



Clinical Profile and Surgical Management of Diabetic Foot in Al-Jala Hospital

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ABSTRACT

Background:

Diabetes mellitus (DM) is a global health concern that continues to grow in prevalence. Among its various complications, diabetic foot stands out as one of the most common and potentially life-threatening conditions. This condition impacts a significant number of individuals worldwide, estimated to be between 40 to 60 million people with diabetes. (1,2) Diabetic foot is characterized by noticeable changes in the skin, resulting from poorly controlled blood sugar levels, tissue damage, and the heightened risk of infection. These factors can ultimately lead to non-traumatic amputation, particularly in individuals with neuropathy and compromised immune systems. Consequently, the **aim of this study** was to investigate the incidence and mortality rates among patients diagnosed with DM at Al Jala Hospital in Benghazi, Libya.

Method: The medical records of 150 patients admitted to Al-jala Hospital with diabetic foot from January 1, 2021 to February 28, 2023 were reviewed retrospectively. The duration of hospital stay, surgical management and outcome were recorded.

Results: The majority of patients (93 93.9%) had type II DM. In total, 53 patients (35.3%) had suffered from DM for 10 years and 94 (62.7%) had been diagnosed 10 years earlier. According to Wagner's grading system, grade IV ulcers were the most prevalent (40.0%), followed by grade III (30.0%). Trauma preceding infection was found in 27 patients (18%), whereas 123 patients (82%) provided no trauma history.

Discussion:- The absence of common symptoms like pain, fever, and swelling in diabetic foot complicates its management, which varies depending on the severity and underlying cause. Our study focused on 150 cases of foot ulcers treated at the surgical department of Al Jala Hospital, with a majority of them being male patients. Out of these cases, 61 individuals had been diagnosed with diabetes for over 10 years, with an average HbA1c level of 9.48%. Among the 58 female cases, the mean HbA1c was 9.45%, and 33 of them had diabetes for more than a decade. Male patients exhibited a higher incidence of diabetic foot ulcerations, likely due to a higher prevalence of neuropathy, reduced joint mobility, and increased foot pressure, compared to their female counterparts. The average duration of hospital stays for our patients was 5 days. However, other studies on diabetic foot ulcers reported longer hospital stays, ranging from 9.5 days in an Iranian study to 10-20 days in Libya. In total, 28 cases required major amputations, all of whom were receiving insulin injections. The relationship between clinical presentation and life-threatening complications remains unclear. Among the 90 cases presenting with pus discharge, only 8 underwent major limb amputation. Similarly, out of the 62 cases with fever, only 22 required major or minor amputations, while the remaining 11 were managed conservatively. It is worth noting that most of the amputation cases were observed in the right foot, possibly due to its higher vulnerability to trauma. However, out of the 54 cases with a right foot amputation, only 16 reported a history of trauma.

Keywords Diabetic Foot Ulcer (DFU), Diabetes Mellitus (DM), Hemoglobin A1c (HbA1c).

Background (Introduction):-

Diabetes mellitus (DM) continues to be a growing global health concern, with an estimated 9.9% of the population aged 40 and above being affected by this disease.(1,2) The number of individuals diagnosed with diabetes is steadily increasing, and it is projected to reach 640 million, according to the International Diabetes Federation. The complications associated with diabetes vary, encompassing both macro and micro changes. One of the most severe and life-threatening complications is diabetic foot, which impacts a significant number of people with diabetes worldwide, estimated to be between 40 to 60 million individuals. (3,4) Diabetic foot is characterized by skin changes resulting from poorly controlled blood sugar levels, tissue damage, and the heightened risk of non-traumatic amputations in individuals with neuropathy and compromised immune systems. Unfortunately, despite various preventive measures, diabetic foot significantly contributes to 40-70% of all non-traumatic amputations, with DM patients being 15 to 20 times more

likely to require amputation.(5,6) Additionally, high rates of mortality and ulceration recurrence are observed after amputation. Managing DM requires a multidisciplinary approach to medically stabilize the patient and control infections, which can be challenging in our healthcare facility in Benghazi, Libya. Surgical intervention often becomes necessary in many of these cases. Moreover, as far as our knowledge extends, there has not been a systematic review specifically focused on diabetic foot issues or diabetes with a dedicated section on diabetic foot complications.

