ISSN:0975-3583,0976-2833 VOL12,ISSUE03,2021

# A study of correlation of pleural fluid ldh, protein, cholesterol, bilirubin and cells as an aid to clinical diagnosis and management of pleural effusion

**Dr. Vishal Malviya[1] (PG Resident), Dr. Abhijeet Khandelwal[2] (Associate Professor), Dr. Sunil Manohar Singh[3] (PG Resident), Dr. Srishti Gour[4] (PG Resident), Dr. Sudarshan Gupta[5] (Asst. Prof.), Dr. Kumar Girendra[6] (Prof. & HOD)**

[1,2,3,4,5,6]Dept. of Respiratory Medicine, Index Medical College Hospital and Research Centre, Indore, M.P., India

First Author: Dr. Vishal Malviya
Corresponding Author: Dr. AbhijeetKhandelwal

**Abstract:**

**Background&Method:** This study was conducted with an aim toassess the usefulness of pleural fluid LDH, PROTEIN, CHOLESTEROL, BILIRUBIN and CELLS in diagnosis and differentiating transudative and exudative pleural effusion patient.All patients between >18 years of age admitted in Chest ward of Index Medical College, Indore with diagnosis of a PLEURAL EFFUSION. Study was be conducted on 60 patients from the Department of TB and CHEST at Index Medical College, Hospital & Research centre Indore and all the tests was be perform with due permission from the Institutional Ethical Committee and informed consent from the subjects or their legal relatives. Subjects were included on the basis of their diagnosis of PLEURAL EFFUSION as per Extended Lights criteria.

**Result:**According to Lights Criteria the mean pleural sugar is 86.29±48.88 in exudates and 116±42.76 in transudate, although it was not statistically significant. The mean protein value is 4.73±1.11 in exudates and 2±0.81 in transudate and this difference between the mean protein values was statistically significant. Mean pleural LDH is 896±867 in exudates and 189±60 in transudate, although this difference between the mean values was not statistically significant. The mean cholesterol value is 78.14±38.20 in exudates and 31.75±21.54 in transudate and this difference between the mean protein values was statistically significant. The mean ADA value is 56.96±28.58 in exudates and 19.75±13.52 in transudate and this difference between the mean protein values was statistically significant.

**Conclusion:**In pulmonary medicine, pleural effusion diagnosis is still a developing field. With the increased prevalence of pleural disease, multidisciplinary initiatives to improve diagnosis accuracy while remaining cost-effective are required. Pleural fluid cholesterol criteria (cholesterol >60 mg/dl – exudate; cholesterol <60 mg/dl – transudate) are shown to be an effective tool for separating pleural effusions in this investigation. As a result, it is suggested that using pleural fluid cholesterol to distinguish exudate from transudate is preferable to using

ISSN:0975-3583,0976-2833 VOL12,ISSUE03,2021

Light's criteria, with the added benefit of not having to collect a blood sample at the same time, especially in countries like India where financial and technical constraints are severe.
**Keywords:** Pleural fluid, LDH, Protein, Cholesterol, Bilirubin & transudates.

**Study Designed:**Observational Study.

## 1. INTRODUCTION

Normally the pleural space contains only a few millilitres of pleural fluid. Pleural fluid accumulates when the rate of formation exceeds the rate of absorption. Pleural effusion is divided into two types depending on pathophysiology. They are Transudate and Exudate[1]. The important step in pleural effusion is to decide whether the effusion is a transudate or exudates by Light's criteria [2]

It is clinically important to classify pleural fluids into exudates and transudates Pleural effusion because this is indicative of the underlying pathophysiological process involved. A transudative pleural effusion develops when the systemic factors influencing the formation or absorption of pleural fluid are altered. The fluid may originate in the lung, pleura, or peritoneal cavity [3]. An exudative pleural effusion develops when the pleural surfaces or the capillaries where the fluid originates are altered .If the effusion is a transudate no further diagnostic procedures are necessary and if the effusion is an exudates, more diagnostic investigation is indicated to delineate the cause of the effusion[4].Such a distinction allows appropriate investigations to be instigated, enabling better patient management. Initially a pleural fluid protein level of 3.0g/dl was used to differentiate transudates from exudates [5].

