

Prevalence of peripheral vascular disease in type 2 diabetes mellitus and correlation with risk factors

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Abstract

Objective: To study the prevalence of Peripheral Vascular Disease in patients with Type 2 Diabetes Mellitus without overt foot disease. To study the correlation of Peripheral Vascular Disease with various risk factors. To correlate the association of Peripheral Vascular Disease with myocardial ischemia by ECG. **Materials and Methods:** Initial history was obtained regarding hyper glycemetic symptoms, symptoms suggestive of limb ischemia, past history of Diabetic foot lesions, duration of Type 2 Diabetes Mellitus, hypertension and habit of smoking. The examination included height, weight, body mass index (BMI), waist hip ratio (WHR), screening for foot lesions, blood pressure recording, and detailed examination of all peripheral pulses. Fasting and post lunch blood sugar levels, complete urine examination, lipid profile, 12 lead electrocardiogram and color Doppler sonography of lower limb arterial system. **Results:** The prevalence of Peripheral Vascular Disease in Type 2 Diabetes Mellitus without overt foot disease was found to be significant. 85.72% of patients with Peripheral Vascular Disease, have normal peripheral pulses on clinical Examination, suggesting more sensitivity of Doppler study. Preferential involvement of peroneal and dorsalis pedis arteries was seen. Myocardial ischemia suggested by electrocardiogram was found to be more in patient with Peripheral Vascular Disease. **Conclusion:** Risk factors significantly associated with PAD were--higher age, longer duration of diabetes, higher systolic and diastolic blood pressure, smoking and CAD. The prevalence of CAD was higher in patients with PAD. Thus the presence of PAD should alert the clinician to a high probability of underlying CAD.

Key Words: Peripheral vascular disease, diabetes mellitus type-2, myocardial ischemia.

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INTRODUCTION

Type 2 Diabetes Mellitus is one of important risk factors for atherosclerotic Peripheral Vascular Disease (PVD). Compared to other macrovascular complications of Type 2 Diabetes Mellitus, that is coronary and cerebro vascular disease, peripheral vascular disease was less attended and less studied in India. But the magnitude of problem is not insignificant. Prevalence of peripheral vascular disease is higher in diabetics than non diabetic patients in

population based and clinical based studies.^{1,2} There is increased association of peripheral arterial disease with Type 2 Diabetes Mellitus in India. In India 20 to 30 % of patients more than 65 years of age have Peripheral Vascular Disease Type 2 Diabetes Mellitus accounts for 50% of all nontraumatic amputations. Peripheral Vascular Disease is one of the chronic complications of Type 2 Diabetes Mellitus. The chronic complication increases as a function of duration Type 2 Diabetes Mellitus. There are usually apparent in second decade of hyperglycemia. Since Type 2 Diabetes Mellitus has long asymptomatic period of hyperglycemia many patients have complications at the time of diagnosis. Evidence implicating causative role of hyperglycemia in macrovascular complications is less conclusive. Other factors that play in important role in Peripheral Vascular Disease are dyslipidemia, hypertension, smoking, obesity etc.³ Peripheral Vascular Disease also termed as Lower extremity arterial disease (LEAD), 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 or sores and ulcers, gangrene, and ultimately to amputation. Intermittent claudication is indicative of clinical occlusive LEAD. LEAD is associated with increasing age and duration of diabetes. In population based and clinical based, it is estimated that between 20-30% of diabetic patients over 65 years of age have peripheral arterial disease. Prevalence of Lower Extremity Arterial Disease Patients in Population – Based and Clinical Studies.⁴ 75% of Peripheral Vascular Disease cases being asymptomatic colour doppler study becomes invaluable noninvasive screening method for early detection, which identifies high risk patients for overt foot disease and appropriate measures can be taken.⁵ So the present study is intended to study the prevalence of Peripheral Vascular Disease in Type 2 Diabetes Mellitus patients by clinical and Doppler evaluation and to correlate it with risk factors.

MATERIALS AND METHODS

The present cross sectional hospital based study was conducted with 40 patients of Type 2 Diabetes Mellitus regularly attending outpatient department at Osmania General Hospital, Hyderabad, Telangana during September 2003 to June 2004.

