



## Study of Pleural Effusion in Chronic Kidney Disease

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### Abstract

**Introduction:** Chronic kidney disease is a spectrum of pathophysiological processes and condition which usually presents with fluid overload leading to accumulation of fluid in pleural or peritoneal cavities. Here is an attempt to study the profile of pleural effusion in chronic kidney disease patients.

**Methodology:** A sample size of 40 patients was taken on OPD and IPD basis and pleural fluid was studied and results were analysed. It was a cross sectional study.

**Results:** The study showed male predominance. Transudative effusions were noted in 75 % of cases and the most common cause of transudative pleural effusion was cardiac failure and most common presentation was cough. In exudative effusion, tubercular pleural effusions were the most common cause in our series.

**Keywords:** Chronic kidney disease, pleural effusion, exudative, transudative.

### Introduction

Chronic kidney disease (CKD) encompasses a spectrum of different pathophysiologic processes associated with abnormal kidney function and a progressive decline in glomerular filtration rate and is defined as a decrease in the GFR less than 60ml/min/1.73 square meters for more than 3 months or presence of 1 or more markers of CKD such as albuminuria, active urinary sediments, fluid and electrolyte imbalance due to tubular cause, abnormal kidneys on radiological examination, abnormal kidneys on renal biopsy finding or post renal transplant status of the patient.<sup>(1)</sup>

Pleural effusion is collection of excess quantity of fluid in the pleural space. With the increase in the

number of chronic kidney disease patients', the spectrum of pathologies that follow it are vast and among them, pleural effusion is very important. Pleural effusion in such patients is a common diagnostic dilemma as it may arise from CKD itself (fluid overload, nephritic syndrome, uremic pleurisy), concomitant infections (especially pneumonias and tuberculosis (TB) in our country), pulmonary embolisms or diseases causing pleura-renal syndromes, like systemic lupus erythematosus.<sup>(2)</sup>

In the Indian scenario, in general population, the ratio of occurrence of both exudative and transudative pleural effusion is in the same frequency.<sup>(3)</sup> However in CKD patients transudative effusion are more than exudative

effusions. The transudative effusions are majorly secondary to congestive cardiac failure. Among exudative effusion, TB effusion is a major challenge. It was observed that in patients with CKD, uremia was the most common cause of exudative pleural effusion even in a TB-endemic country like India.<sup>(4)</sup>

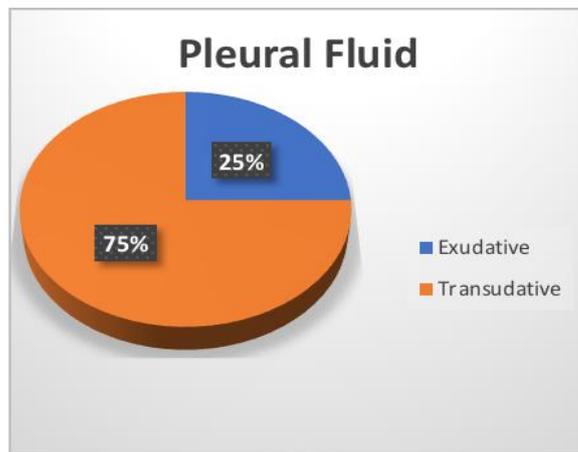
**Methods**

This study was a tertiary hospital based observational study conducted at Department of Medicine, Bharati Hospital, Pune from September 2016 to March 2018. The aim of the study was to evaluate the spectrum of pleural effusion in patients with Chronic Kidney Disease. All 40 consecutive IPD and OPD consenting patients during this study period of 18 months who had CKD with pleural effusion were included in the study. Patients having acute renal failure, concomitant cirrhosis, malignancy and those having very small non tappable effusions were excluded from the study. A detailed history and examination were done in all cases. Pleural fluid was studied for biochemical parameters (protein, LDH), cytology and categorised as transudate or exudates as per Light’s criteria. Exudative pleural effusion was studied additionally by Z-N stain, Gram – stain and culture for pyogenic cytology.

