ISSN: 2754-4516

Journal of Medicine and Healthcare

SCIENTIFIC Research and Community

Review Article

Open Access

The Incidence of Peripheral Arterial Disease in Diabetic Type 2 Sudanese Patients

Sohep Abdalla Osman[1], Nahla Ahmed Mohammed Abdelrahman[2], Mohammed Ahmed Ibrahim Ahmed[3*], Isam Eldeen Eltayeb Osman Ali[4], Onysa Abdallah Aljak Osman[1], Sara Taj Alsir Bakheat Alhassan[1] and Wafaa Mahmoud Mohammed Ali[1]

[1]Assistant professor of Internal Medicine, Endocrinologist, Elsheikh Abdallah Elbadri University-Faculty of Medicine, Sudan

[2]Assistant professor of Biochemistry, Nile Valley University, Faculty of Medicine, Sudan

[3]Assistant professor of Microbiology, Nile Valley University, Faculty of Medicine, Sudan

[4]Assistant professor of Internal Medicine, Cardiologist, Ministry of Health, Sudan, MBBS Medical Students, Final Year, Elsheikh Abdallah Elbadri University-Faculty of Medicine, Sudan

ABSTRACT

Back Ground: Peripheral artery disease (PAD), which is linked to greater mortality rates and a frequent occurrence of impairment in diabetic patients after the amputation of an extremity, is one of the main macro-vascular consequences associated with diabetes mellitus.

Objectives: In order to assess the prevalence and risk of PAD in people with type 2 diabetes (T2DM) at Atbara Teaching Hospital in Atbara, River Nile State, Sudan.

Methodology: A cross-sectional analytic hospital-based study was carried out in Nassir Alden Awadallah Diabetic Center at Atbara Teaching Hospital from July to November 2022. The information was taken from interviews to 100 type 2 diabetic patients who visited the diabetes center and they were selected randomly. The statistical package for social science (SPSS) version 20 was used to examine the data. The participating hospital and the ministry of health approved the present study after conducting an ethical review.

Result: 22% of patients, out of a total of 100%, had PAD manifestations. Age, smoking, and Body Mass Index (BMI) were all correlated significantly with PAD. As a crucial macro-vascular complication of type 2 diabetes, 14% of participants were having lower limbs amputation.

Conclusion: Patients with type 2 diabetes were at high risk for PAD. Age, BMI, and smoking were all strongly linked to PAD.

***Corresponding author**

Mohammed Ahmed Ibrahim Ahmed, Assistant professor of Microbiology, Nile Valley University, Faculty of Medicine, Medical officer, Atbara, Sudan, Tel 00249122570655, 00249912656095.

Received: May 12, 2023; **Accepted:** May 29, 2023; **Published:** May 31, 2023

List of Abbreviations

BMI= Body mass index
PAD= Peripheral Arterial Disease
T2DM= Type 2 Diabetes Mellitus
ABI= Ankle Brachial Pressure Index
CKD=Chronic Kidney Disease

Keywords: Peripheral Arterial Disease, Type 2 Diabetes Mellitus, Atbara

Introduction

Diabetes Mellitus (DM) is a complicated metabolic health condition marked by recurrent hyperglycemia caused by insufficient insulin secretion, insulin resistance, or both. DM is classified into two categories: Type 1 diabetes which characterized by a complete lack of insulin and T2DM which related mainly to insulin resistance [1]. DM requires regular medical attention and multi-dimensional risk reduction strategies because the consequences of T2DM include early micro-complications such as peripheral neuropathy, retinopathy, and nephropathy, along with late macro-complications like peripheral arterial disease, coronary artery disease, and cerebrovascular accident [2].

PAD is an atherosclerotic vascular disease precipitated by obstruction of peripheral arterial vessels that result in ischemia [3]. Patients with PAD are symptomless, with a greater risk of myocardial infarction, stroke, amputations, cardiovascular disease-related fatalities intermittent claudication and muscle spasms [4]. The risk factors for PAD are age greater than 65, tobacco, high blood pressure, chronic kidney disease beside

hyper-homocysteinemia, female sex, dyslipidemia, vitamin D deficiency, black race diabetic duration, glycemic control level, and incidence of peripheral neuropathy [5,6]. Lessen of PAD risk of developing heart disease is by controlling blood pressure, hyperglycemia, cholesterol levels, quitting smoking, consuming a healthy diet, exercise regimen, and ideal weight. Furthermore, anticoagulants prescription drugs should also be administered to enhance blood flow and minimize the possibility of acute limb ischemia. In severe cases of PAD using balloon angioplasty or an arterial bypass to open constrictive arteries, is also possible [7]. To identify PAD using diagnostic assessment of the Ankle-Brachial Index (ABI) and ischemic gangrene. Just after 10 minutes of rest, the ABI, meaning the ratio of systolic blood pressure measured at the ankle to systolic blood pressure brachial. Specialists also use other parameters for the diagnosis of PAD, such as Doppler ultrasonography or magnetic resonance angiography if systolic pressure in the ankle falls below systolic pressure in the brachial [1,6].

