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Research Article

Frequency of Various Bacterial Pathogens in Skin and Soft Tissue Infections

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ABSTRACT
Background: Skin and soft tissue infections are important cause of morbidity and excess costs in health care systems.
Aims and Objectives: This study was conducted to determine frequency of bacterial pathogens causing skin and soft tissue infections and their drug resistance pattern.
Materials and Methods: This cross-sectional study was conducted at the Pathology laboratory of Rai Medical College, Sargodha. Non-repetitive pus specimens received in laboratory were processed to isolate pathogens. Bacteria were identified on the basis of colony morphology and biochemical tests. Antimicrobial susceptibility test was performed to detect susceptibility of organisms to various drugs.
Results: A total number of 123 pus samples were processed during the study period. Bacterial growth was obtained from 76.4% pus samples. Out of total isolates, 55.3% were Staphylococcus aureus, 23.4%Escherichia coli, 11.7% Klebsiella species, 3.2% Proteus species, 2.1% were Pseudomonas aeruginosa, Acinetobactor and Enterococcus species each.
Out of 52, all Staphylococcus aureus isolates were resistant to Penicillin, 61.5% were methicillin resistant and 38.5% were methicillin sensitive. Almost 80% of isolates were resistant to Ciprofloxacin, 86.5% to Azithromycin, 63.5% to Clindamycin and 44.2% to Tetracycline.
Out of 40 gram negative isolates, 92.5% were Ampicillin resistant, 65% to Amoxillin-Clavulanic acid, 70% to Ceftriaxone, 57.5% to Cefepime, 30% to Piperacillin-Tazobactam, 40% to Cefoperazone-Sulbactam, 80% of isolates were resistant to Ciprofloxacin and Tetracyclines.
Conclusion: In addition to Staphylococcus aureus, Escherichia coli and Klebsiella pneumoniae with significant resistance to empirically used drugs were responsible for causing Skin and Soft tissue Infections.

Keywords: Bacterial Skin Diseases, Complications, Drug Resistance, Inappropriate Prescribing, Morbidity, Soft Tissue Infection.

INTRODUCTION

Skin and soft tissue infections (SSTIs) are caused by microbial invasion of the skin and underlying soft tissues. Approximately, 7% to 10% of patients presenting in hospitals suffer from SSTIs .[1]Surgical site infections, infections due to device or graft, mastitis, cellulitis, abscess, furuncle, carbuncle, impetigo, folliculitis and decubitus ulcers can be categorized as SSTIs. Failure to administer appropriate therapy results in treatment failure and can lead to development of various complications resulting in prolonged hospital stays, surgeries, blood stream infection and even death.[2]

SSTIs can be categorized as primary or secondary skin infections. Primary infections occur in the absence of predisposing condition or risk factors while in secondary infections chronic skin conditions, cellulitis, vascular insufficiency, foreign body, accidental or surgical trauma and co-morbid conditions are present. Primary infections are caused by gram positive while in secondary infections

gram positive as well as negative bacteria can play their role.[3]

Treatment of SSTIs has become more challenging due to acquisition and spread of resistance among bacteria over the last 2 decades. Although Staphylococcus aureus(S. aureus) and Streptococci are thought to be responsible for most cases of SSTI but Gram negative bacteria as well as mixed bacterial infections have emerged as significant cause of healthcare-associated (HCA) SSTIs.[4]

Antimicrobial drug for empiric therapy before receiving results of culture and sensitivity depend on its efficacy, tolerability, easy administration and cost effectiveness. Drug that are commonly used to treat SSTIs are beta lactam drugs but most of the infections being caused by S. aureus and these drugs are ineffective against methicillin resistant Staphylococcus aureus (MRSA).[5]Inappropriate empiric therapy can result in a longer length of hospital stay and duration of antimicrobial use.[6]

This study was conducted to see frequency of various pathogens responsible for causing SSTI and pattern of drug susceptibility thus helping clinicians in prescribing empiric antibiotics before results of antimicrobial susceptibility are obtained.