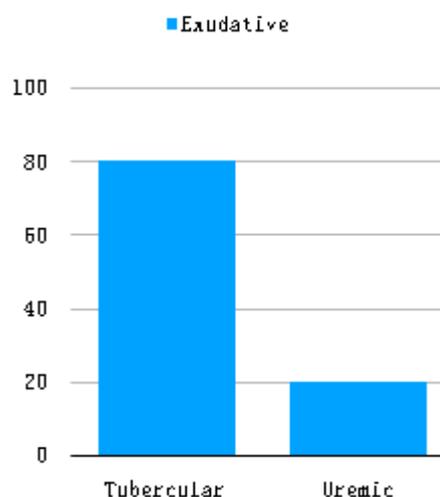
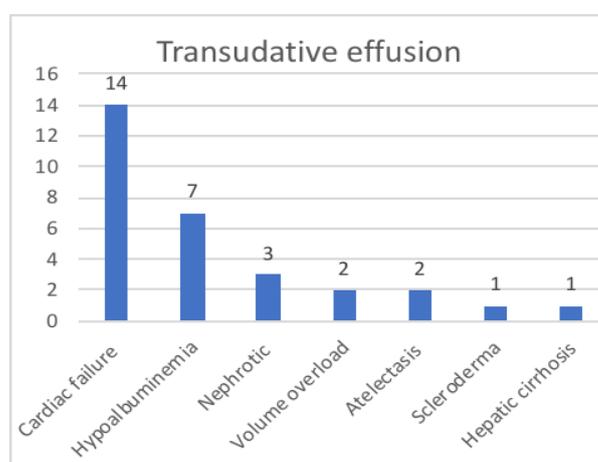
**Results**

Mean age of the study subjects was 53.67 years with over half of the cases in the age group of 41-60 years. A male predominance was seen in the study group with 57.5% males to 42.5% females. Out of total 40 cases, 30 (75%) had transudative effusion while remaining 10 (25%) had exudative effusion.

Out of the 30 cases of transudative effusion, 10 (33.33%) were cardiac failure, Hypoalbuminemia - 7(23.33%), nephrotic-3(10%), volume overload - 2(6.66%), atelectasis-2(6.66%), scleroderma - 1(3.33%) and hepatic cirrhosis (3.33%).



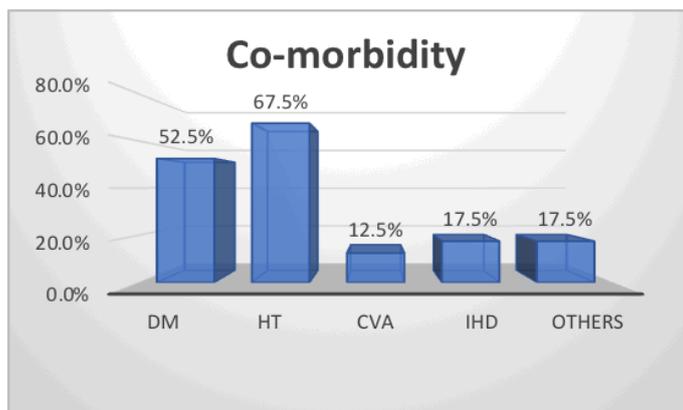
**Figure 1. (a)** Distribution of cases as per Type of Pleural effusion



**Figure 1. (b)** Break up of cases with Type of Pleural effusion

Out of total 10 cases, causes for exudative effusion were tuberculous-8 (80%), Uremic -2 (20%). No parapneumonic or empyema cases were noted.

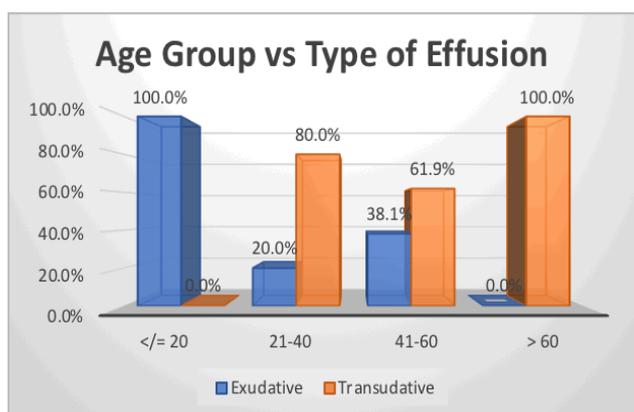
Most common associated clinical feature was cough (75%) followed by pleuritic chest pain (55%); breathlessness (50%); fever (15%); night sweats (10%), weight loss (5%). Overall prevalence of tuberculous effusion was 20% among CKD cases. Most common associated comorbidity was hypertension (67.5%) followed by diabetes (52.5%). However No association was seen between Diabetes and Hypertension with type of pleural effusion (p=0.148)



