Antibiotic use in the treatment of diabetic foot ulcers: A cross-sectional study at a general hospital, Vietnam in 2023 - 2024

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ABSTRACT

Background: Diabetic foot ulcers (DFUs) are a frequent diabetes complication, creating major social, psychological, and economic burdens. With rising antibiotic resistance and the high prevalence of infected DFUs, rational and safe antibiotic use is increasingly important. Objectives: This study investigated the prevalence and patterns of antibiotic use and evaluated the appropriateness and safety of therapy for infected DFUs at Thong Nhat Dong Nai General Hospital. Materials and methods: A cross-sectional, retrospective study was conducted from June 2023 to December 2024. Medical records of 235 patients aged ≥ 18 years with infected DFUs were reviewed. Data included patient characteristics, antibiotic regimens, and outcomes. Appropriateness and safety were assessed using international and national guidelines. Results: Among 235 patients (mean age 60.71 ± 12.28 years; male-to-female ratio 1:1.06), vancomycin was most frequently used prior to antimicrobial susceptibility testing (AST) (42.13%), while piperacillin/tazobactam was most frequently used following AST (77.10%). Most patients continued empirical therapy (65.53%). Dose and regimen appropriateness were 68.94% and 66.53%. Adverse reactions included gastrointestinal disturbances (7.65%), allergies (5.11%), and neurological effects (0.85%). Drug-drug interactions were frequent: moderate 53 - 62% and severe 9 - 15%. Conclusion: Antibiotic prescribing was generally guideline-consistent but associated with adverse reactions and moderate-to-high interaction risks, highlighting the need for careful monitoring and enhanced clinical pharmacy support.

Keywords: antibiotics, diabetic foot ulcer, type 2 diabetes mellitus

1. INTRODUCTION

Diabetic foot ulcer (DFU) is defined as a localized ulcerative lesion occurring on the foot - ranging from the ankle downward, including the dorsum, plantar surface, heel, and toe areas - in patients with diabetes mellitus (DM). It is estimated that approximately 19 - 34% of individuals with diabetes will develop DFU at least once in their lifetime [1]. According to the International Diabetes Federation (IDF), there are 9.1 to 26.1 million new cases of DFU globally each year [2]. In Vietnam, studies indicate that the majority of hospitalized DFU cases present with varying degrees of infection. According to Huynh Tan Dat et al., the annual incidence of diabetic foot infections ranges from 5.3% to 10.5% [3], with severe infections being associated with poorer prognosis, prolonged hospitalization, higher treatment costs, and increased risk of limb amputation. Antibiotics play a foundational role in controlling infection at ulcer sites, and the appropriate selection and use of antibiotics are key determinants of therapeutic success [4].

Currently, national statistics on DFU in Vietnam remain limited. Some individual studies have reported that approximately 20% of hospitalized patients with diabetes present with foot ulcers.

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Recurrence rates are high, estimated at 40% within 1 year, 60% within 3 years, and 65% within 5 years after the initial ulcer episode [1]. Globally, more than one million lower limb amputations occur annually among diabetic patients, accounting for approximately 85% of all non-traumatic limb amputations. With the increasing prevalence of diabetes worldwide, the burden of DFU-related complications is projected to rise substantially in the near future [1].

Meanwhile, the treatment of infected DFU - especially in patients with diabetes - relies heavily on the use of antibiotics. However, the growing challenge of antimicrobial resistance worldwide threatens the effectiveness of current treatment protocols. This concern is particularly alarming in the context of DFU infections, which are common and often associated with severe consequences. Despite the clinical importance of DFU, existing studies in Vietnam remain limited, with most focusing on clinical characteristics or microbiological profiles rather than evaluating the appropriateness and safety of antibiotic use. Evidence on real-world prescribing practices - especially at the provincial hospital level - is still scarce. This gap highlights the need for updated data to inform antimicrobial stewardship and optimize treatment strategies. Therefore, this study aim to (1) To determine proportion of antibiotics used in the treatment of infected diabetic foot ulcers at Thong Nhat General Hospital - Dong Nai Province in 2023 - 2024 (2) To determine proportion of rational and safe antibiotic use in the treatment of infected diabetic foot ulcers at Thong Nhat General Hospital - Dong Nai Province in 2023 - 2024.