MATERIALS AND METHODS

This cross-sectional study was performed for a period of six months from April 2025 to September 2025 in pathology laboratory at Rai Medical College, Sargodha. Samples received during period of study were selected and processed through consecutive sampling technique. All pus specimens received in laboratory during period of study were included. No discrimination was made on age and gender basis. A total of 123 pus specimens were included in this study. Details like hospital identity number, age, gender of the patients, type and place of submission of specimen were recorded. All the specimens were inoculated on Chocolate and MacConkey's agar as soon as these were received in the department of microbiology and incubated at 35 °C for 24 to 48 hours. Culture plates were evaluated for evidence of growth after 24 and 48 hours of incubation. Microbial growth obtained was further processed and causative agents were identified on the basis of colony morphology, Gram-stain and biochemical tests. Antimicrobial susceptibility of the isolate was carried out by Kirby Bauer disc diffusion technique and E-strips as per recommendations of Clinical and Laboratory Standards Institute (CLSI).[7] The data was entered in SPSS (version 28) software and results were interpreted as frequencies and percentages.

RESULTS

A total number of 123 pus samples were processed during the study period. Out of 123, 94 (76.4%) cultures yielded bacterial growth while 29 (23.6%) were labeled no growth. 0ut of a total number of 94 isolates, Staphylococcus aureus (S. aureus)were most frequent pathogen showing a frequency of 52 (55.3%). 32(61.5%) were methicillin resistant (MRSA) while 20(38.5%) were methicillin sensitive (MSSA). Regarding frequencies of other pathogens, 22(23.4%) were Escherichia coli (E. coli), (11.7%) Klebsiella species, 3(3.2%) Proteus species, 2(2.1%) Pseudomonas aeruginosa, 2 (2.1%) Acinetobactor and 2 (2.1%) were Enterococcus species. (Figure#1)

