Original Research Article

A prospective study of peripheral arterial diseases in chronic kidney disease patient attending tertiary care hospital Andhra Pradesh

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ABSTRACT

Background: Around 10% populations worldwide develop chronic kidney disease and two million people require frequent dialysis due to it[1]. Cardiovascular diseases related complications are more common in chronic kidney patients and responsible for greater morbidity and mortality. This study is designed to determine the peripheral artery disease in patients with chronic kidney disease in our clinical setup and risk factor associated with them.

Methods: In present study 140 patients with chronic kidney disease were enrolled for this study. Demographic profile of each patient was recorded. Detailed history of patients regarding claudication was taken. Ankle-brachial index was calculated in each patient with CKD for diagnosis of PAD based on American heart association guideline.

Results: There was male predominance. History of smocking was present in 80 (57.14%) patients and absent in 60 (42.85%) patients. Symptom of PAD was present in 28 (20%) patients and absent in 114(80%) patients. Ankle-Brachial Index was positive in 38(27.14%) patients and absent in 102 (72.85%) patients. 80 (57.14%) patients were in stage 3 and 24 (17.14%) patients were in stage 4. Diabetes mellitus was present in 26 (18.57%) patients, Hypertension was present in 64 (45.71%), IHD was present in 22 (15.71%) remaining have no risk factor.

Conclusions: From present study we can conclude that PAD was common in CKD patients more than 50 years of age and here is male predominance. It is more common in smoker and in most of the patients it was asymptomatic. Prevalence of PAD was 27.14% in CKD patients. In our study PAD was more common in stage 3 CKD and least common in stage 2, and cardiovascular risk factor was more common in PAD patients then CKD in general.

Keywords: Peripheral arterial diseases, Chronic kidney disease, Risk factor

INTRODUCTION

Around 10% populations worldwide develop chronic kidney disease and two million people require frequent dialysis due to it.[1] cardiovascular diseases related complications are more common in chronic kidney patients and responsible for greater morbidity and mortality. Patients with chronic kidney disease are at higher risk of developing peripheral artery disease than normal population not only because of atherosclerosis as common risk factor but chronic kidney disease itself can become risk factor because of chronic inflammation, hypoalbuminemia, and a pro-calcific state.[2-4] But peripheral artery diseases are largely overlooked when

chronic kidney patients are evaluated for cardiovascular risk factor. But peripheral artery disease can work as predictor for coronary artery disease and mortality associated with it. As the incidence of peripheral arterial disease are more in chronic kidney disease patients so it can work as guide for nephrologists to access the risk cardiovascular disease in chronic kidney disease patients.[4,5] De-Loach et al has reported that cardiovascular disease is a major source of morbidity and mortality for patients with chronic kidney disease (CKD). Peripheral arterial disease (PAD) is a strong predictor of coronary artery disease and a risk factor for mortality in the general population.[5] Yevzlin et al from their study concluded that peripheral arterial disease (PAD) is a

cardiovascular disease risk equivalent and is a common problem in chronic kidney disease patients.[6] Ix JH et al has reported that among subjects with CKD, arterial disease may be due to atherosclerosis, medial arterial calcification (MAC), or both conditions concomitantly. It is important for clinicians to recognize both conditions.[7] Muñoz-Terol et al has concluded from his study that peripheral arterial disease (PAD), that is associated with a high mortality rate, is not usually assessed in these patients.[8] Based on above literature search we have designed present study to determine the peripheral artery disease in patients with chronic kidney disease in our clinical setup and risk factor associated with them.

METHODS

This is a prospective, cross sectional, observational study and analytic study conducted in the department of general medicine and nephrology Konaseema institute of medical science Amalapuram India from June 2019 to March 2021.

Patients with chronic kidney disease admitted in the department of general medicine and nephrology were included for this study as per following inclusion and exclusion criteria. A written informed consent was obtained from all patients before enrolling them for study.

Inclusion criteria

Inclusion criterion for current study was all patients diagnosed cases of chronic kidney disease of age above 18 years and both sex.

Exclusion criteria

Exclusion criterion for current study was pre-existing peripheral arterial disease, congestive heart failure, aortic regurgitation and amputation of lower limb.

