

## ORIGINAL PAPER

# A clinical study of peripheral vascular diseases in type 2 diabetes mellitus

**Bhattacharyya Dipen K<sup>1</sup>, Bhattacharyya Dipak K<sup>2</sup>, Barua Swaroop K<sup>3</sup>, Nath Sivam RK<sup>4</sup>**

*Received on December 23, 2016; editorial approval on March 07, 2017*

## ABSTRACT

**Background:** Peripheral Vascular Disease (PVD) is a very common complication of Diabetes Mellitus, but as the whole spectrum of PVD is mostly asymptomatic or only mildly symptomatic, it is likely to be under-estimated or under-diagnosed and lack of awareness may lead to significant morbidity and mortality. **Methods:** The study was done on 74 patients of type 2 diabetes mellitus, admitted into the department of Medicine and allied specialities. Detailed history, clinical examination, biochemical parameters, ankle-brachial index (ABI) and all other relevant investigations were done in all patients. **Results:** In the total of 74 patients, the prevalence of PVD is found to be 17.56% where the mean duration of diabetes was  $9.2 \pm 4.3$  years. About one-third of the patients were asymptomatic while 53.8% were of foot ulcer, followed by intermittent claudication and gangrene. Longer duration of diabetes, deranged lipid profile, raised levels of HbA<sub>1c</sub> and CRP and smoking habit were found to be significantly related to the incidence of PVD. **Conclusion:** PVD, in most cases is asymptomatic, but carry significant risks regarding morbidity and mortality. Early detection by screening for PVD may go a long way in preventing these in the high risk groups.

**Keywords:** Ankle brachial index, lipid profile, C-Reactive protein

## INTRODUCTION

Peripheral vascular disease (PVD), the pathological narrowing of lumen of arteries causing reduction in blood supply to extremities, is a common condition with variable morbidity affecting men and women over age of 40 years.<sup>1</sup> It is a common manifestation of the atherosclerotic disease process usually in its diffuse and severe form. Diabetes mellitus is an important risk factor of PVD, with the incidence of the later in presence of the former reportedly varying from 14.4% to

20.46%.<sup>2-4</sup> Longer duration of diabetes and higher levels of glycosylated haemoglobin (HbA<sub>1c</sub>) have been seen to be directly related to the development of PVD in diabetes mellitus.<sup>2-4</sup> Other risk factors found to be significantly associated with PVD were higher age of patient, higher systolic and diastolic blood pressure, smoking habit and presence of coronary artery disease.<sup>4</sup> In relation to the association of lipid profiles in the genesis of PVD, the findings were inconclusive, with few studies getting no significant variables to relate to PVD while others have implicated triglyceride as the only variable.<sup>2,3</sup> Endothelial inflammation, as evident from rising high-sensitivity C-reactive protein (hs-CRP), has also been related to the pathogenesis of diabetic vascular disease.<sup>5</sup>

Though the cardinal symptom of PVD is intermittent claudication, majority of the patients are largely asymptomatic, but carry potentially significant risks of morbidity including diabetic foot, gangrene and other vascular complications, and even increased mortality. Hence screening for PVD has been suggested to be made a routine practice at primary care level.<sup>6</sup>

The main objectives was study the incidence and presenting features of Peripheral Vascular Disease in patients with type 2 diabetes mellitus; to assess vascular involvement in both symptomatic and asymptomatic patients; and to study the correlation of PVD with duration of diabetes, levels of HbA<sub>1c</sub>, CRP, Lipid profile and the habit of smoking.

## Address for correspondence:

<sup>1</sup>Associate Professor of Medicine

**Email:** bhattadipen63@gmail.com

**Mobiles:** 09864012133 / 08812861139

<sup>2</sup>Associate Professor and Head, Cardio-thoracic and vascular Surgery

Assam Medical College, Dibrugarh, Assam

<sup>3</sup>Professor of Medicine; <sup>4</sup>Registrar of Cardiology, Gauhati Medical College and Hospital, Guwahati

**Cite this article as:** Bhattacharyya Dipen K, Bhattacharyya Dipak K, Barua Swaroop K, Nath Sivam RK. A clinical study of peripheral vascular diseases in type 2 diabetes mellitus. *Int J Health Res Medico Leg Prae* 2018 July;4(2): 3-5. DOI 10.31741/ijhrmlp.v4.i2.2018.2

## METHODS

**Place of study:** Gauhati Medical College and Hospital, Guwahati, Assam, India. **Type of study:** Hospital based observational study. **Duration and design of study:** Study was conducted from 1<sup>st</sup> July, 2011 to 30<sup>th</sup> June 2012. Data was collected by taking proper history, doing thorough clinical examination and with the help of relevant investigations. Investigations included Blood R/E, Urine R/E, Fasting and post-prandial Blood glucose, HbA<sub>1c</sub>, Creatinine, blood urea, fasting lipid profile, Liver Function tests, CRP, TSH, Chest X-Ray, Ankle brachial index (ABI), color Duplex and color waveform Doppler combine ultrasound and any other relevant investigations, if indicated. For clinical evaluation of PVD, ABI is calculated, recording peak systolic pressure at first appearance of sound, using non-invasive colour Doppler study by using the formula:

**ABI = Ankle systolic blood pressure ÷ Brachial systolic blood pressure.**

ABI less than 0.9 was taken as an indicator of PVD in our study.<sup>7</sup> Data were then put into preformed and pretested proforma and due statistical analysis was done.

