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Prevalence and antimicrobial susceptibility pattern of Clindamycin in MRSA isolates of patients in a tertiary care hospital

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Abstract
Aim: To ascertain the prevalence and antimicrobial susceptibility and resistance pattern of Clindamycin in Methicillin resistant *Staphylococcus aureus* (MRSA) isolates of patients from a tertiary care hospital.
Methods: A crossectional study was performed over a time period of 9 months and a total of 369 clinical specimens were obtained which included pus, wound swabs, ear swabs, eye swabs, urine, blood, tracheal aspirates and sputum samples. All specimens were processed using brain heart infusion broth. All other specimens (wound swabs, ear swabs, eye swabs, sputum, aspirates) were inoculated onto sheep blood, chocolate and MacConkey agar plates. Specimens were also inoculated on mannitol-salt agar and the incubation was extended to at least 48-72 hours for discernible colony development. SPSS version 20 was used to deduce the prevalence of MRSA and sensitivity to clindamycin.
Results: Out of a total 369 strains of S.aureus 169 were found to be strains of MRSA which makes the prevalence at 44.71% for it. The age of patients ranged from 20-66 years. Out of the total male patients were 44% (n=163) while female patients were 56% (n=206).Majority of the lesions were found in pus 36.8 %(n=136) followed by tracheal aspirate 23.3 %(n=86). 100% MRSA isolates were resistant to Oxacillin and Cephalexin, 91.5% were resistant to Clindamycin and only 8.5% were sensitive to Clindamycin. All the isolates showed 100% sensitivity to vancomycin and linezolid.
Conclusions: Our analysis of prevalence of MRSA in our hospital showed a regional high which is alarming. Therefore, a countrywide surveillance should be done to find the current prevalence across Pakistan. Secondly, awareness should be spread in the hospital as well as the community of this hidden vice.

Keywords: S.aureus; Methicillin, Prevalence, Resistance, MRSA.

Introduction
MRSA refers to strains of S. Aureus, which have become resistant to Methicillin because of altered penicillin-binding proteins. MRSA is known to cause a spectrum of infections including folliculitis and endocarditis[1]. Infections caused by MRSA have poor prognosis as compared to the ones caused by S. Aureus[2]. While pneumonia and bacteremia account for the majority of MRSA clinical infections, intra-abdominal infections, osteomyelitis, toxic shock syndrome, food poisoning, and deep tissue infections are also prominent clinical diseases [3]. Developing nations are becoming increasingly prone to MRSA infections because locally produced antimicrobials are of substandard quality. Moreover, low compliance is observed with high quality, costly antimicrobials[4]. Another significant reason for the prevalence of resistant strains is easy accessibility and availability of medicines and self-medication. The absence of drug regulation authority in developing countries further facilitates the prescription of unnecessary medication by practitioners for their own financial gain[5]. Overtime these factors have led to the formation of MRSA, a strain resistant to multiple antimicrobials[6].
MRSA was first reported in 1961[7]. Since then MRSA is a growing concern throughout the world. Approximately 30% of the population in United Kingdom has S. Aureus and MRSA is present in about 3% of the population[8]. In England and Wales, from 2006 -2010, 0.4% of hospital deaths and 0.2% of all deaths were attributed to MRSA[8]. Detecting MRSA as culprit of nosocomial sepsis has become increasingly common with more than 50% of the hospital isolates now resistant to methicillin [9]. Significant correlation has been proposed earlier for clindamycin and community acquired MRSA[10], but no such data is available for developing nations.
Most of the published reports of MRSA are from developed nations, only a few reports are available from developing nations. Thus finding valuable data for the latter is of essence so

that early detection of MRSA and subsequently proper management with antibiotics is possible[11]. In this study, we observed the pattern of MRSA in isolates of patients under care of Ziauddin Hospital, Karachi, Pakistan, a tertiary care hospital in an urban setting.

Material and Methods

A total of 369 clinical specimens, which included pus, wound swabs, ear swabs, eye swabs, urine, blood, tracheal aspirates and sputum samples, were cultured over the period of March 2014 to Nov 2014. Cultures positive for S. Aureus were identified. All specimens were processed using brain heart infusion broth and were incubated at 35ºC. Cultures were examined macroscopically for growth for 7 days. Subcultures of all the blood specimens were done on the 7th day before reporting the culture as negative. Plates were incubated aerobically at 37ºC for 18-24 hours. All other specimens (wound swabs, ear swabs, eye swabs, sputum, aspirates) were inoculated onto sheep blood, chocolate and MacConkey agar plates and incubated at 37C for 18-24 hours. In addition all specimens were inoculated on mannitol-salt agar and the incubation was extended to at least 48-72 hours for discernible colony development. Identification of the isolates was done using standard procedures.

