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Plueral effusion in Chronic Kidney Disease Patients

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A B S T R A C T

Background: Chronic renal failure problems are seen more frequently in uremic patients as a result of the increasing prevalence of long-term hemodialysis and longer life spans. Such patients may experience a variety of thoracic and extra thoracic issues, with uremic pleuritis, pleural effusion, and pericarditis being the most common.

Objective: To assess the incidence of pleural effusions and its etiology in hemodialysis patients with chronic renal failure.

Methodology: This was a cross sectional study conducted at Department of Nephrology, Lady Reading Hospital, Peshawar - Pakistan From January till July 2022.Patients undergoing hemodialysis for chronic kidney disease (CKD) were enrolled. Confirmation of CKD was done by renal function tests and imaging, revealing chronic renal parenchymal changes. Pleural effusion was confirmed on clinical and radiological findings. diagnostic aspiration was done especially for unilateral and suspected pathological pleural effusion and was sent for pleural fluid examination. For exudative lymphocytic pleural effusion, pleural biopsy was done by Abrahams needle while neutrophilic exudative fluid was sent for c/s and chest intubation was performed by pulmonology colleagues.

Results: A total of 500 patients enrolled in this study. These patients are hemodialysis patients, age of which varied between 20 to 60. The patients' mean age was 39.80 + 5.245 years. The ratio of men to women was 2.6:1. Pleural effusion was noted in 127 sufferers (25.4%).

Conclusion: Patients getting long-term hemodialysis often experience pleural effusion. Pleural effusion is common in patients receiving long-term hemodialysis. It could be bilateral or unilateral. Bilateral is mostly transudative while unilateral effusion mostly exudative. Unilateral pleural effusion is not uncommon in ckd patients because of immunocompromised status and must not be overlooked.

Keywords: Chronic Kidney Disease (CKD); Hemodialysis; Pleural Effusion; End Stage Renal Disease (ESKD)

Introduction

Chronic kidney disease is known to be a major health problem. Globally the burden of ckd is increasing day by day, its estimated prevalence is about 13.4% while 17 million people in Pakistan are suffering from this disease. Uremic pleural effusion is the term used to describe pleural effusion among individuals with chronic renal disease (CKD). It is characterized by abnormal and excessive amount of fluid accumulation of fluid in the pleural cavity in patients with end stage renal disease (ESRD) getting dialysis.[1,2] There is no correlation between the occurrence of pleural effusion and the seriousness of the disease, and the probability of pleural effusion is estimated to be around 3% in patients of end-stage renal disease (ESRD).[3]

Patients with chronicrenal illness may experience pleural effusion, however its exact pathophysiology is unknown. Hemodialysis patients with ESRD who develop pleural effusion may also have heart failure, hypoproteinemia, persistent pleural infection (particularly tuberculosis), malignancy, or pulmonary embolism. The two most frequent causes are hypervolemia and cardiac failure.[5]

Pleural effusion can be transudative or exudative and can be diagnosed according to lights criteria. Both exudative and transudative effusions have been reported in patients with chronic kidney, however, transudative pleural effusion is more commonly reported in Indian population.[2,6] Though uremic pleural effusion is reasonably common in patients with ESRD, it is still regarded as diagnosis of exclusion. Hence before labelling a patient with uremic pleural effusion, one must rule out other causes of effusion. Transudative left sided pleural effusion in the setting of ESRD with normal pleural biopsy is highly suggestive of uremic pleural effusion. Intensifying renal replacement regimens is effective in these patients.[7]

In a study Uzan et al, pleural effusion was reported in3.2% patients with CKD getting permanent hemodialysis.[3] In another study by T Bakirci and colleagues, pleural effusion was reported in 20.2% patients with CKD getting hemodialysis.[8]

Though the exact mechanism of uremic pleural effusion is uncertain, it is frequently reported in patients with CKD getting hemodialysis. Thorough literature search has revealed that no study has been done on this subject in the recent past in our local population. Therefore, I planned to assess the incidence of pleural effusion and its etiology in patients with CKD in our local population. Results of this research will give an approximate about the burden of pleural effusion in chronic kidney disease sufferers. Results of the present study will also help researchers on this topic in future.

