

# Approach to Managing Diabetic Foot Complications. A Study of 200 Cases

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**Objective:** Diabetic foot complications result mostly from uncontrolled diabetes and it has become an increasingly significant public health concern in both developed and developing world. The aim of this study was to evaluate the surgical management in diabetic foot patients presenting with different complications.

**Design:** A descriptive study.

**Place & Duration of Study:** From April 2007 to March 2008 for a period of one year in Surgical unit I at DHQ Hospital Sargodha.

**Patients & Methods:** This descriptive study was conducted on a total of 200 diabetic patients with different severity of foot infections who presented in casualty and surgical outpatient department in DHQ Hospital Sargodha. Patients under the age of twelve years were excluded from this study; it included patients of both sexes. A detailed history was taken followed by the clinical examination. Routine investigations including complete blood examination, complete urine examination, renal parameters, X ray foot, CXR, ECG and pus for culture and sensitivity were recorded. Lesions were graded according to Maggit Wagner classification and appropriate medical and surgical treatment was carried out.

**Results:** This study was carried out on 200 diabetic patients, out of which one hundred and sixty (80.0%) were male and forty (20%) were female. Male to female ratio was 4:1 Majority of the patients (n=116) were between the age group of 50 to 60 years. In majority of these patients forefoot was involved, mostly big or little toe. Patients were grouped into five grades according to the severity of infection. Forty three (21.5%) patients were managed with antibiotics and dressings, ninety seven (48.5%) patients needed debriedment and skin grafting while sixty (30.0%) needed amputations of different types. Staphylococcus aureus was the commonest organism isolated.

**Conclusion:** There is a high occurrence of foot ulcers with in the population of people with diabetes. Majority of the diabetic foot lesions in our study were in grade II to V. lesser grade lesions responded well to conservative management with antibiotics, dressings and debriedment. While those with higher grades needed amputations. In order to diminish the detrimental consequences associated with diabetic foot, a high standard of care must be provided. Delayed and improper treatment leads to osteomyelitis resulting in amputation and permanent disability or deformity.

**Key Words:** Diabetic foot disease, Infection, Complication.

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## Introduction

Foot problems remain one of the main challenges associated with management of diabetic patients. Physicians who provide ongoing diabetic foot care education, prescribe appropriate shoes and practice an aggressive multi disciplinary approach to wound care can reduce the lower extremity amputations by more than 50%.<sup>1,2</sup> With the availability of insulin therapy since early 1900's, diabetes is no longer fatal disease and with the increased expectancy of life in diabetic patients long term complications have become more common. Most patients are older, but increasing numbers of young patients also develop diabetic foot ulcer and about one third of patients are under 50 years of age.<sup>17</sup> Diabetic foot is the most common complication of diabetes mellitus presenting for surgical management<sup>3</sup>. Before the development of effective antibiotics, the severity of diabetic foot infection almost always needed amputation regardless of peripheral circulation. A better understanding of pathophysiology of diabetic foot disease, development of new antimicr-

obial 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. Diabetic foot infection is graded according to Maggit-Wegner classification regarding the severity of infection at the time of presentation into six grades,<sup>4</sup> (table 1) and is managed accordingly ranging from simple wound debriement to amputation and rehabilitation. Antibiotics are given according to the culture and sensitivity reports. This study was performed to evaluate the outcome of surgical management of diabetic foot disease presenting with varying severity of infections.

