Original Research Article

A clinical study of peripheral vascular disease in the lower limbs of diabetics

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Abstract

Introduction: Diabetes mellitus (DM) affects over 170 million people worldwide, with the global burden expected to rise to 366 million by 2030. Impaired insulin production or an insufficient response to released insulin are two of the most common causes of diabetes. Diabetes mellitus (DM) is a substantial risk factor for atherosclerosis, cardiovascular mortality, and morbidity. **Materials and Methods:** A Prospective Study was conducted at Department of General Surgery, Sri Venkateshwara Ramnarayan Ruya Government General Hospital, Tirupati. 100 Type II diabetic patients with peripheral vascular disease were included in the study. Patients fulfilling the inclusion and exclusion criteria are selected. Informed written consent would be taken from patients included in the study. **Results:** In the present study, 52% of the patients were aged above 50 years, 32% aged between 41 to 50 years and only 16% in patients below 40 years age. In the present study, 77% of the patients were males and only 23% were females. In the present study, 15% of the patients had diabetes for 1-5 years, 30% for 6-10 years, 55% of the patients had diabetes for >10 years. In the present study 18% of the patients has HbA1c < 6.5, 82% of the patients has HbA1c >6.5. In the present study, 26% of the patients presented with grade 5 disease, 14% had grade 4 disease, 20% had grade 3 disease, 21% had grade 2 disease and 19% had grade 1 disease according to fontaine classification. **Conclusion:** From this study, it was concluded that there is increased risk of PAD in diabetic patients who need regular checkups for early intervention. Control of diabetes decreases the progress of PAD. Amputations can be prevented by early detection, control of risk factors, appropriate medical management and endovascular procedures.

Key Words: Diabetes mellitus, atherosclerosis, cardiovascular mortality, morbidity.

Introduction

Diabetes mellitus (DM) affects over 170 million people worldwide, with the global burden expected to rise to 366 million by 20301. Impaired insulin production or an insufficient response to released insulin are two of the most common causes of diabetes. Diabetes mellitus (DM) is a substantial risk factor for atherosclerosis, cardiovascular mortality, and morbidity[2].

Diabetic people not only have a higher prevalence of atherosclerotic disease, but their progression is also hastened, accounting for up to 44% of all-cause death. Atherosclerosis caused by diabetes can cause difficulties in all major arterial beds, including the coronary arteries, carotid vessels, and arteries in the lower extremities[3].

Atherosclerotic occlusive disease of the lower limbs is known as peripheral arterial disease (PAD). PAD is linked to a higher risk of lower-extremity amputation and serves as a marker for atherothrombosis in the cardiovascular, cerebrovascular, and renovascular systems. As a result, patients with PAD have a higher risk of MI, stroke, and mortality. In diabetic people, PAD also causes considerable long-term damage. Because of the necessity for a multitude of diagnostic tests, therapeutic procedures, and hospitalizations, treating patients with PAD can be costly.

In individuals with pre-existing DM, age, diabetes duration, and peripheral neuropathy are all linked to an increased risk of PAD. The prevalence of PAD in persons with DM over 40 years of age has been reported to be 20% 9 using ABI to identify PAD. Patients with diabetes who are over 50 years old have a prevalence of 29%. As seen in the United Kingdom Prospective Diabetes Study, the severity and duration of DM are important predictors of both the incidence and the extent of PAD. Each 1% increase in glycosylated haemoglobin was linked to a 28 percent increase in the incidence of PAD, as well as higher rates of death, microvascular complications, and major amputation.Diabetes mellitus is also linked to more severe PAD below the knee (e.g., popliteal, anterior tibial, peroneal, and posterior tibial arteries), whereas smoking is linked to more proximal PAD in the aorto-ilio-femoral capillaries.The risk link between PAD and DM is observed to be reciprocal: while DM is a risk factor for PAD, diabetic people have higher incidence of PAD, up to 30%14. The Hoorn study shed more light on the disparity in PAD frequency between diabetic and non-diabetic patients: glucose intolerance was linked to a 20.9 percent prevalence of an ABI less than 0.9, compared to just 7% in those with normal glucose tolerance.The goal of this study was to evaluate the presentation of peripheral vascular disease in diabetic patients with lower limb symptoms, analyse the clinical outcome based on the amount and degree of blockage, and determine which patients needed surgery.

