

“STUDY OF PULMONARY HYPERTENSION IN PATIENTS WITH CHRONIC KIDNEY DISEASE”

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ABSTRACT

Background: Pulmonary hypertension is a recognised complication of chronic kidney disease, especially in end stage renal disease. It has prevalence estimates of 30-50%. Present study aimed to study magnitude of pulmonary artery hypertension in chronic kidney disease patients

Material & Method: This observational analytical cross sectional study was conducted among the adult more than 18yrs of age with CKD attending department of general medicine. After obtaining informed and written consent from the patients, detailed history, clinical assessment and laboratory diagnosis to be done. (Blood urea, Serum creatinine, Serum uric acid, Serum electrolytes, Urine Routine, Complete hemogram, Liver function tests)

Result: The mean age of the patients was found to be 49.45±8.97yrs, with majority of the patients in age group of 41-60yrs. On gender assessment majority of the patients were male (68%), with male preponderance. There is 18.4% of patients presented with pulmonary hypertension. There is a significant higher incidence of the pulmonary hypertension among the patients with stage 3 (30.4%) and stage 4 CKD (60.9%) patients.

Conclusion: CKD patients have a higher prevalence of pulmonary hypertension. The prevalence of pulmonary hypertension is high in stage 5 CKD patients, and it is also higher in dialysis patients. In CKD patients, there is no gender difference in the development of pulmonary hypertension.

Keyword: Chronic Kidney Disease, Pulmonary Hypertension, Prevalence, Diabetes Mellitus.

INTRODUCTION

Pulmonary Hypertension is a routinely made diagnosis in cardiology and pulmonary clinic. Pulmonary hypertension is defined as elevation in pulmonary arterial pressures (mean pulmonary artery pressure [PAP]>22mmHg or an estimated systolic PAP>36mmHg).¹ Pulmonary hypertension is a recognised complication of chronic kidney disease, especially in end stage renal disease. It has prevalence estimates of 30-50%. Occurrence of pulmonary hypertension in patients on hemodialysis ranges from 27 to 58%. Pulmonary hypertension is an independent predictor of increased mortality in patients on dialysis and those undergoing kidney transplantation.²

The pathogenesis of pulmonary hypertension in CRF is not fully elucidated. It is most likely due to interaction of multiple aspects of altered cardiovascular physiology such as, increased cardiac output, Myocardial dysfunction leading to elevated left heart filling pressure, Volume overload, Arteriovenous fistula, Exposure to dialysis membranes, alteration in endothelial function due to hormonal and metabolic disorders in uraemia leading to pulmonary vasoconstriction and decreased compliance of pulmonary vasculature, Vascular calcification and stiffening, Severe anemia³, Thromboxane B2 and pro-BNP⁴

Pulmonary hypertension is a recognised complication of chronic kidney disease, especially in end stage renal disease. It has prevalence estimates of 30-50%. Early diagnosis and treatment of pulmonary artery hypertension to prevent cardiovascular complications. In this study there will be correlation of Pulmonary artery hypertension and Chronic Kidney Disease patients attending OPD and IPD WARD of AVMCH (Tertiary Care center).

MATERIAL & METHOD

This Observational analytical cross sectional study which was conducted after getting institutional ethical clearance in AVMCH from October 2020 to October 2022.

The study included all the adult patients age>18years diagnosed to have ckd as per kdigo criteria⁵ and known case of chronic kidney disease on dialysis

The study excluded patients those not willing for participating in the study, Coexisting heart diseases, Congenital heart diseases, Pulmonary obstructive and restrictive lung diseases, HIV infected patients, Chronic liver disease, Connective tissue diseases

After informed & written consent from the patients, detailed history, clinical assessment & laboratory investigations were done. All data were collected by the investigator and was analysed statistically using SPSS v21 on windows 10.

