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### RESEARCH ARTICLE

#### CLINICORADIOLOGICAL ASSESSMENT OF PERIPHERAL ARTERIOPATHY IN DIABETICS

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Peripheral Arteriopathy, Diabetes,  
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#### Abstract

**Background :** The steady rise in prevalence of Diabetes mellitus has resulted in increase in the complications related to diabetes. Peripheral arterial disease in diabetes is an independent risk factor for subsequent ulceration and limb loss in diabetics. It is therefore essential that peripheral arterial disease is identified in all patients with diabetics.

**Methods :** The present prospective observational study conducted at a tertiary centre in central India was aimed at clinico-radiological assessment of lower limb vessels in patients with diabetes. 184 patients with diabetes were assessed clinically and with doppler ultrasound.

**Results :** Peripheral vascular disease was more common among patients with type II diabetes. Ankle Brachial Pressure Index (ABPI) of < 0.8 was common among patients with longer duration (> 10 years), Doppler ultra sound of lower limbs revealed significant changes bilaterally with type II diabetes and increased duration of diabetes.

**Conclusion :** Peripheral arteriopathy is an important risk factor for diabetic foot especially with longer duration of type II diabetes.

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#### Introduction:-

The dramatic increase in world wide prevalence of Diabetes mellitus has resulted in an inevitable rise in diabetes related complications. In 2011 there was an estimated 366 million adults with diabetes world wide and projections indicate this figure will rise to 552 million by 2030 (Leonor G., et al, 2011). The number and incidence of amputations in patients with type 2 diabetes has risen in some countries (Vamos E.P. et al, 2010). Foot lesions carry high morbidity and represent most common cause of hospitalization in patients with diabetes. Lifetime risk of foot ulceration in patients with diabetes lies between 15 % and 25 % (Sing N. et al, 2005) (Wild S. et al, 2004) and an annual incidence of around 2 % (Abbott CA et al, 2002). The risk of person with diabetes undergoing a lower extremity amputation is estimated to be 23 times that of person without diabetes (National Diabetes Audit, NHC Info Centre, 2011). Peripheral arterial disease is an independent risk factor for subsequent ulceration and limb loss in diabetics. It is present in 50 % of patients with diabetic foot ulceration, a proportion which may be increasing (Prampers L. et al, 2007). It is therefore essential that peripheral arterial disease is identified in all patients with diabetes. The evaluation of below knee vessels may serve as a useful and intermediate adjunct to other more invasive modalities (Schaper NC et al, 2012). The present study setting was a tertiary referral hospital, hence forming a representative data of rural population in central India.

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### Materials and Methods:-

The study of clinicoradiological assessment in diabetics was conducted at MGIMS, Wardha (MS), India, from April 2002 to April 2003. A total of 184 diabetic patients attending surgery OPD with complaints of lower limb pain, numbness, edema and ulceration were examined for peripheral vasculopathy. Vascular status of lower limbs was evaluated for the following.

1. Palpation of peripheral arteries. (Dorsalis Pedis and posterior tibial artery)
2. Ankle blood pressure.
3. Ankle brachial index
4. Colour Doppler ultrasound.

The ankle blood pressure was recorded by conventional method using standard sized cuff and the level at which posterior tibial artery could be palpated was recorded. The ankle Brachial Index was calculated using the following formula.

$$\text{Ankle Brachial Index} = \frac{\text{systolic ankle blood pressure}}{\text{systolic arm blood pressure}}$$

All patients were interviewed for details about diabetes mellitus. This included type of diabetes and duration of diabetes mellitus. The findings were analysed using standard tables.

### Results:-

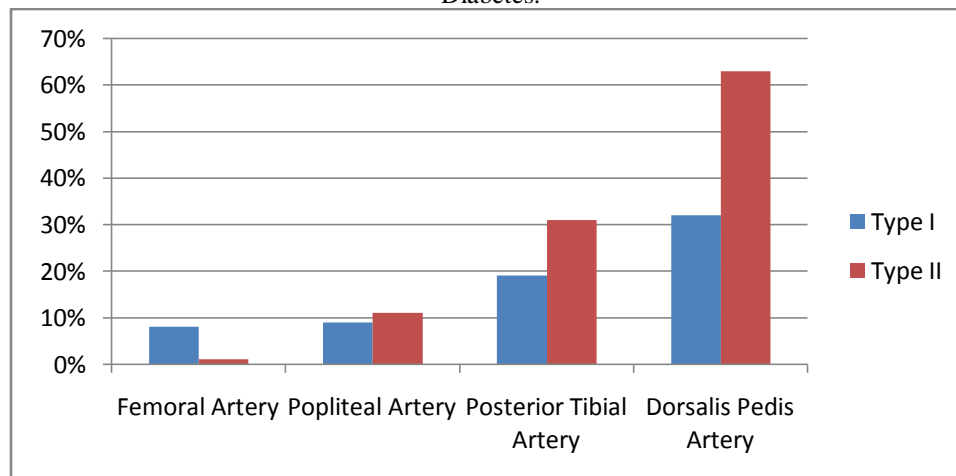
**Table 1:-** Abnormal peripheral arterial pulsations and relationship with duration of diabetes.

