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## Clinical Profiling and Therapeutic Outcomes in Diabetic Foot Ulcer

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### ABSTRACT

Diabetes is one of the chronic causes of diabetic foot ulcers. Diabetes was expected to affect 131 million people globally in 2000, with a projected increase to 366 million by 2030. Diabetes foot ulcers are thought to account for around 20% of hospital admissions among diabetic individuals. The purpose of this study is to assess the disease burden in terms of clinical outcomes and surgical intervention of diabetic foot ulcer patients at our hospital, including debridement and amputation. Between December 2020 and April 2021, 50 diabetic foot ulcer patients were admitted to the Department of General Surgery at the NRI Institute of Medical Sciences and Hospital in Mangalagiri, chinnakakani, Krishna dist., Andhra Pradesh, India. The male to female ratio was around 1.7. The age range 56-65 years had the highest number of patients. Most of the patients had history of diabetes in between 5 to 10 years. Surgical complications were more common in male patients than female patients. Staphylococcus aureus was the most common organism found in culture report. The mainstay of treatment was a conservative approach that included diabetes control with human insulin, antibiotics, and wound debridement. The surgical procedure opted were split skin grafting, disarticulation and below knee amputation in few cases. In our study, there was no mortality. The success of diabetic foot ulcer management depends on prevention, early assessment and treatment by multidisciplinary approach.



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### INTRODUCTION

One of the most prevalent manifestations of diabetes foot is a diabetic foot ulcer. It is characterized as a collection of illnesses in which neuropathy, ischemia, and infection cause tissue disintegration, culminating in morbidity and, in severe cases, amputation. Diabetes is one of the most prevalent chronic

diseases; according to one estimate, there were 285 million diabetics worldwide in 2010, with that number anticipated to rise to 439 million by 2030. Diabetic foot ulcer (DFU) incidence in the general population is estimated to be between 1.0 and 4.1 percent per year. It's possible that the lifetime incidence is as high as 25%.

Surgical debridement, removal of distal osseous and soft tissue structure, endovascular intervention, daily dressings, strict glycemic control, and intravenous antibiotic therapy may be required for infection eradication in these cases. Despite the fact that we are all aware of the clinical relevance of diabetic foot ulcers, descriptive data on demographical and clinical factors in diabetic foot ulcers has been rare in Indonesia till now. The current study's goals are to [1] document the clinical profile and outcome of diabetic foot hospitalization, and [2] provide a report that may be utilized to improve diabetic foot care management.

Diabetic foot ulcers are open sores or lesions that develop on the bottom of the foot in around 15% of diabetics. 6 percent of people who get a foot ulcer will end up in the hospital due to infection or another ulcer-related problem [3, 4]. The lesions that occur in a diabetic patient's foot are referred to as the anatomical region underneath the malleoli. Patients with infection, septicemia, or gangrenous tissue that required amputation, difficult wound therapy, or co-morbid illness were admitted to DFU [5]. By integrating first-line medical care, revascularization if required, surgical management, and second-line limited lower extremity amputation (LEA) surgery, the techniques were aimed to improve limb salvage rate and healing time [6]. An endocrinologist or surgeon will serve as the primary physician and treat the patients in close proximity.

To relieve pressure on ulcers, all patients were told to stay in bed or use crutches, and casts were only available to those who could afford them. Antibiotics were given when clinical signs of infection were apparent. A superficial skin lesion was treated with local treatment (debridement, dressing), whereas an abscess was incised and emptied. All contaminated lesions were debrided as soon as possible [7, 8]. Managing infection sometimes necessitated many debridements. Osteomyelitis without peripheral vascular dysfunction was treated with limited bone resection (PAD). When severe PAD was discovered, angiography was used to guide revascularization as soon as the patient's overall health improved as a consequence of medical treatment. To treat gangrene, various degrees of amputation were utilized. In life-threatening situations of infected ischemic limbs, LEA was also recommended. The Wagner classification will be used to inspect and treat patients, taking into account the severity of the infection as well as the presence of PAD at the time of presentation [9]. From the time of admission until the time of release, the length of stay in the hospital was calculated. Treatment Debridement, unloading, and infection management are the three most important aspects of diabetic foot ulcer treatment. To reveal viable tissue, all necrotic tissue, peri-wound callus, and foreign substances must be removed. To reduce the possibility of infection and peri wound pressure, which can both hinder normal wound contraction and healing, proper debridement is essential [10]. The wound should be irrigated with saline or cleaner and dressed after debridement. Dressings should protect the wound from infection, keep the tissue moist, and absorb excess fluid. Hundreds of dressings, including hydrogels, foams, calcium alginates, absorbent polymers, growth factors, and skin replacements,

are available on the market.

