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Diabetes Meeting 2020: The international debate on the Identification and Drug Sensitivity of Aerobic Bacterial Isolates from Diabetic Foot Ulcers of Sudanese Patients- Saada Nour- University of Bahri

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Aims: Diabetic foot ulcer infection cause seriously great morbidity and mortality among diabetic patients. Globally this is a major cause of lower extremity amputation. This study aimed to determine the profile of aerobic bacterial and their antibiotic sensitivity patterns in diabetic foot infections (DFI) in different Wagner's grades.

Methodology: cross-sectional study was conducted during the period December 2017- March 2018 at the Department of Surgery, Jabir Abo Eliz Diabetic Center, Sudan. A total of 152 patients admitted with different grades of foot ulcers were randomly selected and enrolled in the study. Demographic data was collected using a predesigned questionnaire. The patients were grouped using Wagner's classification: Grade 1, 2, 3, 4 and long standing wounds (maturation phase). Tissue biopsies and deep swabs were collected from the ulcers for aerobic cultures. The cultured isolates were identified using phenotypic and biochemical properties and their sensitivity to commonly used antibiotics, Aikacin, Ciprofloxacin, Augmentin, Ceftazideme, Ceftriaxone, Colistin, Cotrimoxazole, Clindamycin, Fusidic acid, Gentamicin, Erythomycin, Meropenum, Oxacillin and Vancomycin, Piperacillin Imepenem
was tested using the Kirby Bauer disk diffusion method according to the guidelines of the Clinical and Laboratory Standards Institute guidelines.

Results: The mean age of the studied patients was 54.31 (SD ± 12.1) years with a male to female ratio of 8: 1. The mean duration of diabetes was 14 (SD ± 8) years. The ulcers varied in duration from 1 day to 10 years. Eighty two patients (53.9 %) lost protective sensation and the sensation loss duration ranged from 7 days to 24 years among all patients. Out of 152 samples 181 aerobic strains were isolated. Cultures yielded bacterial isolates with a range of 1-3 organisms per culture with monomicrobial to polymicrobial infection ratio of 2.3: 1. The maximum number of bacteria was isolated from grade 3 group followed by long standing ulcer group 50.8% and 28% respectively. Polymicrobial infection was higher in long standing ulcers than grade 3 ulcers (30.4%) and (27%) respectively. The infections were mostly due to Gram-negative bacteria. The most frequent were proteus spp. (35.3%), S. aureus MRSA 14.4% and Coliform 12.2% respectively. Typical bacterial pathogens encountered in each Wagner grade varied. The most common isolates in grade 3 were P. Mirablis, Staphylococcus and Coliform and in long standing ulcers were P. Mirablis, S. aureus MRSA and Co agulase negative staphylococcus respectively.

Conclusion: Gram-negative bacteria were more prevalent than Gram-positive bacteria in diabetic foot ulcers. The most frequent pathogens were Proteus spp. The m ost common associated bacteria in polymicrobial infection were P. mirablis with; P. aerginosa, S. MRSA and Coliform respectively. The highest sensitivity of Gram negative rods was to Amikacin, (80.6) %) while the highest sensitivity of Gram positive was to Imepnem (85%). Most of the isolates were sensitive to Meropenem. No significant relation between Wagner grades and neuropathy was detected suggesting no obvious role in DFU healing. CD4 / CD8.

Discussion: Foot infections in diabetes patients are a complex problem and a common cause of morbidity, ultimately leading to severe complications like gangrene and amputation. Effective management of the infection requires isolation and identification of the bacteria and determining their sensitivity to antimicrobial agents. The diabetes and diabetic foot infections are on the rise in Sudan with little data available to guide the doctor to achieve effective cure.

This study aimed to isolate and identify aerobic bacterial pathogens associated with diabetic foot infections in different grades of wounds and to determine their sensitivity to the commonly used antibiotic. As reported in other studies males were more represented in this study with the male to female ratio reaching 8:1. High prevalence of diabetic foot infection among males has been reported in other studies and was attributed to increased outdoor activities among males than females. To the contrary a study done in the J. D. C. 2012 reported the male to female ratio of 3:3.3. In our study, we found that the ulcers varied in duration from 1 day to 10 years which was a long duration range in comparison to previous study in the same center. Two patterns of bacterial infections were detected in present work; monomicrobial infection – which was the most 63.82% while polymicrobial infections was 26.97%. The average numbers of isolates was 1.2 per case which was similar to study done by Eithar in the same diabetic Centre reported similar findings. In addition other study reported a similar number of isolates per case 1.39. Polymicrobial nature of DFIs has been reported in several studies conducted both in Sudan and abroad. A study in India reported the majority of DFIs were polymicrobial nature with aerobic Gram-positive cocci, and especially staphylococci as the most common causative agents. This disagreement with our result could be due to the hospital environment and the use of different antibiotics in the two studies. Also, study done in USA reported variation of the bacterial pathogens encountered

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with the Wagner grade and severity of infection and early infections are generally monomicrobial, whereas advanced infections tend to be polymicrobial. Low grades are generally infected with gram-positive organisam and these findings were highly consistent with the present work, in which Gram positive bacteria found in grade 1, 2 and decreased in grade 3 where the ratio of Gram negative to Gram positive was 5:1 then disappeared towards grade 4 and reappeared in long standing ulcers which were in maturation phase. Like-wise Widatalla found that the most common pathogens were Staphylococcus aureus (33.3%), Pseudomonas aeruginosa (32.2%), and Escherichia coli (22.2%). Other study in J. D. C, also found the commonest isolated organism was S. aureus (46%). Those 2 studies were in agreement with most international reports where S. aureus was found as the most predominant and not agrees with our findings. Recent study in Sudan; identified proteus spp. (mirabils and vulgaris) as the most frequent bacteria in diabetic wounds (37.5%) and it was in agreement with the findings of this study.