Original Article

Frequency of Peripheral Arterial Disease in Diabetic Patients by Ankle Brachial Index

PAD in Diabetic

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ABSTRACT

Objective: To determine the frequency of peripheral artery disease (PAD) in diabetic patients by assessing ankle brachial index (ABI).

Study Design: Cross-sectional study

Place and Duration of Study: This study was conducted in the Department of Medicine, Abbasi Shaheed Hospital for a period of six month from September 2011 to March 2012.

Materials and Methods: All type 2 diabetics of more than two years disease duration, on treatment, of either gender, were included between 41 years to 70 years of ages. Peripheral artery disease was assessed by ankle brachial index (ABI). Frequency and percentages were presented for gender, smoking status, family history of type 2 diabetes and PAD. Mean and standard deviation was presented for age of patients, duration of diabetes and smoking status.Chi square test was used to compare relative frequencies.

Results: A total of 125 patients were included with a mean age of 57.10 $\pm$ 8.77 years. 68 (54.4%) were female. Mean duration of diabetes was 4.62 $\pm$ 2.21 years. PAD was found in 74 (59.2%) while 51 (40.8%) patients were free from PAD.

Conclusion: A high frequency of PAD was detected in the diabetic subjects with a female pre-ponderance, with statistically significant association with increasing age, hypertension and duration of diabetes.

Key Words: Peripheral artery disease, ankle brachial index, diabetes mellitus

INTRODUCTION

The term peripheral artery disease (PAD) broadly includes the vascular disease and is common in diabetic patients. The frequency of PAD in Pakistan is 5.5%.[1,2] However its prevalence depends on the diagnostic method applied. There is some evidence that PAD is under diagnosed and that risk factor management is suboptimal in those most at risk. The prevalence of diabetes for all age groups worldwide was estimated to be 2.8% in 2000 and 4.4% in 2030. The total number of people with diabetes is projected to rise from 171 million in 2000 to 366 million in 2030.[3] The prevalence of diabetes in Pakistan, according to world health organization (WHO) criteria is 8.6%, 11.1% and 13.9% in the provinces of Balochistan, Khyber pakhtoon Khwan (KPK) and Sindh respectively.[4,5,6] The prevalence of diabetes in the urban versus rural areas was 6% in men and 3.5% in women against 6.9% in men and 2.5% in women respectively.[7]

In Pakistan diabetic patients showed 44.6% prevalence of macrovascular complications and 4% foot ulcer.[8] The term PAD broadly comprises the vascular disease and is common in diabetic subjects, the frequency of PAD in Pakistan is 5.5%.[1,2]

ABI is the ratio of ankle and arm blood pressure, is the single most non-invasive, convenient and cost effective tool for the diagnosis of PAD.[9] An ABI of < 0.9 is 95% sensitive and 99% specific for angiographically documented PAD.[10]

This study is done to detect the magnitude of subclinical forms of PAD in Pakistan by using hand held Doppler which may reveal early manifestation of arterial disease.

Atherosclerosis is a process affecting different vascular beds.[11] PAD is defined as atherosclerosis in arteries distal to the aortic bifurcation with or without symptoms in the legs.

The PAD prevalence has been determined in many studies and is reported to be in range of 15-20% in persons over 70 years old.[12] Few studies however, are truly population based and data is lacking for some PAD stages as well as prevalence data for women. While the majority of elderly individuals in most western societies are women, most early studies enrolled only men. These results cannot automatically be extrapolated to women, in a similar way as the data for middle aged cohorts are not applicable for elderly. Furthermore, the risk factor that is well described for coronary arterial disease (CAD) is the same for men and women and all stages of PAD.

MATERIALS AND METHODS

This study was conducted in the department of Medicine in Abbasi Shaheed Hospital for a period of six months from September 2011 to March 2012. This was a hospital based descriptive cross-sectional study with non-probabilty consecutive sampling.