In double-blind placebo-controlled experiments, becaplermin, which contains  $\alpha$ -chain platelet-derived growth factor, was shown to significantly enhance the incidence of complete wound healing. Its usage for ulcers that do not heal with standard dressings should be investigated. Incision and drainage, as well as debridement of all abscessed tissue, are necessary in the event of an abscess. Many limbs have been saved as a result of timely incision and drainage therapies; yet, many limbs have been lost as a consequence of failure to carry out these procedures. When antibiotics are used alone to treat a deep abscess, effective treatment is delayed, resulting in increased morbidity and mortality. Many limbs have been saved as a result of timely incision and drainage therapies; nevertheless, many limbs have been lost as a consequence of failure to perform these operations. When antibiotics are used alone to treat a deep abscess, effective treatment is delayed, resulting in higher morbidity and mortality. Armstrong et al. found that utilizing an "instant TCC," which was made by wrapping a detachable cast walker in a layer of cohesive bandage or plaster of Paris, they were able to achieve identical healing rates. TCCs should not be utilized in deep or draining wounds, especially in noncompliant, blind, morbidly obese, or severely vascular impaired people.

Detachable cast walkers are popular among clinicians because they eliminate some of the disadvantages of TCCs. The flexibility to remove the dressing allows for regular wound inspection, dressing changes, and infection detection early on. Removability, on the other hand, is the most important disadvantage, since studies have shown that patients only wear them 30% of the time when walking (frequently to and from the doctor's office) [11]. Post-operative shoes or wedge shoes are also used, which must be large enough to accommodate heavy dressings. Proper unloading is the most challenging for clinicians dealing with diabetic foot ulcers. Polymicrobial infections are more prevalent in diabetic foot infection patients. Methicillin-resistant *Staphylococcus aureus*, *Beta-hemolytic streptococci*, *Enterobacteriaceae*, *Pseudomonas aeruginosa*, and *enterococci*. *Bacteroides*, *streptococcus*, and *streptococcus* are rarely the predominant pathogens, although they can be seen in mixed infections with aerobes. Antibiotics used to treat serious or life-threatening infections should have coverage for both gram-positive and gram-negative bacteria, as well as aerobic and anaerobic bacteria. Such wounds should be brought to the hospital and treated with intravenous antibiotics. In the outpatient context, medicines such as cephalexin,

amoxicillin-clavulanate potassium, moxifloxacin, or clindamycin can be used to treat mild to severe infections with localized cellulitis. Antibiotics should be started once the initial cultures are obtained and modified as needed [12].

**Preventing infections** In diabetic foot infections, polymicrobial infections of the limbs are prevalent. Methicillin-resistant Common infections include *Staphylococcus aureus*, -hemolytic streptococci, Enterobacteriaceae, *Pseudomonas aeruginosa*, and enterococci. *Bacteroides*, *Peptococcus*, and *Pepto streptococcus* are rarely the predominant pathogens, but they might appear in mixed infections with aerobes. Antibiotics used to treat serious or life-threatening infections should have coverage for both gram-positive and gram-negative bacteria, as well as aerobic and anaerobic bacteria. Such wounds should be brought to the hospital and treated with intravenous antibiotics. In the outpatient context, medicines such as cephalexin, amoxicillin-clavulanate potassium, moxifloxacin, or clindamycin can be used to treat mild to severe infections with localized cellulitis. Antibiotics should be started when the initial cultures are obtained and modified as needed [10].

### Prevention

Diabetic complications can be prevented. Diabetes is a long-term metabolic disorder that has a wide range of effects on the circulatory system. Diabetes' metabolic implications should all be addressed at the same time, with no priority given to one metabolic condition over another. Diabetes-related metabolic problems should be treated, and target levels should be kept below the needed minimum. As a result, prophylactic interventions to minimize neuropathy and PAD, which are the major causes of DFU, should be adopted. The following are some of the preventive measures [13] and diabetic complications treatment options:

1. Altering one's lifestyle
2. Cessation of Smoking
3. Controlling the blood pressure
4. Lipid management
5. Glycemic control
6. Diabetic patients should inspect their feet on a regular basis for nail and skin maintenance.

