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Common Pathogens Isolated from Infected Diabetic Foot Ulcers at King Abdulaziz University Hospital, Saudi Arabia: A Retrospective Study

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ABSTRACT

Objectives: To determine the common pathogens isolated from DFI to administer appropriate antibiotic treatment, followed by surgical interventions.

Methods: A retrospective study was performed on 260 patients who presented with diabetic foot at King Abdulaziz University Hospital, Jeddah, Saudi Arabia, from October 2014 to September 2020. All patients underwent swabs and tissue culture for microbiological evaluation. Patient medical records were reviewed to collect demographic and clinical data, including Glycated Hemoglobin (HgA1C), Diabetes Mellitus (DM) type, duration of diabetes, swab, tissue culture, type of surgery, and type of isolated organism.

Results: *Escherichia coli* was the most common organism isolated from the feet of diabetic patients, followed by *Staphylococcus aureus, Klebsiella pneumoniae, Streptococcus agalactiae,* and *Pseudomonas aeruginosa*. Amputations were significantly higher in patients who did not have *Staphylococcus aureus* or *Pseudomonas aeruginosa* infection, with no significant relationship between amputation and any other isolated organisms. A significant negative correlation between patient age and HgA1C level was discovered, as well as a significant positive correlation between HgA1C and the number of minor amputations. Patients with major and minor amputations had a significantly higher percentage of non-Multidrug Resistance (MDR), whereas patients with MDR had a significantly higher rate of infection with *Klebsiella pneumoniae, Escherichia coli, Pseudomonas aeruginosa,* or *Staphylococcus aureus.*

Conclusion: DM is a metabolic syndrome that affects all the body systems and impacts both morbidity and mortality. The most common organism isolated from the feet of diabetic patients was *Escherichia coli,* followed by *Staphylococcus aureus*. Ulcer specimens should be collected for culture and identification of causative organisms. Preventive measures such as good glycemic control, appropriate foot care, targeted antibiotic therapy, and patient education can reduce the incidence of amputation.

Keywords:

Pathogen, Isolated, Diabetic, Foot, Ulcers, Diabetic foot

Abbreviations:

BMI: Body Mass Index; DFI: Diabetic Foot Infections; DFU: Diabetic Foot Ulcers; DM: Diabetes Mellitus; MDR: Multidrug Resistance

Introduction

Diabetes Mellitus (DM) is a metabolic syndrome characterized by hyperglycemia, which can be caused by a decrease in insulin secretion, a defect in insulin activity, or both, causing serious damage to the heart, kidneys, eyes, blood vessels, nerves, and causing diabetic foot ulcers [1]. Diabetes is more prevalent in developing countries than in developed countries [2].

Saudi Arabia is ranked fifth worldwide for the prevalence of type 1 diabetes in children aged 0-14 years, with an estimated incidence of 31 per 100,000. Diabetes is estimated to affect 18% of adults in Saudi Arabia [3]. Neuropathy affects approximately 15.8% of Saudi patients with diabetes [1]. The World Health Organization defines Diabetic Foot Ulcers (DFUs) as foot ulcers associated with neuropathy, varying degrees of ischemia, and infection [4]. The proportion of people with diabetes with a history of foot ulceration is understandably higher than the proportion who have an active ulcer; 3.1-11.8% of people with diabetes, or 12.9-49.0 million people worldwide, have a history of foot ulceration [5-7].

Diabetic Foot Infections (DFIs) account for up to 20% of all diabetes-related hospitalizations in both Europe and the US, making it the single most common cause of DM-related hospital admissions and one of the leading causes of amputation. Diabetes is the most common cause of non-traumatic amputation and is usually precipitated by the development of a chronic wound, which is clinically defined as a wound that does not heal within 30 days. According to previous studies, the presence of DFI increases the risk of lower extremity amputation by 50% compared to DFU without infection [8-12].

The etiology of DFU is multifactorial, with diabetic peripheral neuropathy, peripheral arterial disease, and foot deformity being the most common. DFI, which has been found to be present in 40-60% of all DFU patients, is another major contributor to DFU outcomes [13,14]. DFI is clinically diagnosed as the presence of two or more cardinal signs of inflammation (pain, erythema, fever, induration, and purulent discharge) and is regarded as a major health problem [9].

