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DETECTION OF PAD IN ESRD: A GUIDE TO THE TIMELY INTERVENTION

Medical Science

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ABSTRACT

Chronic kidney disease (CKD) is a major public health concern worldwide and is associated with high morbidity and mortality. End-stage renal disease (ESRD) occurs only in 0.15–0.20% of CKD patients per year. However, the risk for cardiovascular (CV) events increases ten to100 fold in such patients, and hence preventive measures are warranted. Peripheral arterial disease is a marker of cardiovascular diseases such as myocardial infarction and stroke. The ankle-brachial index (ABI) is a sensitive and cost-effective screening tool for PAD. The present study was taken up to find out the prevalence of PAD in ESRD and its association with the risk factors. A total of 100 CKD patients with ESRD were included in the study. The age of the patients ranged from 18 to 76 years, with a mean of 55.10 ± 14.2 years. Of all the patients, 62% were male, and 28% patients were female. Diabetes mellitus (DM), hypertension and smoking were present in 58%, 73% and 33% of the patients respectively. 42% of the patients had an ABI <0.9 and hence had PAD. Serum urea, creatinine, and eGFR were significantly higher in the PAD group of ESRD (p=0.003, 0.01) compared to the patients without PAD. We conclude that the detection of PAD in ESRD is of paramount importance. Timely intervention with statins and antiplatelet agents may reduce the morbidity and mortality in these group of ESRD patients.

KEYWORDS

Peripheral arterial disease, End-stage renal disease, Chronic kidney disease, Ankle -brachial index.

INTRODUCTION

Chronic kidney disease (CKD) is a major public health concern worldwide and is associated with high morbidity and mortality [1,2]. it is the seventeenth most important cause of death all over the world. In India, chronic kidney disease is the eighth leading cause of death [3,4]. Prevalence of CKD is 13–15 % with stage 1, 2 and 3 as 6.6%, 5.4% and 3.0% respectively [5]. With increasing life expectancy and the high prevalence of metabolic diseases, many parts of the world have witnessed a rise in the prevalence of CKD in the last few years [6]. End-stage renal disease (ESRD) occurs only in 0.15–0.20% of CKD patients per year. However, the risk for cardiovascular (CV) events increases ten to100 fold in such patients, and hence preventive measures are warranted [7]. Peripheral arterial disease (PAD) is characterized by decreased blood flow to the limbs, due to an obstruction or narrowing of the peripheral vessels. It is a marker of cardiovascular diseases such as myocardial infarction and stroke. The ankle-brachial index (ABI) is a sensitive and cost-effective screening tool for PAD. ABI is valuable for screening of peripheral artery disease in patients at risk and for diagnosing the patients with lower-extremity symptoms [8].

There is a paucity of data regarding the prevalence of PAD in patients with ESRD, as well as its association with the risk factors. The present study was taken up to find out the prevalence of PAD in ESRD and its association with the risk factors

METHODS AND MATERIALS

This is an observational study on patients with ESRD visiting a tertiary care hospital in eastern India for hemodialysis from February 2019 to January 2020.

Subjects: The sample size is based on the prevalence study by PP Verma [9], who found the prevalence of stage 3 CKD to be 6.3%. Stage 3 patients have chances of progression to ESRD. With a 95% confidence interval and a margin of error of 5%, the required sample size was 91. Further, considering an attrition rate of 10%, a total of 100 cases were recruited for the study. As patients departed the study (because of death, withdrawal, or transfer to other hospitals), replacement patients were randomly selected. Patients new to hemodialysis were added in place of the departed patients.

Data Collection: Data regarding patient demographic characteristics, comorbidities, risk factors, and medical history were collected at patient entry with the use of standardized proforma. History of cigarette smoking was taken as nonsmoker versus current smoker.

Diagnosis of PAD: Diagnosis of PAD wad made based on the ankle-brachial index value. ABI measurement was done with a handheld doppler and a cuff. ABI <0.9 was considered as PAD [10],[11].

Biochemical analysis: Random blood sugar, serum urea, serum creatinine, and urinary protein creatinine ratio was measured in a fully automated biochemistry analyzer from Dirui CS-t 240, from Korea using a photometric method. eGFR was calculated using the MDRD formula [2].

Statistical analysis

The statistical analysis was conducted using the SPSS software version 20.0. Descriptive statistics were used to get baseline characteristics of the patients. Independent sample t-test was applied to find out the test of significance. *P* values less than 0.05 were considered significant.

The study was approved by the institutional ethical committee, RIMS, Ranchi. An informed consent was taken from each of the study participants.

RESULTS:

A total of 100 CKD patients with ESRD were included in the study. The age of the patients ranged from 18 to 76 years, with a mean of 55.10 ± 14.2 years. Of all the patients, 62% were male, and 28% patients were female. Diabetes mellitus (DM), hypertension and smoking were present in 58%, 73% and 33% of the patients respectively. The ABI ranged from 0.38 to 1.67. 42% of the patients had an ABI <0.9 and hence had PAD.

Table 1: Baseline characteristics of the study group.