Aim and objectives of the study

- To assess the presentation of peripheral vascular disease in diabetic patients

Presenting with lower limb symptoms,

- To analyse the clinical outcome based on the level and degree of obstruction
- To evaluate the patients who need surgical intervention

Materials and methods

Study Design

Prospective Study

Study Subjects

100 Type II diabetic patients with peripheral vascular disease.

Study Settings

Department of General Surgery, Sri Venkateshwara Ramnarayan Ruya Government General Hospital, Tirupati.

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Study Period
One Year From the approval by the Ethical and scientific Committee.

Study Methods
Detailed history taking,
Lower limb examination,
Palpating lower limb pulses,
Arterial Duplex examination of lower limbs
Data will be collected in standardized proforma from all the Patients presenting to department of General Surgery, S.V.R.R.G.G.H. Tirupati. Patients fulfilling the inclusion and exclusion criteria are selected. Informed written consent would be taken from patients included in the study.

Methodology
A prospective study was conducted on one hundred patients admitted at the Sri Venkateshwara Ramnaraian Ruya Government General Hospital, Tirupati, India between September 2019 to August 2020, who were Type II diabetic patients with signs and symptoms of the different stages of Chronic Arterial Insufficiency (CAI) of lower extremities verified by ultrasonography. CAI of the lower extremity was determined on the basis of clinical findings and colour Doppler duplex scan echosonography results. Using the conventional method (single-gate) and colour Doppler duplex scan (multi-gate), the presence and localization of stenosis, the segmental predominance (with multisegmental forms) and the degree of progression of stenotic-occlusive lesions were verified. The colour Doppler duplex scan ultrasonography was used to determine the localization of stenotic-occlusive lesion in the study group of patients in the stage of functional ischemia and stage of critical ischemia. In our present study, the age and gender of the diabetic patients presenting with peripheral vascular disease were analysed, effect of uncontrolled diabetes and duration of diabetes on severity of the disease and outcome of the disease were analysed.

Inclusion Criteria
1. Patient informed and written consent
2. Type II diabetic patients with peripheral arterial disease of lower limbs.

Exclusion Criteria
1. Non diabetic patients
2. Patients with juvenile diabetes mellitus
3. Patients below 18 years and above 60 years
4. Patients with renal failure

Results

Table 1: Distribution of study participants by age

	Frequency	Percentage
21 - 30	7	7%
31 – 40	9	9%
41 – 50	32	32%
51 – 60	52	52%
Total	100	100%
Mean ± SD	49.33 ± 10.02	

In the present study, 52% of the patients were aged above 50 years, 32% aged between 41 to 50 years and only 16% in patients below 40 years age.

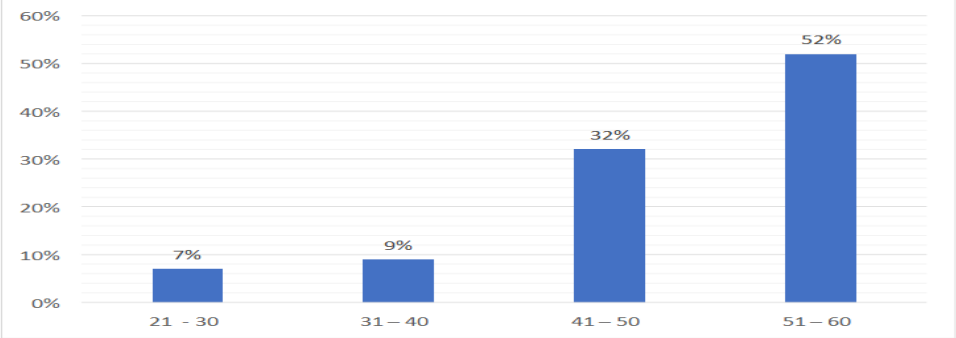

Figure 1: Distribution of study participants by age

Table 2 : Distribution of study participants by Gender

	Frequency	Percentage
Male	77	77%
Female	23	23%
Total	100	100%

In the present study, 77% of the patients were males and only 23% were females.

