Effective Empirical Antibiotics Therapy for Diabetic Foots

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ABSTRACT

Objective: To assess the impact of empirical antibiotic therapy on diabetic foot infection.

Study Design: Randomized controlled trial study

Place and Duration of Study: This study was conducted at the Department of Surgery, Central Park Teaching Hospital, Lahore from January 2023 to June 2023.

Methods: This descriptive study was conducted at Central Park Hospital, Lahore. A total of 100 participants with diabetic foot infections were enrolled in this study after taking informed consent. Data was entered and analyzed by SPSS 26.

Results: In this study the mean age of the cases was 45.12 ± 3.88 in group A and 46.72 ± 4.17 in group B. there were 31 (62%) males and 19 (38%) females were found in group A while 28 (56%) male and 22 (44%) female were found in group B. Among gram positive bacterias staphylococcus aureus was found most prevalent found in 51% patients. Among gram negative bacteria pseudomonas aeruginosa was found in 42% cases. The comparison of drug effectiveness showed sensitivity of linezolid 92% and vancomycin 90% with insignificant p-value 0.727 showing both drugs equally effective.

Conclusion: Both vancomycin and linezolid are equally good but antibiotics should be timely administered to manage the diabetic foot and to prevent super imposed infection.

Key Words: Empirical, Antibiotic, Diabetic Foot

INTRODUCTION

Infections resulting from diabetic foot ulcers (DFUs) are common in clinical and healthcare settings. Most DFU infections impact the skin and soft tissues, however when osseous structures are involved, they can also result in osteomyelitis. It is commonly known that over 40% of DFU patients contract the infection while receiving clinical care, and that a person with diabetes has a 35% lifetime chance of developing DFU [1-3]. A DFU infection precedes 85% of lower extremity amputations, and individuals with DFU infection are 155 times more likely to need an amputation than those without one [4, 5].

Guidelines for the clinical care of patients with DFU infections have been developed at the national and international levels [6].

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These recommendations include checking for peripheral artery disease, applying offloading techniques, debriding the wound of any nonviable tissue, and using local wound care to improve wound healing for DFU. Based on the presence of systemic involvement and/or localized signs of inflammation, DFU infections can be categorized as none, mild, moderate, or severe [6].

To direct antibiotic therapy for DFU infections, a deep tissue culture should be collected regardless of illness severity [6]. The International Wound Group Diabetic Foot (IWGDF) and the Infectious Diseases Society of America (IDSA) both advise against using a superficial wound sample to diagnose infection [7,8]. Empirical antibiotic selection in the absence of cultures should focus on the most likely pathogen [6, 8, 9], while also taking the patient's medical history and comorbid illnesses into consideration. But according to IDSA guidelines based on low-quality evidence [6, 8], therapy guided by culture might not be the best course of action for moderate DFU infections. Not enough research has been done on how these suggestions are implemented at the site of treatment, or how they affect standard of care and hospitalization rates after DFU infection therapy in the outpatient setting. The purpose of this study was to assess the impact of empirical antibiotic therapy on diabetic foot infection.

METHODS

A randomized controlled trail was conducted at the department of general This descriptive study was carried out from January 2023 to June 2023 at Central Park Teaching Hospital in Lahore. In the outpatient department of Central Park Hospital, 100 individuals with diabetes were diagnosed with acute-onset DFU infection. Those who initiated their treatment with an antibiotic prescription that was not supported by the results of a microbiological culture were classified as members of the empirical cohort.

After fulfilling inclusion criteria a total of 100 patients were randomly allocated into two equal groups (n=50 each) by simple random sampling. We collected data on previous ulceration, amputation, angioplasty and recent antibiotic usage. The patients included had complete information on their physical examination, laboratory testing, and scans. While patients with incomplete medical records were excluded. Patients with history of previous amputations.

Following permission from the hospital's ethics council, patients who met the inclusion requirements were randomly assigned using a computer program. All patients provided informed written permission. A predesigned performa was used to record demographic and clinical characteristics (e.g., age, gender, length of hospital stay), as well as complications after surgery.

Statistical Analysis: The data was analysed with SPSS version 26. Quantitative factors (age, Hba1c) were represented as mean ± SD, while qualitative variables (gender, comorbidities, and drug effectiveness) were described as frequencies and percentages. The chi-square test was performed to compare drug effectiveness. A p-value of <0.05 was considered significant.

RESULTS

In group A, the mean age of the cases was 45.12 ± 3.88, and in group B, it was 46.72 ± 4.17. Group A contained 31 (62%) men and 19 (38%) females, whereas Group B contained 28 (56%) males and 22 (44%) females. Group A consisted of 30 (60%) smokers, 23 (46%) hypertension patients, and 28 (56%) patients with a family history of diabetes. Group B included 23 (46%) smokers, 21 (42%) hypertensive patients, and 22 (44%) patients with a family history of diabetes. (Table 1)

Staphylococcus aureus was the most common gram-positive bacterium, present in 51% of patients; enterococcus faecalis was present in 21% of cases; staphylococcus haemolyticus was present in 13%; streptococcus agalactiae was present in 10% of cases; and staphylococcus epidermidis was present in 5% of cases. (Fig 1)

Among gram negative bacteria pseudomonas aeruginosa was found in 42% cases, Escherichia coli was found in 21% and klebsiella pneumoniae was found in 13% cases. (Fig 2)

