

## Screening of Peripheral Arterial Disease in Patients with Diabetes

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### ABSTRACT

**Background:** Out of many atherosclerotic complications, peripheral arterial disease (PAD) is also important one. To prevent morbidity and mortality related with PAD, early detection is must, and is possible by duplex screening. This study aims at screening for PAD in patients with type 2 Diabetes mellitus.

**Methods:** This study is single centered cross-sectional, observational study conducted in department of internal medicine of DMCRI- a tertiary care hospital. A total of 140, type 2 diabetes patients were screened for peripheral arterial disease by duplex ultrasound after taking informed consent and fulfilling inclusion and exclusion criteria.

**Results:** In our study among 140 Participants, 50% are male and 50% are female with mean age of  $57.6 \pm 10.4$  years standard deviation (SD) and mean duration of diabetes was  $8.31 \pm 5.9$  SD years with 13.6% were alcohol consumer; 1.4% were smokers; 59.3% of them had high blood pressure; (28.6%) had dyslipidaemia and 11.4% had hypothyroidism. The prevalence of PAD in type 2 diabetes was 27.1% in our study. The mean of glycated hemoglobin (HBA1c) was  $7.23 \pm 1.75\%$  and while performing analytical test {chi-square ( $\chi$ )}, we found there was no association between HBA1c level and presence of peripheral arterial disease.

**Conclusions:** The prevalence of peripheral arterial disease is high almost more than one quarter (27.1%). Screening of diabetic patients is must especially those aged and high glycated hemoglobin for early detection and effective management of PAD.

**Keywords:** Diabetes mellitus; glycated hemoglobin; peripheral arterial disease; screening

### INTRODUCTION

Peripheral arterial disease (PAD), a marker of atherosclerosis is one of the complications of diabetes mellitus. Potential sequel of this finding in type 2 Diabetes Mellitus (DM) are diverse ranging from cardiovascular morbidity, atherosclerotic nephropathy, the development of foot ulceration, increased risk for amputations and depending on severity, may result in death from any of the mentioned complications of DM.<sup>1</sup> DM also cause asymptomatic neuropathy with asymptomatic peripheral arterial disease, both causes increased morbidity, lead to use of health care resources either individually or in combination.<sup>2</sup>

To overcome from these complications, there are several screening methods for diagnosing peripheral arterial disease. Screening via Duplex ultrasound to detect peripheral arterial disease is one of the reliable methods.

This study aims find out atherosclerosis marker by screening for the peripheral artery disease in type 2 diabetes mellitus and the association between glycated hemoglobin (HBA1c) and presence of PAD.

### METHODS

This is observational, cross-sectional research design conducted at Department of medicine and Radio-

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diagnosis, in Devdaha Medical College and Research Institute (DMCRI), Bhaluhi, Rupandehi, Lumbini province, Nepal. The duration of the study was 30<sup>th</sup> January 2022 to 31<sup>st</sup> July 2022. Ethical clearance was taken from Devdaha Medical College and Research Institute - Institutional Review Committee (DMCRI-IRC). Patient consent was taken both verbally and in written form. A total of 140 patients recruited in daily basis at Out- Patient Department (OPD) of Internal medicine fulfilling the inclusion criteria, as cases should be already diagnosed of type 2 diabetes mellitus with both male and female of age more than 18 years. Exclusion criteria was known case of type 1 diabetes, pregnant woman and those patients who were already had a marker of atherosclerosis like peripheral arterial disease (PAD). Non- probability, purposive sampling technique was opted with sample size calculated using Cochrane formula, taking prevalence of PAD in type 2 diabetes mellitus as 8.6%.<sup>1</sup> So, using this formula sample size was calculated as 121 minimum but we considered total sample of 140.

All recruited patient fulfilling the inclusion criteria were sent to the department of Radiodiagnosis for duplex USG. USG was performed by radiologists using Samsung SonoAceR7 USG machine by the help of linear probe (5-12MHz) and curvilinear probe (2-8MHz) for evaluation of lower limb arteries and reports were sent to medicine OPD with patients. Then the semi-structured questionnaires were filled.