Variables	ESRD patients (n=100)
Age (SD ± Mean)	55.10 ± 14.2
Urea (SD ± Mean)	194.5 ± 69.0
Creatinine (SD ± Mean)	11.23 ± 4.0
Spot UPCR (SD ± Mean)	4.85 ± 1.48
eGFR (SD ± Mean)	4.99 ± 2.48
Left ABI (SD ± Mean)	1.05 ± 0.25
Right ABI (SD ± Mean)	1.02 ± 0.22
Male gender (%)	62
Smoking (%)	33
PAD (%)	42
Diabetes mellitus (%)	58
Hypertension (%)	73

The prevalence of the risk factors like DM, hypertension and smoking were higher in PAD group as compared to non-PAD group. Figure 1 shows the prevalence of the risk factors in the PAD patients and the patients without PAD.

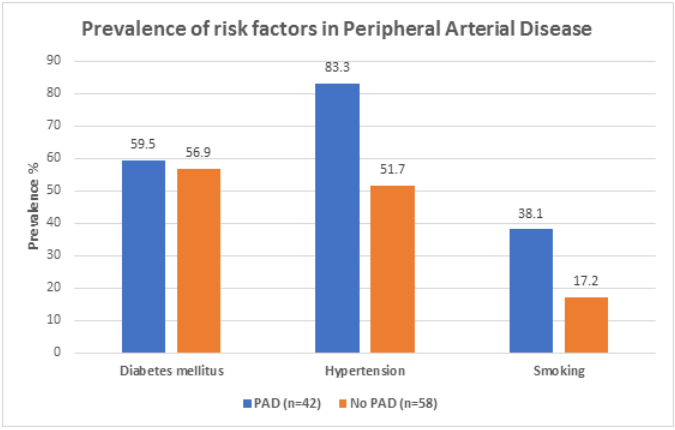

Figure 1: Prevalence of the risk factors in the PAD group and the patients without PAD.

The mean age of the patients in PAD group was higher (56.29 ± 2.45) than the non-PAD group (54.24 ± 1.69). However, the difference was statistically not significant. Serum urea, creatinine, and eGFR were significantly higher in the PAD group of ESRD (p=0.003, 0.01) compared to the patients without PAD. Table 2 outlines the characteristics of the PAD patient population versus patients without PAD.

Table 2: Baseline characteristics of the PAD patient population versus patients without PAD.

Variables	No PAD (n=58)			PAD (n=42)			P-value
	Mean ± SE	95% CI	IQR	Mean ± SE	95% CI	IQR	
Age (years)	54.24 ± 1.69	50.84-57.64	16	56.29 ± 2.45	51.34-61.24	21	0.480
Serum urea (mg/dl)	177.28 ± 7.56	162.13-192.42	56.5	218.4 ± 11.83	194.5-242.3	130.5	0.003
Serum creatinine (mg/dl)	10.23 ± 0.48	9.26-11.20	4.13	12.62 ± 0.63	11.36-13.89	5.70	0.003
Urinary Protein Creatinine Ratio (mg/mg)	4.67 ± 0.19	4.29-5.05	2.57	5.10 ± 0.23	4.63-5.57	2.55	0.148
eGFR (ml/min/1.73 m^2 BSA)	5.53 ± 0.36	4.80-6.25	2.00	4.24 ± 0.28	3.66-4.81	2.00	0.01

Abbreviations: PAD (Peripheral arterial disease), BSA (Body surface area).

The mean age of the patients in PAD group was higher (56.29 ± 2.45) than the non-PAD group (54.24 ± 1.69). However, the difference was statistically not significant. Serum urea, creatinine, and eGFR were significantly higher in the PAD group of ESRD (p=0.003, 0.01) compared to the patients without PAD. Table 2 outlines the characteristics of the PAD patient population versus patients without PAD.

DISCUSSION:

In a recently published Screening and Early Evaluation of Kidney Disease study, the mean age of the population was 45.22 ± 15.2 years. They found that the prevalence of CKD with stage 4 and 5 was 0.8% and 0.8% respectively. 18.8% of their cohort had diabetes, and 43.1% had hypertension [12]. DM and hypertension were present in 58 and 73% of our patients respectively. The prevalence of PAD in ESRD was found to be 25.3% in DOPPS study [13]. We found a prevalence of 42% PAD in ESRD patients which was consistent with the USRDS study [14]. The traditional risk factors of atherosclerosis, such as smoking, diabetes, hypertension, dyslipidemia, obesity, physical inactivity, and increased age, are associated with PAD [15]. In our study, smoking and hypertension had the strongest association with PAD in ESRD. Serum urea, creatinine, and eGFR were significantly higher in the PAD group of ESRD (p=0.003, 0.01) compared to the patients without PAD. Due to the strong association between PAD and increased cardiovascular mortality rates in ESRD patients, the early detection of subclinical PAD is crucial. The early recognition of PAD may allow the timely initiation of preventive measures like administration of statins and antiplatelet agents for the prevention of CVD and critical limb ischemia [16]. Hence, we conclude that the detection of PAD in ESRD is of paramount importance.

Limitations of the study: The limitation of our study was that we did not use doppler ultrasound for the detection of PAD. Although ABI has been widely used as screening tool for PAD in HD patients, the measurement of ABI might be strongly influenced in cases of highly calcified or incompressible arteries in our patients.

CONCLUSION:

Early detection of PAD is crucial. Timely intervention with statins and antiplatelet agents may reduce the morbidity and mortality in these group of ESRD patients.

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Conflict of Interest: None declared.

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