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Original Research

Bacteriological Profile and Antibiotic Sensitivity of Cellulitis in a Tertiary Care Hospital

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ABSTRACT

Introduction: Cellulitis is an acute inflammatory condition of the skin characterised by localised pain, erythema, swelling and heat. It may be caused by indegenous flora colonizing the skin and associated appendages (e.gStaphylococcus aureus and Streptococcus pyogenes) or by a wide variety of exogenous bacteria. Cellulitis usually follows a breach in the skin, such as a cut, fissure, laceration, or puncture wound. In some cases, there is no obvious source of entry and the break may be due to microscopic changes in the skin or invasive qualities of certain bacteria. The aim is to study the profile of microorganisms causing cellulitis and the antibiotic profile of pathogens. **Material and methods:** The present cohort study was conducted 50 patients admitted in surgical wards of MMIMSR with diagnosis of cellulitis admitted in the Department of General Surgery, MMIMSR, Mullana, distt. (Ambala). Antimicrobial sensitivity of all the isolates will be performed and correlated with epidemiological factor i.e age, sex, history of trauma, concomitant diseases like diabetes. Specimens will be collected either by sterile swab or needle aspiration. **Results:** The study included a total of fifty patients, with age ranging from 21 years to 70 years. Out of the total 50 swabs obtained for microscopic examination by gram staining, majority 35(70%) were showing gram positive cocci while only 15 (30%) were showing gram negative bacilli. Among the gram positive organisms, isolates were Staphylococcus aureus (65.7%) and streptococci (34.3%). In gram negative isolates, most common organism was found to be pseudomonas (25%). Among the gram positive isolates, all (100%) were sensitive to vancomycin and imepenam while among the gram negative isolates, antibiotic sensitivity testing showed maximum sensitivity to imipenem (100%), followed by piperacillin-tazobactam (93.4%). **Conclusion:** To conclude, it was observed that there were more gram positive organisms causing cellulitis. Most common organisms responsible was staphylococcus aureus (65.7%) followed by streptococci(34.3%).All the gram positive and gram negative organisms were sensitive to vancomycin and imepenam respectively. However changing pattern of bacterial infection and drug resistance must be considered during treatment of petients.

Key words: Cellulitis, Gram positive, Gram negative, culture, sensitivity.

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INTRODUCTION

Skin and soft tissue infections have been common human afflictions for centuries. Despite decades of dramatic progress in their treatment and prevention, infectious diseases remain a major cause of death and debility and are responsible for worsening the living conditions of many millions of people around the world.[1] Traditionally, surgical infections have been considered to be those that require surgical therapy (e.g., complicated intra-abdominal infections [cIAIs] and skin or soft tissue infections [cSSTIs]).[2] Cellulitis is an acute inflammatory condition of the skin usually follows a breach in the skin, such as a fissure, cut, laceration, insect bite, or puncture wound. In some cases, there is no obvious portal of entry and the breach may be due to microscopic changes in the skin or invasive qualities of certain bacteria. Gram's stain and

culture provide a definitive diagnosis. Cultures and sensitivity tests are critically important in this setting because of multidrug resistance.[3-4] As per majority of text books the vast majority of cases of cellulitis are likely caused by β-hemolytic Streptoccoci and, to a lesser degree, by Staphylococcus aureus.[4] The present study was done to elicit the profile of microorganisms causing cellulitis and their antibiotic sensitivity in a tertiary care centre.

MATERIAL AND METHODS

The present cohort study was conducted in the Departments of General Surgery and Microbiology of Maharishi Markandeshwar Institute of Medical Sciences and Research-Mullana (Distt Ambala) over a period of one and half year(Dec 2015-June2017). 50 patients were admitted in surgical wards of MMIMSR with diagnosis of cellulitis suspected to be due to infection were included in the study.Patients not willing for admission,already on antibiotics and negative culture for bacteria were excluded from the study.The samples were collected with two sterile swabs from infected site, one for culture & sensitivity and one for gram staining.Under all aseptic precautions, two sterile cotton wool swabs were used to collect samples from the wound site and transported in sterile containers immediately for culture to the laboratory. The samples were processed in the microbiology department as per standard recommendations.[5]

OBSERVATIONS AND CONCLUSIONS

A total of 50 patients, hospitalised for cellulitis were included in the study. Two swabs were taken from each of the patients. First swab from each patient was subjected to gram staining. Second swab was cultured on Macconkey's agar and Blood agar medium for 24 hours. Out of 50 patients included in the study, 11 (22%) were in the age group 41-50 years, 17 (34%) were in the age group 51-60 years. Out of 50 patients included in the study, based on site of cellulitis 28(56%) involved legs, 12(24%) involved arms. Out of 50 patients included in the study, 34 (68%) were male and 16 (32%) were female. 18 (36%) were diabetic of the total cases while 22 (44%) were obese.Out of 50 patients included in the study, cause of cellulitis was found to be trauma in 34 (68%) patients. All the cases were associated with ulcer formation.

