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ANTIBACTERIAL RESISTANCE PATTERN IN ORGANISMS ISOLATED FROM SKIN AND SOFT TISSUE INFECTIONS IN CANCER PATIENTS: OBSERVATIONS FROM A TERTIARY CARE HOSPITAL

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ABSTRACT: Background: In recent years, bacterial infections have become a major problem and worse in immunocompromised cancer patients. The objective of this study was to observe for drug resistance pattern in bacteria isolated in infections of Skin and soft tissue in Cancer Patients (SSTI). **Methods**: This is a retrospective study and was carried out checking in to the medical records for 3 years (January 2009 to December 2011). The incidence and drug resistance pattern for various clinically used antibiotics against the isolated bacteria were analyzed. **Results**: A total of 395 cases of organisms were isolated. The gram negative bacteria accounted for 59.45% of the total culture positives. Methicillin-resistant Staphylococcus aureus (MRSA) and Escherichia coli were the most common gram positive and negative bacteria respectively. The isolates were resistant to most antibiotics with highest resistant being seen in the MRSA and the Multidrug resistant coagulase-negative staphylococci (MRCONS). However all isolates were sensitive to the new generation antibiotics Linezolid, Tigecycline, Daptomycin and Vancomycin. **Conclusions**: The study demonstrated that the bacteria studied had different resistance to most of the standard antibiotics. However all Gram negative organisms studied were sensitive to colistin, and Gram positive were sensitive to vancomycin, linezolid and teicoplanin

KEY WORDS: Cancer; Skin and soft tissue infections; Methicillin-resistant *Staphylococcus aureus* (MRSA) and Multidrug Resistant Coagulase-Negative *Staphylococci* (MRCONS)

INTRODUCTION:

In people suffering with cancer, bacterial infections are a serious cause of morbidity and at times also a cause for mortality .[1] This is primarily because the disease itself compromises the body's defense system and worse the treatment treatment-related adverse effects increases the risk for infection.[1] The primary host-associated factors having a forbearing

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encompass underlying immune deficiencies, medical comorbidities, past infections, poor nutritional status, and psychological stress, while the treatment-associated factors include surgery, radiation, immunosuppressant therapies, antimicrobial use and the various invasive procedures.[1,2] The problem is worse when the patient is neutropenic as this leads to delay in administering of the proposed chemotherapy/radiotherapy can impact the patient's treatment schedule and survival.[1,3]

In cancer patients, skin and soft tissue infections (SSTIs) are commonly observed condition[4]. The severity of SSTIs may range from mild superficial to deeper or potentially fatal necrotizing infections and merit immediate medical infection.[2] Worse, cancer patients are at a major risk of acquiring nosocomial infections during the various invasive diagnostic and therapeutic procedures like during biopsy, surgery, intravenous line placement.[4,5] In lieu of these observations in clinics even a small and mild lesions merits a detail investigation because the reduced immune system functioning will facilitate the apparently mild infection to a more virulent life threatening infection.[5]

This was a retrospective study and was carried out in the Clinical Microbiology department of Father Muller Medical College Hospital. The study was initiated after obtaining the approval from the Institutional ethics Committee. Data on the antibiotic sensitive pattern of the bacteria isolated from the skin and soft tissue infections from cancer patients during January 2010 to December 2012 were collected from the Hospital database. The gram positive and gram negative organisms were tested for a total of 13 and 15 standard antibiotics.

MATERIAL AND METHODS:

This is a retrospective study and was carried out in the department of clinical Microbiology of Father Muller Medical College Hospital, Mangalore, India. The data on the antibiotic sensitive pattern of the various bacteria isolated from the skin and soft tissue infections were studied from January 2009 to December 2011. The data was collected from Hospital database after obtaining the necessary permission from the Institutional ethics Committee. The sensitive pattern for the following antibiotic was conducted in according to the Clinical and Laboratory Standards Institute (CLSI) guidelines.

Antibiogram was conducted in accordance to the standard microbiological procedures for antibiotics these Ampicillin (10µg), Amoxycillin/ Clavulanic Acid (20/10µg),Cefazolin (30µg), Cefuroxime(30µg), Ceftriaxone (30µg), Ceftazidime (30µg), Cotrimoxazole (25µg), Gentamycin (10µg), Amikacin (30µg), Ciprofloxcian (5µg), Levofloxacin (5µg), Piperacillin/Tazobactam (100/10µg),Cefoperazone+Sulbactum (50/50µg), Imipenam (10µg), Meropenem (10µg), Colistin (10µg),Tigecycline(15µg),Ceftazime/Clavulunae (30/10µg). The Zone of diameter was measured and interpreted as per the Clinical and Laboratory Standard Institute guidelines.6

