

A Cross-Sectional Analytical Pilot Study of Diabetic Foot Ulcer Risk Factors among Adult Patients with Diabetes in Sulaimani Teaching Hospitals

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Abstract: Diabetic foot care is essential because, while it is an avoidable problem, it is harmful since even minor injuries can have major repercussions. Nerve damage brought on by diabetes may impair foot feeling. Diabetes may also lessen blood supply to the feet, which can hinder their ability to fight off infections or repair wounds. Patients may become less aware of the initial foot deformities as a result of these issues. Preventing these issues is mostly dependent on diabetic individuals' knowledge of proper foot care. This cross-sectional analytical pilot study aimed to identify risk factors associated with diabetic foot ulcers among adult patients with diabetes attending Sulaimani Teaching Hospitals. Conducted from October 15th to April 15th, 2024, the study employed a quantitative approach using a non-probability convenience sample of 38 patients. Data collection focused on patients' knowledge, attitudes, and practices regarding diabetic foot care, to examine their potential influence on the development of foot ulcers. A standardized questionnaire was used to collect data. It has consisted of four major parts, which include 24 items. Data were analyzed through the application of measurement of central tendency (Frequencies, percentages, mean of scores, and standard deviation). The results indicate that illiteracy was high among educational levels (39.5%). The majority of patients (65.8%) reported a family history of diabetes mellitus. Additionally, more than half of the patients have had previous admission to the hospital for foot problems (55.3%). The use of medications to control blood sugar was the highest among patients (97.4%), the highest number of patients who have used diabetic medication regularly (76.3%), and a majority of patients (63.2%) did not undergo surgical treatment. The study findings identified risk factors for diabetic foot ulcers early on, and starting the right therapy, complications, such as the need for amputation, are less likely to occur. Education and awareness-building about diabetes and its consequences have become more important.

Keywords: Diabetic Foot Ulcer, Wound Dressing, Offloading, Wound Debridement

1. Introduction

Taking good care of diabetic feet is essential because, while diabetic foot ulcers are largely preventable, even minor injuries can lead to serious complications. Nerve damage caused by diabetes may impair sensation in the feet, making it difficult for patients to detect injuries. Additionally, reduced blood flow due to diabetes can slow healing and increase the risk of infection. These issues may cause patients to be less aware of early foot abnormalities. Therefore, diabetic individuals' knowledge of proper foot care plays a crucial role in preventing complications [1].

Foot problems have been identified as the most common cause of death among individuals with diabetes. Most diabetic foot ulcers remain asymptomatic until non-healing wounds are discovered, often worsened by chronic peripheral arterial disease. To promote early detection of diabetic patients

at high risk for foot complications, preventive measures such as annual diabetic foot screening and coordinated care by a multidisciplinary specialist team have been implemented [2].

In patients without trauma, diabetic foot ulcers (DFUs) are the leading cause of lower-limb amputations. These ulcers are strongly associated with several risk factors, including age, duration of diabetes, tobacco use, obesity, hypertension, poor ankle-brachial index (ABI), and elevated neutrophil-to-lymphocyte ratio (NLR) [3].

One of the most dangerous side effects of diabetes is diabetic foot ulcers (DFU), which, if left untreated, can end in the amputation of all or a portion of a limb [4]. One of the endocrine conditions that has spread like an epidemic over the world is diabetes, which is thought to be a disease of affluent nations. The secondary pathophysiologic alterations in several organ systems brought on by the metabolic dysregulation linked to diabetes mellitus (DM) place a significant burden on both the diabetic patient and the healthcare system [5]. One of the chronic consequences of diabetes mellitus that can result in infection and lower extremity amputation is foot ulcers. The results of a small number of studies conducted in Ethiopia were mixed, and it is necessary to carefully combine the available data to ascertain the extent of diabetic foot ulcers and the variables that contribute to them [6].

Potential sources of infection include both Gram-positive and Gram-negative bacteria, as well as anaerobic bacteria and fungi. A favorable prognosis depends on the early detection of DFU infection and the proper treatment, which is determined by the bacteria that cause it and their pattern of antibiotic susceptibility. Thus, the purpose of this study was to identify the antibiotic resistance profile of the bacteria that cause foot ulcers in particular hospitals [7]. A major consequence of diabetes mellitus that raises patient morbidity and has a major socioeconomic impact is diabetic foot ulcers. The study referenced as [8] offers a detailed examination of the underlying biological mechanisms, pathophysiology, and etiology of diabetic foot ulcers. It further explains different classification schemes used by clinicians to categorize the severity and types of ulcers. Additionally, it reviews contemporary care strategies aimed at managing this serious but largely preventable medical condition. Included were 43 publications (46 research) that detailed the measuring characteristics of ten distinct PROMs. No instruments that could be suggested for usage were found by us. We found eight PROMs that might be advised but would need more research, and two that were not advised for usage [9].

