ORIGINAL ARTICLE

FREQUENCY AND ANTIBIOTIC SUSCEPTIBILITY PROFILE OF MRSA AT LADY READING HOSPITAL, PESHAWAR

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ABSTRACT

Background: Methicillin-resistant Staphylococcus aureus (MRSA) is a major public health problem worldwide especially in developing countries. There is continuous change in the prevalence of MRSA due to acquisition of mecA gene showing resistance to a group of antibiotics and leads to affect treatment strategies.

Material & Methods: The present study was designed to investigate the recent trend in the prevalence and antibiotic susceptibility of MRSA. A total of 1283 clinical samples were collected at Lady Reading (LRH) Hospital, Peshawar from May, 2013 to December, 2013. All samples were immediately processed for isolation of MRSA using standard microbiological procedures.

Results: Among all 1283 isolates, 957(74.6%) were confirmed phenotypically as MRSA. Gender wise prevalence showed that males were more affected than females. High prevalence of MRSA was observed in 437(45.6%) pus samples while least was in sputum samples (n=112; 11.7%). Similarly its frequency was high in surgical wards (n=489; 51.0%) and lowest in samples from outdoor patients (n=73; 7.6%). MRSA isolates showed high drug sensitivity (n=957; 100%) to Vancomycin, Teicoplanin and Linezolid. These MRSA isolates were found more resistant to Ciprofloxacin (n=747; 78.1%), followed by Fusidic acid (n=690; 72.2%), Chloramphinicol (n=631; 66%) and Clindamycin (n=575; 60.1%).

Conclusion: The present study highlighted that MRSA is present in our hospitals with significantly high prevalence and drug resistance pattern. Strict surveillance, timely diagnosis and effective control measures are urgently needed to prevent its rapid spread.

KEY WORDS: MRSA; Prevalence; Antibiotic susceptibility; Infection control.

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INTRODUCTION

Methicillin Resistant Staphylococcus aureus (MRSA) is a leading cause of nosocomial infections worldwide.[1] Soon after its discovery, it was considered an important pathogen globally in both clinical practices and communities.[2] Methicillin, a semisynthetic penicillin that is poorly hydrolyzed by pencillinase, came in clinical practice in 1960 and after a very short usage of this new antibiotic MRSA emerged unfortunately in 1961.[3] MRSA infection first determined in hospitalized patient and then subsequently described as powerful nosocomial infection.[4]Nosocomial infection started soon when people started methicillin as antibiotic in 1961. Physicians start giving Methicillin against Penicillin resistant Staphylococci, but unfortunately it was no longer effective and soon MRSA was recognized as an important bacteria causing hospital acquired infection.[5]

MRSA came in to being from the methicillin-susceptible *S. aureus* (MSSA) by exogenously acquisition of methicillin resistance gene carried out by a mobile genetic element known as *staphylococcal* cassette chromosome i.e. mec (SCCmec) at 30 end (i.e., 15-bp SCCmec insertion site, att) orFX of their chromosome. SCCmec carries a mecA gene that encoding a penicillin binding protein known as PBP20 which show resistance toward beta-lactam agents.[6,7]

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In industrialized countries the rate of nosocomial infection is very low as compare to the developing countries; it is because of the devastating effort of these people to overcome the morbidity and mortality rate for which they follow standard legislative measure. According to the World Health Organization (WHO) in 2001, nosocomial infection is the highest in the Eastern Mediterranean and South East Asia and their possible reasons for increased resistance in MRSA was believed to be miss use of antibiotics, overcrowding and unhygienic environment.[8]

Hospital acquired MRSA are frequently multidrug resistant and poses a constant problem to clinicians and hospital infection control program. Moreover, the MRSA situation is getting worse with the passage of time at our tertiary care level hospitals of Pakistan despite so many precautionary measures. We are a resource challenge society and a prompt infection control policy is the only way to reduce this burden.

MATERIAL AND METHODS

The present study was carried out over a period of six months from May 2013 to December 2013 at the Department of Microbiology, Lady Reading Hospital Peshawar. Clinical samples received from wards, and outpatient department, were considered in the study. Samples include pus, blood, urine, HVS swabs, catheter tips, tissue and implants. All samples were immediately processed for isolation of MRSA using standard microbiological procedures.

All samples except urine was inoculated on Blood agar, Mannitol Salt agar (MSA) and MacConkey's agar and incubated at 37°C for overnight. While urine samples were inoculated on Blood agar, MSA and Cysteine Lactose Electrolyte Deficient (CLED) agar. Following successful bacterial growth, *S. aureus* was identified based on Gram staining, cultural and biochemical characteristics.

Two or three colonies were taken with a sterilized loop & emulsified in distilled water ampoule. Inoculums were prepared based on 0.5 M McFarland standard, followed by inoculation in the form of uniform lawn on Mueller Hinton agar plate. Antibiotics such as Cefoxitin (30 mcg), Vancomycin (30 mcg), Teicoplanin (30 mcg), Linezolid (30 mcg), Ciprofloxacin (5mcg), Chloramphinicol (30 mcg), Clindamycin (2 mcg) and Fusidic acid (10 mcg) were placed with distance of about 25 mm from each other. The plates were incubated at 37°C for 16-18 hours. Zones of inhibition were measured with a caliper & results were reported as per CLSI guidelines.[9]

RESULTS

In the present study among 1283 isolates, 957 (74.4%) were phenotypically confirmed as MRSA.

