

Comparative Analysis and Evaluation of Pleural Fluid Biochemical Parameter with Cholesterol to Differentiate Transudates from Exudates- A Study in Uttar Pradesh Region

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Abstract

Background: Pleural fluid (PF) is ultra filtered plasma formed by the parietal pleura and reabsorbed by visceral pleura in a unremitting process. The mean quantity of pleural fluid (PF) present in normal state is as small as 8.4±4.3ml. Based on the fundamental pathological abnormality and method of formation, effusions may be either transudates or exudates. Therefore, differentiating the pleural fluid either as transudates or exudates is an significant step in the assessment of pleural effusions. Objective: To find the analytical value of pleural fluid Cholesterol and Lactate dehydrogenase in differentiating exudate and transudate effusion compared to Light's criteria. **Subjects and Methods:** A total number of 150 adult patients of both sex having pleural effusions substantiate through radiological investigations; chest x ray and ultra-sonogram were taken into this study. Pleural fluid cholesterol of more than 45mg/dl and LDH of more than 200IU/L was taken as cut off value and presence of any one or both constraint is diagnosed as exudates. And other reference values meeting the Light's criteria for exudate is regard as exudate pleural fluid. **Results:** Statistically significant disparity were observed in mean pleural fluid protein and LDH, i.e, exudates (5.1±1.4, 346±8 IU/L) and transudates (3.1±1.7, 129±6 IU/L) respectively p<0.007. Sugar value also shows a significant difference between transudates and exudates (81±3 mg/dl) and (37±8 mg/dl) respectively P< 0.001. On the other hand single parameter, i.e, total Cholesterol level shows a statistical significant difference between exudates and transudates value (78±9 mg/dl), (31±4 mg/dl) respectively. P<0.003 Which has been used to classify pleural effusion and was extremely reliable in explain the type of fluid. **Conclusion:** Thus, the present study shows the utility of total cholesterol in classifying transudate from exudates fluid. According to the result of this study we can consider, only the measurement of total fluid cholesterol can play a imperative role in classifying transudates from exudates fluid. The major precincts of this study are the small numbers of patients and all adult individual as a study subject. The results of this present study need to be established in additional studies with large sample size and bearing in mind the different age group of the patients.

Keywords: Pleural fluid, Cholesterol, transudates, exudates.

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Introduction

Pleural fluid (PF) is ultra filtered plasma formed by the parietal pleura and reabsorbed by visceral pleura in a unremitting course.^[1] As a rule there is less than 10 ml of fluid in each pleural cavity.^[2] More than this will accrue when the rate of fluid development exceeds the rate of fluid confiscation which can be seen during some pathological conditions (e.g. Heart failure, Hypoproteinemia, malignancy, Parapneumonic or Tuberculosis, etc.).^[3] The mean amount of pleural fluid (PF) present in typical state is as small as 8.4±4.3ml. Pleural effusion (PE) is a pathological state often develop in patients with thoracic or systemic diseases and if appropriately not diagnosed and treated early, can cause serious health issue.^[4] Roughly one million patients develop pleural effusion every year.^[5]

Pleural effusion is a materialization of several diseases, both pulmonary and extra-pulmonary, often secluded. Based on the underlying pathological abnormality and mechanism of formation, effusions may be either transudates or exudates.^[7] Therefore, differentiating the pleural fluid either as transudates or an exudates is an important step in assessment of pleural effusions and also investigation of pleural effusions is an important diagnostic step to guide further investigations and treatment. The most commonly accepted criteria for differentiating exudates from transudates in pleural effusions is through the measurement of total protein and lactate dehydrogenase (LDH) levels in serum and pleural fluid. These were recognized by Light et al 8 in 1972. On the other hand many pleural effusions were also misclassified using these criteria. Therefore, other biochemical parameters are required to classify pleural

effusions and another shortcoming of this lights procedure is it is pricey and time consuming to measure all the parameters as stated by light et al. Our objective was to find the diagnostic value of pleural fluid total cholesterol and Lactate dehydrogenase in differentiating exudate and transudate effusion compared to Light's criteria and to find the position of pleural fluid cholesterol and Lactate dehydrogenase in analytical algorithm of pleural effusion. Cholesterol is synthesized by cells coating the pleura, depending on metabolic activity and needs.^[9-11] Cholesterol in pleural fluid is augmented by degenerated leucocytes and erythrocytes.^[12] Increased vascular permeability of pleural capillaries adds to the increased pleural fluid cholesterol level.^[13] If Pleural fluid cholesterol level can differentiate transudates from exudates as a single factor instead of several parameters used in Light's criteria, it can be the choice of parameter for physician or health workers to easily understand the type of fluid and to proceed further. On the other hand it can be cost effective and result can be obtained in quick succession.