## Material & Methods

This descriptive study was carried our in surgical unit I, D H Q Hospital, Sargodha for a period of one year from April 2007 to March 2008. Two hundred patients having long standing diabetes mellitus with foot complications present-

**Table 1:** *Maggit-Wegner classification of Diabetic foot ulcer.*

Grade of Ulcer	Characteristics
0	High risk foot with no ulceration
I	Skin involvement
II	Skin & soft tissue involvement
III	Skin, soft tissue & bone involvement
IV	Localized gangrene (forefoot, heel or toes)
V	Gangrene of entire foot

**Table 2:** *Age Distribution n=200.*

Age (in years)	Number of Patients	Percentage (%)
<40	22	11%
40—50	24	12%
50—60	116	58%
Above 60	38	19%
Total	200	100%

ing with different severity of foot infections, were included in this study. Ninety two (46.0%) patients were admitted through casualty department due to septic lesion or gangrene of the foot while one hundred and eight (54.0%) patients were admitted through surgical out patient department. Data was collected by taking a detailed history and clinical examination of the foot. Description of the wound or ulcer on the foot was noted. These patients were thoroughly examined for any other systemic complication of diabetes mellitus and were investigated for any such problem. Investigations done included complete blood examination, complete urine examination, blood sugar profile, renal parameters, X-ray foot, CXR, ECG, plain insulin was started according to the blood sugar level and urine sugar reports, pus from the ulcer was sent for culture and sensitivity. Broad spectrum antibiotics were prescribed accordingly.

**Table 3:** *Surgical Management of Diabetic Foot n = 200.*

Grade of Ulcer	Management	No. of Patients	Percentage
I	Debridement and non-stick of dressing	43	21.5%
II	Debridement and skin grafting	97	48.5%
III	Rays amputation	20	10.0%
IV	Local radical surgery	23	11.5%
V	Proximal amputation	17	18.5%

Patients were evaluated and managed by grading their disease according to Wegner’s classification, considering the severity of infection at the time of presentation. The management was planned according to the grade of infection. Both medical and surgical treatment methods were used. Surgical procedures carried out were debridement, incision drainage, skin grafting and amputations of different types. Postoperatively most patients needed repeated dressing and wound toilet. Patients were discharged with instructions for proper care of foot and toes. Patients requiring amputation were rehabilitated by physiotherapists.

**Results**

In this study 200 patients with diabetes mellitus having foot infections were included. 160 patients (80%) were male, while 40 patients (20%) were female. Male to female ratio 4:1. Most of the patients (n = 116, 58%) were between the age of 50-60 years (table 2). After thorough physical examination and investigations, these patients were grouped into five grades, according to Maggit- Wegner classification.

Treatment strategy was planned according to grade of infection at the time of admission as shown in table III. 97 patients (48.5%) were having grade I and II infection, and were managed conservatively with debridement and skin grafting. While almost one third of the patients which is 60 (30.0%) needed amputation of different types (table 3).

Staphylococcus aureus was the most common organism isolated from the wound of 131 patients (65.5%). Other organisms isolated are shown in table IV. In most patients Clindamycin Amoxicillin plus clavulenic acid were used as reported by culture and sensitivity reports. In patients with grade III and above I/V antibiotic therapy including quinolones or fucidic Acid were used.

In this study most common postoperative complication observed was wound infection in 25 patients (12.5%). 11 patients (5.5%) had stump dehiscence, 8 (4.0%) developed septicemia while 3 patients (1.5%) had gas gangrene as shown in table V. Average hospital stay in these patients was two weeks. All patients were advised follow-up three months along with proper control of diabetes mellitus.

**Discussion**

Long standing diabetes mellitus leads to multi-system complications. Foot ulcers develop in 20-30% of such patients<sup>5</sup>. As reported in a study conducted in U.S.A one out of every four diabetic patient will develop some kind of foot problem during his life time<sup>6</sup>. This infection of foot in a diabetic patient is pri-

marily due to neuropathy, ischemia and altered host response to infection. However in our population the major problem is gross infection in patients with diabetic foot. Major contributing factors for late presentation include bare foot gait, attempts at home surgery, trust in quacks and unskilled personals and undetected diabetes.<sup>7</sup> It is more common in males, which form 80% of our patients with diabetic foot and 20 % females, with male to female ratio of 4:1. A study done by Munawar J showed that patients who develop foot ulcers are more frequently males having diabetic mellitus for long duration and usually have non palpable pedal pulses and reduced joint mobility.<sup>8</sup> In another local study 66.6% were male and 33.3% were female.<sup>18</sup>

In our study 21.6% patients were with superficial ulceration and erythema, 10.8% had deep ulceration with hard granulation tissue, 40.9% had osteomyelitis, 8.8% had gangrenous patches on pressure areas while 18.3% patients had gangrene of foot. In another local study common presentations were patients with ulcers 21%, abscess in 31% and gangrene in 12.5%.<sup>18</sup> As patients come with advanced disease to surgeons so for this reason patients with grade III to V are in majority in our study.

