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A Prospective Observational Study On Management Of Diabetic Foot Ulcer In Tertiary Care Hospital

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Abstract
Background: *A common and serious consequence of diabetes includes diabetic foot ulcers (DFU), which may result in infection, hospitalization, and amputation. Effective management is essential to reduce the burden of disease and improve patient outcomes, especially in tertiary care settings where advanced interventions can be provided. This study aimed to evaluate the management strategies employed for diabetic foot ulcers in a tertiary care hospital, with a focus on patient demographics, microbiological profiles, treatment methods, and outcomes.*
Materials And Methods: *This prospective observational study included 106 patients with diabetic foot ulcers admitted to a tertiary care hospital. Data were collected through medical chart reviews, including microbiological test results, treatment protocols, and patient outcomes. Patients were observed during their hospital stay, and the treatment methods used such as debridement, amputation, and antibiotic therapy were documented.*
Results: *The study found that most patients were older males, with a mean age of 61.67 years. Gram negative bacteria were the most prevalent organisms, affecting 47.08% of patients, followed by Gram positive bacteria (33.02%). Debridement was the most commonly employed treatment (44.34%), while 16.04% of patients underwent amputation. Severe pain was reported in 35.85% of cases. The use of broad-spectrum antibiotics, particularly Inj Metronidazole (88.6%) and Inj Piptaz (64%), was a significant component of the management strategy.*
Conclusion: *The management of diabetic foot ulcers in this tertiary care setting primarily involved surgical debridement and the use of broad-spectrum antibiotics. However, the high rates of severe pain and amputations suggest the need for earlier intervention and improved preventive strategies to reduce the severity of cases. A multidisciplinary approach remains crucial to improving patient outcomes and reducing complications such as amputations.*
Keywords: *Diabetic foot ulcer, debridement, amputation, Gram-negative bacteria, tertiary care hospital, management*

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I. Introduction

Diabetes is a significant global public health concern, with its prevalence and associated healthcare costs continuing to rise. The estimated global number of individuals with diabetes has almost quadrupled in the past 40 years, increasing from 108 million in 1980 to 422 million in 2014, with the prevalence among adults over 18 years rising from 4.7% to 8.5% during the same period.[1] In the UK alone, 3.6 million people have been diagnosed with diabetes, a number expected to reach 5 million within 10 years.[2] Among the many complications of diabetes, diabetic foot complications are a leading cause of hospital admissions and present a significant burden on the healthcare system.[2]Foot ulcers, one of the most common complications, affect approximately 15% of individuals with diabetes during their lifetime.[3] The incidence of diabetic foot ulcers (DFU) ranges from 1% to 4.1% annually, with the lifetime incidence reaching as high as 25%.[3],[4] DFU is associated with a higher risk of peripheral vascular disease, peripheral neuropathy, and lower extremity amputations.[3] Diabetic foot ulcers are also the primary cause of more than 80% of non-traumatic amputations, resulting in significant morbidity and mortality. Effective management of diabetic foot ulcers involves early detection, debridement, and appropriate use of antibiotics to control infection. Surgical intervention, such as debridement and reconstruction, may be necessary in advanced cases[4] The Braden scale is commonly employed to assess pressure ulcer risk, and its use is crucial in managing patients with DFUs[6] A multidisciplinary approach involving medical, surgical, and wound care strategies is essential to improve patient outcomes and reduce the risk of amputation[7]

II. Material And Methods

Study Design

This was a prospective observational study conducted at Tertiary Care Hospital, focusing on the management of diabetic foot ulcers.

Study Population

The study includes 106 patients admitted to Tertiary Care Hospital with diabetic foot ulcers.

Data Sources

The study utilizes medical charts, microbiological test results, clinical data, and physicians' diagnoses for data collection.

Data Collection and Study Procedure

Hospitalized patients were observed during ward rounds, and their medical charts were reviewed. The charts included results of microbiological tests, clinical data, and the physician's diagnosis. Patients who met the inclusion criteria were enrolled in the study. Regular investigations were performed, and laboratory and clinical data were documented using a structured data collection form.

Inclusion Criteria

1. Patients with diabetic foot ulcers due to diabetes mellitus.
2. Patients aged 18 years and older.

Exclusion Criteria

1. Patients with foot ulcers due to causes other than diabetes mellitus.
2. Patients with gangrene, osteomyelitis or foot abscess
3. Pregnant and lactating women.

III. Results

Demographics of Study Population:

The study included 106 patients with diabetic foot ulcers, with a mean age of 61.67 years (SD ± 11.24). The majority of patients (33.02%) fell within the 51-60 year age group, followed by 25.5% in the 61-70 year range. A smaller proportion of patients were aged 31-40 years (8.49%) and 81-90 years (1.88%). The gender distribution was predominantly male, accounting for 80.5% of the sample, while females comprised 19.81%. Overall, this demographic data highlights a higher prevalence of diabetic foot ulcers in older male patients, details are depicted in Table 1.

