BACTERIAL PROFILE AND ANTIBIOTIC SENSITIVITY IN CHRONIC LEG ULCERS IN DIABETICS AND NON-DIABETICS IN A TERTIARY CARE CENTRE IN SOUTH INDIA

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ABSTRACT
Background
Because of poor wound healing and an elevated risk of infection, chronic leg ulcers (CLUs) pose a serious healthcare challenge, especially for patients with diabetes. Multidrug-resistant organisms like MRSA, Pseudomonas aeruginosa, and Klebsiella spp. are commonly involved in these infections, which are frequently polymicrobial. Empirical antibiotic therapy is frequently used in environments with limited resources, which raises the possibility of ineffective treatment and antibiotic resistance. Regional information on antibiotic sensitivity and bacterial profiles in diabetic versus non-diabetic ulcers is scarce, despite the burden. By contrasting microbial patterns and resistance trends in a tertiary care facility in South India, this study seeks to close this gap.
Methodology
Over a five-year period, a retrospective descriptive study was carried out at the Government Medical College's General Surgery Department in Ernakulam. A total of 152 patients, both diabetic and non-diabetic, with chronic leg ulcers lasting longer than six weeks were included. Hospital records were used to gather patient information, such as demographics, clinical history, and microbiological culture and sensitivity reports. Patients with diabetes who were solely on diet control or cases without microbiological reports were not included. SPSS software was used to analyse the data.
Result
91 (60%) of the 152 patients had diabetes, while 61 (40%) did not. The most frequent isolate in both groups was Staphylococcus aureus (30.8% in diabetics and 16.4% in non-diabetics). Additionally, MRSA, Pseudomonas aeruginosa, and Klebsiella spp. were more common in diabetic ulcers. 45.1% of diabetic cases and 47.5% of non-diabetic cases had antibiotic resistance. Compared to non-diabetics, the spectrum of bacterial isolates in diabetic patients was wider and more resistant.

Conclusion

Bacterial infections in diabetic leg ulcers were more varied and resistant to medication than those in non-diabetic ulcers. These results highlight the necessity of localised bacterial surveillance and culture-guided therapy to maximise antibiotic use, particularly in environments with limited resources. Preventing antimicrobial resistance and improving outcomes depend on the rational prescription of antibiotics based on local data.

Keywords: Chronic Leg Ulcer, Diabetic Foot Ulcer, Antibiotic Resistance, Bacterial Isolates, MRSA, Pseudomonas Aeruginosa, Klebsiella SPP., Microbial Pattern, Empirical Therapy.

INTRODUCTION

Healthcare workers commonly face the clinical challenge of CLUs (Chronic Leg Ulcers), especially in environments with limited resources. Prolonged infections, delayed healing, and recurrence make managing these ulcers challenging. Peripheral neuropathy, vascular insufficiency, and compromised immune responses-all of which contribute to poor wound healing-make diabetic patients particularly susceptible. On the other hand, non-diabetic patients frequently have distinct microbiological profiles but may also present with ulcers due to arterial disease or venous insufficiency.

Particularly in rural or isolated locations with few microbiological diagnostic resources, the choice of antibiotics for persistent leg ulcer infections is frequently empirical and primarily depends on clinical experience rather than culture-guided therapy. The type and growth pattern of aerobic and anaerobic bacteria are influenced by differences in blood glucose levels and oxygenation between people with and without diabetes. Thus, it is possible to greatly enhance empirical treatment decisions and patient outcomes by determining the common bacterial pathogens in these patient groups and comprehending their patterns of antibiotic susceptibility. The purpose of this study was to identify the patterns of antibiotic resistance and bacterial profile in chronic leg ulcers in patients with and without diabetes. The results could lower morbidity and improve healing outcomes by helping clinicians make well-informed decisions regarding initial antibiotic therapy, especially in rural areas. Chronic leg ulcers continue to be a significant public health concern despite improvements in wound care because common pathogens are becoming more resistant to antibiotics. Numerous investigations have recorded changing bacterial spectra and resistance patterns, particularly in diabetic foot infections where multidrug-resistant organisms and polymicrobial flora are more common.[1–4] Localised data from particular areas, like India's industrial and semi-urban towns, are still scarce, though. Empirical antibiotic therapy may be ineffective in the absence of current knowledge of the microbial landscape, which could lead to prolonged infections and the development of AMR (Anti-Microbial Resistance).[5,6]

