THE TERRORIST STILL LURKS IN THE HOSPITAL- PREVALENCE OF MRSA

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ABSTRACT

BACKGROUND

MRSA poses a very serious problem producing difficult to treat infections in the community as well as in health facilities. Out of these, Health Care associated MRSA infections have the additional problem of being multidrug resistant. This fact led us to conduct this study in a tertiary care hospital in Kolkata.

MATERIALS AND METHODS

Samples of pus were collected from all the wards of the hospital. Samples were received within 30 minutes of their collection. The usual protocol of Gram stain, culture, biochemical tests and antibiotic sensitivity was followed. Phenotypic method using 30 µg cefoxitin disc was followed for identifying MRSA according to CLSI guidelines. The results were tabulated, and prevalence of MRSA was calculated.

RESULTS

Out of 102 *Staphylococcus aureus* samples 35.3% were found to be methicillin resistant. This prevalence of MRSA is found to be at par with a study done by Sangram S Patel et al. in 2015.

CONCLUSION

Thus, the results of the present study show a high endemicity of MRSA in our hospital in Kolkata. Though our results show 50% of the MRSA were MDR which could be due to selective antibiotic pressure. But fortunately, none of the isolates were XDR or PDR. This poses a serious problem for drug therapy because the treatment options become limited to potentially toxic antimicrobials like vancomycin, teicoplanin, streptogramins, linezolid and ceftaroline leading to increased mortality and morbidity.

KEY WORDS

Prevalence, *Staphylococcus aureus*, MRSA, Pus, Hospital Acquired.

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BACKGROUND

Staphylococcus aureus, a pluripotent pathogen has been the subject of immense interest over the past several decades. Though a part of the normal flora, it is considered as one of the most important human pathogens in community as well as hospital settings worldwide.^[1] Community-acquired infections affect the skin and soft tissues, bones and joints, urinary tract and lungs while nosocomial or hospital-acquired infections include surgical wound infections, bacteraemia associated with intravenous devices and other types of prosthetic material and septicaemia.^[2] Methicillin resistant *Staphylococcus aureus* (MRSA) strains, initially described in 1961, has emerged as a multidrug resistant bug worldwide with a prevalence ranging from 4.6% to 54.4%.^[3,4] The frequency of MRSA has great geographic variation. Most American hospitals report MRSA rates of 5 to 25%, but an increasing number of hospital outbreaks are being reported from USA, Europe, Australia and Japan.^[5] The hospitals in south and north India have reported an MRSA prevalence as high as 55%.^[6,7]

Intrinsic resistance to all β -lactam antibiotics and cephalosporins due to low affinity is an important feature of MRSA. Even vancomycin, the drug of choice for severe MRSA infections, has become intermediate sensitive or resistant. Emergence of Vancomycin Intermediate *S.aureus* (VISA) and Vancomycin resistant *S.aureus* (VRSA) has now become a global issue including India.^[8,9] Also several studies have reported the resistance to the newer antimicrobial agents like linezolid, teicoplanin and daptomycin. The fear of pan drug-resistance as cautioned in Gram-negative pathogens cannot be ruled out in *S. aureus* and our return to a post-antibiotic era.^[10] Being a frequent colonizer of the skin, *S. aureus* predominates in localized suppurative wound and soft tissue infections and since the prevalence and sensitivity pattern of MRSA varies widely geographically, there is an increasing need of antibiotic susceptibility surveillance. The aim of this study is to know the prevalence and drug resistance pattern of MRSA among various pus samples and to know the number of multidrug resistant (MDR) and extensively drug resistant (XDR) strains in order to utilize the information obtained for choosing empirical therapy, to screen colonized patients or staff and formulate appropriate control measures.

MATERIALS AND METHODS

An observational cross-sectional study was undertaken for one year at the Department of Microbiology, R. G. Kar Medical College and hospital- a tertiary care hospital. The prospective analysis included 226 culture positive pus samples obtained from various anatomical sites of patients admitted at different wards.

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Samples were obtained using sterile cotton tipped swabs from all skin wounds and direct aspiration of pus from deep seated wounds. Wound swabs and catheter tips were transported in brain heart infusion broth. The samples were delivered to the microbiology laboratory within 30 minutes of collection.

All clinical pus samples after reaching the Microbiology department, were immediately inoculated in Nutrient agar, MacConkey agar, and Blood agar and were incubated for 24 hours at 37°C. Sterile precautions were taken while processing samples. A direct gram stained smear was done and observed for any gram-positive cocci singly or in clusters. After 24 hours, *Staphylococcus aureus* was identified from samples by colony characteristics such as golden yellow appearance on nutrient agar, pale pink, lactose fermenting colonies on MacConkey agar and yellowish-white butyrous colonies with narrow zone of haemolysis on blood agar. The colonies were sub cultured on selective media like mannitol salt agar which showed yellow coloured colonies indicating mannitol fermentation and phenolphthalein diphosphate agar where the colonies turned pink on exposure to ammonia. Characteristic features such as catalase positivity, slide and tube coagulase positivity, mannitol fermentation, urease production, and VP test positivity were demonstrated to confirm *Staphylococcus aureus*.