Objective

The aim of this study was to assess the incidence of pleural effusions and its etiology in hemodialysis patients with chronic renal failure.

Methodology

Lady Reading Hospital Peshawar, Department of Nephrology carried out this cross- sectional study from 10th January 2022 till 9th July 2022.Sample size was determined using WHO sample size formula, making use of the proportion, p = 20.2%[9] Margin of the error = 7%, Confidence level =95% n = 127.

Technique used is this method is Non Probability Consecutive Sampling Technique. Patients of both genders from age 20 to 60 years having History of CKD as per operational definition, undergoing hemodialysis for the last 06 months was included in this research while acute renal failure were excluded from taking part in study. After approval from the ethical Department of the Hospital, informed consent was taken from all study participants. Baseline demographics including age (years), gender, weight in kilograms (using weighing scale), root source of Chronic kidney disease and timespan of hemodialysis (months) was determined.

For pleural effusion, complete medical history was taken. Patients complaining of chest pain and shortness of breath was noted. Careful general physical examination followed by abdominal and chest examination was performed. Patients with decreased chest expansion, dull percussion notes, reduced air entry and reduced vocal resonance was noted, which was considered suggestive of pleural effusion. For confirmation of pleural effusion, a chest radiograph in PA view was carried out in the radiology Department of hospital. X-ray chest showing radio opacity in the lower lung field, blunting of the costo-phrenic and cardio phrenic angles and/or mediastinal shift to the opposite side was considered confirmatory for pleural effusion. Chest radiograph was reported by consultant radiologist blinded to clinical data. Exudative pleural effusion after diagnosis on lights criteria were referred to pulmonologist for pleural biopsy through Abraham's needle.[4] Data was recorded for pleural effusion in terms of frequency of pleural effusion as per operational definition. Data was examined using statistical analysis program IBM SPSS version 23. Frequencies and percentages were calculated for qualitative factors including sex, cause of CKD and positive pleural effusion. Mean ± standard deviation was computed for quantitative variables including age, duration of hemodialysis and weight.

Effect modifiers like age, gender, cause of CKD and duration of dialysis was controlled by stratification. Post stratification chi square test was used. P value ≤ 0.05 is regarded statistically reliable.

Results

In this research, total of 500 CKD patients participated. Patient's age ranged from 20 to 60 years. Mean age was 39.80 ± 5.245 years, out of 500 participants 362 (72.4%) were male and 128 (27.6%) were female.

Pleural effusion was observed in 127 patients (25.4%) patients respectively. Pleural effusion typically transudate in 71.2% of cases and exudate in 28.8% of individuals and is shown in Table 1. Fluid overload and uremic pleuritis were the most common reasons for transudative effusions and tuberculosis was the main cause exudative pleural effusion based on pleural biopsy. Among 28% of the exudative pleural effusion 18% were tuberculosis and 10% parapneumonic effusion for which chest intubation was done.

Table 2 and 3 shows frequency and percentage of patients with respect to cause of CKD and dialysis duration respectively.

Stratification of Pleural effusion with respect to duration of dialysis shown in Table 4.

Table 1. Frequency and %age of Type of Pleural effusion

Type of Pleural effusion	Frequency	Percent
Transudative	91	71.6%
Exudative	36	28.4%
Total	127	100.0%

Table 2. Frequency and %age of patients according to Cause of CKD N = 127

Cause of CKD	Frequency	Percent
Diabetes Mellitus	217	43.3
Hypertension	177	35.4
Others	106	21.3
Total	500	100.0

Table 3. Frequency and %age of patients according to Duration of Dialysis

Dialysis Duration (Months)	Frequency	Percent
24 months or Below	271	54.3
More than 24 months	229	45.7
Total	500	100.0

Table 4. Stratification of Pleural effusion with respect to duration of dialysis N = 127

Dialysis Duration * Pleural Effusion		Pleural Effusion		Total	P-value
		Yes	No		
Dialysis Duration (months)	24 Months or Less	56 (20.3%)	215 (79.7%)	271 (100.0%)	= 0.851
	More than 24 Months	43 (19.0%)	186 (81.0%)	229 (100.0%)	
Total		99 (19.7%)	401 (80.3%)	500 (100.0%)	