2. MATERIALS AND METHOD
2.1. Study subjects
Medical records of patients diagnosed with infected diabetic foot ulcers, treated at the Endocrinology Department and the Department of Orthopedic Surgery of Thong Nhat Dong Nai General Hospital, from June 2023 to December 2024.

Inclusion criteria
- Medical records of patients aged ≥ 18 years;
- Diagnosed with infected diabetic foot ulcers due to diabetes mellitus.

Exclusion criteria
- Medical records of patients who were pregnant or breastfeeding;

- Medical records showing concomitant infectious diseases;
- Medical records indicating severe life threatening comorbidities;
- Medical records of patients who left the hospital or were transferred before treatment outcomes were recorded;
- Medical records with incomplete data.

2.2. Research methodology
Study design
A cross-sectional descriptive study based on retrospective data from medical records of patients diagnosed with infected diabetic foot ulcers, treated at the Endocrinology Department and the Department of Orthopedic Surgery of Thong Nhat Dong Nai General Hospital from June 2023 to December 2024.

Study sample
A total sampling method was applied for all cases meeting the inclusion criteria during the data collection period at Thong Nhat Dong Nai General Hospital, with the following inclusion criteria:

Study variables
The study variables included general characteristics of the study population such as age, age group, gender, body mass index (BMI), and duration of diabetes mellitus. In addition, the study examined the types of antibiotics used in the treatment of infected diabetic foot ulcers and evaluated both the rationality and safety of antibiotic use in this context. Rational use was assessed based on the appropriateness of antibiotic selection, dosage, route of administration, and treatment duration according to clinical guidelines. Safety of antibiotic use was evaluated based on the occurrence of adverse drug reactions (ADRs), contraindications, and potential drug-drug interactions during treatment.

Criteria used in the study
- Infection severity was classified according to the IWGDF/IDSA framework, which categorizes diabetic foot infections into mild, moderate, and severe based on clinical signs of inflammation, systemic involvement, and extent of tissue damage. Operational definitions were applied as follows: mild infection was defined as localized involvement of the skin and subcutaneous tissue; moderate infection included deeper tissue involvement without systemic inflammatory response; and severe infection referred to cases

with systemic toxicity or metabolic instability. Classification was based on documented clinical examinations in the medical records.

- Assess the conformity of antibiotic regimens with recommendations from the IWGDF 2019 guidelines, the Vietnamese National Pharmacopoeia 2022 [4], and the Ministry of Health of Vietnam [5]. This includes evaluating the appropriateness of antibiotic selection, dosing (with renal and weight-based adjustments), route of administration, and treatment duration for both initial empirical therapy and subsequent regimen modifications after pathogen identification.- Evaluate the appropriateness of empirical and adjusted antibiotic regimens (after receiving AST results) according to UpToDate guidelines, with a focus on appropriate antibiotic dosing.

- Identify the severity of potential drug-drug interactions using three reference databases: Drugs.com, Medscape, and Micromedex. Each database uses different original severity categories. Specifically, Drugs.com classifies interactions as *major, moderate,* or *minor*; Medscape uses *contraindicated, serious, significant,* and *minor*; while Micromedex classifies interactions as *contraindicated, major, moderate,* and *minor*. For each patient, all prescribed antibiotics and chronic medications were entered, and the resulting interaction lists were exported. Unique drug-drug *pairs* were then identified for each database.

