

Incidence of Methicillin Resistant Staphylococcus Aureus (MRSA) Among Patients Necessitating Reconstructive Surgery

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ABSTRACT

Purpose: Staphylococcus aureus is an important nosocomial pathogen and the progression of methicillin resistance stances a most important threat for its control. The current study was directed to govern the MRSA prevalence and its susceptibility to various antibiotics given for anti-staphylococcal strains in OPD treated patients.

Study design: Prospective descriptive study.

Place and duration: This study was conducted in the East Surgical Ward of Mayo Hospital, Lahore for two-year duration from January 2020 to December 2021.

Methods: A total of 200 patients with septic wounds of both sexes were encompassed in the study. Swabs were taken from wounds which were infected and Stuart's medium was used to transport them. The samples were grown onto MacConkey agar, nutrient agar and blood agar and for 24 hours; incubated at 37 ° C. All MRSA isolates were biochemically and morphologically identified using standard procedures of laboratory by processing clinical specimens submitted to a microbiology laboratory. All isolates were tested for patterns of resistance and sensitivity.

Results: A total of 200 patients were included, 115 (57.5%) were men and 85 (42.5%) were women with 27.3 years of mean age and age range from 15-70 years. The incidence of positive cases confirmed by culture was 118 (59%) and the MRSA incidence was 78 (39%). Of the 78 cases of MRSA, 50 (64.10%) are men and 28 (35.90%) are women. The incidence of other microorganisms was 40 (33.8%). MRSA was 100% sensitive to vancomycin, teicoplanin and linezolid. Of these, 24.4% were sensitive to cotrimoxazole, 47.4% were sensitive to fucidic acid and 28.2% were sensitive tetracycline antibiotics. Cultured MRSA were resistant 100% to main antibiotic groups including penicillin, macrolides, cephalosporins, fluoroquinolones, meropenem, imipenem, gentamicin, and tazobactam/ piperacillin. Of all 78 MRSA patients, > 50% were from general surgery and orthopaedics departments, and the remainder from other related specialties, such as Gynecology, pediatric surgery, maxillofacial surgery, neurosurgery and otolaryngology. Of 78 patients with MRSA, 70 (89.7%) were hospitalized with a history of hospitalization, and 60 (76.9%) were hospitalized for >1-week. The organism was institute to be hundred percent resistant to the generally directed antibiotics.

Conclusions: The incidence of MRSA is increasing. The organism spreads readily in a hospital setting, causing morbidity, mortality and higher costs. Special infection control actions and precautions should be taken to stop and prevent the MRSA spreading.

Keywords: Nosocomial infections, MRSA and Antibiotic resistance

INTRODUCTION

Staphylococcus aureus is a gram+ve bacterium that sources numerous infections in humans. The micro-organism can cause infectious conditions such as skin infections, pneumonia, toxic shock syndrome, and life-threatening bloodstream infections¹⁻². This bacterium is tough to control for its capability of developing resistance to many antimicrobial drugs³. The Staphylococcus aureus multi-drug resistant nature restricts various options of treatment⁴. Resistance is emerging with almost all new drugs introduced. S. aureus strains developed resistance to almost all classes of antibiotics currently used⁵. These are glycopeptides and β -lactams, aminoglycosides, fusidic acid, tetracyclines, trimethoprim sulfamethoxazole, quinolones etc. The 1st beta-lactam antibiotic evolved was Penicillin in 1940 and in 1942; the resistance emerged shortly⁶⁻⁷. β -lactamase (penicillinase) was phased out in 1944. Penicillinase-resistant β -lactams like semi synthetic penicillin and cephalosporins introduced in the late 1950s in the form of nafcillin and methicillin⁸. In 1959; Methicillin was presented but S. aureus quickly became resistant to it. MRSA was primary introduced in 1961. Methicillin resistance Staphylococcus aureus confers cross-resistance to other broad-spectrum beta-lactam antibiotics such as cephalosporins. The MRSA emergence is considered to be a serious problem of health because of the problem of control to these strains⁹. Infections with antibiotic-resistant organisms often led to in high mortality and morbidity than organisms which are susceptible to antibiotics. Changes in the susceptibility pattern of S. aureus to antimicrobial agents have been reported worldwide. In developing countries, antimicrobials are turning to be less operative in bacterial infections treatment.

