

Frequency of Peripheral Arterial Disease in Diabetic Foot

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ABSTRACT

OBJECTIVE: To determine the frequency of peripheral arterial disease in patients with diabetic foot.

STUDY DESIGN: Prospective descriptive study.

PLACE AND DURATION: This study was conducted at Medical Unit-IV Liaquat University Hospital, Jamshoro/Hyderabad from February 2007 to August 2008.

PATIENTS & METHODS: Diabetic patients with non-healing foot ulcer, were selected for the study by non-probability purposive sampling technique. Ankle brachial index (ABI) was calculated; peripheral arterial disease (PAD) was diagnosed when ankle brachial index was less than 0.9 and further graded as mild, moderate and severe as per recommendations of American Diabetes Association. Frequencies with proportions in different grades were calculated.

RESULTS: A total of 67 diabetic foot patients were included, amongst which 51 (76.1%) were males and 16 (23.9%) were females. Peripheral arterial disease was found in 30 (44.78%) patients, among them 18 (60%) had mild, 12 (40%) had moderate and none had severe peripheral arterial disease.

CONCLUSION: Ankle brachial index (ABI) is a simple and cheap technique for the diagnosis of peripheral arterial disease (PAD). The PAD is one of the major risk factors for diabetic foot, which can be prevented by monitoring ABI in at-risk patients.

KEYWORDS: Diabetic foot, Peripheral arterial disease, Ankle brachial index.

INTRODUCTION

Pakistan is one of the countries which have highest number of diabetics. According to WHO estimation Pakistan has currently more than eleven million diabetics, the number is estimated to escalate to over 16 million by the year 2030.¹ The country currently ranks 6th according to the number of diabetics and is estimated to jump to the 4th position by the year 2030 if no action is taken.¹ In Pakistan 15% of diabetics suffer from foot problems.² Diabetic foot is one of the disabling complications of the diabetes mellitus which leads to non-healing ulcers and chronic wounds that are difficult to treat and often lead to foot amputations.³

In USA about 15% of diabetics develop foot ulcers during their lifetime and this is the frequent reason of hospitalization in patients with diabetes, accounting for upto 25% of all diabetic admissions in United States.⁴

Various predisposing factors can lead to the development of foot ulcers in a diabetic patients such as foot deformities, neuropathy, trauma, infections and peripheral arterial disease.⁵⁻⁷ Peripheral arterial disease is one of the major complications of diabetes, which can lead to diabetic foot ulcer, which is four times more prevalent in diabetics than in non-diabetics and which can leads to amputations.⁸ Twenty-five percent of all leg amputations are preventable through an organized foot care.⁹ Unfortunately no integrated dia-

betic foot care strategy exists in most of the health-care facilities in this country. Hence, we conducted this study to find out the frequency of peripheral arterial disease in patients of diabetic foot ulcers with the aim that this complication of diabetes may be diagnosed earlier by ABI, which is a simple and cheap method of monitoring PAD so that the preventive measures may be taken at early stages.

PATIENTS AND METHODS

Diabetic patients with non-healing foot ulcer lasting longer than 2 weeks were selected for this study by non-probability purposive sampling technique, which were admitted at Medical Unit-IV Liaquat University Hospital, Jamshoro/Hyderabad, from February 2007 to August 2008.

After obtaining an informed consent, the detailed history of each patient was taken, which included previous treatment received and level of control of Diabetes mellitus. All patients were questioned about occurrence of intermittent claudication and rest pain. General physical examination of all patients in the study was done including palpation of the pulses in the femoral, popliteal, posterior tibial and dorsalis pedis arteries.

A thorough local examination of the foot of each patient was done and graded according to Meggitt Wagner classification¹⁰, i.e. Grade 0=No open lesions; Grade 1=Superficial ulcer; Grade II=Deep ulcer;

Grade III=Bony involvement; Grade IV=Localized gangrene; Grade V=Gangrene of entire foot.

In all patients blood pressure was recorded in both arms by sphygmomanometer and high systolic pressure was considered. Ankle systolic pressure was taken using Doppler ultrasound. The sphygmomanometer was positioned above the ankle, the Doppler probe was positioned at 45° in retromalleolar fossa and the posterior tibial artery was sought with the Doppler signal; the dorsalis pedis was sought if this signal was un-locatable. The pressure value was recorded at this point. Systolic pressure at the brachial artery was recorded by the same method. The corresponding blood pressure was recorded of the right upper and lower limbs, and the left upper and lower limbs to obtain ankle brachial index value, interpreted as per recommendations of American Diabetes Association.¹¹ Ankle brachial index was calculated by dividing ankle systolic pressure by brachial systolic pressure. Peripheral arterial disease was diagnosed when ankle brachial index was less than 0.9, which was further graded as mild, moderate and severe according to ankle brachial index between 0.7-0.9, 0.5-0.69 and less than 0.49 respectively.¹¹ Data were collected on a pre-designed proforma and analysed by SPSS v.14. Frequencies and proportions were calculated for gender, Meggit Wagner classification, and ABI grades (mild, moderate, severe). Means with standard deviations were calculated for age and duration of diabetes.

