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LETTER TO EDITOR

Bacteriological Study of Diabetic Foot Infections at an Iranian Hospital

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Dear Editor,

Foot infections are one of the main causes of hospitalization and the leading cause of morbidity in patients with diabetes (1, 2). Diabetic foot lesions may manifest as ulceration, gangrene, Charcot's joint, or fracture, and if not treated promptly, may necessitate amputation (3). The proper management of these infections requires early recognition, selection of the appropriate antibiotic, and quick initiation of the antibiotic therapy on the basis of the results of culturing and antimicrobial susceptibility testing. The aim of this study was to determine the relative frequency of bacterial isolates cultured from diabetic foot infection. We also performed antimicrobial susceptibility testing with commonly used antimicrobial agents to assess the prevalence of antimicrobial resistance patterns in the bacterial isolates.

A total of 77 patients with diabetic foot infection who were referred to the surgery ward of Taleghani Hospital between 2007 and 2009 were included in this study. The samples obtained from these patients included ulcers curettages, abscesses, and deep-tissue needle aspirates. Standard identification tests and antimicrobial susceptibility testing using disc diffusion method were performed for all the isolated strains. (4,5)

Staphylococcus aureus, coagulase-negative *Staphylococci* (CoNS), and *Escherichia coli* were the most common bacterial species *(Table 1)*. Out of the 69 patients with positive cultures, 34 (49 %) were infected with a single organism, while 43 (51 %) had mixed infections. One hundred and four aerobic (96.5 %) and 5 anaerobic (4.5 %) bacteria were detected. Aerobic as well as anaerobic organisms were isolated from diabetic foot ulcers of 4 patients (6 %). *S. aureus* was the most frequently detected pathogen (19.4 %); this finding is similar to that of a previous study conducted in Iran (34.4 %) (6). Antibiotic susceptibility analysis of *S. aureus* and *Staphylococcus epidermidis* showed that all strains were methicillin resistant; a majority of the isolates of *S. aureus* were sensitive to vancomycin and imipenem. The *S. epidermidis* isolates were sensitive to vancomycin and imipenem. *Enterococcus spp*. showed high levels of resistance to erythromycin, oxacillin, penicillin, and Amoxicillin/ clavulanic acid. In *E. coli* isolates, 90 %, 95 %, and 95 % of the isolates were resistant to ciprofloxacin, co-trimoxazole, and cephalothin, respectively, while 95 % were sensitive to imipenem. All isolates of *P. aeruginosa* were sensitive to imipenem and 16 % were sensitive to clavulanic acid and ciprofloxacin. All *P. aeruginosa* isolates were resistant to co-trimoxazole and cephalothin *(Table 1)*. The most commonly isolated microorganisms from diabetic foot lesions in this study were gram-positive aerobes; this finding is consistent with those of previous studies conducted in other countries (7-9). Some studies from India showed that the *Proteus* species and *P. aeruginosa* were the most frequently isolated bacteria from diabetic foot lesions (1, 9). Polymicrobial infections were seen in 35 (51 %) of the cases of diabetic foot infection. The anaerobes identified in this study belonged to the *Peptococcus* and *Peptostreptococcus* genera; this finding is in agreement with those of a study by Gerding and smith *et al.* in USA (10, 11). The percentage of anaerobes identified in this study (4.5 %) was lower than those reported by Shankar *et al.* (10.5 %) and El-Tahawy (11 %) (12,

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Table 1. Bacterial species isolated from patients with diabetic foot infections

Bacteria	No. (%)
Staphylococcus aureus	21 (19.4)
Staphylococcus epidermidis	20 (18.4)
Other Staphylococcus spp.	4 (3.6)
Enterococcus spp.	7 (6.5)
Group D Streptococcus (non-Enterococcus)	3 (2.7)
Streptococcus viridans	2 (1.8)
Escherichia coli	20 (18.4)
Klebsiella spp.	7 (6.5)
Proteus spp.	5 (4.5)
Enterobacter spp.	3 (2.7)
Morganella spp.	1 (0.9)
Pseudomonas aeruginosa	6 (5.6)
Acinetobacter spp.	2 (1.8)
Peptostreptococcus spp.	3 (2.7)
Peptococcus spp.	2 (1.8)
Corynebacterium spp.	3 (2.7)
Total	109 (100)

13). *Clostridium spp*. and gram-negative anaerobes like *Bacteroides spp*. and *Fusobacterium spp*. were reported in some other studies (14, 15). Methicillin-resistant *S. aureus* (MRSA) has become increasingly prevalent in diabetic foot wounds. All the isolates of *S. aureus* were methicillin-resistant; this finding is in accordance with the finding reported by Ravisekhar *et al*. (1).

In conclusion, our study showed that gram-positive bacteria are the most frequently isolated bacteria from patients with diabetic foot infections caused by microorganisms with the multidrug resistance phenotype. It appears that imipenem and vancomycin can effectively treat the infections when empirical therapy needs to be considered. Further understanding of the causative organisms of diabetic foot infections and their antimicrobial susceptibility pattern is essential for establishing antimicrobial therapy and managing complications of diabetic foot infections, such as foot amputation.

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Conflict of interest

None declared.

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Keywords: Diabetic foot; Antibiotic susceptibility; Multidrug resistance

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