DOI: https://doi.org/10.53350/pjmhs20221611611

ORIGINAL ARTICLE

Comparison of Angiographic Characteristics of Peripheral Arterial Disease between Diabetic and Non-Diabetics

IKRAM ULLAH[1], SAMI ULLAH[2], SALMAN AHMAD[3], MOHAMMAD ASGHAR KHAN[4], HIKMAT ULLAH JAN[5]
[1]*FCPS (Cardiology), Fellow in Interventional Cardiology, Trainee Medical Officer, Interventional Cardiology Department, Hayat Abad Medical Complex, Peshawar*
[2]*Assistant Professor Interventional Cardiology, MBBS, FCPS Cardiology, Fellow in Interventional Cardiology, Hayat Abad Medical Complex, Peshawar*
[3]*MBBS, MCPS, FCPS (Cardiology), Fellow in Clinical Cardiac Electrophysiology, Trainee Medical Officer at Electrophysiology Department, Hayatabad Medical Complex, Peshawar*
[4]*Associate Professor Cardiology Hayatabad Medical Complex, Peshawar*
[5]*Professor of Cardiology, Hayatabad Medical Complex, Peshawar*
Corresponding author: Sami Ullah, Email: drsami82@gmail.com

ABSTRACT

Background and Aim: Several factors contribute to the poor outcomes of peripheral arterial disease (PAD). The current study examined the results of peripheral transluminal angioplasty (PTA) in diabetics and non-diabetics with peripheral arterial disease (PAD).

Patients and Methods: This cross-sectional study was carried out on 136 peripheral arteries disease patients including 84 non-diabetic and 52 diabetics in the department of Cardiology, Hayatabad Medical Complex, Peshawar during the period from January 2022 to June 2022. This study included patients with PADs who had PTAs performed on their femoral, iliac, infrapopliteal, and popliteal arteries. Study protocol was approved by the research and ethical committee. Patient's demographic details and medical history were recorded. SPSS version 26 was used for data analysis.

Results: The overall mean age was 64.6 ± 10.51 years. Diabetic patients were compared with non-diabetic patients in terms of age (63.8±11.2 versus 65.4± 9.82 years), smoking history (80.7% vs. 46.4%), hypercholesterolemia (25.4% versus 31.9%), and ischemic heart disease (40.6% versus 36.5%). The frequency of hypertensive patients was higher 64.8% in diabetic patients against 40.6% in non-diabetic patients. In terms of arterial segment below the knee and profunda femoris, arterial disease had higher severity in diabetic patients. Diabetic patients were more susceptible to amputation (43.2% vs. 12%, OR=4.8, P=0.001) and had higher mortality (48.9% versus 23.8%).

Conclusion: The present study found that higher prevalence of limb ischemia, amputation, and higher rates of restenosis following peripheral transluminal angioplasty was found in diabetic patients compared to non-diabetic patients. Diabetic patients had poor prognosis and worse arterial disease than non-diabetic patients.

Keywords: Diabetic patients, Angiographic characteristics, Peripheral arteries disease.

INTRODUCTION

Peripheral arterial disease is defined by a steady decrease in blood flow to one or more limbs. Peripheral arterial disease is a complication of atherosclerosis [1]. The peripheral arterial disease rate varies from 2% to 6% for men and women under the age of 50, increasing to.7% for those over the age of 70 [2, 3]. Diabetes, hyperlipidemia, smoking, and high blood pressure are all risk factors for peripheral artery disease [4]. Peripheral arterial disease patients frequently have concurrent cerebrovascular disease, resulting in a shortened life expectancy and poor prognosis [5, 6]. A large proportion of deaths are due to coronary heart disease, while most deaths are due to vascular disease in general [7]. People with peripheral arterial disease are also more likely to have renal artery stenosis [8].

Diabetes is a significant risk factor for peripheral arterial disease (PAD). Patients with PAD are more likely to experience future cardiovascular events such as mortality, myocardial infarction, and stroke. Approximately 20%-30% of the 12 million PAD patients in the United States have diabetes. Diabetes mellitus raises the risk of lower extremity gangrene by a factor of 100. The incidence of non-traumatic lower-limb amputations in the United States is disproportionately attributed to diabetes mellitus. Diabetic individuals with PAD frequently have a high prevalence of calcific and fibrocalcific illness, especially in the distal vasculature. Severe calcification raises the likelihood of short-term problems and complicates peripheral transluminal angioplasty (PTA). It has been found that diabetic patients have greater infrapopliteal illness than nondiabetics with peripheral artery disease, whereas King et al. [9] found that nondiabetics had more Wang et al, [10] discovered that diabetic patients had more involvement of the profunda femoris. The current study examined the results of peripheral transluminal angioplasty (PTA) in diabetics and non-diabetics with peripheral arterial disease (PAD).

