# ETIOLOGIES OF UNILATERAL PLEURAL EFFUSION AND COMPLICATIONS OF INTERCOSTAL DRAINS

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## ABSTRACT

**Background:** Pleural effusion is a common medical problem faced by internists in general and chest specialists in particular. It occurs due to abnormal collection of fluid in the pleural space resulting from excess fluid production or decreased absorption or both.[1] It is the most common manifestation of pleural disease. The etiological spectrum of pleural effusion may vary based on geographical location of the patient. In the Western world where people live longer, effusion is mostly seen due to non-infectious causes including malignancies and heart failure. Whereas, in developing countries, infectious causes predominate.[2]

**Objective:** To study the etiologies of unilateral pleural effusion and complications of intercostals drain.

**Methodology:** This was a prospective study conducted at Liaquat National Hospital Karachi, Pakistan, during June 2015 to Dec 2106. All (48) adult patients (age above 16 years) admitted to chest ward from various sources with unilateral pleural effusion were included. Case notes were reviewed and data collected. Diagnostic pleural tap was performed in every case and aspirate was sent for biochemical, microbiological and cytological analysis. Pleural biopsies were taken where diagnosis could not be established with the help of other investigations. Duration of hospital stay, details of intercostal drain insertion and any related complications were recorded.

**Results:** 48 patients with unilateral pleural effusion were identified. There were 28 (58%) men and 20 (42%) women. Majority 30 (42%) were in the age range between 40-69 years with mean age of 48 years. (Table 1). 31 (64%) patients needed to stay in hospital for more than a seven days. 30 (62%) had one and 18 (37%) had 2 or more attempts of thoracocentesis. 35 (73%) underwent contrast CT chest and 11 (31%) were found to have a pulmonary lesion and 4 (11%) had pleural lesion. 7 (15%) were referred to thoracic surgeons for surgical intervention. 5 underwent VATS and 2 had thoracotomies. Average waiting period between referral and surgery was 14 days. 11 effusions were transudate, 37 exudate, 4 had positive cytology. Microbiology was not positive in any case. 4 pleural biopsies were taken via Abraham's needle and remaining during surgery. Pleural TB, malignancy, left ventricular failure, chronic liver disease and parapneumonic effusions were the common causes of unilateral pleural effusion. Intercostals drain falling out or dislodging 8 (22%) and subcutaneous emphysema 4(11%) were the most common complications of intercostals drain insertion.

**Conclusion:** Tuberculous pleural effusion and malignancy were the two common causes of unilateral pleural effusion. Majority of the patients needed to stay in hospital for more than a week if they had pleural effusion. Commonly observed complications of intercostals drain may be avoided by observing proper tube insertion and securing techniques.

**Key words:** Unilateral pleural effusion; Tuberculosis; Malignancy; Etiologies

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## INTRODUCTION

Pleural effusion is a common medical problem. It occurs due to imbalance between the formation and absorption of pleural fluid within the pleural cavity. Mostly, based on their protein content, pleural effusions are classified as transudative (pleural protein less than 29g/L) or exudative (pleural protein > 30g/L), alternatively other Light's criteria may be applied.[3] Congestive heart failure, cirrhosis of liver, nephrotic syndrome, superior vena cava obstruction, hypo-proteinemic states and peritoneal dialysis are common causes of transudative effusion. Tuberculosis, malignancies, parapneumonic effusion, pulmonary embolism, systemic lupus erythematosis and rheumatoid arthritis commonly account for exudative pleural effusion in various studies.[4]

Pleural effusion is a common medical problem dealt by internist in general and pulmonologist in particular. Cough and breathlessness are two common symptoms associated with pleural effusion. Symptoms related to pleural effusion may vary in severity Presenting symptoms may also vary with the amount of effusion, the rapidity with which it is accumulated and the underlying disease causing pleural effusion. A diagnostic pleural tap and its analysis is a very helpful tool in narrowing down the differentials in a patient with pleural effusion.

