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ANTIBIOTICS APPREHENSION IN PATIENTS WITH HOSPITAL ACQUIRED INFECTION

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ABSTRACT

A total of 170 strains from cancer patients undergoing chemotherapy were examined. Coagulase producing *S. aureus* were further studied by using phenotypic method (slide coagulase), which revealed 141 strains as coagulase positive, while 29 remained negative. From overall of 170 samples 50% MRSA were resistant to ciprofloxacin and 59.5% were to levofloxacin, ceftriaxone showed 52% and resistant to meropenam and imipenam were 26% and 14% respectively, although all strains were sensitive to vancomycin.

Keywords: MRSA, *Staphylococcus aureus, Antibiotics, Multidrug resistance*

INTRODUCTION

Infections caused by *Staphylococcus aureus* are a leading cause of morbidity and mortality, particularly among the immunosuppressive cancer patients **[1]**. Most strains of *S. aureus* which were initially sensitive to penicillin and later to methicillin finally reported to develop resistance to these drugs **[2, 3].** However, glycopeptides are mostly prescribed against infections caused by methicillin-resistant *Staphlococcus aureus* (MRSA), which may be due to their unique mechanism of action and lack of cross resistance **[4, 5]**. Bacterial resistance

against antibiotics is mostly of genetic origin and can be transferred between species and genera of bacteria **[6]**. MRSA produces a specific protein PBP2a that possesses reduce affinity for binding to β lactam antibiotics resulting in resistance **[7]**. The PBP2a is encoded by *mecA* gene, carried by *Staphylococcal cassette chromosome mec* **[8, 9]**. The phenotypic methods of MRSA determination may be affected by heterogeneous expression of resistance, variations in inoculum's size, incubation time and pH of medium **[10, 12]**. National Committee for Clinical Laboratory Standards (NCCLS) have provided guidelines for antibiotic resistance, but problems occur when microorganisms show their zone of inhibition and minimum inhibitory concentration (MIC) near standard break points **[13],** thus misleading to proper diagnosis and ultimately results in poor prognosis **[11]**.

MATERIAL AND METHODS

The isolates of *S. aureus* were collected from Institute of Nuclear Medicine and Oncology, Lahore (INMOL). The *S. aureus* strains were identified on the basis of their morphology and Gram stain characteristics and then characterized by biochemical (catalase and coagulase) tests. Finally, of all these strains of *S. aureus*, MRSA were isolated by disc diffusion method. Muller Hinton broth was prepared by dissolving 8 gm of Muller Hinton broth in one liter distilled water with the help of stirrer. The media was sterilized by autoclaving at 121°C for 15-20 minutes. Disc diffusion test was performed with 5 µg of methicillin per disc placed on 25 ml of Muller Hinton agar plates. For determination of resistance and sensitivity parameters (NCCLS 2004) protocols were followed. The zones of inhibition were determined after 24 hours after incubation at 37ºC. The zones of inhibition for methicillin and vancomycin considered sensitive if these were ≥ 15 mm, for ceftriaxone and ciprofloxacin ≥ 21 mm, for imipenam and meropenam ≥ 16 mm and for levofloxacin ≥ 17 mm. The zones of inhibition were considered resistant for methicillin if it was ≤ 14 mm, for ceftriaxone, imipenam, meropenam and levofloxacin ≤ 13 mm and ciprofloxacin ≤ 15 mm.MRSA strains were tested against levofloxacin, ciprofloxacin, ceftriaxone, meropenam, imipenam and vancomycin by disc diffusion test **[14]**, as described above.

RESULTS

MRSA was isolated and characterized from 170 blood samples of cancer patients who are undergoing chemo- and/or radio-therapies. MRSA characterization was performed according to NCCLS **[21]**, and biochemical characterization was carried out following the methods mentioned in Cheasbrough **[16] (Figure 1)**. Though all samples showed positive reaction to catalase, but 141 strains found coagulase positive and 29 strains remained coagulase negative.

Antimicrobial sensitivity testing

The resistance pattern against different antimicrobial groups was determined in *S. aureus* isolated from blood sample of cancer patients using disc diffusion method **[15]**. Out of 170 samples 50% MRSA were fount resistant to ciprofloxacin, 59.5% were resistant to levofloxacin, ceftriaxone showed 52% and resistant to meropenam and imipenam were 26% and 14% respectively, while all strains were sensitive to vancomycin **(Figure 2, 3)**.

Multi drug resistance

Of all the strains of MRSA, 61.95% were resistant to more than one antibiotic, while 38.05% showed single drug resistance **Figure 4**.