METHODOLOGY

This cross-sectional study was carried out on 136 peripheral arteries disease patients including 84 non-diabetic and 52 diabetics in the department of Cardiology, Hayatabad Medical Complex, Peshawar during the period from January 2022 to June 2022. This study included patients with PADs who had PTAs performed on their femoral, iliac, infrapopliteal, and popliteal arteries. Study protocol was approved by the research and ethical committee. Patient's demographic details and medical history were recorded. After intervention, the presence of ≥50% angiographic stenosis in treated segment was considered as binary restenosis. Primary aided patency refers to situations in which the PTA is revised to prevent occlusion or stenosis advancement. Ischemic pain at rest, gangrene, and ulcer in one or both legs caused by clinically established artery occlusive disease was described as critical limb ischemia. The primary outcome was the rate of binary restenosis at 8 months as measured by angiography. During the follow-up period, the secondary objectives were target lesion revascularization, repeat PTA, amputation, and target extremity revascularization (TER).

PTA was performed using standard procedures. A catheter and 0.014 guidewire were employed to cross below-the-knee lesions. Subintimal angioplasty or a retrograde technique was used if intraluminal wiring failed. Following the guidewire passing, balloons ranging in size from 1.5 to 3.5 mm were inflated for 120 seconds. If the balloon angioplasty outcomes were inadequate, provisional stenting with self-expanding nitinol stents was done. True lumen angioplasty was performed for chronic complete occlusion (CTO) in the iliac artery and superficial femoral artery (SFA) using customized 0.018 CTO wires. SPSS version 26 was used for data analysis. For continuous variables, the unpaired t-test or Mann-Whitney rank test were used to assess differences between the two groups. For discrete variables, differences were reported as frequency and percentages and examined using the or Fisher's exact test. A statistically significant two-tailed P-value of.05 was considered.

RESULTS

The overall mean age was 64.6 ± 10.51 years. Diabetic patients were compared with non-diabetic patients in terms of age

(63.8±11.2 versus 65.4± 9.82 years), smoking history (80.7% vs. 46.4%), hypercholesterolemia (25.4% versus 31.9%), and ischemic heart disease (40.6% versus 36.5%). The frequency of hypertensive patients was higher 64.8% in diabetic patients against 40.6% in non-diabetic patients. In terms of arterial segment below the knee and profunda femoris, arterial disease had higher severity in diabetic patients. Diabetic patients were more susceptible to amputation (43.2% vs. 12%, OR=4.8, P=0.001) and had higher mortality (48.9% versus 23.8%). Diabetic patients had insignificant association with non-diabetic patients in terms of age, smoking history, gender, prevalence of intermittent claudication during angiography and follow-up. Gangrene and foot ulcer was found more in diabetic patients than non-diabetic patients. Table-I represent the comparison of variation in baseline characteristics and angiographic indications in diabetic and non-diabetics. Gender's distribution in diabetic and non-diabetic patients are illustrated in Figure-1. Diabetic and nondiabetic individuals had different median arterial occlusion scores as shown in Table-II. Figure-2 depicts the comparison of revascularization levels performed in diabetic and non-diabetic patients.

Table-1: variation in baseline characteristics and angiographic indications in diabetic and non-diabetics

Parameters	Diabetic N=52	Non-diabetic 84	P-value
Age (yrs.)	63.8±11.2	65.4± 9.82	0.39
Smoker N (%)	42 (80.7)	39 (46.4)	0.34
Hypercholesterolemia	13 (25.4)	27 (31.9)	0.001
Ischemic heart disease	21 (40.4)	31 (40.6)	0.0001
Angiography indications N (%) Intermittent claudication Rest pain Foot ulcer Gangrene	 44 (84.6) 3 (5.8) 22 (42.3) 7 (13.5)	 68 (81) 10 (11.9) 7 (8.3) 3 (3.6)	 0.31 0.03 0.001 0.01
Amputation High low	23 (43.2) 17 (32.7) 6 (11.5)	11 (12) 11 (13.1) 0 (0)	<0.001

