

Original article:

Detection of peripheral vascular disease in patients with type-2 DM using Ankle Brachial Index (ABI)

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Abstract:

Introduction: Peripheral arterial disease is defined as a clinical disorder in which there is stenosis or occlusion in the arteries of the limbs. Atherosclerosis is a leading cause of Peripheral arterial disease (PAD). There is increased risk of PAD in cigarette smokers and in persons with diabetes mellitus, hypercholesterolemia and hypertension.

Methodology: The study was conducted among 40 patients of type 2 diabetes mellitus to detect peripheral vascular disease using Ankle Brachial Index (ABI). In the study various factors were correlated with occurrence of PVDs.

Results: Out of total 40 patients 14 (35%) were female and 26 (65%) were male. The above table indicate age and sex wise distribution of the patient. There is no significant difference in age and sex wise distribution of the cases ($p>0.05$) . The mean age in male was 48.35 years and in female 50.86 years. However, this difference is not significant ($p>0.05$). Mean BMI in male was 27.50 and in female 26.86 years. However, this difference is not significant ($p>0.05$). Number of cases with abnormal ABI were 5 (12.5%), among them 3 were male and 2 were female. Thus total 5 cases had PVD based on ABI method. In male 3 cases were there and female 2 were there. Among cases with PVD, 54.3% were in 51 to 60 year of age and 40% were in 41-50 year of age. So age wise distribution was not significantly difference. On application chi square test, it was not significant ($p>0.05$), thus age was not associated with PVD in DM cases.

Conclusion: Among the type 2 diabetes mellitus cases using Ankle Brachial Pressure Index (ABI) method prevalence of Peripheral Vascular Disease (PVD) was 12.5%.

Keywords: Ankle Brachial Pressure Index , Peripheral arterial disease , atherosclerosis

Introduction:

Diabetes mellitus is characterised by chronic hyperglycemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action or both.¹ Peripheral arterial disease is defined as a clinical disorder in which there is stenosis or occlusion in the arteries of the limbs. Atherosclerosis is a leading cause of Peripheral arterial disease (PAD). There is increased risk of PAD in cigarette smokers and in persons with diabetes mellitus, hypercholesterolemia and hypertension.²

Diabetic patients are at high risk for Peripheral Vascular Disease (PVD) characterized by symptoms of intermittent claudication or critical limb ischaemia. Given the inconsistencies of clinical findings in the diagnosis of PAD in the diabetic patient, measurement of ankle-brachial pressure index (ABI) has emerged as the relatively simple, non-invasive and inexpensive diagnostic tool of choice. An ABI < 0.9 is not only diagnostic of PAD even in the asymptomatic patient, but is also an independent marker of increased morbidity and mortality from cardiovascular diseases.³With better understanding

of the process of atherosclerosis in type 2 Diabetes mellitus, avenues for treatment have increased. Modification of lifestyle and effective management of the established risk factors such as smoking, dyslipidaemia, hyperglycaemia and hypertension retard the progression of the disease and reduce cardiovascular events in these patients. With this back ground the present study was conducted to assess usefulness of Ankle Brachial Index (ABI) in detection of Peripheral Vascular Disease (PVD) in patients with type-2 DM .

Materials and methods :

This was a cross sectional descriptive study.

Place of study: The study was conducted in Dr. D Y. Patil Medical College and Research Centre, Pimpri, Pune-411018 . Period of study: The study was conducted from July 2013 to September 2015, over a period of 2 years.

Ethical Approval: Approval of Institute Ethics committee was obtained before the start of study.

Sample Size: Considering the patients flow of young IHD cases in the hospital and study duration the sample size was kept at 40 cases

Inclusion Criteria: Diagnosed case of type 2 DM irrespective of age, sex & duration Diabetes

Exclusion criteria : Patients with one or more of the following characteristics were excluded from the study.

- Smokers
- Coarctation of aorta
- Vasculitis syndromes

- Valvular heart diseases
- Deep vein thrombosis

Methods

Patients diagnosed as type 2 diabetes were considered for the inclusion in the study. After that they were assessed for inclusion and exclusion criteria. Patients eligible for the study were informed about the details of the study and those who were willing to participate in the study gave written consent.

