

Peripheral Arterial Disease More Prevalent in Chronic Kidney Disease Patients (STAGE III-V)

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Abstract: ***Introduction:** Peripheral artery disease in chronic kidney disease patients is commonly reported in Jammu region, especially in patients with concomitant coronary artery disease, attributable to accelerated atherosclerosis. The present study establishes wide prevalence of peripheral artery disease in chronic kidney disease stage III-V. **Material and Methods:** This study is a cross sectional study which was carried out in Department of Nephrology, GMC Jammu during the year 2013-2014. 130 patients were included in the study period and after taking their proper history and medical records, all patients of Chronic kidney disease(stage III-V) were subjected to baseline investigations and their Ankle Branchial index(ABI) was calculated. The GFR was calculated by Cockcroft –Gault equation. **Results:** The mean age of the patients was 52.34±14.42years, 84(64.6%) being male and 46(35.3%) being females. All the patients were known case of CKD (diagnosed or first time evaluated) following Nephrology OPD at Government Medical College, Jammu with mean eGFR of 15.69±9.8 ml/min⁻¹. 12 patients (9.23%) were CKD stage III, (K/DOOI classification), 55(42.3%) were CKD stage IV and 63(48.46%) were CKD stage V. The lower eGFR was independently associated with PAD. **Conclusion:** Our study showed that the PAD is associated with thrice higher mortality than that of the general population and its prevalence is much higher among end-stage renal disease patients i.e. CKD stage III-V.*

Keywords: chronic kidney disease, peripheral artery disease, coronary artery disease, atherosclerosis

1. Introduction

Chronic kidney disease (CKD) includes a spectrum of pathophysiological processes leading to kidney malfunction and a progressive decline in glomerular filtration rate¹. Two equations most commonly used for GFR estimation are **Modification of Diet in Renal Disease (MDRD) and Cockcroft-Gault Equation**². **Kronenberg (2009)** had reported that the normal annual mean decline in GFR with age during the third decade of life is 1 ml/min per year per 1.73m² and the mean GFR is lower in women than in men. The clinical and laboratory complications of CKD become more prominent in stage III and stage IV CKD³. If the patient progresses to stage V CKD, toxic accumulation of metabolic wastes impair daily living and well-being, compromise nutritional status, and water and electrolyte homeostasis, manifesting in the uremic syndrome⁴. Atherosclerosis goes unabated even in the absence of traditional cardiovascular risk factors. The non-traditional risk factors such as inflammation, malnutrition, and oxidative stress, which enhance and accelerate atherosclerosis are also present more in CKD patients. Even minor renal dysfunction influences cardiovascular risk⁵. The literature on PAD in the lower extremities in patients with CKD is scarce. PAD is associated with thrice higher mortality than that of the general population⁶ and its prevalence is much higher among end-stage renal disease patients⁷. The most widely used test for diagnosis of asymptomatic PAD is the measurement of the ankle-brachial systolic pressure index (ABI)⁸. PAD is defined as stenosis or occlusion of aorta or the arteries of the limbs. It is traditionally defined by an ankle-brachial index of <0.9, atherosclerosis being the leading cause and intermittent claudication being the most common symptom. The patients without claudication have walking difficulties⁹. About 10-50% of patients with intermittent claudication have never consulted a doctor about their symptoms¹⁰. In patients with diabetes, renal insufficiency, or other diseases that cause

vascular calcification, the tibial vessels become non-compressible leading to a false elevation of the ankle pressure. Additional non-invasive diagnostic testing using Toe-Brachial Index, pulse volume recordings, transcutaneous oxygen measurements or duplex ultrasound should be employed to evaluate the patient for PAD⁹. Risk factors of PAD in general population include non-white (black) ethnicity¹⁰, race (non-Hispanic Blacks)⁶, male gender¹⁰, age more than 70 years¹, smoking¹¹, diabetes mellitus¹², dyslipidemia, hypertension, obesity¹³, C-reactive protein (CRP)¹⁴, hyperviscosity and hypercoagulability⁹, hyperhomocysteinemia¹⁵, chronic renal failure¹⁶. For every 1% increase in HbA1c, there is a corresponding 26% increased risk of PAD¹². Nevertheless, despite its importance, there are few reports of PVD in CRF patients, and most of them, with a few exceptions, have been performed in dialysis patients⁷. PAD in renal patients showed a higher mortality rate than those not affected by PAD¹⁷. There is paucity of data on peripheral arterial disease in patients with chronic kidney disease from this part of the world. Hence, the present trial was undertaken to study the profile of peripheral arterial disease in chronic kidney disease patients (Stage III-V) presenting to Nephrology Department of Government Medical College, Jammu from November 2013 to October 2014.