TABLE 1 : DEMOGRAPHY

Age Group (in yrs)	No. of Patients	No. of Patients (%)
21-30	5	10
31-40	3	6
41-50	11	22
51-60	17	34
61-70	14	28
Site of cellulitis		
Legs	28	56
Arms	12	24
Any other sites	10	20
Gender predisposition		
Male	34	68
Female	16	32

Swabs taken from all the 50 patients were subjected to gram staining for microscopic findings. 35(70%) were found to be gram positive, while 15 (30%) were gram negative.

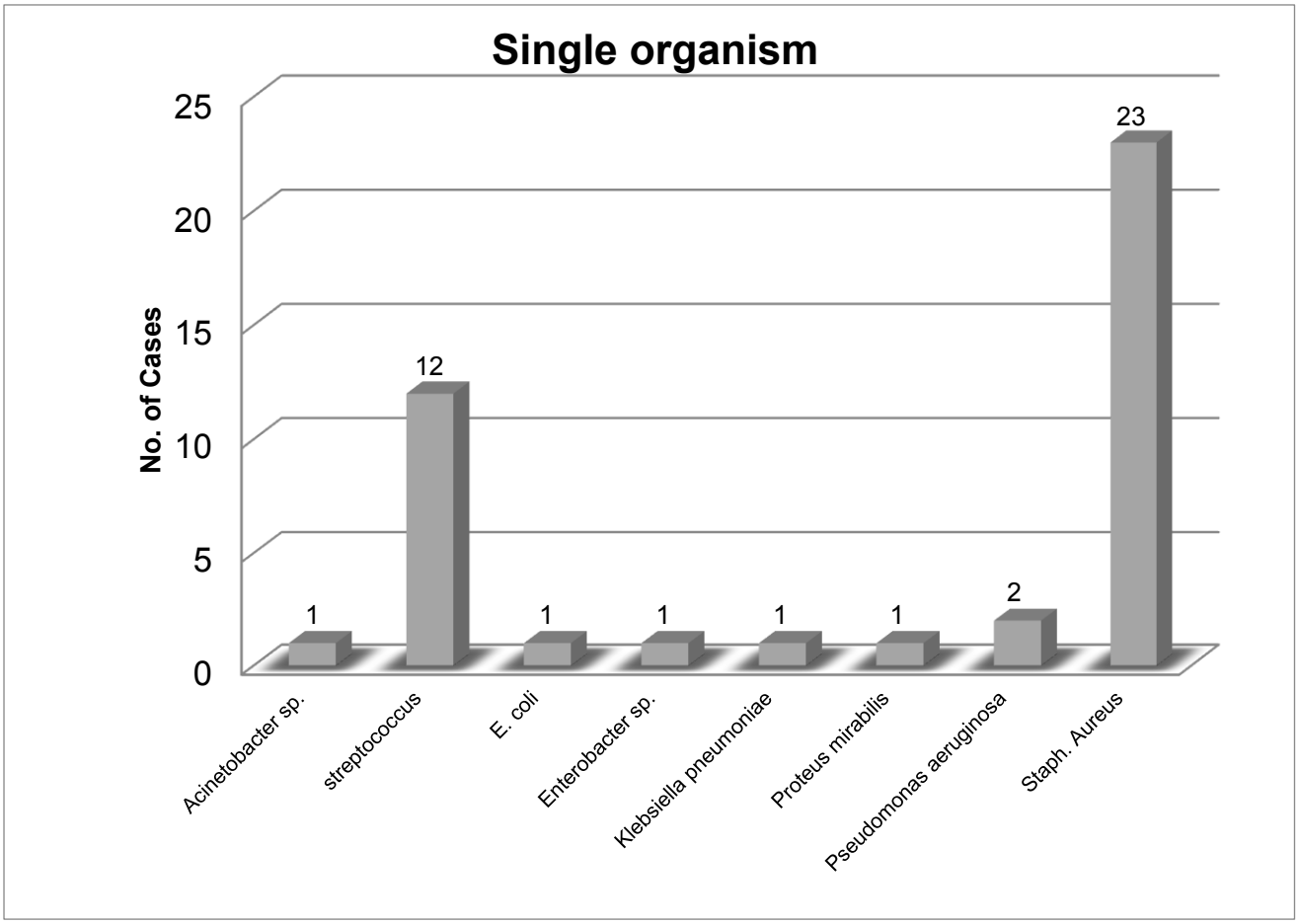
TABLE 2: Microscopic findings (Gram staining)