Aims and Objectives

To determine the clinical profile and surgical management approach of diabetic foot patients in Al-Jala Hospital.

Method

We conducted a retrospective review of the medical records of 150 cases admitted to Al-Jala Hospital with diabetic foot between January 1, 2021, and February 28, 2023. The study aimed to collect patient characteristics such as age, sex, and presence of comorbid illnesses. Clinical characteristics such as the type and duration of diabetes, treatment received, location of foot ulcers, clinical presentation, history of amputations, and Wagner's classification were also documented. Additionally, we recorded the duration of hospital stay, surgical interventions, and outcomes. Routine blood tests, including blood glucose levels and glycated hemoglobin, were reviewed as well. All the collected data were analyzed using SPSS software.

Results

We examined a cohort of 150 patients, comprising 92 (61.3%) males and 58 (38.7%) females, with an average age of 55 years (figure1,2).

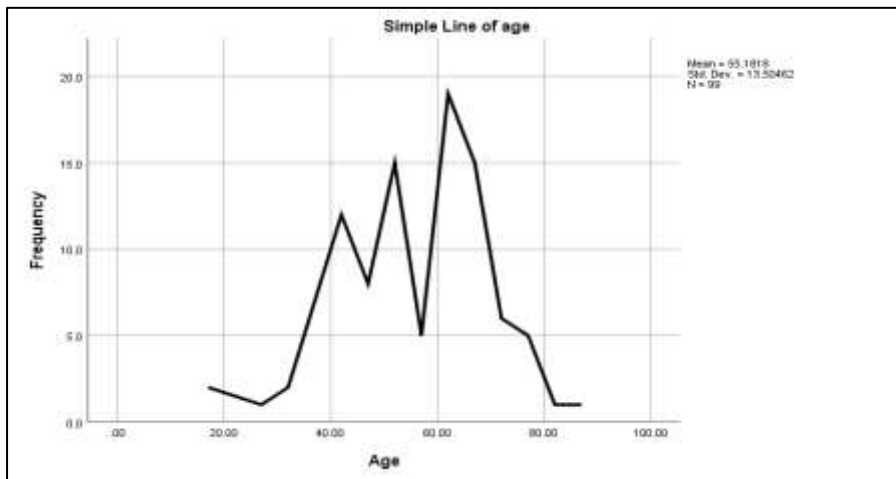


Figure 1 Mean Age of Patients

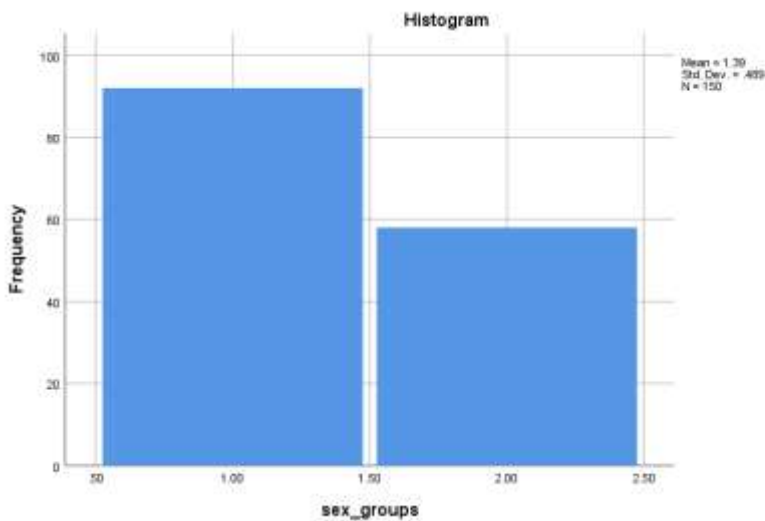


Figure 2 Mean Age of Both Genders

The average duration of hospitalization was 5 days. Among the patients, the majority (93.9%) had type II diabetes mellitus (DM). Out of the total, 53 patients (35.3%) had been living with DM for less than 10 years, while 94 (62.7%) had received their diagnosis more than 10 years ago (figure3).

