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KEY WORDS: Hypertension, Chronic kidney disease, Non-pulmonary hypertension, Pulmonary hypertension, Cardiovascular complications.

TO STUDY THE INCIDENCE OF GROUP V PULMONARY HYPERTENSION IN CKD V PATIENTS ON MAINTANANCE HEMODIALYSIS AT OUR CENTRE

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ABSTRACT

BACKGROUND: The incidence of chronic kidney disease in India is around 17.4%. Pulmonary hypertension is common in dialysis dependent chronic kidney disease patients, which in turn increase the risk of cardiovascular complications.

AIMS AND OBJECTIVES: Evaluation of Group V pulmonary hypertension in chronic kidney disease stage V patients on maintenance hemodialysis.

MATERIAL AND METHODS: The present observational,prospective study was conducted from April 2016 to October 2017 on 100 patients of chronic kidney disease stage V on maintenance hemodialysis. Pregnant woman, patients on PAH medication were excluded from the study. The patients with pulmonary hypertension came for follow-up after 3 months. For classification of chronic kidney disease - National Kidney Foundation Classification was used. For diagnosis of pulmonary hypertension, diagnostic criteria given by RHC was used.

RESULTS: There were 36.84% females and 63.16% males, while in the pulmonary hypertension group, there were 20.83% females and 79.17% males, showing a male preponderance. The mean age comparison (47.8 ± 14.1 years vs. 49.0 ± 17.9 years in non-pulmonary and pulmonary hypertension) was found to be statistically not significant (p>0.05). The mean hemoglobin level comparison (9.43 ± 1.76 gm% vs. 9.11 ± 1.27 gm% in non-pulmonary and pulmonary hypertension) was found to be statistically not significant (p>0.05).The mean systolic blood pressure comparison (150.3 ± 18.3 mm Hg vs. 153.8 ± 18.1 mm Hg in non-pulmonary and pulmonary hypertension) was found to be statistically not significant (p>0.05).The mean diastolic blood pressure comparison (90.0 ± 10.3 mm Hg vs. 93.8 ± 11.3 mm Hg in non-pulmonary and pulmonary hypertension) was found to be statistically not significant (p>0.05).The mean body mass index comparison (21.57 ± 4.11 kg/m2 vs. 20.65 ± 3.79 kg/m2 in non-pulmonary and pulmonary hypertension) was found to be statistically not significant (p>0.05).The mean serum creatininecomparison (8.95 ± 3.55 mg/dL vs. 8.10 ± 2.31 in non-pulmonary and pulmonary hypertension) was found to be statistically not significant (p>0.05).

CONCLUSION: There was no statistically significant difference seen in the age, gender, hemoglobin level, serum creatinine level, body mass index, systolic and diastolic blood pressure between the non-pulmonary hypertension and pulmonary hypertension patients.

INTRODUCTION

Chronic kidney disease (CKD) is a worldwide public health problem. Globally, CKD is the 12th cause of death and the 17th cause of disability. In our country incidence of CKD is around 17.4%.[1] Pulmonary hypertension (PH) is common in patients with dialysis-dependent chronic kidney disease and is independent predictor of mortality and is recognized as a condition that increases the risk of cardiovascular complications.[2] Pulmonary hypertension (PH) has been reported in patients with ESRD maintained on long-term hemodialysis.[3] Based on echocardiographic studies, the prevalence of pulmonary hypertension in these patient populations is estimated to be around 17–56%. Pulmonary Hypertension is a hemodynamic and pathophysiological state found in a range of clinical conditions and is characterized by an increase in mean pulmonary arterial pressure (mPAP>30 mmHg). The different forms of Pulmonary Hypertension have been classified into five clinical groups with specific characteristics.

Group 1 consists of idiopathic, heritable, associated with connective tissue disease and congenital heart disease.

Group 2 is pulmonary hypertension due to left heart disease including diastolic dysfunction,

Group 3 pulmonary hypertension due to lung diseases and/or hypoxia,

Group 4 is chronic thromboembolic pulmonary hypertension (CTEPH).

Group 5 pulmonary hypertension with unclear and/or multifactorial mechanisms including''chronic renal failure on dialysis''.[2,4]

The normal pulmonary artery pressure in a person at sea level has a peak systolic value of 18-25 mmHg. Definite pulmonary hypertension is present when pulmonary artery systolic and mean pressures exceed 30 and 20 mmHg, respectively.[5] The normal pulmonary vascular bed offers less than one-tenth of the resistance to flow offered by systemic bed. Pulmonary artery pressure and pulmonary vascular resistance increase with advancing age.