DFI is classified as mild, moderate, or severe and are commonly polymicrobial [9,15]. A wide variety of microbiological organisms found in DFI have been reported in the literature. Aerobic gram-positive cocci, primarily Staphylococcus aureus, are the most commonly isolated organisms in North America and Europe, whereas aerobic gram-negative organisms are more common in Asia and Africa [16].

An appropriate treatment strategy for moderate-to-severe DFIs includes empirical broad-spectrum antibiotics tailored to the local bacterial profile. Previous studies have demonstrated that treatment success depends on the severity of infection, patients' comorbidities, early surgical drainage, and debridement [15,16].

Few studies have been conducted to identify the most common pathogens isolated from DFI in Saudi Arabia. Therefore, this study aimed to identify the common pathogens isolated from DFI to apply proper targeted antibiotic treatment followed by surgical interventions.

Materials and Methods

Study design, setting, and duration

This retrospective study was conducted from September 2021 to October 2021 at King Abdulaziz University Hospital, Jeddah, Saudi Arabia.

Study participants

Data were collected retrospectively from 260 patients who presented with diabetic foot in the study setting from October 2014 to September 2020. All patients who presented with diabetic foot, which was confirmed using swabs and tissue culture for microbiological evaluation, were included. Nondiabetic patients with foot ulcers were excluded.

Study instrument

A checklist was prepared to collect patients' demographic and clinical data, such as Body Mass Index (BMI), Glycated Hemoglobin (HgA1C), DM type, duration of diabetes, swab, tissue culture, type of surgery, and type of isolated organism. All data were obtained from patients' medical records.

Ethical considerations

Ethical approval for this study was obtained as a signed paper from the Institutional Review Board of King Abdulaziz University Hospital (Approval No. 1-21). Written informed consent was obtained from each participant.

Statistical analysis

Data were analyzed using the SPSS version 26 (IBM® SPSS® Statistics, Chicago, USA). Qualitative data were expressed as numbers and percentages, and the chi-square test (χ^2) was applied to test the relationship between variables. Quantitative data are expressed as mean and standard deviation (mean ± SD). Statistical significance was set at $p < 0.05$.

Results

This study included 260 patients whose mean age was 63.04 ± 13 years; 69.2% were males, 36.2% had a Saudi nationality, and 71.5% had DM type 2 (Table 1). Among the study population, 30.4%, 26.5%, and 10.4% had dry, wet, and gas gangrene, respectively. Almost half of the patients (51.2%) had chronic ulcers, 79.6% were admitted through the ER, 64.6% were receiving insulin on a treat to target titration schedule, and 81.9% had foot infection. Most patients (83.8%) had comorbid chronic diseases, including hypertension (74.2%) and cardiovascular disease (30.8%). The mean number of chronic diseases was 1.39 ± 1.03.

Table 1: Distribution of studied patients according to their demographic characters, diabetes type, gangrene, admission site, chronic diseases, chronic ulcer, insulin ttt, and foot infection (No.: 260).

Variable	No. (%)
Age (years)	63.04 ± 13
Sex	
Female	80 (30.8)
Male	180 (69.2)
Nationality	
None-Saudi	166 (63.8)
Saudi	94 (36.2)
Diabetes type	
NA	23 (8.8)
Type 1	51 (19.6)
Type 2	186 (71.5)
Dry gangrene	
No	181 (69.6)
Yes	79 (30.4)
Wet gangrene	
No	191 (73.5)
Yes	69 (26.5)
Gas gangrene	
No	233 (89.6)
Yes	27 (10.4)
Chronic ulcer	
No	127 (48.8)
Yes	133 (51.2)
Site of admission	
ER	207 (79.6)
NA	12 (4.6)
Outpatient	41 (15.8)
Chronic diseases	
Yes	218 (83.8)
No	42 (16.2)

If yes: what type? (No.: 218)	
CVD	80 (30.8)
DM	26 (10)
CKD	52 (20)
HTN	193 (74.2)
Number of chronic diseases	1.39 ± 1.03
Insulin ttt	
NA	27 (10.4)
No	65 (25)
Yes	168 (64.6)
Foot infection	
NA	22 (8.5)
No	25 (9.6)
Yes	213 (81.9)

