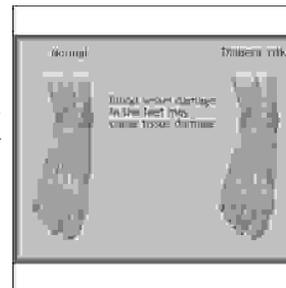


ORIGINAL

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DIABETIC FOOT ULCER GRADES; CORRELATION WITH ANKLE BRACHIAL PRESSURE INDEX



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ABSTRACT... Diabetic foot is one of the most common complications of diabetes mellitus. The management and outcome is very much dependent on proper assessment of foot ulcer severity. **Objectives:** To assess severity of diabetic foot and to find a correlation between Ankle Brachial Pressure Index (ABPI) and foot ulcer grades. **Study design:** Prospective study. **Period:** Jan 2001 to Dec 2003. **Patients & Methods and Setting:** Patients with diabetic foot ulcers from all the medical and surgical units of Ayub teaching hospital Abbottabad were enrolled in the study. **Results:** Ankle Brachial Pressure Index (ABPI) levels revealed 5 (5.8%) with ABPI < 0.5 for grade V, 8 patients (9.3%) ABPI 0.5 – 0.89 for grade IV, 18 patients (20.9%) ABPI 0.9-1 for grade III, 44 (51.2%) ABPI 0.9-1 for grade II, and 9 patients (10.5%) ABPI > 1 for grade I diabetic foot ulcer. This data was analyzed via SPSS version 8.0. **Conclusions:** Ankle brachial pressure index is a good diagnostic tool to assess the lower extremity arterial disease in diabetic foot patients. ABPI readings should be cautiously interpreted as these may be falsely elevated in atherosclerotic patients.

Key words: Ankle Brachial pressure index Meggit Wagners ulcer Grades Diabetic foot.

INTRODUCTION

Diabetes mellitus is a metabolic disorder in which there is increased level of blood glucose as a result of insulin deficiency leading to significant morbidity and mortality. Diabetic foot ulcer is a recognized complication of long-term un-controlled diabetes resulting in microangiopathy and neuropathy. Studies show that prevalence of diabetic neuropathy was 23% and incidence of

peripheral vascular disease was found to be 146 per 1000 people's year. 1 in 100 diabetic patients end up with some sort of minor or major amputation. 5-15 of diabetics will require lower limb amputation during the course of their disease, the US national committee on diabetes estimates¹.

Hashim² et al revealed a six times higher risk of

amputations of diabetic foot patients in Pakistan as compared to western observation. Maggit and Wagner³ assessed diabetic foot ulcer severity through following grades:

Grade of ulcer

S #	Grade of foot ulcer	Grade
1	Foot at risk	0
2	Superficial ulcer, skin deep	I
3	Deep ulcer cellulites	II
4	Osteomyelitis & ulcer	III
5	Gangrene of fore foot	IV
6	Gangrene of entire foot	V

Main underlying pathology in the development of diabetic foot ulcer is micro and macroangiopathy⁴. Distal limb arterial perfusion is non-invasively assessed with the help of Doppler ultrasonography⁵. Normally ABPI level I is considered normal and ABPI level 0.3 – 0.5 is suggestive of eminent necrosis. The purpose of this study was to evaluate and find a co-relation between ABPI and grade of foot ulcer in a sample of Pakistani population.

PATIENTS AND METHODS

This prospective study was conducted in Ayub teaching hospital complex Abbottabad from Jan 2001 - Dec, 2003. A total of 86 patients selected from all over the medical and surgical wards through convenient sampling. The inclusion criteria was all the patients with diabetic foot ulcer, who consented for investigations were included in the study and elderly patients with severe medical comorbidity were excluded from the study. Patients foot ulcers were clinically assessed and graded according to established criteria of Maggit and Wagner.

A detailed history was taken followed by general physical examination and systemic examination; special emphasis was made on peripheral vascular pulses i.e. radial femoral, popliteal, dorsal pedis, posterior tibial and carotid. Full blood count, blood sugar, urea, creatinine,

chest X-ray, ECG, X-ray of affected foot (PA, Cat View) were obtained.