The majority of the patients with CKD have hypertension with diastolic dysfunction, arterio-venous fistulas (AV fistulas), anemia, uremic lung, volume overload with interstitial pulmonary edema, and a high cardiac output state, all of which can lead to increased pulmonary vascular pressures.[6,7] During the last 2 decades, evidence has accrued documenting that mild to moderate forms of pulmonary hypertension are much more common than traditionally has been thought.[8] These forms often remain undetected because the disease has a long preclinical asymptomatic phase and pulmonary hypertension often is suspected only when the clinical signs and symptoms of right ventricular dysfunction, namely progressively worsening fatigue, dyspnea, and syncope, are manifested.[9] It is increasingly being recognized that pulmonary hypertension in patients with chronic kidney disease (CKD) is not confined to those with connective tissue and systemic diseases and that the decrease in kidney function per se may be a trigger for the development of this disturbance.

There is a paucity of data on the incidence and prevalence of pulmonary hypertension in chronic kidney disease (CKD) in Indian patients.

The present study was conducted with the aim to find out the

incidence of Group V Pulmonary Hypertension in patients with CKD V on maintenance hemodialysis at our center.

AIMS AND OBJECTIVES

AIM

Evaluation of Group V Pulmonary Hypertension in CKD V patients on maintenance hemodialysis.

OBJECTIVES

1. To study incidence of Group V Pulmonary Hypertension in CKD V patients on hemodialysis.
2. Comparison of sex, age, hemoglobin level, systolic and diastolic blood pressure, BMI, serum creatininebetween pulmonary hypertension and non-pulmonary hypertension group.

MATERIAL AND METHODS

STUDY AREA

Department of Nephrology, Sri Aurobindo Medical College and Postgraduate Institute (SAMC & PGI), Indore (M.P.)

STUDY POPULATION

All CKD V Patients on Maintenance hemodialysis coming to our center during the study period.

TYPE OF STUDY

It was a prospective, observational study.

TIME FRAME TO ADDRESS THE STUDY

The study was conducted between April 2016 to October 2017.

SAMPLE SIZE AND SAMPLING TECHNIQUE

A total of 100 patients fulfilling all the inclusion criteria and none of the exclusion criteria were included in this study.

Convenient sampling technique was used.

INCLUSION CRITERIA

1. Age more than 18 years of either gender
2. CKD stage V patient on hemodialysis
3. Patient and/or his/her legally acceptable representative willing to provide their voluntary written informed consent for participation in the study

EXCLUSION CRITERIA

1. Patient of age less than 18 years
2. Pregnant woman
3. Patient on PAH medication
4. Patient and/or his/her legally acceptable representative not willing to provide their voluntary written informed consent for participation in the study

METHODOLOGY

All the prospective patients were explained about the study in detail including the risks/benefits, procedures, etc. in their own language. After obtaining their verbal consent for participation, a voluntary written informed consent form was obtained from either the patient and/or his/her legally acceptable representative.

All the study related procedures were conducted only after obtaining the voluntary written informed consent form.

All the patients underwent detailed clinical examination, echocardiography, chest x-ray and biochemical tests.

All the patients with pulmonary hypertension were follow-up at 3 months.

Classification and staging of the chronic kidney disease was done using National Kidney Foundation Classification. If GFR was found to be <15 ml/min/1.73m2, the patient was labeled as having Stage V chronic kidney disease.

For pulmonary hypertension diagnostic criteria given by RHC was used:

Diagnosis	Pressure values
No Pulmonary Hypertension	mPAP< 25 mmHg
Pulmonary Hypertension	mPAP ≥ 25mmHg
Pre-capillary Pulmonary Hypertension	mPAP ≥ 25mmHg PCWP < 15mmHg
Post-capillary Pulmonary Hypertension	mPAP ≥ 25mmHg PCWP ≥ 15mmHg

**** Where mPAP is mean pulmonary artery pressure and PCWP is pulmonary capillary wedge pressure.***

OUTCOME MEASURES

Pulmonary / non-pulmonary hypertension, age, sex, hemoglobin level, systolic and diastolic blood pressure, BMI, serum creatinine, etc. formed the outcome measures of the study.

METHOD OF COLLECTION OF DATA

A customized pre-designed proforma was used for collecting the data for the study.

STATISTICAL ANALYSIS

Microsoft Excel was used for analyzing the data and online statistical software were used for calculating the p values. Association between non-parametric variables was done using Pearson Chi-square test, comparison of mean between the two groups was done using Unpaired 't' test. A p value of < 0.05 was taken as statistically significant.

ETHICAL AND LEGAL CONSIDERATIONS

The protocol of the study was submitted to the Ethics Committee of the institution. After obtaining their approval, the study was initiated in the institution. Also before including any patient into the study, a voluntary written informed consent was obtained from either the patient and/or his/her legally acceptable representative. This consent was in addition to the consents that are routinely obtained as per institutions laid down norms.

FINANCIAL CONSIDERATIONS

The patient was managed according to the guidelines laid down by the institution. No additional test / procedure was conducted for the specific purpose of the study. Hence, there was no financial burden either on the patient or on the institution. All the study related expenses were borne by the researcher himself.

RESULTS

In our study there were 100 patients at the beginning of the study. Of which 24% patients were having pulmonary hypertension and 76% patients were not having any pulmonary hypertension.**Amin et al (2002)**[10] reported an incidence of pulmonary hypertension to be 29% in their study.

