

**Original article:**

## **Diagnostic value of pleural fluid cholesterol versus lights criterion to differentiate transudative and exudative pleural effusion**

**Dr. Mahajan SN, Dr. Pranay Raghuwanshi**

Department of Medicine, Rural Medical College, Pravara Institute of Medical Sciences (DU) ,Loni

Corresponding author: Dr. Pranay Raghuwanshi

### **ABSTRACT:**

**Background:** The mean amount of pleural fluid normally present is as small as  $8.4 \pm 4.3$  ml. The abnormal collection of fluid in pleural cavity is known as pleural effusion. Pleural fluid maybe trasudative or exudative in nature depending on aetiology. Light et al. in 1972 found criteria to have sensitivity and specificity of 99% and 98% respectively in differentiating the nature; but other studies could only produce specificities of 70-86% using the same.

**Methodology:** Present study was evaluative type of study and was conducted in Pravara Rural Hospital (PRH) with sample size of 86 patient within September 2017 till August 2019.

**Result:** It was seen that according to Lights criteria 77.50% patient were having exudative effusion while 22.50% were having transudative effusion. It was noted that according to Pleural cholesterol level 73.33% patients were having exudative effusion while 26.67 % were having transudative effusion. It was seen that according to Heffner criterion 75.38% patient were having exudative effusion while 24.17% were having transudative effusion.

**Conclusion:** The sensitivity of pleural cholesterol level to differentiate pleural fluid in exudative and transudative was 91.40% and 88.89%. The positive predictive and negative predictive value was 95.59% and 75.00% respectively. The diagnostic accuracy was 90.83%.

### **INTRODUCTION:**

The accumulation of an abnormal quality and quantity of fluid in the pleural cavity is called pleural effusion.<sup>1</sup> Collection of fluid in the pleural cavity has varied etiological factors.<sup>2</sup> Because of the various etiologies that can cause pleural effusion, it often present a diagnostic problem, even after extensive investigations. The initial step is the distinction between transudates and exudates as this gives an indication of pathophysiological mechanisms, differential diagnosis and the need for further investigation. The diagnosis of the cause of pleural effusion is usually done by clinical, radiological, histological and laboratory findings.<sup>2</sup>

The mean amount of pleural fluid in the normal is as small as  $8.4 \pm 4.3$  mL. Fluid that enters the pleural space can originate in the pleural capillaries, the interstitial spaces of the lung, the intrathoracic lymphatics, the intrathoracic blood vessels, or the peritoneal cavity. Pleural fluid is usually absorbed through the lymphatic vessels in the parietal pleura by means of stomas in the parietal pleura, or through the alternative transcytosis.<sup>1</sup> But various pathogenic mechanisms increase the amount of pleural fluid by increasing the rates of pleural fluid formation exceeding the rate of pleural fluid absorption.<sup>1</sup> The first step of differential diagnosis or determination of pathogenesis for pleural fluid is to determine whether the patient has a transudative or exudative pleural effusion.<sup>2</sup>

Initially, measurement of the protein concentration and lactate dehydrogenase (LDH) activity is of prime importance because they permit classification of the pleural fluid as either a transudate or exudate - a distinction of important diagnostic significance. Light et al. in 1972 found criteria to have sensitivity and specificity of 99% and 98%, respectively, for differentiating transudative and exudative

Pleural fluid cholesterol can be used to classify exudates and transudates as it misclassified fewer cases than any other Light's parameters.

- Pleural fluid protein/serum protein  $>0.5$
- Pleural fluid L.D.H/serum L.D.H  $>0.6$
- Pleural fluid L.D.H  $>2/3$  normal upper limit for serum L.D.H.

Pleural cholesterol is thought to be derived from degenerating cells and vascular leakage from increased permeability. The cause of the rise in cholesterol levels in pleural exudates is still unknown.

There are many criteria to differentiate exudates but none has 100% sensitivity and specificity.

Therefore, the present study was conducted to study the diagnostic value of pleural fluid cholesterol level versus pleural fluid protein, pleural fluid LDH level (light's criterion) to differentiate transudative and exudative character in patients with pleural effusion.

#### **MATERIAL AND METHODS:**

The present study was observational hospital based evaluation of diagnostic test value of pleural fluid cholesterol level versus pleural fluid protein, pleural fluid LDH level (light's criterion) to differentiate transudative and exudative character in patients with pleural effusion.

The present study period was September 2017 to August-2019. The study population was all patients with clinical and biochemical evidence of pleural effusion in a tertiary care hospital .A total sample size of 86 patients with clinical and biochemical evidence of pleural effusion were included in the study.

#### **Inclusion criteria:**

- Subject with Age  $>12$
- Subject of both sexes
- Patient ready to give written informed consent for study and parental consent for patient below 15 years

#### **Exclusion criteria:**

- Non consenting

The study was approved by the Ethics Committee.

Methodology:

Light's criteria (1972) :

- Pleural fluid protein/serum protein  $>0.5$
- Pleural fluid L.D.H/serum L.D.H  $>0.6$
- Pleural fluid L.D.H  $>2/3$  normal upper limit for serum L.D.H.

Investigations Done:

- Serum proteins
- X Ray chest PA view

- Pleural fluid proteins
- Pleural fluid L.D.H
- Pleural fluid cholesterol

Pleural fluid tapping was done in these patients and pleural fluid protein, LDH, is determined and light's criterion and cholesterol level was also calculated to define fluid as transudative or exudative.