Table 1: Sample-wise distribution of MRSA.

Samples	Frequency of MRSA, n (%)
Pus	437 (45.6)
Blood	131 (13.6)
Urine	129 (13.4)
Sputum	112 (11.7)
Miscellaneous (tissue, HVS and implants)	148 (15.4)
Total	957 (74.4)

Table 2: Ward-wise distribution of MRSA.

Ward	Frequency of MRSA, n (%)
Surgical	489 (51.0)
Medical	218 (22.7)
Pediatrics	90 (9.4)
Obstetrics and gynecology	87 (9.0)
Outpatients	73 (7.6)

Table 3: Antibiotic susceptibility pattern against MRSA.

Antibiotics	Resistance, n (%)	Sensitivity, n (%)
Vancomycin	0(0)	957 (100)
Teicoplanin	0(0)	957 (100)
Linezolid	0(0)	957 (100)
Clindamycin	575 (60.1)	382 (39.9)
Chloramphinicol	631 (66)	326 (34.0)
Fusidic acid	690 (72.2)	267 (27.8)
Ciprofloxacin	747 (78.1)	210 (21.9)

When specimen wise distribution was investigated, MRSA was more prevalent in pus (n=437; 45.6%) and miscellaneous samples (n= 148; 15.4%) such as tissue, HVS and implants while MRSA was less prevalent in sputum samples (n= 112; 11.7%). (Table 1)

In the ward-wise distribution MRSA was more frequent in surgical ward (n=489; 51.0%) and medical ward (n= 218; 22.7%) while less frequent in samples from outpatients (n= 73; 7.6%). (Table 2)

MRSA isolates were more resistant to Ciprofloxacin 747 (78.1%), followed by Fusidic acid 690 (72.2%), Chloramphinicol 631 (66%) and Clindamycin 575 (60.1%). Interestingly, MRSA were found uniformly sensitive 957 (100%) to vancomycin, Teicoplanin and Linezolid. (Table 3)

DISCUSSION

MRSA is recognized as a major threat to the patients globally and their associated infection is a challenge for clinicians due to its rapid spread and limited therapeutic options avalaible.[10] As soon as MRSA introduced, steady rise in the number of *S. aureus* isolates found in various clinical settings. Several studies have been carried out to find MRSA prevalence in different infections. Study reported by National Nosocomial Infections surveillance, showed an increase of MRSA from 2.5% to 29% in 1975 to 1991.[11] Ashiq and Tareen in a prospective study reported 5% prevalence of MRSA in Karachi.[12] Bukhari et al[13] in 2004 find out that 38.5% of bacterial isolates were MRSA, in an antibiotic susceptibility based study conducted at King Edward Medical College, Lahore, Pakistan. Similarly, Khatoon et al[14] concluded 38.5% prevalence of MRSA in a laboratory based antibiotic susceptibility study, carried out from June 2000 to December 2000.

Similar studies were also carried out in different parts of the world like Germany, France, Spain, Italy and the United Kingdom which revealed about 25% MRSA prevalence while Austria, Poland, Slovakia, Czech Republic had reported MRSA rates of 7% to 14%.[15] Karakatsanis et al[16] reported 40% MRSA prevalence in Greece. While George reported a high prevalence (73%) of MRSA based on bacteriological, epidemiological and clinical observation, in a Greek hospital.[17] But studies from the Westerns countries show a decline of MRSA which is because of infection control program and strict ascetic techniques.[18]

In our study maximum numbers of MRSA (45.6%) were isolated from pus. A similar study was carried out in India that reported the same prevalence rate of MRSA in pus samples.[19] The main reasons may be the increased number of pus specimen compared to other samples received in our Bacteriology section. Similarly the highest numbers of specimen were reported from surgical units. This may be due to the easy adaptation of MRSA to the environment of surgical units where patients undergo procedures that undermine the main organs of the immune system, making situation ideal for MRSA to flourish and cause devastation. Residence in a care facility for a long time, catheters, dialysis and other medical devices also contribute as a risk factor of MRSA. Furthermore, busy surgeons and paramedical staff also contribute to this scenario. However, some cases of MRSA infection were also reported from healthy communities without having any risk factor for MRSA.[20]

MRSA is also resistant to all other group members of beta-lactam antibiotics including Penicillins, Cephalosporins, and Cephamycins. Along with that MRSA is often resistant to other classes of antimicrobials agents, like aminoglycosides, quinolones, and macrolides. This feature makes MRSA as multidrug-resistant bacteria.[21] The progressive spread of MRSA poses a huge threat to the patients as well as to the community in term of diseases and high financial losses. The high variation in number of MRSA among various hospital setting limited the therapeutic option.[22]

Regarding other therapeutic options of MRSA all isolates were found uniformly sensitive to Vancomycin and Linezolid, thus making treatment options possible. Similar findings was observed by Ahmad et al., in Saudi Arabia while performing a prevalence study to find out nosocomial infections of MRSA in worker of a hospital.[23] In this study resistance to Clindamycin, Chloramphinicol, Fusidic Acid and Ciprofloxacin suggest that the use of these antibiotics should be carefully prescribed to treat MRSA infections.

CONCLUSION

The present study highlighted that MRSA is present in our hospitals with significantly high prevalence and drug resistance pattern.

Strict surveillance, timely diagnosis and effective control measures are urgently needed to prevent its rapid spread.

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CONFLICT OF INTEREST
Authors declare no conflict of interest.
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None declared.