At 3 months follow-up, of the 24 patients with pulmonary hypertension, 4 patients withdrew their consent after initial visit, 4 patients were lost to follow-up. Thus, 16 patients finally came for the follow-up visit.

In the non-pulmonary hypertension group, there were 36.84% females and 63.16% males, while in the pulmonary hypertension group, there were 20.83% females and 79.17% males. There was a male preponderance in the study. The distribution of males and females in relation to the hypertension groups (non-pulmonary and pulmonary) was found to be comparable (2=2.114, df=1, p value = 0.146, not significant). Similar non-significant results were reported by **Tarrass et al (2005).**[11]

The mean age in the non-pulmonary hypertension group was 47.8 ± 14.1 years, while in the pulmonary hypertension group it was 49.0 ± 17.9 years. The difference was found to be statistically not significant ($p>0.05$), showing that the mean age was comparable between the two groups. Studies done by **Amin et al (2002)**[10] and **Tarrass et al (2005)**[11] reported no significant association between the age and pulmonary hypertension.

The mean hemoglobin level in the non-pulmonary hypertension group was 9.43 ± 1.76 gm%, while in the pulmonary hypertension group it was 9.11 ± 1.27 gm%. The difference was found to be statistically not significant (p>0.05), showing that the mean hemoglobin level was comparable between the two groups. Study done by **Amin et al (2002)**[10] reported no significant association between hemoglobin level and pulmonary hypertension. [Table 1]

Table 1: Comparison of mean hemoglobin in relation to pulmonary hypertension

Hb (gm%)	Pulmonary Hypertension	
	No (n=76)	Yes (n=24)
Mean ± SD	9.43 ± 1.76	9.11 ± 1.27
't' value	0.82, df=98	
P value	0.412, NS	

The mean systolic blood pressure in the non-pulmonary hypertension group was 150.3 ± 18.3 mm Hg, while in the pulmonary hypertension group it was 153.8 ± 18.1 mm Hg. The difference was found to be statistically not significant (p>0.05), showing that the mean systolic blood pressure was comparable between the two groups. [Table 2]

Table 2 :Comparison of mean systolic blood pressure in relation to pulmonary hypertension

SBP (mm Hg)	PulmonaryHypertension	
	No (n=76)	Yes (n=24)
Mean ± SD	150.3 ± 18.3	153.8 ± 18.1
't' value	-0.80, df=98	
P value	0.424, NS	

The mean diastolic blood pressure in the non-pulmonary hypertension group was 90.0 ± 10.3 mm Hg, while in the pulmonary hypertension group it was 93.8 ± 11.3 mm Hg. The difference was found to be statistically not significant (p>0.05), showing that the mean diastolic blood pressure was comparable between the two groups. [Table 3]

Table 3: Comparison of mean diastolic blood pressure in relation to pulmonary hypertension

DBP (mm Hg)	PulmonaryHypertension	
	No (n=76)	Yes (n=24)
Mean ± SD	90.0 ± 10.3	93.8 ± 11.3
't' value	-1.51, df=98	
P value	0.133, NS	

The mean body mass index in the non-pulmonary hypertension group was 21.57 ± 4.11 kg/m^2, while in the pulmonary hypertension group it was 20.65 ± 3.79 kg/m^2. The difference was found to be statistically not significant (p>0.05), showing that the mean body mass index was comparable between the two groups. Study done by **Agarwal et al (2012)**[12] reported no significant association between body mass index and pulmonary hypertension. [Table 4]

Table 4: Comparison of mean body mass index in relation to pulmonary hypertension

BMI (kg/m^2)	PulmonaryHypertension	
	No (n=76)	Yes (n=24)
Mean ± SD	21.57 ± 4.11	20.65 ± 3.79
't' value	1.11, df=98	
P value	0.271, NS	

The mean serum creatininein the non-pulmonary hypertension group was 8.95 ± 3.55 mg/dL, while in the pulmonary hypertension group it was 8.10 ± 2.31 mg/dL. The difference was found to be statistically not significant (p>0.05), showing that the mean serum creatininewas comparable between the two groups.Study done by **Amin et al (2002)**[10] reported no significant association between serum creatinineand pulmonary hypertension. [Table 5]

Table 5: Comparison of mean serum creatinine in relation to pulmonary hypertension

Serum Creatinine	PulmonaryHypertension	
	No (n=76)	Yes (n=24)
Mean ± SD	8.95 ± 3.55	8.10 ± 2.31
't' value	1.11, df=98	
P value	0.271, NS	

CONCLUSION

From the results obtained in our study, we conclude that pulmonary hypertension is independent of the age and the gender of the patients.

There was no statistically significant difference seen in the hematological parameters like hemoglobin level, serum creatinine between the non-pulmonary and pulmonary hypertension groups.

Also there was no statistically significant difference in the hemodynamic parameters like systolic blood pressure, diastolic blood pressure of the patients.

Body mass index was also found to be comparable between the non-pulmonary and pulmonary hypertension groups.

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