

## “Efficacy of Total Pleural Fluid Bilirubin And Ratio to Serum Levels, Pleural Fluid Cholesterol And Total Protein Level in Diagnosing Pleural Effusion Exudates And Transudates And Its Correlation with light’s Criteria”

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### Abstract

**Objectives:** To evaluate the usefulness of Total Pleural fluid Bilirubin and its ratio to serum Bilirubin levels, Pleural fluid Cholesterol and Pleural fluid Total Protein level in classifying pleural effusions as exudates and transudates.

**Methods:** This study was conducted among 50 Patients with clinical and radiological evidence of pleural effusion. Then they are classified into exudates and transudates on the basis of the clinical, radiological and biochemical evaluation. Pleural fluid LDH, bilirubin, protein, cholesterol & Serum LDH, protein, Bilirubin were estimated and classified into exudates or transudates. Sensitivity, specificity, Positive predictive value, negative predictive value, diagnostic accuracy of each tests were calculated.

**Results:** From our study we came to know that there was no statistically significant difference among various criteria in classifying pleural effusion as exudates and transudates. The misclassification of exudates and transudates by various criteria when compared to Light’s criteria was not statistically significant as  $p$  value < 0.05.

**Conclusion:** From our study we came to a conclusion that to classify exudative and transudative pleural effusion, the most specific test is pleural fluid total protein and the most sensitive test is pleural fluid / serum bilirubin ratio. To conclude, though Light’s criteria remains as gold standard to differentiate transudates and exudates, in cases where there is a mismatch between clinical diagnosis and the outcome from Light’s criteria, pleural fluid bilirubin / serum bilirubin ratio and pleural fluid total protein evaluation may add to the diagnostic accuracy.

**Keywords:** Pleural fluid, bilirubin, cholesterol, total protein, Light’s criteria, exudates, transudates

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### I. Introduction

Pleural effusion is a very common clinical presentation of diseases. A correct diagnosis of the underlying disease is essential for the management of pleural effusion. Therefore, the first step is to classify them as transudates or exudates. Light’s criteria is the most commonly applied criteria. It was found that even Light’s criteria misclassified a large number of effusions, 25% of transudates as exudates. Hence, there is a need to investigate into new parameters which will prove to be superior or supportive to the present available array of tests. Hence, this study is being done to evaluate the Efficacy of Total Pleural fluid Bilirubin, ratio between pleural fluid bilirubin and serum bilirubin levels, Pleural fluid Cholesterol and Pleural fluid total Protein level in classifying the Pleural Effusion as Exudates and Transudates and its correlation with Light’s criteria.

### II. Materials And Methods

This study was conducted among 50 patients with pleural effusion, attending the Department of Medicine & Department of Thoracic Medicine in Government Rajaji Hospital, Madurai. Patients with clinical and radiological evidence of pleural effusion, irrespective of etiology, both sexes with age > 12 years were included. The study was conducted in patients who had pleural effusion with clinical background of congestive cardiac failure, chronic liver disease, chronic kidney disease, tuberculosis, parapneumonic effusions and malignancy. Patients with jaundice, dyslipidemia, hypoproteinemia and age < 12 years were excluded. Pleural fluid LDH, bilirubin, cholesterol, total protein & Serum Bilirubin, LDH, total protein were estimated and the patients were classified into exudates and transudates. Then they were classified into exudates and transudates on the basis of Light’s criteria. Now the classification of exudates and transudates done on the basis of Total Pleural fluid bilirubin and ratio between Pleural fluid bilirubin and serum bilirubin, Pleural fluid cholesterol, Pleural fluid Total protein were compared with results of the classification of exudates and transudates done on the basis of Light’s criteria. Sensitivity, specificity, Positive predictive value, negative predictive value,

diagnostic accuracy of each tests were calculated. In our study to diagnose exudates the following parameters were used :

- A pleural fluid bilirubin of more than 0.48 mg / dL ,
- A pleural fluid bilirubin to serum bilirubin ratio of more than 0.62 ,
- A pleural fluid cholesterol of more than 60 mg / dL ,
- A pleural fluid total protein more than 3 g/dL .

**The Light’s Criteria Is One Or More Of The Following For Diagnosing Exudates.**

1. Pleural fluid protein /serum protein >0.5
2. Pleural fluid LDH/serum LDH >0.6
3. Pleural fluid LDH more than 2/3 rd of the upper limit of serum.

**III. Statistical analysis**

All the details obtained from the patients were noted and results were analysed statistically. The 'p' value < 0.05 denoted significant one to one relationship.

**IV. Results**

Gender distribution 58% male 42% female. Among this 56% are exudates 44% are transudate. Among the exudates, about 50 % of study groups have tuberculosis , 35.72% have malignancy and 14.28 % have parapneumonic effusions. Among the transudates , about 50% of study groups have tuberculosis, 35.72% have malignancy and 14.28 % have parapneumonic effusions. From our study it is evident that most specific test to classify an exudative pleural effusion from a transudative pleural effusion is pleural fluid total protein which is 95.45 % and most sensitive test is pleural fluid / serum bilirubin ratio which is 95.45 %.