At least once a year, all diabetics should get their feet thoroughly examined. The goal of this inspection is to find out what circumstances are likely to cause a

foot ulcer and, as a result, amputation of the affected organ. The physical examination includes observing and palpating pulses in the lower limbs, particularly the posterior tibial and dorsalis pedis pulses. The physical examination also includes neurological tests. At least two neurologic tests are performed, one of which uses a 10 g monofilament to measure the protective sensation. Vibration feeling using a 128 Hz diapason, pinprick sensation, ankle reflex, and position are some of the other neurologic tests performed during a full foot exam.

## METHODOLOGY

### Aim of the Study

To study the disease burden in terms of clinical outcomes and surgical interventions of diabetic foot ulcer (DFU) patients.

### Objectives

1. To identify the disease occurrence among patients by age and gender.
2. To evaluate the prevalence among males & females.
3. To identify the disease outcomes using Wagner grade system.
4. To educate the patient regarding the reducing of recurrence of DFU.

### Study Criteria

#### Inclusion Criteria

1. Patients with Diabetes-I & II. Patients aged 18 & above.
2. Patients with diabetic foot. Wound corresponding to Wagner 2-4.
3. A diabetic foot lesion that has been present for at least four weeks.

#### Exclusion Criteria

1. Pediatrics; 2. Pregnant & lactating females; 3. Diabetic patients who are seriously unwell and unable to converse during the research period;
4. Patients who have a traumatic ulcer as a result of an automobile accident

### Study Design

1. 156 type 2 diabetes patients were participated in this study.

2. Study was conducted among 144 diabetic patients
3. Data was collected by 50-foot ulcer using pre-tested questionnaire method. Relatively physical and laboratory examinations tests collected.
4. Assessment of ulcer and pressure of foot by wagner gray system.
5. Management of foot by wound care, debridement, pressure offloading, amputation and proper medication.
6. Finally, results were studied and concluded

(28%) followed by Enterococcus (20%), Streptococci (18%), were specific in patients represented in Figure 5.

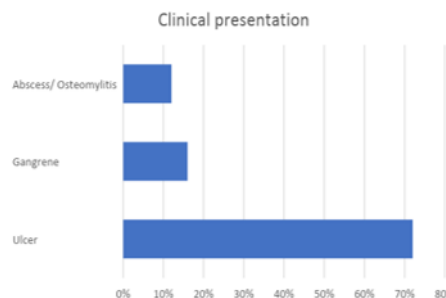


Figure 3: Common Causes

**RESULTS**

In the present series, 50 cases of diabetic foot ulcer patients study was carried out over a period of 6 months and more emphasis was given on various clinical presentation, proper patient care and surgical approach with involvement of multidisciplinary team of experts. In the present study of 50 diabetic foot ulcer patients, age distribution was represented in Figure 1. Male to female ratio in this study was 1.7. male predominance is observed in our study represented in Figure 2.

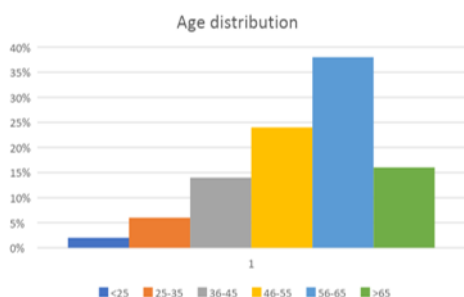


Figure 1: Age Distribution



Figure 2: Gender Distribution

In our study, ulcer was most common (72%) other clinical presentations represented in Figure 3. Pathological findings, neuropathy was most observed in our study around of 74% of patients represented in Figure 4. In our present study the most common pathogens are Staphylococcus aureus



