

A cross-sectional of pleural fluid analysis in chronic kidney disease patients with pleural effusion

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Abstract

Background: Pleural effusion is a common problem in patients with CKD patients. The objectives of this study were to find out the percentage of patients with exudative and transudative pleural effusion. Pleural effusion in chronic kidney disease can be transudative or exudative. The common causes of transudative pleural effusion are fluid overload, heart failure. The causes for exudative pleural effusion were pneumonia, tuberculosis and uremia. Both transudative and exudative pleural effusion are found in more frequency in chronic kidney disease. Heart failure is very common in chronic kidney disease. This is because many mechanisms in chronic kidney disease are responsible for cardiac remodeling. Chronic kidney disease is also an immunosuppressed state making these patients increasingly susceptible. **Methods:** Cross-sectional prospective study of Chronic kidney disease patients who got admitted to Amala medical college from January 2017 to December 2017 were selected in to the study. The pleural fluid analysis of those patients was done. We compared the numbers of exudates and transudates in the various stages. Among the exudative pleural effusion based on clinical suspicion and ADA values selected patients were taken up for thoracoscopy and the cases with tuberculous pleural effusion were identified. Also, we have tried to compare end stage renal disease patients with rest of the CKD patients **Results:** Of the 89 CKD patients who got admitted with pleural effusion 47% were exudative and 53% were transudative. 8.9% of the patients diagnose to have tuberculous pleural effusion. Statistically by chi-square test there was no significant difference in type of effusion between those who were undergoing hemodialysis and those who weren't. **Conclusion:** The predominant type of pleural effusion in CKD patients in this study was transudative. There was no significant difference in type of pleural effusion between dialysis dependent and non-dialysis dependent patients. 8.9% of the patients admitted were of tuberculous pleural effusion. There was no statistically significant difference in prevalence of tuberculous pleural effusion between dialysis dependent and dialysis non-dependent population. So finally, from this study we were not able to find any difference in type of effusion between dialysis dependent and non-dependent population

Key Word: pleural fluid analysis.

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INTRODUCTION

Pleural effusion is a common problem in patients with CKD patients. The objectives of this study were to find out the percentage of patients with exudative and transudative pleural effusion. Pleural effusion in chronic kidney disease can be transudative or exudative. The common causes of transudative pleural effusion are fluid overload, heart failure. The causes for exudative pleural effusion were pneumonia, tuberculosis and uremia. Both transudative and exudative pleural effusion are found in more frequency in chronic kidney disease. Heart failure is very common in chronic kidney disease. This is because many mechanisms in chronic kidney disease are responsible for cardiac

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remodeling. Heart failure and renal failure are interdependent processes. Studies have shown that impaired renal function increase the risk of heart failure¹. The key association between renal failure and heart failure is due to the neurohumoral response². Neurohumoral response causes the activation of RAAS and sympathetic nervous system causes increased prevalence of cardiac failure. Also RAAS activation leads to vasoconstriction of renal vasculature, intraglomerular hypertension, necrosis of glomeruli and fibrosis of renal tubules³. More than one third of the patients who are undergoing hemodialysis have heart failure⁴. Chronic kidney disease is also an immunosuppressed state making these patients increasingly susceptible to infection⁵. There are many causes of immunodeficiency in chronic kidney disease. The reason for immunodeficiency in CKD is oxidative stress, inflammation, 25 – hydroxy vitamin D deficiency and malnutrition⁶. These factors cause functional abnormalities in a variety of immune cells including B and T cells, neutrophils, monocytes and Natural killer cells. Studies show that immunity significantly worsen when the GFR falls to less than 60. There is an increase in the prevalence of tuberculosis in chronic kidney disease patients. This is mainly by reactivation of latent tuberculosis^{7,8}. Tuberculosis also increases in post-transplant recipients due to immunosuppressive drugs used⁸. The other factor that leads to increased prevalence of tuberculosis in patients on hemodialysis is proximity with other patients in the hemodialysis room. This is due to the closed space creating sharing of air^{9,10}. In this project that was undertaken in Amala Institute of Medical sciences 89 CKD patients belonging from stage 2 to stage 5 who got admitted with pleural effusion were studied. The proportion of people in each stage of CKD with exudative and transudative pleural effusion was calculated. In the population of patient with ADA>10 or clinical suspicion of tuberculosis thoracoscopy was performed and patients with pleural tuberculosis was identified. The main tool that is used in this study is the Lights criteria. Lights criteria is used to differentiate exudative from transudative pleural effusion¹¹. Lights criteria for pleural fluid is