Table 3: Distribution of study participants by duration of diabetes

Duration of diabetes	Frequency	Percentage
1 – 5	15	15%
6 – 10	30	30%
11 – 15	24	24%
16 – 20	15	15%
21 – 25	16	16%
Total	100	100%
Mean ± SD	12.27 ± 6.53	

In the present study, 15% of the patients had diabetes for 1-5 years, 30% for 6-10years, 55% of the patients had diabetes for >10 years.

Table 4: Distribution of study participants by HbA1c level

HbA1c	Frequency	Percentage
<6.5	18	18%
>6.5	82	82%
Total	100	100%
Mean ± SD	7.87 ± 1.42	
Range	5 – 12	

In the present study 18% of the patients has HbA1c < 6.5, 82% of the patients hasHbA1c >6.5.

Table 5: Distribution of study participants by smoking

	Frequency	Percentage
Yes	63	63%
No	27	27%
Total	100	100%

In the present study, 63% of the patients were smokers and 27% were non smokers.

Table 6: Distribution of study participants by grade of the disease

	Frequency	Percentage
Grade 1	19	19%
Grade 2	21	21%
Grade 3	20	20%
Grade 4	14	14%
Grade 5	26	26%
Total	100	100%

In the present study, 26% of the patients presented with grade 5 disease, 14% had grade 4 disease, 20% had grade 3 disease, 21% had grade 2 disease and 19% had grade 1 disease according to fontaine classification.

Table 7: Distribution of study participants by lower Limb Involved

	Frequency	Percentage
Right	36	36%
Left	29	29%
Bilateral	35	35%
Total	100	100%

In the present study, 36% of the patients had disease in right lower limb, 29% in leftlower limb and 35% had biteral disease.

Table 8: Distribution of study participants by level of obstruction on duplex scan

44	Frequency	Percentage
Aortoiliac	28	18%
Femoropopliteal	45	45%
Multiple segmental	1	1%
Tibio-dorsal	1	1%
Tibio-peroneal	10	10%
No	15	15%
Total	100	100%

In the present study, 45% of the patients had obstruction at the femoro-popliteal level, 18% at aorto-iliac level, 10% at tibio peroneal level, 15% had no obstruction and 1% each at multi segmental level and tibio dorsal level.

Table 9: Distribution of study participants based on severity of occlusion onduplex scan

	Frequency	Percentage
Mild	20	20%
Moderate	35	35%
Severe	30	30%
Diffuse narrowing withno obstruction	15	15%
Total	100	100%

In the present study, 35% of the patients had moderate occlusion, 30% had severe occlusion, 20 % on mild occlusion and 15% had diffuse narrowing with no obstruction.

Table 10: Distribution of study participants based on SpO^2 values

table	Frequency	Percentage
=or> 95	16	16%
< 95	84	84%
Total	100	100%

In the present study, 84% of the patients had SpO^2 <95 and 16% had >95.

Table 11: Distribution of study participants based on management

	Frequency	Percentage
Conservative	37	37%
Open and Endovascular surgery	34	34%
Amputation	29	29%
Total	100	100%

In the present study, 37% of the patients were managed conservatively, 34% were managed by open and endovascular surgery and 29 % patients underwent amputations.

Table 12: Distribution of study participants by Age and Grade of the Disease

Risk Factor	<40 years	41 – 60 years	Total
Grade I	15 (88.2%)	1 (1.20%)	16 (16%)
Grade II	1 (5.88%)	19 (22.8%)	20 (20%)
Grade III	0	20 (24.09%)	20 (20%)
Grade IV	0	16 (19.2%)	16 (16%)
Grade V	1 (5.88%)	27 (32.5%)	28 (28%)
Total	17 (100%)	83 (100%)	100 (100%)

In the present study, 15% of patients who were below 40 years presented with grade 1 disease whereas above 40years, 27% presented with grade 5 disease, 16%presented with grade 4 disease, 20% with grade 3, 19% with grade 2 and only 1% withgrade 1 disease.