Prognostications state that there will be 366 million cases of diabetes worldwide by 2030, up from 171 million cases in 2000 [6]. Compared to the 14 million instances in 2011, there are projected to be 28 million cases of diabetes in Africa by 2030. North Sudan's urban zones were estimated to have a diabetes incidence of around 19%, compared to 2.5% in rural places. Parallel to other developed and developing nations, Sudanese individuals with T2DM have a higher incidence of uncontrolled diabetes (85%) [9]. According to estimates, the total number of individuals with PAD is estimated at 202 million internationally and that DM impacts almost 30% of people with PAD [2,7]. The occurrence of PAD in sub-Saharan Africa extends from 1.7 to 52.5%, with an increasing incidence highlighted in studies that use Doppler-based diagnostic methodologies instead of clinical determination [10].

There is little documentation obtainable relating to the incidence rates of PAD in T2DM patients and the high proportion of amputation processes in Sudan. Atbara Teaching Hospital has received increase in the number of ulcerated diabetic feet. Understanding PAD in the diabetes population might guide direct prospective research and pinpoint probable intervention priorities.

Methodology

Study Design, Area and Study Populations: A descriptive cross-sectional hospital-based study was conducted in Nassir Alden Awadallah diabetic Centre, in Atbara Teaching Hospital. The center accepts all diabetic referred from primary health center of Atbara, Eldamer and Barber localities. 100 diabetic patients of them with or without diagnosed of any of diabetes complications of different ages were included in this study. The study was performed from July to November 2022.

Data Collection Tools: The related demographic data and other significant information was collecting by used closed questions questionnaire consist of demographic and anthropometric measurements and personal medical history and habits. BMI was calculated using the following equation: BMI = (weight in kg) / (height in m)2(Ng M, 2014) [11].

The International Classification of adult underweight, overweight and obesity according to BMI

Class	Reference range
Underweight	<18.50
Normal range	18.50 - 24.99
Overweight	≥25.00
Obese class I	30.00 - 34.99
Obese class II	35.00 - 39.99
Obese class III	≥40.00

Source: http://apps.who.int/bmi/index.jsp?introPage=intro-3.html

Blood pressure (BP) measurement by asked patient to rest 10 minutes in supine position and then BP measured by mercury sphygmomanometer, ABI was calculated by ratio of higher reading of Ankle Systolic Blood pressure SBP to Brachial SBP of the arm. PAD is diagnosed if ABI ratio is less than or equal 0.9. The normal range of ABI ratio from 1.00-1.40. Data was analyzed using statistical Package for social sciences (SPSS) version 20.

Ethical Consideration: The ministry of health's research committee gave permission for the study's ethical considerations, while the management of the Nassir Alden Awadallah Diabetic Center granted their consent. Each patient who volunteered to participate in the study gave verbal agreement before it was carried out, and they were free to withdraw at any moment. Individual data confidentiality would be secure.

Results: In a cross-sectional investigation, 100 individuals with T2DM of both sexes participated. 35 men and 65 women made up the contestants. Participants' ages ranged from 28 to 85 years old, and their mean age was 54 10 years, indicating that they were all elderly. 63 of the participants are Atbara residents, 27 are Berber, and 10 are from the Eldamer region. 30 of the respondents were doing free work, 54 were housewives, and 16 worked for the government. The mean duration of diabetes mellitus (DM) in our study ranged from a few months after the disease was diagnosed to a long time of more than 15 years, therefore we included both old cases of diabetic patients and newly discovered cases. 64 participants were using an oral hypoglycemic medication. According to BMI, 40% of the participants were classified as obese (BMI 30 and above), 30% as overweight (BMI 25–29.9), and the other participants were classed as normal (BMI 18.5-24.9). According to HbA1C level the participants classified into controlled 18% (HbA1C≤7) and 82% uncontrolled (<7). 25% of the participants suffering of dyslipidemia all of them on medication statin group. Regarding hypertension status 32 participant were currently hypertensive. The incidence of PAD was 22%, one participant had severed PAD ankle brachial index reading was 0.3 and one had undetectable ankle pressure in both lower limb, 2 had high reading ABI ratio > 1.3 as calcified peripheral blood vessels (table 1).