Table No. 1: Demographics and clinical parameters

		Linezolid (Group A=50)	Vancomycin (Group B=50)
Age (Mean ± S.D)		45.12 ± 3.88	46.72 ±4.17
Gender	Male	31 (62%)	28 (56%)
	Female	19 (38%)	22 (44%)
HBA1c (Mean ± S.D)		7.86±0.86	8.74 ± 1.05
Smokers	Yes	30 (60%)	23 (46%)
	No	20 (40%)	27 (54%)
Hypertension	Yes	23 (46%)	21 (42%)
	No	27 (54%)	29 (58%)
Family History of DM	Yes	28 (56%)	22 (44%)
	No	22 (44%)	28 (56%)
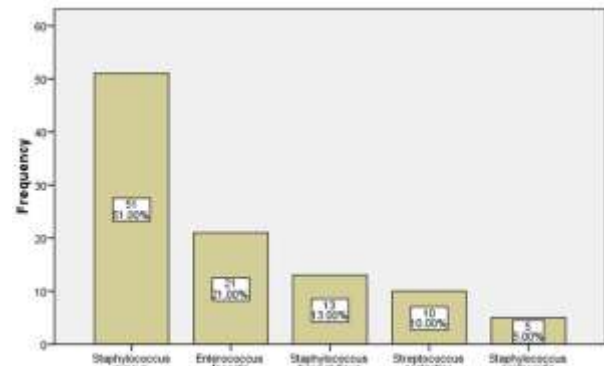
Figure No. 1: Graphical representation of Gram positive bacteria
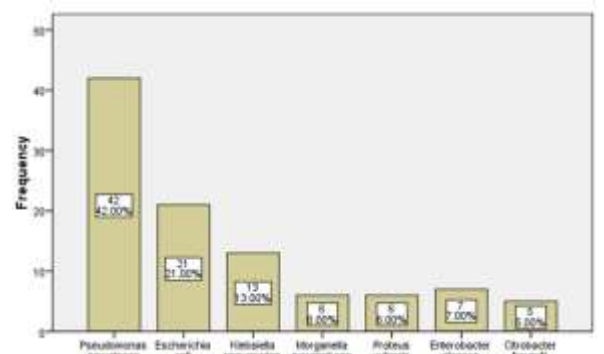
Figure No. 2: Graphic detail with frequency

Table No. 2: Comparison of antibiotic effectiveness

Drug_ Effectiveness	Study Group		P-Value
	Linzolid	Vancomycin	
Sensitive	46	45	0.727
	92.0%	90.0%	
Resistant	4	5	
	8.0%	10.0%	
Total	50	50	

Drug_ Effectiveness	Study Group		P-Value
	Linzolid	Vancomycin	
Sensitive	46	45	0.727
	92.0%	90.0%	
Resistant	4	5	
	8.0%	10.0%	
Total	50	50	
	100.0%	100.0%	

The comparison of drug effectiveness showed sensitivity of linezolid 92% and vancomycin 90% with insignificant p-value 0.727 showing both drugs equally effective. (Table 2)

DISCUSSION

Diabetes mellitus has become more prevalent dramatically in recent decades. Diabetes is expected to reach approximately 600 million people worldwide by 2035, with emerging nations accounting for 80% of the total.[9] In China, diabetes (11.6% incidence) and prediabetes (50.1% incidence) have become public health issues.[10] One of the most dangerous side effects of diabetes is diabetic foot, which can cause diabetic impairment or even death. More than 80% of lower-extremity amputations connected to diabetes are caused by foot ulcers, and 15% to 25% of diabetics will most likely develop diabetic foot ulcers at some point in their lives.

A common(40–80%) result for these people is diabetic foot ulcer infection, which can lead to serious morbidity including reduced physical and mental quality of life, frequent trips to the doctor, antimicrobial therapy, and surgical resections or amputations.[11] Furthermore, DFI was the leading cause of hospitalization, imposing a significant economic burden on patients and their families.[11] In addition to surgical treatment, antibiotic medication is the primary treatment for DFI. Antibiotic medication administered on time and effectively is frequently linked to improved clinical results.

In this investigation, the average age of the cases was 45.12 ± 3.88 in group A and 46.72 ± 4.17 in group B. Group A contained 31 (62%) men and 19 (38%) females, whereas group B contained 28 (56%) males and 22 (44%) females. Group A had 30 (60%) smokers, 23 (46%) hypertensives, and 28 (56%) patients with a family history of diabetes, while group B had 23 (46%) smokers, 21 (42%) hypertensives, and 22 (44%) patients with a family history of diabetes.

These comorbid diseases were thought to increase the risk of diabetic foot ulcers and infections.[12-13] Patients with moderate to severe foot ulcer infection were more likely to be malnourished than uninfected patients with mild diabetic feet. This was also observed in prior research by Jiang et al. and Chaturvedi et al.[14-15] This implies that malnutrition is one of the indicators of severe DFI. As a result, patients with severe DFI and malnutrition must be identified and treated as soon as possible. Staphylococcus aureus was the most frequent gram-positive bacteria in our facility. The most common gram-negative bacteria were P. aeruginosa, E. coli, and Klebsiella spp. This conclusion was consistent with that of an Indian investigation that investigated the microbiological profiles of harmful bacteria in DFIs.[16]

In this study drug effectiveness showed sensitivity of linezolid 92% and vancomycin 90% with insignificant p-value 0.727 showing both drugs equally effective. Nonetheless, the efficiency of empirical antibiotic treatment in another trial was only about 73%[17], which was slightly lower than the 85% reported by Balakrishnan et al.[18].

CONCLUSION

Both vancomycin and linezolid are equally good but antibiotics should be timely administered to manage the diabetic foot and to prevent super imposed infection.

Author's Contribution:

Concept & Design of Study:	Anam Batool
Drafting:	Hafsa Rauf, Mudassar Murtaza
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Revisiting Critically:	Anam Batool, Hafsa Rauf
Final Approval of version:	By all above authors

Conflict of Interest: The study has no conflict of interest to declare by any author.

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