- ADRs were identified through retrospective review of medical records, including physician notes, nursing documentation, laboratory results, and recorded medication-related events. Gastrointestinal adverse effects (GI AEs) - including nausea, vomiting, diarrhea, abdominal discomfort, and antibiotic-associated dysbiosis -were defined using standard clinical terminology and recorded as ADRs when documented by treating clinicians. For each patient, all documented ADRs were collected. If multiple ADRs occurred in the same patient, each reaction was counted individually.

2.3. Data analysis

Data collected during the study were recorded using standardized data collection forms. Data entry, processing, and analysis were performed using SPSS version 20 and Microsoft Excel 2016. The study was documented and presented using Microsoft Office Word 2016 and PowerPoint 2016.

2.4. Ethical considerations

This study was approved by the Ethics Committee of Hong Bang International University under Decision No. 860/QĐ-HIU, dated August 19, 2024, and by the Medical Ethics Committee of Thong Nhat Dong Nai General Hospital under Decision No. 02/HĐĐĐ, dated January 16, 2025. As this was a retrospective review of existing medical records, the requirement for informed consent was waived. All patient data were anonymized and handled in accordance with ethical standards to ensure confidentiality and privacy.

3. RESULTS

3.1. Proportion of antibiotics used in the treatment of infected diabetic foot ulcers patient characteristics in the study sample

A total of 235 patients with infected diabetic foot ulcers treated at the Endocrinology Department and the Department of Orthopedic Surgery of Thong Nhat Dong Nai General Hospital were included in the study. The characteristics of the study population are presented in Table 1.

Table 1. General characteristics of the study sample

Variable		Frequency (Percentage %)/Mean ± SD
Age		60.71 ± 12.28
Gender	Male	114 (48.6%)
	Female	121 (51.4%)
BMI (kg/m^2)		22.01 ± 3.36
Duration of diabetes mellitus	< 5 years	12 (5.11%)
	≥ 5 years	223 (94.89%)
Type of diabetes mellitus	Type 1	22 (9.36%)
	Type 2	213 (90.64%)
Duration of ulcer	< 1 month	142 (60.43%)
	≥ 1 month	93 (39.57%)

Variable		Frequency (Percentage %)/Mean ± SD
Infection classification	Mild	7 (2.98%)
	Moderate	131 (55.74%)
	Severe	97 (41.28%)
Ulcer location	Toe	46 (19.57%)
	Plantar surface	57 (24.26%)
	Dorsum of the foot	97 (41.28%)
	Heel	22 (9.36%)
	Forefoot	13 (5.53%)
Length of hospital stay (day)		14.35 ± 8.46
Surgical intervention	Debridement performed	184 (78.30%)
	Amputation performed	37 (15.75%)
	No surgical intervention	14 (5.95%)
Treatment outcome	Improved	208 (88.51%)
	No change	23 (9.78%)
	Worsened	4 (1.71%)

Notes: SD - Standard deviation

The study showed that the mean age of patients was 60.71 ± 12.28 years, with a male-to-female ratio of 1:1.05 and an average BMI of 22.01 ± 3.36 kg/m². Most patients had a long history of diabetes, with 94.9% having been diagnosed for ≥ 5 years. The majority were diagnosed with type 2 diabetes (90.7%), while only a small proportion had type 1 diabetes (9.3%). The study also found that in most cases, ulcers had developed for less than one month (60.5%) and debridement was required in 78.4% of patients. Following treatment, 88.5% of patients showed clinical improvement, 9.8% remained unchanged, and 1.7% experienced worsening of their condition.

Proportion of antibiotic use in the treatment of infected diabetic foot ulcers

The proportion of antibiotic regimens used is presented in Table 2.