Table 13: Distribution of study participants by Age and Level of Obstruction in Doppler

Level of Obstruction inDoppler	<40 years	41 – 60 years	Total
Diffuse vessel wall thickeningwith No obstruction	1 (33.33%)	14 (14.4%)	16 (15%)
Aorto-iliac	0	28 (28.8%)	28 (28%)
Femoro-poplietal	1 (33.33%)	43 (44.3%)	43 (43%)
Multiple segmental	0	1 (1.03%)	1 (1%)
Tibio-peroneal	0	10 (10.6%)	10 (10%)
Tibio- dorsal	1 (33.33%)	1 (1.03%)	1 (1%)
Total	3 (100%)	97 (100%)	100 (100%)

In the present study, 1% of the patients who were below 40 years presented with diffuse wall thickening with no obstruction, femoro popliteal and tibio dorsal obstruction each. In patients above 40 years, 43% presented with femoro popliteal level obstruction, 28% with aorto iliac obstruction, 14% with diffuse vessel wall thickening,10% with tibio peroneal block and only 1% with multi segmental disease.

Table 14: Distribution of study participants by Age and Severity of the Occlusion

Severity of Occlusion	<40 years	41 – 60 years	Total
Skin changes with noocclusion	14 (82.3%)	1 (1.2%)	15 (15%)
Mild	1 (5.8%)	18 (21.6%)	19 (19%)
Moderate	0	35 (42.1%)	35 (35%)
Severe	2 (11.2%)	29 (34.5%)	31 (31%)
Total (n value)	17 (100%)	83 (100%)	100 (100%)

In the present study, in patients above 40 years, 42% had moderate occlusion, 34%had severe occlusion, 22% had mild occlusion and only 1% had just skin changes. Without occlusion. In patients below 40 years age, 82% had only skin changes with no occlusion, 11% had severe occlusion and only 6% had mild occlusion.

Table 15: Distribution of study participants by Age and Outcome of the Disease

Outcome of thedisease	40 years	41 – 60 years	Total
Conservative	13 (86.6%)	23 (27.05%)	36 (100%)
Open and Endovascular Surgery	1 (6.6%)	34 (40.0%)	34 (100%)
Amputation	1 (6.6%)	28 (32.9%)	29 (100%)
Total	15 (100%)	85 (100%)	100 (100%)

In the present study, up to 87% of patients below 40 years were treated conservativelyand 7% were treated with open and endovascular surgery and amputation respectively. 40% of the patients >40 years were managed by open and endovascularsurgery, 33% underwent amputation and 27% were managed conservatively.

Table 16: Distribution of study participants by Gender and Grade of the Disease

Risk Factor	Male	Female	Total
Grade I	17 (22.07%)	0	17 (17%)
Grade II	16 (20.77%)	5 (21.7%)	21 (21%)
Grade III	18 (23.3%)	3 (13%)	21 (21%)
Grade IV	6 (7.79%)	9 (39.1%)	15 (15%)
Grade V	20 (25.9%)	6 (26.1%)	26 (26%)
Total	77 (100%)	23 (100%)	100 (100%)
Yates' Chi-Square = 13.519, df = 4, p = 0.008			

In the present study, 33% of the males presented with grade 4 and 5 disease, 23% presented with grade 3 disease, 22% presented with grade 1 disease and 20% with grade2 disease. In females, 39% presented with grade 4 disease, 26% with grade 5, 21% with grade 2, 13% with grade 3 and no females were asymptomatic.

In present study, 45% of the males presented with femoro popliteal

disease, 21% with aorto iliac disease, 19% with diffuse vessel wall thickening with no obstruction, 12% with tibio peroneal block and only 3% with multisegmental and tibio dorsal disease.
52% of the females had aorto iliac disease, 48% had femoro popliteal disease and 9%had tibio peroneal disease.