2. Methodology

2.1 Design of the Study:

This descriptive study was conducted from 15th October to 15th April in Sulaimani teaching hospitals to identify how patients' knowledge, attitude, and practice influence the risk of diabetic foot ulcers among diabetic patients.

2.2 Setting of Study:

This study was conducted in the Sulaimani teaching hospitals

2.3 Sample of the Study:

This study was conducted with a relatively small sample size of 38 admitted patients, which may limit the generalizability of the findings. Future studies with larger samples are recommended to validate these results.

2.4 Instrument construction:

A standardized questionnaire was used from the period of 15 February to 30 March 2024. Overall items included in the questionnaire were 24) items. The questionnaire consists of two major parts:

Part One: - The patient's socio-demographic characteristics, such as (patient age, gender, marital Status, educational level, family history of diabetes mellitus, Previous admission to hospital for foot problem, medications history to control blood sugar, and surgical history for foot problem, consisted of (8) items.

Part Two: - This part is related to the patient's knowledge, attitude, and practice as a factor that influences diabetic foot ulcer in diabetic patients attending Sulaimani teaching hospitals, and it consisted of (16) items.

2.5 Rating Scales and Scores:

Researchers followed the scale and score rating in the parts of the questionnaire to measure the items accurately and statistically.

2.6 Statistical Analysis:

All the data were coded and entered into the computer using SPSS software version 23. In this study, the data were analyzed by using basic statistical methods, which include

2.7 Descriptive statistics:

This approach is employed through:

- Frequency Distribution
- Percentage % = $\frac{\text{Frequencies}}{\text{Sample size}} \times 100$
- Mean of Score $M.S = \frac{\sum Fi \times Si}{\sum Fi}$ $i=1$
- Standard Deviation $S.D = \sqrt{\frac{\sum (xi - x)^2}{n}}$

3. Results

This chapter will present the results according to the statistical analysis of the data collected during the study period.

Table 1: The sample's demographic properties

Item	Response	Frequency (F)	Percentage (%)
Patient's Age	21–30	1	2.6%
	31–40	1	2.6%
	41–50	6	15.8%
	51–60	11	28.9%
	61–70	10	26.3%
	71–80	8	21.1%
	81–90	1	2.6%
	Total	38	100%
Gender	Male	18	47.4%
	Female	20	52.6%
	Total	38	100%
Marital Status	Married	33	86.8%
	Widowed	3	7.9%
	Single	2	5.3%
	Divorced	0	0.0%
	Total	38	100%

Practices Related to Diabetic Foot Care in Study Participants	Response	Frequency (F)	Percentage (%)
Do you take your prescribed diabetes medications regularly?	Yes	37	97.4%
	No	1	2.6%
	Total	38	100%
Do you use diabetic medication regularly?	Yes	29	76.3%
	No	9	23.7%
	Total	38	100%
Did you undergo any surgical treatment for your feet?	Debridement	9	23.7%
	Amputation	5	13.2%
	None	24	63.2%
	Both	0	0.0%
	Total	38	100%

Table 1 presents the demographic characteristics of the sample. The majority of participants were between 51 and 60 years old (28.9%), and more than half were female (52.6%). Most of the participants were married (86.6%). In terms of education, the largest group was illiterate (39.5%). A significant portion of the patients reported a family history of diabetes mellitus (65.8%). Additionally, over half of the patients (55.3%) had previously been admitted to the hospital due to foot-related problems. The vast majority were using medications to control their blood sugar (97.4%), and a high percentage reported using diabetic medications regularly (76.3%). Furthermore, most of the patients (63.2%) had not undergone any surgical treatment for their feet.

Table 2: Knowledge of the sample

Item	Response	Frequency (F)	Percentage (%)	Mean	S.D.
Does diabetes cause diabetic feet to have less blood flow?	Yes	21	55.3%	2.76	1.375
	No	2	5.3%	4.00	0.00
	Don't know	15	39.5%	3.27	1.280
	Total	38	100%		
Can a diabetic patient have a loss of feeling in their feet?	Yes	27	71.1%	1.70	0.953
	No	5	13.2%	1.80	1.095
	Don't know	6	15.8%	2.50	0.837
	Total	38	100%		
Are foot ulcers possible in diabetics?	Yes	34	89.5%	1.44	7.46
	No	3	7.9%		0.00
	Don't know	1	2.6%	3.00	–
	Total	38	100%		
Can diabetics get gangrene in the foot?	Yes	23	60.5%	1.00	0.00
	No	6	15.8%	1.50	0.548
	Don't know	9	23.7%	1.22	0.667
	Total	38	100%		
Can smoking reduce blood flow to the feet?	Yes	8	21.1%	1.75	0.463