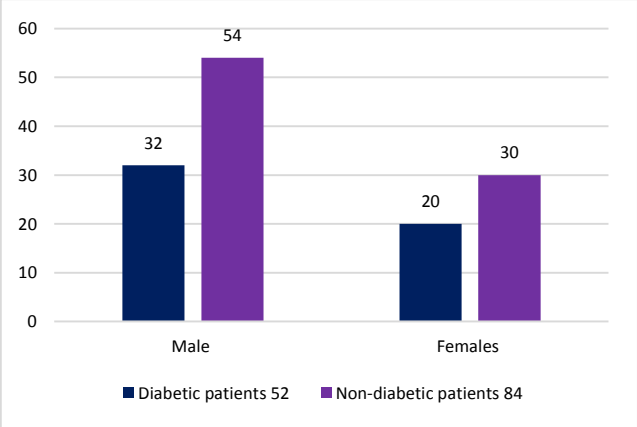

Figure-1: Gender's distribution in diabetic and non-diabetic patients

Table-2: Diabetic and nondiabetic individuals had different median arterial occlusion scores

Arterial segments	Diabetic N=52	Non-diabetic N=84	P-value
Aorta	3.2 (3–4)	3.2 (3–3.5)	0.49
Common iliac	2.8 (2–3)	2.6 (2–3)	0.67
External iliac	2.4 (0–3)	2.9 (2–3)	0.21
Internal iliac	3.6 (0–6)	3.3 (0–4)	0.49
Profunda femoris	3.4 (0–5)	0 (0–2)	0.01
Superficial femoral	8.8 (4–13)	7.3 (2–9)	0.20
Popliteal	7.3 (3–10)	3.2 (0–4)	0.01
Anterior tibial	13.2 (4–15)	3.8 (0–13)	0.001
Peroneal	5.7 (0–15)	0 (0–6)	0.002
Posterior tibial	14.8 (0–15)	4.6 (0–14)	0.001

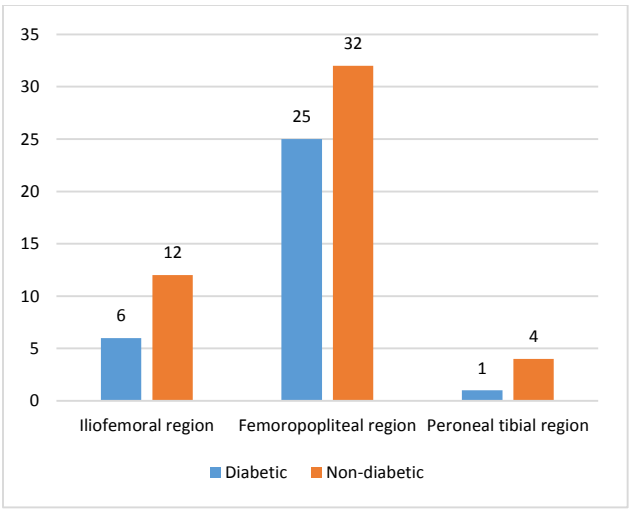

Figure-2: comparison of revascularization levels performed in diabetic and non-diabetic patients

DISCUSSION

The present study mainly focused on comparison of angiographic characteristics in diabetic versus non-diabetic patients with peripheral arteries diseases and found that the prevalence of intermittent claudication during angiography and follow-up among diabetic patients was not significantly different from non-diabetic patients in terms of age, smoking history, gender, or history of intermittent claudication. Diabetic patients were more likely to develop gangrene and foot ulcers. The diabetic patients had a higher rate of limb ischemia, amputation, and restenosis as compared to non-diabetics after peripheral transluminal angioplasty in non-diabetics. Diabetic individuals are more likely to have critical limb ischemia (CLI) because they are predisposed to tissue necrosis, chronic sores, and foot ulcers, which can progress to serious infection or gangrene. Foot ulcers are the cause of around 85% of amputations in diabetes individuals [11, 12]. Arteriosclerosis and peripheral neuropathy are the reasons for development of foot ulcers in PAD. Diabetic peripheral neuropathy can cause loss of protective feeling as well as sympathetic innervation of arteriovenous vascular shunts. Arteriosclerotic alterations can occur at a faster pace in the larger arteries, leading to ischemia situations [13, 14].

According to Chen et al, [15] infrapopliteal illness is highly related with diabetes and CLI. In diabetics with PTA for CLI, the most important objective is to repair ischemic ulcers and save limbs by establishing a direct blood flow to the foot [16].