In the present study, 31%, 28%, 22% and 18% of the males presented with severe, moderate, mild and no occlusion respectively. In females, 35%, 30%, 20% and 15% presented with moderate, severe, mild and no severity respectively.

Table 17: Distribution of study participants by Gender and Outcome of the Disease

Outcome of the disease	Male	Female	Total
Conservative	31 (40.3%)	5 (21.7%)	36 (100%)
Open and EndovascularSurgery	23 (29.9%)	12 (52.2%)	35 (100%)
Amputation	23 (29.9%)	6 (26.1%)	29 (100%)
Total	77 (100%)	23 (100%)	100 (100%)
Yates' Chi-Square = 0.208, df = 2, p = 0.208			

In the present study, 40%, 30% and 30% of the males were treated conservatively, by open and endovascular surgery and amputation respectively. Among females, 52%, 26% and 22% were treated by open and endovascular surgery, amputation and conservatively respectively.
In the present study, 94% of the patients with grade 1 disease had diffuse narrowing with no obstruction. 60% of those with grade 2 disease had femoro-popliteal block and35% had aorto iliac block. 60% of those with grade 3 disease had aorto iliac block and40% had femoro popliteal block. 68% of the patients with grade 4 disease had aorto iliac block and 33% had femoro popliteal block. Of those presenting with grade 5 disease, 62% had femoro popliteal block and 34% had tibio peroneal block.
In the present study, 88% of those with grade 1 had only skin changes and 12% had mild obstruction. 86%, 14% of those with grade 2 disease had mild and moderate obstruction respectively. 90% and 10% of those with grade 3 disease had moderate and severe obstruction respectively. 93% and 7% of those with grade 4 disease had moderate and severe obstruction respectively. 96% and 4% of those with grade 5 disease had severe and moderate obstruction respectively.

Table 18: Distribution of study participants by Grade of the disease and Severity of theocclusion

Severity	Grade of the disease					Total
	Grade I	Grade II	Grade III	Grade IV	Grade V	
Skin changes With no severity	15 (88.2%)	0	0	0	0	18 (18%)
Mild	2 (11.7%)	18 (85.7%)	0	0	0	20 (20%)
Moderate	0	3 (14.3%)	19 (90.4%)	13 (92.85%)	1 (3.5%)	36 (36%)
Severe	0	0	2 (9.6%)	1 (7.14%)	27 (96.4%)	26 (26%)
Total	17 (100%)	21 (100%)	21 (100%)	14 (100%)	28 (100%)	100 (100%)
Yates' Chi-Square = 223.445, df = 12, p = 0.000						

In the present study, 100% of those with grade 1 and 2 disease were treated conservatively. 100% of those with grade 3 and 4 disease were treated by open and endovascular surgery. 100% of those with grade 5 disease underwent amputation.
In the present study, 100% of those with only skin changes were managed conservatively. 94% and 6% of those with mild disease were managed conservatively and open and endovascular surgery respectively. 86%, 9% and 3% of those with moderate occlusion were managed by open and endovascular surgery, conservatively and amputation respectively. 93% and 7% of those with severe occlusion were managed by amputation and open and endovascular surgery respectively.