Inclusion Criteria: Patients with Type 2 Diabetes Mellitus

Exclusion Criteria: Patients with Type 1 Diabetes Mellitus and Patients with Type 2 Diabetes Mellitus with overt foot disease. Initial history was obtained regarding hyper glycaemic symptoms, symptoms suggestive of limb ischemia, past history of Diabetic foot lesions, duration of Type 2 Diabetes Mellitus, and compliance with treatment, glycaemic control based on previous records, hypertension and habit of smoking. The examination included height, weight, body mass index (BMI), waist hip ratio (WHR), screening for foot lesions, blood pressure recording, and detailed examination of all peripheral pulses.(a body mass index of more than 25 was taken to indicate generalized obesity; a waist hip ratio of more than 0.9 in males and 0.85 in females was taken to indicate central obesity; waist measurement of more than 94cms in males and more than 80cms was also taken to indicate central obesity). The investigations included fasting and post lunch blood sugar levels, complete urine examination, lipid profile (total cholesterol, LDL cholesterol, Triglycerides, HDL cholesterol), 12 lead electrocardiogram and color Doppler sonography of lower limb arterial system.

RESULTS

In the present study, among 40 patients of Type 2 Diabetes Mellitus, 14 patients were found to have peripheral vascular disease after history, examination and color Doppler evaluation. These 14 patients were designated as group I. The rest of the patients were designated as group II (Table 1).

Table 1: Prevalence of peripheral vascular disease in type 2 diabetes mellitus

Group	No. of Patients	Percentage
I	14	35
II	26	65

Various parameters (clinical and investigational) were found to be distributed between these two groups as follows.

Table 2: Age distribution in current study sample

Group	Age range	Mean age
I	42-65 yrs	55.35 yrs
II	35-67 yrs	47.9 yrs

The age of the patients in our study was between 35 to 65 yrs. The mean age is more in group I patients (Table 2).

Table 3a: Sex distribution in current study sample

Group	Males (28)	Females(12)
I	12(85.71%)	2(14.29%)
II	16(61.54%)	10(38.46%)

Both males and females were included in our study. Relatively more males were included incidentally. Males dominated both groups, but more in group I (Table-3a).

Table 3b: Sex predilection in current study sample

Group	No. of patients	Pts with PVD
Males(total)	28	12(42.85%)
Males(non smokers)	12	4(33.33%)
Females	12	2(16.67%)

Prevalence of peripheral vascular disease in males is thrice that of females and even in non smoking males, it is twice that of females (Table-3b).

Table 4: Duration of type 2 diabetes mellitus in current study sample

Group	Duration of type 2 DM	Mean duration
I	5-20 yrs	10.6 yrs
II	3-15 yrs	7.32 yrs

The duration of type 2 diabetes mellitus ranges from 3-20yrs. The mean duration was more in group I (Table 4).

Table 5: Association of various factors in current study sample

Group	Glycemic No. of patients (percentage)	Hypertension No. of patients (percentage)	Mean systolic blood pressure	Smoking No. of patients (percentage)
I	12 (85.7)	8 (57.14)	131.4 mm of Hg	8 (57.14)
II	14 (53.84)	24 (92.3)	150.1 mm of Hg	8 (30.76)

Poor glycemic control is associated more with group I patients, surprisingly hypertension association was more in group. Mean SBP was more in group II. Smoking habit in group I (patients with PVD) is nearly double that of group II, suggesting strong positive association (Table 5).

Table 6: Intermittent claudication and abnormal peripheral pulses in patients with peripheral vascular disease

	Yes, % (no. of pts)	No, % (no. of pts)
Intermittent claudication	28.57%(4)	71.43%(10)
Abnormal peripheral pulses	14.28%(2)	85.72%(12)

Among 14 patients with PVD only 4 patients (28.57%) were having intermittent claudication and only 2 patients (14.28%) were having abnormal peripheral pulses (Table 6).

