

CLINICAL RESEARCH

# The Prevalence of Peripheral Vascular Disease (PVD) and Its Correlation with Biochemical Parameters in Type 2 Diabetes Mellitus (T2DM) - A Tertiary Care Hospital Based Study in Eastern India

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Received: 24 February 2023; Accepted: 06 March 2023; Published: 13 March 2023

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## **ABSTRACT**

### **INTRODUCTION**

PVD, one of the major macrovascular complications of T2DM, usually begins at an earlier age and remains subclinical for a long duration. So early detection of PVD will help to assess its true prevalence and hence prevention of overt manifestation.

### **OBJECTIVES**

To assess the true prevalence of PVD in T2 DM from Eastern India and its correlation with clinical and biochemical parameters

### **METHODS**

It was a cross sectional study with consecutive diabetes patients attending OPD from 2015 January to 2016 July. Each was subjected to meticulous history, measurement of ABPI by handheld Doppler and various laboratory parameters. Patients having known vascular disease due to other causes were excluded.

### **RESULTS**

Out of 103 patients, PVD was present in around 25% cases with positive association with age, male gender, and high body weight. Hypertension, hyperglycemic state (PPBS, HbA1C), total cholesterol, triglyceride and LDL independently increases the risk of PVD. Though low levels of HDL are a well-recognized risk factor for PVD, this was not reflected in study.

### **CONCLUSION**

The true prevalence of PVD is higher in DM and ABPI can detect subclinical PVD much before its progression and overt manifestations.

## **KEYWORDS**

Diabetes; PVD; ABPI

## **INTRODUCTION**

Peripheral vascular disease (PVD), one of the major macrovascular complications of diabetes mellitus (T2 DM), usually begins at an earlier age and remains subclinical for a long duration before it manifests with significant morbidity and mortality. Hyperglycaemia induced endothelial dysfunction, chronic inflammation and coagulation abnormalities contribute to the early evolution and rapid progression of PVD in DM [1]. Literature showed that 15%-17% of total intermittent claudication cases, 30%-50% of patients undergoing lower extremity vascular surgery and 50%-60% of patients with lower extremity major amputation were found to have DM [2]. More than 50% diabetic patients diagnosed with PVD based on abnormal ankle brachial pressure index (ABPI) are asymptomatic or with minimal symptoms [3]. So early detection of PVD by ABPI, an easy bedside test, will help to assess its true prevalence and hence prevention of overt manifestation.

## **OBJECTIVES**

The primary objective of the study was to assess true prevalence of PVD including subclinical form by measuring ABPI with a handheld portable doppler device in DM patients. Other objectives were to assess correlation between biochemical parameters and PVD.

## **METHOD**

### ***Patients***

This was a hospital based cross sectional study conducted in a tertiary care hospital of east India from 2015 January to 2016 July. consecutive T2DM patients attending in medicine indoor and outdoor were considered as study participants. Those with type 1 DM, history of known vascular disease, trauma to limbs were excluded from the study. Informed consent was taken for all study participants. Ethical approval was taken as per Helsinki declaration.

### ***Study Parameters***

The ABPI was measured using a 5 MHz - 7 MHz handheld Doppler device. In supine position, brachial and ankle blood pressure were measured and ABPI was calculated. ABPI <0.9 was considered as significant PVD with or without clinical symptoms. Fasting and postprandial blood sugar (FBS & PPBS) were measured by glucose oxidase peroxidase method. HbA1c and serum lipid profile were measured by high performance liquid chromatography and spectrophotometry, respectively. Detailed history of patient demographics and risk factors were also taken.

### ***Statistical Analysis***

Categorical variables were expressed as Number of patients and percentage of patients and compared across the groups using Pearson's Chi Square test for Independence of attributes. Continuous variables were expressed as Mean  $\pm$  Standard Deviation and compared across the 2 groups using unpaired t test. The statistical software SPSS version 20 was used for the analysis. An alpha level of 5% was taken, i.e., p value less than 0.05 was considered as significant.

## RESULT

### Demography

Among the 103 patients studied 26(25.2%) had peripheral vascular disease (ABPI <0.9). PVD was prevalent in older patients - 42.31% & 50% in the age group 61-70 and 71-80 respectively. PVD was found to be present in 22(37.29%) male patients and 4(9.09%) of female patients. Mean body weight of the patients with and without PVD were 65.88 + 6.65 & 61.58 + 6.05 years, respectively. PVD occurring in patients with higher body weight was statistically significant (p-0.003). Among the patients from rural areas, 20(33.33%) had PVD while it was 6(13.95%) in urban areas (p-0.026). Hypertension is more prevalent in PVD (45% vs. 19%, p -0.001). Smoker has stronger association with PVD (72% vs. 4%, p <0.001). Among patients with PVD, the mean duration of diabetes was 9.08 + 2.54, whereas among the patients without PVD, the mean duration of diabetes was 3.93 + 2.69. This association of PVD with higher disease duration was found to be statistically significant (p value <0.001).

