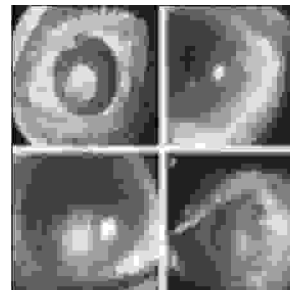


ORIGINAL

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CUTANEOUS BACTERIAL INFECTIONS; ANTIMICROBIAL SUSCEPTIBILITY PATTERN.

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ABSTRACT ... Objective: To find out causative pathogens and their frequency in study group in common cutaneous bacterial infection and determine antibacterial susceptibility pattern. **Design:** Samples were collected either by swabs from skin lesions or where required aspiration of tissue fluid followed by examination in the laboratory for identification of organisms through culture on appropriate media and antimicrobial susceptibility testing. **Setting:** Department of Dermatology Military Hospital Rawalpindi. **Subjects:** Hundred patients irrespective of age and sex who had not received antibiotic in last 72 hours, with a clinical diagnosis of any common cutaneous bacterial infection were selected irrespective of any coexisting cutaneous or systemic disease. **Results:** The data was compiled and statistical analysis was done by using SPSS version 10. Isolated colonies of *Staphylococcus aureus* were found in 52% of the cases while *Streptococcus pyogenes* was found as a pure growth in 18% of the cases. Mixed cultures of both these organisms were found in 30% of the cases. *Staphylococcus aureus* resistance to Penicillin (97.5%), Erythromycin (37.8%), Cotrimoxazole (31.7%), Cephadrine (30.4%) and Tetracycline (34.1%). Resistance against Cloxacillin (3.6%) and Gentamicin (2.4%) was much less. Among 82 isolated *Staphylococcus aureus* three isolated (3.6%) were found to be MRSA (Methicillin Resistant *Staphylococcus Aureus*). *Streptococcus pyogenes* although found completely sensitive to penicillins, showed resistance to Tetracycline (39.5%), Cotrimoxazole (31.2%) Erythromycin (27%) and Gentamicin (10.5%) Vancomycin sensitivity was shown by 100% of isolates. **Conclusion:** The comparison of this study with previous studies indicates that problem of bacterial resistance amongst common cutaneous pathogens is increasing. The situation calls for creating awareness regarding dangers of indiscriminate use of antibiotics.

Key word: Cutaneous bacterial infection, Antibiotics, Bacterial resistance, MRSA, *Staphylococcus aureus*, *Streptococcus pyogenes*.

INTRODUCTION

There is an increasing concern about antimicrobial resistance in Pakistan¹. The indiscriminate use of antibiotics in the community and in hospital environment has lead to increasing resistance in many human

pathogens^{2,3}. World Health Organization recognized long ago that growing resistance to antimicrobial agents was creating universal threat to health⁴. Clinical isolates differ in their susceptibility patterns from one geographical region to another^{5,6}. Therefore there is

need to have an update knowledge of antibiotic susceptibility patterns^{1,7}. The comparison of analysis from different regions and countries enables us in highlighting problems of national and international consequences⁸.

Bacterial infection of skin are quite commonly encountered in clinical practice and include conditions like impetigo, ecthyma, boils, carbuncle, cellulitis, erysipelas and secondary infection of preexisting skin lesions such as eczema. *Staphylococcus aureus* and *Streptococcus pyogenes* are major pathogens causing bacterial infections of skin⁹.

Antibiotic resistance is a significant problem with *Staphylococcus aureus*^{3,5,6}. Resistance appeared because of penicillinase production by organisms⁸. More recently strains resistant to methicillin have emerged¹⁰⁻¹³. *Streptococcus pyogenes* remains sensitive to penicillins although decrease susceptibility to erythromycin¹⁴ and Tetracycline¹⁵ has been reported.

MATERIALS AND METHODS

In this study one hundred patients reported to Dermatology OPD, Military Hospital Rawalpindi or admitted in wards, irrespective of age, sex and concomitant disease with a clinical diagnosis of any common skin bacterial infection includes impetigo/ecthyma, boil, cellulitis, carbuncle and infected eczema were included. Patients who had received antibiotic therapy within 72 hours were excluded from the study.

A set protocol was followed in collection of samples. Swabs from skin lesions were obtained by firmly rubbing Gamma sterilized swab on the floor of the lesion after the crusts or vesicle roof had been removed. In case of cellulitis or erysipelas specimens collected by one or more of following ways. Swab from primary site of infection, vesicle fluid or eroded/ulcerated surface or aspiration of tissue fluid alone or following subcutaneous saline infiltration. Samples were transported to

microbiology department Army Medical College Rawalpindi within two hours of collection. The specimens were immediately inoculated on blood and MacConkey agar followed by incubation at 37° for 24-28 hours. Smears were prepared from the clinical specimens, Gram staining was performed and examined under microscope for bacterial morphology and staining characteristics.