SPSS version 20 was used for statistical analysis. Prevalence of MRSA was calculated and sensitivity of clindamycin was deduced as well.

Results and Discussion

When penicillin was first discovered, it was known to be able to successfully cure infections caused by *S. Aureus*. However, over the next few years, *S. Aureus* which was once susceptible to penicillin started showing resistance. It did so by the production of an enzyme called Penicillinase. This protein is encoded by the bacterial plasmid, which can be transmitted and spread to different strains of *S. Aureus* [12]. To overcome this a modified Penicillin, Methicillin, was created which was able to resist the damage caused by staphylococcal penicillinase. Within years after development of methicillin, the first case of MRSA was reported [7]. MRSA displays multiple drug resistance. These not only include the b-lactam antibiotics but cover a wide range of antibiotic classes such as fluoroquinolones, tetracycline, macrolides, lincosamides and aminoglycosides[13-14].

MRSA has been reported from hospitals in various parts of the world[15]. The control and prevention of MRSA involves early and reliable detection in the laboratory through surveillance, patient isolation when admitted to the hospital, strict adherence to professional guidelines by all healthcare workers (including compliance with hand hygiene guidelines), effective hospital hygiene programs and the sensible use of antibiotics. The antimicrobial agents generally preferred are clindamycin and cotrimoxazole and in some cases in combination with rifampin for the treatment of infections caused by community acquired MRSA. Vancomycin, a drug approved in 1956 but not used extensively until the last 20 years, has been the drug of choice for treatment of infections caused by MRSA.[16]. It is a bactericidal agent effective against gram positive bacteria. It carries out its effect by blocking transpeptidation which in turn inhibits cell wall synthesis.

A total of 369 S. aureus strains were tested out of which 165 strains were found to be MRSA. The prevalence was calculated to be 44.71% .Mean age of patients was found to be 43.53±17.44 years, the age of patients ranged from 20-66 years. Out of the total, male patients were 44% (n=163) while female patients were 56% (n=206). Table no.1 shows age distribution of the patients of the study showed 28.5% (n=105) between 20-30 years, 22.3% (n=82) from 31-40 years, 17.3 %(n=64) were from 41-50 years, 13 %(n=48) were between 51-60 years and 19% (n=70) were above 60 years of age. Table no.2 shows the frequency of MRSA in different sample sites. Out of the 369 specimens the most lesions were found in pus 36.8 %(n=136) and tracheal aspirate 23.3 %(n=86) while 10.6% were found from wound swabs and 8.7% from blood samples. 100% MRSA isolates were resistant to Oxacillin and Cephalexin, 91.5% were resistant to Clindamycin and only 8.5% were sensitive to clindamycin. All the isolates showed 100% sensitivity to vancomycin and linezolid.

The prevalence of MRSA in our study was 44.71%, which is similar to a study done in Lahore, Pakistan, where it was reported to be 41.9%[17] .Other regional studies reported MRSA to be 41% in India (2009)-[18],29.1% in South India (2008)[11],while studies done in Iran and Nepal reported 35.3%[19] and 39.6%[20] respectively. The prevalence rate of MRSA resistance in this study was significantly high, emphasizing the need for local or country based surveillance to characterize and monitor MRSA and to develop strategies that will improve the control and treatment of MRSA. Furthermore, inappropriate and non-judicious use of antibiotics should be controlled.

MRSA isolates gathered from our center showed resistance of 43.04 %(n=65) in male while 56.95 %(n=86) in females, exhibiting a total resistive pattern to Clindamycin of 91.5 %(n=151) .Studies carried out across Pakistan from 2006-2009 reported the prevalence of MRSA resistant to Clindamycin to be 79% [17] and 37%[21]. In comparison to these results our study implies that there is a progressive trend of MRSA.

Table no. 1 Age distribution of MRSA among patients (n=369)

Age groups	MRSA +ve	% MRSA +ve
20-30 years	105	28.5%
31-40 Years	82	22.2%
41-50 Years	64	17.3%
51-60 Years	48	13%
60 and above Years	70	19%
Total	369	100%

Table no. 2 Frequency of MRSA among different sample sites

Sample Site	MRSA +ve	% MRSA +ve
Pus	136	36.8%
Tracheal Aspirate	86	23.3%
Blood	32	8.7%
Sputum	30	8.1%
Ear swab	26	7.04%
Eye swabs	20	5.4%
Wound Swab	39	10.6%

Conclusion

From our study we gathered that MRSA showed a progressive trend within the country. It also indicated that the prevalence of MRSA in our hospital showed a regional high, which is an alarming discovery. Therefore, a country wide surveillance should be carried out to determine the prevalence across Pakistan. Measures should be taken to

spread awareness in hospitals and communities about this hidden vice.

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