The drug resistance pattern for each isolate was entered in the Microsoft Excel, coded and then subjected to statistical analysis

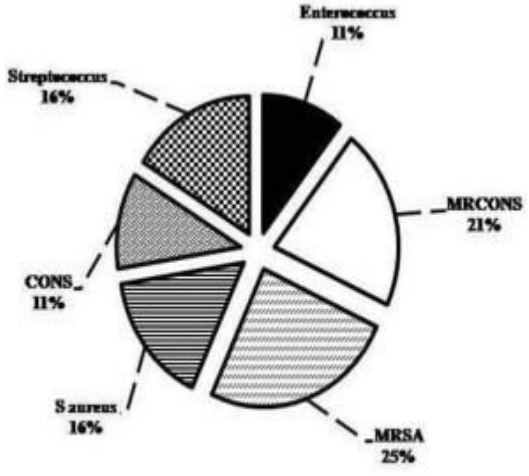

Figure 1: Percentage of gram positive organisms isolated from the SSTIs in cancer patients

for the incidence of resistance for the antibiotic tested as well as to the pharmacological class/type the antibiotic
belonged to. The data were analyzed by x^2 for each antibiotic tested. In addition to this the mean was calculating considering the number of resistance possessed by each organism and subjected to unpaired students *t* test. A statistical value of $p < 0.05$ was considered significant.

RESULTS:

A total of 160 gram positive and 235 gram negative organisms were isolated from the SSTI during the study period. MRSA (39) and E coli (106) were the most commonly observed gram positive and negative organisms. Only one sample of Corynebacterium was observed during the whole study period. The details of the gram positive organisms are as follows: Enterococcus 10.69%, MRCONS 21.38%, MRSA 25%, S aureus 15.72%, CONS 11.32% and Streptococcus species 16.35%, while that for gram negative was Acinetobacter species 7.37%, Citrobacter species 7.83%, E coli 48.85%, Enterobacter species 3.68%, Klebsiella species 20.74%, Proteus species 2.30% andPseudomonas aeruginosa 17.51% (Figure 1 and 2).

In this study it was observed that the all the gram positive organisms tested were sensitive to TP and LZ (Table 1), while the gram negatives were sensitive to Colistin (Table 2). The sensitivity for other antibiotics varied depending on the organism. With regard to the gram positive organisms, the MRSA were found to have the highest resistance to most antibiotics (9.66±0.47), followed by MRCONS (8.5±1.11) (Figure 3). Analysis of gram negative organisms showed that Acinetobacter had the resistance to the highest number of antibiotics tested (11.75±1.85) followed by E coli (9.61±3.23) and Citrobacter (9.58±3.08) (Figure 4).

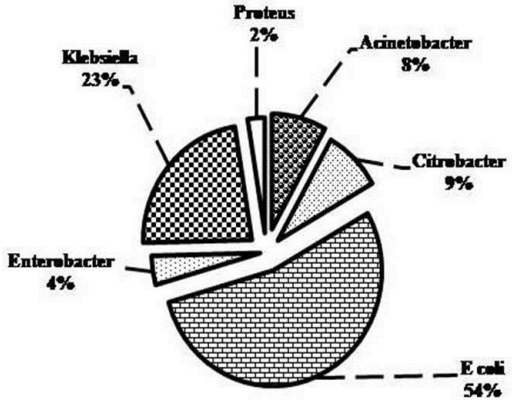

Figure 2: Percentage of gram negative organisms isolated from the SSTIs in cancer patients

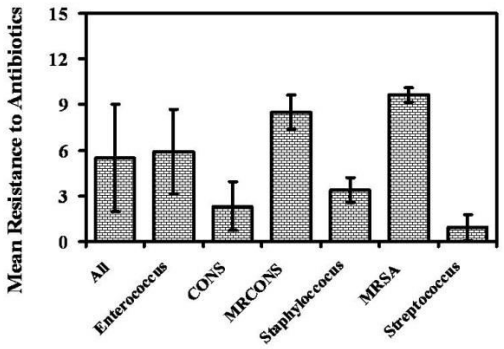

Figure 3: Mean of antibiotic resistance of the various gram positive organisms isolated from the SSTIs in cancer patients

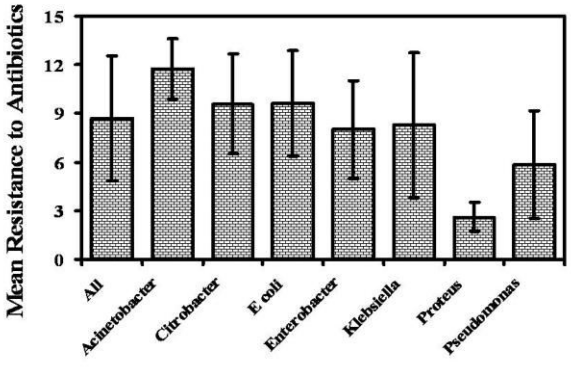

Figure 4: Mean of antibiotic resistance of the various gram negative organisms isolated from the SSTIs in cancer patients