1. Pleural fluid/Serum protein ratio ≥ 0.5 and/or
2. Pleural fluid/Serum LDH ≥ 0.6 and/or
3. Pleural fluid LDH $\geq 2/3^{\text{rd}}$ of the upper limit of normal

Transudative pleural effusion is caused by non-inflammatory conditions like heart failure and cirrhosis. Exudative pleural effusions are caused by inflammatory or malignant process affecting the pleura. Common causes of exudates include pleura, cancer, tuberculosis and pulmonary embolism. As stated, earlier tuberculosis is more prevalent in later stages of CKD. Pleural fluid ADA

is a sensitive (92%) and specific (90%) marker when cut off value is kept above 40. Thoracoscopy was done in few of these patients. Thoracoscopic findings in tb pleural effusion may be normal, hyperemic pleura, hyperemia with adhesions, sago like nodules with hyperemia, hyperemia with non – sago like nodule/ plaques. Pleural biopsy specimens taken reveal caseation necrosis in tuberculous pleural effusion

MATERIALS AND METHODS

A cross sectional study conducted in the department of General Medicine department in Amala Institute of Medical sciences, Thrissur, Kerala from January 2016 to June 2017. Study included CKD patient who got admitted to Amala Institute of Medical sciences with pleural effusion. Based on lights criteria the pleural effusion was divided in to exudative and transudative pleural effusion. The predominant type of CKD in each stage of CKD is identified. In patients where there is clinical and blood investigations showing suspicion of tuberculosis thoracoscopy is performed. Proportion of tuberculosis in such patients is found out.

Tools used in the study

1. Lights criteria
2. Thoracoscopy (where clinical suspicion of tuberculosis)

Thoracoscopy was performed in patients where there is exudative pleural effusion identified by lights criteria in whom ADA>40 and in individuals where clinical suspicion of tuberculosis. Clinical suspicion was thought about in patients who had pyrexia of unknown origin with weight loss not responding to routine antibiotics where no evidence of other infectious agent could be found from cultures and other blood tests.

RESULTS

The study was conducted in Amala institute of medical sciences. The study intention was to find out the predominant type of pleural effusion in each stage of chronic kidney disease. A total of 89 patients who were previously diagnosed stage 2 CKD and above were admitted with pleural effusion were studied. In this study all 89(100%) patients were above the age of 40 years. 24(27%) patients were between the age of 60 – 69. In this study 75(84%) were males and 14(16%) were females. 31(41%) of the males and 7(50%) of the female patients were on hemodialysis. 38(42%) patients who developed pleural effusion belonged to CKD stage 5. Major chunk of the patients (n=20) in this study were in the age group between 50 – 59. The table 1 shows the number of patients in the study who had exudative and transudative pleural effusion. In the study 42(47%) patients had exudative pleural effusion while 47 (53%) had transudative pleural effusion.

Table 1:

Type	Count
Exudate	42 (47%)
Transudate	47(53%)
Grand total	8(100%)

Table 2 and graph 2 shows the distribution of transudative and exudative pleural effusion in the various stages of CKD. In all stages transudative was the predominant type of pleural effusion. The only exception being stage where 17 (58.6%) were exudative while 12 (41.4%) were transudative.

Table 2:

Stage	Exudate	Transudate	Total
stage 2	3	4	7 (7.85%)
stage 3	17	12	29 (32.5%)
stage 4	4	11	15 (16.85%)
stage 5	18	20	38 (42.6%)
Total	42 (47.2%)	47 (52.8%)	89(100%)

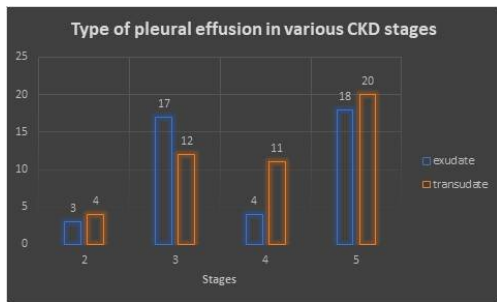


Figure 1:

The first thing we compared is the difference in the type of pleural effusion between patients on hemodialysis when compared with the population not undergoing hemodialysis. We came to the following results (graph 2). Table shows that there is 51 (57.3%) in the study were in the stages 1 to 4. The rest (stage 5) were undergoing hemodialysis. In both groups transudative was the predominant type of pleural effusion. Of the 51 patients who belonged to stage 1 to stage 4 24 (47%) exudative while 27(53%) were transudative. Of the 38 patients who were undergoing hemodialysis 18 (47.3%) were exudative while 20 (52.7%) were transudative.