CVD: Cardiovascular Disease; DM: Diabetes Mellitus; CKD: Chronic Kidney Disease; HTN: Hypertension

Approximately 25.8% of patients had osteomyelitis, and 54.2% had a surgical history, with a mean number of surgeries of 1.31 ± 1.3 (Table 2). Overall, 21.2% (one-fifth) of the patients had co-infection, while 58.1% had a single infection. Of the 260 patients, 25.8% had Multidrug Resistance (MDR) and 86.9% had amputations, with a mean number of amputations of 1.38 ± 0.87. More than half of the patients (55.8%) had minor amputation, with a mean number of amputations of 0.74 ± 0.8 and with 16.2% of amputations through the metatarsal bones.

Table 2: Distribution of studied patients according to osteomyelitis, surgical history, MDR, amputations, co-infection, hospital stay, and lab results (N0.: 260).

Variable	**No. (%)**
Osteomyelitis	
N/A	95 (36.5)
No	98 (37.7)
Yes	67 (25.8)
Surgical history	
NA	47 (18.1)
No	72 (27.7)
Yes	141 (54.2)
Number of surgeries	1.31 ±1.3
Co-infection	
Single infection	151 (58.1)
Co-infection	55 (21.2)
No organism or NA	54 (20.8)
MDR	
NA	46 (17.7)
No	147 (56.5)
Yes	67 (25.8)
Amputation	
No	34 (13.1)
Yes	226 (86.9)
Number of amputations	1.38 ± 0.87
Minor amputation	
No	115 (44.2)
Yes	145 (55.8)
Number of minor amputations	0.74 ± 0.8
Level of minor amputation	
Above_knee	2 (0.8)
Below_Knee	13 (5)
Great_toes_or_first_ray	36 (13.8)
N/A	115 (44.2)
Other_toes	41 (15.8)
Through_ankle_or_Taurus	2 (0.8)
Through_metatarsal_bones	42 (16.2)
Through_tarsometatarsal_joints	9 (3.5)
Major amputation	
NA	0.4
No	129 (49.6)
Yes	130 (50)
Number of major amputations	0.67 ± 0.76
Level of major amputation	
Above_knee	80 (30.8)
Below_Knee	56 (21.5)
Hip	2 (0.8)
N/A	121 (46.5)
Through_knee	1 (0.4)
Debridement	
NA	91 (35)
No	105 (40.4)
Yes	64 (24.6)
Hospital stay (days)	21.16 ± 32.53
Mean values	
BMI	26.88 ± 7.4
WBC	16.4 ± 11.32
Hg	9.19 ± 3.08
HgAIC	6.95 ± 5.88
CRP	62.94 ± 95
ESR	61.53 ± 48.01
Creatinine	175.8 ± 201.42

MDR: Multidrug Resistant Bacteria; N/A: Not Available; BMI: Body Mass Index; WBC: White Blood Cells; Hg: Hemoglobin; HgAIC: Glycated Hemoglobin; CRP: C-Reactive Protein; ESR: Erythrocyte Sedimentation rate

Overall, 50% of the patients underwent major amputation, with a mean number of amputations of 0.67 ± 0.76 and with 30.8% of amputations above the knee. Fewer patients (24.6%) underwent debridement, and the mean hospital stay was 21.16 ± 32.53 days.

The mean values of BMI and laboratory results are shown in (Table 2). The most commonly isolated organisms were *Escherichia coli* (16.9%), *Staphylococcus aureus* (10.8%), *Klebsiella pneumoniae* (9.6%), Streptococcus agalactiae (8.5%), *Pseudomonas aeruginosa* (7.3%), *Morganella morganii* (5.8%), and *Proteus mirabilis* (5%) (Figure 1). There was no significant relationship between amputation and the isolated organisms listed in (Tables 3 and 4) ($p > 0.05$), except for *Staphylococcus aureus* ($p < 0.001$), as shown in (Figure 2) (Table 3). Patients who had no *Staphylococcus aureus* infection had a significantly higher incidence of amputation (major and minor) ($p < 0.001$) (Figure 2). There was no significant relationship between minor amputations and the isolated organisms ($p > 0.05$), and the same applies to major amputations, except for P*seudomonas aeruginosa* and *Staphylococcus aureus* infection ($p < 0.05$) (Table 4). Patients who had no *Pseudomonas aeruginosa* or *Staphylococcus aureus* infection had a significantly higher incidence of amputation ($p < 0.05$) (Figures 3 and 4).