**Figure 2**

Bilateral pleural effusion was seen in 60% cases while right and left effusion was seen in 27.5% and 12.5% cases respectively. No association was seen between gender and type of pleural effusion (p=0.471).

Transudative effusion was observed to be associated with increasing age (p<0.05).



**Figure 3**

## Discussion

Pleural effusion is the most common pleural disease affecting a significant bulk of population in India. It can be a result of pleural, lung parenchymal, and systemic disease. The pleural effusion may be benign or malignant.<sup>(5)</sup> The pleural fluid is characterized into transudate and exudate based on the modified Light's criteria.<sup>(6)</sup> Exudative pleural fluid has at least one of the following characteristics as per the Light's criteria: 1. Pleural fluid protein/serum protein ratio more than 0.5; (2) Pleural fluid lactate dehydrogenase (LDH)/serum LDH ratio more than 0.6 and; (3) Pleural LDH is more than two-thirds of the upper limits of normal laboratory value for serum LDH. If these criteria are not met, then the fluid is considered as transudate.

The present study aimed to evaluate the spectrum of pleural effusion in patients with chronic kidney disease with special reference to find out the prevalence of tuberculous effusions in patients with CKD.

There are many causes of pleural effusion in uremic patients. In uremic patients, pulmonary edema can occur secondary to a variety of interacting factors such as pulmonary over hydration, left ventricular failure, uremic cardiomyopathy, coronary disease, anaemia or polycythemia, hypoproteinemia, high-output arteriovenous fistula, injury of the alveolo-capillary membrane secondary to toxic lesional factors, uremic pleurisy.<sup>(7)</sup> Uraemic pleurisy is a diagnosis of exclusion that persists or recurs despite aggressive haemodialysis<sup>(8)</sup>

The frequency of bronchopulmonary infections in chronic kidney disease patients is greater than that in the rest of the population due to depression of humoral and cellular immunity and to reduced macrophage activity. The body fluid balance and homeostasis is the most important deciding factor when it comes to chronic kidney disease patients. The thoracic complications of hemodialysis are mainly related to loss in the equilibrium of body

fluid balance in the extravascular and intravascular compartments.<sup>(9)</sup>

It was observed that mean age of the study subjects was 53.67 years with over half of the cases in the age group of 41-60 years. A male predominance was seen in the study group with 57.5% males to 42.5% females which was similar to the study done by Ray S et al.<sup>(8)</sup> The age distribution of the patients in the study by Virupakshappa et al.<sup>(10)</sup> ranged from 15 years to 70 years with maximum number of patients in the age group 41 to 50 years. Average age of study cases was 46±11.6 years with 35 males (70%) and 15 females (30%).

Diabetes and hypertension as co-morbidities was present in 52.5% and 67.5% cases of CKD respectively. Other major co-morbidities seen in CKD cases was IHD (30%) and CVA (12.5%). This trend is similar to that reported by Dash and Agarwal in the study conducted at the All India Institute of Medical Sciences<sup>(11)</sup>. Lysaght et al have also demonstrated similar trends in American populations<sup>(12)</sup>. In the study conducted by Xue et al the number of patients with diabetic nephropathy was almost 50% of the study group<sup>(13)</sup>.