The incidence of MRSA in Asia is lesser than United States and Europe¹⁰⁻¹¹. The variance in incidence may be because of different policies and practices in different hospital settings. Numerous researches have revealed an upsurge in the numeral of cases with MRSA, which is a difficult task for the current health care system. MRSA infections have increased significantly in some countries, especially the UK, over the past 20 years. MRSA is particularly difficult to treat, with limited treatment options¹². Therefore, it is very important to control this organism to stop its spread to other patients. The current research was directed to determine the prevalence of MRSA and its susceptibility to various antibiotics given for anti-staphylococcal strains in OPD treated patients.

METHODOLOGY

This study was conducted in the East Surgical Ward of Mayo Hospital, Lahore for two-year duration from January 2020 to December 2021, after approval by the hospital's ethics committee. Total 200 patients were enrolled in the study and Informed consent was obtained from all volunteers. All patients had septic wounds involving different body parts. All patients presenting for various surgical procedures were involved, regardless of age, sex, site involved, cause of sepsis and prior surgical interference. Patient comorbidities, prior treatment and taking antibiotics were not included. The duration of hospitalization varies from 7-21 days. Swabs were taken from wounds which were infected and Stuart's medium was used to transport them. The samples were grown onto MacConkey agar, nutrient agar and blood agar and for 24 hours; incubated at 37 ° C. To isolate MRSA, morphological studies of purulent smears and cultures were performed including

colonial morphology, β-hemolysis production on blood agar and pigmentation on nutrient agar, as well as biochemical studies such as catalase, coagulase, mannitol fermentation and novobiocin sensitivity. SPSS-21 statistical software was used for data analysis.

RESULTS

A total of 200 patients were included, 115 (57.5%) were men and 85 (42.5%) were women with 27.3 years of mean age and age range from 15-70 years. The incidence of positive cases confirmed by culture was 118 (59%) and the MRSA incidence was 78 (39%). Of the 78 cases of MRSA, 50 (64.10%) are men and 28 (35.90%) are women. The incidence of other microorganisms was 40 (33.8%). MRSA was 100% sensitive to vancomycin, teicoplanin and linezolid. Of these, 24.4% were sensitive to cotrimoxazole, 47.4% were sensitive to fucidic acid and 28.2% were sensitive tetracycline antibiotics. Cultured MRSAs were resistant 100% to main antibiotic groups including penicillin, macrolides, cephalosporins, fluoroquinolones, meropenem, imipenem, gentamicin, and tazobactam/ piperacillin (Table 1).

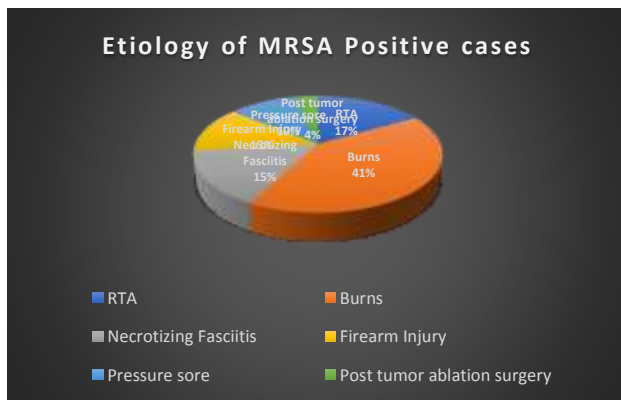
Table 1: Shows the MRSA pattern of sensitivity

Antibiotic	Sensitive	Resistant	Total
Vancomycin	78 (100%)	0	78
Linezolid	78 (100%)	0	78
Fucidic acid	37 (47.4%)	41 (52.6%)	78
Teicoplanin	78 (100%)	0	78
Tetracycline	22 (28.2%)	56 (71.8%)	78
Cotrimoxazole	19 (24.4%)	59 (75.6%)	78
Cephalosporins	0	78 (100%)	78
Penicillin	0	78 (100%)	78
Fluoroquinolones	0	78 (100%)	78
Macrolides	0	78 (100%)	78
Imipenem	0	78 (100%)	78
Gentamycin	0	78 (100%)	78
Piperacillin/tazobactam	0	78 (100%)	78
Meropenem	0	78 (100%)	78

Of all 78 MRSA patients, > 50% were from general surgery and orthopaedics departments, and the remainder from other related specialties, such as Gynecology, pediatric surgery, maxillofacial surgery, neurosurgery and otolaryngology (Table 2).