Hence the requirement of a straightforward and cost efficient biochemical test to differentiate between transudate and exudate in pleural effusions is the call for to help the people of developing country; therefore our work was leaning towards the assessment of simple constraint which is more specific and precise to classify transudate and exudate pleural fluid.

Subjects and Methods

A total number of 150 adult patients of both sex having pleural effusions corroborate through radiological investigations; chest x ray and ultra-sonogram were taken into this study. Pleural fluids and blood samples were taken concurrently in the fasting state. The blood and pleural fluids were unruddled in red capped plain sterile vacutainer. Blood sample after clot formation were centrifuged at 3500rpm for 10 minutes to obtain serum. Pleural fluid sugar level was estimated by hexokinase method. Serum and pleural fluid LDH, total protein, and total cholesterol was predictable by a modified IFCC method,^[14] Biuret method,^[15-17] CHOD-PAP method¹⁸ respectively. Pleural fluid cholesterol of additional than 45mg/dl and LDH of further than 200IU/L was taken as cut off value and presence of any one or both parameter is diagnostic of exudates. And other indication values of Light's criteria taken for various parameters were:^[19]

- a) Pleural fluid protein >3.0 gm/dl as an exudate, <3.0 gm/dl as transudate.
- b) Pleural fluid to serum protein ratio >0.5 as an exudate and <0.5 as transudate.
- c) Pleural fluid to serum LDH ratio >0.6 as an exudate, <0.6 as transudate.

Statistical analysis of serene data has been determined by using SPSS (16.0). Chi square (chi-square) analyses were done to evaluate the test values involving transudates and exudates. P value < 0.05 was considered as statistically significant.

Inclusion Criteria

Patients admitted to in-patients department of medical wards and newly diagnosed to have pleural effusion clinically and radiologically were incorporated in the study

Exclusion Criteria

Traumatic pleural effusion and Patients already in progress on treatment for pleural effusion were excluded from the study.

Results

In this study out of 150 adults 97 were males and 53 were females. Out of which 122 patients were distress from exudates and 28 were having transudates pleural effusion as per the criteria of light's et al. The results are as follows.

Statistical significant difference were experiential in mean pleural fluid protein and LDH, i.e, Exudates (5.1±1.4, 346±8 IU/L) and transudates (3.1±1.7, 129±6 IU/L) respectively p<0.007

Sugar value also shows a significant difference between transudates and exudates (81±3 mg/dl) and (37±8 mg/dl) respectively. P< 0.001

Total Cholesterol level shows a Statistical significant difference between Exudates and Transudates value (78±9 mg/dl), (31±4 mg/dl) respectively. P<0.003

Table 1: Comparison of transudations and exudates peritoneal fluid with respect to different parameters

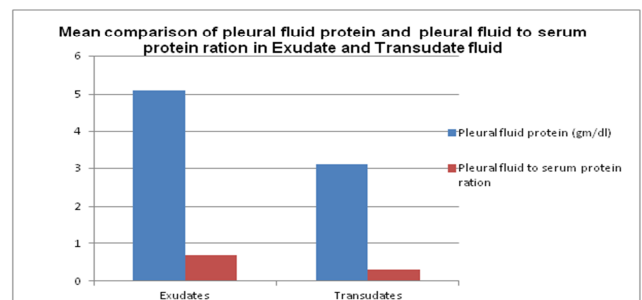
Parameters	Exudates	Transudates	P-value
Pleural fluid protein (gm/dl)	5.1±1.4	3.1±1.7	<0.007
Pleural fluid to serum protein ration	0.7±0.3	0.3±0.1	<0.004
Pleural fluid LDH (IU/L)	346±8 IU/L	129±6 IU/L	<0.001
Pleural fluid to serum LDH ration	0.88±0.2	0.41±0.1	<0.001

Table 2: Mean difference between sugar level of Exudates and transudates Pleural effusion.

Test Parameter	Exudates	Transudates	p-value
Sugar	37±8 mg/dl	81±3 mg/dl	<0.001

Table 3: Mean difference of total cholesterol level between exudates and transudates pleural effusion.

Test parameter	Exudates	Transudates	P-value
Pleural fluid total cholesterol level	78±9 mg/dl	31±4 mg/dl	<0.003



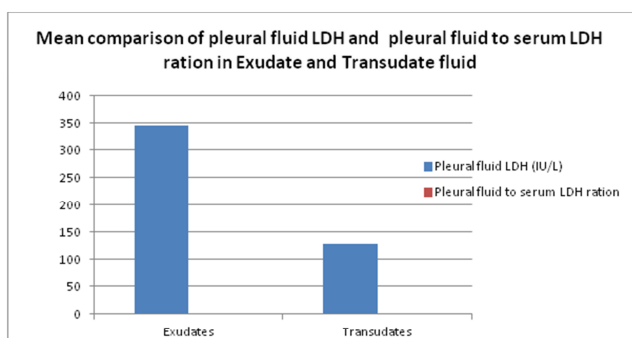


Figure 1a,b: Graphical representation of various parameters among Transudate and exudate fluid