### Biochemical Parameters

Higher HbA1c had stronger association with PVD (31.5% vs. 10%, p-0.022). hypercholesterolemia, hypertriglyceridemia, and elevated HDL were more common in PVD (82.4% vs.14%, p <0.01, 72.7 vs. 19.5, p <0.01, 41.3 vs. 4.4, p <0.01 respectively) but HDL failed to show protective effect in PVD. All the patients having PVD had dyslipidaemia, but the dyslipidaemia being highly prevalent in this diabetic population, this relation was not found to be statistically significant.

### Causative Factors

Among the different causative factors of PVD, odds ratio was found to be highest among smokers, odds ratio being 64.1. Male sex (odd's ratio 0.69), hypertension (odd's ratio 4.71) and hyperglycaemic state with high HbA1C (odd's ratio 3.46) also increases chance of having PVD (Figure 1).

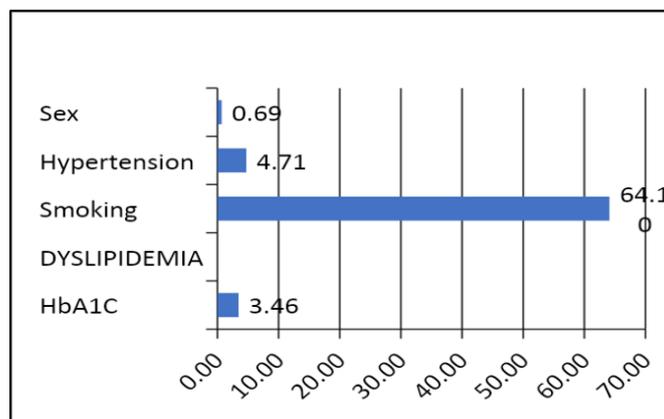


Figure 1: Comparing odds ratio of the different variables affecting PVD.

### Correlation of PVD with Multiple Parameters Taken at a Time

Odds ratio for a male, smoker and hypertensive taken together was 33.636 (95% CI - 8.4 - 135.3). Odds ratio for smoking, hypertension and high HbA1C became 28.778(7.2-115.2) and for male, hypertension, and hyperglycaemic status, it was 11.833(3-36). When male patients with smoking and high HbA1c were considered, odds ratio comes out to be 48(13.3 to 173.7). Smoking, hypertension, hyperglycaemia, and hypertension all were considered the odds ratio is 37.5(7.5-185) which correlated with the increased chance of PVD in these patients (Table 1).

Parameters	B value	p value	OR	95% CI
Smoker hypertension	3.37	0.00	29.2	8.1-104.9
Smoker high HbA1c	3.9	0.00	49	13.7-179.2
Male, hypertensive high Hba1c	2.5	0.00	11	3.8-36.7
Male smoker hypertensive	3.52	0.00	33.6	8.3-135.6
Male, Smoker, High HBA1c	3.87	0.00	48.0	13-173
Male, Smoker, High HbA1c, Hypertension	3.6	0.00	37.5	7.5-185.9

**Table 1:** Correlation of PVD with multiple parameters taken at a time.

## **DISCUSSION**

The prevalence of PVD is higher in DM compared to non-DM and ABPI can detect subclinical PVD much before its progression and overt manifestations. Using the ABI, one survey [4] found a prevalence of PAD in people with diabetes 40 years of age to be 20%, a prevalence greater than anticipated using less reliable measures, such as symptoms or absent pulses. Moreover, another survey of patients with diabetes 50 years of age showed a prevalence of PAD of 29% [5]. Our study also showed a higher prevalence of PVD (25%) in DM patients from Eastern India.

Studies reported that the prevalence of PVD in diabetics increases with age increasing from 3.2% in those below 50 years. of age to 33% in those above 80 years. of age [6,7] which was also reflected in our report. The prevalence of PVD in diabetics also increases with the duration of diabetes from 15% to 45% at 10 years to 20 years respectively after the diagnosis of diabetes [8]. In this descriptive analysis we found that PVD is more common in long standing diabetes though of similar age, with a similar history of smoking, ischemic heart disease and hypercholesterolemia. U.K. Prospective Diabetes Study (UKPDS) study showed that hyperglycemia, assessed as HbA1c, was associated with an increased risk for incident PVD, independent of other risk factors. Each 1% increase in HbA1c was associated with a 28% increased risk of PVD (95% CI 12-46) [9]. In our study we found the highest odds ratio for HbA1c with the PVD association supporting the previous report.

A nation-based survey from the US predicted a model of PVD risk and the results of the fully adjusted model showed that current smoking, previous smoking, diabetes mellitus, treated but not controlled hypertension, and untreated hypertension were all significantly associated with prevalent PAD [10]. Similar association was also reflected in this present study.

## **CONCLUSION**

By using the handheld Doppler device and sphygmomanometer we can easily measure the ankle brachial pressure index (ABPI). Therefore, according to our results, we suggest each patient with type 2 diabetes mellitus must be screened for presence of peripheral vascular disease regardless of presence or absence of symptoms. Age, sex, smoking, hypertension, lipid status, hyperglycaemia can influence incidence of PVD. Duration of diabetes is a strong predictor and increase in disease duration increases the probability of the disease.

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