

ORIGINAL RESEARCH

To Assess the Prevalence of Pleural Effusion in Critically ill Patients: An Institutional Based Study

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ABSTRACT

Introduction: Pleural effusion is common in medical ICU (MICU) patients and may affect patient outcomes.

Objective: This study aimed to determine the prevalence, causes, and clinical significance of pleural effusion in critically ill patients.

Methods: A total of 500 patients included in the present study. The patients initially had pleural effusion or effusion developed during their ICU stay.

Results: Overall, 350 patients were males and 150 were females, and their mean age was 51.5±18.6 years. Pleural effusion was found to be exudates in 60% of cases and transudates in 40%. Uncomplicated parapneumonic effusion was the most common cause (18%), followed by heart failure (16%). The cause of pleural effusion did not significantly affect the patient outcome or duration of ICU stay. No significant reduction in duration of ICU stays or ICU mortality was seen in patients who received therapeutic aspiration or tube drainage compared with patients who received no specific management for effusion.

Conclusion: The commonest cause of pleural effusion in MICU is parapneumonic effusion, and chest ultrasonography is the best method of fluid detection. Different methods of management do not significantly affect patient outcomes.

Keywords: Prevalence, Pleural Effusion, ICU.

INTRODUCTION

Pleural effusions are common in critically ill patients, though they are rarely the primary indication for admission to an intensive care unit (ICU). The prevalence of pleural effusion among patients in the ICU is difficult to discern, as few studies have addressed this question explicitly, and results vary depending on the diagnostic modality used to detect them. Critically ill patients who undergo pleural drain insertion have a 10% risk of complications, the consequences of which may be life-threatening.^{1,2} These adverse events seem to be directly related to the size of the catheter used (the larger the catheter, the more severe the adverse event) and to the experience level of the operator.^{3,4} Feasibility and periprocedural safety in this context have been analyzed and are the subject of various guidelines, underlining the importance of the training process and the use of reduced caliber drains and point-of-care ultrasound.^{5,6}

Medical ICU (ICU) patients are at risk for developing different types of pleural effusions, as many patients present with hemodynamic instability that requires treatment with aggressive fluid replacement leading to fluid overload, which results in transudative effusions usually bilateral even in the absence of heart failure. Moreover, mechanical ventilation, sedation, and acute lung injury may lead to development of basal atelectasis that can be associated with pleural effusions.

This study aimed to determine the prevalence, causes, and clinical significance of pleural effusion in critically ill patients and to study the different methods of assessment and follow-up of patients till reaching final diagnosis, as well as the different management strategies and to correlate all these data with the final patient's outcomes.

MATERIALS AND METHODS

We conducted a cross-sectional study including 500 patients having pleural effusion in critically ill patients. Discharge records of adults who had received a diagnosis of PE were reviewed. Patients with PE confirmed by ultrasonography or computed tomography (CT) were included. This study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline.

STATISTICS ANALYSIS

Data were collected, tabled, and statistically analyzed using SPSS version 15 (SPSS Inc., Chicago, Illinois, USA). Parametric data

- (1) Data were expressed as minimum, maximum, and mean \pm SD.
- (2) Comparisons between two groups were done using unpaired t-test.
- (3) Comparisons between more than two groups were done using one-way analysis of variance (F-test).

Nonparametric data

- (1) Data were expressed as number and percentage.
- (2) Comparisons between two groups were done using χ^2 .
- (3) Comparisons between more than two groups were done using χ^2 -test.

Two tailed P value greater than 0.05 was considered insignificant, whereas P value less than or equal to 0.05 was considered significant.

RESULTS

A total of 350 (70%) were males and 150 (30%) were females. Their ages ranged from 13 to 90 years, with a mean of 50.8 \pm 20.50 years. The mean duration of the ICU stay was 9.0 \pm 7.5 days. Various causes had led to admission of patients to the ICU (Table 1). The most common cause of admission was severe pneumonia (36%) followed by exacerbation of chronic obstructive pulmonary disease (18%) and sepsis (14%).

Uncomplicated parapneumonic effusion was the most common cause of pleural effusion (18%), followed by heart failure (16%). Infectious exudate including uncomplicated parapneumonic effusion and empyema forming 30% of causes of pleural effusion. Malignant pleural effusion was the second most common cause of exudative pleural effusion (16.7%).