Proportion of peripheral arterial disease is 5.5%[1] confidence interval 95%, marginal error 4%. The

required sample size came to be 125 diabetic patients by WHO sample size calculator[13].

Patients with type 2 diabetes of more than 2 years duration on treatment with either gender of age range between 41 – 70 years were included in the study.

Patients having proven PAD or not consenting to be included in the study were excluded.

All type 2 diabetics visiting the outpatient department consenting and fulfilling the inclusion criteria were enrolled in the study. Permission from the institutional ethical review committee was taken prior to the conduction of the study. All patients were registered in a questionnaire. Brief history of duration of diabetes, family history of diabetes, hypertension, and smoking status was taken.

ABI was determined by a senior medical resident (year 2 or more) with a portable mini Doppler device used as the distal sensor at dorsalis pedis and posterior tibial arteries. The brachial systolic blood pressure was measured in both arms. ABI was calculated by dividing the higher reading of the ankle pressure at dorsalis pedis or posterior tibial artery, by the brachial systolic pressure. If there was a difference of more than 10mmHg in between both brachial pressures then a mean was taken out and then was used for ABI. ABI $\leq$ 0.9 will be chosen as the cut off value for PAD and was defined as low.

Data Analysis: Data was analyzed on SPSS version 13, frequency and percentages were used to present gender, hypertension, smoking status, family history of diabetes and PAD. Mean and standard deviation were used for age and duration of diabetes. Effect modifiers will be controlled through stratification of age, gender, hypertension, duration of diabetes and smoking status. Age, number of males and females, number of hypertensives and duration of diabetes will be quantitative variables. Chi square test was used to compare relative frequencies. P value of less than 0.05 will be taken as significant.

RESULTS

Total of 125 patients were enrolled in the study. Minimum age of the patients was 41 years while maximum age was 70 years. Mean age was 57.10 $\pm$ 8.77 years. Age distribution showed that out of 125 patients, 34 (27.2%) were in the age range of 41-50 years, 37 (29.6%) were between 51-60 years,44 were in the range of 61 -70 years.

There was a female dominance seen, 68 (54.4%) were females. Out of 125 diabetic subjects, 59.20% had peripheral artery disease and 40.80% did not have PAD. Mean duration of diabetes was found to be 4.62 $\pm$ 2.21 years. Minimum duration of diabetes was 2 years while maximum was of 12 years.

Out of 125 patients 87 (69.6%) were hypertensives, 64 (51.2%) were smokers, 102(81.6%) had a family history of diabetes, 74 (59.2%) had peripheral artery disease.

Stratification of age group showed frequency of PAD was higher among the age range of 61-70 years. Out of 74 patients having PAD 45 (83.3%) (p=0.001) were in the age range of 61-70 years while 13 (38.2%) and 16 (43.2%) were in the age range of 41-50 years and 51-60 years respectively.PAD was seen significantly with an increasing age (p=0.001).

Stratification of hypertension showed, 87/125 had hypertension. 63/87 (72.4%) had PAD. Stratification of gender showed that 31 (54.4%) male patients had PAD while 43 (63.2%) females had PAD, with an overall female predominance (p=0.316). Gender was not significantly associated with PAD.

Frequency of PAD was 49 (76.6%) in patients with > 4years duration of diabetes while in 25 (41%) the duration of diabetes was $\leq$ 4years (Table-1). Increased duration of diabetes was significantly associated with increasing PAD (p-0.001).

Stratification of smoking status showed that those patients with or without PAD were similar in patients who were smokers.

Table No.1: Peripheral artery disease and duration of diabetes

Duration of Diabetes (years)	Peripheral Artery Disease		Total (n=125)	p Value
	Present	Absent		
$\leq$ 4	25 (41%)	36 (59%)	61	0.001
> 4	49 (76.6%)	15 (23.4%)	64	
Total	74 (59.2%)	51 (40.8%)	125	

Note: Increased duration of diabetes was significantly (p=0.001) associated with increasing PAD.