Arteries of the Foot	Duration of Diabetes (Years)			Total
	< 5 (%)	5 - 10 (%)	> 10 (%)	
Impaired Posterior Tibial Artery (PT)	2 (2.3)	9 (19.2)	5 (23.8)	<b>16 (8.8)</b>
Impaired Dorsalis Pedis Artery (DP)	10 (8.7)	17 (37.6)	7 (33.3)	<b>34 (18.4)</b>
Total Patients assessed	117 (63.5)	46 (25)	21 (11.4)	<b>184</b>

**Table 2:-** Abnormal peripheral arterial pulsations and relationship with type of diabetes.

Arteries of the Foot	Type of Diabetes		Total
	I	II	
Impaired Posterior Tibial Artery (PT)	4	12	<b>16</b>
Impaired Dorsalis Pedis Artery (DP)	6	29	<b>35</b>
Total Patients assessed	53	131	<b>184</b>

**Graph 1 :-** Colour Doppler Ultrasound Findings of Peripheral Vascular Impairment with respect to Type of Diabetes.



**Table 3:-** Findings on Colour Doppler Ultrasound Examination with respect to Vascular Impairment of Lower Limbs.

		Unilateral Impairment (%)	Bilateral Impairment (%)	Normal (%)
Artery on Doppler Ultrasound in 184 Patients	Femoral	4 (2.2)	0 (0)	180 (97.8)
	Popliteal	26 (14.1)	3 (1.6)	155 (84.2)
	Posterior Tibial	35 (19)	32 (17.4)	117 (63.6)
	Dorsalis Pedis	11 (6)	98 (53.2)	75 (40.7)

**Table 4:-** Colour Doppler Ultrasound Findings of Peripheral Vascular Impairment with respect to Duration of Diabetes.

Impairment on Doppler Ultrasound	Duration of Diabetes (Years)			Total
	< 5 (%)	5 - 10 (%)	> 10 (%)	
Femoral Artery	3 (3.3)	1 (1.6)	0 (0)	4
Popliteal Artery	3 (3.3)	9 (14.7)	8 (25)	20
Posterior Tibial Artery	10 (11)	25 (41)	16 (50)	51
Dorsalis Pedis Artery	35 (38.5)	45 (73.7)	24 (75)	104
Total Patients assessed	91 (49.4)	61 (33.1)	32 (7.3)	184

**Table 5:-** Relationship of Duration of Diabetes with Ankle Brachial Index.

		Duration of Diabetes (Years)			Total
		< 5 (%)	5 - 10 (%)	> 10 (%)	
Ankle Brachial Index	> 1	75 (64.1)	19 (41.3)	6 (28.5)	100
	0.8 to 1	38 (32.4)	24 (52.1)	13 (61.9)	75
	< 0.8	4 (3.4)	3 (6.5)	2 (9.5)	9
<b>Total</b>		<b>117 (63.5)</b>	<b>46 (25)</b>	<b>21 (11.4)</b>	<b>184</b>

**Discussion:-**

An important group of problems amongst the diabetic patients is complications affecting the foot. The present study was undertaken to find out the pattern of lower extremity vascular involvement in diabetic patients attending a tertiary referral centre in Central India. In the present study, clinical examination of the peripheral vessels showed that 8.8 % of diabetic patients had weak or absent post tibial pulsations and 18.8 % patients had weak or absent pulsations of dorsalis pedis artery. The prevalence of peripheral vascular disease as reported by (Bryfogle J W et al, 1957) was 15 %, 68.97 by (Haimovici H, 1967), 40.6 % by (Helfand AE, 1974), 65 % by (Black JR, 1981) 20.6 % by (Janett RT, 1991), 14 % by (Frykberg RL et al, 1998) and 20.6 by (Mac Gregor et al, 1999). The findings of the present study are comparable to Helfand AE who reported 40.6 % weak or absent pulsations of dorsalis pedis artery. In the present study 36.5 % had weak or absent dorsalis pedis artery and post tibial artery was abnormal in 23 % of the patients. Frykberg et al reported that pedal pulses were abnormal in 23 % of patients with diabetic foot. Ellenberg reported that the dorsalis pedis was abnormal in 11 % and post tibial artery was abnormal in 5.5 % (Ellenberg, 1968). The prevalence of abnormal pedal pulses was found to be higher in our study than previously reported studies. In present study it was observed that Ankle brachial pressure index of less than 0.8 was present in 13.4 % of the patients with diabetic foot. This was similar to prevalence of 10 % reported by (Lavery LA et al, 1998). (Faris I, 1991) reported that Ankle Brachial Pressure index was less than 0.8 in 46.1 % (Reiber GE, 1997) reported that ankle brachial pressure index was < 0.8 % in 35 % in patients in Manchester setting and 24.1 % in Seattle setting. Prevalences of abnormally low ankle brachial pressure index in the present study may be probably because of lower prevalence of smoking in the studied Indian population.

**Conclusion:-**

Peripheral vascular disease was more common among patients with type II diabetes. Ankle brachial pressure index of < 0.8 was commonest among patients with longer duration (> 10 years) of diabetes and in type II diabetes. Higher number of patients with diabetic foot had peripheral vascular disease and ankle brachial pressure index < 0.8. Vasculopathy is important risk factor responsible for diabetic foot especially with longer duration of type II diabetes.

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