

Frequency and extent of Foot Lesion and the Susceptibility Pattern of Infective Organisms in Diabetic Foot

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ABSTRACT

Objective: To determine frequency and extent of foot lesion and the susceptibility pattern of infective organisms in Diabetic foot.

Design: (Descriptive) cross sectional study

Place and duration of study: Surgical Unit –II Holy Family Hospital, Rawalpindi completed in 4 months (5 Feb.2008 to 5 June, 2008)

Patients and methods: A total of 50 consecutive patients with diabetic foot lesions were assessed for angiopathy, neuropathy and extent of foot lesion. Necessary investigations including x-ray foot, pus for culture & sensitivity and fungal scraping were carried out.

Results: 40% of total patients were insulin dependent diabetics (IDDM) out of which 80% were on irregular treatment. 52% of total patients were non insulin dependent (NIDDM) out of which 73% were on irregular treatment and 8% of total patients were getting no treatment. Most of the infection

were due to staphylococcus aureus (22%), pseudomonas (18%) Proteus (16%) E.Coli (12%) Streptococci(12%). Angiopathy was present in 62% patients and partial or complete sensory loss was present in 74% patients. 54% patients had Osteomyelitis. 61% patients had partial or complete sensory loss in Grade I, II, III and in (Grade IV&V), 100% patients had partial or complete sensory loss. All the patients in Grade IV&V had random blood sugar values more than 200md/dl, showing poor glycaemic control.

Conclusion: Diabetic foot lesions are more common in older age group, mostly in males and present in fairly advanced grades (Grade III, IV&V). Main contributing factors are sensory neuropathy, angiopathy, poor glycaemic control. Most common infecting organisms are staphylococci and pseudomonas.

Keywords: IDDM, NIDDM, Foot ulcer, Diabetic polyneuropathy, Diabetic Angiopathies.

INTRODUCTION

Diabetic foot problems are global in nature, with no boundaries. They result in major economic consequences for the patients, their families, and the society as a whole. Foot ulcers are more likely to be of neuropathic origin, and are more common in developing countries[1]. Rapid access to expert multidisciplinary service is an essential component of care and there are some pertinent approaches to the treatment of different types of foot ulcers [2]. The principles of management for the diabetic foot include; control of diabetes mellitus, control of infection, repeated debridements and amputation if required. Surgical management depends on the stage of the disease and varies from minor debridements, incision and drainage to amputation [3].

Diabetic gangrene is due to underlying predisposing factors and these factors are atheroma of the arteries

resulting in Ischemia, trophic changes resulting from peripheral neuritis, excess of glucose or hyperglycemia in the tissues, which lower their resistance to infection including fungal infections [4].

Providing patient education and early diagnosis can prevent it. Early referral and prompt treatment are important in the management [5].

A Descriptive study was designed at Surgical Unit II, Holy Family Hospital, Rawalpindi, with the objective to determine the frequency of diabetic foot patients presenting at various stages of the disease and to determine the frequency of infective organisms involved.

Sample Size: Using WHO sample size calculators, where Confidence Interval= 95%, Absolute precision= 0.10%, Prevalence (taken from literature review) = 15% [4,5]. Sample size=50 patients

PATIENTS AND METHODS

This study comprised of 50 consecutive patients presenting to Surgical Unit II, Holy Family hospital, Rawalpindi. A total of 50 consecutive patients with diabetic foot lesions were assessed for angiopathy, neuropathy and extent of foot lesion. Necessary investigations including x-ray foot, pus for culture & sensitivity and fungal scraping were carried out. Microorganisms isolated (Anaerobes, Aerobes, and Fungi). Diabetic foot was treated on the principles of control of diabetes, control of infection, and wound management by dressings & debridement. Diabetic patients presenting with foot complications, irrespective of age, sex and type of diabetes (both diabetes type I and II) in surgical outpatient department and emergency department were selected. Patients already getting treatment and those with chronic liver disease and chronic renal failure, psoriasis, eczema, and other skin problems were excluded from the study.

The data was collected according to Proforma. Permission from Hospital Ethical committee was taken prior to the commencement of the study. Informed written consent was taken from the patients. The data of the patients included information regarding age and sex and patient's diabetic status along with duration of diabetes and type of medication, the foot lesion and its extent, and assessment of peripheral neurological status presence or absence of retinopathy, basic investigation, swab culture and microscopy for fungal infection and involvement of foot wound. This data was analyzed with the help of SPSS version 10. Frequency percentages were calculated for the categorical data, and mean, SD was calculated for the numerical data. Association was determined between age, gender and angiopathy as well as grades of diabetic foot disease and random blood sugar levels.

RESULTS

Males were more affected than females (64% versus 36%). Mean Age of presentation of patients was 53.74 years, the youngest being 35 years and oldest 70 years of age. The mean duration of diabetes of study population was 11.4 years. Minimum duration of disease was 1 year and maximum duration was 25 years. According to Meggitt Wagner classification most of the patients (38%) presented with deep seated infection (Grade II & III), and 36% patients presented with gangrenous foot. Right foot was involved in 62% patients as compared to 32% patients who had left foot

involvement, while 6% patients had involvement of both feet. Mean value of random blood sugar of these patients was 240.98 mg/dl.