For clinical evaluation of peripheral vascular disease, ankle brachial index is calculated using non-invasive colour Doppler study.

$$ABI = \frac{\text{Ankle Systolic Blood Pressure}}{\text{Brachial Systolic Blood Pressure}}$$

Same standard cuff was used for both upper and lower limb. In lower limb the cuff was applied above the malleolus and posterior tibial artery, dorsalis pedis artery were located using doppler and peak systolic pressure is noted on first appearance of sound. Higher of these two values were consider as ankle portion of the ABI.

Observation & results

The study was conducted among 40 patients of type 2 diabetes mellitus to detect peripheral vascular disease using Ankle Brachial Index (ABI). In the study various factors were correlated with occurrence of PVDs. Following tables shows observation of the study.

Table 1: Occurrence of PVD in study population using ABI

ABI	Female	%	Male	%	Total	%
<0.5	0	0.0%	1	3.8%	1	2.5%
0.5-0.9	2	14.3%	2	7.7%	4	10.0%
0.9-1.3	12	85.7%	23	88.5%	35	87.5%
Total	7	100.0%	26	100.0%	40	100.0%

Number of cases with abnormal ABI were 5 (12.5%), among them 3 were male and 2 were female. Thus total 5 cases had PVD based on ABI method. In male 3 cases were there and female 2 were there.

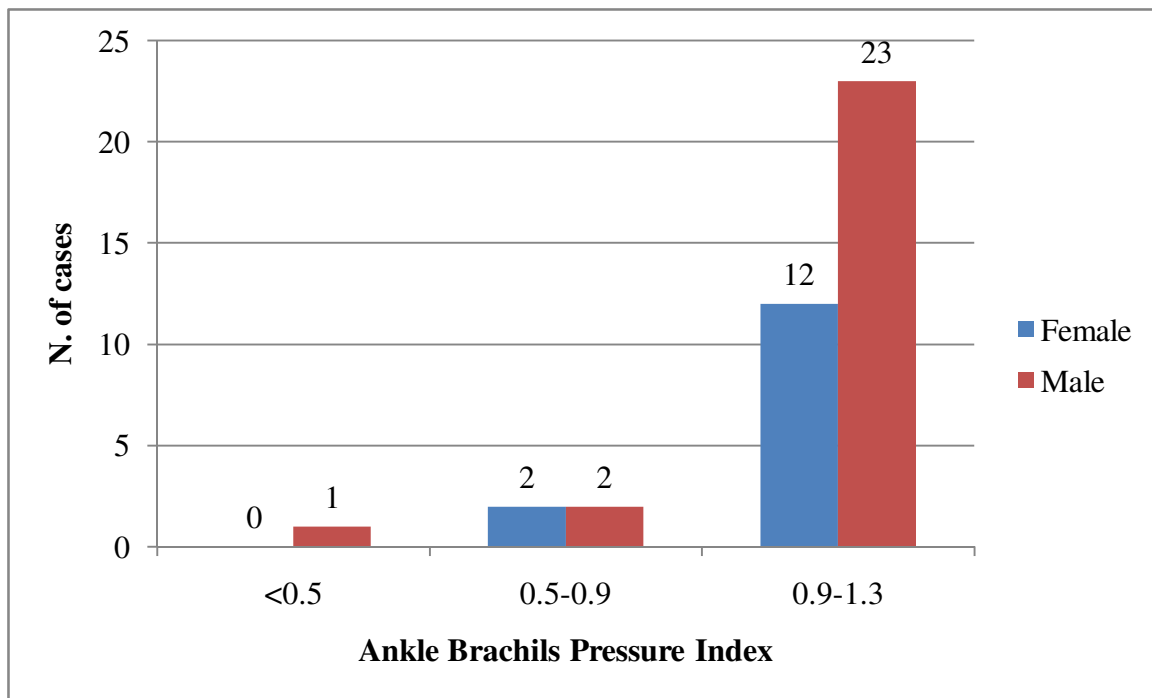


Chart 1: Occurrence of PVD in study population using ABI

Table 2: Occurrence of PVD according to the Age of patients

Age Group	No. of Diabetes patients	PVD	%	P value
31 - 40 yrs	2	0	0.0%	0.679
41 - 50 yrs	21	2	40.0%	
51 - 60 yrs	15	3	60.0%	
61 - 70 yrs	2	0	0.0%	
Total	40	5	100.0%	

Among cases with PVD, 54.3% were in 51 to 60 year of age and 40% were in 41-50 year of age. So age

wise distribution was not significantly difference. On application chi square test, it was not significant

($p>0.05$), thus age was not associated with PVD in DM cases.