DISCUSSION

PAD in patients with diabetes has become an increasingly significant public health concern in both the developed and developing world. Epidemiologic evidence suggests a strong association between diabetics and increase prevalence of PAD. Individuals with diabetes have a two to four fold increase in PAD rates[14]. It has been estimated that PAD is present in 15% of patients with diabetes 10 years after the initial diagnosis.[15]The true prevalence of PAD in people with diabetes has been difficult to determine, as most patients are symptomatic and many do not report their symptoms.[16]

This study focused on detecting PAD in diabetic subject and found that 59.20% had PAD. It was higher than 39.28% reported by Zeeshan et al.[17] from Pakistan, 12.3% reported from Taiwan and 20.0% from United states of America, while being almost equal 61.4% reported from Saudi Arabia.[18-20] This difference in prevalence of PAD could be due to different methods of sampling, variation in sample size, different risk factors stratification. The variation on ethnicity and gender

could also be one possibility, for the difference in prevalence of PAD in diabetic subjects. A multicenter trial at eight centers throughout Pakistan included 830 patients out of which 262 (31.6%) had PAD[21] which is lower than that found in our study. Rehan et al.[22] studied 350 cases of acute coronary syndrome out of which 62 (17.7%) had PAD, while diabetes was found in 34% patients, and PAD was significantly higher 24.16% in diabetics as compared to 14.3% in the non-diabetics.[22] A study conducted on 67 diabetic foot patients showed 44.77% had an evidence of PAD.[23]This difference reflects the increasing prevalence of PAD in diabetic patients due to lifestyle changes such as eating habits, eating out accompanied with a decreasing physical activity seen commonly in our society.

In this study females were more 68 (54.4%) than males 57 (45.6%) and females had a higher frequency of PAD 43 (63.2%) as compared to males 31 (54.4%) but the difference was not statistically significant. Similarly seen in a study conducted by Zeeshan et al. showing females with a higher frequency of PAD then males, in all age groups.[17] These results were consistent with other published studies,[24] while a higher frequency of PAD in men has also been reported.[14,25]

Mean age in our study was 57.10 $\pm$ 8.77 years. Minimum age in our study was 41 years while maximum was 70 years. Frequency of PAD was higher (83.3%) in in 61-70 years age group. This was similar to the study of American college of cardiology/American heart association (ACC/AHA) guidelines for PAD. This study further showed risk factors for PAD can increase in patients with 50-69 years of age, with a history of smoking/diabetes.[25] An American survey of 2174 patients older than 40 years, showed a PAD prevalence of 0.9% between the ages 40-49 years, 2.5% between the ages 50-59 years, 4.7% between the ages of 60-69 years, and 14.5% for the ages of 70 years and older.[27]

In our study 87 (69.6%) were hypertensives, 64 (51.2%) were smokers, 102 (81.6%) had a family history of diabetes. Hypertension is associated with lower extremity PAD, although the association is generally weaker than that with cerebrovascular accident and coronary artery disease.[28]Our study revealed significant association between hypertension and PAD. Out of 87 (69.6%) hypertensives 63 (85%) had PAD, which is similar to a study conducted by Zeeshanet al.[17]

Smoking is one of the highest risk factors for vascular atherosclerosis including PAD. In this study, smoking status showed that patients with or without PAF were similar in patients who were smokers. Similar results have been reported by Zeeshanet al.[17] from Pakistan. Increasing age and duration of diabetes are important risk factors for PAD and our study showed statistically significant association with these variables.

Given the very high prevalence of PAD found in diabetic patients, and the morbidity and mortality associated with PAD, it is assumed that better public and health professional awareness would help to reduce the devastating effects of PAD. Effective treatment and monitoring of diabetes, hyperlipidaemia and hypertension along with increasing physical activity, smoking cessation, may be effective strategies. They may reduce cerebrovascular and cardiovascular morbidity and mortality.

CONCLUSION

A high frequency of PAD was detected in the diabetic subjects with a female pre-ponderance, with statistically significant association with increasing age, hypertension and duration of diabetes.

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