By examining the current bacterial spectrum and antibiotic sensitivity in patients with and without diabetes who have chronic leg ulcers, this study aims to close this knowledge gap. The findings are meant to encourage antimicrobial stewardship and rational antibiotic use, particularly in environments with limited access to culture and sensitivity testing.

AIM

To compare the bacterial profile in chronic leg ulcers in diabetic and non-diabetic patients admitted to general surgery.

MATERIALS AND METHODS

This retrospective descriptive study was conducted in the Department of General Surgery at Government Medical College, Ernakulam, and included all patients admitted with chronic leg ulcers within five years of the date of Institutional Ethical Committee approval. The study population consisted of patients who had leg ulcers that lasted longer than six weeks. Individuals without access to microbiological culture reports and diabetic patients receiving only dietary control were excluded. The formula and a total enumeration sampling technique were used to calculate the sample size.

$$N = \frac{4pq}{q2}$$

where p is the proportion of gram-positive aerobes based on a previous study by Sankar M. et al. from Manipal College of Pharmaceutical Sciences, q = 100 - p, and d is the relative error (15% of p). This results in a sample size estimate of 152. Institutional ethical clearance was obtained prior to the start of the study. Patient records were provided by the MRD (Medical Records Department), and relevant information such as clinical history, ulcer characteristics, microbiological culture and sensitivity reports, and demographic data were collected using a structured proforma. There was no documentation of any personally identifiable patient information. The data was entered using Microsoft Excel, and the analysis was done using SPSS software. Together with the appropriate statistical tests, descriptive statistics such as means, percentages, and standard deviations were used to compare the outcomes between the diabetic and non-diabetic groups; a p-value of less than 0.05 was considered statistically significant. The study didn't require any special funding, and the data collection and analysis were completed in six months.

RESULT

Out of the 152 patients with chronic leg ulcers included in this study, 91 (60%) had diabetes and 61 (40%) did not. The two groups' bacteriological profiles were very different from one another. The most commonly isolated organisms among diabetic patients were Staphylococcus aureus (30.8%), Pseudomonas aeruginosa (14.3%), and MRSA (16.5%). Additionally, compared to non-diabetics, Klebsiella spp. were more common in diabetic ulcers. The most frequent isolates in non-diabetic patients were MRSA (11.5%), Pseudomonas aeruginosa (18.0%), and Staphylococcus aureus (16.4%). Although diabetic ulcers showed a wider and more resilient bacterial spectrum, Gram-positive organisms were generally more prevalent in both groups. In terms of antibiotic susceptibility, resistant bacterial isolates were found in 29 out of 61 non-diabetic patients (47.5%) and 41 out of 91 diabetic patients (45.1%). Although resistance was seen in both groups, multidrug-resistant Gram-negative bacteria, including Pseudomonas aeruginosa and Klebsiella spp., were more common in diabetic patients.

Bacterial Isolate	Diabetic (n = 91)	Non-Diabetic (n = 61)
Staphylococcus aureus	28	10
MRSA	15	7
Pseudomonas aeruginosa	13	11
Klebsiella spp.	16	7
E. coli	8	6
Streptococcus spp.	8	9
Enterococcus spp.	8	6

Table 1: Distribution of Bacterial Isolates by Diabetic Status

Resistance Status	Diabetic (n = 91)	Non-Diabetic (n = 61)
Resistant	41 (45.1%)	29 (47.5%)
Sensitive	50 (54.9%)	32 (52.5%)

Table 2: Antibiotic Resistance Pattern by Diabetic Status

DISCUSSION

The emergence of antibiotic-resistant organisms, high risk of infection, and delayed healing make CLUs, particularly in diabetic patients, a serious public health concern. The results of this investigation are consistent with previous research that shows a clear distinction between diabetic and non-diabetic ulcers in terms of bacterial profiles and resistance patterns.