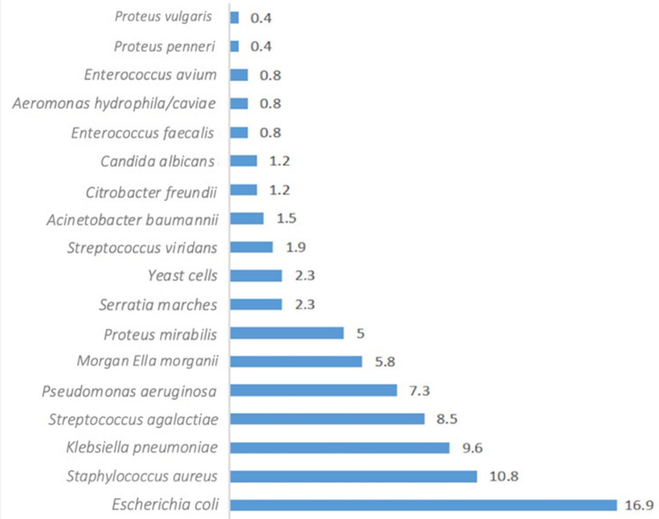

Figure 1: Percentage distribution of isolated organisms from diabetic foot ulcers.

Table 3: Relationship between amputation and isolated organism.

Variable	Amputation		χ^2	p-value
	No No. (%)	Yes No. (%)		
Enterococcus faecalis	0 (0.0)	2 (100)	0.3	0.582
Acinetobacter baumannii	1 (25)	3 (75)	0.5	0.476
Streptococcus viridans	1 (20)	4 (80)	0.21	0.643
Klebsiella pneumonia	3 (12)	22 (88)	0.02	90.867
Morganella morganii	0 (0.0)	15 (100)	2.39	0.122
Escherichia coli	7 (15.9)	37 (84.1)	0.36	0.549
Streptococcus agalactiae	3 (13.6)	19 (86.4)	0.007	0.935
Pseudomonas aeruginosa	1 (5.3)	18 (94.7)	1.1	0.294
Citrobacter freundii	0 (0.0)	3 (100)	0.45	0.499
Aeromonas hydrophilic/caviae	0 (0.0)	2 (100)	0.3	0.582
Enterococcus avium	0 (0.0)	1 (100)	0.15	0.698
Candida albicans	0 (0.0)	3 (100)	0.45	0.499
Serratia marches	0 (0.0)	6 (100)	0.92	0.336
Proteus mirabilis	1 (7.7)	12 (92.3)	0.34	0.555
Proteus penneri	0 (0.0)	1 (100)	0.15	0.698
Proteus vulgaris	0 (0.0)	1 (100)	0.15	0.698
Yeast cells	1 (16.7)	5 (83.3)	0.07	0.792

Table 4: Relationship between minor and major amputations and isolated organisms.

Variable	Minor amputation No. (%)	χ^2 (p-value)	Major amputation No. (%)	χ^2 (p-value)
Enterococcus faecalis	2 (100)	-0.206	1 (50)	-0.996
Acinetobacter baumannii	3 (75)	-0.435	1 (25)	-0.591
Streptococcus viridans	3 (60)	-0.847	1 (20)	-0.389
Klebsiella pneumonia	15 (60)	-0.654	11 (44)	-0.766
Morganella morganii	11 (73.3)	-0.158	9 (60)	-0.713
Escherichia coli	25 (56.8)	-0.903	21 (47.7)	-0.854
Streptococcus agalactiae	14 (63.6)	-0.437	6 (27.3)	-0.076
Pseudomonas aeruginosa	12 (63.2)	-0.501	8 (42.1)	-0.002

Staphylococcus aureus	13 (46.4)	-0.292	7 (25)	-0.017
Citrobacter freundii	3 (100)	-0.121	1 (33.3)	-0.836
Aeromonas hydrophila/caviae	2 (100)	-0.206	1 (50)	-0.996
Enterococcus avium	0 (0.0)	-0.261	1 (100)	-0.605
Candida albicans	3 (100)	-0.121	2 (66.7)	-0.843
Serratia marches	3 (50)	-0.773	3 (50)	-0.988
Proteus mirabilis	10 (79.9)	-0.115	6 (46.2)	-0.931
Proteus penneri	0 (0.0)	-0.261	1 (100)	-0.605
Proteus vulgaris	0 (0.0)	-0.261	1 (100)	-0.605
Yeast cells	1 (16.7)	-0.051	5 (83.3)	-0.255