Table 2. Proportion of antibiotic regimens in the study sample

Regimen	Initial antibiotic regimen		Adjusted regimen after AST results	
	Frequency (n = 235)	Percentage (%)	Frequency (n = 131)	Percentage (%)
Monotherapy	32	13.61	38	29.01
Dual antibiotic therapy	203	86.39	92	70.23
Triple antibiotic therapy	-	-	1	0.76

Note: AST-Antimicrobial susceptibility testing

According to Table 2, among 235 patients receiving initial antibiotic therapy, dual antibiotic combinations predominated (86.39%), while monotherapy accounted for only 13.61%. Among 131 patients with available antibiogram results, the proportion of monotherapy increased to 29.01%, whereas dual therapy decreased to 70.23%. Notably, only one case (0.76%) was treated with a triple antibiotic combination regimen.

The proportion of antibiotic use before antimicrobial susceptibility testing is shown in Table 3.

Table 3. Proportion of antibiotic use before antimicrobial susceptibility testing (n = 235)

Antibiotic class	Antibiotic	Frequency (Percentage %)
Penicillin combinations	Amoxicillin/clavulanic	21 (8.94%)
	Ampicillin/sulbactam	2 (0.85%)
	Piperacillin /Tazobactam	-

Antibiotic class	Antibiotic	Frequency (Percentage %)
Carbapenem	Meropenem	9 (3.83%)
	Imipenem	-
Cephalosporin	Cefamadol	68 (28.94%)
	Cefoxitin	13 (5.53%)
	Ceftizoxim	82 (34.89%)
	Ceftazidim	21 (8.94%)
	Ceftriaxone	-
	Cefepim	-
Aminoglycosid	Netilmicin	81 (34.47%)
	Tobramycin	10 (4.26%)
	Amikacin	-
Glycopeptid	Vancomycin	99 (42.13%)
Oxazolidinon	Linezolid	15 (6.38%)
Polymyxin	Colistin	-
Fluoroquinolone	Ciprofloxacin	-
	Moxifloxacin	-
	Levofloxacin	-

As shown in Table 3, the most commonly used empiric antibiotic was vancomycin, accounting for 42.13%. Cephalosporins were also frequently prescribed, particularly second-generation agents such as cefamadol (28.94%) and cefoxitin (5.53%), as well as the third-generation ceftizoxime (34.89%). In addition, the aminoglycoside group was represented by netilmicin, which was used in a high proportion of cases (34.47%).

The proportion of antibiotic use after antimicrobial susceptibility testing is presented in Table 4.

Table 4. Proportion of antibiotic use after antimicrobial susceptibility testing (n = 131)

Antibiotic class	Antibiotic	Frequency (Percentage %)
Penicillin Combinations	Amoxicillin/clavulanic	72 (54.96%)
	Ampicillin/sulbactam	34 (25.95%)
	Piperacillin /Tazobactam	101 (77.10%)
Carbapenem	Meropenem	21 (16.03%)
	Imipenem	24 (18.32%)
Cephalosporin	Cefamadol	82 (62.60%)
	Cefoxitin	28 (21.37%)
	Ceftizoxim	90 (68.70%)
	Ceftazidim	11 (8.40%)
	Ceftriaxone	30 (22.90%)
	Cefepim	14 (10.69%)
Aminoglycosid	Netilmicin	1 (0.76%)
	Tobramycin	1 (0.76%)
	Amikacin	5 (3.82%)
Glycopeptid	Vancomycin	7 (5.34%)
Oxazolidinon	Linezolid	5 (3.82%)
Polymyxin	Colistin	2 (1.53%)
Fluoroquinolone	Ciprofloxacin	2 (1.53%)
	Moxifloxacin	5 (3.82%)
	Levofloxacin	3 (2.29%)

Following antimicrobial susceptibility testing, combination penicillins remained the most frequently prescribed, with Piperacillin/Tazobactam accounting for 77.10%, amoxicillin/clavulanic 54.96%, and ampicillin/sulbactam 25.95%. Cephalosporins were also widely used, particularly Ceftizoxime (68.70%) and Cefamandol (62.60%), while Ceftriaxone (22.90%), Cefepime (10.69%), and Ceftazidime (8.40%) were less common. Carbapenems were prescribed in 16.03% (Meropenem) and 18.32% (Imipenem) of cases. Other classes, including aminoglycosides, glycopeptides, oxazolidinones, polymyxins, and fluoroquinolones, were used at relatively low frequencies (<6%).