Table 1: Distribution of Participants According to Variables

Variable	Characteristic	Frequency%	Variable	Characteristic	Frequency%
Age group\years	< 40 years	5%	Medication of DM	Hypoglycemic	64%
	40-50 years	35%		Insulin	17%
	51-60 years	39%		Hypoglycemic + Insulin	19%
	61-70 years	14%	HbA1C	7 and less	18%
	> 70 years	7%		More than 7	82%
Sex	Male	35%	Dyslipidemia	Have	25%
	Female	65%		Haven't	75%
Residence	Atbara	63%	BMI\Kg/m^2	18.5-24.9	30%
	Berber	27%		25-29.9	30%
	Eldamer	10%		30 and more	40%
Occupation	Housewife	54%	Duration of DM	<=10 years	60%
	Free worker	30%		11-15 years	17%
	Employee	16%		> 15 years	23%
Social habits	Smoker	22%	Hypertension	Have	32%
	Non-smoker	78%		Haven't	68%

BMI= Body mass index; **DM**= Diabetes Mellitus; **HbA_{1C}**=Glycated haemoglobin; **Kg**=kilogram, **m**=meter

78% had not PAD and 64% of participants were normal while 2% were calcified and 1% was in severe stage. Microvascular symptoms were observed in 38% and claudication in 20% while participants without PAD symptoms 42%. 14% undergo non-traumatic lower limb amputation which was end stage disability complication of PAD and 16% had a family history of amputation as a result of DM (table 2).

Table 2: Distribution of participants according to suffering of PAD

Variable	Characteristic	Frequency%
PAD	Have	22%
	Haven't	78%
PAD Stages	Sever	1%
	Mild	21%
	Borderline	12%
	Calcified	2%
	Normal	64%
Symptoms of PAD	Nothing	42%
	Claudication	20%
	Micro-vascular symptoms	38%
Undergo non-traumatic amputation	Have	14%
	Haven't	86%
Family history of amputation	Have	16%
	Haven't	84%

Cross-tabulation between PAD and age, smoking and BMI reveal significant association by p=0.049, p=0.002 and p=0.003 respectively.

Table 3: Cross-tabulation between PAD & Age and BMI

Association between PAD & age			**Association between PAD & BMI**		
Age group	**PAD**		**BMI Group**	**Have**	**Haven't**
	Have	Haven't	18.5-24.9	12	18
< 40 years	1	4		40.0%	60.0%
	20.0%	80.0%		6	24
40 - 50 years	5	30		20.0%	80.0%
	14.3%	85.7%		4	36
51 - 60 years	9	30		10.0%	90.0%
	23.1%	76.9%		22.0%	78.0%
61 - 70 years	6	8		0.003	
	42.9%	57.1%	Association between PAD & Smoking		
> 70 years	1	6	Smoker	10	12
	14.3%	85.7%		45.5%	54.5%
Total	22%(22)	78% (78)	Non-smoker	12	66
p-value	0.049			15.4%	84.6%
			Total	22.0%	78.0%
			P-value	0.002	

P-value significant at ≤0.05

Cross-tabulation between PAD and duration of DM and HbA1C reveal non-significant association by p=0.991, p=0.220 respectively (table 4).

Table 4: Association between PAD & duration of DM and HbA_{1C}

Duration of DM	**PAD**		**HbA_{1C}**	**PAD**	
	Have	**Haven't**		**Have**	**Haven't**
10 years and less	11	49	less than 7 years	2	16
	18.3%	81.7%		11.1%	88.9%
11-15 years	5	12	More than 7 years	20	62
	29.4%	70.6%		24.4%	75.6%
> 15 years	6	17	Total	22	78
	26.1%	73.9%		22.0%	78.0%
Total	22	78	P-value	0.220	
	22.0%	78.0%			
P-value	0.991				

P-value significant at ≤ 0.05

Cross-tabulation between PAD, hypertension, dyslipidemia and CKD reveal non-significant association by p=0.313, p=0.405 and p= 0.274 respectively (table 5).

Table 5: Association Between Pad & Hypertension, Dyslipidemia and Ckd

Hypertension	**PAD**		**Dyslipidemia**	**PAD**		**CKD**	**PAD**	
	Have	**Haven't**		**Have**	**Haven't**		**Have**	**Haven't**
Have	9	23	Have	7	18	Have	3	5
	28.1%	71.9%		28.0%	72.0%		37.5%	62.5%
Haven't	13	55	Haven't	15	60	Haven't	19	73
	19.1%	80.9%		20.0%	80.0%		20.7%	79.3%
Total	22	78	Total	22	78	Total	22	78
	22.0%	78.0%		22.0%	78.0%		22.0%	78.0%
P-value	0.313		P-value	0.405		P-value	0.274	

P-value significant at≤0.05

Discussion

This is across sectional study was conducted in Nusseraldein Awadalla Diabetic Center to estimate the incidence of PAD among T2DM patient.