Figure 1: MRSA characterization

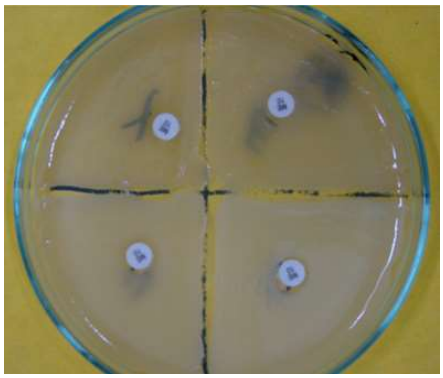

Figure 2: Antimicrobial sensitivity testing

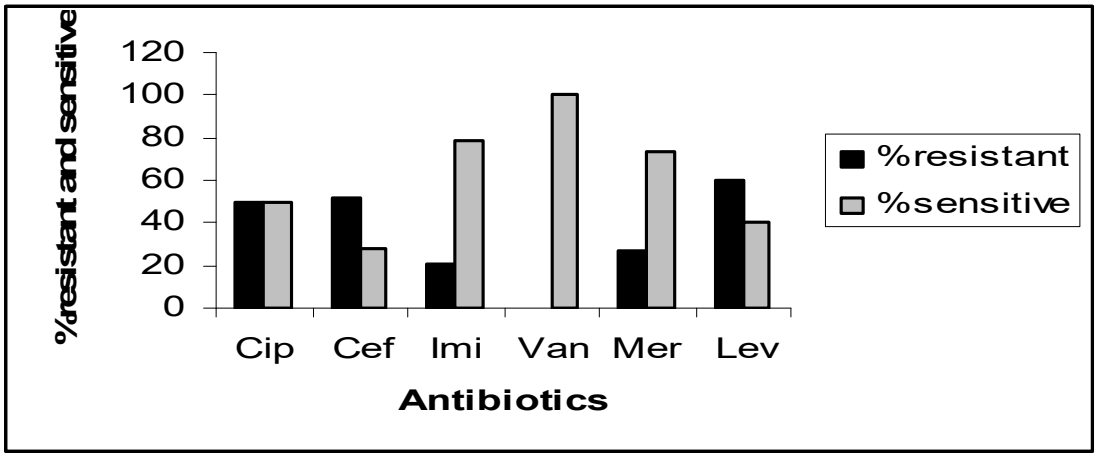

Figure 3: % Resistance and % Sensitivity

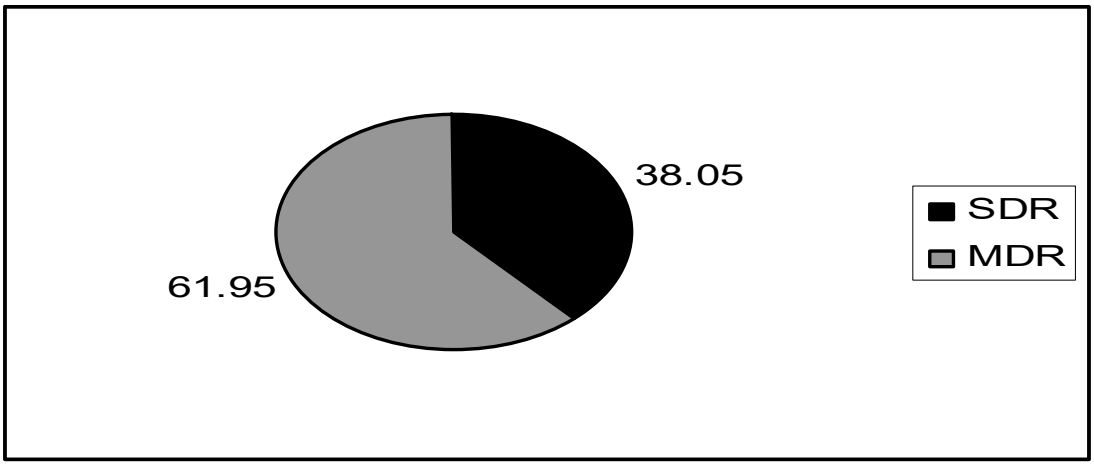

Figure 4: Multi drug resistance

DISCUSSION

Different strains of *S. aureus*, resistant to methicillin are considered as the leading cause of nosocomial infections, particularly among immuno-compromised patients **[1]**. The prevalence of MRSA is constantly rising in many parts of the world and in some hospitals it is more than half of all *S. aureus* infections **[17]**. The MRSA caused around 30% hospital-based infections in the Unites states **[18]**, while up to 40% have been reported in Pakistani hospitals (5, 26, and 28). Current study shows 50% - 60% of MRSA strains were resistant to ciprofloxacin, levofloxacin and ceftriaxone, 14% -25% to meropenam and imipenam, however all of the strains did not exhibit any resistance to vancomycin. These results are in agreement with Qureshi and Rajaduraipandi **[19, 20]** who reported 60%-95% resistance of MRSA toward ciprofloxacin in their studies.

Vancomycin is currently the drug of choice to treat infections caused by MRSA and our results compliment this trend, which has further been supported by the results of Qureshi **[21]**, who reported 100% sensitivity rate of vancomycin against MRSA.

High prevalence of multi drug resistant *S. aureus* strains (60%) among hospital-based patients may suggest higher incidence of resistance among immuno-compromised cancer patients. Our results are in compliance with multi-drug resistance rate of 65%-75% for patients in Nigeria **[22]**, India **[23],** and USA **[24]**. However, comparatively lower (22% - 32%) pattern of resistance was reported in some parts of India as well **[25, 26]**. This contrast may suggest a varying pattern of rate of resistance of *S. aureus* to various antibiotics in different hospitals and locations.

CONCLUSION

This study clearly demonstrates that choice of antibiotic is essential in patient with hospital acquired infections.

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Conflict of interests

Authors found no conflict of interest.

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