Table 1: Sensitivity pattern of various gram positive organisms

All G +ve	Enterococcus (17)	CONS (18)	MRCONS (34)	MRSA (40)	Staphylococcus (25)	Streptococcus (26)	All (160)
A	5 (29.41)	15 (83.33)	32 (94.11)	40 (100)	20 (80)	3 (11.53)	114 (71.69)
AMC	5 (29.41)	13 (72.22)	32 (94.11)	40 (100)	15 (60)	0 (0)	104 (65.40)
CP	17 (100)	0 (0)	32 (94.11)	40 (100)	0 (0)	0 (0)	88 (55.34)
CU	17 (100)	0 (0)	32 (94.11)	40 (100)	0 (0)	0 (0)	88 (55.34)
CT	0 (0)	0 (0)	32 (94.11)	40 (100)	0 (0)	0 (0)	71 (44.65)
COT	0 (0)	0 (0)	8 (23.52)	40 (100)	0 (0)	6 (23.07)	53 (33.33)
CF	10 (58.82)	12 (66.66)	32 (94.11)	40 (100)	20 (80)	10 (38.46)	123 (77.35)
LF	0 (0)	7 (38.88)	16 (47.05)	40 (100)	15 (60)	5 (19.23)	82 (51.57)
E	17 (100)	10 (55.55)	32 (94.11)	20 (50)	10 (40)	0 (0)	89 (55.97)
CD	6 (35.29)	6 (33.33)	24 (70.58)	40 (100)	5 (20)	0 (0)	80 (50.31)
VA	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
TP	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
LZ	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

DISCUSSION:

SSTIs are a very common infection and their incidence is relatively high in the immunocompromised cancer patients[4]. The main objective of this study was to report on the pattern of bacterial isolates and antibiotic resistance pattern in skin and SSTI rather than on episodes of infection. In our study among the gram positive organisms the MRSA accounted for the highest number of isolates (39/160) and were resistant to nearly 10 of the 13 antibiotics tested. They were observed to be sensitive only for VA, TP and LZ. Under these

circumstances the development of antibiotics like Vancomycin, Teicoplanin and Linezolid has been observed to be beneficial. However their use is associated with untoward side effects and is expensive for the patient and the hospital. From a clinical perspective, infection of cancer patients by MRSA is difficult to control and is associated with significant morbidity and mortality[4].

In our study the gram negative bacteria were the most common and accounted for (59.45%) pathogens identified. Additionally, analysis also showed that *E coli, Klebsiella and Pseudomonas aeruginosa* were the three most prevalent organisms in our oncology setup. The observations that gram negative organisms are more common like in previous studies[3,7-11] and that *E coli, Klebsiella and Pseudomonas aeruginosa* are the most common are in agreement to earlier reports with cancer patients.[3,12-16] With respect to the antibiotic resistance the results indicate that more than 80% of the organisms were resistant to A, AMC, CF, COT and CP, the most commonly used antibiotics and is in agreement to earlier reports[11,17]. However all gram negative organisms were sensitive to colistin.

The continued emergence of antimicrobial drug resistance is a serious problem for the antibiotic treatment of patients with staphylococcal infections in the clinic. Studies have reported that 60-85% of Methicillin-resistant *Staphylococcus aureus* (MRSA) and Multidrug resistant coagulase-negative staphylococci (MRCONS) present on the normal human skin microflora are the most prevalent organism in immunocompromised patients[16, 18]. The most striking aspect was that all the MRSA organisms were resistant to 9 of the 13 antibiotics, while with the MRCONS more than 90% of the organisms were resistant to 7 of the 13 antibiotics studied. All organisms were sensitive to the newer generation drugs, such as linezolid, tigecycline and vancomycin. These observations clearly indicate that the immunocompromised individuals are susceptible to MRSA and MRCONS and that due to high rates of infection, mortality, and high treatment costs both these organisms are important issue for healthcare facilities.

CONCLUSION:

The present study demonstrated that the bacteria studied were resistant to most antibiotics and that they were sensitive to colistin, vancomycin, linezolid and teicoplanin. The major limitations are that this is a single institutional, retrospective study with only SSTIs. Prospective studies are planned considering inclusion of clinical factors and correlating it with the resistance pattern of the bacterial isolates to ascertain the magnanimity and pattern of drug resistant in cancer patients. Additionally, the observations have suggested the need for a more rigorous adherence to the good practice guidelines and antibiotic policy to minimize the evolution of drug resistant strains.

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