The prevalence of PAD was found to be 22% with various stages in 100 T2DM patients. This result was consistent with research done in northwest Ethiopia, where 172 individuals had a high incidence of PAD (30.7%), and in India, where 36% of 200 participants had PAD [6]. In line with the findings of the Shukla V, et al. 2018 study, which showed that increasing age, having a high HbA1C, and smoking increase the risk of PAD, there was a significant association between age, smoking, increased DM duration, and PAD risk in the current study [2]. Another study done in South Angola discovered that the age range of 51 to 60 years was the most common for PAD incidence, with decreased prevalence at the extremes of age.

Females exhibit high BMI, which demonstrated a significant association with BMI, in contrast to smoked males. These results contrasted with those of a cross-sectional study conducted in South Angola with 115 patients aged 40 and older, which showed a significant incidence of PAD and hypertension [5]. About 2-5% of hypertension patients present with intermittent claudication, with age-related prevalence rising. Otherwise, hypertension is predominant in 35–55% of patients with PAD at presentation. Because hypertension is regarded as a risk factor for vascular illnesses, including PAD, patients with PAD who also have hypertension have a significantly higher risk of myocardial infarction and stroke [12].

Conclusion

The incidence of PAD among type 2 diabetic patients was high. Age, BMI and cigarette smoking were significantly associated with PAD.

Recommendation

PAD should be screening periodically in all diabetic patient especially in high risk to minimize disability complication of DM by early detection of the disease.

Limitations

Use of less accurate diagnostic method.

References

1. Jameson J, Fauci AS, Kasper DL, Hauser SL, Longo DL, et al. (2020) Diabetes mellitus. Harrison's Manual of Medicine, 20e. McGraw Hill. https://accessmedicine.mhmedical.com/content.aspx?bookid=2738&sectionid=227559769
2. Akalu Y, Birhan A (2020) Peripheral Arterial Disease and Its Associated Factors among Type 2 Diabetes Mellitus Patients at Debre Tabor General Hospital, Northwest Ethiopia. J Diabetes Res 2020: 9419413.
3. Mejias SG, Ramphul K (2018) Prevalence of peripheral arterial disease among diabetic patients in Santo Domingo, Dominican Republic and associated risk factors. Arch Med Sci Atheroscler Dis 3: e35-e40.
4. Okello S, Millard A, Owori R, Asiimwe SB, Siedner MJ, et al. (2014) Prevalence of lower extremity peripheral artery disease among adult diabetes patients in southwestern Uganda. BMC Cardiovasc Disord 14: 75.
5. Paquissi F C, Cuvinje A B P, Cuvinje A B (2016) Prevalence of peripheral arterial disease among adult patients attending outpatient clinic at a general hospital in South Angola. Scientifica 2016: 2520973.
6. Shukla V, Fatima J, Ali M, Garg A (2018) A Study of Prevalence of Peripheral Arterial Disease in Type 2 Diabetes Mellitus Patients in a Teaching Hospital. J Assoc Physicians India. 66: 57-60.
7. Giannopoulos S, Armstrong EJ (2020) Diabetes mellitus: an important risk factor for peripheral vascular disease. Expert Rev Cardiovasc Ther 18: 131-137.
8. Jameson J, Fauci AS, Kasper DL, Hauser SL, Longo DL, et al. (2020a) Peripheral vascular disease. Harrison's Manual of Medicine, 20e. McGraw Hill. https://accessmedicine.mhmedical.com/content.aspx?bookid=2738&sectionid=227558190
9. Almobarak AO, Awadalla H, Osman M, Ahmed MH (2017) Prevalence of diabetic foot ulceration and associated risk factors: an old and still major public health problem in Khartoum, Sudan? Ann Transl Med 5: 340.
10. Mwebaze RM, Kibirige D (2014) Peripheral arterial disease among adult diabetic patients attending a large outpatient diabetic clinic at a national referral hospital in Uganda: a descriptive cross-sectional study. PLoS One 9: e105211.
11. Ng M, Fleming T, Robinson M, Blake Thomson, Nicholas Graetz, et al. (2014) Global, regional, and national prevalence of overweight and obesity in children and adults during 1980-2013: a systematic analysis for the Global Burden of Disease Study 2013. Lancet. 384:766-781.
12. Clement DL, De Buyzere ML, Duprez DA (2004) Hypertension in peripheral arterial disease. Curr Pharm Des 10: 3615-3620.