2. Material and Methods

The present work is a hospital-based cross-sectional study that included 130 subjects, 84 being males and 36 females. The diagnosis and staging of CKD was based on history, clinical examination, investigation and according to guidelines of the National Kidney Foundation [Kidney Dialysis Outcomes Quality Initiative (KDOQI)]. All the patients with Chronic Kidney Disease (Stage III-V) were subjected to baseline investigations. The GFR was calculated by Cockcroft-Gault equation. All the patients with Chronic Kidney Disease (Stage III-V) were asked

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Edinburgh Questionnaire of Claudication in PAD. All patients with Chronic Kidney Disease (Stage III-V) were subjected to Ankle Brachial Index (ABI) using sphygmomanometer with standard sized cuffs and a Doppler ultrasound probe with 7.5 MHz frequency. The highest value obtained was used to calculate ABI.

Inclusion Criteria

Patients >18 years who were diagnosed with CKD (Stage III-V)

Exclusion Criteria

Patients of age <18 years
Patients of CKD (Stage I-II)

Statistical analysis: The data obtained was subjected to statistical analysis. Categorical variables were analysed by Pearson chi square test, Fisher exact test and continuous variables were analysed by ANOVA technique along with post-hoc and Kruskal Wallis test. Also, the multivariate analyses like binary logistic regression analysis have been used to analyse the data using SPSS software ver. 20. A p-value less than 0.05 was considered to be statistically significant.

3. Results and discussion

The mean age of the patients was 52.34 ± 14.42 years, 84(64.6%) being male and 46(35.3%) being females. All the patients were known case of CKD (diagnosed or first time evaluated) following Nephrology OPD at Government Medical College, Jammu with mean eGFR of 15.69 ± 9.8 ml/min⁻¹. 12 patients (9.23%) were CKD stage III, (K/DOQI classification), 55(42.3%) were CKD stage IV and 63(48.46%) were CKD stage V. 31(23.8%) subjects were smokers, 31(23.8%) subjects were ex-smokers and 68(52.3%) subjects were non-smokers. 112(86.15%) patients were hypertensive, 40(30.7%) were diabetics 15(11.5%) had dyslipidemia, 8(6.15%) had been diagnosed with CAD and 3(2.3%) were having history of cerebrovascular accident (CVA) in the past. Intermittent claudication was seen in 16(12.31%) subjects. 19 (14.62%) subjects were having PAD with ABI<0.9. Out of 19 subjects with ABI<0.9 (PAD), 9(47.37%) were having history of IC, whereas 10(52.63%) subjects were having asymptomatic PAD. **De Vinuesa et al. (2005)** had reported a mean age (years) 70 ± 11 , 64% males, estimated GFR of 35 ± 12 (range 6-59) ml/min⁻¹ and 17% of PAD with CKD had intermittent claudication. **De Vinuesa et al. (2005)** by logistic regression analysis had found male sex and age as independent indicators of PAD risk¹⁸.

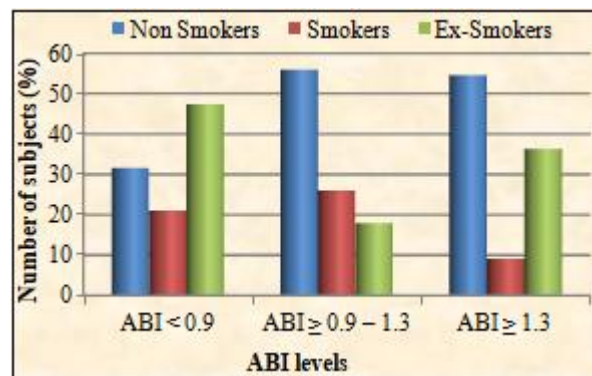
Table 1: Risk factor association with PAD

Risk factor	Frequency	p value
Smoking	4(21.05%)	0.046
Hypertension	19(100%)	0.015
Diabetes Mellitus	11(57.89%)	0.017
Dyslipidemia	5(26.32%)	0.05
CAD	6(31.58%)	0.0001
Stroke	1(5.26%)	0.595

Joachim et al. (2009) had similarly found that lower ABI participants were older and more frequently male. **Angeles et al. (2012)** too had reported that PAD affects significantly

more males subjects ($P = 0.001$). **Angeles et al. (2006)** had reported 19% prevalence of PVD in patients with CKD stages IV and V, a mean age of 58 ± 15 years and estimated GFR of 18.6 ± 6.1 ml/min⁻¹⁽¹⁹⁾. **Shlipak et al. (2002)** had reported PVD prevalence of 12%, 24%, 13% and 15.9% respectively in CKD stages IV and V patients. **They** had reported that lower eGFR was independently associated with PAD²⁰. Mean eGFR in these studies was higher compared to **Angeles et al. (2012)** and our study. This can be explained by the fact that our study population is relatively small in epidemiologic terms, which suggests that there may not have been sufficient numbers of patients representing the whole range of renal function deterioration.

In our study, no association was found between BMI and prevalence of PAD (p-value 0.521). Our results are similar to that observed by **Angeles et al. (2006)**¹⁹. **Joachim et al. (2009)** too reported that lower ABI participants had a higher prevalence of hypertension, diabetes and tobacco use and had more risk of having dyslipidemia²¹.