The inoculated culture plates blood agar and MacConkey agar were examined for the growth of organisms, which were identified by colony characteristics, gram staining and biochemical profile. The sensitivity testing was done by modified Kirby-Bauer method. Antibiotics tested were: Ampicillin, Amoxycillin, penicillin, Erythromycin, Cloxacillin, Cotrimoxazole, Tetracycline, Gentamicin, Vancomycin, Cephadrine and Fusidic acid (only in MRSA).

The data was compiled and statistical analysis was done by using SPSS version 10. Significance was calculated by using Chi-square test. The value $p > 0.05$ was taken as non-significant while values $p < 0.05$ were taken as significant.

RESULTS

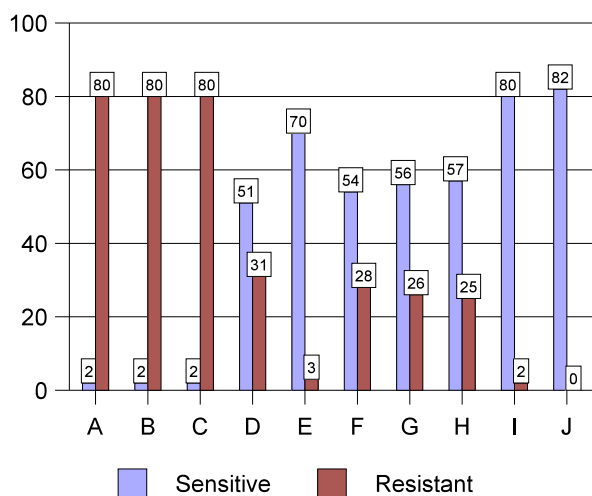
The bacteria isolated from the different diseases are summarized in table I. Overall *Staphylococcus aureus* was found to be the major pathogen followed by *Streptococcus pyogenes*, except in cases of cellulitis where the later organism was largely responsible. Percentage of mixed infection by both the organism was found in 30% of the cases. The antimicrobial sensitivity patterns of the isolated organism were found as shown in figures 1 and 2. *Staphylococcus aureus* showed a high degree of resistance to penicillin, Ampicillin and Amoxycillin (80%). Resistance against Erythromycin was (37.8%), Cotrimoxazole (31.7%), cephadrine (30.4%), tetracycline (34.1%), Cloxacillin (3.6%) and Gentamicin (2.4%). Among 82 isolates of *Staphylococcus aureus* three (3.6%) were found to be MRSA

Table-I. Identification of the isolated in the cases included in study.

Diseases	Number of cases	Organisms isolated		
		S. aureus	Strep. Pyogenes	S.aureus+Strep. Pyogenes
Impetigo and Ecthyma	25	7	3	15
Boils	25	20	-	5
Infected Eczema	25	18	-	7
Cellulitis	20	2	15	3
Carbuncle	5	5	-	-

p value>0.05 i.e. statistically non-significant between organisms isolates

Fig-1. Sensitivity pattern of staphylococcus found in the study. (n=82)



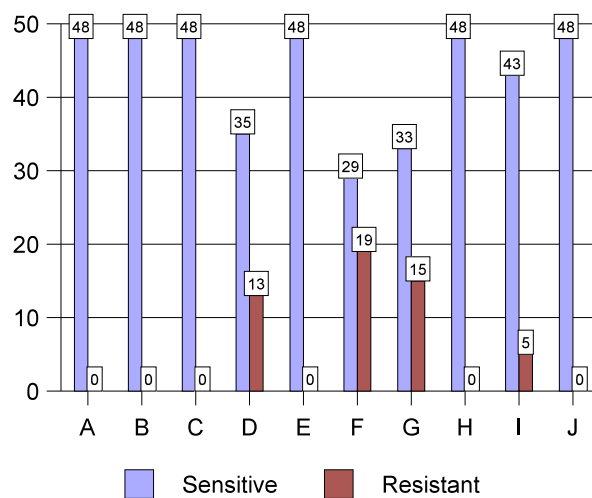
A. Ampicillin, B. Amoxycillin, C. Penicillin, D. Erythromycin
 E. Cloxacillin, F. Tetracycline, G. Co-trimoxazole,
 H. Cephadrine, I. Gentamicin, J. Vancomycin

(p>0.05 i.e statistically non-significant)

Hundred percent of the Streptococcus pyogenes isolated were found sensitive to penicillin, Ampicillin, Amoxycillin, Cloxacillin, Cephadrine and Vancomycin. 89.5% of the isolates were found sensitive to Gentamicin. However resistance to Erythromycin, Cotrimoxazole and

Tetracycline was found in 27%, 31.2%, and 39.5% of cases respectively. All the isolates including Staphylococcus aureus and Streptococcus pyogenes showed sensitivity to vancomycin.

