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Protein, Lactate Dehydrogenase and Glucose Estimation in Pleural Fluid of Tuberculosis Pleural Effusion Patients

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Abstract:

Introduction: *Tuberculosis Pleural effusion is a leading inflammatory pleural disease in clinical practice and a common public health problem related to tuberculosis.*

Aim: *To estimate value of protein, lactate dehydrogenase and glucose, in pleural fluid of tuberculosis pleural effusion patients.*

Methods and Material: *Biochemical tests protein, lactate dehydrogenase and glucose was done in 30 patients of tuberculosis pleural effusion.*

Result: *In our study, mean ± S.D of protein is 5.3 ± 1.4, lactate dehydrogenase is 1007.2 ± 167.6 and glucose is 39 ± 4.8. It shows that protein and Lactate dehydrogenase level is high, when compared with Light's criteria and glucose level is low.*

Conclusion: *This study concludes that, in tuberculosis pleural effusion patients, pleural fluid shows, high protein, high lactate dehydrogenase, and low glucose level, Hence it is exudative type.*

Keywords: ***Exudative Pleural fluid, Tuberculosis, pleural effusion.***

INTRODUCTION

Tuberculosis is the major leading health problem in developing countries and pleural effusion occur up to 50% of TB infected patients[1]. Many authors have studied that in Tunerculosis infection, one third of the patients develop pleural effusion. In high prevalence, tuberculosis area, pleural effusion is the most common complication of pulmonary tuberculosis[2]. The increased prevalence of human immunodeficiency virus infection also is an additional factor for higher incidence of Tuberculosis Pleural effusion. Pleural effusion is defined as an abnormal, excessive collection of fluid in the pleural space. Thus it develops when more fluid enters the pleural space than removed. Pleural fluid may be either transudative or exudative. Transudative pleural effusion result from imbalances in hydrostatic and oncotic forces. It is caused in limited clinical conditions such as heart failure and cirrhosis, nephritic syndrome, atelectasis, peritoneal dialysis constrictive pericarditis. In contrast, when the local factors influencing the accumulation of pleural fluid get altered, it results in exudates. It is seen in various diseases like tuberculosis, pneumonia and malignancy, thromboembolism. So the first step in the evaluation of pleural fluid is to determine whether an effusion is transudative or exudative.

Study of biochemical parameters protein, LDH and glucose, provides a better direction to decide exudation of pleural fluid in a simpler way with the help of Light's criteria.

Aim: To estimate the level of protein, lactate dehydrogenase and glucose in pleural fluid of tuberculosis pleural effusion patients.

Inclusion criteria:

1) Patients with tuberculosis pleural effusion only.
2) Patients who gave consent for pleural fluid examination.

Exclusion criteria:

Patients with pleural effusion due to diseases like pleuridosis, malignancy etc. other than TB.

Method and Material:

This study was carried out in Dr Shankar Rao Chavan Govt Medical College, Nanded. It was approved by our institutional ethical committie.The type of study, was cross sectional. Total 30 patients were taken for study, who was

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admitted in ward of T.B. and Chest department. Pleural fluid samples from the patients were analyzed within 4 hours of extraction. Approximately 3 ml of aspirated pleural fluid was taken in appropriate plain bulb for protein and LDH and fluoride bulb was used for glucose for biochemical investigation.

Protein was done by Biuret End point method, using biolab diagnostic Kit and Lactate dehydrogenase was done by Kinetic method, Kit of Bio Lab diagnostics. Glucose was estimated by GOD-POD End point method, using Bio Lab diagnostic Kit, on semi autoanalyzer Erba Chem -7 instrument.

Result:

Total 30 pleural fluid samples of tuberculosis pleural effusion patients were taken and their laboratory values were compared with Light's Criteria. Results are expressed in Mean ± SD.

Table 1: Shows Light's Criteria.

	Pleural fluid	**Pleural fluid**
Light's Criteria	Protein (gm/dl)	Lactate Dehydrogenase (IU/L)
Exudative pleural fluid	> 3	More than 200 IU or > $\frac{2}{3}$ rd of the upper limit of normal for serum LDH.
Transudative pleural fluid	< 3	Less than 200 IU or < $\frac{2}{3}$ rd of the upper limit of normal for serum LDH.

Description: - Table 1, shows light's criteria, in which, in Exudative pleural fluid, total protein level is > 3gm/dl, level of LDH is > 200 IU/L While in Transudative pleural fluid, total protein level is < 3 gm/dl, level of LDH is < 200 IU/L.

Table no 2: Shows, mean level of study parameters in Tuberculosis Pleural fluid samples in Mean ± SD.