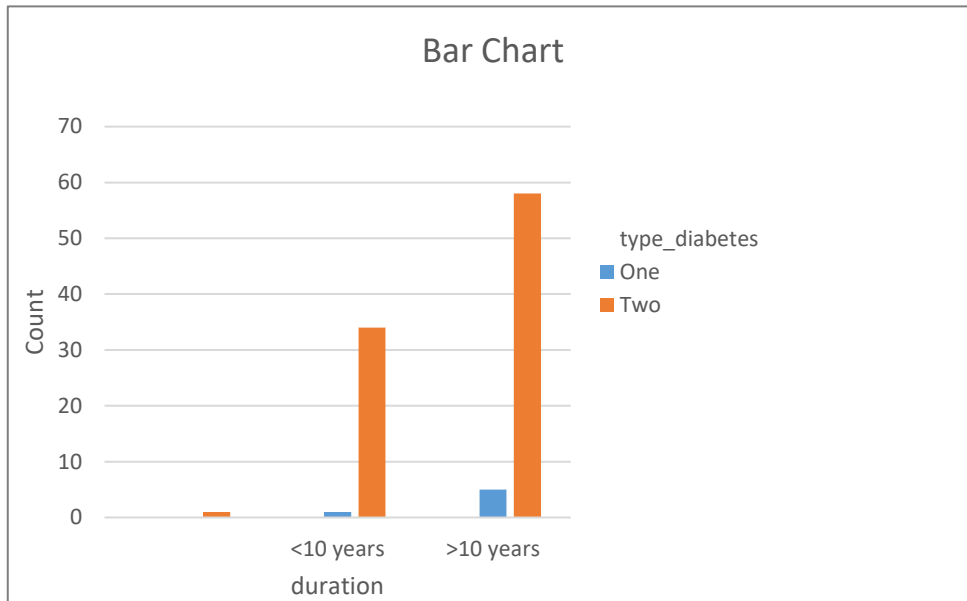


Figure 3 Duration and Type of Diabetes

Within this study, 51 patients (34.0%) were treated using oral hypoglycemic agents, while 56 (37.3%) received insulin therapy, and 43 (28.7%) were prescribed a combination of both insulin and oral hypoglycemic agents (figure4).

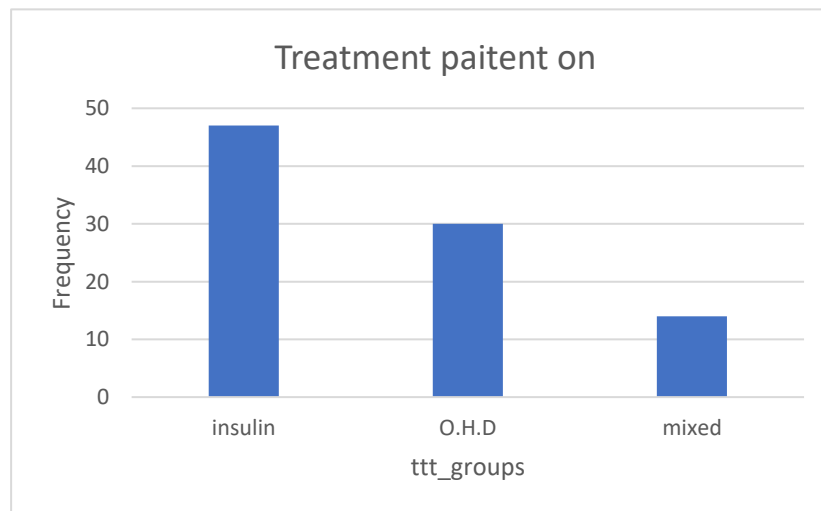


Figure 4 Type of Treatment Patients Take

Evaluating the HbA1C assays, it was determined that 77.8% of the patients exhibited poor glycemic control, with HbA1C levels exceeding 7% (figure5).