RESULTS

In present study, In present study total of 125 patients fulfilling inclusion criteria were included. The mean age of the patients was found to be 49.45 ± 8.97 yrs, with majority of the patients in age group of 41-60 yrs. On gender assessment majority of the patients were male (68%), with male preponderance. There is no significant difference in mean age of the patients with pulmonary hypertension and patients without PHT. Similarly, there is significant higher incidence of age group among the patients with PHT. ($p < 0.05$), there is significant higher incidence of PHT among the female (52.2%) compared to male (47.8%). ($p < 0.05$), there is a significant higher incidence of the pulmonary hypertension among the patients with stage 3 (30.4%) and stage 4 CKD (60.9%) patients. ($p < 0.05$)

Table 1: Comparison of mean age of patients with pulmonary hypertension

	PHT				p-value
	No		Yes		
	Mean	SD	Mean	SD	
Age in yrs	49.1	9.4	51.0	7.0	0.393

Table 2: Comparison of the age group among patients with pulmonary hypertension

		PHT				Chi-square (p-value)
		No		Yes		
		Count	N %	Count	N %	
Age group	30-40yrs	23	22.5%	0	0.0%	8.562 (0.036)*
	41-50yrs	38	37.3%	10	43.5%	
	51-60yrs	27	26.5%	11	47.8%	
	>60yrs	14	13.7%	2	8.7%	

Table 3: Comparison of the stages of CKD among patients with pulmonary hypertension

		PHT				Chi-square (p-value)
		No		Yes		
		Count	N %	Count	N %	
Stage	3.0	34	33.3%	2	8.7%	6.052 (0.045)*
	4.0	28	27.5%	7	30.4%	
	5.0	40	39.2%	14	60.9%	

DISCUSSION

Because India is the diabetes capital of the world, chronic kidney disease is on the rise. Cardiovascular disease and other consequences are more likely in those with CKD. Cardiac disease is a major cause of death in CKD patients.

PHT is more prevalent as a result of increased cardiac output and pulmonary blood flow. Patients with CKD are additionally at risk of developing pulmonary hypertension due to metabolic and hormonal changes. This causes an increase in pulmonary artery constriction and, as a result, an increase in pulmonary resistance. Pulmonary hypertension is a problem in CKD patients that is caused mostly by metabolic and hormonal imbalances. The presence of pulmonary hypertension may be linked to an increased risk of cardiovascular disease. As a result, precautions should be made to limit the prevalence of pulmonary hypertension in CKD patients.

In a review study by Bolignano D et al., (2013) to assess the prevalence of pulmonary hypertension in CKD patients. Pulmonary hypertension affects 9 percent to 39 percent of people with stage 5 CKD, 18.8 percent to 68.8 percent of hemodialysis patients, and 0 percent to 42 percent of peritoneal dialysis patients. There are currently no epidemiologic data for the initial phases of CKD. Left ventricular disorders and risk factors associated with CKD, such as volume overload, an arteriovenous fistula, sleep-disordered breathing, exposure to dialysis membranes, endothelial dysfunction, vascular calcification and stiffening, and severe anaemia, can all cause or aggravate pulmonary hypertension in patients with CKD. To far, no particular intervention study aiming at lowering pulmonary hypertension in CKD patients has been conducted. Correcting volume overload and addressing left ventricular abnormalities are critical variables in alleviating pulmonary hypertension in CKD patients. In this population, preventing pulmonary hypertension is critical since even kidney transplantation may not reverse the significant mortality associated with preexisting pulmonary hypertension.⁶

In a study by Khamis OA et al., (2015) to assess the prevalence of pulmonary hypertension among the patients with CKD. The mean ages for the control, CKD, and hemodialysis groups were 52.2 ± 13 years, 55 ± 12 years, and 55 ± 10 years, respectively. PHT was found in 76.7 percent of hemodialysis patients and 43.3 percent of CKD patients ($P < 0.005$). Patients with PHT had considerably longer durations of renal illness, hemodialysis, and AVF than those without ($P < 0.001$). PHT patients showed significantly increased AVF blood flow ($P < 0.001$). In contrast to all patients with brachial AVF, 66.7 percent of radial AVF patients exhibited PHT ($p < 0.05$). PHT is more common in individuals who get frequent hemodialysis, and it is associated to shunt placement and high AVF blood flow.⁷

