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Invitro Susceptibility Profile of Methicillin-Resistant *Staphylococcus aureus* Isolates From Clinical Specimens to Commonly Used Antibiotics in Minna, Nigeria

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ABSTRACT

Multiple resistant *Staphylococcus aureus* became a world-wide problem. It has been commonly reported to be one of the commonest causes of hospital acquired infections. The aim of this study was to investigate its prevalence in clinical specimens and its sensitivity pattern to other antibiotics. Different clinical specimens collected from patients attending General Hospital Minna were cultured and screened for *S. aureus* using standard microbiological procedures. The isolates were then subjected to disc diffusion technique. All the isolates were highly susceptible to tetracycline, cefxime and ciprofloxacin (80%) followed by erythromycin (72%), chloramphenicol (68%), gentamicin (64%), cotrimozaxole (52%) and the least ampicillin (32%) and penicillin (24%). All the MRSA isolates showed resistance to at least two antibiotics tested in this study, indicating the presence of strong selective pressure from antibiotics use in this locality. There is an urgent need to adopt basic principles of aseptic and high personal hygiene, for most staphylococcal infections are readily transmitted among susceptible populations by the individuals who have acquired them by hospitalization

INTRODUCTION

Multiple resistant *S. aureus* became a world-wide problem in the 1950[1]. Methicillin-resistant *S. aureus* (MRSA) is a serious threat to hospitalized patients globally and it now represents a challenge for public health. The overall incidence of MRSA isolation has gradually increased to reach levels of 30% or more in some countries(2 methicillin-resistant *Staphylococcus aureus*). It was estimated that MRSA strains accounted for 84% of hospital-acquired *S. aureus* isolates and 45% of non-hospital acquired *S. aureus* in Taiwan in 1998[3].

MRSA can cause a wide variety of deep tissue infections. These infections include osteomyelitis, arthritis, endocarditis and cerebral, pulmonary, renal and breast – abscesses (in nursing mother). It is a notorious cause of wound infection, staphylococcal infections at the site of intravenous lines can result in bacteremia[4]. Resistance in MRSA is related to a MecA gene that specifies the production of an abnormal, penicillin binding protein called PBP2a. Penicillin-binding proteins are membrane – bound enzymes, which target a for all β-lactam antibiotics. PBP2a has a decreased affinity for binding β-lactam antibiotics resulting in resistance not only to methicillin but also to all β-lactam including penicillin and cephalosprins[5]. The Mec A gene complex also contains insertion sites for plasmids and transposons that facilitate acquisition of resistance to other antibiotics. Thus, cross-resistance to non-β-lactam antibiotics such as erythromycin, clindamycin, gentamicin, cetrimoxazole and ciprofloxacin is common [6]. Nevertheless MRSA isolates susceptible to several non-β-lactum antibiotics have appeared in European regions[7,8]. This study evaluate the prevalence and susceptibility profile of MRSA isolates in clinical specimens in Minna, Nigeria.

Antibiotics and Media

Different antibiotics and media used are all of analytical grade (Oxoid, UK).

Bacteriology

Each of the specimen was inoculated into mannitol salt agar plates and incubated at 35^{0}C for 24hrs characteristic isolates were asceptically isolated and characterized using established microbiological procedures; including colonial morphology, Gram's stain reaction and biochemical characteristics[11]. Isolates that were Gram positive cocci, catalase positive and coagulase positive were considered as *S. aureus* in this study.

Antibiotic Susceptibility Testing

The antibiotic Susceptibility profile of the *S. aureus* isolates was determined using Kirby-Bauer-NCCLS modified disc diffusion technique[9].

All the isolates were tested for sensitivity to ten [10] antibiotics. Standardized overnight culture (0.5 MacFalard Standard) of each isolate was used to flood the surface of Mueller

Hinton agar (MHA) plates; excess drained off and allowed to dry. Standard antibiotic disc were asceptically placed at reasonable equidistance on the inoculated MHA plates and allow to stand for 1hour. The plates (in duplicates for each isolates) were then incubated at 35^{0}C for 24 hours.

Interpretation of Results

The diameter of the zone of inhibition produced by each antibiotic disc was measured, recorded and the isolates were classified as "resistant" "intermediate" and "sensitive" based on the standard interpretive chart updated according to the current NCCLS standard[10] and Fluka Zone interpretative chart in accordance with WHO requirement.

RESULTS AND DISCUSSION

Results of invitro susceptibility pattern of clinical strains of *S.aureus* to commonly used antibiotics are presented in Figure 1. All the isolates were highly sensitive to tetracycline cefxime and ciprofloxacin (80%) followed by erythromycin (72%), Chloramphenicol (68%), Gentamicin (64%), Cotrimozaxole (52%) and the least Ampicillin (32%) and Pennicilin (24%).

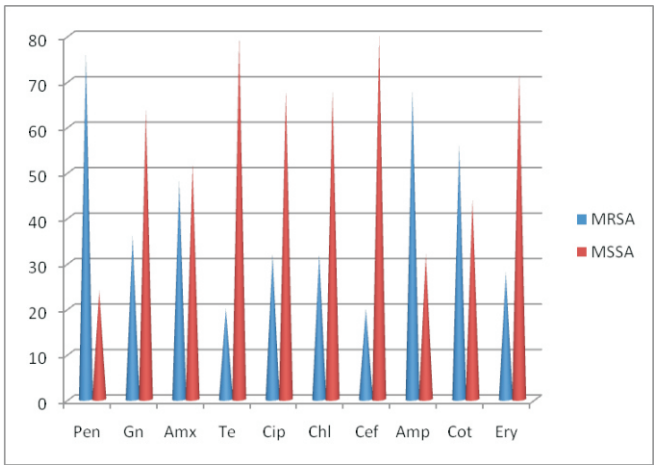

Fig. 1: Susceptibility pattern of *Staphylococcus aureus* to commonly used antibiotics

Drug resistance in *S. aureus* including the emergence of MRSA in health care and community settings is an increasing reported event that makes treating serious infection difficult. MRSA colonization may subsequently cause infections[11]. In this result, MRSA strains are equally resistance to all β-lactam antibiotics[5,12]. Which may be due to the presence of chromosomal Mec A gene that specifies the production of an abnormal penicillin binding protein (PBP2a) which has low affinity for binding β-lactam antibiotics. There is a high level of MRSA susceptibility to gentamicin and the flouroquinolones tested in this study. This may be due to the absence of resistance conferringenes in these MRSA strains as reported by[13]. The observed high MRSA susceptibility to gentamicin and fluoroquinolones in this study support some previous reports[11]. Thus, the existence of MRSA susceptible to these non β-lactam antibiotics may provide an opportunity for the recommendation of these drugs for empirical treatment of hospital acquired MRSA strains. The high level of multiple drug resistance shown by the MRSA isolates in this study is of great concern. All the MRSA isolates showed resistance to at least two antibiotics tested in this study; indicating the presence of strong selective pressure from antibiotic use in this locality.

There is an urgent need to adopt basic principles of aseptic and high personal hygiene, for most staphylococcal infections are readily transmitted among susceptible populations by the individuals who have acquired them by hospitalization. Our study however involved only a small number of isolates, so we recommend a multi-centre study to be carried out to determine the true incidence of MRSA in both community and hospital settings. The central focus of this study is the hospital setting because MRSA is a serious threat to hospitalized patients globally. It was estimated that MRSA strains accounted for 84% of nosocomial *S. aureus* isolates and 45% of non-hospital acquired *S. aureus* in Taiwan[3]. Also the overall incidence of MRSA isolation has gradually increased to reach levels of 30% or more in some countries[3].

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