e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2023; 15(7); 984-987

Original Research Article

Prevalence of Pulmonary Hypertension in Patients of Chronic Kidney Disease in Western Rajasthan: A Cross Sectional Study

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Received: 10-01-2023 / Revised: 16-02-2023 / Accepted: 25-02-2023

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Conflict of interest: Nil

Abstract

Chronic kidney disease (CKD) includes a spectrum of pathophysiologic processes associated with abnormal kidney function and progressive decline in glomerular filtration rate (GFR). Hospital based cross-sectional study was conducted on 100 diagnosed cases of CKD (according to different stages based on GFR) and age more than 18 years. All data collected and analyzed by SPSS software. Prevalence of pulmonary hypertension in CKD patients was 15.00%.46.67% patients were mild, 40.00% patients were moderate and 13.33% patients were in severe pulmonary hypertension group. The association between pulmonary hypertension and CKD stage was found statically insignificant. Pulmonary hypertension had positive correlation with stage of CKD, duration of CKD and age of patients.

Keywords: CKD, Pulmonary hypertension, Stage.

Introduction

Chronic kidney disease (CKD) includes a spectrum of pathophysiologic processes associated with abnormal kidney function and progressive decline in glomerular filtration rate (GFR). There are different stages of CKD which are stratified by both estimated GFR and the degree of albuminuria.[1]

The normal pulmonary artery pressure is peak systolic value of 18- 25 mm Hg. Pulmonary artery pressure and pulmonary vascular resistance increases with advancing age. Reduced compliance of pulmonary artery due to intimal fibrosis or increased wall thickness in pulmonary arteries is a possible cause for this. Majority of patients with CKD have hypertension, diastolic dysfunction, AV fistula, Anemia, uremia, volume overload with interstitial pulmonary edema and a high cardiac output state all of which can lead to increased pulmonary vascular pressure.[2]

Factors specific to hemodialysis like exposure to dialysis membrane, AV fistula, contributes to pulmonary hypertension. Uremic patients on hemodialysis therapy via AV access exhibit decreased nitric oxide production.

This endothelial dysfunction coupled with prolonged elevation of endothelin reduces capacity of pulmonary circulation to maintain AV access mediated elevation of cardiac output and contributes to pulmonary hypertension. [3]

Materials and Methods

Hospital based cross-sectional study conducted at Department of medicine, S.P. Medical College and P.B.M Hospital, Bikaner

Inclusion Criteria

1. Those who are giving informed consent.
2. Diagnosed cases of CKD (according to different stages based on GFR).
3. Age ≥18 years.

Exclusion Criteria

1. Those not willing to participate in the study.
2. Age <18 years.
3. Valvular heart diseases.
4. Congenital heart diseases.
5. Pulmonary obstructive and restrictive diseases.
6. HIV-infected patients.
7. Chronic liver disease.
8. Connective tissue diseases.
9. Hypothyroidism and hyperthyroidism.

Data Analysis

For data analysis Microsoft excel and statistical software SPSS was used and data were analyzed with the help of frequencies, figures, proportions, measures of central tendency. Chi-square test was use for qualitative data and t-test was used for

quantitative data. Co-relation co-efficient was used for correlation

Results

In our study out of 108 subject, maximum (53.70%) subject were 46-60 years age group followed by 28.70% subject were <45 years age group and only 17.60% subject were more than 60 years age group.76 (70.67%) subjects were male and 32(29.63%) subjects were female.41.67% patients were suffering from diabetes and 55.56% patients were suffering hypertension.66.67% subject CKD duration was <5 years and 25.00% subject CKD duration was 5-10 years.

Table 1: Distribution of study subjects according to stage of CKD

CKD stage	No. of subject	Percentage
3	28	28.00
4	29	29.00
5	43	43.00
Total	100	100.00

In our study out of 100subject, maximum (43.00%) subject CKD stage was 5 and 29.00% subject CKD stage was 4

Table 2: Prevalence of Pulmonary hypertension in CKD subjects

Pulmonary hypertension	No. of subject	Percentage
Present	15	15.00
Absent	85	85.00
Total	100	100.00

Prevalence of pulmonary hypertenstion in CKD patients was 15.00%.