Table 7: Obesity in current study sample

	Group I (14), % (no. of pts)	Group II (26), % (no. of pts)
BMI > 25	28.57 (4)	53.84 (14)
WHR, (M > 0.9, F > 0.85)	42.85 (6)	38.46 (10)
Waist circumference (M >94 cms, F > 80 cms)	28.57 (4)	30.76 (8)

Abnormal waist hip ratio is more commonly seen in group I. Abnormal waist circumference is seen in nearly equal percentage of both groups. Conversely, BMI >25 is more commonly seen in group II (Table 7).

Table 8: Dyslipidemia in current study sample

	Group I (14), % (no. of pts)	Group II (26), % (no. of pts)
Total cholesterol	42.85 (6)	38.46 (10)
HDL cholesterol	35.71 (5)	26.92 (7)
M < 40, F < 50		
LDL > 130	42.85 (6)	38.46 (10)
Triglycerides	42.85 (6)	50 (13)

Raised total cholesterol, LDL cholesterol and low HDL cholesterol were more commonly associated with group I, conversely hypertriglyceridemia was more common in group II (Table 8).

Table 9: Ischemic heart disease in current study sample

Group	No. of patients	Percentage
I (14)	8	57.14
II (26)	12	46.15

Prevalence of IHD by ECG in group I (patients with PVD), is more than that of group II (Table 9)

Table 10: Color Doppler study in current study sample

Arteries	No. of patients	Percentage
Peroneal artery	12	85.71
Dorsalis pedis artery	8	57.14
Posterior tibial artery	2	14.28
Popliteal artery	2	14.28
Superficial femoral, common femoral arteries	1	7.14

The most common artery involved is peroneal artery, followed by dorsalis pedis artery and the least being superficial and common femoral arteries (Table 10).

DISCUSSION

Peripheral vascular Disease (LEAD) is clinically identified by intermittent claudication and /or absence of peripheral pulses in the lower legs and feet. The incidence and prevalence of Peripheral Vascular Disease increase with age in both diabetic and non-diabetic subjects and, in those with diabetes, increase with duration of diabetes. In India the disease was known to occur at an earlier age (45 yrs). Many elderly diabetic persons have Peripheral Vascular Disease at the time of diabetes diagnosis. Diabetes is an important risk factor for Peripheral vascular Disease. Hypertension, smoking and hyperlipidemia, which are frequently present in patients with diabetes, contribute additional risk for vascular disease. Peripheral vascular Disease in diabetes is compounded by the presence of peripheral neuropathy and by susceptibility to infection. These confounding factors in diabetic patients contribute to progression of Peripheral Vascular Disease to foot ulcerations, gangrene and ultimately to amputation of part of the affected extremity. Diabetes accounts for 50% of all nontraumatic amputations in the United States. Mortality is increasing inpatient with Peripheral Vascular Disease. Prevention is an important component of Peripheral Vascular Disease management. By the time Peripheral Vascular Disease becomes clinically manifests, it may be too late to salvage an extremity or it may require more costly resources to improve the circulatory health of the extremity. Ultrasonic duplex scanning adds a new dimension to assessment of Peripheral Vascular Disease. This technology is still evolving and may help localize occlusive disease and determine appropriate intervention strategies. The present study was aimed to know the prevalence of Peripheral vascular Disease clinically and by color duplex scanning, in Type 2 Diabetes Mellitus patients without overt foot disease, and to correlate it with risk factors and ischemic heart disease. In this study 14 patients (35%) out of 40 were found to have Peripheral vascular Disease. This value is higher than that reported by Mohan and co-workers⁶, Who studied 726 South Indian Type 2 Diabetes Mellitus patients with more than 25 years duration of Type 2 Diabetes Mellitus and found to have 15.4% prevalence of Peripheral vascular Disease. Two more Indian studies, one by Sastry and co-workers⁷, Premalatha and group⁸, reported Peripheral vascular Disease prevalence of 3.9% and 6.3% respectively. Hoorn Study conducted in Caucasian population, Netherlands. reported 20.9% prevalence by using ABI less than 0.9, 41.8% prevalence by Doppler study⁹. In our study the