According to Sulaiman and Awad (2016), diabetic leg ulcers are often polymicrobial, with a high isolation of Gram-negative bacilli like Pseudomonas aeruginosa and Klebsiella spp.[7] and a preponderance of Gram-positive cocci like Staphylococcus aureus (including MRSA). These organisms frequently show multidrug resistance, especially to macrolides, fluoroquinolones, and beta-lactams, which makes empirical therapy more difficult and slows the healing of wounds. This is in line with our study's findings, which showed that diabetic ulcers had more varied bacterial flora and higher resistance patterns than non-diabetic cases.

On the other hand, non-diabetic chronic ulcers typically contain fewer multidrug-resistant organisms, according to Mohanty (2019). Although MRSA is less common, Staphylococcus aureus is still the most common isolate. Additionally common are Streptococcus and Enterococcus species, which are relatively more susceptible to first-line antibiotics such as vancomycin and penicillin.[8] These findings corroborate our findings that non-diabetic ulcers exhibited reduced overall antibiotic resistance, despite the fact that they were still frequently polymicrobial.

Diabetic patients had significantly higher rates of polymicrobial and anaerobic infections, according to Shokri and Zeynizadeh's (2018) direct comparison of diabetic and non-diabetic ulcers. The authors also pointed out that the chronicity and resistance profiles of these infections are influenced by immune dysregulation, poor perfusion, and hyperglycemia in diabetic patients.[9] This is in line with previous reviews by Boulton and Vileikyte (2005) and Kim and Attinger (2014), who highlighted the distinct pathophysiological environment of diabetic foot ulcers, including biofilm formation and compromised host defenses, which promote resistant and persistent bacterial colonisation.[10,11]

The issue of resistance has also been made worse by improper use of antibiotics and poor stewardship. In order to curb the careless use of broad-spectrum antibiotics and stop the emergence of AMR, Zong and Guo (2017) emphasised the significance of culture-based therapy.[12] This demonstrates the importance of our research, particularly in rural areas where, because of a lack of diagnostic resources, empirical treatment is frequently the standard. In addition, Basu et al. (2021) documented a rise in ESBL and carbapenemase-producing Enterobacteriaceae in lower limb ulcers across tertiary centers in India, emphasizing the urgent need for updated regional antibiograms and national surveillance programs.[13] Our findings are consistent with these trends, particularly the rising resistance among Gram-negative bacilli.

Finally, a meta-analysis by Eladawy et al. (2022) concluded that chronic wound infections are not only a clinical but also a public health issue, stressing the importance of education, sanitation, and local treatment protocols tailored to microbial patterns.[14] Public awareness and healthcare provider training on the rational use of antibiotics could play a crucial role in reversing current resistance trends.

CONCLUSION

This study demonstrates how patients with chronic leg ulcers who have diabetes and those who do not differ significantly in their bacterial profiles and patterns of antibiotic resistance. Polymicrobial infections and resistant organisms, especially Staphylococcus aureus, MRSA, and Gram-negative bacilli such as Klebsiella spp. and Pseudomonas aeruginosa, were more commonly linked to diabetic ulcers. Better antibiotic susceptibility and a relatively smaller range of pathogens were observed in non-diabetic ulcers. The results highlight how crucial culture and sensitivity testing are in determining the best course of antibiotic treatment, particularly for diabetic patients who are more vulnerable to infection-related complications. Understanding local bacterial patterns and resistance trends can help clinicians make better empirical treatment decisions in settings with limited resources where such testing may not be practical. To enhance healing results and stop the development of antibiotic resistance, sensible antibiotic use based on current local data must be implemented.

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