Fig-2. Sensitivity pattern of streptococcus pyogenes found in the study. (n=48)



A. Ampicillin, B. Amoxycillin, C. Penicillin, D. Erythromycin
 E. Cloxacillin, F. Tetracycline, G. Co-trimoxazole,
 H. Cephadrine, I. Gentamicin, J. Vancomycin

(p<0.01 i.e statistically significant)

DISCUSSION

Bacterial infections of skin are quite commonly encountered in clinical practice. *Staphylococcus aureus* and *Streptococcus pyogenes* are major pathogens causing bacterial infections of skin⁹. Antibiotic resistance is significant with *Staphylococcus aureus*^{3,5,6}. Bacterial infection of skin are so common that culture and sensitivity testing in very case is not practicable and therefore in clinical setting the patients are mostly treated empirically. In these circumstances it is the knowledge of the likely pathogen in a given clinical situation and the susceptibility pattern that are important consideration in planning an empirical antimicrobial regimen. Therefore there is need to have an updated knowledge of antibiotic susceptibility at different geographical areas for empirical therapy based on prevailing susceptibility pattern.

In this study *Staphylococcus aureus* found to be the major pathogen in common cutaneous infections followed by *Streptococcus pyogenes*. Mixed infection with *Staphylococcus aureus* and *Streptococcus pyogenes* was also found to be quite high i.e. 30% of the cases. Mixed infection were especially common in cases of impetigo/ecthyma found in 60% of cases. Cellulitis was the only condition in which *Streptococcus pyogenes* emerged as major pathogen involved.

The result of the sensitivity testing (Figures 1 & 2) reveal that vast majority of *Staphylococcus aureus* strains are highly resistant to commonly used antibiotics. Very high degree of resistance was shown by *Staphylococcus* strains to penicilins reaching almost 100% i.e. in 95.5% of the cases.

These figures are quite higher then the previous studies carried out in Pakistan 92% and 63.9%⁶ and the comparable figures to present study have been more recently reported i.e.96.1%³. Similarly the resistance against another commonly used antibiotic Erythromycin resistance was also significantly high i.e.37.8% which is comparable to other studies, carried out in Pakistan 38.5%⁵. Isolates showed greater resistance to Tetracyclines as reported earlier^{16,17}. The resistance to Cotrimoxazole was also high i.e. in 31.7% of cases but

was quite less as compared to other studies in Pakistan 54.5%⁵ 74.2%⁶. First generation Cephalosporin (Cephadrine) showed sensitivity in about 79% of the cases that match other reports^{5,6,16}. Gentamicin showed sensitivity in 97.6% of isolates. The sensitivity pattern for Gentamicin in our study is better than the previously reported studies^{4,5,16}.

In the present study 3.6% of isolates were MRSA, which is towards the lower side of the figures quoted in different Pakistani studies 2-61%^{11,12}. In the present study although the percentage of MRSA was low but the finding was important as most of isolates showed sensitivity only to Vancomycin and Fusidic acid, both are expensive drugs and carry a very high cost to treat common bacterial infection of skin.

The resistance to *Streptococcus pyogenes* is not as grave as in *Staphylococcus aureus* but by no means insignificant. Hundred percent of isolated showed sensitivity to penicillins, including Ampicillin and Amoxycillin, Cloxacillin, Cephalosporin and Vancomycin. This is in agreement with previous studies¹⁰. Present study also revealed that 27% of *Streptococcus pyogenes* strains are resistant to Erythromycin. Resistance to Erythromycin¹⁴ and tetracycline¹⁵ has been reported in other studies. The study also revealed significant resistance to other antibiotic including Cotrimoxazole and tetracycline, which is higher than previous studies¹⁸.

CONCLUSION

The increased, injudicious and indiscriminate use of antibiotics by physicians as well as self medication by patients has lead to emergence of resistant strain. Emerging antibiotic resistance is worldwide problem requiring global leadership for the solutions. At local microbiologist and clinicians should keep a continuous surveillance on the sensitivity pattern of the organisms for preparing the doctors and creating awareness amongst public regarding hazards of indiscriminate use of antibiotic. Without strict attention to the rapidly emerging crisis of antibiotic resistance the evolution of organisms resistance to all pharmacological entities may become a reality.

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