**STATISTICAL ANALYSIS:**

Data were double entered using Microsoft excel 2007 and analyzed using SPSS version 22. Data were summarized in frequency tables, pie chart and histogram. Categorical variables were reported as proportions. Continuous data were described as means (standard deviation) or medians (interquartile range) depending on the distribution of data. The T- test where applied in the following results whenever necessary. If applicable, for qualitative data tests like Chi-square test and for quantitative data test like t-test /ANOVA was used for comparison of variables. P-value < 0.05 was considered as significant.

**RESULTS:**

The results of the present study are described in the following tables and figures.

**Table no.1: Distribution of subject according to Lights criteria.**

TYPE	No of patients	Percentage
Exudate	67	77.50
Transudate	19	22.50

**Table no.2: Distribution of subject according to Pleural cholesterol level**

TYPE	No of patients	Percentage
Exudate	64	73.33
Transudate	22	26.67

**Table no.3: Distribution of subject according to Heffner criteria.**

TYPE	No of patients	Percentage
Exudate	74	75.83
Transudate	12	24.17

**Table no.4: Diagnostic accuracy of Pleural cholesterol level**

		Lights criteria		
		Exudate	Transudate	Total
Pleural cholesterol level	Exudate	62	2	64
	Transudate	5	17	22
Total		67	19	86

**Table 5 : Sensitivity, Specificity, positive and negative predictive value of pleural fluid cholesterol in diagnosis of type of effusion**

Statistic	Value	95% CI
Sensitivity	91.40%	83.75% to 96.21%
Specificity	88.89%	70.84% to 97.65%
Positive Predictive Value	96.59%	90.68% to 98.80%
Negative Predictive Value	75.00%	60.42% to 85.50%
Accuracy	90.83%	84.19% to 95.33%

**DISCUSSION:**

The present study was conducted in the department of Medicine with the aim to evaluate probability of using pleural fluid cholesterol in classifying pleural effusion into exudative and transudative types which was compared with light's criterion as gold standard. Total 86 cases of pleural effusion were enrolled.

We found that according to Lights criteria 77.50% patients were having exudative effusion while 22.50% were having transudative effusion. By using Light's criteria Poongavanam Paranthaman<sup>3</sup> diagnosed 85% cases having exudative and 20% cases as transudative pleural effusion. In the study by A. B. Hamal et. Al<sup>4</sup> pleural effusion in 69.4% cases was exudates and 30.6% cases was transudates. In the Hiremath AM<sup>5</sup> study patients with pleural effusion were classified as transudative and exudative pleural effusion based on Light's criteria and it was seen that in 90% cases pleural fluid transudative and exudative in 10% cases.

In present study accord to Pleural cholesterol level 73.33% patients had exudative effusion while 26.67% were having transudative effusion. While according to Heffner criteria 75.83% patients were having exudative effusion while 24.17% were having transudative effusion.

The sensitivity of Pleural cholesterol level to differentiate pleural fluid in exudative and transudative types was 91.40% while specificity was 88.89%. The positive predictive and negative predictive values were 96.59% and 75.00%, respectively. The diagnostic accuracy was 90.83%. In the Poongavanam Paranthaman<sup>3</sup> study Pleural fluid cholesterol was compared with the standard LIGHTS criteria it was seen that the sensitivity was 95%, specificity was 80%, positive predictive value of 95%, negative predictive value of 80%, and p value of <0.001.(S) A. B. Hamal<sup>4</sup> study reported the sensitivity of pleural fluid cholesterol for differentiating the transudate and exudates was 97.7% while specificity was 100%. The positive and negative predictive value was 100% and 95% respectively. Guleria R of AIIMS, New Delhi<sup>6</sup> found that for exudative pleural effusion, pleural fluid cholesterol  $\geq 60$  mg/dl has 92% accuracy, 88% sensitivity and 100% specificity;

#### REFERENCES:

1. Paramasivam E, Bodenham A. Pleural fluid collections in critically ill patients. *Continuing Education in Anesthesia, Critical Care & Pain* 2007; 7: 10-14
2. Noppen M, De Waele M, Li R et al. Volume and cellular content of normal pleural fluid in humans examined by pleural lavage. *Am J Respir Crit Care Med* 2000; 162: 1023-26
3. Poongavanam Paranthaman, Ramani Bala Subra Manian, Balaji Thenrajan. Study of pleural fluid cholesterol and lactate dehydrogenase to differentiate exudate from transudate and compared with Light's criteria. *IAIM*, 2017; 4(6): 31-37.
4. B. Hamal, K. N. Yogi, N. Bam, S. K. Das, and R. Karn, "Pleural Fluid Cholesterol in Differentiating Exudative and Transudative Pleural Effusion," *Pulmonary Medicine*, vol. 2013, Article ID 135036, 4 pages, 2013
5. Hiremath AM, Shetty DU, Rachita P. A study of clinical profile, aetiology and outcome of patients presenting with pleural effusion. *J. Evolution Med. Dent. Sci.* 2019;8(08):494-499
6. Guleria R. Role of pleural fluid cholesterol in differentiating transudates from exudative pleural effusion. *National Medical Journal of India.* 2003;16(2):64-69