FREQUENCY OF METHICILLIN RESISTANT STAPHYLOCOCCUS AUREUS IN PATIENTS REFERRED FROM OTHER SPECIALITIES AND ITS ANTIMICROBIAL SUSCEPTIBILITY AND RESISTANCE PATTERN

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ABSTRACT

Objectives: To determine the frequency of Methicillin-Resistant Staphylococcus Aureus in patients referred from other specialities to plastic surgery unit at lady reading hospital, Peshawar and to document its current antimicrobial sensitivity and resistance pattern.

Material and Methods: Over a three months period a descriptive cross-sectional study was conducted including all patients with infected wounds referred to plastic surgery and burns unit lady reading hospital Peshawar, from December 2012 to March 2013, for the purpose of various plastic procedures. Swab specimens taken from wound sites were sent for microbial culture, and their antimicrobial sensitivity and resistance testing was done.

Results: Out of a total of 144 cases included in the study, the frequency of culture positive cases was 84 (58.3%), of which the frequency of MRSA was 51 (60.71%). The frequency of culture negative cases was 60(41.7%). All the MRSA showed 100% sensitivity to linezolid, teicoplanin and vancomycin. The MRSA obtained was 100% resistant to major groups of antibiotics.

Conclusion: Our study showed a significant number of MRSA as a cause of wound infection, which may have been contracted during dressing exercises. The majority of these MRSA are now resistant to the commonly prescribed antibiotics.

Key Words: MRSA, Frequency, Antimicrobial, Sensitivity, resistance.

INTRODUCTION

Methicillin-Resistant Staphylococcus Aureus was initially reported in a hospital in Malaysia in 1972.[1] An alarming number of major hospital outbreaks were reported in many countries including Australia, Japan, Europe and USA in the early 1970s.[2] The MRSA induced infections impose a serious burden as far as the medical and socio-economic costs are concerned and cause considerable morbidity and mortality.[3,4,5] Even though a wide range of effective antimicrobial chemotherapeutic agents are at our dispense, the MRSA still remains notorious for causing postsurgical wound infections.[6,7] The multiple-drug resistant strains of MRSA limits the therapeutic options available for managing MRSA induced infections and has become a major global issue.[8] Among the many mechanisms for methicillin resistance seen in S. aureus, the most important one is the production of a unique penicillin-binding protein that has a low affinity for β-lactam antibiotics, the effects of which are determined by some structural genes.[9,10] The other major mechanism of methicillin resistance is the increased production of the enzyme penicillinase.[11,12] The main importance is to decrease the frequency of MRSA by its effective and reliable identification, its susceptibility patterns to the various antibiotics, surveillance and treatment of the positive cases and carriers, and adherence to standard hand washing practices by health care professionals.[13]

Due to the differences in health policies and clinical practices in different hospitals in various parts of the world, there is a significant variation in the frequency of MRSA among these areas.[14] The incidence and prevalence of MRSA is lower in Asia as compared to Europe and the United States.[15] As a reference for South-East Asia, multiple studies in Iran have shown that there is a rise in the number of MRSA positive cases in the country.[16]

The purpose of this study was to review and document: the frequency of methicillin resistance among the isolates of Staphylococcus aureus recovered from hospital sources and the pattern of antimicrobial susceptibility and resistance of MRSA isolates to the commonly prescribed antimicrobials in Peshawar.

MATERIAL AND METHODS

This study was conducted at the department of plastic surgery and burns unit, Lady Reading Hospital,

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Peshawar, Pakistan, over a three months period from December 2012 to March 2013. Patients with infected wounds irrespective of their wound etiology, age, sex, region involved, referring unit or hospital and any previous surgical intervention, that were referred to our unit for the purpose of various plastic and reconstructive procedures were registered in the study. The mean age of the study patients was 30.74 years with a range of 2 to 70. The different regions in the province were not taken into account and neither were the co-morbidities, immune status of the patient, previous antibiotics used and the duration of hospital stay. A total of 144 patients were included in our study. All these cases were referred from other units of our hospital or other hospitals. All of them had a duration of hospital stay from 5 to 7 days and had undergone various surgical interventions before coming to our unit. After taking an informed consent, wound swabs were taken from all patients who participated in the study. Stuart's transport medium was used for the swabs after they were taken. Before the swabs were collected from the infected wounds any residual ointment was cleansed. After collection, the swabs were inoculated on Blood agar, nutrient agar and Mac-Conkey's agar, and incubated at 37 degrees centigrade for 24 hours. Antimicrobial sensitivity testing was performed by disc diffusion method according to the National Committee of Clinical Laboratory standards (NCCLs). Statistical analysis of the data was done using Statistical Package for Social Sciences (SPSS,version 16).

