World Journal of Medical Sciences 9 (4): 239-242, 2013
ISSN 1817-3055

DOI: 10.5829/idosi.wjms.2013.9.4.8178

Prevalence and Antibiotic Susceptibility Profile of MRSA Strains Isolated from Anterior Nares of Hemodialysis Patients

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Abstract: Patients with End Stage Renal Disease on maintenance hemodialysis are at a greater risk for bacterial infection particularly *Staphylococcus aureus* (*S. aureus*). Methicillin-resistant S. aureus (MRSA) is a challenge in clinical practice nowadays, because they resist a great range of antibiotics. This study mainly designed in order to determine the prevalence MRSA in anterior nares samples of hemodyalisis patients. The results of this study show that 153 (59.8%) out of 256 patients who had admitted for hemodialysis were colonized with *S. aureus* and more than half of these colonizations (51.6%) were with MRSA. Emerging of MRSA isolates that are resistant to vancomycin, as we found one in our study, can be an alarm for clinical practice.

Key words: *Staphylococcus aureus* · Methicillin-Resistant *Staphylococcus aureus* · Vancomycin Resistance

INTRODUCTION

Patients with End Stage Renal Disease (ESRD) on maintenance hemodialysis are at a greater risk for bacterial infection, particularly *Staphylococcus aureus* (*S. aureus*) infection [1]. Infection remains a major cause of morbidity and mortality among patients with ESRD [2]. Rate of resistance to different antibiotics are increasing every day moreover, unwise use of even last lines of treatment antibiotics such as vancomycin worsen the situation [3]. Methicillin-resistant S. aureus (MRSA) challenge the clinical practice nowadays, because they resist a great range of antibiotics [4-12]. Vancomycin is the last line of treatment antibiotic in ESRD patients but MRSA isolates have shown resistance to this antibiotics and reports of this resistant have been published by the authors [8, 9, 12].

Patients with ESRD are at increased risk for infection and colonization with methicillin-resistant S. aureus (MRSA) because they are repeatedly exposed to the healthcare environment and often receive prolonged courses of antibiotics, besides being immunocompromised [2].

MRSA colonization may lead to infection and there are some reports that 38% of individuals with colonized MRSA develop skin or soft tissue infection in 8-10 weeks [13]. Infections caused by MRSA strains are associated with longer hospital stay, prolonged antibiotic administration and higher cost than infections caused by methicillin-susceptible S. aureus strains [8].

This study mainly designed in order to determine the prevalence of *S. aureus* colonization and MRSA rate in anterior nares samples of hemodialysis patients admitted in Alzahra Hospital from Jan 2012 to June 2013. It also assesses the resistance rate of MRSA to different antibiotics.

MATERIALS AND METHODS

This prospective study was conducted at Alzahra hospital. Eligible patients were 18 years or older and receiving hemodialysis continuously for at least 8 weeks before enrollment using a native-vessel fistula. Patients were excluded if they had S. aureus infection within 3 months of study entry, severe viral or bacterial infection, HIV infection, current use of immunosuppressive or

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immunomodulatory drugs, or malignant disease in the previous 6 weeks. All enrolled patients provided written informed consent.

From all of the patients, specimens were taken from both anterior nares with rayon swabs for culture. The swabs were plated directly onto sheep's blood agar 5% plates, which were incubated at 35°C with 5% CO2 for 48hours. *S. aureus* was identified systematically [13]. Antimicrobial susceptibility was evaluated by the Kirby-Bauer disk diffusion method in guide lines of Clinical and Laboratory Standards Institute [14]. Oxacillin disk was used to show methicillin resistance of *S. aureus* isolates and *S. aureus* ATCC 25923 used as a control strain.

Patients were in MRSA group if the *S. aureus* test was positive and resistant to oxacilin. Patients in Non-MRSA group had either negative *S. aureus* test or a positive *S. aureus* test and susceptible to oxacillin.

This study was carried out in accordance with Committee of Medical Ethics of Kashan University of Medical Sciences. Each participant signed a consent that illustrated the study protocol. All data entered SPSS version 13.5 for analysis.