Diabetic foot infection is usually polymicrobial in nature consisting of gram positive and gram negative aerobes as well as anaerobes. However the most common microorganism isolated is staphylococcus aureus followed by streptococcus and pseudomonas.<sup>9</sup> In this study staphylococcus aureus was isolated from culture of pus in 65.8%, whereas staphylococcus aureus was isolated in 54% of cases in a study done by Zafar A.<sup>18</sup> However when deeper tissues are invaded by the organisms, anaerobes are more frequently found.

Depending upon the extent of foot infection, lesions are graded into five groups as in Maggit-Wegner classification.<sup>4</sup> For grade I and II disease broad spectrum antibiotics such as clindamycin along with gentamicin or amoxicillin plus clavulenic acid are usually prescribed for at least 2-4 weeks.<sup>10</sup> However ciprofloxacin and metronidazole have also been found useful.<sup>8</sup> In our study 21.5% patients were treated with antibiotics and debridements. Fusidic Acid (Fucidin) 250 mg twice a day was used in our patients having long standing non healing superficial ulcers of the foot with good results. Patients having grade III grade V disease needed some form of amputation for their management and comprises a bulk of patients. In our study 30.0% patients were in these grades like an other local study whereas 36% needed amputations.<sup>18</sup> In our study 48.5% patients had skin grafting. In our study 12.5% patients develop wound infection, 4% patients gone into septicemia and 1.5% patients develop gas gangrene.

Diabetic foot complications are the most common cause of non traumatic lower extremity amputations in the Indus-

**Table 4:** *Organisms Cultured n=200.*

Infective Agent	No. of patients	Percentage
Staphylococcus aureus	131	65.5%
Pseudomonas aeruginosa	13	6.5%
Proteus vulgaris	16	8.0%
Others	40	20.0%

**Table 5:** *Postoperative Complications n=200.*

Serial No.	Postoperative Complication	No. of Patients	Percentage
1.	Wound infection	25	12.5%
2.	Septicemia	8	4.0%
3.	Gas gangrene	3	1.5%
4.	Stump dehiscence	11	5.5%

trialized world. The risk of lower extremity amputation is 15 to 46 times higher in diabetics than in persons who do not have diabetes mellitus.<sup>11,12</sup>

Furthermore, foot complications are the most frequent reason for hospitalization in patients with diabetes, accounting for up to 25 percent of all diabetic admissions in the United States and Great Britain.<sup>13-15</sup> Repeated debridement and incision drainage of abscess along with wound toilet with hydrogen peroxide is needed frequently in such patients.<sup>16</sup>

**Conclusion**

Diabetic foot infections being the most common complication of diabetes mellitus reporting to surgeons require multidisciplinary approach for its management. Effective control of infection and diabetes itself along with surgical procedures required according to the grade of infection are the most important steps in the management of such patients. Thorough and repeated examination and necessary investigations to assess the grades of infection at the time of presentation are very essential. Some time there is underlying osteomyelitis of the foot bones in patients presenting only with small superficial ulcer. If not treated properly minor infection can complicate into more grade of severity leading to deformity and disability. It is recommended that patient should be trained for care of foot and prevention of infection at the time of discharge, and those having amputation needs rehabilitation. Prophylaxis and appropriate management of patients at risk of developing foot ulcers would contribute to reduce the number of amputations among diabetic patients.

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