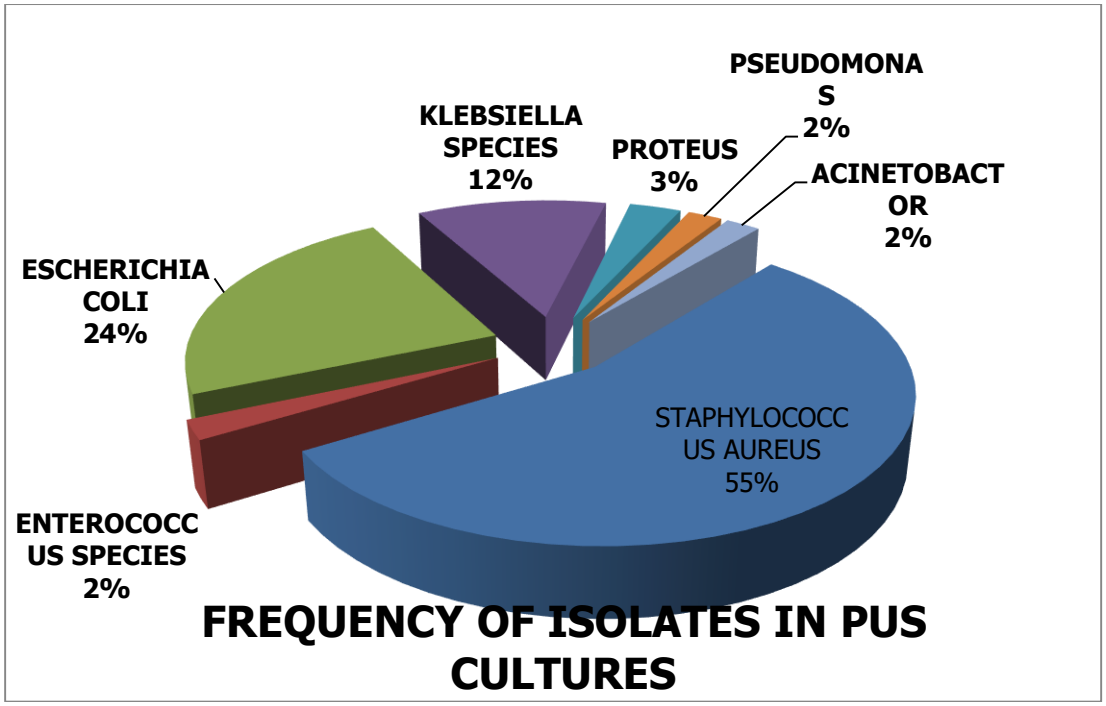

Figure 1 Showing Frequencies of Isolates from Pus Specimens

All 52 (100%) S. aureus isolates were resistant to Penicillin, 32 (61.5%) Cefoxitin resistant, 42 (80%) Ciprofloxacin, 45 (86.5%) Azithromycin, 33 (63.5%) Clindamycin, 23 (44.2%) Tetracycline, 22 (42.3%) Chloramphenicol and 06 (11.5%) were Amikacin resistant. (Figure#2)