RESULTS

Out of the total 144 cases, the frequency of culture positive cases was 84 (58.3%), of which the frequency of Methicillin-Resistant Staphylococcus Aureus was 51 (60.71%) and that of Methicillin-Sensitive Staphylococcus Aureus was 12(14.28%). The frequency of culture negative cases was 60(41.7%). 24(47.1%) MRSA were present as the only microbes harbouring the infected wounds while 27(52.9%) were associated with other bacteria. Rest of the details are given in Table 1. All the MRSA showed 100% sensitivity to linezolid, teicoplanin and vancomycin, and 100% resistance to major groups of antibiotics, the details of which are given in Table 2. The major referring units and their details are given in Table 3. Among the MRSA positive cases, 15(29.4%) were females and 36(70.6%) males. As far as the etiology is concerned, 21(41.2%) were road traffic accident cases, 9(17.6%) were burns, 9(17.6%) postinfective, 6(11.8%) were trauma, 3(5.9%) fall from a height and 3(5.9%) firearm injury cases. For previous surgical intervention among the positive cases, 42(82.4%) underwent debridement and dressing and 9(17.6%) had some form of amputations.

Table 1: Frequency & Percentage

	Frequency & percent
Total cases	144(100%)
Total male patients	108(75%)
Total female patients	36(25%)
Culture positive cases	84(58.3%)
culture negative cases	60(41.7%)
MRSA positive cases	51(60.71%)
MSSA positive cases	12(14.29%)
cases of other bacteria	21(25%)

Table 2: Antimicrobial Sensitivity and Resistance pattern of MRSA

Name of the drug or group	Frequency & percent of MRSA sensitive	Frequency & percent of MRSA resistant
Vancomycin	51(100%)	—
Linezolid	51(100%)	—
Teicoplanin	51(100%)	—
Chloramphenicole	36(70.58%)	15(29.41%)
Fucidic acid	30(58.82%)	21 (41.18%)
Doxycycline	21(41.18%)	30(58.82%)
Penicillins	—	51(100%)
Cephalosporins	—	51(100%)
Macrolides	—	51(100%)
Flouroquinolones	—	51(100%)
Imipenem	—	51(100%)
Meropenem	—	51(100%)
Cotrimoxazole	—	51(100%)
Gentamicin	—	51(100%)

Table 3: Referring units for MRSA positive cases

Referring unit	Frequency & percent
Orthopedics	15(29.4%)
General surgery	15 (29.4%)
Other hospitals	12(23.5%)
Accident & emergency	6(11.8%)
Neurosurgery	3(5.9%)

DISCUSSION

Our study showed a significant number of MRSA positive cases among the total patients included in the study. Majority of these patients were referred from orthopedics and general surgery units of the hospital and the rest from other hospitals. It also showed that most of the MRSA was present in combination with other bacteria. The sensitivity pattern showed that 100% of the MRSA strains were sensitive to linezolid, vancomycin and teicoplanin. The sensitivity declined

for chloramphenicole, fucidic acid and doxycycline respectively. The MRSA showed 100% resistance to major groups of antimicrobial agents such as penicillins, cephalosporins, macrolides, flouroquinolones, imipenem, meropenem and getamicin. It also showed some stepladder resistance to chloramphenicole, fucidic acid and doxycycline in that order. Majority of these positive patients were males and most of them were road traffic accident cases whereas others included burns, post-infective, trauma and firearm injury. The study also showed that most of them had some form of previous surgical intervention, the most common being debridement and dressing and amputations.

A study on such a problem in Peshawar is unique since only limited data is available on the subject in this area. According to a study, a total of 170 burn wound swab specimen collected from 52 patients showed Forty one isolates of Staph. Aureus which were confirmed by biochemical reactions and coagulase test to be Methicillin-resistant. All (100%) isolates were sensitive to Vancomycin and Chloramphenicol, all of them were resistant to Ciprofloxacin, whereas 70-90% strains were resistant to Clindamycin, Amikacin, Clarithromycin and Gentamicin. The MRSA were resistant to all β-lactam drugs.[17] In a study conducted in Peshawar, 207 cases were detected in 2009 and 284 in 2010, this was an increase of 37.2%. In 2011, 438 cases were reported, which shows an increase of 54.2% from 2009.[18] Another study showed a steady increase in the prevalence rate of MRSA (18.6%) over the other study of 9.8%. Here the greatest prevalence of resistance of MRSA was seen for erythromycin (86.7%), and clindamycin (75.3%). The MRSA recovery rates from hospital sources (20.8%) was significantly higher than that of previous years (12.5%).[13]

The main limitations of the study were, time period of the study which was short, specimens were taken from the wound sites only, community-acquired cases were not included in the study and, co-morbidities and immune status of the patients and previous antibiotics used were not taken into account. On the other hand the study showed a pattern of MRSA in different units of the hospital. An attempt was made to evaluate the factors that may have contributed to the contraction of MRSA. The current sensitivity and resistance pattern of MRSA were described forming a foundation for effective antibiotic prescription by the physicians.

CONCLUSION

Our study showed a significant number of MRSA as a cause of wound infection regardless of its cause of injury. Most isolates were associated with infected surgical and burn wounds which may have become infected through the hands of health-care professionals during dressing exercises and surgical interventions under unsterilized conditions. Infection control measures aimed at the proper hygiene procedures may interrupt the spread of MRSA. Most MRSA are resistant to several non-β-lactam antibiotics. Regular monitoring of susceptibility and resistance patterns of MRSA and the implementation of a definite antibiotic policy maybe helpful in decreasing the frequency of MRSA infection.

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