3.2. Proportion of rational and safe antibiotic use in the treatment of infected diabetic foot ulcers
3.2.1. Appropriateness rate of empirical treatment regimens
The appropriateness rate of empirical treatment regimens is shown in Table 5.

According to the IWGDF 2019 guideline, the appropriateness rate of empirical treatment regimens among 235 patients was relatively high, with 75.75% of prescriptions classified as appropriate.

Table 5. Appropriateness rate of empirical treatment regimens (n = 235)

Appropriateness	Appropriate		Inappropriate	
	Frequency	Percentage (%)	Frequency	Percentage (%)
According to the IWGDF 2019 guideline	178	75.75%	57	24.25%

3.2.2. Assessment of antibiotic appropriateness
The result is presented in Table 6. The appropriateness of antibiotic dosage showed that the proportion of appropriate dosing was twice as high as inappropriate dosing (68.94% vs. 31.06%). The proportion of the appropriate route of administration was 100%. Overall rational antibiotic use - defined as appropriateness in terms of antibiotic selection, dosage, route of administration, and duration of use - was observed in 66.53% of cases, while 33.47% of prescriptions were classified as inappropriate.

Table 6. Assessment of antibiotic appropriateness (n = 235)

Appropriateness	Appropriate		Inappropriate	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Antibiotic dosage	163	68.94	73	31.06
Route of administration	235	100	0	0
Overall antibiotic regimen	154	66.53	81	34.47

3.2.3. Evaluation of the safety of antibiotic use
Adverse effects of antibiotics are presented in Table 7. Adverse effects of antibiotics were recorded, with disruption of gut microbiota being the most common (7.65%), followed by drug allergy (5.11%), hepatic or renal toxicity (3.40%), and neurological effects being the least common (0.85%). Drug interaction severity in medical records based on reference databases is presented in Table 8.

Table 7. Assessment of antibiotic safety

Adverse drug reaction	Disruption of gut microbiota	Drug allergy	Hepatic or renal toxicity	Neurological effects	Total (%)
Penicillin combinations (n = 46)	2 (4.3%)	2 (4.3%)	-	-	4 (8.6%)
Cephalosporin (n = 215)	9 (4.2%)	5 (2.3%)	-	-	14 (6.5%)
Carbapenem (n = 31)	2 (6.4%)	-	-	-	2 (6.4%)

Adverse drug reaction	Disruption of gut microbiota	Drug allergy	Hepatic or renal toxicity	Neurological effects	Total (%)
Aminoglycoside (n = 106)	-	-	3 (2.8%)	-	3 (2.8%)
Glycopeptid (n = 101)	5 (4.95%)	5 (4.95%)	4 (3.96%)	-	14 (13.86%)
Oxazolidinon (n = 28)	-	-	1 (3.6%)	2 (7.2%)	3 (10.8%)
Total (n = 235)	18 (7.65%)	12 (5.11%)	8 (3.40%)	2 (0.85%)	40 (17.02%)

Table 8. Drug interaction severity in medical records based on reference databases

Databases	Drug interaction severity	Interaction pairs	Percentage (%)
Drugs.com (n = 60)	Major	9	15.00%
	Moderate	32	53.33
	Minor	19	31.67
Medscape.com (n = 66)	**Contraindication**	0	0.00
	Major	7	10.60
	Moderate	37	56.06
	Minor	22	33.34
Micromedex (n = 66)	**Contraindication**	0	0.00
	Major	6	9.09
	Moderate	41	62.12
	Minor	19	28.79

According to the databases, the proportions of moderate and major drug interactions were 53.33% and 15.00% respectively, on Drugs.com, 56.06% and 10.60% on Medscape, and 62.12% and 9.09% on Micromedex.