Pleural effusion is common in CKD and was observed to be predominantly transudative in most of the studies<sup>(14)</sup>. In present study too, Out of total 40 cases, 30 (75%) had transudative effusion while remaining 10 (25%) had exudative effusion. The aetiological diagnosis in patients with exudative pleural effusion has always been a diagnostic dilemma. This predicament becomes all the more obvious in patients having exudative effusion with co-morbid illnesses like chronic kidney disease (CKD). Patients on dialysis are at a growing risk for tuberculosis (TB) worldwide with a recent summary article documenting a 6.9 to 52.5-fold increased risk. Besides defective-cell-mediated immune response and uraemia, co-morbid conditions such as diabetes and prolonged corticosteroid and immunosuppressive therapy

also predispose patients to active TB<sup>(15)</sup>. A higher incidence of pulmonary tuberculosis had been reported in patients with CKD on hemodialysis in India, 8.7% in patients on maintenance hemodialysis and 12.3% in renal transplant patients<sup>(16)</sup>. In present study, out of the 10 cases of exudative effusion, 8 (80%) were of tuberculous etiology. Overall prevalence of tuberculous effusion was 20% among CKD cases. In the study by Virupakshappa et al., the tuberculous etiology was found in 16% of patients. Ray et al. in their study observed tuberculous etiology in 26% CKD cases with pleural effusion. Qureshi SQ et al.<sup>(17)</sup> in a similar study observed prevalence of tuberculous effusion in CKD cases as 30%. Management of TB in CKD patients is more complicated than usual TB patient management since most of the drugs except rifampicin requires dose modification and RNTCP regimen is very difficult to administer. Higher incidence of vomiting and gastritis further complicates the compliance for the drugs. Adverse drug effects are more frequent and require a very close follow-up and care.

Jarratt et al found a 21% incidence of pleural effusion in patients receiving long-term hemodialysis. In our study the most common cause of pleural effusion was heart failure as was observed in a study by Jarratt et al.<sup>(18)</sup> Infection is the second most common cause of death in patients undergoing long-term hemodialysis, and at autopsy 45% have pathological evidence of significant acute pulmonary infection.<sup>(19)</sup>

Jarratt et al reported that 15% of the patients were directly related to pneumonia, and they did not identify any cases of tuberculous pleurisy, on the other hand in our study every 5th patient of chronic kidney disease had a tubercular origin to pleural effusion. The difference may be attributed to this study taken place in India which is a TB endemic nation. However tuberculous pleural effusion is being increasingly recognized, even in developed nations, as the incidence of EPTB has more than doubled following the HIV pandemic.

Most tuberculous pleural effusion manifest as an acute illness, with approximately one third of patients being symptomatic for < 1 week and two thirds for < 1 month. Pleural fluid analysis by a diagnostic pleurocentesis is very important in chronic kidney disease patients.

The definitive diagnosis of TPE depends on the demonstration of Mycobacterium tuberculosis in the sputum, pleural fluid, or pleural biopsy specimens. Other diagnostic methods are by ADA, mycobacterium stain and liquid culture, interferon gamma, interleukin 27 level nucleic acid amplification test and pleural biopsy.<sup>(20)</sup>

To summarize, present study observed that pleural effusion is a common occurrence among patients with CKD. Etiologies of these are multifactorial. Transudative effusions are found to be more common than exudative effusions. In exudative effusions tuberculous pleural effusions were seen predominantly. Tuberculous effusion was observed in every one out of five patients with CKD. We thus recommend that, while evaluating a case of pleural effusion, a combined approach, involving clinical evaluation, radiographic and sonographic evaluation, pleural fluid analysis, pleural fluid cytology, must be utilized for accurate diagnosis, in view of the different management strategies for varied etiologies.

### Conclusion

This study concludes that there are multiple aetiologies for pleural effusion in chronic kidney disease patients and among them, congestive cardiac failure is the most common cause. Invective aetiology for pleural effusion in chronic kidney disease patients undergoing hemodialysis was second most common. Pneumonia and pleural effusion that of tubercular origin should be considered in cases of exudative unilateral and bilateral pleural effusion.

Chronic kidney disease patients should be offered a good cardiac therapy and control of blood pressure. The immune status of these patients should be improved keeping a high index of suspicion for tubercular pleural effusion. If the

effusion is found to be exudative, prompt treatment of the condition with the appropriately modified dosages of the drugs should be done.

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