Sample size

Based on previous study indicating that the incidence of PAD was 24% of patients with renal insufficiency and in 3.7% of participants with normal renal function, confidence level of 0.95 and power of study 0.8 was taken to calculated sample size of 140.[9,10] Based on exclusion and inclusion criteria 140 patients with chronic kidney disease were enrolled for this study.

Procedure

In present study 140 patients with chronic kidney disease were enrolled for this study. Demographic profile of each patient was recorded. Detailed history of patients regarding claudication was taken. Blood sample was collected for estimation of complete blood count, fasting and post prandial blood sugar, serum protein, electrolyte, serum urea and creatinine. CKD-EPI formulae were used

for calculation of GFR.[11] Ankle-brachial index was calculated in each patient with CKD for diagnosis of PAD based on American heart association (AHA) guideline.[12] For diagnosis of hypertension (JNC8) guideline was used and for diagnosis of diabetes mellitus ADA Classification and diagnosis of diabetes: Standards of medical care in diabetes 2019 was used.

Statistical analysis

Data were recorded in excel sheet and statistical analysis was done with software SPSS-14 version. Qualitative data were calculated as percentage and proportions.

RESULTS

During our study period of one year and 10 months we have enrolled 140 patients with chronic kidney disease were enrolled for evaluation of peripheral arterial disease. As per (Table 1), regarding profile of patients with chronic kidney disease (CKD), the mean age of patients with CKD was 55.64±18.71 years.

Table 1: Profile of patients with chronic kidney disease.

Variable		N	(%)
Age Mean= 55.64±18.71 years	Less than 20	21	15
	21 to 30	22	15.71
	31 to 40	24	17.14
	41 to 50	30	21.42
	More than 51	43	30.71
Sex	Male	96	68.57
	female	44	31.42
H/O smoking	Present	80	57.14
	Absent	60	42.85
Symptom of PAD	Present	28	20
	Absent	112	80
Ankle-Brachial Index positive	Positive	38	27.14
	Negative	102	72.85
Stages of CKD	Stage 2	46	32.85
	Stage 3	80	57.14
	Stage 4	24	17.14
Risk factor	DM	26	18.57
	Hypertension	64	45.71
	IHD	22	15.71
	Nil	28	20

Most of the patients were more than 51 years of age 43 (30.71%) which is followed by 41 to 50 years 30 (21.42%). Number of patients less than 20 years were 21 (15%), between 21 to 30 years were 22 (15.71%) and 31 to 40 years were 24 (17.14%). There was male predominance. History of smocking was present in 80 (57.14%) patients and absent in 60 (42.85%) patients. Symptom of PAD was present in 28 (20%) patients and absent in 114 (80%) patients. Ankle-brachial index was

positive in 38 (27.14%) patients and absent in 102 (72.85%) patients.

Table 2: Profile of peripheral artery patients with chronic kidney disease.

Variable		N	%
Age Mean (43.15 ±15.94 years)	Less than 20	3	7.89
	21 to 30	7	18.42
	31 to 40	8	21.05
	41 to 50	11	28.94
	More than 51	9	23.68
Sex	Male	30	78.94
	female	8	21.05
H/O smocking	Present	24	63.15
	Absent	14	36.84
Symptom of PAD	Present	28	73.68
	Absent	10	26.31
Stages of CKD	Stage 2	8	21.05
	Stage 3	18	47.36
	Stage 4	12	31.57
Risk factor present in patients with PAD	DM	14	36.84
	Hypertension	22	57.89
	IHD	8	21.05
	No symptom	6	15.78

Regarding stages of CKD, 46 (32.85%) patients were in stage 2, 80 (57.14%) patients were in stage 3 and 24 (17.14%) patients were in stage 4. Diabetes mellitus was present in 26 (18.57%) patients, Hypertension was present in 64 (45.71%), IHD was present in 22 (15.71%) remaining have no risk factor. As per (Table 2), regarding profile of patients with peripheral arterial disease having chronic kidney disease (CKD), the mean age of patients with CKD was 43.15 ±15.94 years. Most of the patients were from 41 to 50 years of age 11 (28.94%) which is followed by more than 51 years 9 (23.68%). Number of patients less than 20 years were 3 (7.89%), between 21 to 30 years were 7 (18.42%) and 31 to 40 years were 8 (21.05%). There was male predominance. History of smocking was present in 24 (63.15%) patients and absent in 60 (36.84%) patients. Symptom of PAD was present in 28 (73.68%) patients and absent in 10 (26.31%) patients.