## METHODS

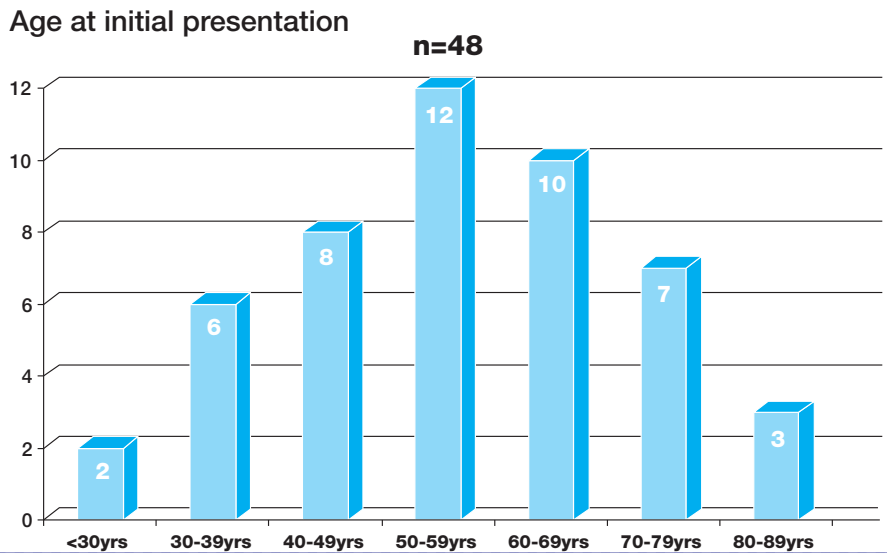
This prospective study was conducted at the Department of Pulmonology, Liaquat National Hospital and Medical College, Karachi, Pakistan. All adult patients admitted in the chest unit with newly diagnosed unilateral pleural effusion between June 2015 and December 2015 were included. Patients previously known to have pleural effusion or bilateral effusions were not included in this study. Based on their initial presentation, 48 patients were clinically suspected to have pleural effusion. This diagnosis was subsequently confirmed either with plain chest radiograph or ultrasound thorax. A detailed record of patients' history and clinical examination was made. Routine blood tests were sent. All patients underwent diagnostic pleural tap and pleural fluid was sent for biochemical analysis, cytology and routine microbiology. Simultaneous, blood and pleural fluid for total protein, albumin and Lactate dehydrogenase (LDH) level were also checked. Pleural fluid was also sent for AFB smear and culture. In cases where pleural biopsies were taken, samples were sent for histology. Additional investigations included bronchoscopy, ultrasound abdomen, ECG (Electrocardiogram), transthoracic echocardiogram and CT scan chest, abdomen and pelvis.

Patients' journey through out the hospital stay was reviewed. A detailed record of intercostals drain insertion including number of thoracocentesis attempts, site of drain insertion, daily output, drain related complications and its outcome was recorded.

## RESULTS

48 patients with unilateral pleural effusion were admitted during the study period. 28 58%) were men. Majority 30 (42%) were in the age range between 40-69 years with mean age of 48 years. 22 admissions were via OPD and 14 via A&E. 4 patients were referred by other specialties within the hospital. 8 had chest X-rays done at their GP's clinic and then referred to us. During the diagnostic journey for unilateral pleural

Table 1: Age at presentation with unilateral pleural effusion



effusion, the average length of stay for majority 31 (65%) of patients was more than a week (range: 1 day to more than 21 days) (Table 2). All (48) patients underwent diagnostic thoracocentesis. First attempt was successful in 30 (62%) cases while 15 (31%) had two attempts. 3 (7%) patients had more than 2 attempts. Contrast enhanced CT thorax was performed in 35 (73%) cases. Pulmonary and pleural lesions on CT were seen in 11 (31%) and 4 (11%) cases respectively (Table 3). 7 (15%) cases were referred to thoracic surgeon. Out of these 7 cases, 5 underwent video assisted thoracic surgery and two had thoracotomies. Diagnosis could be established in 5 out of seven cases referred to surgeons post operatively. There was an average delay of 14 days between referral to surgeons and the procedure.