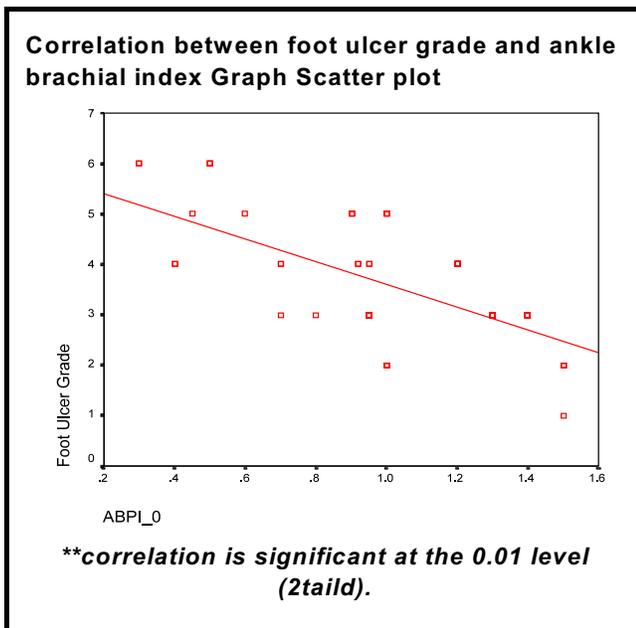
Ankle Brachial pressure index was measured by hand held Doppler ultrasonography and pneumatic cuff arm and mid of corresponding calf. Reading of ankle pressure was the nominator and Brachial was the denominator. Both observations were divided and index was measured. Pearson co-efficient was used to establish any co-relation b/w ABPI and Maggit and Wagner's Grades.

RESULTS

A total of 86 patients were selected. Mean age of pts were ranging from 30-50 years. Female numbers dominate 49 (57%) with poor hygiene 55 (64.0%) 41 (47.7%) were taking oral hypoglycemics while 38 (44.2%) were not taking any medication at all. Majority of patients presented with foot ulcerations, 35 (40.7%). Ulcers were found over bases of metatarsal bones 29 (33.7%). Dorsalis pedis pulse in 73 (84.3%), anterior tibial pulse was palpable in 80 (93%) 4 (51.2%) patients had grade II ulcers while grade III were making 18 (20.0%), both of them constitute 71.2% of all diabetic foot ulcer grades.

Level of ankle brachial pressure index (ABPI) (n=86)			
S #	Level of ABPI	No. of patients	% age
1	<0.5	05	5.8%
2	0.5 - 0.89	8	9.3%
3	0.9 - 1.0	35	40.7%
4	> 1.0	38	44.2%

The above data was analyzed via SPSS version 8.0. Foot ulcer grades were co-related with ABPI levels by using Pearson co-efficient (r). An inverse association was established suggesting more the peripheral vascular occlusion severe will be the foot ulcer grade. The co-relation was significant at the level 0.01 (2 tailed).



DISCUSSION

Diabetic foot ulcer is the most common complication of untreated long standing diabetes. Up to 8% of diabetics develop varying grade of foot ulcer at some point of their lives⁶, macro and micro-angiopathy, neuropathy play a major role in the causation progression and healing of diabetic foot ulcer weight bearing points⁷ of the lower limb are more prone to get ulcers⁸. Higher rates of limb amputations are seen with considerable morbidity and mortality in diabetic vasculopathies⁹. Grade V ulcer patients who had amputations bear 50% more chances of having another amputation with in five years of his life and contralateral foot in involved with in two years time and contralateral half of these patients need amputations^{10, 11}.

Diabetic patients are 20 times more prone to atherosclerosis affecting lower limb extremity vessels hence healing of foot ulcer is significantly reduced¹². Peripheral pulsations are felt by manual palpations but some times false positive pulse is also noticed hence caution should be exercised to rely upon this method for distal pulse intactness especially in those patients who are candidates of amputation¹³. Doppler ultrasonography and measurement of ABPI is a simple non-invasive way of peripheral vascular evaluation in diabetic foot patients.

This imaging modality and ABPI are considered to be reliable guide to assess vascular narrowing. Severity of Ischemia, studies reveal that ABPI has low sensitivity but a high specificity¹⁴.

Female gender was dominating in terms of foot ulcer development 79 (57.0%) contrary to the study conducted by Jamil et al but similar to study by Usman¹⁶ et al. Assessment of ulcer severity revealed MW grade-I 9 (10.5%) MW grade-II 34 (50.0%) MW grade-III 18 (0.9%) while all MW grade-IV 10(11.6%), MW grade-V 5 (5.8%) MW grade-II and III were consistently more than 50% of all grades this observation simulates study by Ahmad M¹⁷ et al.

In grade-I 9 patients had superficial ulcer and ABPI were above-1. This associations were near similar to studies by Aslam M. some patients showed false high. ABPI levels due to calcification of arterial wall. There findings are noted in some of our patients with grade IV and grade I ulcers. There are the patients who need further evaluation by DSA or angiography¹⁸. It is also noted above in grade-III and IV that some of these patients had gangrene but ABPI levels are damped or normal. It has been reported that 35% of diabetic foot ulcer patients with complete distal vessel occlusion have normal Doppler signals. Systolic pressure of more than 55 mm Hg in the ankle is needed for rapid healing of foot ulcers in non-diabetics¹⁹.

RECOMMENDATIONS

ABPI has 100% sensitivity but a low specificity. Falsely elevated ABPI levels are seen in arteriosclerotic patients, who have definite distal Ischemia. This observation demands consideration other investigation modalities before resorting to reconstructive vascular surgery or limb amputations.

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