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BACTERIAL SKIN AND SOFT TISSUE INFECTIONS: ANTIBIOTIC RESISTANCE PATTERNS IN LOCAL CLINICAL PRACTICE

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Abstract. Bacterial skin and soft tissue infections (SSTIs) represent a major cause of outpatient visits and antibiotic prescriptions worldwide. The growing prevalence of antimicrobial resistance has complicated empirical treatment strategies, particularly in regional clinical settings with limited surveillance data. This study aimed to analyze bacterial etiologies and antibiotic resistance patterns among patients presenting with SSTIs in local clinical practice. A retrospective observational study was conducted at the Radeski Skin & Aesthetic Clinic in the Fergana Valley, Uzbekistan. Clinical specimens from patients with purulent and non-purulent SSTIs were cultured, and antimicrobial susceptibility testing was performed using standard laboratory protocols. The most frequently isolated pathogens included *Staphylococcus aureus*, *Streptococcus pyogenes*, and Gram-negative organisms such as *Escherichia coli* and *Pseudomonas aeruginosa*. High resistance rates were observed for commonly prescribed antibiotics, including penicillins and macrolides, while relatively preserved susceptibility was noted for glycopeptides and select fluoroquinolones.

Keywords: skin infections, antibiotic resistance, bacterial pathogens, antimicrobial susceptibility, local surveillance, clinical dermatology

Introduction

Skin and soft tissue infections (SSTIs) are among the most common bacterial infections encountered in dermatological and primary care settings, ranging from superficial impetigo to deep soft tissue abscesses and cellulitis [1]. These conditions account for a substantial proportion of outpatient antibiotic prescriptions, often initiated empirically without microbiological confirmation [2]. While empirical therapy is necessary in many clinical scenarios, its effectiveness is increasingly threatened by the global rise in antimicrobial resistance.

Antibiotic resistance has emerged as a critical public health concern, particularly in low- and middle-income regions where surveillance systems are underdeveloped [3]. In dermatological practice, resistance among common SSTI pathogens—especially *Staphylococcus aureus*, including methicillin-resistant strains (MRSA)—poses significant therapeutic challenges [4]. Inappropriate antibiotic selection not only leads to treatment failure but also accelerates resistance development.

In Uzbekistan, data on antibiotic resistance patterns in SSTIs remain limited, despite the widespread use of broad-spectrum antibiotics in outpatient settings. Regional factors such as self-medication, incomplete treatment courses, and unrestricted antibiotic access may further contribute to resistance [5]. The Fergana Valley, one of the most densely populated regions of the country, presents unique epidemiological characteristics that warrant focused investigation [6-13].

This study aims to evaluate the bacterial spectrum and antibiotic resistance patterns of SSTIs encountered in local clinical practice at the Radeski Skin & Aesthetic Clinic. By providing locally relevant data, this research seeks to support evidence-based antimicrobial selection and inform regional stewardship strategies.

Methods

Study Design and Setting

A retrospective observational study was conducted at the Radeski Skin & Aesthetic Clinic, a tertiary outpatient dermatology center located in the Fergana Valley, Uzbekistan. The study period covered January 2023 to December 2024.

Study Population

Patients aged ≥18 years presenting with clinically diagnosed bacterial SSTIs—including abscesses, cellulitis, folliculitis, and infected wounds—were included. Patients who had received systemic antibiotics within 72 hours prior to sample collection were excluded to reduce confounding effects.

Microbiological Analysis

Clinical specimens (pus, wound swabs, or aspirates) were collected under aseptic conditions. Samples were cultured on standard media, and bacterial identification was performed using biochemical methods. Antimicrobial susceptibility testing was conducted using the Kirby–Bauer disk diffusion method, interpreted according to Clinical and Laboratory Standards Institute (CLSI) guidelines.

Antibiotics Tested

The antibiotic panel included penicillins, cephalosporins, macrolides, fluoroquinolones, aminoglycosides, and glycopeptides. Resistance rates were calculated as percentages of non-susceptible isolates.

