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Prevalence of Peripheral Artery Disease in Uncontrolled Diabetic Patients by Using Ankle Brachial Pressure Index as a Routine Procedure

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ABSTRACT

Aim: Patients with peripheral artery disease (PAD) have an increased risk of MI, stroke and death. The main aim of this study is to evaluate prevalence of peripheral artery disease in uncontrolled diabetic patients by using ankle brachial pressure index as a routine procedure
Material and Methods: 1800 uncontrolled diabetic patients were evaluated through a routine procedure by using ankle brachial pressure index. Handheld Doppler machine was used to measured ankle brachial pressure index. All anthropometric measurements and demographic details were noted in a predesigned proforma. To evaluate the status of diabetes participant's blood sugar level and lipid profile were also recorded.
Result: Among 1800 patients who were screened by using ankle brachial pressure index as a routine procedure, 1268 patients were diagnosed with mild to moderate PAD. This once again confirms that among uncontrolled DM patients prevalence of PAD is very high and in our study it was as high as 70.4%. ABPI was significantly different between diabetic and non-diabetic patients. Blood glucose parameters are more uncontrolled in PAD group as compare to Non PAD group.
Conclusion: ABPI can be used to screen the PAD in diabetic patients as prevalence of PAD in uncontrolled diabetes patients was very high.

Keywords: Uncontrolled Diabetes Mellitus, Pad, ABPI, Prevalence

INTRODUCTION

Diabetes Mellitus (DM) is one unique disease, which increase morbidity and mortality by development of complications only. Peripheral artery disease (PAD) is defined as atherosclerotic occlusive disease of lower extremities. PAD is associated with increased risk of lower extremity amputation and is also a marker for atherothrombosis in cardiovascular, cerebrovascular and renovascular beds. Patients with PAD therefore have an increased risk of MI, stroke and death. [1] Additionally, PAD causes significant long-term disability in diabetic patients. [2,3] In diabetes, Peripheral Vascular Disease (PVD) is extremely prevalent and can indication of generalized atherosclerotic process. PVD is the third important manifestation of atherosclerosis after coronary artery disease and cerebrovascular disease but very often neglected by clinicians and the comorbidities are not properly focused.

Ankle Brachial Pressure Index (ABPI) is a simple non-invasive method to assess lower extremity circulation. Using a blood pressure cuff and a Doppler ultrasound probe, we can measure systolic pressure in the brachial arteries of both arms; and in the dorsalis pedis and posterior tibial arteries of both lower extremities. The ankle pressure is determined by the higher of two readings between the dorsalis pedis and posterior tibial artery. ABPI is calculated by dividing the ankle pressure by higher of two brachial artery pressure.

In patients with isolated iliac artery stenosis, typical claudication feature is present with normal peripheral pulses and normal ABPI. In certain situation ABPI

should be measured before and after exercise. If there is no deterioration following exercise then extravascular causes must be considered.

The main aim of this study is to evaluate prevalence of peripheral artery disease in uncontrolled diabetic patients by using ankle brachial pressure index as a routine procedure.

MATERIAL AND METHODS

1800 uncontrolled diabetic patients were evaluated through a routine procedure by using ankle brachial pressure index. Handheld Doppler machine was used to measured ankle brachial pressure index. All anthropometric measurements and demographic details were noted in a predesigned proforma. To evaluate the status of diabetes participant's blood sugar level and lipid profile were also recorded. Data was collected using a standard data sheet.

All diabetic patients were under the anti-diabetic treatment at least for 5 years and more. None of the patients had CNS disorders or organ damage. Subjects of both the groups were in between the age group of 40 to 70 yrs. Some of the subjects not suffering from PAD had the habit of doing mild to moderate type of physical activity e.g. long distance walking, jogging and cycling while the subjects with PAD had the problem of intermittent claudication and hence they were reluctant to go for physical activity.

Ankle Brachial Pressure Index Measurement was done with the help of - Handheld Doppler machine (EMCO Meditek India, model no. D- 580). The ABI is calculated by dividing ankle systolic pressure by brachial systolic pressure: ABI=ankle systolic pressure/ brachial systolic pressure. Ankle pressures were obtained using pressure cuff and hand held Doppler in both limbs. Brachial pressures were also obtained using the same procedure in both arms. The ABPI was then calculated. The lower value if there was any difference between the two limbs was adopted.

Data was coded and entered in SPSS version 20 for analysis. The baseline characteristics were summarized and presented as means/medians and proportions. Associations were tested using chi square test for categorical variables (proportions) and student t-test for continuous variables (means). Associations between different parameters were tested.

RESULTS

Among 1800 uncontrolled diabetic patients (HbA1c $\geq$ 8%) who were screened by using ankle brachial pressure index as a routine procedure, 1268 patients were diagnosed with mild to moderate PAD. This once again confirms that among uncontrolled DM patients prevalence of PAD is very high and in our study it was as high as 70.4%.

It has been noticed that height of DM with PAD group was 169.42±7.29 where as it was 165.81±8.14 for DM without PAD patients. The mean BMI in diabetic subjects with PAD was 29.35±4.71 and the mean BMI in non-PAD subjects was 28.89±3.98 ($P < 0.01$). Other standard anthropometric measurements between PAD and NON-PAD are mentioned in table 1.