Table 3: Distribution of study subjects according to grade of pulmonary hypertension

Grading	No. of subject	Percentage
Mild	7	46.67
Moderate	6	40.00
Severe	2	13.33
Total	15	100.00

46.67% patients were mild, 40.00% patients were moderate and 13.33% patients were in severe pulmonary hypertension group. The association between pulmonary hypertension and CKD stage was found statically insignificant

Discussion

Since India is capital of diabetes, chronic kidney disease is also in increasing trend. CKD have elevated risk of cardiac disease and other complications. Cardiac disease is important cause of mortality in CKD patients.Pulmonary hypertension occurs more commonly due to increased cardiac output and increase in pulmonary blood flow. CKD patients also have risk of developing pulmonary hypertension due to metabolic and hormonal abnormalities. This leads to increased pulmonary artery constriction and associated increase in pulmonary resistance.

Presence of AV Fistula, decreased hemoglobin, volume overload status leads to increase in cardiac output and increase in pulmonary artery pressure.

Hence aim of our study is to evaluate prevalence of pulmonary hypertension in CKD patients.

Pulmonary hypertension occurs more commonly due to increased cardiac output and increase in pulmonary blood flow. Among 100 CKD patients evaluated in our study 15.00% patients had pulmonary hypertension as assessed by 2D Echo.

Pulmonary hypertension, a disorder characterized by elevated pulmonary artery pressure, is a progressive disorder complicating heart, lung, or systemic diseases, with increased morbidity and mortality regardless of its etiology.[4]

Recently it has been found that Pulmonary hypertension is a strong independent predictor of morbidity and mortality in hemodialysis patients.[5]

In an observational study of 58 haemodialysis patients, with a mean follow-up of 30 months, patients with Pulmonary hypertension had mortality of 30.4% compared with 8.5% among patients without PH ($p < 0.03$).[6]

Yigla *et al*.,[7] in their cohort of CKD patients, reported significantly lower survival than those without PHT with 1 year, 3 years, and 5 years survival rates of 78.6% versus 96.5%, 42.9% versus 78.8%, and 25.2% versus 66.4% respectively ($p = 0.0001$). There are very few Indian studies addressing the prevalence of PHT in CKD patients. In patients with ESRD, PHT has been recognized to be a frequent condition and appears to be independent from cardiovascular disease prevalence.

In our study prevalence of pulmonary hypertenstion in CKD patients was 15.74%.Tarras et al[8] found PH prevalence to be as low as 26.74% and Moniruzzaman et al[9] found it to be as high as 68.6%.

In another Indian study Patel et al[10] studied 100 patients (69 males, 31 females) who were on conservative management, haemodialysis or continuous ambulatory peritoneal dialysis (CAPD). The prevalence of PH in this cohort was 41% and the highest prevalence was in the hemodialysis group (33%). The variability in the prevalence of PH among CKD patients in different studies[11,12] can be explained by the difference in the ethnicity of the population studied as well as in the study group, regarding stage of CKD, mode of dialysis (HD vs PD), comorbid conditions such as COPD/CHF and inclusion criteria. Though these studies considered different parameters and are not truly comparable, most concluded that there was high prevalence of PHT among CKD patients.

There was no effect of age on prevalence of PH in our study. This result was similar to the study by Mazdeh et al [13] ($p = 0.58$) Tarras et al [7] ($p = 0.37$). Patel et al. [10] also did not find correlation between age and PHT ($p = 0.402$).

In the present study, positive correlation was found in CKD stages and PH but due to small numbers of study subjects, this was not in significant range. Being a tertiary referral centre, our patients are usually late referrals and all patients in our study group were in stage III, IV, or V.

Yang et al [14] found PH prevalence of 23.76% (24/101) in stage II and 48.15% (13/27) in GFR <60 mL/min/1.73 m2 group ($p < 0.05$) raising the alarm that PH exists and may be prevalent prior to drop in GFR to <60 ml/min/1.73 m2. Severe PH was detected in CKD patients in stage-V along with increased prevalence of PH and cardiovascular morbidity as renal disease progressed in study by Li et al.[15]

The exact mechanisms of PH in higher stages of CKD remain poorly understood. PH might be induced and/or aggravated by left ventricular disorders and risk factors typical of CKD, including volume overload, AVF, sleep disordered breathing, exposure to dialysis membranes, endothelial dysfunction, vascular calcification and stiffening, and severe anemia.[9] ESRD-related PH, for the first time, was grouped into the 5th subtype (PH with unclear multifactorial mechanisms) of PH by the World Symposium of PH (WSPH).[11]This group includes PH in CKD without significant cardiac and pulmonary diseases. Ruling out these comorbid conditions—which were found in 40%–70% of patients in most cohorts—typically involves chest radiography, pulmonary function tests, CT scans, and ventilation/perfusion scans.