In a study by Thenappan T et al., (2017) to assess the pulmonary hypertension in chronic kidney disease. The study provides a comprehensive hemodynamic assessment of PH in CKD patients. This study also raises the intriguing possibility that CKD might trigger pulmonary vascular remodelling on its own. However, before this is widely used, it must be tested in preclinical and clinical research.⁸

In a prospective study conducted by Suresh H et al., (2018) to assess the pulmonary hypertension in patients with CKD. A high prevalence of pulmonary hypertension was found in 27 patients (41.53 percent) receiving long-term hemodialysis, with a mean systolic PAP of 49.33 ± 9.18 mmHg; two patients (16.66 percent) receiving peritoneal dialysis, 43.41 mmHg; and five patients (22.72 percent) receiving conservative management, 44.8 ± 5.89 mmHg. This study found a significant frequency of pulmonary hypertension among CKD patients on and off dialysis. Patients with ESRD undergoing long-term hemodialysis had the highest prevalence (41.53 percent), especially those who were older, had been on dialysis for a longer period of time, had a greater AV fistula flow, and had a higher cardiac output. The PH group had a higher calcium phosphate product 50 than the non-PH group. Despite being on

hemodialysis, the majority of them had mild PH at the start of the trial, which remained stable. With a frequency of 43.5 percent -50 percent, PH is a prevalent complication in CKD patients. Risk factors for developing PH include left-sided heart failure, anaemia, fluid retention, and a rise in calcium phosphate product.⁹

In a study by Walther CP et al., (2019) to assess the diagnosis and management of pulmonary hypertension in patients with CKD. Although there is a greater frequency of PH in CKD and renal failure, as well as a relationship with poor outcomes, high-quality data for its diagnostic and therapeutic options in patients with CKD is lacking. Volume control, as well as treatment of underlying risk factors for PH, are crucial in CKD that does not need renal replacement therapy. Options for patients on hemodialysis are limited, and peritoneal dialysis may be used if recurrent hypotension prevents appropriate volume management.¹⁰

In a study by Zhang Y et al., (2020) to assess the prevalence of pulmonary hypertension among the patients with CKD. The prevalence of PH among ESRD patients on maintenance dialysis was 34.6 percent. Most echocardiographic parameters, including left atrial, left ventricle, right atrial, and pulmonary artery end-diastolic internal diameters, as well as interventricular septum mobility, left ventricular posterior wall mobility, fractional shortening, stroke volume, and left ventricle ejection fraction (LVEF), were associated with PH. Furthermore, Mg²⁺ (p = 0.037) and Cl (p = 0.043) were shown to be strongly related to PASP. Only internal diameters of the left atrium, right atrium, and LVEF were independently related with PH after adjustments were made in the regression analysis. PH is common, with a higher prevalence among ESRD patients who receive continuous dialysis. The diameters of the left and right atria, as well as LVEF, were found to be independently related to PH, although further cohort and fundamental mechanistic research is needed to corroborate this conclusion.¹¹

CONCLUSION

In this research group, CKD patients have a higher prevalence of pulmonary hypertension. The prevalence of pulmonary hypertension is high in stage 5 CKD patients, and it is also higher in dialysis patients. In CKD patients, there is no gender difference in the development of pulmonary hypertension. Decreased haemoglobin, lower serum calcium, and a high phosphorus value are all associated with pulmonary hypertension in CKD patients. An evaluation of volume overload status and repair of anaemia may be beneficial. Because dialysis duration is related with an increased prevalence of pulmonary hypertension, renal transplantation may be beneficial

9. REFERENCE

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