mean age of patients with and without Peripheral vascular Disease was 55.3 years and 47.9 years respectively. This observation keeps in with the report by earlier study⁸, who reported association of others Peripheral vascular Disease with an age of more than 50 years. In our study 42.85% of males. 33.3% of non smoking males. 16.67% of females were having Peripheral vascular Disease. The prevalence of Peripheral vascular Disease was found to be more in males, compared to females, even after excluding smoking. This supports the fact that male sex is an independent risk factor for Peripheral vascular Disease.¹⁰ In our study the mean duration of diabetes in patients with and without Peripheral vascular Disease was 10.6 years and 7.3 years. This observation is in accordance with earlier study¹¹, who studied 48,607 men and found that the relative of Peripheral vascular Disease in diabetes risk patients increases with the duration of the diabetes. Worse glycemic control was seen in 85.71% and 53.84% of patients with and without Peripheral vascular Disease respectively. This observations keeps in with the report by Adler al and *et al*¹², in which 3834, patients were studied and found that higher HbA1c level is associated with increased risk of Peripheral Vascular Disease. In our study 57.14% of patients with Peripheral Vascular Disease, 30.76% of patients without Peripheral Vascular Disease are smokers. The present observations are in accordance with earlier studies¹² Raised total cholesterol and LDL cholesterol was found in 42.85% and 38.4% of patients with and without Peripheral Vascular Disease, respectively. Low HDL cholesterol was found in 57.14% and 46.15% of patients with and without Peripheral Vascular Disease, respectively. This observation of dyslipidemia keeps in with the report by Adler and co-workers¹². But contradicting the known fact, the triglycerides levels were more in patients without Peripheral vascular Disease. The waist hip ratio suggesting central obesity is seen in 42.85% and 38.46% of patients with and without Peripheral vascular Disease, respectively. This keeps in with the report by Katsil and co-workers⁽¹³⁾. Waist circumference suggesting central obesity is seen in 28.57% and 30.76% of patients with and without Peripheral vascular Disease, respectively. This contradicts the fact that waist circumference is an independent risk factor of peripheral vascular disease. Body mass index suggesting obesity was seen in 28.57% a 53.84% of mass index suggesting patients with and without Peripheral vascular Disease, respectively. This keeps in with the report by Katsil and co-workers⁽¹³⁾. Hypertension was found to be associated with 57 and 92.3% of patients with and without Peripheral vascular Disease, respectively. The mean systolic blood pressure was 131.4 mm Hg and 150.1 mm Hg in patients with and without Peripheral vascular Disease, respectively. This

contradicts with the report by Adler and co-workers¹². Sufficient Physical activity was seen in 57.14% and 15.38% of patients with and without Peripheral vascular Disease, respectively. This contradicts the known fact that physical activity. that is sufficient to keep a person 'active', was a protective factor against development of Peripheral vascular Disease. In our study 57.14% and 46.15% of patients with and without Peripheral Vascular Disease respectively, were found to have myocardial ischemia by electrocardiogram. This keeps in with the report by Sastry and co-workers⁷. An interesting observation from our study is that, among patient with peripheral vascular disease (detected by color duplex scanning) only 14.28% of patients were having abnormal peripheral pulses on examination. This shows the higher sensitivity of color duplex scanning in detecting Peripheral Vascular Disease. Peroneal arteries were the commonest to be affected in our study (85.71%). The other lower limb arteries affected, in the decreasing order of frequency, are Dorsalis pedis artery (57.14%), posterior tibial artery 14.28%). popliteal artery This keeps in with the fact that diabetes mellitus preferentially affects tibial and peroneal arteries.

CONCLUSIONS

Risk factors significantly associated with PAD were-- higher age, longer duration of diabetes, higher systolic and diastolic blood pressure, smoking and CAD. The prevalence of CAD was higher in patients with PAD. Thus the presence of PAD should alert the clinician to a high probability of underlying CAD. As PAD becomes an increasingly important complication in T2DM subjects, a deeper understanding of the related diseases is particularly important. PAD confers poorer prognosis in T2DM patients compared with nondiabetic patients, and early diagnosis, management and positive treatment are necessary.

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