Biochemical Parameters	Protein (gm/dl)	Lactate Dehydrogenase (IU/L)	Glucose (mg %)
Pleural fluid sample (Mean ± SD)	5.3 ± 1.4	1007.2 ± 167.6	39 ± 4.8

Description: - Table no.2 – Shows that, mean value of Protein in pleural fluid of tuberculosis pleural effusion patients, is 5.3 ±1.4 and mean value of LDH is 1007.2 ± 167.6 this result, when compared with Light's criteria, in tuberculosis pleural effusion, pleural fluid appears to be exudative type. And it's mean glucose level is 39 ± 4.8.

DISCUSSION:

In our study ,mean value of protein in pleural fluid of tuberculosis pleural effusion patients is 5.3 ±1.4 gm/dl, mean value of LDH is 1007.2 ± 167.6, This suggest that effusion present in tuberculosis pleural effusion is exudative type.

Protein and LDH level seems to be increased in tubercular pleural effusion due to increased permeability of capillaries by delayed hypersensitivity reaction. Also when inflammation affects the pleura, proteins leak from the pleural capillaries into the pleural space; thus, total protein and LDH level increases.[3]

The extracellular appearance of LDH is used to detect cell damage or cell death. Thus, LDH might be released from injured cells or damaged cells in the lung and then in pleural fluid.[4] Hence, LDH level increases.

The present study is consistent with findings of other studies like Dr Arum Islam et al, Light RW & Macgregor MI et al, Jose M et al, etc.

Light RW ,explained that ,in pleural fluid sample values, pleural protein greater than 5 gm/dl is frequently encountered in TB pleural effusion which is probably due to systemic inflammatory response to mycobacterium [5] .

Dr. Arup Islam et al, proposed that, pleural fluid of TB pleural effusion patients shows protein level more than 3 gm/dl and pleural lactic acid dehydrogenase (LDH) level usually higher than the serum LDH level [3].

According to Light's criteria , a pleural fluid LDH level is usually more than 200 IU and one of the criteria to differentiate exudative pleural effusion is, protein level more than 3 gm/dl [6].

Jose M et al, summarized that, in clinical practice, exudative effusions can be separated effectively from transudative effusions using Light's criteria.

These criteria classify an effusion as exudate if one or more of the following are present: (1) the ratio of pleural fluid protein to serum protein is greater than 0.5, (2) the ratio of pleural fluid lactate dehydrogenase (LDH) to serum LDH is greater than 0.6, or (3) the pleural fluid LDH level is greater than two thirds of the upper limit of normal for serum LDH [7].

Along with Protein and LDH , we also estimated Glucose in Pleural fluid in this study .Mean value of Glucose in pleural fluid of Tuberculosis pleural effusion patients is 39 ± 4.8 mg%, it's level is found to be decreased in this clinical condition.

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The mechanism responsible for a low pleural fluid glucose level appears to be a combination of enhanced glycolysis by either pleural fluid cells, bacteria or pleural tissue in conjunction with an impairment to transport of glucose from blood to pleural fluid [8].

This study coincides with many other studies like Maskell et al, Willian N Rom et al, etc

A low pleural fluid glucose (<60 mg/dl) is mainly caused by complicated Tuberculosis, parapneumonic effusion, malignancy and rheumatoid pleuritis

In exudative pleural fluid, glucose level is less than 60 mg/dl [9].

Willian N Rom et al, explained that ,low pleural fluid glucose (< 40 mg%) can also be seen in T.B , although it is rarely less than 20 mg% [10] . This helps in narrowing, the differential diagnosis of the exudative pleural fluid especially in TB pleural effusion.

It is therefore evident from the above study that , in pleural fluid samples of tuberculosis pleural effusion patients , in our laboratory, result showed , protein level exceeded above 5 gm/dl and LDH level exceeded above 1000 IU/L and glucose level was lower than 60 mg/dl. This data meets Light's criteria; hence, Pleural fluid of TB pleural effusion patients is exudative type.

Zahra Hadizadeh, et al summarised that, as in every pleural effusion, generally Light's criteria is used, therefore the access to the proposed index is completely feasible[11].

CONCLUSION

Castro et al, summarised that, diagnosis of pleural TB is mainly based on biochemical, microbiological and cytological study which has limitation[12]**.** The analysis of pleural fluid is the most diagnostic and useful test to find out possible causes and also directing further investigations. *Mycobacterium tuberculosis bacteria* takes 6-8 weeks to grow in culture medium by culture method. Cytological examination is not so effective procedure, as the presence of predominant lymphocyte and neutrophill cells in pleural fluid do not indicate or gives assurance of the tubercular / parapneumonic effusion. So biochemical examination is the ideal and confirmatory test, which provides better and quick alternative for pleural fluid assessment in routine as well as emergency situations.

Our study concludes that ,along with microbiological and cytological study , biochemical study should be involved in assessment of pleural effusion , to suggest /aid diagnosis or pleural fluid assessment in T.B. Pleural effusion which shows high protein, high Lactate dehydrogenase and low glucose levels and further study with more samples may required in this regards.

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