Bar chart: Smoking versus ABI levels

Binary logistic regression analysis showed significant association of CAD with PAD (p-value 0.041). **Angeles et al. (2012)**, by multivariate risk factor analysis, had reported that a previous clinical record of coronary heart disease increases the risk of developing PAD as both condition share same pathogenesis and risk factor profile resulting in accelerated atherosclerosis¹⁹.

4. Conclusion

PAD is associated with thrice higher mortality than that of the general population and its prevalence is much higher among end-stage renal disease patients.

Aggressive screening for risk factors and early risk factor modification should be done in CKD patients in a pursuit to reduce the PVD, CAD and CVD.

Conflict of interest: none

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References

- [1] **National Kidney Foundation.** K/DOQI Clinical Practice Guidelines for Chronic Kidney Disease: Evaluation, classification and stratification. *Am J Kidney Dis* 2002; **39**: 1-266.

- [2] **Cockcroft DW, Gault MH.** Prediction of creatinine clearance from serum creatinine. *Nephron* 1976; **16**: 31-41.
- [3] **Kronenberg F.** Emerging risk factors and markers of chronic kidney disease progression. *Nat Rev Nephrol* 2009; **5**: 677.
- [4] **Abboud H, Heinrich WL:** Clinical practice- Stage IV chronic kidney disease. *N Engl J Med* 2010; **362**: 56-65.
- [5] **Mann JF, Gerstein HC, Pogue J, et al.** Renal insufficiency as a predictor of cardiovascular outcomes and the impact of Ramipril: The Hope Randomized Trial. *Ann Intern Med* 2001; **134**: 629-36.
- [6] **Criqui MH, Fronck A, Connor BE, et al.** The prevalence of peripheral arterial disease in a defined population. *Circulation* 1985; **71**: 510-15.
- [7] **O'Hare AM, Vittinghoff E, Hsia J, et al.** Renal insufficiency and the risk of lower extremity peripheral arterial disease: results from the Heart and Estrogen/Progestin Replacement Study (HERS). *J Am Soc Nephrol* 2004; **15**: 1046-51.
- [8] **Greenlan DJ, Aurigemma GP, Bond MG, et al.** Prevention conference V. Beyond secondary prevention: Identifying the high-risk patients for primary prevention. Non-invasive tests of atherosclerosis burden. *Circulation* 2000; **101**: 1-7.
- [9] **Norgren L, Hiatt WR, Dormandy JA, et al.** Inter-society consensus for the management of peripheral arterial disease (TASC II). *J Vasc Surg* 2007; **45**: 65-7.
- [10] **Kannel WB, Skinner Jr JJ, Schwartz MJ, et al.** Intermittent claudication. Incidence in the Framingham Study. *Circulation* 1970; **41**: 875-83.
- [11] **Fowkes FG, Housley E, Cawood EH et al.** Edinburgh Artery Study: prevalence of asymptomatic and symptomatic peripheral arterial disease in the general population. *Int J Epidemiol* 1991; **20**: 384-92.
- [12] **Selvin E, Erlinger TP.** Prevalence of and risk factors for peripheral arterial disease in the United States: Results from the National Health and Nutrition Examination Survey, 1999-2000. *Circulation* 2004; **110**: 738-43.
- [13] **ADA.** Peripheral arterial disease in people with diabetes. *Diabetes Care* 2003; **26**: 3333-41.
- [14] **Ridker PM, Stampfer MJ, Rifai N.** Novel risk factors for systemic atherosclerosis: A comparison of C-reactive protein, fibrinogen, homocysteine, lipoprotein(a) and standard cholesterol screening as predictors of peripheral arterial disease. *JAMA* 2001; **285**: 2481-85.
- [15] **Ishani A, Collins AJ, Charles AH.** USRDS 2003 Annual Data Report: Atlas of End-Stage Renal Disease in the United States. *Kidney International* 2005; **68**: 311-18.
- [16] **Chertow GM, Fan D, McCulloch CE, et al.** Chronic kidney disease and the risks of death, cardiovascular events and hospitalization. *N Engl J Med* 2004; **351**: 1296-305.
- [17] **Leskinen Y, Salenius JP, Lehtimäki T, et al.** The prevalence of peripheral arterial disease and medial arterial calcification in patients with chronic renal failure: requirements for diagnostics. *Am J Kidney Dis* 2002; **40**: 472-79.
- [18] **De Vinuesa SG, Ortega M, Martinez P, et al.** Subclinical peripheral disease in patients with chronic kidney disease: Prevalence and related risk factors. *Kidney Int* 2005; **93**: 44-7.
- [19] **Angeles G, Rafael M, Munoz-Terol J, et al.** Peripheral arterial disease in patients with stages IV and V chronic renal failure. *Nephrol Dial Transplant* 2006; **21**: 3525-31.
- [20] **Shlipak MG, Fried LF, Crump C, et al.** Cardiovascular disease risk status in elderly persons with renal insufficiency. *Kidney Int* 2002; **62**: 997-1004.
- [21] **Joachim HL, Ronit Katz, Kestenbaum BR, et al.** Association of chronic kidney disease with the spectrum of ankle brachial index. *J Am Coll Cardiol* 2009; **54**: 1176-84.