In grade I to III there were 32 patients. Out of these 23 patients (71.8%) had one or both distal pulses present and 9 patients (28.2%) had absent pulses. There were 18 patients in grade IV & V. Out of these, 3 patients (16.7%) had dorsalis pedis pulses positive and 15 patients (83.8%) had absent pulses. This shows that angiopathy has direct relation with grades and extent of foot lesion.

In grade IV & V, all the 18 patients (100%) had complete or partial sensory loss, so this signifies that sensory loss plays a very vital role in formation of diabetic ulcers. All the 18 patients in grade IV and V had random blood sugar value more than 200 mg/dl.

Table-1
Percentage of patients adhering to Insulin and oral Hypoglycemics

Medication	Patients		Adherence to Treatment			
	Number(n)	Percent	Regular		Irregular	
			Number(n)	Percent	Number (n)	Percent
Insulin	20	40.0 %	4	20%	16	80%
Oral Hypoglycemic medication	26	52.0%	7	27%	19	73%
None (no medication)	4	8.0%	-	-	-	-

Out of 50 patients, 20 were being administered insulin treatment (40%) and 26 were taking oral hypoglycemic tablets (52%) and 4 were getting no treatment (8%) as given in table-1.

In these 50 patients, 32 patients had an infection of right foot (62%), and left foot was infected in 16 patients (32%). Both feet were infected in 3 patients (6%).

The foot lesion was graded according to Meggitt and Wegner classification. Out of 50 patients, 13 patients were in Grade I (26%), and 11 patients were in Grade II (22%), 8 patients in Grade III (16%), 17 patients were in Grade IV (34%) and 1 patient in Grade V (2%) as shown in Fig-1.

According to the study results in 19 patients both distal pulses i.e. dorsalis pedis and posterior tibial were positive (38%). In 7 patients (14%), only dorsalis pedis was positive & in 24 patients both distal pulses were negative (48%). 8 patients had complete sensory loss (16%) and 30 patients had partial sensory loss (60%) & 12 patients had no sensory loss (24%).

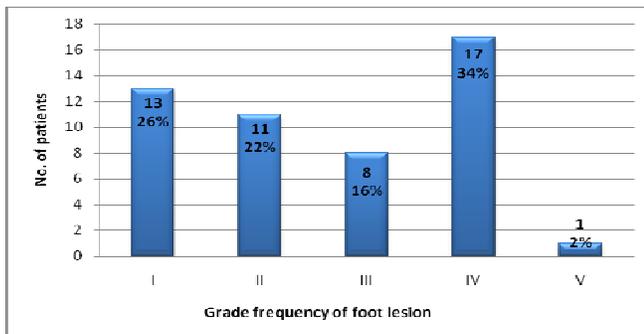


Fig 1: Distribution of Patients according to Grade Frequency of Foot Lesion



Fig-2: Dryness and Eruption of skin due to Autonomic Neuropathy



Fig-3: Partial Gangrene of Foot Grade IV.

In 27 patients (54%) autonomic neuropathy was present and only 9 patients (18%) Out of 50 were present with retinopathy. Similarly Osteomyelitis was present in 27 patients (54%) and in 23 patients osteomyelitis was absent (46%).

Out of 50 patients Staphylococcus aureus was present in 11 patients (22%), E.Coli in 6 patients (12%), Pseudomonas in 9 patients (18%), Streptococci in 6 patients (12%), Proteus in 8 patients (16%), Fungus (candida) in 3 patients (6%), Klebsiella in 1 patient (2%), Poly microbial growth was in 1 patient (2%) and there was no growth in 5 patients (10%), as shown in Fig-4.

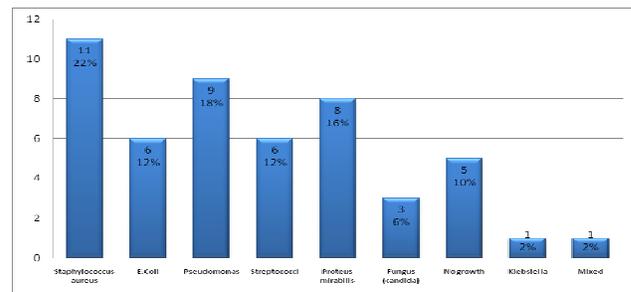


Fig-4: Frequency of Infective Organisms (both bacterial and fungal) on culture/sensitivity

DISCUSSION

Diabetic foot problems are common throughout the world, resulting in major economic consequences for the patients, their families, and society. Foot ulcers are more likely to be of neuropathic origin, and therefore eminently preventable, in developing countries, which will experience the greatest rise in the prevalence of type 2 diabetes in the next 20 years. People at greatest risk of ulceration can easily be identified by careful clinical examination of the feet: education and frequent follow-up is indicated for these patients [6].