Table 1: Admission diagnosis

Severe pneumonia	180 (36%)
COPD exacerbation	94 (18%)
Pulmonary embolism	24 (4.8%)
Pulmonary edema	40 (8%)
TB meningitis	25 (5%)
Empyema and sepsis	70 (14%)

OHVS exacerbation	19 (3.8%)
Pericardial effusion and mediastinal mass	15 (3%)
Myasthenia gravis exacerbation	13 (2.6%)
Post-TB bronchiectasis	12 (2.4%)
Lung collapse	8 (1.6%)

Table 2: Final etiology of effusion

Etiology of pleural effusion	n
Exudative	300 (60%)
Uncomplicated parapneumonic effusion	90 (18%)
Malignancy	75 (15%)
Empyema	60 (12%)
Pulmonary embolism	40 (8%)
TB	35 (7%)
Transudative	200 (40%)
Heart failure	80 (16%)
Volume overload	60 (12%)
Hypoalbuminemia	30 (6%)
Uremia	30 (6%)

DISCUSSION

Pleural effusion is common among medical ICU (MICU) patients, and it is usually caused by pulmonary or extrapulmonary disorders, rather than by primary pleural diseases.⁷ The main finding of our study was the absence of serious complications resulting from the positioning of small-bore pleural drains by resident doctors in the ICU, although a rather high number of irrelevant pneumothoraces did occur despite the use of TUS. Small-bore pleural drain insertion is becoming a first line therapy for the treatment of benign PLEFF in the ICU; it is also used for malignant PLEFF by pulmonologists.^{8,9}

The prevalence of pleural effusion among patients admitted to ICU was 62.7% in our study, which is dissimilar to the results of Chinchkar et al.¹⁰ who found a prevalence of 14.7% for pleural effusion in ICU patients over an 8-month duration.

Fartoukh et al.⁷ reported a lower prevalence (8.4%) in their study which was conducted on 1351 patients admitted to three teaching hospital MICUs during 1 year. This relatively lower prevalence may be an underestimation, as effusion was diagnosed in that study based on physical examination and CXR with no chest US performed, which suggests the possibility of missing detection of lower amounts of pleural fluid. Another study conducted by Mattison et al.¹¹ reported a higher prevalence (62%) of pleural effusion in ICU patients, and this may be explained by difference in the type of recruited patients, as that study was conducted at general ICU in Medical University of

South Carolina with different causes of admission and multiple comorbidities including decompensated heart failure, which is commonly associated with transudative pleural effusion.

The most common cause of ICU admission in the current study was severe pneumonia (36%) followed by acute exacerbation of chronic obstructive pulmonary disease (18%). In the retrospective study of Park et al.¹² conducted on 78 patients who underwent diagnostic thoracentesis, the commonest cause of admission was respiratory disorders (64.1%), followed by cardiovascular disorders (12.8%) and sepsis (11.5%).

In the present study, pleural infection was the commonest cause of pleural fluid accumulation; uncomplicated parapneumonic effusion and empyema constituted 30% of all

causes of pleural effusion, followed by heart failure. This agrees with Fartoukh et al.⁷ who demonstrated that the most frequently detected cause (43%) of pleural effusion in ICU patients was infectious exudate (parapneumonic 26% and empyema 17%), followed by noninfectious exudate (33%) and transudate (24%). Similar results were reported by Tu et al.¹³, who found that 62% of MICU patients who underwent thoracentesis had infectious exudate including parapneumonic effusion, empyema, urosepsis, liver abscess, deep neck infection, and wound infection.

Park et al.¹² found that infectious exudate, especially parapneumonic effusion, was the most common cause of pleural effusion in ICU (41%), followed by malignant pleural effusion (19.2%), and heart failure-related effusion (17.7%), whereas Chinchkar et al.¹⁰ reported that the most common cause of pleural effusion in ICU was malignancy (24%), followed by parapneumonic effusion (22%) and then heart failure (18%). In contrast to these results, Mattison et al.¹¹ found that the most common causes of pleural effusion in ICU were heart failure (35%) and atelectasis-related effusion (23%). Infectious causes of pleural effusion were seen in only eight (12%) cases.

CONCLUSION

The commonest cause of pleural effusion in MICU is parapneumonic effusion, and chest US is the best method of fluid detection. Different methods of management do not significantly affect patient outcomes.

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