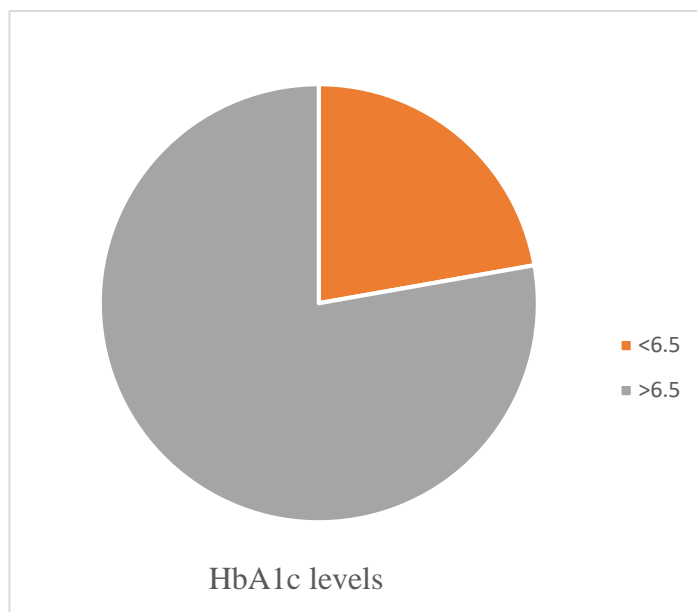


Figure 5 HbA1c Level

Upon presentation, 40% of the patients exhibited fever, and leukocytosis was observed in 61.6% of the cases. Furthermore, 64% of the patients reported painful ulcers, 61.3% reported pus discharge, and 45.3% had swelling associated with their diabetic foot condition.

Table 1 Clinical Presentation

		Count
swelling	yes	68
	no	82
fever	yes	60
	no	90
pus discharge	yes	92
	no	58
Painful ulcer	yes	96
	no	54

Based on Wagner's grading system, grade IV ulcers were the most prevalent, accounting for 40.0% of the cases, followed by grade III ulcers at 30.0%. Concerning comorbid illnesses, 47.8% of the patients had no comorbidities, 31.4% had one comorbid illness, and 20.7% had multiple comorbid illnesses.

Table 2 Wegner Classification

Wegner classification					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ii	27	18	18	18
	iii	45	30	30	48
	iv	60	40	40	88
	v	18	12	12	100.0
	Total	150	100.0	100.0	

Among the patients, 38% had an ulcer in the left foot, while 57% had an ulcer in the right foot. Additionally, 4% of the patients had multiple ulcers affecting both feet. Out of the total, 27 patients (18%) reported a preceding trauma that led to the infection, while 123 patients (82.0%) did not have a history of trauma. Various surgical procedures were performed as part of the management for diabetic foot ulcers, although specific details of the procedures were not provided.

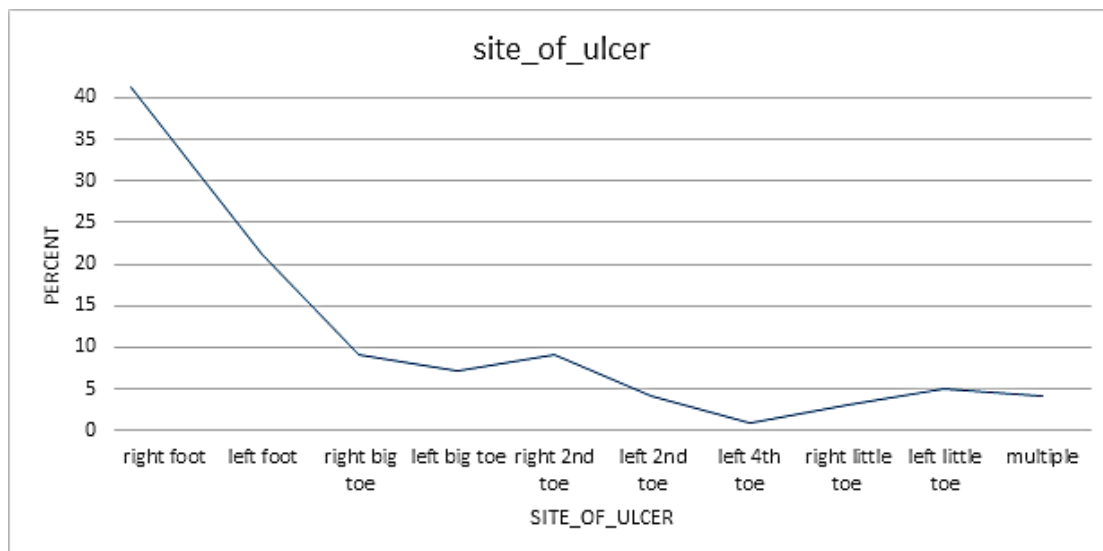


Figure 6 Site of Ulcer

In terms of management, 13.3% of the patients underwent conservative treatment, while 18.7% received incision and drainage. Additionally, 27.3% underwent debridement of the affected area. Amputation procedures were performed on a subset of patients, with 9.1% undergoing big toe amputation, 7.1% undergoing second toe amputation, 2% undergoing fourth toe amputation, 3% undergoing little toe amputation, and 5% undergoing multiple toe amputations. Furthermore, 6% of the patients underwent transmetatarsal amputation, 5% had above knee amputation, and 3% had below knee amputation. Among the patients, 89 had no history of previous amputations, while 61 patients had a history of amputations.