Results

Bacterial Isolates

A total of 162 clinical isolates were analyzed. Gram-positive bacteria accounted for 68% of isolates, while Gram-negative organisms constituted 32%. *Staphylococcus aureus* was the predominant pathogen (45%), followed by *Streptococcus pyogenes* (18%), *Escherichia coli* (15%), and *Pseudomonas aeruginosa* (10%). Mixed infections were identified in 7% of cases.

Antibiotic Resistance Patterns

High resistance rates were observed among *S. aureus* isolates to penicillin (82%) and erythromycin (61%). Methicillin resistance was detected in 28% of *S. aureus* strains. In contrast, vancomycin and linezolid retained near-complete efficacy. Gram-negative isolates demonstrated notable resistance to ampicillin and first-generation cephalosporins, while susceptibility to ciprofloxacin and gentamicin remained moderate.

Table 1

Antibiotic resistance rates among major SSTI pathogens (%)

Antibiotic	*S. aureus*	*S. pyogenes*	*E. coli*	*P. aeruginosa*
Penicillin	82	35	78	100
Erythromycin	61	42	55	70
Ceftriaxone	28	15	46	52
Ciprofloxacin	22	18	31	40
Gentamicin	19	12	27	35
Vancomycin	0	0	–	–

During the study period, a total of 162 bacterial isolates were recovered from patients diagnosed with bacterial skin and soft tissue infections (SSTIs). The majority of isolates were Gram-positive organisms (68%), while Gram-negative bacteria accounted for 32%, indicating a predominance of traditional pyogenic pathogens in local clinical practice.

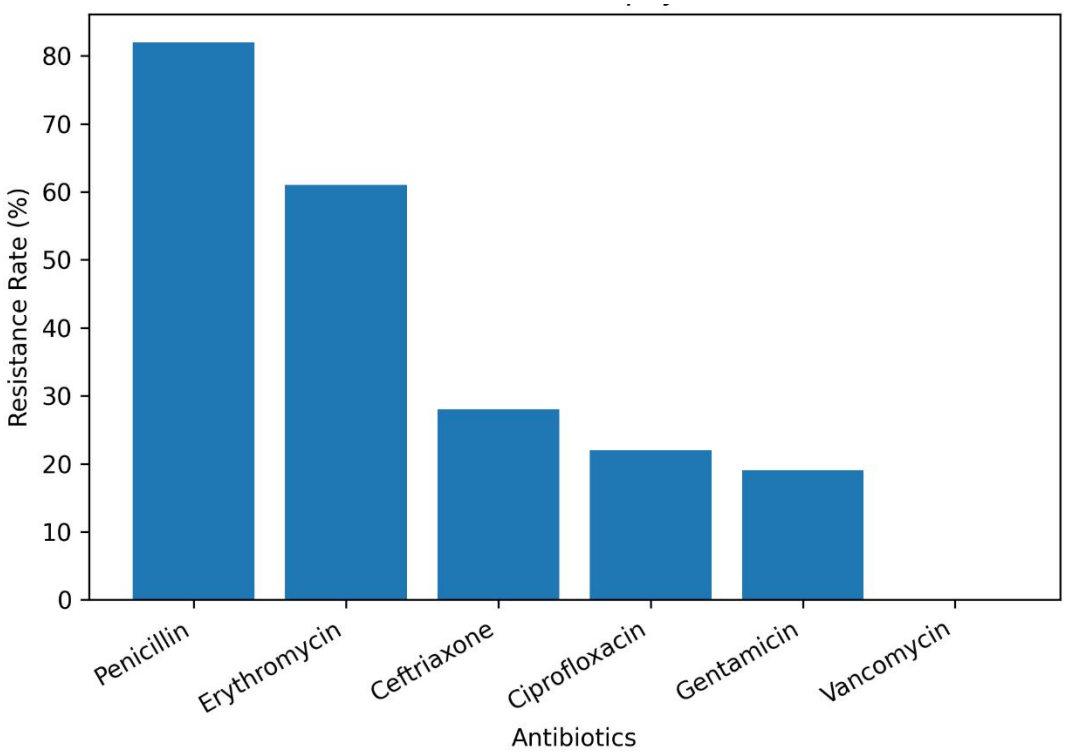

Fig. 1. Antibiotic resistance pattern of Staphylococcus aureus in SSTIs

Figure 1 illustrates comparative resistance rates of *S. aureus* isolates to commonly prescribed antibiotics. The bar graph demonstrates markedly higher resistance to penicillin and erythromycin compared to fluoroquinolones and aminoglycosides, emphasizing the limitations of traditional first-line agents.