Diabetes is becoming more common in our community, which will certainly increase the frequency of CLI in PAD. PAD affects around twelve million individuals in the United States [17]. Chronic high blood sugar levels in diabetes significantly enhance the risk of developing PAD, since patients exhibit endothelial and vascular abnormalities that lead to damaged vessel walls, hypercoagulability, and atherogenesis [18]. As a sign of PAD, intermittent claudication is prevalent, and if these symptoms worsen, they can lead to gangrene or limb-threatening infections, known as CLI. Approximately 40 percent of diabetic patients develop necrosis and gangrene as a result of CLI, compared to only 9% of non-diabetics [19, 20].

PVD is more likely in any form of diabetes, however males were shown to have a higher frequency in diabetes. Diabetic patients had lower prevalence of PVD due to age differences in both groups. The prevalence of PVD in the non-diabetic group may be underestimated since the population was smaller and the review rate was lower than in diabetics [21, 22]. However, because urine testing was the primary technique of screening for diabetes,

some undiagnosed diabetic persons may have been included in the non-diabetic category.

It is widely considered that diabetic patients are more prone to illness below the, however the current survey found no evidence of this. Although pulse palpation can only reveal severe occlusive illness, previous research in highly chosen populations may explain for some of the disparity with our results. Previous population studies that used pulse palpation or claudication as a disease marker reported lower prevalence values ranging from 9 to 11% [23, 24]. The sensitivity of pulse palpation and claudication in our study was low, which may have underestimated the frequency of PVD.

CONCLUSION

The present study found that diabetic patients had higher prevalence of limb ischemia, amputation, and higher rates of restenosis following peripheral transluminal angioplasty than non-diabetic patients. Diabetic patients had poor prognosis and worse arterial disease than non-diabetic patients.