Table 1: Demographics of Study Population

Characteristic	Category	Number of Patients (n)	Percentage (%)	Mean ± SD
Age Group (years)	31-40	9	8.49	
	41-50	15	14.2	
	51-60	35	33.02	
	61-70	27	25.5	
	71-80	18	16.98	
	81-90	2	1.88	
Gender Distribution	Male	85	80.5	
	Female	21	19.81	
Total		106	100	61.67±11.24

Distribution of Causative Organisms by Gender

The study of 106 patients (80.5% male, 19.81% female) found that Gram-negative bacteria were the most common infections, affecting 47.08% of patients (38.68% male, 8.4% female). Gram-positive bacteria affected 33.02% (30.19% male, 2.83% female). Both Gram-positive and Gram-negative organisms were observed in 16.8%, equally distributed between genders. Key organisms included Beta Hemolytic Streptococcus, Morganella Morganii, and Coagulase Negative Staphylococcus, each affecting 8.4% of males. Some bacteria, like Protease Mirabilis and Coagulase Negative Staphylococcus, were found only in females. Overall, Gram-negative organisms were the most prevalent, details are depicted in Table 2.

Table 2: Distribution of Causative Organisms			
Causative Organism	**Male (%)**	**Female (%)**	**Total (%)**
Gram +VE	30.19	2.83	33.02
Gram -VE	38.68	8.4	47.08
Both Gram +VE and Gram -VE	8.4	8.4	16.8
Bacteriuria	2.83	0	2.83
Specific Causative Organisms	**Male (%)**	**Female (%)**	**Total (%)**
Acinetobacter sp.	2.83	0	2.83
Beta Hemolytic Streptococcus	8.4	0	8.4
Bacteriuria	2.83	0	2.83
Beta Hemolytic Streptococcus + Enterococcus sp.	2.83	0	2.83
Citrobacter	2.83	0	2.83
Coagulase Negative Staphylococcus	8.4	0	8.4
Enterococcus sp.	2.83	2.83	5.66
Escherichia Coli + Enterococcus sp.	0	2.83	2.83
Klebsiella sp. + Beta Hemolytic Streptococcus	2.83	0	2.83
Klebsiella sp. + Pseudomonas Aeruginosa	2.83	2.83	5.66
Morganella Morganii	8.4	0	8.4
Protease Mirabilis	2.83	0	2.83
Protease Mirabilis + Coagulase Negative Staphylococcus	0	2.83	2.83
Protease Mirabilis + Enterococcus sp.	2.83	2.83	5.66

Severity Of The Patients According To Pain Score.

As shown below, in the current study, the pain score was calculated for 106 patients. Of these, 33(31.13%) were suffering from mild pain, 35(33.01%) from moderate pain, and 38(35.85%) from severe pain, depicted in Fig 1.

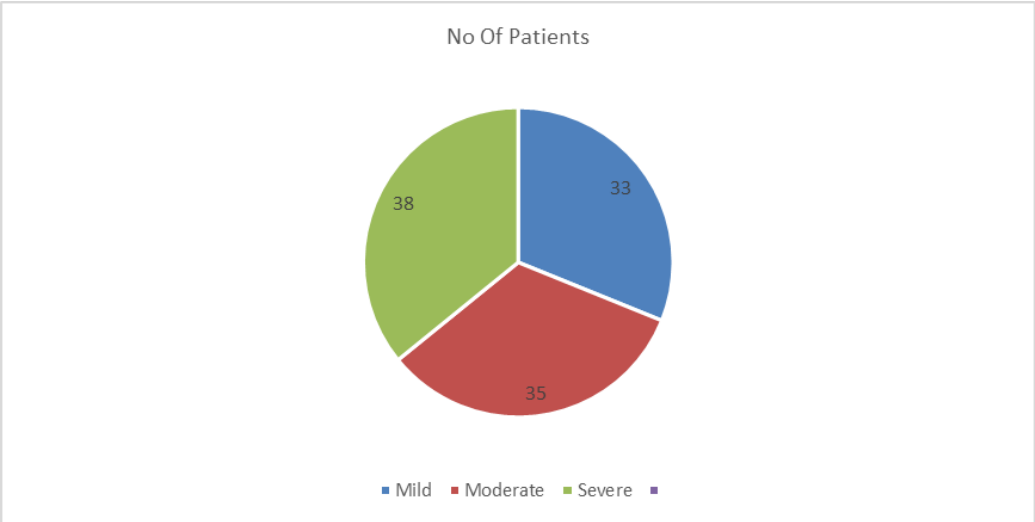

Fig 1 Severity Of The Patients According To Pain Score

Plan of Care

In the study involving 106 patients, the **plan of care** primarily consisted of **debridement** (44.34%), followed by **amputation combined with debridement** (19.81%) and **amputation** alone (16.04%). Additionally, **antibiotics** were used in 16.04% of cases, while **antifungals** were administered to 3.77% of patients. Regarding **Care**, details are depicted in Table 3.

