



Prevalence and Risk Factors for Bacterial Resistance in Diabetic Foot Infections at a Hospital in Nicaragua.

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Background: Diabetic foot infections have a negative impact in quality of life and mortality. Bacterial resistance could have a deleterious outcome in patients with diabetic foot infections.

Objective: The aim of this study was to determine the prevalence, the main risk factors, and clinical outcomes for diabetic foot infections caused by bacteria that were resistant to different categories of antimicrobials in a hospital in Nicaragua.

Methods: A case-control study was conducted between January 2019 and March 2020. Cases were patients with diabetic foot infections caused by drug-resistant organisms (DRO) and the controls were patients infected by non-drug resistant organisms (NDRO). The resistance to quinolones, beta-lactams, and carbapenems were evaluated in the Gram negative bacteria. In the case of *Staphylococcus aureus* the resistance to methicillin was evaluated. Samples of tissue and exudates obtained by aspiration were processed. Conventional methods such as blood agar and McConkey agar were used and the final identification method was Vitek 2 System. Different variables of both groups were compared.

Results 1: A total of 76 bacteria were identified in 61 patients. Forty-four patients had an infection with at least one resistant bacterium for a prevalence of 72% (Figure 1). *Staphylococcus aureus* was the most prevalent bacterium and 76.9% of the isolates were resistant to methicillin (MRSA). *Escherichia coli* was the most frequent Gram negative bacterium (Table 1). Seventy-one percent of the Gram negative bacteria were resistant to at least one class of antibiotic.

Results 2: The pattern of bacterial resistance is shown in the Figure 2. The main risk factor to have an infection with a resistant bacteria was the use of antibiotics in the previous 3 months (OR: 4.28; 95% CI: 1.31-13.98). An infection caused by DRO was associated with an increased risk of amputation. Infections caused by NDRO had 86% more probability of clinical resolution (Table 2).

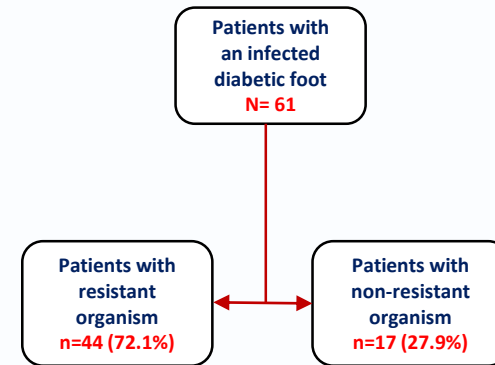


Figure 1.- Distribution of patients with diabetic foot infection and resistant organisms

Table 1.- Microbiology of diabetic foot infections

Microbiology	N=76 (%)
Gram positive	
<i>Staphylococcus aureus</i>	13 (17.1)
<i>Enterococcus faecalis</i>	8 (10.5)
<i>Staphylococcus negative coagulase</i>	7 (9.2)
<i>Streptococcus agalactiae</i>	3 (3.9)
Gram negative	
<i>Escherichia coli</i>	10 (13.1)
<i>Klebsiella pneumoniae</i>	9 (11.8)
<i>Serratia marcescens</i>	8 (10.5)
<i>Escherichia fergusonii</i>	1 (1.3)
<i>Serratia spp</i>	1 (1.3)
<i>Pseudomonas aeruginosa</i>	3 (3.9)
<i>Acinetobacter baumannii</i>	4 (5.2)
<i>Enterobacter spp</i>	5 (6.5)
Others	4 (5.2)

Table 2.- Associated factors and clinical outcomes related with bacterial resistance in diabetic foot infections

Factors and outcomes	Drug Resistant Bacteria n=44 (%)	Non-drug Resistant Bacteria n=17 (%)	OR (95% CI)
Use of antibiotics in the previous 3 months	33 (75.0)	7 (41.2)	4.28 (1.31-13.98)
Amputation	21 (47.7)	2 (11.8)	6.84 (1.39-33.50)
Clinical resolution	9 (20.5)	11 (64.7)	0.14 (0.04-0.48)

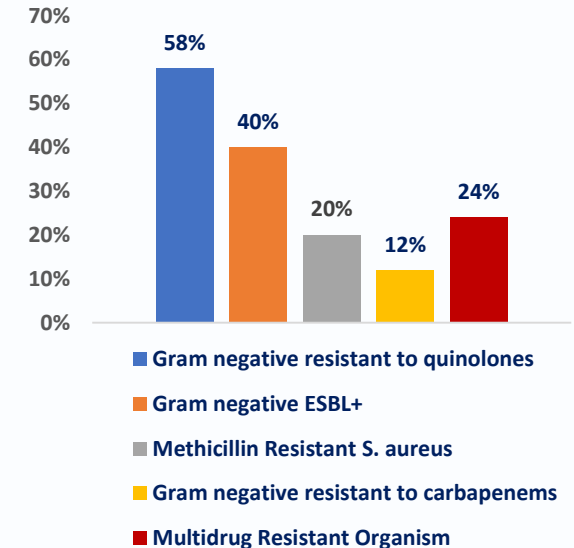


Figure 2.- Pattern of bacterial resistance in diabetic foot infections in this study.

Conclusion: In this setting, the bacterial resistance in diabetic foot infections is considered significant. The resistance to quinolones and beta-lactams (ESBL positive) were the most frequent. MRSA is also a relevant pathogen. The main risk factor was the previous use of antibiotics. The clinical outcome is affected by the bacterial resistance.

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