Original Research Article

A STUDY ON DIABETIC FOOT AND ITS ASSOCIATION WITH PERIPHERAL ARTERIAL DISEASE

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A B S T R A C T

Background: Diabetes is the leading cause of non-traumatic limb amputations. Diabetic patients tend to have an ongoing atherogenic process in the peripheral arteries, which is more manifest in patients with diabetic foot. This study aims to evaluate the association between diabetic foot and prevalence of peripheral arterial disease.

Materials and Methods: This prospective study was conducted by the department of surgery over a period of 1 year and included 100 patients with diabetic foot.

Results: The prevalence of peripheral arterial disease in patients with diabetic foot was 54% in this study. The prevalence of PAD was significantly more in male patients, in patients with duration of diabetes >20 years, in patients who have undergone amputation procedures.

Conclusion: With the rising prevalence of diabetes and diabetic foot being associated with higher prevalence of peripheral arterial disease in males, and in patients with diabetes above 20 years duration, one must regulary screen at-risk population for PAD.

Keywords: Diabetes, diabetes foot, peripheral arterial disease.

INTRODUCTION

Diabetic foot ulcers (DFUs) are a major chronic complication of diabetes mellitus (DM) that carry significant medical and social importance. DFUs have a substantial impact on patients' quality of life and result in higher healthcare costs. The prevalence of DFUs in hospitalized diabetic patients ranges from 4-10%. DFUs are also a leading cause of non-traumatic amputations worldwide, with almost 14-24% of DFU patients requiring amputation.[1-4]

The risk of a diabetic patient developing a foot ulcer in their lifetime is estimated to be around 25%. Key risk factors for DFUs include male sex, long-standing diabetes (over 10 years), peripheral neuropathy, abnormal foot structure (e.g. bone deformities, calluses, thickened nails), peripheral arterial disease (PAD), smoking, and poor glycemic control.[5-7]

Diabetic peripheral neuropathy disrupts normal protective mechanisms, making patients prone to unnoticed severe or repetitive minor trauma. Proprioceptive sensory deficits lead to abnormal weight-bearing patterns during walking, causing calluses and ulcers. Motor and sensory neuropathy also results in abnormal foot mechanics and structural deformities. Autonomic neuropathy causes reduced sweating and altered blood flow, promoting skin dryness and fissure formation.[8,9]

Peripheral arterial disease (PAD), defined as stenosis or occlusion of the peripheral arteries, is a major contributor to DFUs. Diabetic patients are associated with a 2-4 fold increased risk of PAD compared to non-diabetic individuals. PAD is an important predictor of foot ulceration in diabetic patients, as up to 50% of DFU patients have concomitant PAD.[10-12]

Interestingly, historical evidence suggests that diabetes-related foot diseases, their association with peripheral arteries and their treatments have been recognized since ancient times, such as in the

mummies of Ramses II and references in the Bible.[13]

The American Diabetes Association recommends ankle-brachial index (ABI) testing for diabetic individuals over 50. Detecting PAD in diabetic foot ulcers is challenging due to altered symptoms and diagnostic limitations. Additionally, the healing of DFUs is influenced not only by the presence of PAD, but also by factors like infection and comorbidities.[14,15]

This study aims to evaluate the association between peripheral arterial disease and diabetic foot in patients presenting to the tertiary health care center in South-India.

MATERIAL AND METHODS

This prospective study was conducted over a period of 1 year in the Department of Surgery, ¬¬-_____.

All diabetic patients aged above 18 years with foot ulceration/ callus/ with complaints with paraesthesias/ with complaints of intermittent claudication pain were included in the study.

Patients with non-diabetic foot ulcers/ diabetic patients with venous ulcers/ ulcers due to malignancy/ patients on corticosteroids/immunosuppressant/ patients with lymphedema.

A detailed history with special emphasis on demographic factors, duration of symptoms, any discoloration, any history of smoking / alcohol intake, or family history of peripheral artery disease was taken. General examination and local examination of the ulcer was done.

The site and size of ulcer, presence or absence of discharge; presence of peripheral pulsations; presence of perception of sensations were examined.

Ankle brachial index was measured of both lower limbs was measured. Radiological investigations such as X-ray, Doppler of lower limbs were done. Patients were followed up every 2 months and physical and radiological examination was done.