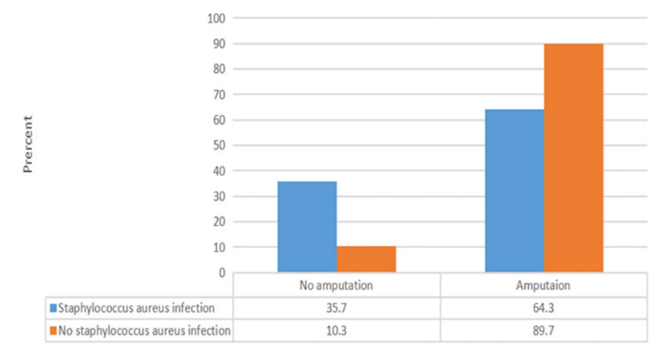

Figure 2: Relationship between amputation and *Staphylococcus aureus* infection.

N.B.: (χ^2=14.14, p-value=<0.001)

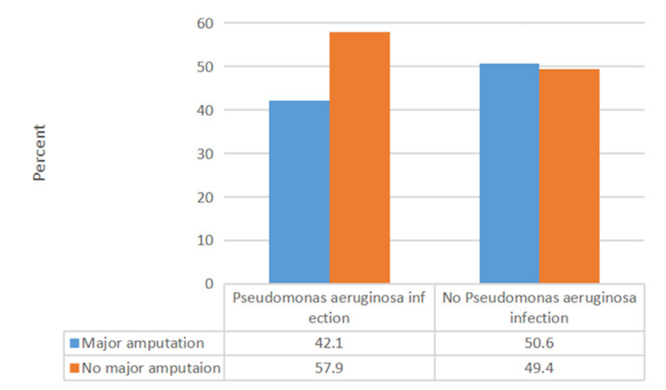

Figure 3: Relationship between major amputations and *Pseudomonas aeruginosa* infection.

N.B.: (χ^2=12.97, p-value=0.002)

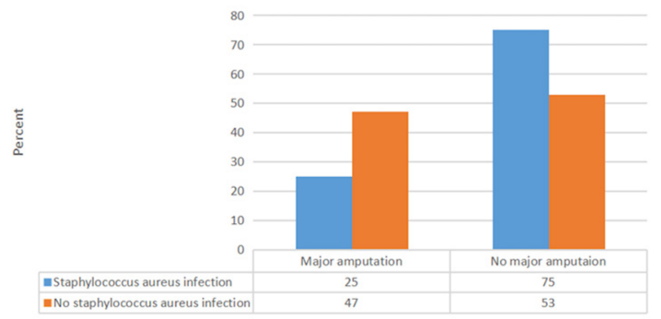

Figure 4: Relationship between major amputation and *Staphylococcus aureus* infection.

N.B.: (χ^2=14.14, p-value=<0.001)

There was a significant weak negative correlation between patient age and HgA1C (r=- 0.16, p-value=0.015), while a significant positive correlation was found between HgA1C and the number of minor amputations (r=0.22, p=0.001) (Table 5). Patients with a HgA1C level < 7% had a significantly higher percentage of minor amputations (p< 0.05) (Table 6). However, a non-significant relationship was found between HgA1C levels and major amputations (p> 0.05). A significantly higher percentage of those who cultured drug-sensitive organisms underwent a minor amputation only (p<0.001) (Table 7). The details of the MDR status of the isolated organisms are shown in (Table 8).

Discussion

This retrospective study aimed to identify the common pathogens isolated from DFI to apply appropriate antibiotic treatment followed by surgical interventions, wherein data were collected retrospectively from 260 patients who presented

Table 5: Correlation analysis between HgAIC and independent variables.