4. DISCUSSION

The mean age of patients in the study was 60.71 ± 12.28 years, with the majority (52.8%) aged 60 years and older. This finding is consistent with the study by Thi Phuong Dung Do et al. (2023) [5], which indicated that diabetic foot ulcers tend to occur more frequently in elderly patients. In terms of gender, the proportion of male patients with diabetic foot ulcers was slightly lower than that of females (48.6% vs. 51.4%), which is in line with the findings of Thi Lieu Tran et al. (2016) [6]. This difference may be associated with hormonal changes, lifestyle factors, dietary habits, and poorer glycemic control in women compared to men. Most patients in the study had been diagnosed with diabetes for ≥ 5 years (94.9%), indicating that diabetic foot ulcers are more common in patients with long-standing diabetes.

The study found that the most commonly empiric antibiotic group among patients was glycopeptides, with vancomycin accounting for 42.13%, indicating a high prevalence of Gram-positive bacterial infections. This was followed by second-generation cephalosporins, with ceftizoxim representing 34.89% of prescriptions. Empiric antibiotic therapy for DFUs often involves broad-spectrum agents and combination regimens. Multiple studies report a high reliance on intravenous beta-lactams and glycopeptides to cover common DFU pathogens. For example, Nam Quang Tran et al. (2024) found vancomycin was the most frequently used antibiotic (in approximately 62% of cases), and over 75% of patients received dual antibiotic combinations [7]. Similarly, Cam Thai Nguyet Vo et al. (2022) showed that the most frequently prescribed initial antibiotic was also from the glycopeptide group (vancomycin), used in 62.5% of cases, followed by cephalosporins (55%) and carbapenems (36.7%). Additionally, the oxazolidinone group (linezolid) accounted for 10.8%, while fluoroquinolones were the least prescribed, at only 0.8% [8]. Likewise, in India, broad-spectrum cephalosporins (such as ceftriaxone and cefotaxime) were among the most prescribed antibiotics (≈ 28 - 19% of prescriptions), with more than half of patients on multi-drug regimens administered via the parenteral route [9].

These patterns reflect the polymicrobial nature of DFU infections and the severity of cases presenting to hospitals, prompting clinicians to initiate empirical coverage for Gram-positive (e.g, *Staphylococcus aureus*) and Gram-negative organisms (including *Pseudomonas spp.* in chronic wounds) from the outset. Notably, beta-lactam/beta-lactamase inhibitor combinations (e.g, piperacillin-tazobactam) and carbapenems are commonly utilized in severe infections[10], aligning with the need to cover resistant organisms.

Clinical practice guidelines (such as the IWGDF 2019 guidelines, IDSA guidelines, and national protocols) provide evidence-based recommendations for empiric antibiotic use in DFU, but real-world adherence to these standards is varied. This study showed that the appropriateness rate of empirical treatment regimens among 235 patients was relatively high, with 75.75% of prescriptions. Meanwhile, Thi Huynh Nguyen et al. (2021) found that only 30% of patients received empiric antibiotics in accordance with IDSA guidelines for diabetic foot infection at a tertiary hospital in Vietnam[11], whereas previous studies reported a range of 31.3% to 83% [11 - 13]. This wide range suggests that some centers perform much better than others in following recommended practices. Common deviations include using antibiotics not indicated for the infection's severity class, or not adjusting therapy when guidelines would suggest a change (e.g., not covering anaerobes when indicated, or vice versa). Lack of familiarity with specialized DFU guidelines appears to be one barrier - physicians not well-versed in the nuances of the IWGDF/IDSA recommendations may default to overly broad or non-standard regimens. Given these findings, ensuring the rational use of antibiotics in DFU is critical, given the risks of resistance and toxicity. Appropriate prescribing means selecting the right agent, dose, route of administration, and duration based on clinical severity and culture results. In practice, however, studies reveal substantial gaps in appropriateness. This study found that the proportion of appropriate antibiotic use in terms of dosage was 68.94%, with the main reason for inappropriateness being the prescription of lower-than-recommended doses. Similarly, a study of Tan To Anh Le et al. (2024) showed that only about 36% of initial empiric antibiotics matched the eventual culture and sensitivity findings in a Vietnamese hospital, indicating many empirical