**Inclusion criteria:** All the patients included in this study were hospitalised cases suffering from type 2 diabetes mellitus as per criteria outlined by American Diabetes Association (ADA) guidelines.

**Exclusion criteria:** (1) Patients with type 1 diabetes mellitus, (2) Type 2 diabetics with hypothyroidism, chronic liver disease, chronic kidney disease, connective tissue disease or those on lipid lowering agents.

## RESULTS

Out of the total 74 patients, 41 (55.40%) were males while 33 (44.60%) were females. Mean age of the patients was  $54.56 \pm 13.15$  years with the highest number of 24 patients in the age group of 51 to 60 years. The mean duration of diabetes was  $9.2 \pm 4.3$  years and majority of patients were of duration of less than 5 years. Using ABI of less than 0.9 as cut off, prevalence of PVD was found to be 17.56% (13 cases) (**Table 1**).

**Table 1** Showing the prevalence of PVD in study population using ABI

Ankle Brachial Index	No. of cases	Percentage among study group	Percentage among PVD patients
<0.4	1	1.35	7.69
0.4–0.69	2	2.70	15.38
0.7–0.89	10	13.51	76.92
>0.9	61	82.44	—

No statistically significant difference in the incidence of PVD was noted between both the sexes. Foot ulcer (53.85%), followed by intermittent claudication (38.46%) and gangrene (38.46%) were the most common presenting symptoms in PVD while 30.77% of the patients were asymptomatic (**Table 2**).

**Table 2** Presenting features in cases of PVD in Diabetes

Symptom	Number	% among study group	% among PVD patients
Intermittent claudication	5	6.75	38.46
Rest pain	3	4.05	23.07
Foot ulcer	7	9.45	53.85
Gangrene	5	6.75	38.46
Acute arterial occlusion	0	0	0
Embolization	0	0	0
Asymptomatic	4	5.4	30.77

Out of a total of 21 patients having diabetes of duration of more than 15 years, 10 (47.60%) were found to have PVD, while it was found in 3 cases (23.07%) out of 13 in the group of diabetics with duration of 10 to 15 years. None of the patients with diabetes of a duration of less than 10 years were found to have PVD ( $p < 0.05$ ) (**Table 3**).

**Table 3** Showing the duration of diabetes and incidence of PVD

Duration of diabetes (Years)	No. of Patients	No. PVD cases	Percentage of PVD in the group
0 - 5	32	0	0
5 - 10	8	0	0
10 - 15	13	3	23.08
>15	21	10	47.62

( $p < 0.05$ )

Incidence of PVD was highest in the age group above 60 years (30%) followed by those in the age group of 50 to 60 years (20.83%). None of the subjects below 40 years were found to have PVD (**Table 4**).

**Table 4** Age distribution and prevalence of PVD in the study group

Age (in years)	No. of diabetics	No. of PVD patient in group	% of PVD in the group.
< 30	3	0	0
30 - 40	8	0	0
40 - 50	19	2	1.05
50 - 60	24	5	20.83
>60	20	6	30

35 patients (47.92%) out of the total of 74, had deranged lipid profile and amongst them, 11 patients (31.42%) had PVD. 2 patients, (5.12%) out of the rest 39 patients with normal lipid profile, had evidence of PVD. 11 patients out of 13 PVD cases (84.61%) had deranged lipid profile which is statistically significant ( $p < 0.05$ ).

In this study group, 43 patients had HbA<sub>1c</sub> level more than 7 NGSP while 31 had below it. Out of the 13 cases with PVD, 12

patients (92.3%) had HbA<sub>1c</sub> level more than 7 NGSP ( $p < 0.05$ ). CRP level was found to be raised in 9 patients (69.23%) out of 13 patients which is statistically significant ( $p < 0.05$ ).

Regarding smoking habits, 21 cases were smokers and 53 were non-smokers. 8 cases (38.02%) out of the smokers and 5 cases (9.43%) out of the non-smokers had PVD, an observation which is statistically significant ( $p < 0.05$ ). The above observations are summarised in **Table 5**.