Light et al. in 1972 found criteria to have sensitivity and specificity of 99% and 98%, respectively, for differentiating transudative and exudative pleural effusions. But the other studies only reproduce specificities of 70–86% using Light's criteria. About 25% of transudates are mistakenly identified as exudates by using Light's criteria. Acute diuresis in heart failure can elevate protein levels into exudative range [6]. Extended Light criteria used a Pleural fluid to serum total protein ratio >0.5, a Pleural fluid lactate dehydrogenase (LDH) value > 200 U/litre, or a Pleural fluid to serum LDH ratio > 0.6 ,Pleural fluid to serum bilirubin >0.6 ,Pleural fluid Cholesterol >60mg/dL ,Pleural fluid to serum cholesterol >0.4 and cells to diagnose exudates with the remaining fluids being transudates. This has been reported as the best method for discriminating between exudates and transudates. Although paired and triple tests had higher diagnostic accuracies than individual tests, no clearly superior test combination was identified.

This study is to establish the effect of analyzing pleural fluid Lactate dehydrogenase and total protein alone on categorization of pleural effusion in routine clinical practice. We compare the resultant categorizations with those produced by application of Extended Light's criteria.

## 2. MATERIAL & METHOD

All patients between >18 years of age admitted in Chest ward of Index Medical College, Indore with diagnosis of a PLEURAL EFFUSION between May 2020 to April 2021. Study was be conducted on 60 patients from the Department of TB and CHEST at Index Medical College, Hospital & Research centre Indore and all the tests was be perform with due permission from the Institutional Ethical Committee and informed consent from the subjects or their legal

ISSN:0975-3583,0976-2833 VOL12,ISSUE03,2021

relatives.Subjects were included on the basis of their diagnosis of PLEURAL EFFUSION as per Extended Lights criteria.

**Source of data:**
The present study was undertaken at Department of T.B. AND CHEST MEDICINE Index Medical College Hospital & Research Centre, Indore for a period of 18 months.

**INCLUSION CRITERIA**

1. All patients above the age of 18 yrs admitted with pleural effusion.

**EXCLUSION CRITERIA:**

1. All patients below the age of 18 years
2. Patient not willing to participate in the study
3. Traumatic effusion
4. Patient previously diagnosing and already on treatment
5. Patient with pulmonary embolism or renal insufficiency with pleural effusion
6. CKD patients on haemodialysis
7. Retrovirus positive cases

## 3. RESULTS

**Table: 01- Distribution of aetiology of pleural effusion among study participants**

| Clinical Diagnosis | Count (N) | Percentage (N %) |
|---|---|---|
| CCF | 11 | 18.3% |
| Hepatic Hydrothorax | 2 | 3.3% |

ISSN:0975-3583,0976-2833 VOL12,ISSUE03,2021

| | | |
|---|---|---|
| Malignancy | 8 | 13.3% |
| Para-pneumonic | 10 | 16.7% |
| Pulmonary Embolism | 1 | 1.7% |
| Rheumatic | 1 | 1.7% |
| Tuberculosis | 27 | 45.0% |

Distribution of aetiology of pleural effusion among study participants,the given table depicts the causes of pleural effusion among the study subjects. Most common cause of pleural fluid effusion was recorded as tuberculosis (45%) followed by CCF (18.3%) and para-pneumonic effusion (16.7%).

**Table:02-Biochemical analysis of pleural fluid**

| Lights Criteria | | N | Mean | Std. Deviation | Std. Error Mean | t | df | P value |
|---|---|---|---|---|---|---|---|---|
| Sugar | Transudative | 4 | 116 | 42.76 | 21.38 | 1.18 | 58 | .242 |
| | Exudative | 56 | 86.29 | 48.88 | 6.53 | | | |

ISSN:0975-3583,0976-2833 VOL12,ISSUE03,2021

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Protein (g/dl) | Transudative | 4 | 2 | .81 | .40 | -4.77 | 58 | **.000** |
| | Exudative | 56 | 4.73 | 1.11 | .14 | | | |
| LDH (IU/l) | Transudative | 4 | 189.75 | 60.24 | 30.12 | -1.61 | 58 | .111 |
| | Exudative | 56 | 896.86 | 867.42 | 115.91 | | | |
| ADA (IU/L) | Transudative | 4 | 19.75 | 13.52 | 6.76 | -2.56 | 58 | **.013** |
| | Exudative | 56 | 56.96 | 28.58 | 3.82 | | | |
| Cholesterol (mg/dl) | Transudative | 4 | 31.75 | 21.54 | 10.77 | -2.77 | 58 | **.007** |
| | Exudative | 56 | 78.14 | 32.80 | 4.38 | | | |
| Serum Bilirubin (mg/dl) | Transudative | 4 | .45 | .21 | .10 | -3.40 | 58 | **.001*** |
| | Exudative | 56 | .66 | .11 | .01 | | | |