Discussion

This study was conducted between September 2019 and august 2020, a total of 100 patients who presented with signs and symptoms of peripheral arterial disease (PAD) were taken into the study. The purpose of this study was to analyse the clinical presentation of patients with PAD, assessing the level and degree of obstruction and finally, the management of those cases.
PAD is a risk factor for increased total mortality and morbidity in Indian population. This risk seems to persist even when PAD is subclinical. Early detection of PAD can lead to better control of risk factors for cardiovascular events and hence, better outcomes[2]. The prevalence of PAD in patients with diabetes mellitus is higher than that of the general population. Chronic arterial insufficiency (CAI) of lower extremitiesis clinically manifested by certain clinical features of functional and critical ischemia, which dependents on the localization of stenotic-occlusive lesions of the arteries, their size, extent of involvement and the development of collateral arterial network. They presented with intermittent claudication or distal trophic lesions, but some subjects were asymptomatic, and the condition was detected during routine physical examination[7]. Currently recommended screening tests include pulse palpation and the ABI[4]. Pulse palpation is easy to perform but varies among observers. The negative predictive value of a posterior tibial pulse is 96%, but the positive predictive value is only 49%. The dorsalis pedis is congenitally absent in 4% to 12% of the population[8].
In the present study, out of 100 participants, 52 patients were in the age group of 51 to 60 years, 32% in the ages 41 to 50 years and only 16% in age below 40 years. Thisbrings the mean age to about 50 years. Of these patients, 77% were males and 23% were females. According to a study by Alla Muthiah et al, the incidence od PAD in males was 22% as compared to 16% in females. In a study conducted by Al-Zoubi NA, a total of 364 patients were analyzed. The prevalence was greater in males thanin females (77.47% vs 22.52%).
In the present study, the frequency of PAD increases with the duration of diabetes, with the mean age being 13 years. About 55% of the patients had diabetes for more than 10 years. 30% of the patients had it for 6 to 10 years and only 15% had it for lessthan 5 years. According to a study by Alla Muthiah, 45% of the patients with PAD had diabetes for less than 10 years where as there was 66% incidence of PAD in those with diabetes for more than 10 years. The prevalence increases also with rising duration of diabetes as shown in the UK Prospective

Diabetes Study (UKPDS): 1.2% at diagnosis of diabetes and 12.5% after 18 years of its evolution[9].

Patients with uncontrolled diabetes, which is reflected in HbA1c values of >6.5, had more incidence of PAD. In the present study 82% of the patients had HbA1c of >6.5 whereas only 18% of the patients had HbA1c <6.5.

Smoking and alcohol were seen to be a secondary risk factor for diabetic patients with PAD. Tobacco cessation is also critical and has been associated with improved outcomes after surgical and endovascular interventions. Such secondary risk factor reduction can help reduce the prevalence and severity of PAD in diabetic patients and also minimize adverse events post revascularization.

There was increased incidence of cardiac disease in diabetic patients with PAD where 5% of the patients had known cardiac disease. With the progression of the disease, the risk of cardio vascular accidents increase significantly.

In the present study, patients presented mostly with ulceration and gangrene that is, 40%. Their presenting complaints were grouped according to Fontaine classification. 20% presented with grade 3 disease. 21% presented with grade 2 disease and 19% with grade 1 disease, which is asymptomatic.

In the present study, 35% of the patients suffered from bilateral disease, 36% sufferedfrom right lower limb involvement and 29% from left.

In the present study, 45% of the patients had femoropopliteal obstruction as identified on duplex scan. 28% had aortoiliac level of occlusion. 15% of the patients had no visible obstruction on duplex imaging. 11% of the patients had tibio dorsal and tibio- peroneal block. Only 1% had multi segmental disease. In the study by Alla Muthiah etal, 60% had femoropopliteal disease and 9% had aorto iliac disease. In the present study, 84% of the patients had SpO^2 of <95 and the remaining 16% had >95 saturation.

In the present study, 37% of the patients were managed conservatively, 34% had open or endovascular surgery and 29% patients underwent amputation. In the study by AllaMuthiah, conservative management by debridement was done in 36% of the patients, amputation in 50% of the patients and revascularisation procedure in 13% of the patients.

As the age increases, the grade of presenting complaint(according to fontaine classification) also increases, as evidenced in the present study where 33% of the patients above 40 years presented with grade 5 disease (gangrene) where as 88.2% of the patients below 40 years presented with grade 1 disease (asymptomatic).

In the present study, 43 patients of >40 years age had femoropopliteal obstruction, 28 patients had aorto-iliac obstruction, 14 patients had diffuse vessel wall thickening with no obstruction whereas <40 years age, only 1 patient had diffuse vessel wall thickening and another patient had femoro-popliteal obstruction.