Gram Stain	No. of Patients	No. of Patients (%)
Gram Positive	35	70
Gram Negative	15	30
TOTAL	50	100

Among total of 50 swabs subjected to culture on Macconkey's and blood agar for 24 hours, then sub-culturing in glucose broth, 42 (84%) yielded single organism growth, 8 (16%) show mixed organisms. In cultures showing single organism growth, most common bacteria isolated was Staphylococcus aureus found in 23 (54.7%) patients. It was followed by streptococcus in 12 (28.5%). Acinetobacter sp., Klebsiellapneumonia, Proteus mirabilis occurred in 1 (2.4%) case each. Pseudomonas aeruginosa in 2 (4.8%) patients.

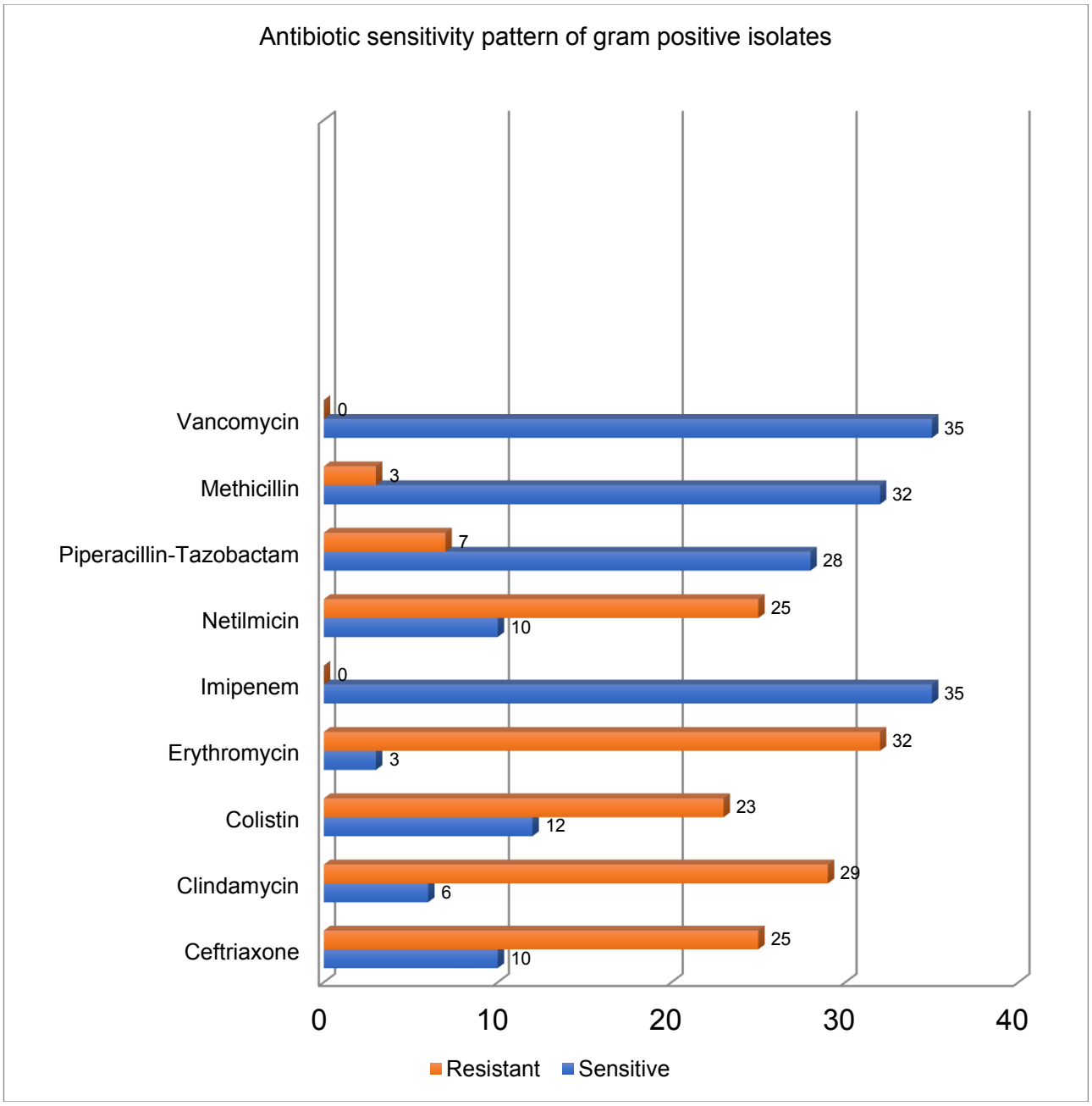
TABLE 3: Cultures showing single organism growth