Pleural effusion was exudative in 37 (77%) cases. Pleural biopsies via Abraham's needle were taken in 4(8%) cases only. 7 (15%) of patients who underwent surgery also had pleural biopsies (Table 4). The most common cause of unilateral effusion was Tuberculosis in 26 (54 %) cases. Other causes included malignancies in 10 (21%), congestive cardiac failure in 4 (8%), chronic liver disease in 3 (6%), parapneumonic in 2 (4%) and others 3 (6%). No definitive diagnosis could

Table 2: Length of hospital stay in days

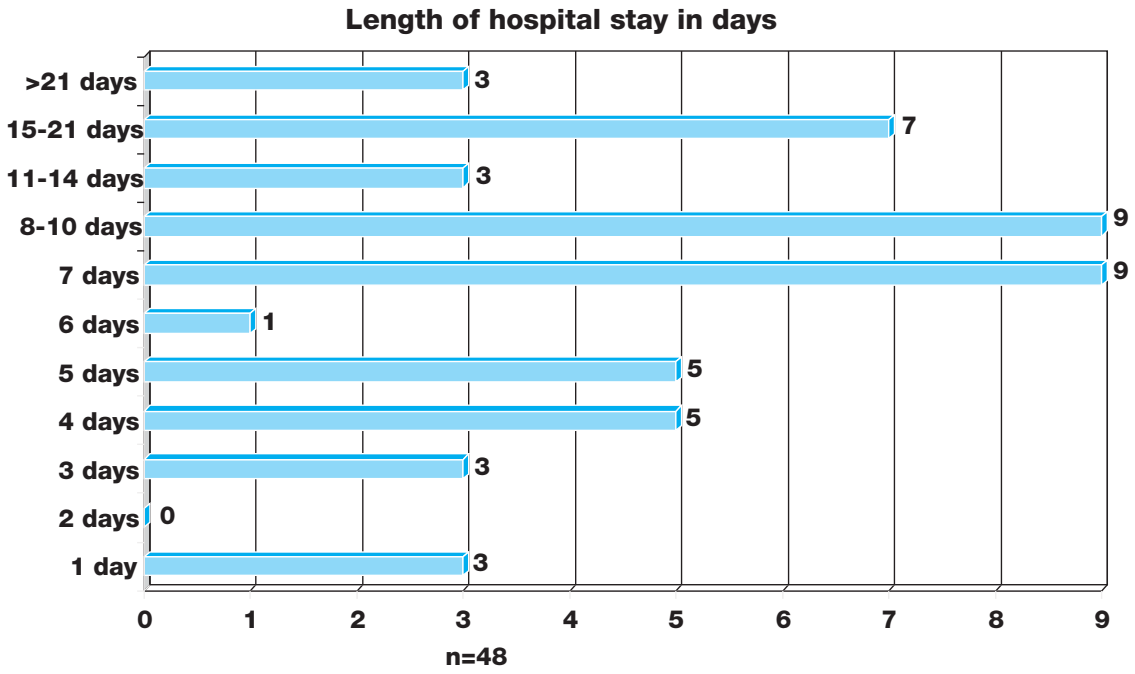