Table 3: Plan of Care			
Category	**Subcategory**	**No. of Patients**	**Percentage (%)**
Plan of Care	Amputation	17	16.04
	Debridement	47	44.34
	Amputation + Debridement	21	19.81
	Antibiotics	17	16.04
	Antifungals	4	3.77
	Antivirals	0	0
Total		106	100

Medications Prescribed

In the study involving 36 patients, the most commonly prescribed were **Inj Metronidazole** (88.6%) and **Inj Piptaz** (64%), reflecting their significant use in infection management. Other medications, such as **Inj Augmentin** (21.7%) and several others, were prescribed to fewer patients, each used in less than 5.66% of cases. This shows a combined approach of surgical intervention and broad-spectrum antibiotics to treat diabetic foot ulcer infections, details are depicted in Table 4.

Table 4: Medications Prescribed

Category	Subcategory	No. of Patients (Out of 106)	Percentage (%)
Medications	Inj Piptaz	77	64
	Inj Metronidazole	94	88.6
	Inj Augmentin	23	21.7
	T Azithromycin	3	2.83
	Inj Linezolid	6	5.66
	Inj Clindamycin	3	2.83
	Inj Ciprofloxacin	3	2.83
	T Cotrimoxazole	6	5.66
	Inj Meropenem	6	5.66
	Inj Ceftriaxone	6	5.66
	T Clarithromycin	3	2.83
	Inj Cefoperazone + Sulbactum	3	2.83
	Inj Imipenem + Cilastatin	3	2.83
	T Fluconazole	3	2.83

IV. Discussion

The study on the management of diabetic foot ulcers (DFU) in a tertiary care hospital revealed that the majority of patients were older males, with a mean age of 61.67 years and standard deviation of ± 11.24 , aligning with findings from similar studies on DFU demographics[8]. The predominant presence of Gram-negative organisms in wound cultures, observed in 47.08% of cases, mirrors other studies emphasizing the importance of broad-spectrum antibiotics[9]. In this study, *Inj Metronidazole* and *Inj Piptaz* were the most frequently administered antibiotics, in line with standard treatment protocols[10]. Debridement was the most common treatment (44.34%), followed by amputation (16.04%), reflecting the necessity of surgical interventions in advanced DFU cases, as highlighted in other research[11]. However, this study showed higher rates of severe pain (35.85%) and amputations, potentially indicating delays in seeking care or more advanced stages of ulcers upon presentation. Other studies, such as those by Abbott et al., have reported lower pain levels and amputation rates, which suggests variations in patient profiles or healthcare access at different centers[12].

Overall, this study's results align with the existing literature on demographic trends and treatment approaches for DFUs, but the higher rates of severe pain and amputation highlight the need for timely intervention. Early detection and a multidisciplinary approach, which combines debridement, appropriate antibiotic use, and preventive strategies, remain essential to improving outcomes and reducing complications such as limb amputations[11, 12].

V. Limitations

The study on the management of diabetic foot ulcers (DFU) in a tertiary care hospital presents several limitations. First, the sample size of 106 patients is relatively small, which may limit the generalizability of the findings to the broader population. A larger sample size would be more representative and provide more robust conclusions. Second, the study is based on a single tertiary care hospital, which might introduce location-specific biases related to patient demographics, treatment protocols, and healthcare access, making it difficult to generalize the results to other healthcare settings or regions. Another limitation is the observational nature of the study, which limits the ability to establish causal relationships between interventions and patient outcomes. Additionally, the study did not assess long-term outcomes, such as ulcer recurrence or overall survival rates, which are important factors in understanding the efficacy of DFU management strategies. Lastly, the study did not account for patients' comorbidities, such as cardiovascular disease or renal insufficiency, which could influence both the progression of diabetic foot ulcers and the effectiveness of treatment interventions.

VI. Conclusion

The findings of this study on the management of diabetic foot ulcers in a tertiary care hospital align with much of the existing research in terms of demographic trends and treatment approaches. However, the higher rates of severe pain and amputation may point to differences in patient profiles or healthcare delays that warrant further investigation. These results underline the importance of early diagnosis and multidisciplinary treatment

approaches to improve patient outcomes and reduce the need for limb amputations.

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