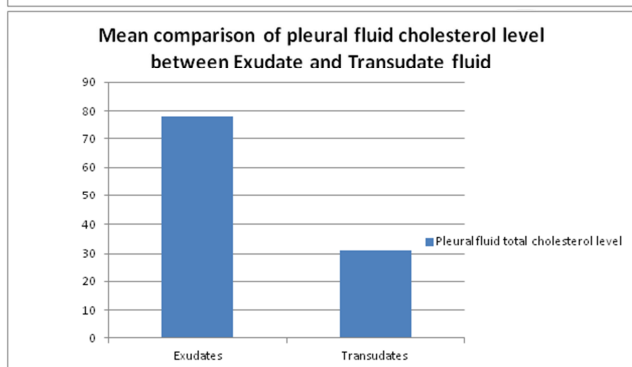
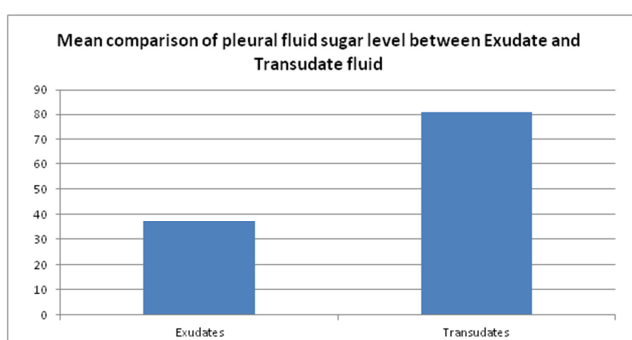


Figure 2a,b: Graphical depiction of Sugar level in transudates and exudates fluid

Discussion

Differentiating the pleural fluid in a transudates or an exudate is an important step in the evaluation of pleural effusions. Pleural fluid can be accumulated for a number of reasons, which may be due to augmented fluid formation or decreased absorption. Transudates fluid accumulation are caused by increased hydrostatic pressure, (e.g. Heart failure), decreased oncotic pressure (e.g. Hypoproteinemia). Increased negative intra thoracic pleural pressure (e.g. Atelactesis) or movement of ascetic fluid through the diaphragm (e. g. Hepatic hydrothorax). In distinction exudates are due to increased capillary permeability and or impaired lymphatic drainage which results from proliferative (e.g. malignancy), or inflammatory (e.g. Parapneumonic or Tuberculosis).^[3] The conventional method which is used to classify pleural fluid is the Light's

criteria. Which consists of different parameter need to be examined. Therefore, this study was conducted to ensure the value of cholesterol in exudates and transudates fluid to classify pleural effusion because cholesterol is synthesized by cells lining the pleura, depending on metabolic activity and needs.^[9-11] Cholesterol in pleural fluid is increased by degenerated leucocytes and erythrocytes. Increased vascular permeability of pleural capillaries adds to the amplified pleural fluid cholesterol level. So, if the cholesterol level in pleural fluid is calculated it may help in classifying the pleural effusion as transudate or exudates fluid. In this study we calculated pleural fluid total protein and pleural fluid to serum protein ratio in transudates and exudates (3.1±1.7, 0.3±0.1) and (5.1±1.4, 0.7±0.3) respectively $p < 0.007$. Which show significant difference in the mean value of both fluids. Similarly fluid LDH and pleural fluid LDH to serum LDH ratio was done which also shows a difference in mean value (129±6 IU/L, 0.41±0.1) and (346±8 IU/L, 0.88±0.2). $p < 0.001$ which is similar to the study of V. Sunanda et al.^[20] on the other hand in our study we also found the elevated level of total cholesterol in exudate fluid as judge against to transudates (78±9 mg/dl, 31±4 mg/dl) respectively $p < 0.003$ this may be due to amplified degenerated leucocytes and erythrocytes.^[21] Which is similar to the study of hamm et al,^[22] Valdes et al and Kalayci et al.^[21,23]

Therefore from this study it can be accomplished either the gold standard method for classification of pleural effusion can be done or simply the pleural fluid total cholesterol can be used for the classification of pleural effusion.

Conclusion

Thus, the present study shows the convenience of Total cholesterol in classifying transudate from exudates fluid. According to this study we can mull over, only the measurement of total fluid cholesterol can also play a crucial role in classifying transudates from exudates fluid. So, pleural fluid total cholesterol can be used as a good matching parameter to discriminate between transudates and exudates in developing country like India which will be straightforward and cost effective.

The major limitations of the present study are the small numbers of patients and all adult individual as a study subject. The results of this present study need to be inveterate in further studies with large sample size and allowing for the different age group of the patients.

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