	No	4	10.5%	2.00	1.155
	Don't know	26	68.4%	1.54	0.905
	Total	38	100%		

Table 2): The information in this table relates to diabetic patients' understanding of diabetic foot ulcers. According to this chart, which measures how frequently people know about diabetic foot issues, 55.3% of the sample knew that diabetes can lower the blood supply to the feet. Seventy-one percent of the participants were conscious that diabetic patients may have a loss of feeling in their feet. Of the group, 89.5% were aware that diabetics can have foot ulcers. Sixty-five percent of patients are aware that diabetics might get foot gangrene. However, the majority of our participants (68.4%) are unaware that smoking causes lower blood circulation to the foot.

Table 3: Participants' Attitudes Toward Risk Factors of Diabetic Foot Ulcers

Participants' Attitude Statements	Response	Frequency (F)	Percentage (%)	Mean	S.D.
Diabetics need to examine their feet daily for any injuries	Agree	25	65.8%	2.40	0.913
	Don't agree	5	13.2%	2.80	0.447
	Neutral	8	21.1%	2.50	0.756
	Total	38	100%		
Diabetics should seek medical attention if they notice any wounds or infections in their feet.	Agree	26	68.4%	1.42	0.758
	Don't agree	6	15.8%	1.83	0.983
	Neutral	6	15.8%	1.83	0.983
	Total	38	100%		
Diabetic individuals should follow their doctor's advice and wear special shoes to prevent diabetic foot."	Agree	22	57.9%	1.36	0.790
	Don't agree	5	13.2%	1.60	0.548
	Neutral	11	28.9%	1.64	0.809
	Total	38	100%		
People with diabetes shouldn't make recurring trips to the diabetic clinic for analysis.	Agree	4	10.5%	1.75	0.500
	Don't agree	20	52.6%	1.50	0.827
	Neutral	14	36.8%	2.00	1.038
	Total	38	100%		
I think I can treat myself for diabetes without first seeing a physician.	Agree	7	18.4%	2.14	0.690
	Total	38	100%		

Table (3): This table is related to the attitude of Diabetic patients regarding diabetic foot ulcer. Concerning the frequency of their attitude to prevent and treat foot disorders due to diabetes, especially foot ulcer, this table shows that (65.8%) of Diabetics should inspect their feet every day for wounds, according to the sample. It was agreed upon by 68.4% of the sample that diabetics should see a doctor if they have any wounds or infections on their feet. According to the doctor's advice, 57.9% of the participants believed that individuals with diabetes should wear specific shoes to prevent diabetic foot.

About half of the patients disagreed that diabetics shouldn't visit the diabetes clinic regularly to get checked up (52.2%). And most of the patients (65.8%) don't believe that they can treat themselves without consulting a doctor if they have diabetes.

Table 4: Assessment of Patients' Practices for Detecting Risk Factors of Diabetic Foot Ulcers

Item	Response	Frequency (F)	Percentage (%)	Mean	S.D.
Do you wash your feet daily?	Yes	32	84.2%	2.09	0.530
	Sometimes	4	10.5%	1.25	0.500
	No	2	5.3%	1.50	0.707
	Total	38	100%		
Do you wear cotton socks regularly?	Yes	6	15.8%	1.17	0.408
	Sometimes	14	36.8%	1.00	0.00
	No	18	47.4%	1.39	0.698
	Total	38	100%		
Do you always walk barefoot?	Yes	15	39.5%	2.60	0.507
	Sometimes	13	34.2%	2.46	0.660
	No	10	26.3%	1.70	0.823
	Total	38	100%		
How often do you change your shoes?	Once per year	5	13.2%	2.00	0.707
	More than once per year	5	13.2%	2.20	1.095
	When the shoe is damaged	28	73.7%	1.79	0.787
	Total	38	100%		
How often do you go to check your feet?	Monthly	7	18.4%	2.71	0.448
	Every 6 months	3	7.9%	2.67	0.557
	Every year	1	2.6%	2.00	–
	When I am sick	27	71.1%	2.59	0.797
	Total	38	100%		
What do you do if you find deformities (wounds/ulcers) on your feet?	Consult a physician	34	89.5%	3.18	1.267
	Treat yourself	4	10.5%	4.00	0.00
	Total	38	100%		

Table (4): This table is related to the practice of diabetic patients regarding daily habits and performing preventive activities related to foot health. About the frequency of practices, this table shows that the majority of patient wash their feet daily, representing 84.2%. At the same time, the highest number of patients do not wear cotton socks regularly (47.4%). Regarding walking, 39.5% of patients have always walked barefoot. Regarding change shoes, the highest number of patients will change their shoes when the shoe is damaged represent (73.7%), most of them will go to check their feet when they are become sick (71.1%), and the highest number of patients (89.5%) will consult a physician if they find deformities (wounds/ulcers) on their feet.