Bacteria	No. of Cases	No. of Cases (%)
Acinetobacter sp.	1	2.4
Streptococcus	12	28.5
E. coli	1	2.4
Enterobacter sp.	1	2.4
Klebsiellapneumonia	1	2.4
Proteus mirabilis	1	2.4
Pseudomonas aeruginosa	2	4.8
Staphylococcus aureus	23	54.7
Total	42	100

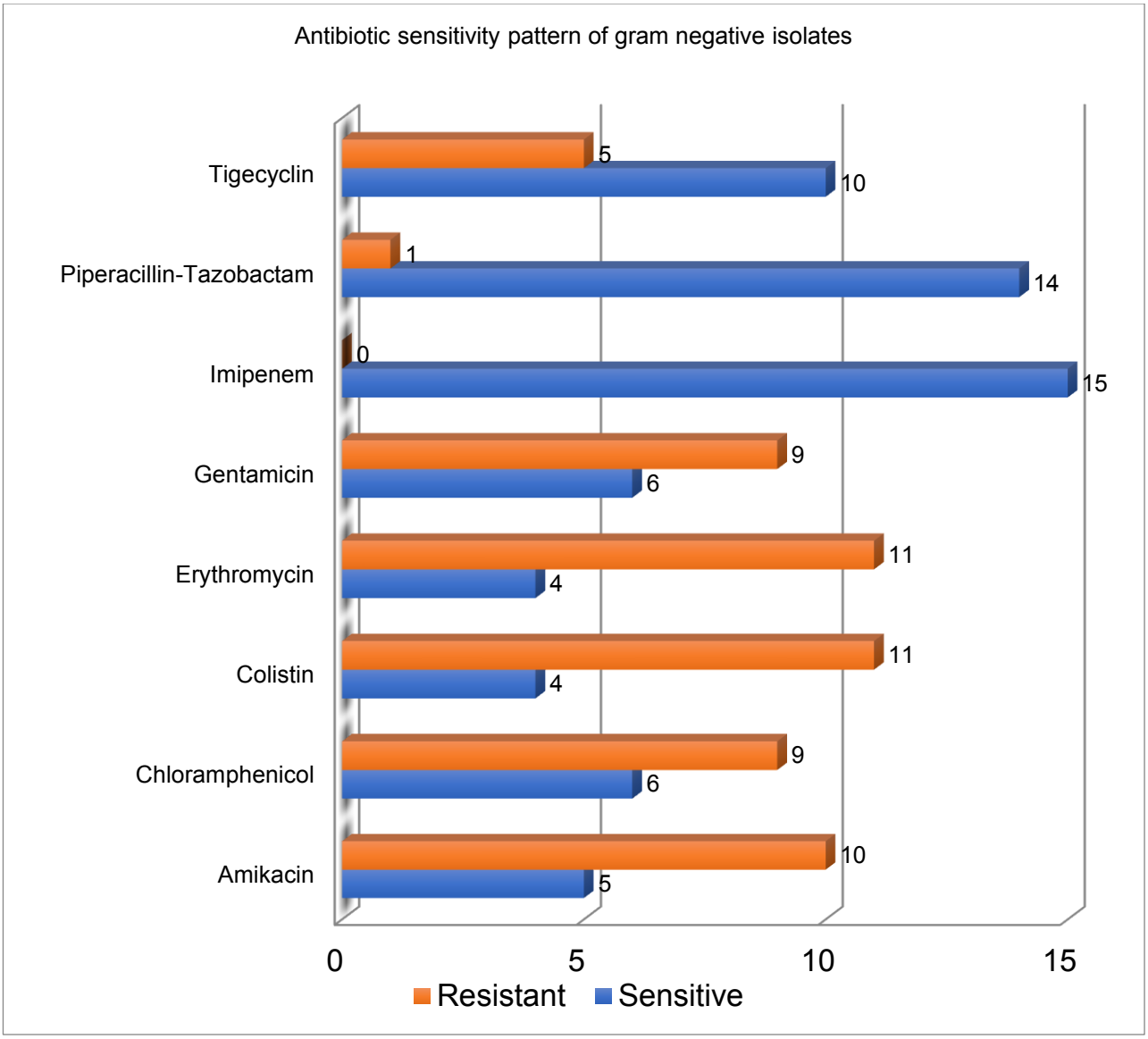


In the 8 cultures showing mixed organisms, Acinetobacter sp. + E. coli were seen in 1 (12.5%) cases, Enterobactersp + Acinetobactersp.,E. coli + Klebsiellapneumoniae, Pseudomonas aeruginosa+ Streptococcus, Proteus + Enterobactersp were found in 1 (12.5%) case each. Streptococcus+ pseudomonas aeruginosa were seen in 1 (12.5%cases) and Staphylococcus aureus + Pseudomonas were seen in 2 (25%) cases.