REFERENCES

1. Hegde SS, Mallesh P, Yeli SM, Gadad VM, M GP. Comparitive angiographic profile in diabetic and non-diabetic patients with acute coronary syndrome. J Clin Diagn Res. 2014 Sep;8(9):MC07-10. doi: 10.7860/JCDR/2014/9072.4851. Epub 2014 Sep 20. PMID: 25386473; PMCID: PMC4225925.
2. Neupane S, Edla S, Maidona E, Sweet MC, Szpunar S, Davis T, LaLonde TA, Mehta RH, Rosman HS, Yamasaki H. Long-term outcomes of patients with diabetes mellitus undergoing percutaneous intervention for popliteal and infrapopliteal peripheral arterial disease. Catheterization and Cardiovascular Interventions. 2018 Jul;92(1):117-23.
3. Pathak SR, Gajurel RM, Poudel CM, Shrestha H, Thapa S, Koirala P. Angiographic Severity of Coronary Artery Disease in Diabetic and Non-Diabetic Acute STEMI Patients in a Tertiary Care Centre of Nepal. Kathmandu University Medical Journal. 2021 Dec 31;19(4):410-4.
4. Mustapha JA, Saab F, Diaz-Sandoval L, Karenko B, McGoff T. Comparison between angiographic and arterial duplex ultrasound assessment of tibial arteries in patients with peripheral arterial disease: on behalf of the Joint Endovascular and Non-Invasive Assessment of LImb Perfusion (JENALI) Group. Journal of Invasive Cardiology. 2013 Oct 31;25(11).
5. Kamil S, Sehested TS, Carlson N, Houlind K, Lassen JF, N Bang C, Dominguez H, Pedersen CT, Gislason GH. Diabetes and risk of peripheral artery disease in patients undergoing first-time coronary angiography between 2000 and 2012–a nationwide study. BMC Cardiovascular Disorders. 2019 Dec;19(1):1-9.
6. Davidson MH. Cardiovascular risk factors in a patient with diabetes mellitus and coronary artery disease: therapeutic approaches to improve outcomes: perspectives of a preventive cardiologist. Am J Cardiol. 2012;110(9 Suppl):43b–9b.
7. Argyriou C, Saleptsis V, Koutsias S, Giannoukas AD. Peripheral arterial disease is prevalent but underdiagnosed and undertreated in the primary care setting in Central Greece. Angiology. 2013;64(2):119–24.
8. Fowkes FG, Rudan D, Rudan I, et al. Comparison of global estimates of prevalence and risk factors for peripheral artery disease in 2000 and 2010: a systematic review and analysis. Lancet. 2013 July 31.
9. Nozari Y, Oskouei NJ, Khazaeipour Z, et al. Effect of elective percutaneous coronary intervention on left ventricular function in patients with coronary artery disease. Acta Med Iran. 2012;50(1):26-30.
10. Iqbal AT, Salehuddin MD, Ayub MD, et al. A comparative study of coronary angiographic data between diabetic and non diabetic with acute coronary syndrome. University Heart Journal. 2019; 15(1): 34-6.
11. Bharath S, satish G, Aparna P, et al. study of angiography findings in diabetic and non-diabetic patients with cardiac symptoms. International journal of contemporary medical research. 2019; 6(2).
12. Altamirano R, Caponigro M, Carrion G, et al. Incidence of Acute Myocardial Infarction in Patients with Diabetes and Its Association with Mortality and Cardiopulmonary Complications in Puerto Rico. American Journal of Public Health Research. 2016; 4(6): 196-201.
13. Poznyak A, Grechko AV, Poggio P, Myasoedova VA, et al. The Diabetes Mellitus-Atherosclerosis Connection: The Role of Lipid and Glucose Metabolism and Chronic Inflammation. Int J Mol Sci. 2020;21(5):1835.
14. Katakami N. Mechanism of Development of Atherosclerosis and Cardiovascular Disease in Diabetes Mellitus. J Atheroscler Thromb. 2018;25(1):27-39.
15. Hasabi IS, Mudagall GS. A comparative study of angiographic severity of coronary artery disease in diabetic and non-diabetic patients with acut coronary syndrome by gensini scoring system. J Evid Based Med Healthc. 2020;7(21): 1009-13.
16. M Mahmoud HE, A Elsaied AR , Hassan MH, et al. Correlation of glycosylated hemoglobin level with the severity of coronary artery disease in diabetic patients. J Biol Med. 2020; 4(1): 1-5.
17. Malthesh MK, P Mallesh. Coronary Artery Involvement in Diabetic and Non-diabetic Patients with Acute Coronary Syndrome. Int J Sci Study. 2016;3:299–302.
18. Sousa JM, Herrman JL, Teodoro M, Diogo S, Terceiro BB, Paola AA, et al. Comparison of coronary angiography findings in diabetic and non-diabetic women with non-ST-segment-elevation acute coronary syndrome. Arq Bras Cardiol. 2006;86:150-5.
19. Nicholls SJ, Tuzcu EM, Kalidindi S, Wolski K, Moon KW, Sipahi I, et al. Effect of diabetes on progression of coronary atherosclerosis and arterial remodeling: a pooled analysis of 5 intravascular ultrasound trials. J Am Coll Cardiol. 2008 22;52(4):255-62.
20. E. Hope Weissler, Yongfei Wang, Jordan M. Gales, Dmitriy N. Feldman, Shipra Arya, Eric A. Secemsky, Herbert D. Aronow, Beau M. Hawkins, J. Antonio Gutierrez, Manesh R. Patel, Jeptha P. Curtis, W. Schuyler Jones, Rajesh V. Swaminathan, Cardiovascular and Limb Events Following Endovascular Revascularization Among Patients ≥65 Years Old: An American College of Cardiology PVI Registry Analysis, Journal of the American Heart Association, 10.1161/JAHA.121.024279, 11, 12, (2022).
21. Anthony Kronfli, Faiza Boukerche, Daniela Medina, Alex Geertsen, Akshil Patel, Shayann Ramedani, Erik Lehman, Faisal Aziz, Immediate Post-Operative Hyperglycemia After Peripheral Arterial Bypass is Associated with Short-Term and Long-Term Poor Outcomes, Journal of Vascular Surgery, 10.1016/j.jvs.2020.08.126, (2020).
22. Ardwan Dakhel, Moncef Zarrouk, Jan Ekelund, Stefan Acosta, Peter Nilsson, Mervete Miftaraj, Björn Eliasson, Ann-Marie Svensson, Anders Gottsäter, Worse cardiovascular prognosis after endovascular surgery for intermittent claudication caused by infrainguinal atherosclerotic disease in patients with diabetes, Therapeutic Advances in Endocrinology and Metabolism, 10.1177/2042018820960294, 11, (204201882096029), (2020).
23. Katharine L. McGinigle, Daniel G. Kindell, Paula D. Strassle, Jason R. Crowner, Luigi Pascarella, Mark A. Farber, William A. Marston, Shipra Arya, Corey A. Kalbaugh, Poor glycemic control is associated with significant increase in major limb amputation and adverse events in the 30-day postoperative period after infrainguinal bypass, Journal of Vascular Surgery, 10.1016/j.jvs.2019.11.048, 72, 3, (987-994), (2020).
24. Adam J. Nelson, Eric D. Peterson, Neha J. Pagidipati, Atherosclerotic cardiovascular disease and heart failure: Determinants of risk and outcomes in patients with diabetes, Progress in Cardiovascular Diseases, 10.1016/j.pcad.2019.07.001, 62, 4, (306-314), (2019).