TYPE OF PLERAL EFFUSION IN CKD PATIENTS UNDERGOING HEMODIALYSI VS THE REST

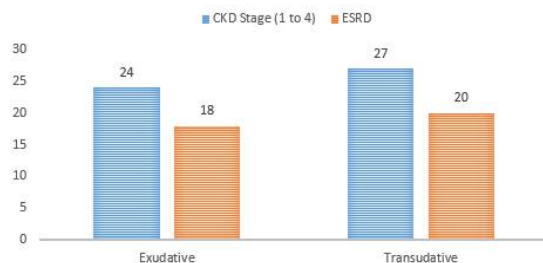


Figure 2:

The study revealed that by chi – square test the p value was 0.95. This proves that there is no difference in the type of pleural effusion between those undergoing hemodialysis from those only on medical treatment. Next, we studied the number of tuberculous pleural effusion by clinical suspicion and confirming by pleural fluid analysis and thoracoscopy. Table 3 shows that only 8 (8.9%) of the 89 cases came out to be tuberculous pleural effusion. By chi square test p value is 0.6 so there is no difference found between stage 2 and stages 3 to 5.

Stages	No of tuberculous pleural effusions
≤2	1
3 to 5	7

Finally, we studied the population undergoing hemodialysis with those not undergoing hemodialysis. Of the 8 patient who were found to have tuberculous pleural effusion 3 (37.5%) were undergoing hemodialysis. Table 4 shows us a comparison of the hemodialysis group vs the non-hemodialysis group.

Column1	Tuberculous pleural effusion	Non Tuberculous	Total
Not on HD	5	46	51
on HD	3	35	38
Total	8	81	89

Chi – square test showed that there was no significant difference between those who were undergoing hemodialysis and those who did not routinely undergo hemodialysis as the p value came to be 0.75. The predominant type of pleural effusion in hemodialysis patients was transudate. This table shows that 47% was exudative while 53% was transudative. In hemodialysis patients 3 patients out of 38 (7.8%) were diagnosed as tuberculous pleural effusion.

DISCUSSION

In this study that was undertaken in Amala institute of Medical sciences we found that maximum number of patients with pleural effusion belonged to end stage renal disease (42%) when comparing to stages 1 to 4 (58%). Of all stages from stage 1 to stage 5 prevalence of pleural effusion was maximum in stage 5 (42%). Of the CKD patients admitted with pleural effusion 53% was transudative while 47% was exudative. This was in contrast to Mitra *et al* where exudative effusion was predominant¹². Only in stage 3 CKD 57% of the patients had exudative pleural effusion. We have further made attempts to find out whether the nature of the pleural effusion varies based on the worsening renal function. So, compared stages 1 to 4 vs end stage renal disease (on hemodialysis). There was % of patients with exudative pleural effusion and % had transudative pleural effusion in stages 1 to stage 4 CKD. Mean while in patients on hemodialysis there was 47% exudative and 53%

transudative pleural effusion. This was compared with the study of Pourdowlat *et al* where exudative pleural effusion was more common¹³. In this study of the 38-hemodialysis patient 3 (7.8%) were diagnosed with tuberculous pleural effusion. This was again compared to Pourdowlat *et al* whose study revealed 6.6% patients undergoing hemodialysis had tuberculous pleural effusion.

CONCLUSION

Through this cross-sectional study, we have concluded that there is only a negligible difference in the prevalence between exudative and transudative pleural effusion where exudative pleural effusion predominates. In this study no, statistical difference in the type of pleural effusion between CKD patients on Hemodialysis and those not undergoing Hemodialysis. Also, the study also did not find any statistical difference in tuberculous pleural effusion occurring in the patients undergoing regular hemodialysis and those not undergoing hemodialysis. Although CKD is a disease highly prone for pleural effusion we could not find any significant difference between type of pleural effusion or tuberculous pleural effusion between hemodialysis patients and those not undergoing hemodialysis.

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