Table 1: Comparison of Standard Anthropometric Measurements between PAD and NON-PAD Subjects

Parameters	DM with PAD (N=1268)	DM without PAD (N=532)	P value
Height (cm)	169.42±7.29	165.81±8.14	< 0.01
Weight (Kg)	79.29±12.10	78.34±13.09	< 0.01
Body Surface area (sq.m)	1.91±0.12	1.89±0.11	< 0.01
Waist circumference (cm)	97.05±8.69	96.87±7.92	< 0.01
Hip circumference (cm)	96.75±5.58	96.75±5.58	< 0.01
West hip ratio	1.00±0.05	0.97±0.06	< 0.01
BMI (Kg/Sq.m)	29.35±4.71	28.89±3.98	< 0.01

It was also been noticed that DM with PAD patients were having higher HbA1c i.e. 8.9±2.27 as compared to DM without PAD patients. It has also observed that lipid profile was slightly higher in DM PAD as compared to DM without PAD group. Comparison of lipid profile between PAD and NON-PAD uncontrolled diabetes subjects were demonstrated in table 2.

Table 2: Comparison of Lipid Profile between PAD and NON-PAD Subjects

Characteristics	DM with PAD (N=1268)	DM without PAD (N=532)	P value
FBS (mg/dl)	188.62±59.37	182.06±65.21	< 0.01
PPBS (mg/dl)	271.17±71.53	239.23±68.94	< 0.01
HbA1c (%)	9.1±0.8	8.7±0.5	< 0.01
HDL (mg/dl)	36.21±5.89	38.67±6.04	< 0.01
LDL (mg/dl)	148.61±32.71	142.68±34.49	< 0.01
Total Cholesterol (mg/dl)	243.71±36.98	234.82±37.36	< 0.01
Triglyceride (mg/dl)	259.98±89.86	236.12±79.68	< 0.01

Table 3: ABPI in DPAD and Non-DPAD Groups

Investigations	DM with PAD	DM without PAD	P Value
ABPI left side	0.88±0.14	1.02±0.09	< 0.01
ABPI right side	0.87±0.17	1.00±0.10	< 0.01

As demonstrated in table 4, ABPI was significantly different between diabetic and non-diabetic patients.

Table 4: Stratification of severity of PAD according to value of ABPI

ABPI Value	Subjects	Interpretation
Above 1.3	0	Abnormal Vessel hardening from PVD
1.0 – 1.3	150	Normal range
0.9 – 1.0	840	Acceptable
0.8 – 0.9	360	Some arterial disease
0.5 – 0.8	450	Moderate arterial disease
Under 0.5	0	Severe arterial disease

DISCUSSION

DM is a major risk factor for atherosclerotic disease as well as cardiovascular mortality and morbidity. [4,5] Atherosclerotic disease is not only increased in incidence in diabetic patients, but its course is also accelerated, [5] thereby accounting for as much as 44% of all-cause mortality. [2] DM-associated atherosclerosis can lead to complications in all major of vascular beds, including the coronary arteries, carotid vessels, and lower extremity arteries. [2,6] For example, a study by Haffner et al, [7] estimated the 7-year incidence of a first-time myocardial infarction (MI) in diabetic patients at 20.2%, compared to 3.5% in nondiabetic patients.

Prevalence of PVD varies from 0 to 2% below 40 years, 0.5 to 2.5% at 50 years, 1 to 4.5% at aged 60 years and 2 to 9% at age of 70 years. [8,9] Moreover, 20%-30% of patients with PAD have DM, although this is likely underestimated by the asymptomatic nature of less severe PAD and the altered pain perception in diabetic patients due to peripheral neuropathy. [2] Age, duration of diabetes, and peripheral neuropathy are associated with an increased risk of PAD in patients with pre-existing DM. [1,10] Using ABI to identify PAD, the prevalence of PAD in people with DM over 40 years of age has been estimated to be 20%. [11] This prevalence increases to 29% in patients with DM over 50 years of age. [2,12] The severity and duration of DM are important predictors of both the incidence and the extent of PAD, as observed in United Kingdom Prospective Diabetes Study, where each 1% increase in glycosylated hemoglobin was correlated with a 28% increase in incidence of PAD, and higher rates of death, microvascular complications and major amputation. [13,14]

But in India incidence is less (3.9%) as noted by A. Ramachandran et al, though prevalence increases with age. [15] In our country lower life span of diabetes, may be the explanation for lower incidence. In future, better diabetic control and increased longevity may lead to increased prevalence of PVD.

Significant independent risk factors PVD are age, male gender, elevated systolic blood pressure, poor glycemic control, low HDL, smoking, co-existing cardiovascular or cerebrovascular disease. In terms of progression of PVD, the risk factors are, hyper homocystinemia, smoking, male sex,

age and higher levels of fibrinogen. Hypertension and hypercholesterolemia are less important in disease progression. Prevalence of claudication in DM is twice, if serum cholesterol is above 260 mg/dl. Prevalence of hyperlipidemia in PVD varies between 31 to 57%. [16]

CONCLUSION

DM is associated with greater severity and more diffuse PAD relative to nondiabetics. It also correlates to greater risk of mortality and impaired quality of life. ABPI can be used to screen the PAD in diabetic patients as prevalence of PAD in uncontrolled diabetes patients was very high.

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