

Pulmonary Hypertension in Patients on Maintenance Hemodialysis in LUMHS Jamshoro

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ABSTRACT

Objective: To assess prevalence of pulmonary hypertension in end-stage renal disease patients on maintenance hemodialysis.

Study Design: Descriptive cross-sectional study

Place and Duration of Study: Department of Nephrology (Dialysis Unit), Liaquat University of Medical & Health Sciences Jamshoro from 1st July 2019 to 31st January 2020.

Methodology: One hundred and fifteen patients having age of 20 to 60 years of either gender with end stage renal disease on hemodialysis for more than 3 months were enrolled. Brief history, with special reference to duration of ESRD and hemodialysis, history of comorbid like type 2 diabetes mellitus, hypertension (on treatment verified by physician's prescription) was taken while pulmonary artery pressure was measured on 2D colour echocardiography.

Results: The mean age was 50.16 ±13.76 years. There were 68 (59.1%) males and 47 (40.9%) females. Frequency of type 2 diabetes was 73 (63.5%) whereas hypertension was 71 (61.7%). Pulmonary hypertension was found in 74 (64.3%) patients. A significant association of pulmonary hypertension was observed with age (p-value <0.001) of the patients while other variables were found to be insignificant.

Conclusion: The prevalence of pulmonary hypertension was found to be higher in end-stage renal disease patients on maintenance hemodialysis.

Keywords: Pulmonary hypertension, End-stage renal disease, Maintenance hemodialysis

INTRODUCTION

Chronic kidney disease is one of the serious health issues in the world with approximately 10% of the population worldwide is suffering from CKD.¹ It is characterized by irreversible loss of its functions, and loss of its ability to sustain homeostasis. End-stage renal disease is a state of kidney dysfunction where one must avail renal replacement therapy either in the form of dialysis (hemodialysis, peritoneal) or kidney transplant.² Death in patients receiving regular hemodialysis is usually occur due to cardiovascular disease, these patients are at ten times higher risk of death due to cardiovascular disease than general population.³

Pulmonary hypertension is a commonly occurring comorbid condition in dialysis dependent and non-dependent chronic kidney disease, its presence keeps these patients at higher risk of hospitalization and cardiovascular mortality.⁴ It is a gradually developing, deadly disease of pulmonary circulation that go along with left or right ventricular failure. Right ventricular dysfunction leading to right-sided heart failure is its long term complication that affects survival in this patient population.⁵ Pulmonary hypertension is described as a mean pulmonary arterial pressure (PAP) >25 mmHg, with a pulmonary capillary wedge pressure of 15 mmHg or less.^{6,7} Severe anemia, fluid overload, an arteriovenous fistula, dialysis membrane exposure, endothelial dysfunction, vascular calcification and stiffening, of chronic kidney disease all give rise to pulmonary hypertension with prevalence of 58.82% in hemodialysis patients.⁸ The local data on pulmonary HTN in CKD patients on hemodialysis varies from 36% to 56%.⁹⁻¹¹ Presence of pulmonary hypertension in dialysis

dependent chronic kidney disease is an self-sufficient predictor of mortality among these.¹²

This study is planned to investigate the current burden of the disease in local population, thereby strategies could be devised to screen such patients on regular basis. This leads to prompt treatment and reduces the consequences of further morbidity and mortality in CKD patients on hemodialysis.

MATERIALS AND METHODS

This descriptive cross-sectional study was done in the Department of Nephrology (Dialysis Unit), Liaquat University of Medical & Health Sciences Jamshoro from 1st July 2019 to 31st January 2020 and enrolled 115 patients of ESRD on hemodialysis. Patients having age of 20 to 60 years with end stage renal disease with either gender on hemodialysis for more than 3 months needing twice a week of 4 hours' duration were included in the study. While the patients which excluded were; with any history of known chronic obstructive airway disease, who were being dialyzed in other centers but came to us for emergency dialysis, with AKI, with history of any valvular heart disease, chronic pulmonary embolism, with stroke, ESRD patients on ventilation and not willing to participate in the study.

Patients on maintenance hemodialysis meeting the inclusion criteria were selected for the study. Brief history, with special reference to duration of ESRD and hemodialysis, history of comorbid like type 2 diabetes mellitus, hypertension (on treatment verified by Physicians prescription) was taken. Height was measured on standing meter without shoes and cap in cm and later on converted to meters. Weight was measured bathroom scale rounded 0.1 kg without shoes and in light clothes. On dialysis free

day patients meeting inclusion criteria was sent for Trans Thoracic Echocardiography by a trained cardiologist. Pulmonary artery pressure was measured on two dimensional colour echocardiography. The above information and the demographics of the patients were recorded. The data was entered and explored through SPSS-20. Effect modifiers like gender, age, BMI, duration of HD and ESRD and co-morbid was controlled through stratification. Post stratification chi square test was applied, keeping p-value ≤ 0.05 as significant.

RESULTS

The average age of the patients was 50.16 ± 13.76 years. Majority of the patients were presented with >50 years of age. There were 68 (59.1%) males and 47 (40.9%) females. The mean weight, height, and BMI of the patients were 60.12 ± 5.11 kg, 1.53 ± 0.06 m and 27.68 ± 4.78 kg/m² respectively. BMI of most of the patients was ≤ 30 kg/m², i.e. 64 (55.7%). The mean duration of ESRD was 5.62 ± 0.97 months. Majority of the patients had ≤ 6 months of duration of ESRD, i.e. 101 (87.8%). The mean duration of hemodialysis was 7.23 ± 0.78 months.