- Number of cases with abnormal ABI were 5 (12.5%), among them 3 were male and 2 were female. Thus total 5 cases had PVD based on ABI method. In male 3 cases were there and female 2 were there.
- Among cases with PVD, 54.3% were in 51 to 60 year of age and 40% were in 41-50 year of age. So age wise distribution was not significantly difference. On application chi square test, it was not significant ($p>0.05$), thus age was not associated with PVD in DM cases.

Discussion

Diabetes is one of the leading causes of overall morbidity in the country. Diabetic morbidity and mortality is increased in patients with PVD, particularly if foot ulcerations, infection or gangrene occur. Three-year survival after an amputation is <50%. Prevention is an important component of PVD management. By the time PVD becomes clinically manifest, it may be too late to salvage an extremity or it may require more costly resources to improve the circulatory health of the extremity.⁴

Peripheral Vascular Disease (PVD) is clinically identified by intermittent claudication and/or absence of peripheral pulses in the lower legs and feet. These clinical manifestations reflect decreased arterial perfusion of the extremity. With the use of blood pressure measurements of the extremity (ankle and brachial), PVD can be identified noninvasively before clinical manifestation.^{5,6}

The present study was conducted among 40 patients of type 2 diabetes mellitus to detect peripheral vascular disease using Ankle Brachial Index (ABI). In the study various factors were correlated with occurrence of PVDs.

PVD manifests itself by decreased arterial perfusion to the lower extremities. This decreased perfusion results in diminution or absence of peripheral pulses and may lead to intermittent claudication (pain on walking, relieved promptly by rest), proneness to infection, ulcerations, poor healing of sores and ulcers, gangrene, and ultimately to amputation. Intermittent claudication is indicative of clinical occlusive PVD. PVD is associated with increasing age and duration of diabetes. Assessment of peripheral vascular disease in diabetes was addressed by an international workshop in 1992.⁷

Palpation of peripheral pulses has been used as a clinical tool to assess occlusive PVD in diabetic and nondiabetic patients, particularly when intermittent claudication is present. However, it is sometimes difficult to interpret the significance of diminished peripheral pulses when symptoms are not present. Ambient temperature, anatomic variation, and expertise in palpating peripheral pulses may contribute to variation in the clinical examination. Absence of pulses remains a significant clinical finding. Absent posterior tibial, popliteal, or femoral pulses with or without bruits that persist on repeated examination are clinically significant and indicate significant occlusive PVD whether intermittent claudication is present or not. However, clinical findings such as diminution or absence of peripheral pulses and presence of bruits are more meaningful of occlusive disease in the context of clinical symptoms such as intermittent claudication. Because of anatomic variation, absence of the dorsalis pedis pulse alone may not indicate PVD.

Measurement of the ankle-brachial index (ABI), which represents the systolic blood pressure at the posterior tibial or dorsalis pedal level compared with brachial blood pressure, can be used to define

clinically significant occlusive PVD. An index of <0.9 is suggestive of occlusive PVD, particularly if symptoms or clinical findings such as bruits or absent pulses are present. ABI levels <0.8 indicate PVD regardless of symptoms. The lower the ABI, the more significant the occlusion whether symptoms are present or not. It is highly unlikely that symptoms would not be present in patients whose ABI is <0.5 . The ABI may be more sensitive with exercise, and a 5-minute exercise period with measurement of the ABI post-exercise may indicate significant occlusive PVD before the resting ABI becomes abnormal.^{7,8,9} The post-exercise ABI helps differentiate the etiology of exercise-induced leg pain.

Among cases with PVD, all (100.0%) were having DM since more than 10 years while duration of DM varied from less than 5 year to more than 15 years in cases without PVD. However on application chi square test, it was found non significant ($p >0.05$), thus presence of hypertension was not associated with presence of PVD in DM cases.

Conclusion

Among the type 2 diabetes mellitus cases using Ankle Brachial Pressure Index (ABI) method prevalence of Peripheral Vascular Disease (PVD) was 12.5%.

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