Table 3: Contrast enhanced CT scan thorax

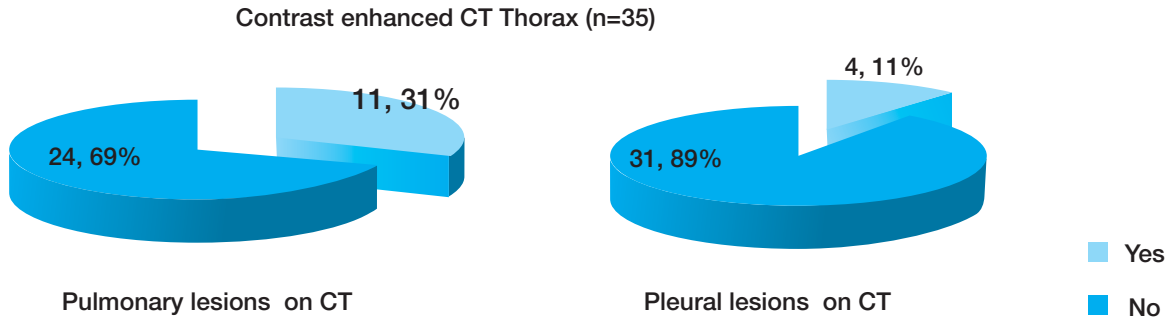


Table 4. Summary of pleural effusion

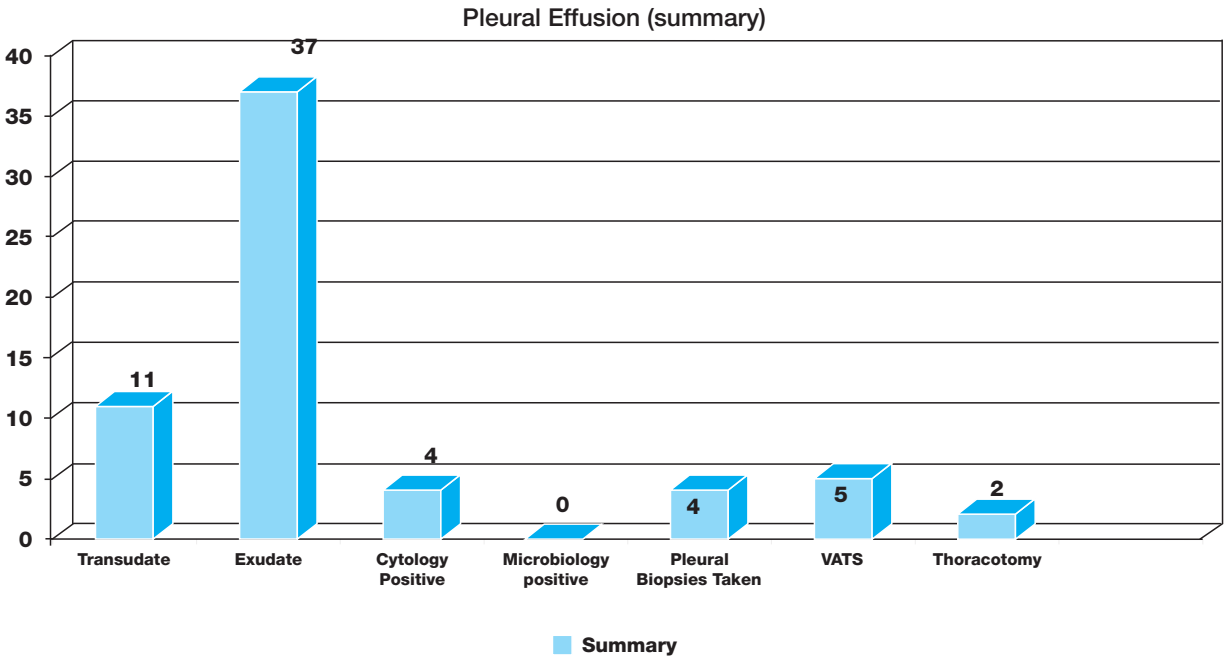
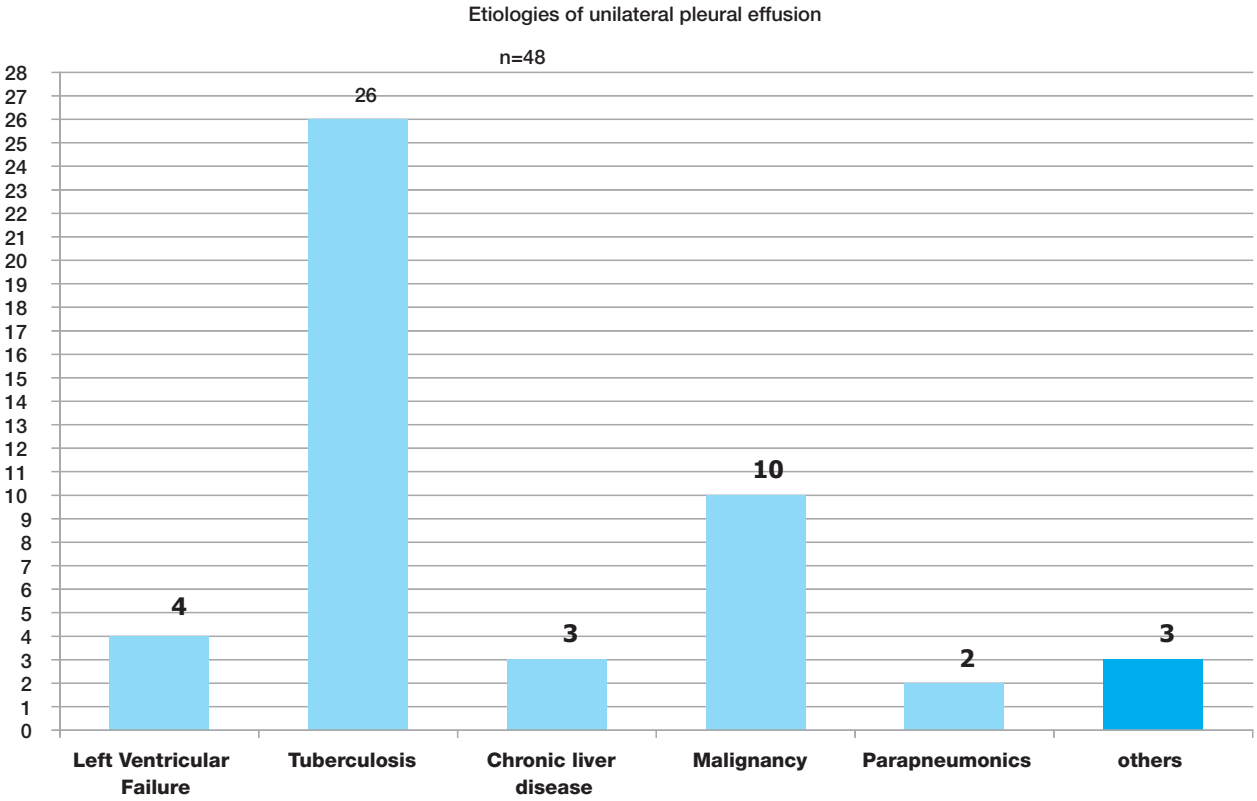
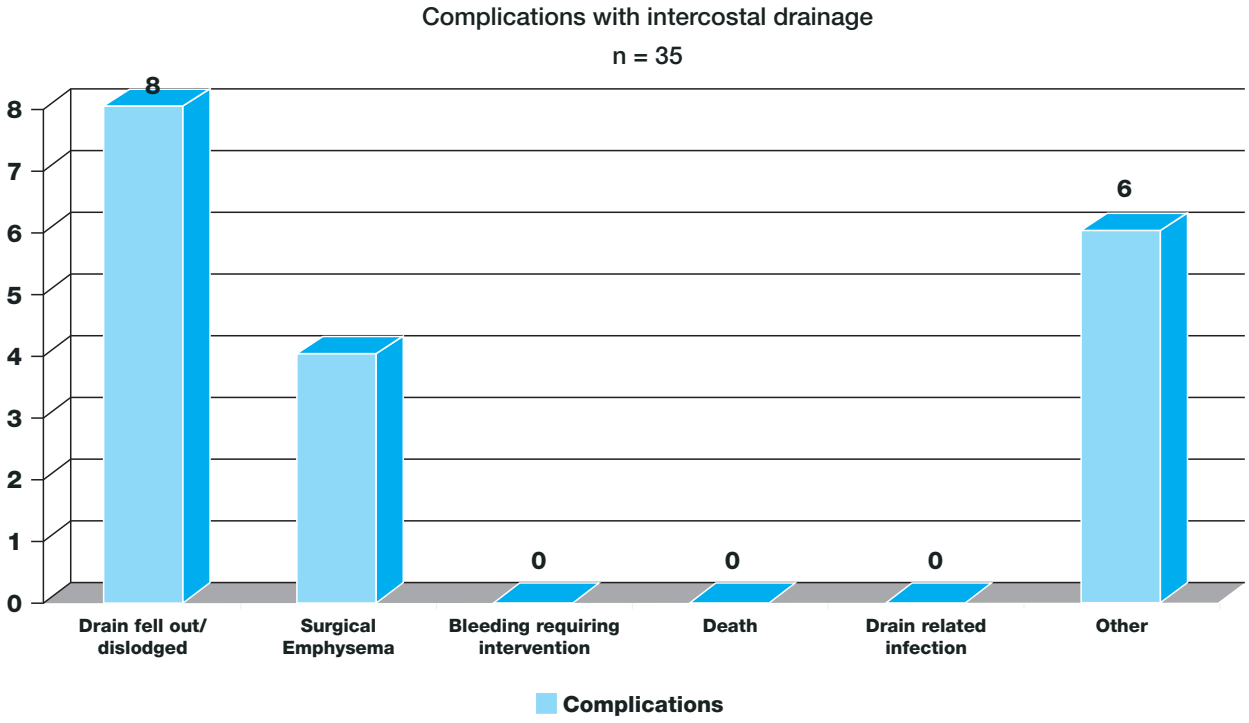