Table 1: Descriptive statistics of the patients

Variable	Mean \pm SD
Age (years) [range 31-70]	50.16 \pm 13.76
Weight (kg) [range 53-66]	60.12 \pm 5.11
Height (meter) [range 1.54-1.63]	1.53 \pm 0.06
BMI (kg/m ²) [range 18.71-33.47]	27.68 \pm 4.78
Duration of ESRD (months) [range 4-7]	5.62 \pm 0.97
Duration of hemodialysis (months) [6-8]	7.23 \pm 0.78

Table 2: Comparison of pulmonary hypertension with variables of the patients (n=115)

Variable	Yes	No	Total	P value
Age (years)				
≤ 50	19 (26%)	25 (61%)	44 (38%)	<0.001
>50	55 (74%)	16 (39%)	71 (62%)	
Total	74 (100%)	41 (100%)	115 (100%)	
Gender				
Male	42 (57%)	26 (63%)	68 (59%)	0.487
Female	32 (43%)	15 (17%)	47 (41%)	
Total	74 (100%)	41 (100%)	115 (100%)	
BMI (kg/m²)				
≤ 30	40 (54%)	24 (58%)	64 (56%)	0.643
>30	34 (46%)	17 (42%)	51 (44%)	
Total	74 (100%)	41 (100%)	115 (100%)	
Duration of ESRD (months)				
≤ 6	66 (89%)	35 (85%)	101 (88%)	0.548
>6	8 (11%)	6 (15%)	14 (12%)	
Total	74 (100%)	41 (100%)	115 (100%)	
Duration of hemodialysis (months)				
≤ 7	39 (53%)	25 (61%)	64 (56%)	0.392
>7	35 (47%)	16 (39%)	51 (44%)	
Total	74 (100%)	41 (100%)	115 (100%)	
Diabetes Mellitus				
Yes	44 (60%)	29 (71%)	73 (64%)	0.229
No	30 (40%)	12 (29%)	42 (36%)	
Total	74 (100%)	41 (100%)	115 (100%)	
Hypertension				
Yes	49 (66)	22 (54)	71 (62)	0.184
No	25 (34)	19 (46)	44 (38)	
Total	74 (100%)	41 (100%)	115 (100%)	

Majority of the patients had ≤ 7 months of hemodialysis, i.e. 64 (55.7%). [Table 01] Frequency of type 2 diabetes was 73 (63.5%) whereas hypertension was 71 (61.7%). Pulmonary hypertension was found in 74 (64.3%) patients. A

significant association of pulmonary hypertension was observed with age (p-value <0.001) of the patients while other variables were found to be insignificant (Table 2).

DISCUSSION

Pulmonary hypertension is a commonly occurring comorbid condition in dialysis dependent and non-dependent chronic kidney disease, its presence keeps these patients at higher risk of hospitalization and cardiovascular mortality.⁴ It is a gradually developing, deadly disease of pulmonary circulation that go along with left or right ventricular failure. Right ventricular dysfunction leading to right-sided heart failure is its long term complication that affects survival in this patient population.⁵ Severe anemia, fluid overload, an arterio-venous fistula, dialysis membrane exposure, endothelial dysfunction, vascular calcification and stiffening, of chronic kidney disease all give rise to pulmonary hypertension with prevalence of 58.82% in hemodialysis patients.⁸ The local data on pulmonary HTN in CKD patients on hemodialysis varies from 36% to 56%.⁹⁻¹¹

In this study, frequency of type 2 diabetes was 73 (63.5%) whereas hypertension was 71 (61.7%). Pulmonary hypertension was found in 74 (64.3%) patients. A significant association of pulmonary hypertension was observed with age (p-value <0.001) of the patients while other variables were found to be insignificant.

Presence of pulmonary hypertension in dialysis dependent chronic kidney disease is an independent predictor of death in these patients.¹² Recent studies have witnessed a high prevalence of PH in end-stage renal disease, particularly among haemodialysis patients and an association with adverse outcomes.¹³⁻¹⁵

literature have witnesses relations with potential causative factors such as A-V fistulae and bone mineral variables.^{16,17} There has been no solid relationship with any individual risk factor, however most of these have demonstrated some affiliation with echocardiographic values of cardiac dysfunction.

Prevalence of pulmonary hypertension in patients with ESRD are established principally on echocardiographic values with small recognition using the suggested gold standard right heart catheterization. Because of the absence of prospective case-controlled studies, the timing of PH beginning and its aggregate frequency at progressive phases of CKD are obscure.

Data on pulmonary hypertension prevalence among CKD stage 5 patients before commencement of renal replacement therapy (RRT) are scanty. Yigla et al.¹⁸ noted a prevalence of 13.7% among 127 pre-dialysis cases, but did not give data about excretory function during echocardiography. One more research reported a high rise prevalence of PH in cases of CKD not on RRT (39%), escalating to 56% in those on hemodialysis.¹⁹ The related prevalence in ESRD cases (32%) was witnessed by Abdelwhab and Elshinnawy.²⁰

In cases on RRT, PH has been accounted for to be more prevalent in 30-58% of cases getting HD.^{13,15,21,22} with the highest and most current research describing the prevalence of 38%.²³ In cases of peritoneal dialysis the range of prevalence differs between 12.5 and 42%.²⁴

The expanded dominance of PH in the HD population brings up the issue of whether this is identified with the dialysis cycle itself. Specifically, it has been suggested that a huge inflammatory response to non-biocompatible membranes come up with endothelial dysfunction and eventually PH. One study analyzed the progressions in sPAP before and after a HD spell with a cellulose membrane versus a biocompatible polysulphone high-flux dialyser. The study indicated a more prominent decrease with the biocompatible high-flux dialyser that was not associated to the higher volume ultrafiltration effect of dialysis membranes on PH²⁵.

CONCLUSION

The prevalence of pulmonary hypertension was found to be higher in end-stage renal disease patients (64.3%) on maintenance hemodialysis.

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