4. Discussion

Analysis of socio-demographic characteristics of the patient:

Diabetes is an illness that is so common, morbid, and fatal that it is regarded as an epidemic on a global scale. One of the primary side effects of diabetes mellitus is diabetic foot ulcers, which are defined as serious, long-term lesions that can extend to the basal layer and tissue underneath and cause a loss of epidermis and/or dermis [10]. Table 1 presents a breakdown of the sociodemographic attributes of the research sample. The sample's demographic properties revealed that the majority of the sample were between the age group 51-60 years old, representing 28.9 %, and 52.6 % of the sample were Female. The highest number in the sample was married (86.6 %). Illiteracy was the highest among the educational levels represented (39.5%). Most of the patients have a family history of diabetes mellitus (65.8%). Additionally, about half patients have had a previous admission to the hospital for a foot problem (55.3%). Use of medications to control blood sugar was the highest among patients represented (97.4%), the highest number of patients had used diabetic medication regularly (76.3%), and most patients did not undergo any surgical treatment for their treatment (63.2%).

Evaluation of Knowledge, Attitudes, and Practices Related to Diabetic Foot Ulcer Risk Factors Among Diabetic Patients Hospitalized for that

Table 2 is related to the knowledge of diabetic patients regarding diabetic foot ulcer. To the frequency of their knowledge of foot problems related to diabetes, this table shows that (55.3%) of the sample were aware that Diabetes can reduce blood flow to the feet. Regarding the suffering from a lack of sensation in the feet (71.1 %) of the sample was aware that Diabetic patients can suffer from a lack of sensation in the feet. (89.5%) of the sample are aware that foot ulcers may occur in diabetics. Sixty-five percent of patients are aware that diabetics might get foot gangrene. The majority of those surveyed (68.4%) were unaware that smoking may lower blood flow to the foot. The cross-sectional research aimed to include all diabetes patients who were 20 years of age or older. The research questionnaire was filled out by 1,000 diabetes patients who met the inclusion criteria. Approximately 77.5% of patients are aware that diabetics can develop foot ulcers, 74.9% are aware that people with diabetes can get infections in their feet, 66.7% reported that diabetes can lower blood flow to their feet, and 66.6% agreed that diabetics can experience loss of feeling in their feet. Specifically, 84.5% of those in the study agreed that diabetics should check their feet every day for wounds, 78.7% agreed that diabetics should see a doctor if they have any wounds or infections in their feet, in terms of attitudes, 57.9% of participants agreed that diabetic individuals should wear special shoes as recommended by their doctor to prevent diabetic foot, while 28.9% were unsure, and 13.2% disagreed of the survey participants, 822 (82.2%) wash their feet daily, 295 (29.5%) typically use cotton socks regularly, and 39.6% sometimes wear the socks. Just 192 people (19.2%) go barefoot daily, while 41.7% do so sometimes [1].

The enhancement in clinical outcomes, cure, and survival has historically been the main endpoint in assessments of medical therapies; however, the emergence of the medical outcomes movement and the global push to control the growing costs of care have highlighted the significance of patient-centered outcomes [11]. Technical, clinical, and patient-oriented health status metrics are all often employed in clinical practice and research. The use of these metrics is crucial to raising the standard of healthcare since they help identify patients' issues, manage them, and assess the results of interventions [12]. Patient-oriented measures get data straight from the patient. These metrics—also known as patient-reported outcome measures, or PROMs—include, among other things, social involvement, community integration, and patient happiness as perceived by the patient. [13] In 2022, Hernández-Segura et al. Table 3 deals with diabetic patients' attitudes toward the health of their feet. According to this table, 65.8% of the sample believed that diabetics should inspect their feet every day for wounds related to the disease to prevent and cure foot diseases caused by diabetes,

particularly foot ulcers. The majority of the sample (68.4%) agreed that diabetics should see a doctor if they have any wounds or infections on their feet. When it came to shoe wear, 57.9% of the sample agreed that diabetic patients should follow their doctor's advice and wear specific shoes to prevent diabetic foot. However, over half of the patients (52.2%) disagreed that diabetics shouldn't attend the diabetes clinic regularly for examinations. And the majority of patients (65.8%) do not think they can manage their diabetes on their own without medical assistance.