A total of 35 gram positive isolates were obtained from 50 swabs in the present study. All the 35 (100%) isolates were sensitive to vancomycin and imepenam. Piperacillin-Tazobactam sensitivity was seen in 28 (80%), while 7 (20%) were resistant. 6 (17.2%) isolates were sensitive to clindamycin , while 29 (82.8%) showed resistance to these.



A total of 15 gram negative isolates were obtained from 50 swabs in present study. 15 (100%) were sensitive to imipenem, 5 (33.3%) to amikacin, 14 (93.4%) to pipracillin-tazobactam, 6 (40%) isolates were sensitive to chloramphenicol and gentamicin. Resistance to these antibiotics was seen as: 0 (0%) were resistant to imipenem, 10 (66.7%) to amikacin, 1 (6.6%) to piperacillin-tazobactam, 9 (60%) to chloramphenicol, and gentamicin. 4 (26.7%) isolates showed sensitivity to colistin, 11 (77.3%) being resistant. Tigecyclin sensitivity was seen in 10 (66.7%) isolates,5 (33.3%) showing resistance.



DISCUSSION

In the present study, out of the total 50 swabs obtained for microscopic examination by gram staining, majority 35(70%) were showing gram positive cocci while only 15 (30%) were showing gram negative bacilli. Among the gram positive organisms, isolates were Staphylococcus aureus (65.7%) and streptococci (34.3%). In gram negative isolates, most common organism was found to be pseudomonas (25%), followed by E. coli, acetinobacter, enterobacter. Also, it was observed that in the cultures showing mixed growth, majority came out to be gram positive organisms, favouring all major tests, which mention β-haemolytic streptococci and staphylococci (both gram positive bacteria) to be the most common causative organisms of cellulitis[1-3].

Table 4 Comparative observation of isolates

STUDY	GRAM POSITIVE	GRAM NEGATIVE
Moet G J et al[6]	81%(Staph aureus)	Not reported
Dryden Matthew S et al[7]	75% (staph aureus)	25%
Sigridurbjornsdottie et al[8]	95% (staph+strepto)	5%
Lipsky et al[9]	54.6%(staph aureus)	43.4%
Present Study	70%	30%

Among the gram positive isolates, all (100%) were sensitive to vancomycin and imepenam. While a majority were sensitive to methicillin (90%) and piperacillin-tazobactam (80%). Resistance was observed against ceftriaxone, colistin, erythromycin, netilmicin. A study by Gales et al[10] also showed 100% sensitivity to vancomycin. Similarly in study conducted by ShibabawA[11],vancomycin was found to be the most effective (86.7%) antibiotic against gram positive isolates.This finding can be implicated as using antibiotics such as vancomycin, amikacin or piperacillin-tazobactam empirically before the results of culture and antibiotic sensitivity are received.

Table:5 Comparative observation of culture and sensitivity of isolates.

STUDY	GRAM POSITIVE	GRAM NEGATIVE
Gales et al[10]	100%(vancomycin)	100% (Meropenam)
Shibabaw A[11]	86.7%(vancomycin)	-
Present study	100% (Vancomycin,Imepenam)	100%(Imepenam)

Among the gram negative isolates,antibiotic sensitivity testing showed maximum sensitivity to imipenem (100%), followed by piperacillin-tazobactam (93.4%), tigecycline (66.7%) and amikacin (33.3%) respectively, supported by Gales et al.[10]
In this study, 34 (68%) patients were male and 16 (32%) were female. Gram positive organisms were found in greater number in males (82.3%) than females (43.8%). This showed that there is gender predilection in microbial profile of cellulitis. This observation was supported statistically significant result (Fischer's exact formula test $p<0.05$). This finding is supported by Gannon and colleagues[12] and Angus et al[13]

CONCLUSION

To conclude, it was observed that there were more gram positive organisms causing cellulitis. Most common organisms responsible were staphylococcus aureus(65.7%) followed by streptococci(34.3%). All the gram positive and gram negative organisms were sensitive to vancomycin and imepenam respectively. However, changing pattern of bacterial infection and drug resistance must be considered during treatment of patients.

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