**Table 5** Risk factors in diabetic patients with and without PVD

Parameters	Total cases	Patients with PVD	No PVD	P value
Lipid profile: Deranged lipid profile	35	11	24	$P < 0.05$
Normal lipid profile	39	2	37	
HbA <sub>1c</sub> level: HbA <sub>1c</sub> > 7	43	12	31	$P < 0.05$
HbA <sub>1c</sub> < 7	31	1	30	
CPR level: Raised CRP	27	9	18	$P < 0.05$
Normal CRP	47	4	43	
Smoking habit: Smokers	21	8	13	$P < 0.05$
Non-smokers	53	5	48	

## DISCUSSION

Peripheral vascular disease (PVD) is not an uncommon condition, but is a commonly neglected condition due to absence of serious or debilitating signs and symptoms at the initial stage. In our study of 74 patients, the age range was from 26 to 85 years with a mean of  $54.56 \pm 13.15$  years and the male to female ratio was 1.25:1.<sup>4,8</sup> The prevalence of PVD was 17.56% with women having a slightly higher incidence that was of no statistical significance.<sup>2-4</sup> The commonest presentation noted in our study was foot ulcer (53.85%) followed by intermittent claudication and gangrene while about one-third of the patients were asymptomatic. While few studies have found intermittent claudication to be the most common presentation, other studies have found that to be foot ulcer, the difference may be due to illiteracy, lack of health awareness and other factors in the study population.<sup>3,4,8</sup> PVD was not found in patients suffering from diabetes for a duration of less than 10 years, while it was seen significantly higher in cases with longer duration, the prevalence being 47.6% in patients with diabetes of more than 15 years. The duration of diabetes has already been identified as a significant predictor of PVD.<sup>3,4,9</sup> Higher levels of HbA<sub>1c</sub> has been associated with PVD by many authors which is also reflected in our study.<sup>2-4</sup> Though varied conclusions are drawn regarding association of lipid profile with the development of PVD, our study showed statistically significant correlation with 11 out of 13 cases (84.61%) of PVD having deranged lipid profile.<sup>3,10</sup> Increased CRP level has been found to be significantly associated with PVD with 9 out of the 13 cases (69.23%) showing raised CRP. Similar observations were made in earlier studies also.<sup>5,11</sup> The implication of smoking habit

in the genesis of PVD has been vindicated by the findings of our study where statistically significant correlation between the two has been found.<sup>2,4,10,11</sup>

## CONCLUSION

Peripheral vascular disease has been found to be fairly common in type 2 diabetes mellitus. As the disease is mostly asymptomatic, majority of the patients presented when there was development of foot ulcer. Significant positive correlation of the incidence of PVD with duration of diabetes, levels of HbA<sub>1c</sub> and lipid profile and presence of smoking habit was noted in this study. Awareness about the entity, both amongst the patients as well as the medical professionals, is very essential for early diagnosis, treatment and prevention of the dreaded complications of the disease.

**Ethical Clearance:** Taken.

**Financial Support:** None.

**Conflict of Interest:** The authors don't have anything to disclose.

## REFERENCES

- Kumar P, Clark M, editors. Kumar and Clark's Clinical Medicine. 5<sup>th</sup> ed. London: WB Saunders; 2002. p. 828-831.
- Guan H, Li YJ, Xu ZR, Li GW, Guo XH, Liu ZM et al. Prevalence and risk factors of peripheral arterial disease in diabetic patients over 50 years old in China. Chin Med Sci J July 2007;22(2):83-88.
- Rhee SY, Guan H, Liu ZM, Cheng SW, Waspadji S, Palmes P et al. PAD-SEARCH Study Group Multi-country study on prevalence and clinical features of peripheral arterial disease in Asian type 2 diabetes patients at high risk of atherosclerosis. Diabetes Res Clin Pract 2007;76(1):82-92.
- Agarwal AK, Singh M, Arya V, Garga U, Singh VP, Jain V. Prevalence of peripheral arterial disease in type 2 diabetes mellitus and its correlation with coronary artery disease and its risk factors. JAPI 2012;60:28-32.
- Megumi Koshikawa, Atsushi Izawa, Takeshi Tomita, Setsuo Kumazaki, Jun Koyoma, Shigetaka Shimodaira et al. Association between circulating endothelial progenitor cells and hs-CRP in patients with diabetes. Br J Diabetes Vasc Dis 2010;10:133-138.
- Diehm C, Kareem S, Lawall H. Epidemiology of peripheral arterial disease. Vasa 2004;33(4):183-9.
- Michael R Jaff. Peripheral vascular disease. Cardiology Clinics 2002;20(4):491-662.
- Franjo Cocce, Zeljko Metelko, Branimir Jaksic, Nikica Car, Pajica Pavkovic et al. Peripheral arterial disease and diabetes mellitus. Diabetologia Croatica 2008;37(2):47-53.
- Bembi V, Singh S, Singh P, Aneja GK, Arora R. Prevalence of peripheral arterial disease in a cohort of diabetic patients. South Med J 2006;99(6):564-9.
- Milla Kallio, Carol Forsblom, Per-henrik Groop, Mauri Lepantalo. Development of new peripheral arterial occlusive disease in patients with type 2 diabetes during a mean follow-up of 11 years. Diabetes care 2003;26:1241-5.
- Yu Hi, Sheu WH, Song YM, Liu HC, Lee WJ, Chen YT. C-reactive protein and risk factors for peripheral vascular disease in subjects with type 2 diabetes mellitus. Diabet Med Apr 2004;21(4):336-41.