Hence after this study we found a positive correlation between pulmonary hypertension in CKD patients which is increasing with stage and duration of CKD and by detecting it in early stages by non-invasive method like 2 D Echo, we can treat it early thereby decreasing related mortality and morbidity and resulting in better patient outcome

Conclusion

Pulmonary hypertension had positive correlation with stage of CKD, duration of CKD and age of patients.

Limitations of the Study

1. The sample size is small.
2. The study excluded patients with CKD stage I and II and patients on peritoneal dialysis.
3. The diagnosis of PH was based on indirect echo-cardiographic estimates of PA systolic pressure and not by right heart catheterization, which is the gold standard.
4. Significant coronary artery disease was not ex-cluded by coronary angiography and stress test.
5. There is no long-term follow-up of patients.

References

1. Locatelli F, Marcelli D, Conte F, et al: Cardio-vasculardisease in chronic renal failure: thechal-lenge continues. Nephrol Dial Transplant2000; 15: 69–80.
2. Pastan S, Bailey J: Dialysis therapy. N Engl J Med 1998; 338: 1428–1436.
3. Barak M, Katz Y. Microbubbles: Pathophysiol-ogy and clinical implica-tions. Chest. 2005;128:2918–32.
4. Humbert, M, Sitbon, O, Chaouat, A, et al. Pul-monary arterial hypertension in France: results from a national registry. Am J RespirCrit Care Med 2006; 173:1023.
5. Hadengue, A, Benhayoun, MK, Lebrec, D, Benhamou, JP. Pulmonary hypertension complicating portal hypertension: prevalen and relation to splanchnic he-modynamics. Gastroenterology 1991; 100:520.
6. Krowka, MJ, Swanson, KL, Frantz, RP, et al. Portopulmonaryhypertension: Results from a 10-year screening algorithm. Hepatology 2006; 44:1502.
7. Yigla M, Fruchter O, Aharonson D, Yanay N, Reisner SA, Lewin M, et al. Pulmonary hyper-tension is an independent predictor of mortality in hemodialysis patients. Kidney Int. 2009; 75:969–75.
8. Tarrass F, Benjelloun M, Hachim K, Benghanem MG, Ramdani B. Pulmonary hy-pertension in patients with end-stage renal dis-ease. Indian J Nephrol. 2005;15:223–6.
9. Moniruzzaman M, Islam MN, Alam MB, Alam M, Khan MMH, Ali Z, et al. Pulmonary Hyper-tension in Hemodialysis Patients. Cardiovasc

J. 2014;4:148–52.
10. Patel P, Abraham G, Pratap P, Ramalakshmi R, Mathew M, Jeevan JM, et al. Clinical and Biochemical parameters in chronic kidney disease with Pulmonary Hypertension. Indian J of Nephrol. 2007;17:4–6.
11. Gokul R. Replacement therapy by dialysis. In: Weatherall DJ, Ledingham JG, Warrell DA, editors. Oxford textbook of medicine. 3rd ed. Oxford: Oxford University Press; 1996. pp. 3306–10.
12. Yigla M, Dabbah S, Azzam ZS, Rubin AH, Reisner SA. Background diseases in 671 patients with moderate to severe pulmonary hypertension. Isr Med Assoc J. 2000;2:684–9.
13. Mazdeh MM, Mousavi SA, Yahyazadeh H, Azadi M, Yoosefnejad H, Ataiipoor Y. Pulmonary hypertension in hemodialysis patients. Saudi J Kidney Dis Transpl. 2008; 19:189–93.
14. Yang, Lambert J, Janssen MJ, Donker AJ, Stehouwer CD. Endothelium-dependent vasodilatation and distensibility of large arteries in chronic haemodialysis patients. Nephrol Dial Transplant. 1997;12:14–8.
15. Li Z, Liang X, Liu S, Ye Z, Chen Y, Wang W, et al. Pulmonary Hypertension: Epidemiology in Different CKD Stages and Its Association with Cardiovascular Morbidity. PLoS One. 2014;9: e114392.