All *Staphylococcal* strains were tested for susceptibility to Amoxicillin, Azithromycin, Clindamycin, Cefuroxime, Ciprofloxacin, Cotrimoxazole, Doxycycline, Gentamycin, Linezolid and Vancomycin by standard disc diffusion method recommended by the CLSI.^[9] Detection of MRSA was done by Kirby Bauer disc diffusion method using Cefoxitin disc (30 µg) and incubated at 37 °C for 16-18 hours and zones of inhibition were matched with CLSI. Data entered into excel sheet, analysed and tabulated.

RESULTS

Total number of culture positive pus sample screened were 226 during one-year period. *Staphylococcus aureus* was the most common cause of surgical and non-surgical wound infections accounting for 102(45.1%) and Methicillin resistance was documented in 36 (35.3%) of the *S.aureus* isolates as shown in Fig. 1. Majority of the MRSA isolates were from males 55.5%. Out of 36 MRSA, most of the isolates (36.1%) were observed in the age group of 20-45 years. In relation to ward distribution, maximum number of MRSA were isolated from general surgery ward (38.9%) followed by orthopaedics (27.8%) as shown in Fig. 2.

Maximum susceptibility was seen to vancomycin (100%) and linezolid (100%) followed by levofloxacin (61%), doxycycline (58%) and chloramphenicol (58%). Macrolides (11%), cotrimoxazole (14%) was found to be less sensitive. None of the isolates were found to be sensitive to amoxicillin. According to the definition of multidrug resistance as acquired non-susceptibility to at least one agent in three or more antimicrobial categories, 18(50%) were found to be multidrug resistant (MDR). None of the isolates were found to be extensively- drug resistant (XDR) or pan-drug resistant (PDR).

Figure 1

Figure 2

Figure 3

DISCUSSION

MRSA, an organism well known for its multidrug resistance, varies according to the geographical pattern. In the present study from Central Kolkata, the prevalence of MRSA was found to be 35.5% which was significantly higher than a study (28.8%) done by Uma Devi^[1] in Andhra Pradesh, but at par with a study done by Sangram S Patel et al.^[11] A study by Arti Tyagi et al on 2080 pus samples at AIIMS, New Delhi, documented an even higher MRSA prevalence of 44%. Prevalence of MRSA varies in different countries. Over 50 % prevalence rate of MRSA was reported in Portugal and Italy; 25 % in England, Greece and France; 2 % in the Netherlands and Switzerland.^[12] Prevalence of MRSA ranged from 23.6 % in Australia to over 61 % in Taiwan and Singapore, and more than 70 % in Japan and Hong Kong.^[13]

The usual inclination of MRSA infection is generally seen in the intensive care unit followed by medicine and surgery wards, where most patients required higher generation, toxic antibiotics. Surprisingly in this study highest occurrence of MRSA was observed in surgical wound infection in General surgery followed by orthopaedic wards. This is mostly because of cross infection due to overcrowding of patients, workload and understaffing.

In the present study, all the isolates of MRSA were susceptible to vancomycin and linezolid which is comparable to studies by Rajadurai pandi et al. and Rao et al.^[14,15] However *S.aureus* isolates with reduced susceptibility to vancomycin was reported earlier by CDC and with complete resistance to vancomycin was reported by Japanese workers.^[16,17] In the recent years Tiwari et al. in a study from northern part of India in 2006 found, out of 381 MRSA isolates, 2 were vancomycin resistant while 6 were intermediately resistant to vancomycin.^[18] Hence vancomycin should always be used as a reserve drug and can be used as empirical therapy for life threatening MRSA infections but step-down therapy to susceptible antibiotics should be started as soon as antibiotic susceptibility data is available.

CONCLUSION

Thus, the results of the present study show a high endemicity of MRSA in our hospital in Kolkata. Though our results show 50% of the MRSA were MDR which could be due to selective antibiotic pressure, but to the relief that none of the isolates were XDR or PDR. This poses a serious problem for drug therapy because the treatment options become limited to potentially toxic antimicrobials like vancomycin, teicoplanin, streptogramins, linezolid and ceftaroline leading to increased mortality and morbidity. Hence preventing colonization and infection of patients on one hand and screening and identifying MRSA carriers on the other hand in the high-risk wards remains the most effective way to control the spread of MRSA. Simple measures like patient isolation, cohorting doctors and nurses working with MRSA infected patients, routine screening of health care workers for MRSA carriage by sending nasal swabs and nail bed samples to microbiology laboratory, proper treatment of MRSA carriers for eradication, strict enforcement of hand washing and early discharge of infected patients will go a long way towards reducing the spread of this deadly bug in this hospital. Also, indiscriminate use of antibiotics should be stopped and routinely all microbiological samples should be sent for in

vitro susceptibility. This will help in detection of multidrug resistant pathogens and start appropriate treatment at the earliest. Thus, in future, based on this study, antibiotic policies should be made and implemented by setting up and/or strengthening hospital infection control committee. Antimicrobial stewardship programs can be implemented to reduce inappropriate use of antimicrobials, thereby controlling the development of resistance. Though this is a limitation of this study due to unavailability of resources, genetic study of *mecA* and *mecC* genes can be done for epidemiological analysis of MRSA strains in different wards of the hospital.

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