Table 2: Shows the referring source of positive cases of MRSA

Referral source	No. of Patients	%age
General surgery	21	26.9%
Orthopaedics	24	30.8%
Gynecology	4	5.1%
Pediatric surgery	12	15.4%
Neurosurgery	2	2.6%
Maxillofacial surgery	5	6.4%
Periphery	4	5.1%
ENT	3	3.8%
Total	78	100%



The septic wounds cause in MRSA positive cases are shown in Table-III. 38 (48.7%) MRSA was found to be the sole organism in infected wounds and 40 (51.3%) were associated with other bacteria such as the original pathogen like Pseudomonas aeruginosa, candida albicans and E. coli found in the culture reports. Of 78 patients with MRSA, 70 (89.7%) were hospitalized with a history of hospitalization, and 60 (76.9%) were hospitalized for >1-week.

DISCUSSION

In running centuries, bacteria have developed numerous defences against antimicrobial drugs. The frequency of multi-drug resistance is increasing in opportunistic and pathogenic bacteria¹³⁻¹⁴. Penicillin antibiotics have long been the main treatment for numerous infections instigated by Staph-aureus¹⁵. The Staph-aureus gained resistance gradually to antibiotics, and some bacteria became resilient to cloxacillin and methicillin¹⁶. Such resistance emergence rises questions about these drugs future in chemotherapy, as transfer of the resistance plasmid of interest to various bacterias will support the genes resistance which spread rapidly. MRSA result in various issues in many hospitals around the globe. MRSA was primary introduced in 1961 and has been documented as a serious health issue due to the difficulty of controlling these strains¹⁷. The reoccurrence of the MRSA problem appears to be due to a deficiency of strong therapeutic drugs that have effect of cell-killing and can eliminate it from the patient's body¹⁸. Hospitals and society face the problem of controlling and eradicating this resistant organism as these infections are linked with longer hospital stays, increased mortality and high hospitalization charges compared to patients with methicillin-sensitive Staphylococcus aureus. A 2013 study by Khan T found that the incidence of positive MRSA cases was 61.50%¹⁹⁻²⁰. Hafiz eta al in 2016 exhibited that the MRSA strains prevalence in various provinces of our country is 42%. This clearly shows that the incidence of MRSA is increasing²¹⁻²². Hassan N. reported an incidence of 43.16% in a survey conducted at a tertiary-care hospital in Lahore²³. The Rehman S. study shows a 55.1% increase in the incidence of MRSA in a two-year period. Naqvi ZA stated a frequency of 23.91% amongst burn patients in Karachi. The Orret AF study exhibited a constant 18.6% upsurge in the incidence of MRSA by 9.8% compared to the previous study²²⁻²³. In 2017, Sanjana RK et al. Reported 39.6% prevalence of MRSA in a clinical hospital in Nepal. When associating the outcomes of this study with the statistics cited, it is clear that there has been an upsurge in the MRSA incidence²⁴.

A long stay in hospital can be an influence in contracting MRSA. The Sanjana RK et al study shows that the MRSA incidence among hospitalized patients (41.1%) is higher than among patients treated at OPD basis (37.4%). He concluded that the difference was because of extended stay in hospital and aggressive procedures. We also note that the MRSA incidence is greater in hospitalized or surgical patients.

CONCLUSION

MRSA is difficult to treat. The organism spreads readily in a hospital setting, causing morbidity, mortality and higher costs. Any positive case in the hospitals must be informed to the concerned authorities and special infection control actions and precautions should be taken to stop and prevent the MRSA spreading. While continuous monitoring of susceptibility or resistance patterns can help reduce the incidence of MRSA infection, extensive research is needed to develop guidelines for controlling and eliminating the organism.

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