Original Article

# Pleural Fluid Estimation and Tubercular Infection in the People admitted with Pleural Effusion: A five Year Survey

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## ABSTRACT

**Purpose of study:** We prospectively conducted this study to evaluate the diagnostic value of Pleural fluid estimation and find the rate of tubercular infection in the people with pleural effusion in city of Lahore. Pleural TB is a common form of extrapulmonary disease and may occur in the presence or absence of pulmonary parenchymal disease on the chest radiograph.

**Study Design:** Prospective Study.

**Place and Duration of Study:** This study was conducted in the Biochemistry Department, FJMC, Lahore from May 2010 to Nov. 2010.

**Materials and Methods:** This study to evaluate the diagnostic value of Pleural fluid estimation and tubercular infection in the people with pleural effusion. All patients aged 22 years and older with clinical and radiographic findings consistent with pleural effusion due to TB admitted to the hospital were evaluated consecutively. The studies were performed on pleural fluid samples: glucose and protein were estimated. Specific gravity was calculated. Cell count, differential cell count, bacterial culture, acid-fast bacilli smear were performed using standard procedures. Specimen was cultured, if effusion contains more than 150 WBC/cumm.

**Results:** It was observed that the level of fluid glucose was increased in both sexes as compared to the normal reported values. Level of fluid protein was more in both sexes as compared to the normal reported values. However level of pH was neutral in both sexes. Present study found that pleural TB is still a major cause of pleural effusion in the city of Lahore, and microbiological and biochemical investigation may be helpful in diagnosing the disease.

**Key Word:** Pleural fluid, Exudate, TB.

## INTRODUCTION

Tuberculosis (TB) remains one of the most important health problems in the world, with an estimated 8 million new cases annually. Tuberculous (TB) pleural effusion occurs in approximately 5% of patients with Mycobacterium tuberculosis infection[1] (Gopi). Pleural TB is a common form of extrapulmonary disease and may occur in the presence or absence of pulmonary parenchymal disease on the chest radiograph[2,3].

Normally, very small amounts of pleural fluid are present in the pleural spaces, and fluid is not detectable by routine methods. When certain disorders occur, excessive pleural fluid may accumulate and cause pulmonary signs and symptoms. Once a symptomatic, unexplained pleural effusion occurs, a diagnosis needs to be established[3]. In normal subjects, 10 to 20 mL of fluid is spread thinly over the visceral and parietal pleurae. The fluid is similar in composition to plasma except that it is lower in protein (< 1.5 g/dL). On the other, Pleural fluid specific gravity is > 1.018 and glucose may be low (60-100 mg/dl)[4]. Pleural fluid enters from the pleural capillaries and exits via parietal pleural stomas and the lymphatics[5].

Pleural effusions are classified as transudates or exudates. Exudates are due to pleural inflammation (pleurisy), with an increased permeability of the pleural surface to proteinaceous fluid. Lymphatic obstruction may also contribute to accumulation of pleural fluid. All tuberculous effusions were exudative and lymphocytic[6].

Accurate biomarkers of pleural TB are useful, particularly for their negative predictive value[7]. Total cell counts should be obtained routinely for clear or turbid fluids. In the early stages of bacterial infection, fluid is not visibly purulent, many PMNs are present, and bacteria may be seen in a Gram stain. The presence of many small mature lymphocytes, particularly with few mesothelial cells, strongly suggests TB. In pulmonary infarction, there is usually a mixture of lymphocytes, PMNs, and mesothelial cells; RBCs may be numerous. Eosinophils in the pleural fluid have little diagnostic significance but are rarely present in a tuberculous or malignant effusion. The presence of Mycobacterium tuberculosis in the respiratory specimen of patients with pleural effusions is diagnostic of TB in someone with a pleural effusion[6]. However,

tuberculous pleural fluid macrophages and T lymphocytes may contribute to the immunopathogenesis of tuberculosis at a local site of disease[8].

A glucose concentration of < 60 mg/dL (< 3.33 mmol/L) in an exudative pleural effusion indicates TB, malignancy, parapneumonic effusion, or rheumatoid disease. The pH of loculated pleural effusions that complicate pneumonia tends to be < 7.2. These laboratory tests are most useful when integrated with all of the clinical data and other appropriate tests, eg, a tuberculin skin test when pleural effusion from TB is suspected[9].

# MATERIALS AND METHODS

**Patient Selection:** All patients aged 22 years and older with clinical and radiographic findings consistent with pleural effusion due to TB admitted to the hospital between January 1999 to 2005 were evaluated consecutively. Patients were not eligible if they had clinical and/or radiographic evidence of renal, cardiac, or liver failure; lung cancer; pregnancy; or had a Karnofsky Performance Status score less than 50%. In addition, patients were excluded if, during the three months before enrollment, they had hemoptysis or had received antituberculosis therapy or anticoagulant therapy for more than 1 week.