Age distribution of the study population (n=50)

Age group	Frequency	Percent
<25 years	2	4
26 – 40 years	6	12
41 – 55 years	17	34
56– 70 years	24	48
>70 years	1	2
Total	50	100

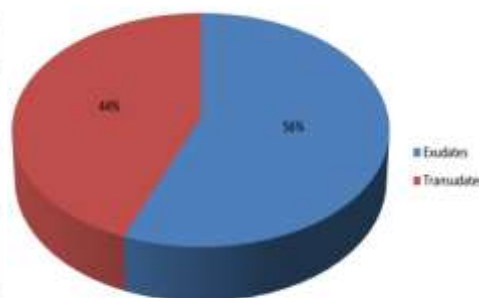
Distribution of Transudates in the study group

Etiology	Frequency	Percent
Congestive cardiac failure	10	45.46
Chronic liver disease	8	36.36
Chronic kidney disease	4	18.18
Total	22	100

The positive predictive value, negative predictive value and diagnostic accuracy is higher for pleural fluid total protein which are 96.29 % ,95.23 % , 94 % respectively .The sensitivity,specificity, positive predictive value, negative predictive value and diagnostic accuracy of Light’s criteria are 85.71 % , 90.90 % , 92.30 % , 83.33 % , 88 % respectively .

Distribution of Exudates in the study group

Etiology	Frequency	Percent
Tuberculosis	14	50
Malignant pleural effusions	10	35.72
Parapneumonic effusions	4	14.28
Total	28	100



Identification of transudate by various criteria (n=22)

Criteria	Correctly classified as transudate N (%)	Wrongly classified as exudate N (%)
Light 's criteria	20 (90.90%)	2 (9.10%)
Pleural fluid Bilirubin	19 (86.36%)	3 (13.64%)
Pleural fluid / Serum Bilirubin ratio	20 (90.90%)	2 (9.10%)
Pleural fluid cholesterol	19 (86.36%)	3 (13.64%)
Pleural fluid Total Protein	21 (95.45%)	1 (4.55%)

Identification of exudates by various criteria (n=28)

Criteria	Correctly classified as exudate N (%)	Wrongly classified as transudate N (%)
Light 's criteria	24 (85.72%)	4 (14.28%)
Pleural fluid Bilirubin	23 (82.14%)	5 (17.86%)
Pleural fluid / Serum Bilirubin ratio	27 (96.42%)	1 (3.58%)
Pleural fluid cholesterol	21 (75.00%)	7 (25.00%)
Pleural fluid Total Protein	26 (92.85%)	2 (7.15%)

**Sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) , diagnostic accuracy of various criteria.**

Criteria	Sensitivity	Specificity	Positive predictive value	Negative predictive value	Diagnostic accuracy
<b>Light 's criteria</b>	85.71 %	90.90%	92.30%	83.33%	88%
<b>Pleural Fluid bilirubin</b>	82.14 %	86.36%	88.46%	79.16%	84%
<b>Pleural Fluid/ Serum Bilirubin</b>	96.42%	90.90%	93.10%	95.23%	94%
<b>Pleural Fluid Cholesterol</b>	75.00%	86.36%	87.50%	73.07%	80%
<b>Pleural Fluid Total Protein</b>	92.85%	95.45%	96.29%	95.23%	94%

The sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of pleural fluid bilirubin and pleural fluid cholesterol were not superior to Light 's criteria. The pleural fluid bilirubin /serum bilirubin ratio and pleural fluid total protein are very effective in differentiating exudative and transudative pleural effusion.

## V. Discussion

One of the most common disease entity encountered by physicians worldwide is pleural effusion . In a situation where undiagnosed pleural effusion has come upon, the first and foremost thing to be resolved is whether the fluid is a transudate or exudate. The most frequently used Light's criteria, though still considered as a gold standard, often misclassify a transudate as an exudates. Bilirubin has a high molecular weight (584).With respect to its concentration between serum and protein it behaves in a manner identical to that of the high molecular weight proteins . Any serous membrane inflammation often leads to increased capillary permeability and this enables the diffusion of high molecular weight bilirubin .A pleural fluid bilirubin of more than 0.48 mg / dL and a pleural fluid bilirubin to serum bilirubin ratio of more than 0.62 is considered as exudates. The mechanism of increased concentration of cholesterol in Exudative pleural effusion is not known clearly.

The permeability of pleura is increased due to “serum leakage” and this leads to the accumulation of cholesterol in exudative pleural effusion. A pleural fluid cholesterol of more than 60 mg / dL is used in diagnosing exudates. Though Light's criteria remains as gold standard to differentiate transudates and exudates, in cases where there is a mismatch between clinical diagnosis and the outcome from Light's criteria, pleural fluid bilirubin / serum bilirubin ratio and pleural fluid total protein evaluation may add to the diagnostic accuracy.

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