Table 5: Etiology of pleural effusion




be established in 2 (4%) cases (Table 5). Only 4 (8%) cases showed malignant cells on pleural fluid cytology. Among 10 unilateral malignant effusions, 7 were treated with pleurodesis with talc slurry which was unsuccessful in 2 cases. Among the 35 intercostal drains that were placed, 8 (21%) either fell out or

Table 6: Complications with intercostal drains




dislodged. 4(11%) developed drain related subcutaneous/surgical emphysema. Leaking from the drain site, small iatrogenic pneumothorax, drain blockage requiring regular flushing and minor hematoma were seen in 6 (12%) cases (Table 6).

## DISCUSSION

Pleural effusion is encountered frequently by physicians from all disciplines. It is the most common manifestation of pleural disease. The etiologies vary and range from cardiac or respiratory problem to inflammatory or malignant diseases requiring urgent evaluation and treatment. Pleural effusion may be acute or chronic.[5, 6] The most useful test to identify its etiology is usually a diagnostic pleural tap. Other investigations like pleural biopsies, CT scan, ultrasound abdomen, transthoracic echocardiogram and some blood tests may also be helpful in establishing the cause. Transudative pleural effusions result from an imbalance between oncotic and hydrostatic pressures. Inflammation of the pleura or reduced lymphatic drainage usually results in exudative pleural effusion. Based on their actual etiology, the treatment differs,[7-9] often requiring drainage of the fluid with the help of intercostals tube. Insertion of chest drain may be associated with certain complications.

This study showed that the commonest cause of unilateral pleural effusion is tuberculosis. Pakistan being a developing country has high prevalence of tuberculosis effecting different body organs including pleura. In countries like India, Ghana, Bangladesh, Malaysia, Iraq and Spain, most exudative unilateral pleural effusions are due to Tuberculosis.[10-13]. Tuberculosis is always the leading etiology of pleural effusions in the developing countries.[14] Although, the diagnosis of tuberculosis should ideally be based on microbiological, histological or nucleic acid testing (MTB-PCR), this may not be possible in every case. In areas with high TB prevalence sometimes therapeutic trial with anti-tuberculous drugs is considered appropriate where other clinical and radiological features are strongly suggestive of tuberculosis.