RESULTS

Out of 67 patients with diabetic foot 51 (76.1%) were males and 16 (23.9%) were females with mean±SD (Range) age of 56.58±10.34 (38-80) years. Mean±SD (Range) for duration of diabetes was 16.95±3.90 (10-25) years. Among 67 study subjects 30 (44.77%) had evidence of peripheral arterial disease. Out of these 30 patients 18 (60%) had mild peripheral arterial disease having ABI between 0.7–0.9, 12 (40%) had moderate peripheral arterial disease having ABI between 0.5–0.69 and none was in severe grade i.e. ABI below 0.49.

Out of 51 male patients 24 (47.0%) had peripheral arterial disease and out of 16 female patients 6 (37.5%) had peripheral arterial disease (Table I).

Out of 30 patients with peripheral arterial disease only 12 (40%) had a history of intermittent claudication, 3 (10%) had rest pain before the development of diabetic foot and 15 (50%) had remained asymptomatic. We graded the patients according to Megitt Wagner classification and found that no patient was in grade 0 and 5, while maximum (35.8%) cases were in grade 1 (Table II).

**TABLE I:
GRADING OF PERIPHERAL ARTERIAL DISEASE
(n=67)**

	ABI Range	Gender	
		Male n= 51(%)	Female n=16 (%)
ABI:			
Normal	0.91 – 1.0	27(52.9%)	10(62.4%)
Mild	0.7 – 0.9	15(29.5%)	3(18.8%)
Moderate	0.5 – 0.89	9(17.6%)	3(18.8%)
Severe	< 0.49	0	0

**TABLE II:
GRADING OF DIABETIC FOOT ACCORDING TO
MEGITT WAGNER CLASSIFICATION (n=67)**

Grades	Gender	
	Male n= 51(%)	Female n=16 (%)
Grade 0	0	0
Grade 1	18(35.3%)	6(37.5%)
Grade 2	22(43.1%)	6(37.5%)
Grade 3	10(19.6%)	3(18.8%)
Grade 4	1(2.0%)	1(6.2%)
Grade 5	0	0

DISCUSSION

The process of atherosclerosis affects the entire vascular system in a diabetic patient and when this process affects lower extremity it leads to peripheral arterial disease and ischaemia. Lower extremity complications in person with diabetes have become an increasingly significant public health concern in both the developed and developing world. These complications beginning with neuropathy and peripheral arterial disease and subsequent diabetic foot wound frequently lead to infection and lower extremity amputation. In order to diminish the detrimental consequences associated with diabetic foot ulcers many of the etiological factors contributing to the formation of diabetic foot ulcers may be identified earlier using simple and inexpensive equipment in a clinical setting.

Our study focused on the occurrence of one of the aetiological factor i.e. peripheral arterial disease in patients of diabetic foot ulcer and we found that 44.77% of patients were having peripheral arterial disease in the study population, which approximately matches with the study of Ince P et al,¹² who found that 42.7% of patients with diabetic foot were having peripheral arterial disease. Ince P et al, who conducted the study in 2007 at United Kingdom also

found that dominant factors influencing healing are cross-sectional area at presentation and the degree of peripheral arterial disease.

Khammash MR et al,¹³ conducted a study on 60 patients of diabetic foot in which they found that ischaemia was present in 35 (58.4%) patients. Among them 27 (45%) had moderate ischaemia (ABI 0.5-0.9) and 8 (13.3%) had severe ischaemia (ABI less than 0.5%) whereas in our study 30 (44.77%) had mild to moderate ischaemic and none was in severe grade. This variation is probably due to difference in presentation of patients to surgeons and physicians because patients present to the surgeons in the advanced stage. In one of the local study performed by Ali SM et al,¹⁴ 58% of diabetic foot patients were having peripheral arterial disease; amongst them 65% were males and 35% were females showing male preponderance. In our study there was also male preponderance i.e. 76.1% of total patients. In our male dominant society especially, males perform most of the outdoor work and hard labour, making their feet prone to wounds and ulcers, which is a great reason of male preponderance in diabetic foot cases.

All these studies prove that main predisposing factor in the development of diabetic foot ulcer is peripheral arterial disease which is preventable. Prevention of diabetic foot ulcer can be accomplished in a primary care setting with a brief history, physical examination and screening. Family physicians have a pivotal role in the prevention or early diagnosis of diabetic foot complication. Unfortunately several studies have found that primary care physicians infrequently perform foot examination in diabetic patient during routine clinical practice,¹⁵ so it is recommended that primary care physicians may properly examine the diabetic patients asking them about symptoms of claudication and rest pain, notice colour changes (blueness or paleness), temperature (coolness) in limbs and look for hair and nail growth on affected limbs (hair loss and deformed nails). Upon suspicion of peripheral vascular disease, the first line study is the ankle brachial index. A reduced ABI (less than 0.9) is consistent with peripheral vascular disease meriting further investigations such as Doppler ultrasound examination, angiography and modern multislice computerized tomography. These measurements may enable clinicians to stratify patients based on risk and help determine the type of intervention, which is essential for successful outcome.

CONCLUSION

Peripheral arterial disease is present in a large

number of patients with diabetic foot, which could be diagnosed earlier by proper history, physical examination and investigations and treated appropriately, Hence preventing the development of diabetic foot. Prevention is the best treatment.

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