Variable	HgA1C	
	R	**P-value**
Age	-0.16	0.015
Diabetes duration	-0.15	0.317
Number of chronic diseases	-0.05	0.388
Number of surgeries	0 07	0.322
Number of all amputations	0.09	0.179
Number of minor amputations	0.22	0.001
Number of major amputations	-0.12	0.053
Hospital stay (days)	0.06	0.33

Table 6: Relationship between minor and major amputations and isolated organisms with regards to HgA1C level.

Variable	HgAIC			χ^2	p-value
	< 7	7.1-10	> 10		
Minor amputation					
No	57 (57.6)	22 (22.2)	20 (20.2)	9.31	0.009
Yes	48 (37.5)	46 (35.9)	34 (26.6)	-	-
Major amputation					
ND	1 (100)	0 (0.0)	0 (0.0)	8.55	0.073
No	44 (39.6)	32 (28.8)	35 (31.5)	-	-
Yes	60 (52.2)	36 (31.3)	19 (16.5)	-	-
HgAIC: Hemoglobin A1C, ND: Not Detected					

Table 7: Relationship between MDR and amputation and its types.

Variable	MDR			χ^2	p-value
	N/A	No	Yes		
Amputation					
No	2 (5.9)	26 (76.5)	6 (17.6)	6.83	0.033
Yes	44 (19.5)	121 (53.5)	61 (27)	-	-
Minor amputation					
No	26 (22.6)	62 (53.9)	27 (23.5)	3.48	0.175
Yes	20 (13.8)	85 (58.6)	40 (27.6)	-	-
Major amputation					
ND	0 (0.0)	0 (0.0)	1 (100)	21.31	< 0.001
No	10 (7.8)	85 (65.9)	34 (26.4)	-	-
Yes	36 (27.7)	62 (47.4)	32 (24.6)	-	-
MDR: Multidrug Resistant, ND: Not Detected, NA: Not Available					

Table 8: Relationship between MDR and isolated organisms.

Variable	MDR			χ^2	p-value
	N/A	No	Yes		
Enterococcus faecalis	0 (0.0)	2 (100)	0 (0.0)	1.54	0.461
Acinetobacter baumannii	0 (0.0)	4 (100)	0 (0.0)	3.12	0.21
Streptococcus viridans	0 (0.0)	5 (100)	0 (0.0)	3.91	0.141
Klebsiella pneumoniae	0 (0.0)	14 (56)	11 (44)	8.46	0.015
Morgan Ella morganii	0 (0.0)	8 (53.3)	7 (46.7)	5.54	0.063
Escherichia coli	0 (0.0)	24 (54.5)	20 (45.5)	17.75	< 0.001
Streptococcus agalactiae	0 (0.0)	16 (72.7)	6 (27.3)	5.38	0.068
Pseudomonas aeruginosa	0 (0.0)	9 (47.4)	10 (52.6)	9.67	0.008
Staphylococcus aureus	0 (0.0)	17 (60.7)	11 (39.3)	7.87	0.02
Citrobacter freundii	0 (0.0)	1 (33.3)	2 (66.7)	2.79	0.247
Aeromonas hydrophila/caviae	0 (0.0)	2 (100)	0 (0.0)	1.54	0.461
Enterococcus avium	0 (0.0)	1 (100)	0 (0.0)	0.77	0.68
Candida albicans	0 (0.0)	3 (100)	0 (0.0)	2.33	0.311
Serratia marches	0 (0.0)	3 (50)	3 (50)	2.53	0.282
Proteus mirabilis	0 (0.0)	8 (61.5)	5 (38.5)	3.33	0.189
Proteus penneri	0 (0.0)	0 (0.0)	1 (100)	2.89	0.236
Proteus vulgaris	0 (0.0)	0 (0.0)	1 (100)	2.89	0.236

Yeast cells	0 (0.0)	6 (100)	0 (0.0)	4.72	0.094
MDR: Multidrug Resistance, N/A: Not Available					

with diabetic foot in the study setting from October 2014 to September 2020. We found that the most common isolated pathogen was the gram-negative *Escherichia coli,* which is in contrast with the finding that gram-positive bacteria are the most common pathogens isolated from diabetic foot ulcers [16].