As the age increases, the severity of occlusion also increases as evidenced in the present study by 76% of the patients aged >40 years had moderate to severe obstruction and 22% had mild to no obstruction. About 82% of patients <40 years had only skin changes with no occlusion.

In the present study 86% of those <40 years and 27% of those >40 years were treated conservatively. 40% of those >40 years had open or endovascular surgery and 33% had amputations done. Only 12% of those <40 years had surgical management done.

In the present study, 96% of those with grade 5 disease had severe occlusion and 88% of people with grade 1 disease had only skin changes with no occlusion.

All the patients with grade 1 and grade 2 disease were managed conservatively and all those with grade 5 disease underwent amputations which included minor disarticulations, above and below knee amputations. In a study by Sharad Pendsay, he concluded that the long-term prognosis of peripheral vascular disease in diabetics is poor because of generalised atherosclerosis, multisystem involvement, advancing age and associated significant coronary artery disease. The risk of major limb amputations, especially above knee and contralateral amputations is high. The mortality within 2 years, in subjects with major limb amputations is also very high[4].

In the present study, 93% of those with severe occlusion on duplex scan underwent amputation. 88% of those with moderate occlusion had open and endovascular surgery. 94% of those with mild occlusion underwent conservative management. All the patients with only skin changes and no occlusion evidenced on doppler underwentconservative management with medicines[10].

Conclusion

From the present study of one year, it was concluded that males are more involved than females but females presented with more severe symptoms. The symptoms increased with the duration of diabetes and were more in those with uncontrolled blood sugars. The most common level of obstruction was found to be at the femoro-popliteal level. Those with complete obstruction presented with critical limb ischemia symptoms like ulceration and gangrene. Most asymptomatic patients had diffuse vessel wall thickening and were managed conservatively whereas those who presented with gangrene or ulceration underwent open or endovascular surgery or amputations. From this study, it was concluded that there is increased risk of PAD in diabetic patients who need regular checkups for early intervention. Control of diabetes decreases the progress of PAD. Amputations can be prevented by early detection, control of risk factors, appropriate medical management and endovascular procedures.

References

1. Armstrong EJ, Waltenberger J, Rogers JH. Percutaneous coronary intervention in patients with diabetes: current concepts and future directions. J Diabetes Sci Technol. 2014;8:581–589.
2. Armstrong EJ, Rutledge JC, Rogers JH. Coronary artery revascularization in patients with diabetes mellitus. Circulation. 2013;128:1675–1685.
3. Marso SP, Hiatt WR. Peripheral arterial disease in patients with diabetes. J Am Coll Cardiol. 2006;47:921–929.
4. Forbang NI, McDermott MM, Liao Y, Ix JH, Allison MA, Liu K, Tian L, Evans N, Criqui MH. Associations of diabetes mellitus and other cardiovascular disease risk factors with decline in the ankle-brachial index. Vasc Med. 2014;19:465-472.
5. Fowkes FG, Rudan D, Rudan I, Aboyans V, Denenberg JO, McDermott MM, Norman PE, Sampson UK, Williams LJ, Mensah GA, Criqui MH. Comparison of global estimates of prevalence and risk factors for peripheral artery disease in 2000 and 2010: a systematic review and analysis. Lancet. 2013 Oct 19;382(9901):1329-40.
6. Setacci C, de Donato G, Setacci F, Chisci E. Diabetic patients: epidemiology and global impact. J Cardiovasc Surg (Torino) 2009;50:263–273.
7. Kaveeshwar SA, Cornwall J. The current state of diabetes mellitus in India. Australas Med J. 2014;7:45– 8.
8. Fowler MJ. Microvascular and Macrovascular Complications of Diabetes. Clin Diabetes. 2008;26:77– 82.
9. McDermott MM. Lower Extremity Manifestations of Peripheral Artery Disease. Circ Res. 2015;116:1540–50.
10. Skyler JS, Bakris GL, Bonifacio E, Darsow T, Eckel RH, Groop L, et al. Differentiation of diabetes by pathophysiology, natural history, and prognosis. Diabetes. 2017;66:241–55.

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