Table 3 Type of Management

Management		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	conservative	20	13.3	13.3	13.3
	Incision drainage	28	18.7	18.7	32
	debridement	41	27.3	27.3	59.3
	minor amputation	41	27.3	27.3	86.6
	major amputation	20	13.4	13.4	100.0
	Total	150	100.0	100.0	

Table 4 Mean HbA1c and Duration of Diabetes to Males and Females

		Sex			
		Male		Female	
		Mean	Count	Mean	Count
HbA1c		8.80		9.45	
Duration	<10 years		31		25
	>10 years		61		33

Table 5 Relation between Anti-Glycemic and Mean Hemoglobin with DF Management

Management		Conservative		Incision and Drainage		Debridement		Minor amputation		Major amputation	
		Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean
Treatment patient Take	Insulin	6		15		11		26		15	
	O.H.D	10		10		20		10		3	
	Mixed	4		3		10		10		2	
Mean Hemoglobin			10.47		12.33		10.58		10.70		10.18

Table 6 Management in Relation to Clinical Presentation

		Management				
		Conservative	Incision and Drainage	Debridement	Minor amputation	Major amputation
		Count	Count	Count	Count	Count
Pus Discharge	yes	11	20	30	21	8
	no	9	8	11	20	12
Swelling	yes	6	15	21	16	8
	no	14	13	20	25	12
Fever	yes	11	13	16	16	6
	no	9	15	25	25	14
Painful Ulcer	yes	14	17	30	25	11
	no	6	11	11	16	9

Table 7 List of Patients with History of Trauma Related to Site of Ulcer

	Site of Ulcer											
	Right foot Count	Left foot Count	Right big toe Count	Left big toe Count	Right 2nd toe Count	Left 2nd toe Count	Right 4th toe Count	Left 4th toe Count	Right little toe Count	Left little toe Count	Multiple Count	
History of Trauma	yes	16	2	3	5	4	0	0	0	0	2	2
	No	38	29	10	6	10	6	0	2	5	6	4

Table 8 List of Patients with leukocytosis related to management

Management									
Conservative		Incision and Drainage		Debridement		Minor Amputation		Major Amputation	
Leukocytosis		Leukocytosis		Leukocytosis		Leukocytosis		Leukocytosis	
Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Count	Count	Count	Count	Count	Count	Count	Count	Count	Count
9	11	13	15	20	21	25	16	15	5

Discussion

The findings of our study indicate that diabetic foot lesions are a common cause of hospitalizations at Aljala Hospital, with various risk factors contributing to their development in Libya. Inadequate facilities for diabetic care, low levels of education, and poor socioeconomic conditions are among the key factors associated with the occurrence of diabetic foot ulcers. In our study of 150 cases presenting at the surgical department of Aljala Hospital with foot ulcers, a majority of the patients were males (92 cases). Additionally, 61 cases had been diagnosed with diabetes for more than 10 years, with a mean HbA1c level of 8.80%. Among the 58 female cases, the mean HbA1c level was 9.45%, with 33 of them having diabetes for more than 10 years. The higher prevalence of diabetic foot ulcers in males can be attributed to factors such as increased neuropathy, reduced joint mobility, and higher foot pressure, which are more frequently observed in males. These findings align with previous studies.(7-9) The average duration of hospital stay for our patients was 5 days, which is shorter compared to other studies reporting a range of 9.5 to 20 days. (10,11) These variations could be attributed to differences in the severity of the ulcers among patients, the settings for inpatient and outpatient care, and the local treatment protocols employed. However, it is concerning that 126 patients had random blood glucose levels exceeding 180 mg/dL. The target blood glucose levels for pre-prandial readings are 80-130 mg/dL, with peak post-prandial levels ideally staying below 180 mg/dL. This indicates that nearly two-thirds of the cases had poor blood glucose control despite receiving anti-glycemic treatment.(12) It is crucial to improve diabetes management and education, enhance healthcare facilities, and implement effective strategies for glycemic control to reduce the occurrence and severity of diabetic foot ulcers and their associated complications. The data from the study indicates that patients on insulin injections had a lower risk of undergoing major amputations compared to those on other anti-glycemic treatments. Poor blood glucose management increases the risk of complications such as infection, delayed healing, and thrombosis, which in turn can lead to a higher possibility of amputation. Amputees, especially those classified as fourth and fifth degrees, also showed a high rate of anemia. Therefore, it is crucial for diabetic foot ulcer (DFU) patients to receive effective medical interventions to reduce mortality and morbidity rates. The relationship between clinical presentation and life-threatening complications is not entirely clear from the study findings. Out of 90 cases presenting with pus discharge, only 8 of them required major limb amputation. Additionally, among 62 cases with fever, only 22 cases underwent major or minor amputation, while 11 were managed conservatively. However, it is worth noting that 54.6% of the cases showed evidence of leukocytosis, and eventually,