RESULTS

A total of 256 patients who had admitted for hemodialysis were enrolled in the study period. One hundred and forty eight (57.8%) were males and 108 (42.2%) were females. The mean age of the patients was 62.3 years old. From the examined 256 patients, 153 (59.8%) were colonized with *S. aureus*. From these 153 isolates, 79 (51.6%) were MRSA. Forty four (55.6%), 24 (30.3%), 25 (31.6%), 39 (49.3%), 41 (51.8%), 49 (62%), 13 (16.4%) and 1 (0.01%) out of the 79 MRSA isolates were resistant to clindamycin, erythromycin, clarithromycin, tetracyclin, rifampin, gentamycin, ciprofloxacin and vancomycin respectively (Fig. 1).

DISCUSSION

MRSA colonization is risky in ill patients especially those with chronic diseases. This may increase the infection rate, morbidity and mortality of these patients. This study evaluated the MRSA colonization and antibiotic susceptibility profile of nasal samples from hemodialysis patients.

Results showed that 59.8% of the patients were colonized with *S. aureus* and more than half of them (51.6%) were MRSA. In the previous study that published by the authors the prevalence of nasal carriage of *S. aureus* and MRSA was 49.1% and 68.6% in children admitted to Shahidbeheshty hospital [12]. These results are in conductance with the results of the present study and show the high prevalence of *S. aureus* and also high prevalence of MRSA colonization in anterior nares of the admitted patients of the study. In a study by Chun-Fu *et al.* [15] that was conducted in Taiwan, the prevalence of MRSA colonization was 9.48% in dialysis patients. This great difference may be due to irrational antibiotic use in Iran compared to Taiwan. In another study conducted by Agumas *et al.* [16] in Ethiopia the rate of *S. aureus* and MRSA colonization was 28.8% and 44.1% out of them were MRSA, which also less that the results of the present study.

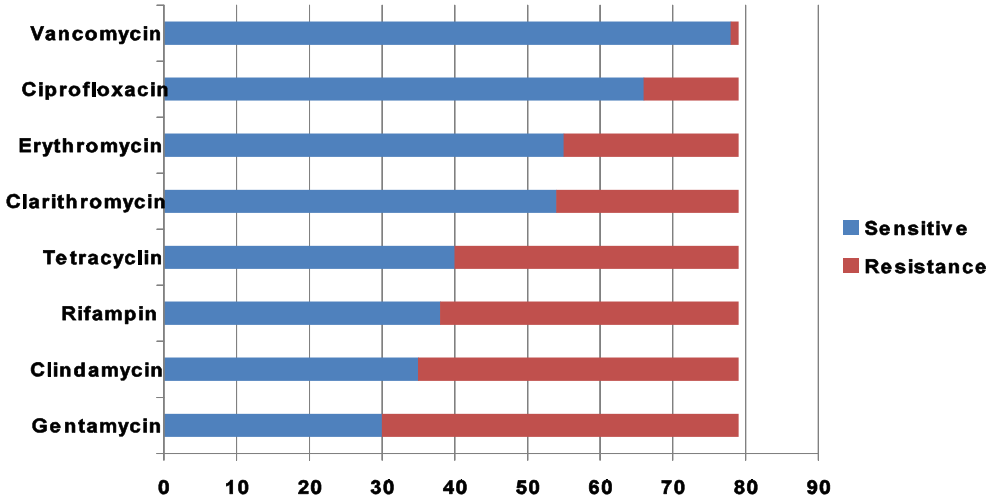

Fig. 1: Resistance rates of MRSA isolates to different antibiotics

MRSA resistant rate in the previous study of the authors [9] to clindamycin, erythromycin, clarithromycin, tetracyclin, rifampin, gentamycin, ciprofloxacin and vancomycin was 36.8, 81.9, 65.5, 43.4, 19.6, 15.5, 71.3 and 1.6% respectively. Results of the current study are slightly less than these results. However the presence of one isolate of MRSA that was vancomycin-resistant in the current study and two vancomycin resistant *S. aureus* (VRSA) in the previous study [9] shows the risk of *S. aureus* becoming resistant to this antibiotic, that was the 100% effective third line of treatment in the not far past and becoming a dangerous challenge in the future.

CONCLUSION

The results of this study show that 59.8% of 256 patients who had admitted for hemodialysis were colonized with *S. aureus* and more than half of these colonizations (51.6%) were with MRSA. Resistance rates of these MRSA isolates to clindamycin, erythromycin, clarithromycin, tetracyclin, rifampin and gentamycin was above 30%. The high resistance rate for ciprofloxacin (16%) represents a challenge in the future. Besides emerging the MRSA isolates that are resistant to vancomycin, as we found one in our study, can be an alarm for clinical practice.

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