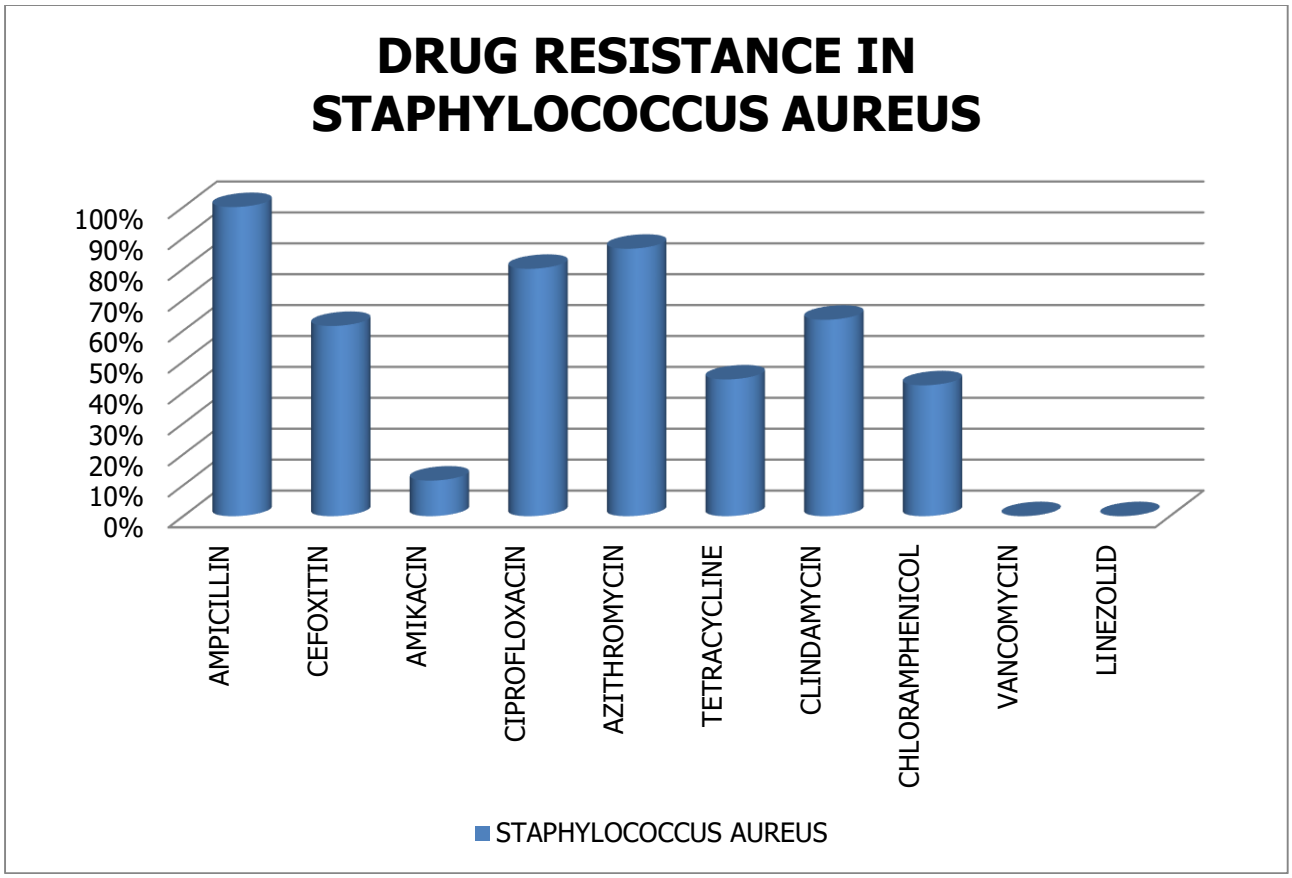

Figure 2 Showing Frequency of Drug Resistance in Staphylococcus Aureus

Out of 40 gram negative isolates, 37 (92.5%) were Ampicillin resistant, 26 (65%) to Amoxillin-Clavulanic acid, 28(70%) to Ceftriaxone, 23(57.5%) to Cefepime, 12(30%) to Piperacillin-Tazobactam, 16 (40%) to Cefoperazone-Sulbactamand32 (80%) of isolates were resistant to Ciprofloxacin and Tetracyclines.Only 06 (15%) of isolates were resistant to Imipenem and 04 (10%) to Amikacin. (Figure#3)