The mean age at presentation in our study was 54 years although the youngest patient was 41years old. Another local study shows the same trends regarding age for patients presenting with diabetic foot ulcers [1]. Male sex preponderance is obvious in our study showing a male to female ratio of 1.8:1. Long standing diabetic status also has been associated with development of foot complications. The mean duration of diabetes in our study was 11.4 years. In our study, the glycaemic control was assessed by treatment history and blood sugar levels. Our study shows that most of the patients with higher grade of foot lesion

had poor diabetic control. Absence of protective sensations leads to minor trauma and injuries that remain unnoticed and progress to septic complications. However, our results show that the degree of sensory loss has no direct relation with the grade of foot lesion. Another study showed that patient education may increase self-care practices in the diabetic population regarding better glucose control [7]. Lesser grade lesions responded well to conservative treatment with antibiotic and surgical debridement while those with higher grades needed amputations. Effective glycemic control, timely hospital admissions, appropriate surgical and medical treatment along with patient education in foot care could decrease the morbidity and mortality due to diabetic foot [8]. Foot ulcers account for up to 20% of diabetes-related hospital admissions. Secondary infection of these ulcers is by far the leading cause of amputation of feet and legs and the polymicrobial nature of diabetic foot infection has been well documented in the literature [9].

Peripheral vascular disease in diabetics occurs at a younger age group and has been shown to be a contributory factor in delayed or no healing of diabetic lesions. Our study showed that 16 patients who had absent pulses at ankle were below 60 years of age (32%). 16 out of 24 patients with peripheral vascular disease were males (66.7%), showing the male preponderance.

In a study with multiple regression analysis, primary healing was related to co-morbidity, duration of diabetes, extent of peripheral vascular disease and type of ulcer. In neuropathic ulcers, deep foot infection, site of ulcer and co-morbidity were related to amputation. Amputation in neuro- ischemic ulcers was related to co-morbidity, peripheral vascular disease and type of ulcer. Age, sex, duration of diabetes, neuropathy, deformity and duration of ulcer or site of ulcer did not have an evident influence on probability of amputation [10].

26% of our patients presented with superficial ulcers (Grade I), 38% with deep seated infections (Grade II & III) and 36% with gangrene of a part or whole of foot (Grade IV & V). Thus majority (74%) of patient has fairly advanced disease at presentation that either mandates (Grade IV & V) or progresses (Grade II & III) to amputation and limb loss.

Diabetic foot ulcer management presents a significant challenge for wound care clinicians; numerous approaches to encourage healing in these difficult wounds have been explored. Female gender, small

ulcer size, and the absence of infection were found to have a positive effect on healing all diabetic foot ulcers; improved glucose control had a significant effect on healing wounds managed with the dermal substitute only [11].

In our study, Culture and sensitivity revealed that only 2% of patients with diabetic foot had mixed infections. *Staphylococcus* & *Pseudomonas* were the main contributors (22 & 18% respectively), followed by *Streptococci*, *Proteus* & *E-Coli* (12%, 16%, 12%).

In a study done to analyze the different bacterial frequencies in Diabetic foot lesions, 287 pathogens were isolated from 194 patients, an average of 1.47 organisms per lesion. The most frequently isolated pathogens were Gram-negative bacteria (52%). Gram-positive bacteria accounted for 45% of all bacterial isolates. *Staphylococcus aureus* was predominant (44%) among Gram-positive bacteria, followed by Group B streptococci (25%) and *Enterococcus* spp. (9%). Antimicrobial susceptibility results showed that Gram-negative bacterial isolates were sensitive to imipenem and amikacin while vancomycin showed good activity against Gram-positive bacteria [12].

Staphylococcus aureus was the commonest isolate being recovered from 28% of cases, including methicillin resistant *Staphylococcus aureus* in 9 of 30 (30%) patient wounds. The other organisms isolated were *Pseudomonas aeruginosa* (22%) and *Proteus mirabilis* (18%), anaerobic gram-negative organisms (11%) mainly *Bacteroides fragilis*. The antimicrobial susceptibility testing, showed that vancomycin was the most effective against gram-positive and imipenem was the most effective against gram-negative organisms [13]. *S. aureus* and *P. aeruginosa* were the most common causes of diabetic foot infections. Anaerobic organisms are still a common cause for infection, although the prevalence is less. These wounds may require use of combined antimicrobial therapy for initial management [14].

A better understanding of pathophysiology of diabetic foot disease, development of new antimicrobial drugs and more sophisticated methods of vascular diagnosis and reconstruction as well as better technique in wound care, have all resulted in higher rate of control of these infections together with a higher incidence of foot salvage [15].

CONCLUSION

It can safely be concluded from above study that Diabetic disease usually present in older age group

(above 50 years 60%) and men are the affected more than women (male: female: 1.8:1). In Long standing diabetic status peripheral sensory neuropathy and vascular disease are major contributory factors. Right foot is affected more than left. Contrary to common belief, polymicrobial infection is only present in minority (2%) of patients, however the commonest infecting organisms are found to be staphylococcus aureus and pseudomonas.

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