Regarding stages of CKD, 8 (21.05%) patients with PAD has stage 2 CKD, 18 (47.36%) patients with PAD has stage 3 CKD and12 (31.57%) patients with PAD has stage 4 CKD. Diabetes mellitus was present in 14 (36.84%) patients, Hypertension was present in 22 (57.89%), IHD was present in 8 (21.05%) remaining 6 (15.78%) have no risk factor.

DISCUSSION

Peripheral arterial disease is obstructive atherosclerotic disorder of lower extremities and its incidence is more common in chronic renal disease patients' then normal population. Diagnosis of peripheral arterial disease in chronic renal disease is always overlooked. It is associated major amputation and increased mortality and morbidity in CKD patients.[15,16]

In present study we have observed that mean age of patients with CKD was 55.64±18.71 years and PAD with CKD was 43.15±15.94 years with male predominance. This finding is supported by the work of Fowkes et al and McDermott et al.[17,18] We have observed that smocking was common in patients with CKD but it was more frequent in patients with CKD with PAD (57.14% vs. 63.15 %). This finding is supported by the work of DeLoach et al and Chen et al.[19,20] Symptom of PAD was present in 28 (20%) patients in total CKD patient but in patients with PAD symptom was present in 28 (73.68%) patients. This finding corroborates with the study of Wattanakit K et al and Liew et al.[21,22] O'Hare et al has reported that PAD is common in patients with CKD, with a prevalence of 24% which support our study. In our study prevalence was 27.14%. Garimella et al and Rajagopalan et al has concluded from their study that when PAD is broadly defined by an inclusive set of clinical criteria (including known PAD, symptomatic claudication, signs of critical limb ischemia (CLI) or reduced pulses on examination, limb artery revascularization, or past ischemic amputation), PAD prevalence ranged from 23-25%.this finding support our study regarding prevalence of PAD in CKD patients.[2,24-26] In current study PAD was more common in stage 3 CKD and least common in stage 2, and cardiovascular risk factor was more common in PAD patients then CKD in general. This finding is supported by the Garimella et al and O'Hare et al.[2,4]

CONCLUSION

From present study it was concluded that PAD was common in CKD patients more than 50 years of age and here is male predominance. It is more common in smoker and in most of the patients it was asymptomatic. Prevalence of PAD was 27.14% in CKD patients. In our study PAD was more common in stage 3 CKD and least common in stage 2, and cardiovascular risk factor was more common in PAD patients then CKD in general.

REFERENCES

1. Kirsten LJ, Pranav SG, Caitlin WH, Philip AK, Dearbhla MK, Sven M, et al. Central and peripheral arterial diseases in chronic kidney disease: conclusions from a Kidney Disease: Improving Global outcomes (KDIGO) Controversies Conference. Kidney Int. 2021;5:85-9.