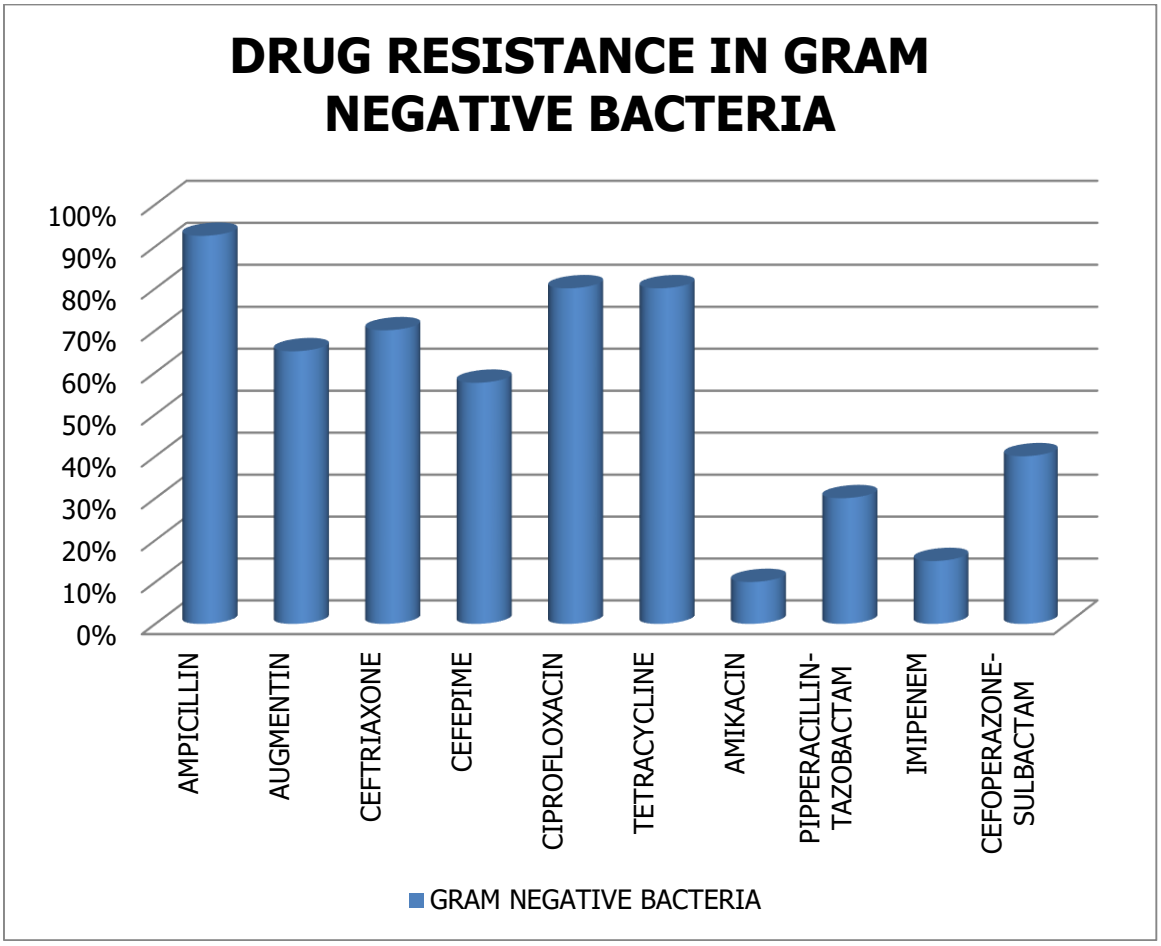

Figure 3 Showing Frequency of Drug Resistance in Gram Negative Isolates

DISCUSSION

SSTIs are among the most common human bacterial infection and indications for antibiotic therapy. The incidence of soft-tissue infections is on the rise.[3] This study highlighted the pathogensresponsible for causing SSTIsin a health care setting, their frequency and antimicrobial susceptibility pattern. In this study, 76.4% pus samples yielded bacterial growth or were pathogen positive. In a study by Ray GT,54% samples were pathogen positive and S. aureus was isolated from 81% of specimens, of which 46% were MRSA[8] while in this study S. aureus was most frequent isolate but was isolated from 55.3% and a significant proportion (61.5%) of which were methicillin resistant. This signifies that a large proportion of SSTIs are being caused by drug resistant bacteria for which commonly used beta lactam drugs are ineffective. Regarding drug resistance to other drugs in S. aureus, 100% of isolates were Penicillin resistant, 80% Ciprofloxacin, 86.5% Azithromycin and 63.5% were Clindamycin resistant. More than fifty percent of isolates were sensitive to Tetracyclines and Chloramphenicol. Amikacin appeared to be most susceptible drug.

In this study significant proportion of SSTIs were caused by gram negative bacteria, E. coli (23.4%) was most frequent gram negative isolate followed by Klebsiella species (11.7%), Proteus (3.2%), Pseudomonas and Acinetobactor (2.1%) each. A study by Marya D documented that Gram-negative organisms were more common cause of HCA-SSTIs and lead to inappropriate treatment resulting in greater length of hospital stay and mortality

rate.[9]Another study byJamatiaA.reported most frequent organisms after S. aureus (30.11%) as Pseudomonas spp. (21.02%), Klebsiella spp. (17.07%), E.coli (13.63%) Proteus spp. (6.40%) and Acinetobacter spp. (3.97%).[10]

A study byMoet G. monitored SSTIs for a period of 7 years and showed E. coli to be third most common cause of SSTIs after S. aureus and Pseudomonas aeruginosa.[11]Another study by Chang CM. documented Klebsiella spp. as second most cause of SSTIs.[12]

Regarding drug resistance in gram negative isolates, 92.5% were Ampicillin resistant, 80% Ciprofloxacin, 80% Tetracycline, 65% Amoxillin-Clavulanic acid, 70% Ceftriaxone and 57.5% were Cefepime resistant.About 60% of isolates were susceptible to Cefoperazone-Sulbactam,70% Piperacillin-Tazobactam, 85% to Imipenem and 90% to Amikacin.

Infections causedby drug resistant pathogens can result in inappropriate empiric therapy and poor outcomes.[4] Therefore, keeping and monitoring record of drug resistance pattern of prevalent pathogens is important to avoid inappropriate prescribing of empiric therapy.

CONCLUSION

In this study,S. aureus appeared as most common cause;however,gram negative bacteria contributed towards significant proportion of SSTIs. A large number of organisms were resistant to commonly used drugs used for empiric treatment of SSTIs. Therefore, it is concluded and recommended that clinicians must be aware of causative agents and the drug resistance pattern prevalent in hospital setting and treat patients with prompt empiric treatment.

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