Due to the frequent hospitalizations and expensive, rigorous treatment they need, diabetic foot ulcers are regarded as a public health concern. After peripheral neuropathy develops, the incidence rate of diabetic foot ulcers among the diabetic community ranges from 1 to 7%, with a worldwide prevalence of 3 to 10% [13]. Diabetic foot ulcers are complicated by peripheral vascular disorders, infections, or diabetic neuropathies. Reduced joint mobility, altered gait, and discomfort are a few of the consequences that impair quality of life and interfere with everyday living tasks. Hyperglycemia may disrupt the healing stages and decrease peripheral blood supply to the area, making permanent healing often a challenging and time-consuming procedure [8].

Table four is related to the practice of diabetic patients regarding daily habits and performing preventive activities related to foot health. Regarding the frequency of practices, this table shows that the majority of patient wash their feet daily (84.2%). At the same time, the highest number of patients do not wear cotton socks regularly (47.4%). Regarding walking, (39.5%) of patients have always walked barefoot. Regarding changing shoes, the highest number of patients changed their feet when the shoe was damaged (73.7%), most of them went to check their feet when they became sick (71.1%), and the highest number of patients (89.5%) consulted a physician if they found deformities (wounds/ulcers) on their feet. A catastrophic consequence of diabetes that is linked to infection, amputation, and death, diabetic foot ulceration is becoming more common in people with diabetes mellitus. Different variables play key roles in various phases of the complicated pathophysiology of foot ulcers [14]. In addition to analyzing the primary cause of death and pertinent clinical parameters linked to survival, this study examines the mortality rate of patients with diabetic foot ulcers (DFU) from the time of their first appointment with a Multidisciplinary Diabetic Foot Team (MDFT) [15].

Diabetic ulcers are treated by identifying and fixing the underlying cause, maintaining proper wound care, and preventing ulcer recurrence. Physical examination and deep anamnesis can be used to identify the origin of diabetic ulcers [16]. A severe and incapacitating sign of uncontrolled and protracted diabetes, diabetic foot ulcers (DFU) typically appear on the plantar surface of the foot. 15% of diabetics will ultimately develop DFU, and 14%–24% of them will need to have their ulcerated foot amputated because of a bone infection or other ulcer-related problems [17]. The lifetime chance of developing a foot ulcer ranges from 19% to 34%, and it is increasing as diabetics live longer and have more complicated medical conditions. With a 5-year death rate of 50–70%, a lifetime lower-extremity amputation incidence of 20%, and recurrence rates of 65% after 3–5 years, morbidity after initial ulceration is significant [18]. In 2000, the government estimated that 668,000 people in Iraq were afflicted. According to recent predictions, more than 2 million people in Iraq will develop diabetes by 2030. Therefore, there is an unmet need to investigate how Iraq's healthcare system now handles and is equipped to handle diabetes as a major health issue [19].

5. Conclusion

The findings of this study highlight several key risk factors associated with diabetic foot ulcers among patients attending hospitals in Kirkuk. Many patients demonstrated limited awareness about the impact of lifestyle behaviors, such as smoking and walking barefoot, on foot health. While some

showed a positive attitude toward seeking medical care and using special footwear, gaps remain in daily preventive practices like regular foot inspection, proper footwear use, and routine checkups. The data also reflect significant knowledge and practice deficiencies, particularly among individuals with low educational backgrounds. These insights emphasize the urgent need for targeted health education and preventive interventions focused on high-risk groups to reduce the burden of diabetic foot complications.

6. Recommendation

Based on the study findings, we recommend the following:

1. The incidence of complications, such as the need for amputation, is reduced when risk factors for diabetic foot ulcers are identified early and adequate treatment is started.
2. Physiotherapeutic treatments such as therapeutic exercise, electrotherapy, manual therapy, and assistive technology are helpful in the healing of diabetic foot ulcers when used in conjunction with conventional treatment.
3. The majority of risk factors may be avoided by maintaining adequate glycemic control and educating the patient about them to prevent lower limb amputation.
4. For diabetic foot ulcers to be treated more effectively and early, it is critical to identify the risk factors for diabetic foot ulcers. The need for information and increased awareness about diabetes and its consequences has grown, particularly among rural people.
5. Creating health-related examination and education programs for nurses to enhance their practices and healthcare quality, as education is crucial in avoiding diabetic foot. Consequently, nurses need to be included in the planning and execution of educational initiatives.

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