regimens were too broad or not targeting the ultimately identified pathogen [14]. Additionally, Memy Avatin et al. (2024) showed that only about 36% of initial empiric antibiotics matched the eventual culture and sensitivity findings in a Vietnamese hospital, indicating many empirical regimens were too broad or not targeting the ultimately identified pathogen [14]. Additionally, Memy Avatin et al. (2023) found that only 54.0% of DFU patients received antibiotics appropriately according to guideline-based criteria, while 46% were judged inappropriate [15]. Common issues include using antibiotics with unnecessarily broad spectra, incorrect dosing, or prolonged durations beyond recommendations. Audits have also found that many patients remain on their initial empiric regimen even after culture results, for example, two-thirds of cases in the study of Tan To Anh Le et al. (2024) stayed on the initial regimen [14], suggesting room to improve de-escalation and tailoring of therapy once pathogen data is available. [15]. Common issues include using antibiotics with unnecessarily broad spectra, incorrect dosing, or prolonged durations beyond recommendations. Audits have also found that many patients remain on their initial empiric regimen even after culture results, for example, two-thirds of cases in the study of Tan To Anh Le et al. (2024) stayed on the initial regimen [14], suggesting room to improve de-escalation and tailoring of therapy once pathogen data is available. (2024) stayed on the initial regimen[14], suggesting room to improve de-escalation and tailoring of therapy once pathogen data is available. Overall, rational antibiotic use in DFU is suboptimal in many settings, and enhancing appropriateness (proper drug choice, dose, and therapy adjustments) is needed to maximize efficacy and minimize harm.

The study recorded that 17.02% of patients experienced adverse effects, with disruption of the gut microbiota being the most common (7.65%). Although the overall rate of adverse effects in this study was not high, it remains a concern - especially in the context of diabetic patients, who often have multiple comorbidities, making them more susceptible to the consequences of prolonged or complex antibiotic therapy. Additionally, the combination of multiple medications is often unavoidable, particularly in patients with multiple comorbidities and complex clinical presentations. Consequently, drug interactions are likely to occur

[4]. In this study, the severity of interactions between antibiotics used in the treatment of infected diabetic foot ulcers was analyzed using three well-established drug interaction databases: Drugs.com, Medscape, and Micromedex. The results indicated that moderate interactions were predominant compared to severe or contraindicated interactions. Specifically, according to Drugs.com, moderate interactions accounted for 53.33% and severe interactions for 15.00%; on Medscape, moderate and severe interactions were 56.06% and 10.60%, respectively; and on Micromedex, moderate interactions made up 62.12%, while severe interactions accounted for 9.09%.

This study provides a detailed description of antibiotic use in the management of diabetic foot ulcers at a provincial hospital. Assessing appropriateness and safety according to international guidelines, it offers practical evidence that may enhance treatment effectiveness and reduce healthcare costs in diabetic patients. However, as a cross-sectional study conducted at a single hospital, the findings may not fully represent national practices. The absence of long-term follow-up restricts the ability to evaluate treatment outcomes over time, particularly regarding recurrence, antibiotic resistance, and the durability of clinical improvements. In addition, the study did not capture therapeutic drug monitoring (TDM)

parameters for vancomycin, such as trough levels, AUC-based monitoring, or documentation of renal dose adjustments. Given the high vancomycin utilization in the pre-AST period, the absence of TDM data may limit our ability to fully evaluate the appropriateness of dosing and safety outcomes. Despite these limitations, the results offer practical implications for refining hospital treatment protocols to reduce antimicrobial resistance, shorten hospital stays, and lower amputation risk, especially in settings with similar patient characteristics and resource constraints. Future studies incorporating TDM variables are warranted to provide a more comprehensive assessment of vancomycin optimization after AST implementation.