Most patient in this study were aged between 30-69 years, with maximum n= 12 (25%) in the age range 50-59 years. In other studies from area of high tuberculosis burden like Pakistan, mainly younger people with mean age of 34 years are reported to have tuberculous pleural effusion, most likely due to primary pleural infection at an early age rather than reactivation of previous lung parenchymal tuberculosis.[15]

We noticed that the average stay of a patient presenting with unilateral pleural effusion was more than a week. This long duration was mostly due to the fact that most of our patients had large effusions requiring intervention and also the fact that the etiology was infectious in majority of cases. It is well known that longer hospitalization is required in patients with

empyemic pleural effusion, patients with underlying lung diseases, those needing decortications / surgical intervention and patients with multiple co-morbidities.[16] The duration of hospital does have significant cost implications particularly for patients who have to pay themselves for their healthcare certain developing countries like ours (Pakistan).

Contrast enhanced CT scan thorax was performed in 37 (77%) of our patients. Pulmonary and pleural lesions on CT were seen only in 11 (31%) and 4 (11%) cases respectively. CT scans in general did not provide additional information over a carefully studied Chest X Ray. Although, contrast- enhanced CT scan of the chest may differentiate among select causes in a small group of patients when used by experienced radiologists, in a highly specialized center where they are able to appreciate the minor details such as pleural thickness and pleural nodules. The routine recommendation of performing CT scan of chest in further evaluation of pleural effusions is not recommended.[17]

Tuberculosis was the most common cause of pleural effusion in our study accounting for 54% of the cases. The presence of pulmonary lesions only in a small (11%) proportion of patients is suggestive of the fact that most of our patients had primary pleural infection rather than reactivation of previous lung parenchymal tuberculosis which is similar to that reported by Ibrahin et al.[18] The second most common cause of unilateral pleural effusion was malignancy in our series accounting for 21% of all cases. In literature, based on geographic location, this percentage has varied from 14.7% to 48%. The higher percentage is reported from middle and older age group.[19] In our study cytology was positive only in 4 cases. The literature suggests that diagnostic yield of pleural fluid cytology may improve with repeated pleural fluid cytologic specimens. Also, in suspected cases of malignant pleural effusion where cytology is negative, pleural biopsy is recommended. [20] In our study, we did not send a repeat sample and the proceeded with pleural biopsies which were helpful in diagnosing the remaining cases of malignant effusion.

Congestive cardiac failure turned out to be the most common cause of transudative pleural effusion. It accounted for 8% of all the unilateral pleural effusions. Heart failure associated pleural effusions are typically bilateral, but if unilateral they are commonly seen on the right side. The fluid is usually transudative but in 25% of cases it may fall into exudative range.[21]

In cases (n=35) where we needed to place an intercostals drain, luckily there were no serious or life threatening complications related to procedure. It is said that "there is no organ in the thoracic or abdominal cavity that has not been pierced by a chest drain". The complications reported in literature include haemothorax usually from laceration of intercostal vessel, lung laceration, diaphragm / abdominal cavity penetration, stomach / colon injury, tube placement in subcutaneous tissue instead of thoracic cavity and tube falling out /dislodging particularly if not secured appropriately.[22] In our study the commonest problem encountered was drain falling out or dislodging in 8 (22%) cases. This was most likely due to faulty technique of securing the drain after appropriate placement. Surgical emphysema was also seen in 4 (11%) cases. It was noted that tube was not inserted well enough in the thoracic cavity and secured with few holes still lodging in the subcutaneous tissue resulting in collection of air in subcutaneous tissue. All these complications can easily be minimized by appropriate training in intercostals drain placement.

## CONCLUSION

Tuberculosis is the commonest cause of unilateral pleural effusion followed by malignancy. Heart failure and chronic liver disease also account for significant proportion of unilateral pleural effusion. Patients with effusion may have prolonged hospital stay particularly those in need of surgical input. Thoracocentesis is a very useful test and provides valuable information to help narrow down the differentials. Most complications associated with intercostals drains may be avoided with better skills and training.

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