40 of these cases had to undergo limb amputation. This aligns with previous studies that have identified leukocytosis as a risk factor for lower extremity amputation.(9,13)

Most of the amputation cases in the study were in the right foot, likely due to its vulnerability to trauma. Surprisingly, only 16 out of 54 cases who had a right foot amputation reported a history of trauma.(11) This finding is consistent with previous reports. Furthermore, previous ulceration and amputation were found to be highly risky for life-threatening amputations. In this study, a significant proportion (52%) of patients with grade III-V ulcers presented according to the Wagner grading system, which is comparable to incidence rates reported in other countries (42-68%).(7,14) This high percentage of late DFUs may be attributed to a long duration of diabetes, delayed medical visits, and inadequate education about diabetic foot care.

In conclusion, the study highlights the importance of optimal blood glucose management, early detection and intervention, and patient education to reduce the risk of complications and amputations associated with diabetic foot ulcers.

Conclusion

The findings of our study indicate that diabetic foot infection significantly contributes to the incidence and mortality rates among patients with diabetes mellitus (DM) at Al Jala Hospital in Benghazi. Diabetic foot ulcers (DFUs) are commonly encountered indications for surgical interventions. Therefore, it is imperative to establish a dedicated diabetic foot clinic in Benghazi that encompasses a multidisciplinary team and is equipped with facilities for vascular assessment. This clinic should be fully committed to addressing the complexities of diabetic foot problems. The primary purpose of the diabetic foot clinic would be to serve as a centralized hub for referrals, treatment, and follow-up care. It would provide specialized care to patients, ensuring comprehensive management of their diabetic foot conditions. Additionally, patient education would be a key component of the clinic's services, aiming to optimize treatment outcomes, reduce hospitalizations, amputations, and the length of hospital stays. By implementing such a setup, we can significantly enhance patient care and ultimately have a positive impact on the healthcare system as a whole. The success of the diabetic foot clinic relies on the collaboration of a multidisciplinary team comprising various healthcare professionals, including diabetologists, surgeons, podiatrists, wound care specialists, vascular specialists, and other relevant experts. This collaborative approach ensures that patients receive comprehensive evaluations, individualized treatment plans, and continuous monitoring to achieve optimal foot health outcomes. Moreover, incorporating facilities for vascular assessment within the diabetic foot clinic is crucial. Vascular complications often underlie diabetic foot problems and can hinder proper healing, thereby increasing the risk of amputations. By having dedicated vascular assessment facilities, healthcare providers can promptly evaluate blood circulation to the lower extremities, enabling targeted interventions to improve vascularity and reduce the likelihood of further complications. Ultimately, the establishment of a diabetic foot clinic in Benghazi, with its multidisciplinary team, vascular assessment capabilities, and patient education focus, will lead to improved patient care. This comprehensive approach will optimize treatment outcomes, reduce hospitalizations, amputations, and the length of hospital stays. By effectively deploying these resources, we can enhance the overall quality of care and positively impact the healthcare system by addressing the unique challenges posed by diabetic foot complications.

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Ethics Committee Approval: Due to the retrospective design of the study, Ethics Committee Approval was not obtained.

Informed Consent: Due to the retrospective design of the study, the informed consent was not obtained.

Conflict of Interest: No conflict of interest was declared by the authors.

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