5. CONCLUSION

Most patients received combination antibiotic regimens, predominantly vancomycin, which were generally maintained throughout treatment. Antibiotic selection and administration were mostly appropriate per susceptibility testing and guidelines, though occasional dosing errors occurred. The main adverse effects were gut microbiota disruption and allergic reactions, with moderate-to-high drug-drug interaction risk. Regularly updated empirical treatment protocols for diabetic foot ulcers are recommended to optimize safety and effectiveness.

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Sử dụng kháng sinh trong điều trị loét bàn chân đái tháo đường: Nghiên cứu cắt ngang tại một bệnh viện đa khoa ở Việt Nam giai đoạn 2023 - 2024

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TÓM TẮT

Đặt vấn đề: Loét bàn chân đái tháo đường (Diabetic Foot Ulcers - DFU) là biến chứng thường gặp của bệnh đái tháo đường, gây ra gánh nặng lớn về xã hội, tâm lý và kinh tế. Trong bối cảnh tình trạng kháng kháng sinh ngày càng gia tăng và tỷ lệ nhiễm DFU cao, việc sử dụng kháng sinh hợp lý và an toàn ngày càng trở nên quan trọng. Mục tiêu nghiên cứu: Nghiên cứu này nhằm khảo sát tỷ lệ và thực trạng sử dụng kháng sinh, đồng thời đánh giá tính hợp lý và độ an toàn của liệu pháp điều trị DFU tại Bệnh viện Đa khoa Thống Nhất tỉnh Đồng Nai. Đối tượng và phương pháp nghiên cứu: Nghiên cứu mô tả cắt ngang, hồi cứu, được tiến hành từ tháng 6/2023 đến tháng 12/2024. Hồ sơ bệnh án của 235 bệnh nhân ≥ 18 tuổi bị nhiễm khuẩn DFU được thu thập. Dữ liệu bao gồm đặc điểm bệnh nhân, phác đồ kháng sinh và kết quả điều trị. Tính hợp lý và độ an toàn được đánh giá dựa trên các hướng dẫn quốc tế và trong nước. Phân tích số liệu được thực hiện bằng phần mềm SPSS phiên bản 20, với p < 0.05 được xem là có ý nghĩa thống kê. Kết quả: Trong tổng số 235 bệnh nhân (tuổi trung bình 60.71 ± 12.28; tỷ lệ nam:nữ là 1:1.06), vancomycin là kháng sinh được sử dụng phổ biến nhất trước khi thực hiện kháng sinh đồ (42.13%), trong khi piperacillin/tazobactam là kháng sinh được sử dụng phổ biến nhất sau khi có kết quả kháng sinh đồ (77.10%). Đa số bệnh nhân duy trì điều trị theo kinh nghiệm ban đầu (65.53%). Tỷ lệ hợp lý về liều và phác đồ lần lượt là 68.94% và 66.53%. Các phản ứng có hại ghi nhận bao gồm rối loạn tiêu hóa (7.65%), dị ứng thuốc (5.11%) và tác dụng phụ thần kinh hiếm gặp (0.85%). Tương tác thuốc được phát hiện với tần suất cao: Mức độ trung bình 53 - 62% và nặng 9 - 15%. Kết luận: Việc kê đơn kháng sinh nhìn chung tuân thủ theo khuyến cáo hướng dẫn, tuy nhiên vẫn ghi nhận các phản ứng có hại và nguy cơ tương tác thuốc từ trung bình đến cao, nhấn mạnh nhu cầu giám sát chặt chẽ và tăng cường hỗ trợ của dược sĩ lâm sàng.

Từ khóa: kháng sinh, loét bàn chân đái tháo đường, đái tháo đường type 2