According to Lights Criteria the mean pleural sugar is 86.29±48.88 in exudates and 116±42.76 in transudate, although it was not statistically significant. The mean protein value is 4.73±1.11 in exudates and 2±0.81 in transudate and this difference between the mean protein values was statistically significant. Mean pleural LDH is 896±867 in exudates and 189±60 in transudate, although this difference between the mean values was not statistically significant. The mean cholesterol value is 78.14±38.20 in exudates and 31.75±21.54 in transudate and this difference between the mean protein values was statistically significant. The mean ADA value is 56.96±28.58 in exudates and 19.75±13.52 in transudate and this difference between the mean protein values was statistically significant.

ISSN:0975-3583,0976-2833 VOL12,ISSUE03,2021

**Table:03- Distribution of type of fluid according to Pleural fluid Cholesterol values**

| Pleural fluid Cholesterol | Count (N) | Percentage (N %) |
|---|---|---|
| <60 mg/dl (Transudative fluid) | 13 | 21.7% |
| >60 mg/dl (Exudative fluid) | 47 | 78.3% |

Distribution of type of fluid according to Pleural fluid Cholesterol values,out of 100 cases pleural fluid cholesterol identifies 21.7% [n=13] of cases as transudates and 78.3% [n=47] of cases as exudates.

## 4. DISCUSSION

The majority of cases were between the ages of 41 and 60, with males accounting for 73.3 % and females for 26.6 %. In a study done by Sumathy et al, Out of 60 patients, males were 38 and females were 22. [7&8] The majority of the participants (50%) had moderate pleural effusion, while 20% had both substantial and mild pleural effusion. Only % of those who took part in the study developed loculated pleural effusion. Lymphocytic pleural effusion accounted for 41.7 %, reactive pleural effusion for 25%, inflammatory pleural effusion for 23%, and malignant cells in pleural fluid for 6.7 % of patients. In present study, radiologically, majority of participants had left sided pleural effusion (n=31) followed by right sided (n=25) and bilateral pleural effusion (n=4). AyaliAmbresh et al[9] reported, Out of 60 patients, 36 had right sided effusion, 19 had left sided effusion, 5 patients had bilateral pleural effusion.In present study, Approx. 41.7% were lymphocytic pleural effusion, 25% were reactive in nature, 23.3% were inflammatory, and 6.7% cases were positive for malignant cells in pleural fluid. In a study done by AyaliAmbresh et al[9], authors reported Out of 60 patients, 3 patients had lymphocytes plus mesothelial cells,42 patients had predominantly lymphocytes and 15 patients had predominantly neutrophils.