The current study included a majority of male participants, which is consistent with the findings of other studies conducted locally and internationally [17,18]. Another finding from this study was that *Escherichia coli* was the most commonly isolated organism, followed by *Staphylococcus aureus*. This finding is consistent with the finding of a study conducted at King Khalid Hospital in Al Kharj city, Saudi Arabia, wherein *Escherichia coli* was the dominant anaerobic organism (22%), leading to the development of infectious processes and being distributed in a proximal direction along the synovial-tendon sheets of the foot [19]. Furthermore, our finding agrees with a previous Iranian study finding [20].

Our findings are also consistent with those of similar studies conducted in Kuwait and Lebanon, which found that gram-negative bacteria are more commonly isolated from DFIs, with *Escherichia coli* being the most common [21,22]. In contrast, Al Ayed et al. conducted a study in 2018 on 126 patients aged 40–70 years at the Prince Sultan Military Medical City in Riyadh, Saudi Arabia, using a swab culture method for microbiological testing and reported that *Staphylococcus aureus* was the most commonly isolated organism, followed by *Pseudomonas aeruginosa* [23]. The high incidence of gram-negative DFI in our region can be explained by multiple theories. The abuse of antibiotics could explain the predominance of gram-negative infections in our patients. Thus, initiating an appropriate empiric antibiotic treatment that covers gram-negative organisms in the Emergency Department for Patients presenting with diabetic foot infection is crucial and will improve the prognosis.

According to our study, 55% of the patients had minor metatarsal amputations, 50% had major above-knee amputations, and 24% had debridement. In comparison, a previous Saudi study reported minor toe amputation as the most common amputation [19]. According to the previously mentioned Iranian study [20], amputations were most frequently performed on the toes and below the knee. The higher number of above-knee amputations in our data could be due to various factors, including later presentation because our hospital is a tertiary care center, type of diabetes, and the pathogen contributing to the infection.

According to a study conducted at Hebron Governmental Hospital between 2013 and 2020, the majority of the patients in the study had major amputations [24]. In our study, the majority of people who underwent amputation were infected with bacteria other than *Staphylococcus aureus.* A previous study found that gram-negative infections severely damage the tissue in diabetic feet and predispose patients to amputation [24].

This study observed a significant positive correlation between HgA1C and the number of minor amputations: patients with a HgA1C level of <7% were significantly more likely to require a minor amputation than patients with HgA1C level of >10%. This is in contrast with the findings of a previous study, which reported that patients who underwent amputation had poor glycemic control, were significantly older and less educated, and had longer hospital stays [25].

It was discovered that patients in the current study who had amputations (major or minor) and those who had minor amputations had a significantly lower percentage of MDR than those who did not. Infections of leg ulcers have a significant impact on patients and healthcare services; therefore, they must be detected early. DFIs can have a monomicrobial or polymicrobial etiology, and microorganisms could be resistant to one or more antibiotics [26-28]. In global comparisons, the most common causative organisms isolated in Western countries are gram-positive, particularly Methicillin-Sensitive *Staphylococcus aureus* (MSSA) [29].

The high incidence of gram-negative infections in our country has not yet been investigated, but it could be attributed to an era when antibiotics were available as over-the-counter medications. As a result, well-established guidelines for treating DFIs advocate empiric antibiotic regimens that cover these organisms.

This study has some limitations. The retrospective nature of the study design could have impacted the generalization of the study results. This study was conducted in a single center, and as such had a limited number of participants and some missing data, multicenter study design will overcome this limitation. There were insufficient studies on common pathogens isolated from infected diabetic foot ulcers in our nation, we recommend to do more studies.

Conclusion

DM is a metabolic syndrome that affects all the body systems and has an impact on both morbidity and mortality. One of the common complications in diabetic patients is diabetic foot ulcer, which is the single most common cause of DM-related hospital admissions and one of the leading causes of amputation. This study discovered that Escherichia coli was the most commonly isolated organism in the feet of diabetic patients, followed by Staphylococcus aureus. These results can serve as reference for local guidelines, aiming to improve patient outcomes and decrease and prevent bacterial resistance to antibiotics. Furthermore, preventive measures such as good glycemic control, appropriate foot care, well-adjusted antibiotic therapy, and patient education may significantly reduce the incidence of amputation among Saudi patients with diabetes. All treating physicians should collect appropriate specimens for culture and encourage clinical microbiology laboratories to report the genus of all organisms recovered from such specimens.

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Conflict of Interest

The authors declare no competing financial interest.

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