleural effusion is more frequently seen in middle aged and elderly male patients. Tuberculosis was the leading cause of the disease, followed by parapneumonic effusion and malignancy, and meant that infectious diseases remain significant in developing countries. Exudative pleural effusion was determined to be

more common than transudative effusion, and dyspnea, cough, and fever were the most common presenting symptoms. The most common radiological findings were right-sided pleural effusion, while the most common pleural fluid findings were straw colored. The study highlights the need for thorough clinical assessment, radiology, and pleural fluid examination for proper diagnosis and prompt treatment. In cases of pleural effusion, early diagnosis and correct treatment are important to minimize morbidity, avoid complications and optimize patient's outcome.

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