ISSN:0975-3583,0976-2833 VOL12,ISSUE03,2021

Out of 60 cases, Light‘s criteria diagnosed 93.33% [n =56] cases as exudates and 6.66% [n=4] of cases as transudates. The most common cause of exudative effusion was tuberculosis (48.2%), followed by pneumonia (17.9%), malignancy (14.3%), CCF (14.3%), PE (1.8%), and Rheumatic fever (1.8%). Congestive heart failure (75 %) was the most common condition among patients with transudative effusion, followed by hepatic hydrothorax (25%). Clinical diagnosis and pleural fluid type were found to have a statistically significant association. Based on Lights criteria, out of 60 patients 46 were exudates (76.7%) and 14 were transudates(23.3%). Among 46 exudates, 40 were tubercular effusions, 5 patients were pneumonic effusion and 1 patient with malignant effusion. Among 14 transudative, 7 patients were congestive cardiac failure, 7 patients were cirrhosis. AyaliAmbresh et al[9] reported, Based on Lights criteria, out of 60 patients 46 were exudates (76.7%) and 14 were transudates (23.3%).[10] In a study done by Kali Gandhi et al[8], among the patients with exudative effusion, tuberculosis was the most common cause, diagnosed in 23 patients (44.2%) followed by pneumonia (23%), malignancy (13.3%), empyema ( 9.6%), pericardial disease (5.7%) and pulmonary embolism (3.8%). However, among the patients with transudative effusion, congestiveheart failure (75%) was the most prevalent condition, followed by hepatic cirrhosis (25%).The majority (51.8%) of patients with exudative effusion were in the 41-60 year age group, followed by the 61-80 year age group (28.6%), and the 19-40 year age group (19.6%). Similarly, patients with transudative effusion in the age groups of 41- 60 years and 61-80 years had an identical proportion. In a study done by Kali Gandhi et al[8], in patients with exudative effusion, the majority (46.2%) of study population were in >65 years age group, followed by the 41- 65 years (34.6%) and 15-40 years (19.2%) age groups. Similarly, in patients with transudative effusion, the majority i.e. 62.5% of study population were in >65 years age group, followed by the 41-65 years (25%) and 15-45 years (12.5%) age groups(3). Both exudative effusions were found to be more prevalent in male patients, with % being male and 25% being female. Transudative effusions had an equal number of males and females. In a study done by Kali Gandhi et al, it was observed that both exudative and transudative effusions were more prominent in male patients i.e. 75% (n=39) were male and 25% (n=13) were female out of 52 exudative effusion. Similarly, 75% (n=6) were male and 25% (n=2) were female out of 8 transudative effusions.[11] Exudative effusions were found to be more common in male patients, with % being male and 25% being female.

## 5. CONCLUSION

In pulmonary medicine, pleural effusion diagnosis is still a developing field. With the increased prevalence of pleural disease, multidisciplinary initiatives to improve diagnosis accuracy while remaining cost-effective are required. Pleural fluid cholesterol criteria (cholesterol >60 mg/dl – exudate; cholesterol <60 mg/dl – transudate) are shown to be an effective tool for separating pleural effusions in this investigation. As a result, it is suggested that using pleural fluid cholesterol to distinguish exudate from transudate is preferable to using Light's criteria, with the added benefit of not having to collect a blood sample at the same time, especially in countries like India where financial and technical constraints are severe.

ISSN:0975-3583,0976-2833 VOL12,ISSUE03,2021

## 6. REFERENCES

[1] Wang N. Anatomy of the pleura. Clin Chest Med. 1998;19:229– 40.
[2] Kugasia I, Kumar A, Khatri A, Saeed F, Islam H, Epelbaum O. Primary effusion lymphoma of the pleural space: Report of a rare complication of cardiac transplant with review of the literature. Transpl Infect Dis. 2019;21(1):e13005.
[3] Karki A, Riley L, Mehta HJ, Ataya A. Abdominal etiologies of pleural effusion. Dis Mon. 2019;65(4):95–103.
[4] Riley L, Karki A, Mehta HJ, Ataya A. Obstetric and gynecologic causes of pleural effusions. Dis Mon. 2019;65(4):109–14.
[5] Krenke R, Mierzejewski M. Anatomy and Physiology of the Pleural Space. In: Janes SMBT-E of RM (Second E, editor. Oxford: Academic Press; 2022. p. 318–40. Available from: https://www.sciencedirect.com/science/article/pii/B97801280123 83115776
[6] Bedawi EO, Hassan M, Rahman NM. Recent developments in the management of pleural infection: A comprehensive review. ClinRespir J. 2018;12(8):2309–20.
[7] Guinde J, Georges S, Bourinet V, Laroumagne S, Dutau H, Astoul P. Recent developments in pleurodesis for malignant pleural disease. ClinRespir J. 2018;12(10):2463–8.
[8] Gandhi K, Raj Singh U, P C K, Garg A, Gandhi K, S K S, et al. Comparison of Light'S Criteria and Pleural Fluid Cholesterol To Distinguish Exudative and Transudative Pleural Fluid. J Evol Med Dent Sci. 2017;6(38):3056–60.
[9] Ambresh A, Mulimani MS. Differentiating transudative and exudative pleural effusion by pleural fluid cholesterol. Int J Clin Biomed Res. 2019;7(1):5–8.
[10] Batra H, Antony VB. Pleural mesothelial cells in pleural and lung diseases. J Thorac Dis. 2015;7(6):964–80.
[11] Na MJ. Diagnostic tools of pleural effusion. TubercRespir Dis (Seoul). 2014;76(5):199–210.