Distribution of Bacterial Pathogens

Staphylococcus aureus was the most frequently isolated pathogen, representing 45% of all cultures, confirming its central role in SSTIs. Among these isolates, 28% were identified as methicillin-resistant *Staphylococcus aureus* (MRSA). *Streptococcus pyogenes* accounted for 18% of isolates and was predominantly associated with non-purulent infections such as cellulitis and erysipelas. Gram-negative pathogens included *Escherichia coli* (15%) and *Pseudomonas aeruginosa* (10%), which were more commonly isolated from chronic wounds, postoperative infections, and recurrent abscesses. Polymicrobial infections were identified in 7% of cases, primarily involving mixed Gram-positive and Gram-negative flora.

Antibiotic Resistance Patterns

Antimicrobial susceptibility testing revealed high resistance rates to commonly prescribed first-line antibiotics. *S. aureus* demonstrated marked resistance to penicillin (82%) and erythromycin (61%), significantly limiting their utility for empirical therapy. Resistance to third-generation cephalosporins, such as ceftriaxone, was moderate (28%), while lower resistance rates were observed for ciprofloxacin (22%) and gentamicin (19%). Notably, no resistance to vancomycin or linezolid was detected, indicating preserved efficacy of these reserve agents.

Streptococcus pyogenes exhibited comparatively lower resistance levels; however, reduced susceptibility to macrolides (42%) raises concerns for patients with penicillin allergy. Gram-negative isolates showed substantial resistance to ampicillin (>75%) and early-generation cephalosporins. *Pseudomonas aeruginosa* demonstrated intrinsic resistance to multiple antibiotic classes, with resistance rates exceeding 50% for ceftriaxone and erythromycin.

Discussion

The present study highlights a concerning prevalence of antibiotic resistance among SSTI pathogens in local clinical practice. The predominance of *Staphylococcus aureus* aligns with global epidemiological trends [14-15], while the observed methicillin resistance rate underscores the growing clinical relevance of MRSA in outpatient dermatology.

High resistance to penicillins and macrolides reflects longstanding prescribing practices and potential overuse in empirical therapy. Similar resistance patterns have been reported in neighboring regions of Central Asia, suggesting shared antimicrobial pressures [16]. Conversely, preserved susceptibility to vancomycin and linezolid indicates their continued role as reserve agents, although their use should be carefully regulated to prevent future resistance.

Gram-negative pathogens, particularly *E. coli* and *P. aeruginosa*, exhibited multidrug resistance profiles consistent with prior reports on complicated SSTIs [17]. The moderate susceptibility to fluoroquinolones suggests these agents may remain viable options in selected cases, provided microbiological confirmation is obtained.

From a local clinical perspective, these findings reinforce the necessity of culture-guided therapy, especially for recurrent or severe infections. Empirical treatment protocols should be periodically revised based on regional resistance data. Furthermore, implementing antimicrobial stewardship initiatives and clinician education programs may help curb inappropriate antibiotic use.

This study is limited by its single-center design and retrospective nature; however, it provides valuable baseline data for future multicenter surveillance efforts.

Conclusion

Bacterial SSTIs in the Fergana Valley are characterized by a high burden of antimicrobial resistance, particularly among *Staphylococcus aureus* and Gram-negative pathogens. Resistance to commonly prescribed antibiotics limits empirical treatment options and highlights the need for localized resistance monitoring. Integrating microbiological diagnostics into routine dermatological practice and strengthening antimicrobial stewardship are critical steps toward improving patient outcomes and combating antibiotic resistance.

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