Statistical analysis was done by SPSS (Statistical package for social science) version 25. Descriptive statistics was represented as Mean  $\pm$  Standard deviation (S.D) with 95% confidence intervals for continuous data (age, level of HBA1c, duration of diabetes) and categorical data (gender, alcohol use, smoking, presence of hypertension, dyslipidemia, hypothyroidism, presence of PAD) was depicted as frequency number. For measuring the association between variables, we use correlation test and if correlation test shows significant, we use t- test for quantitative data and chi- square for qualitative data. Statistical significance was assumed at p- value < 0.05.

## RESULTS

In our study, mean age of participants was  $57.6 \pm 10.4$  years standard deviation with minimum of 31 years and maximum of 82 years. The mean duration of diabetes was  $8.31 \pm 5.9$  years; Half of them were male and rest female. Almost 13% were alcohol consumer and 1.5 % were smokers. More than half, (around 60%) of them

had high blood pressure; around one quarter (28.6%) had dyslipidaemia and almost one tenth (11.4%) had hypothyroidism as shown in table 1. The frequency of presence of PAD was 27.1%.

Tables 1. Baseline clinico-demographic profile of Screening of PAD in diabetic Patient.

Variables	Total (n=140)			
	Male (N=70)	Female (N=70)	Total Percent	
Gender	70	70	100	
Alcohol	Yes	14	5	13.6
	No	56	65	86.4
Smoker	Yes	1	1	1.4
	No	69	69	98.6
Hypertension	Present	41	42	59.3
	Absent	29	28	40.7
Known dyslipidemia	Present	22	18	28.6
	Absent	48	52	71.4
Hypothyroidism	Present	5	11	11.4
	Absent	65	59	88.6
Peripheral arterial disease	Present	22	16	27.1
	Absent	48	54	72.9

The mean level of glycated hemoglobin (HBA1c) was  $7.23 \pm 1.75\%$  SD as shown in figure 1. HBA1c was categorized as controlled level group if less or equal to 7% and uncontrolled level group if more than 7%. Also, peripheral arterial disease was categorized as 'yes' or 'No' groups. While performing analytical test {chi-square (x)}, we found that there was no association between HBA1c level and presence of peripheral arterial disease. But clinically when there is increase level of HBA1c, there is increase chance of having peripheral arterial disease as shown in figure 2 and table 2.

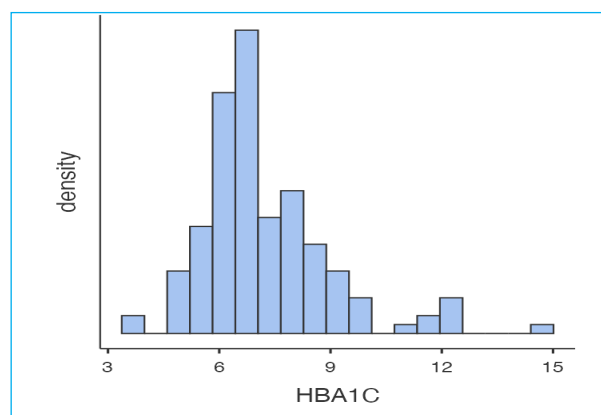


Figure 1. Frequency of Glycated Hemoglobin.

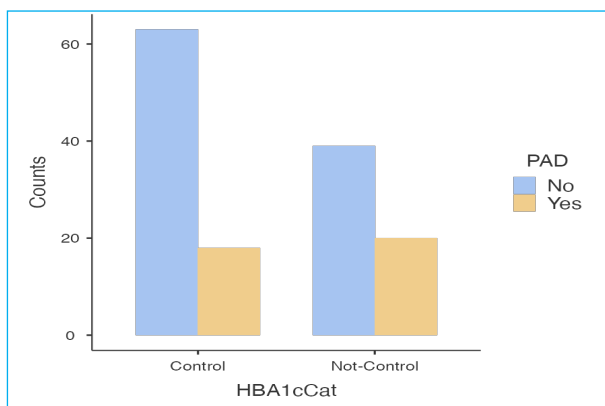


Figure 2. Bar-Plot diagram of relation of HBA1c level and presence of PAD.