RESULTS

100 diabetic patients with foot ulcers were included in the study. Out of the 100 patients, 54% of the patients had peripheral arterial disease.

Average age of patients was 54.6 years. Most common age group of presentation was from 50-60 years.

Males (65%) were more commonly involved than females (35%). Amongst the 54 diabetic patients with peripheral arterial disease, males were more commonly affected (n = 35) than females (n=19).

Majority of the patients were diabetic since 21- 30 years (30%). These patients had the highest prevalence of peripheral arterial disease. There was significant correlation between duration of diabetes mellitus and prevalence of peripheral arterial disease. [Table 1]

In present study, 59% of the patients had diabetic foot ulcers for < 1-year duration. 10% had ulcer >5 years of duration. The association between duration of ulcer and prevalence of peripheral arterial disease was significant. [Table 2]

In present study, 58% of the patients required debridement. The prevalence of PAD was higher in patients who underwent amputations or revascularization procedure. The association between outcomes of diabetic foot with prevalence of PAD was not statistically significant. [Table 3]

In present study, the most common site of PAD is the junction of femoro-popliteal artery. [Table 4]

Table 1: Duration of diabetes mellitus

Duration (in years)	No. of diabetic patients	No. of patients with peripheral arterial disease	P value
< 1 year	10	1	
1-10 years	20	15	
11-20 years	25	12	
21-30 years	30	20	0.01247
>30 years	15	2	
Total	100	54	

Table 2: Duration of ulcer

Duration of ulcer at time of presentation	No. of diabetic patients	No. of patients with PAD	P value
<1 year	59	22	
1-5 years	31	24	0.0024
> 5 years	10	8	
Total	100	54	

Table 3: Outcomes of diabetic foot ulcers

Outcome at hospital	No. of patients	No. of patients with PAD	P value
Debridement	58	13	
Amputation/ disarticulation	32	28	0.0754
Revascularization	10	9	
total	100	54	

Table 4: Location of PAD

Location	No. of patients
Aorto-iliac	1
Iliac	2
Femoral	7
Femoro-popliteal	20
Popliteal	10
Tibial	14
Total	54

DISCUSSION

Due to urbanization and lifestyle changes, the incidence of diabetes mellitus is on the rise. With the increase in patients with Diabetes, are increase in cases of metabolic syndrome, coronary artery disease, diabetic nephropathy, diabetic retinopathy and diabetic foot.

The prevalence of peripheral arterial disease in patients with diabetic foot ulcers is on the rise due to similar pathological processes.

In present study, 100 patients with diabetic foot ulcers have been studied over 1-year period in the Department of Surgery. Amongst the 100 patients, the prevalence of peripheral arterial disease was 54%.

In present study the most commonly affected age group was from 50-60 years. Males were predominantly involved than females. This could be owing to the fact that males have more tendencies to develop atherogenic occlusion of peripheral arteries. Similar to present study, Altoijry A et al16 observed that males were the ones predominantly to get affected.

Evaluation of PAD in patients with diabetic foot ulcers is quite a task due to overlapping of symptoms such as peripheral neuropathy, formation of ulcer and gangrene. The prevalence of PAD is higher in elderly patients due to age related atherosclerotic changes in the arteries. Similar observation was seen in study done by Dua et al.[17]

In present study, diabetic patients with duration of 21-30 years were predominant. Higher the duration of diabetes, higher is the prevalence of PAD as observed in present study. In a study done by Zagreb et al,[17] the duration of diabetes was significantly related to the prevalence of PAD.

In present study, most of the diabetic patients with PAD had underwent amputations/ disarticulations/ revascularization surgery. the association between outcomes and prevalence of peripheral vascular disease was however, not significant. Similar to present study, the observations made by Zagreb et al, also showed significant number of patients undergoing amputations in diabetic patients with PAD.

CONCLUSION

Diabetes mellitus affects multiple organs including the nerves and blood vessels leading to macro and micro complications. Patients with diabetes are at higher risk to develop peripheral arterial disease due to the complex interplay of pathological processes which make the arteries atherogenic. Proper foot care in patients with diabetes is necessary so as to prevent diabetic foot ulcers. Screening for peripheral arterial disease is important so as to minimize/ prevent the morbidity and disabilities associated with amputations or disarticulation of limbs.

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