Figure 4: Pathological Conditions

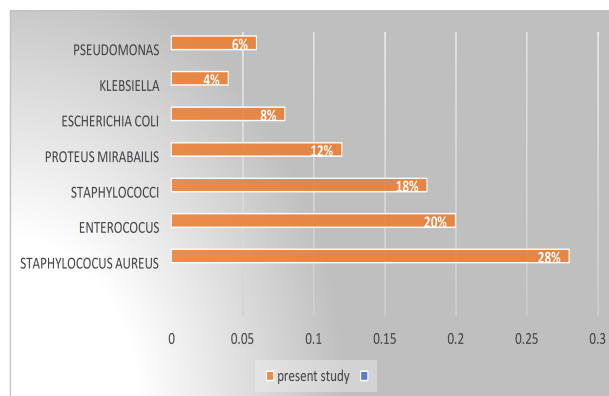
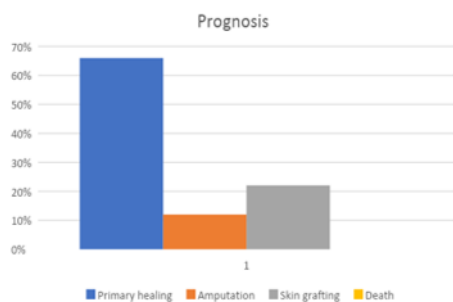


Figure 5: Causative Organisms

The standard care for diabetic foot ulcer was ensured by glycemic control, wound care, regular debriment, and control of infection by appropriate antibiotics and management of co-morbidities. The average duration of hospital stay followed by treatment was 45 days represented in Figure 6.

**DISCUSSION**

This study of 156 patients was type II diabetic, conducted from December 2020 to April 2021 at NRI Institute of medical Sciences and hospital mangalagiri, chinnakakani, Krishna dist, Andhra Pradesh, India. Most of the patients presented with diabetic foot ulcer were in the age of 55-65 years in our



**Figure 6: Prognosis**

series which is found quite similar in Mayfield et al study. It indicates that diabetic foot ulcer affects the older individuals very often. In our study 78% of the patients were above the age of 55 years presented with diabetic foot ulcer. In developing countries majority of the patients with diabetic foot ulcer are in the age group of 45-65 years, whereas it is more than 64 years of age in developed countries. Patient education and self-care practice is definitely plays a great role in the management of diabetic foot ulcer. The male to female ratio in our study was 1.7, whereas it was almost equal in Mayfield study. There is no clear answer to this gender discrimination may be males are more prone to diabetic foot ulcer due to their occupational and outdoor activities.

The most fatal complications in the form of gangrene and abscess/ osteomyelitis were noted in few patients due to their self negligence and proper care of their diabetic foot ulcer. Patient's lack of awareness about diabetes, disease process, control of sugar, nutritional diet and foot care further deterioration of the ulcer occur. The most prevalent location of ulcer in diabetes individuals is the dorsal and plantar site. The severity of the ulcer is more crucial than the location in deciding the end result. Endothelium-derived vasodilators and nitric oxide are reduced in hyperglycemia, resulting in blood vessel constriction, atherosclerotic alterations, and ischemia. Clinically the patients have signs of vascular insufficiency such as claudicating, rest pain, absent peripheral pulses, loss of limb hairs, thinning of skin. Soft tissue and bone infections are the major cause of hospitalization in diabetic foot ulcer patients. Infections of many forms may be more common and frequently severe in diabetic people. Culture should be taken from the deeper tissues for selecting appropriate antibiotics. In our study, most common organism cultured was Staph.aureus (28%) followed Enterococcus (20%), Stretococci (18%). Antibiotics were given intravenously for limb threatening infections. Subsequently antibiotics were changed.

## CONCLUSION

Soft tissue and bone infections are the major cause of hospitalisation in diabetic foot ulcer patients. Infections of many forms may be more prevalent and often severe in diabetic people. Culture should be taken from the deeper tissues for selecting appropriate antibiotics. In our study most common organism cultured was Staph. aureus (28%) followed Enterococcus (20%), Stretococci (18%). Antibiotics were given intravenously for limb threatening infections. Subsequently antibiotics were changed as per the culture and sensitivity report. Strict glycemic control was achieved with use of diabetic diet, oral hypoglycemic agents and insulin. Routine fasting and postprandial blood sugar estimation was carried out strictly for every patients. A multidisciplinary team provided standard treatment for diabetic foot ulcers, including rigorous glycemic control, sufficient tissue perfusion, local wound dressing and frequent debridement, off-loading of the foot, infection control with appropriate antibiotics, and management of co-morbidities. Patient education was provided to help avoid ulcers and their recurrence. Self-care habits such as foot hygiene and nail care must be promoted. Moisturizers should be used after cleansing the feet with soap and water on a regular basis to keep the skin hydrated.

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## Conflict of Interest

The authors declare that there is no conflict of interest.

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