The studies were performed on pleural fluid samples: glucose and protein were estimated by autoanalyzer[10]. Specific gravity was calculated by titrametric method. Cell count, differential cell count, bacterial culture, acid-fast bacilli smear were performed using standard cytospin procedures and haematoxylin-eosin or Papanicolau stains. Cell count was carried out by using Neubar Chamber. Specimen was cultured, if effusion contains more than 150 WBC/cumm, on chocolate agar, blood agar and MacConkey's agar at $37^0$c for 24 hour [11].

**Analysis:** Comparisons between groups were done using student 't' test.

# RESULTS

Among patients with pleural TB, 75.2% (93/125) were male and 85% (85/100) were female. The mean age was 45.72 years (SD 19.22; range = 22–85) in male. In female the mean age was 43.74 year (SD 16.09; range = 20–80). Ninety-six percent of the chest radiographs demonstrated unilateral small or medium-sized effusion.

Level of fluid glucose, protein, sp gravity and pH of male and female patients were tabulated. It was observed that the level of fluid glucose was increased in both sexes as compared to the normal reported values (60-100 mg/dl) with a range of 10 to 400 mg/dl. However it was observed that the level of fluid glucose was more in male patients than the female. Level of fluid protein was more in both sexes as compared to the normal reported values (<0.5 gm/dl) with a range of 0.68-7.9 gm/dl. Specific gravity was in near to normal in both sexes as compared to the normal reported values (>1.018) with a range of 1.009 to 1.023. Level of pH was also neutral in both sexes.

Number of polymorphoneutorphils (PMN) and lymphocytes were also count down (data not shown). It was observed that the range of lymphocytes was from nil to 80%. On the other the range of PMN count down was from nil to 3200/cumm. Microbiological assay of only those specimen was performed, where lymphocytes were more than 120/cumm. Possible gram positive microorganisms were Staph aureus, Streptococus pneumoniae, Streptococus pyogens and Actinomycetes. However the possible gram negative microorganism were Hemophilus influenzae, Bacteriolus species, Pseudomonus aureginosa, Klebsiella strains and other enterobacterie were observed in samples of pleural fluid with TB. In some cases Mycobacterim tuberculosis, fungi, viruses especially Coxsaclie B virus was seen.

**Table No.1: Level of fluid glucose, protein, sp gravity and pH of male and female patients**

| Parameters | Male (93) | Female (100) |
|---|---|---|
| Age (years) | 45.72± SD=19.22 | 43.74± SD=16.09 |
| Glucose (mg/dl) | 146.33±13.42 SD=95.81 | 126.08±10.37 SD=74.03 |
| Protein (gm/dl) | 3.39±0.24 SD=1.75 | 3.02±0.26 SD=1.86 |
| Sp. Gravity | 1.020±0.01 | 1.020±0.01 |
| pH | 7.3 | 7.2 |

# DISCUSSION

Tuberculous (TB) pleurisy remains a diagnostic challenge. A high regional incidence for TB often correlates with poor financial resources necessitating a cost-effective diagnostic strategy[12].

Among patients with pleural TB, 75.2% (93/125) were male and 85% (85/100) were female. The mean age was 45.72 years (SD 19.22; range = 22–85) in male. In female the mean age was 43.74 year (SD 16.09; range = 20–80). However, a group of workers[13] found that 67% of patients with pleural TB were male. Their mean age was 37.2 years with a range of 18–89. On the other, a study reported[14] reported that the mean age of male patient with pleural TB was 61.00 years. Another study found that pleural effusions in tuberculosis are commonly seen in young adults as an immunological phenomenon occurring soon after primary infection[15].

Present study observed the mean fluid protein was 3.0-3.5 gm/dl. However, a group of workers reported[16] that the pleural fluid, total protein concentration was between 5.1-5.5 g/dl. Our study observed a high level of fluid glucose and it was in accord with a study[17].

Present study was in accord with a study. They found that the mean pH of fluid was 7.33 with a typical clinical presentation for tuberculous pleurisy[18].

It was observed that the range of lymphocytes was from nil to 80%. On the other the range of PMN count down was from nil to 3200/cumm. Our study is in accord with a study[19] who observed that the neutrophils were the predominant cells for the first 24 hours, and then were followed by lymphocytes. The study suggested that this shows that Tuberculous inflammatory and immunological responses in acute tuberculous pleurisy is enhanced rather than suppressed. The study reported that exudative-sensitized lymphocytes in tuberculous pleural fluid reacted to the specific antigen more effectively and produced higher titers of cytokines including interferon gamma (IFN-gamma) than circulating lymphocytes. Thus, activated T lymphocytes concern the production of cytokines at the morbid site and they effectively exert local cellular immunity through the action of such cytokines. The results of a study[9] suggest that tuberculous pleural fluid macrophages and T lymphocytes may contribute to the immunopathogenesis of tuberculosis at a local site of disease. Another study stated that the accumulation of MTB-specific T cells at the site of infection may prove as useful diagnostic marker for an accurate and rapid diagnosis of active TB[20].

# CONCLUSION

Present study observed no sputum in patients of both sexes. The fact that most patients with pleural TB do not produce sputum spontaneously may be the reason for the reportedly low yield of sputum culture in this setting[21,22].

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