2. Garimella PS, Hirsch AT. Peripheral artery disease and chronic kidney disease: clinical synergy to improve outcomes. Adv Chronic Kidney Dis. 2014; 21(6):460-71.
3. Sarnak MJ, Levey AS, Schoolwerth AC. Kidney disease as a risk factor for development of cardiovascular disease: a statement from the American heart association councils on kidney in cardiovascular disease, high blood pressure research, clinical cardiology, and epidemiology and prevention. Hypertension. 2003;42(5):1050-65.
4. O'Hare AM. Management of peripheral arterial disease in chronic kidney disease. Cardiol Clin. 2005;23(3):225-36.
5. DeLoach SS, Mohler ER. Peripheral arterial disease: a guide for nephrologists. Clin J Am Soc Nephrol. 2007;2(4):839-46.
6. Yevzlin AS, Gimelli G. Diagnosis and treatment of peripheral arterial disease in CKD patients. Semin Dial. 2013;26(2):240-51.
7. Ix JH, Criqui MH. Epidemiology and diagnosis of peripheral arterial disease in patients with chronic kidney disease. Adv Chronic Kidney Dis. 2008; 15(4):378-83.
8. Guerrero A, Montes R, Muñoz-Terol J, Gil-Peralta A, Toro J, Naranjo M, et al. Peripheral arterial disease in patients with stages IV and V chronic renal failure. Nephrol Dial Transplant. 2006;21(12): 3525-31.
9. Ašćerić RR, Dimković NB, Trajković GŽ, Ristić BS, Janković AN, Durić PS,et al. Prevalence, clinical characteristics, and predictors of peripheral arterial disease in hemodialysis patients: a cross-sectional study. BMC Nephrol. 2019;20(1):281.
10. Sample size calculation using on line calculator. Available at: https://epitools.ausvet.com.au/sample size. Accessed on 25 March 2021.
11. Levey AS, Stevens LA. Estimating GFR using the CKD Epidemiology Collaboration (CKD-EPI) creatinine equation: more accurate GFR estimates, lower CKD prevalence estimates, and better risk predictions. Am J Kidney Dis. 2010;55(4):622-7.
12. AHA releases recommendations on ankle-brachial index measurement and interpretation, Available at: http://circ.ahajournals.org/content/126/24/2890.full. Accessed on 25 March 2021.
13. James PA, Ortiz E. 2014 evidence-based guideline for the management of high blood pressure in adults. JAMA. 2014;311(5):507-20.
14. American Diabetes Association. Classification and diagnosis of diabetes: standards of medical care in diabete 2019. Diabetes Care 2019;42(1):S13-28
15. LaMendola B, Altrichter J, Cutillo A, Price A. Peripheral arterial disease and the CKD patient: the case for early screening, diagnosis, and minimally invasive revascularization. Dial Transplant. 2010;39(11):490-4.
16. Anantha-Narayanan M, Sheikh A, Nagpal S, Smolderen KG, Turner J, Schneider M, et al. Impact of Kidney Disease on Peripheral Arterial Interventions: A Systematic Review and Meta-Analysis. Am J Nephrol. 2020;51:527-33.
17. Fowkes FGR, Rudan D, Rudan I, Aboyans V, Denenberg JO, McDermott MM, et al. Comparison of global estimates of prevalence and risk factors for peripheral artery disease in 2000 and 2010: a systematic review and analysis. Lancet. 2013;382 (9901):1329-40.
18. Laghari S, Ullah K, Masroor I, Butt G, Kifayat F. Prevalence of peripheral arterial disease diagnosed by ankle brachial index among chronic kidney disease patients in a tertiary care unit. Saudi J Kidney Dis Transpl. 2015;26:924-30.
19. DeLoach SS, Mohler ER. Peripheral arterial disease: A guide for nephrologists. Clin J Am Soc Nephrol. 2007;2:839-46.
20. Chen J, Mohler ER, Xie D. Risk factors for peripheral arterial disease among patients with chronic kidney disease. Am J Cardiol. 2012;110(1): 136-41.
21. Wattanakit K, Folsom AR, Selvin E, Coresh J, Hirsch AT, Weatherley BD. Kidney function and risk of peripheral arterial disease: results from the Atherosclerosis risk in communities (ARIC) study. J Am Soci Nephrol. 2007;18(2):629-36.
22. Liew YP, Bartholomew JR, Demirjian S, Michaels J, Schreiber MJ. Combined effect of chronic kidney disease and peripheral arterial disease on all-cause mortality in a high-risk population. Clin J Am Soc Nephrol. 2008;3(4):1084-9.
23. O'Hare AM. High prevalence of peripheral arterial disease in persons with renal insufficiency: Results from the National Health and Nutrition Examination Survey. Circulation. 2004;109:320-3.
24. Cheung AK, Sarnak MJ, Yan G. Atherosclerotic cardiovascular disease risks in chronic hemodialysis patients. Kidney Int. 2000;58(1):353-62.
25. Rajagopalan S, Dellegrottaglie S, Furniss AL. Peripheral arterial disease in patients with end-stage renal disease: observations from the dialysis outcomes and practice patterns study (DOPPS) Circulation. 2006;114(18):1914-22.
26. Salvador T-I, Rafael M-I, Rebeca F-S, Alba R-G, Eduardo H-R, Juan B. Peripheral artery disease and chronic kidney disease: clinical synergy to improve outcomes. Adv Chronic Kidney Dis. 2014;21(6): 460-71.