Discussion

Uremia has detrimental impact on all thoracic organs. Pleural effusion in uremic individuals has a wide range of causes. Possible pathogeneses in addition to uremic pleuritis include hypoproteinemia, hemothorax, bronchopulmonary bacterial infection, tuberculosis, heart failure, and overhydration.[4] We discovered that 25.4% of long-term hemodialysis patients admitted to the hospital had pleural effusions. Patients on long-term hemodialysis had a 21% chance of developing pleural effusion, according to Jarratt et al.[5] So their study results are consistent with the results of this study. This contrasts with the 51% incidence of pleural effusions in patients with congestive heart failure admitted to a coronary care unit, 4% incidence of carcinomatous malignant pleural effusions, 6% incidence of hepatic hydrothorax in patients with cirrhosis and clinical and 44% to 57%

incidence of parapneumonic effusions in hospitalized patients with cancer.[6-9]

Hemodialysis-related thoracic problems are mostly caused by improper fluid balance control[10]. Although the pathophysiology appears to be mostly focused on hemodynamics, pulmonary edema can arise related to a number of interacting variables in uremic individuals.

Potential contributing factors high-output arteriovenous fistula, systemic hypertension, uremic cardiomyopathy, coronary disease, anemia or polycythemia, hypoproteinemia, pulmonary overhydration secondary to water and solute retention, left ventricular failure secondary to toxic lesional factors, and damage to the alveoli capillary membrane.[10] Heart failure was listed as the leading cause of pleural effusions by Jarratt et al.[5]

Necrotizing fibrinous inflammation causes uremic pleurisy, which frequently culminates in exudate production due to the inflammation rise in the permeability of capillaries. Even though the exudate is sterile, it can get contaminated and cause empyema, especially in people whose immune systems have been reduced by uremia or medications.[11]

Although pleural eosinophilia has been described, the distinctive exudative effusion is often serosanguineous or hemorrhagic with a paucity of nucleated cells that are primarily lymphocytes.[13] Chronic fibrinous pleuritis is seen in parietal pleural tissue acquired by open or closed biopsy. The fibrosing pleuritis may be enough severe to result in restricting function and necessitate decortication. 1% to 58% of individuals with ESRD have been documented to have uremic pleuritis.[5] In our research, we discovered a 3.8% occurrence.[5] Due to decreased humoral and cellular immunity as well as decreased macrophage activity, uremic individuals have more bronchopulmonary infections than the general population. At autopsy, 45% of patients on long-term hemodialysis had pathological proof of a substantial acute lung infection, making infection the second most prevalent cause of death in these patients.[10] We found that 1.9% of the patients developed tuberculous pleurisy in spite of the greater chance of tuberculous infection that had been reported. In each of these individuals, the pleural effusions were entirely one-sided. According to Jarratt et al., 15% of the patients had a direct connection to pneumonia, although they found no reports of tuberculous pleurisy.[5]

Pleural fluid should be acquired for investigation even though there is high risk of thoracentesis in uremic . When a transudate's chemical characteristics are apparent, the likely source should be identified. Excess salt and water should receive special consideration. Pleural exudates hould be examined for malignancy, medication responses, collagen vascular disease.[11]

Pleural effusions are typically transudate in 64.3% of cases and exudate in 35.7% of individuals. Over hydration is the most common reason for exudate effusions, while uremic pleurisy was the main reason for transudate effusions. In 68.8% of individuals with overhydration and 66.7% of transudate effusions, bilateral effusions are more frequent than unilateral ones.

Conclusion

Ultimately, those who receive long-term hemodialysis frequently develop pleural effusion most commonly. It could be bilateral or unilateral. Bilateral pleural effusion is mostly transudative and is caused by over-hydration. Uremic pleurisy and infection must be taken into consideration as a source of unilateral and exudate effusions in patients on hemodialysis. To rule out a parapneumonic effusion that might occur in individuals with a unilateral pleural effusion, an early thoracocentesis should be performed.

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