Table 2. Contingency table showing correlation of HBA1c level and presence of PAD

HBA1cCat	PAD		Total
	No	Yes	
Control	63	18	81
Not-Control	39	20	59
Total	102	38	140

Note: *chi-square (x) value 2.35, degree of freedom (df) = 1 and significance (p-value) = 0.125*

## DISCUSSION

In this cross-sectional study on 140 participants, mean age  $57.6 \pm 10.4$  years and mean duration of diabetes was  $8.31 \pm 5.9$  years, which is comparable with study done by Agrawal AK et al. and Ali Z et al from India in which mean age was  $59.4 \pm 7.2$  and  $52.22 \pm 9.671$ , with mean duration of diabetes were  $8.8 \pm 3.8$  years and  $9.38 \pm 6.39$ . (2,3) Also, our study showed 13.6% were alcohol consumer; 1.4% were smokers; 59.3% of them had high blood pressure; (28.6%) had dyslipidaemia and 11.4% had hypothyroidism.

The prevalence of PAD in type 2 diabetes was 27.1% in our study. This data is comparable with the study by Akram J et al.; Ghosh U et al.; Ali Z et al.; Shukla V et al.; Umer A et al. studies where prevalence was 31.6%; 53%; 53%; 36%; 41%.<sup>3-7</sup> Though these studies were done in India and Pakistan which are our neighbor countries, the prevalence of PAD in our study is lesser than these. If, we compare our study with western countries like with Janka et al., Walters et al. and the Fremantle diabetes study by Paul et al. where prevalence was 15.9%, 23.5% and 13.65 respectively, our study had higher values than these.<sup>8-10</sup> The prevalence of PAD in south Indians was also found lesser than our study like Pradeepa R et al., Mohan et al. and Premalatha G et al. where prevalence of PAD

in diabetics were 8.6%, 3.9% and 6.3%, respectively.<sup>1,11,12</sup> This difference could be due to education factors, cost factors, food habit, non-compliance of treatment and health policy.

In our study the mean glycated hemoglobin level was  $7.23 \pm 1.75$  % which was close to control range according to American Diabetic Association guideline.<sup>13</sup> Many western studies showed the positive association between increase level of glycated hemoglobin (HBA1c) and increase prevalence of PAD as in studies by Selvin E et al.; Aronow W et al. and Yang C et al.<sup>14-16</sup> But, our study had not showed any association between HBA1c with PAD statistically. But if we go through the data, it showed that when level of HBA1c is higher (uncontrolled as more than 7%), chances of presence of peripheral disease in patients with type 2 diabetes would be higher. This could be due to infrequent use of statins and non-compliance in treatment of patients. There were many confounding factors that could give rise to peripheral arterial disease like age, duration of diabetes, level of sugar on fasting state, dyslipidemia, alcohol, smoking habit, physical inactivity, hypertension. As our study did not show any association between HBA1c and PAD on linear bivariate analysis, we did not perform multivariate regression analysis. Like other study, our study had few limitations like single centered, hospital based, and limited sample size.

## CONCLUSIONS

Almost one quarter of cases with type 2 diabetes can developed peripheral arterial disease. So, screening for PAD in patients with type 2 diabetes is must. Forget about our own guideline, we don't even have such kind of study done in Nepal. Along with many other confounding factors, uncontrolled glycated hemoglobin is associated with increase prevalence of PAD.

Further study with larger sample size, is needed to investigate about the relationship between type 2 diabetes mellitus and peripheral arterial disease with early screening led to early intervention and management of PAD in Diabetes patients by clinicians.

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## CONFLICT OF INTEREST

The authors declare no conflict of interest

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