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Prevalence And Antibiotic Susceptibility Pattern Of Methicillin Resistant *Staphylococcus Aureus* Isolated From Staff And Patients At Mararaba Medical Centre, Nasarawa State.

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ABSTRACT
Out of 250 nasal swap samples collected from staffs and patient for the study, 125 samples were positive for *Staphylococcus aureus* basis on colony morphology, gram staining, catalase and coagulase test and 76(30%) was methicillin resistant. The frequency of occurrence between male to female were 51.2% and 48.6% respectively while, that of staff to patients was 52.6% to 47.4%, hence relatively highly frequency of occurrence of MRSA with age amongst staffs and patients was noticed. The antimicrobial susceptibility of the isolates were resistant to methicillin (91%), ampiclox (85%), amoxicillin (69%), gentamycin (60%) and pefloxacin (59%) and susceptibility to streptomycin (52%), erythromycin (42%), septrin(42%) and zimnacef (42%) which further established that *S. aureus* is a major causative agent for nosocomial infections, therefore it is recommended that proper infection control measure be put in place in our hospitals from primary to tertiary institutions especially in the institution where this study was done.

KeyWords; Methicillin Resistant *Staphylococcus Aureus* (MRSA), Antibiotic Susceptibility,Mararaba,Nasal swap

INTRODUCTION

Staphylococcus aureus is a gram-positive coccal bacterium that is a member of the Firmicutes, and is frequently found in the respiratory tract and on the skin forms where perspiration is present. It is often positive for catalase and nitrate reduction. Pathogenic strains often promote infections by producing potent protein toxins, and expressing cell-surface proteins that bind and inactivate antibodies[3]. *Staphylococcus aureus* was first identified in 1880 in Aberdeen, Scotland, by the surgeon Sir Alexander Ogston in pus from a surgical abscess in a knee joint. [14].This name was later appended as *Staphylococcu aureus* by Friedrich Julius Rosenbach, who was credited by the official system of nomenclature at the time.

An estimated 20% of the human population are long-term carriers of *S. aureus* [14] which can be found as part of the normal skin flora and in the nostrils [6]. *S. aureus* is the most common species of Staphylococcus to cause Staph infections and is a successful pathogen due to a combination of nasal carriage and bacterial immune evasive strategies[20]. *S. aureus* can cause a range of illnesses, from minor skin infections, such as pimples [3], impetigo, boils, cellulites, folliculitis, carbuncles, scalded skin syndrome, and abscesses, to life-threatening diseases such as pneumonia, meningitis, osteomyelitis, endocarditis, toxic shock syndrome, bacteremia, and sepsis. Its incidence ranges from skin, soft tissue, respiratory, bone, joint, endovascular to wound infections. [8]. It is still one of the five most common causes of hospital-acquired infections and is often the cause of postsurgical wound infections.It is also the leading bacteria in the normal flora of humans especially, in the skin and nasal vestibule. Besides, this bacterial colonization is very common in certain areas in the body namely – axilla, umbilicus, perineal region and mammary folds. *Staphylococcus aureus* mainly cause opportunistic infections acquired from different sources like patients, hospital staff mainly through their hands and also from their normal flora [22]. The other gram positive bacteria causing such infections are Enterococcus, Pneumococcus and Coagulase negative Staphylococcus. Due to many invasive procedures among the critically ill patients, the bacteria can cause serious bacteremia leading septicemia. [26].

MRSA is any strain of *S. aureus* that has evolved resistance to beta-lactam antibiotic which include the penicillins (Methicillin, dicloxacilin, naficillin, oxacillin etc) and the cephalosporins. In 1961, the first isolate of MRSA was reported in England [13]. Since then, MRSA has increasingly been isolated in various countries, and at present, it is one of the major causes of nosocomial infection throughout the world, thus it is alternatively called hospital-acquired MRSA (HA-MRSA). In addition, from 1997 to 1999, another class of MRSA has become a major concern worldwide because it has become an emerging pathogen in the community ([24,9]

The prolonged hospital stay, indiscriminate use of antibiotics, lack of awareness, receipt of antibiotics before coming to the hospital etc. are the possible predisposing factors of MRSA emergence. [25]. Serious endemic and epidemic MRSA infections occur globally as infected and colonized patients in hospitals mediate the dissemination of these isolates and hospital staff assist further transmission. [18]. The development of resistant to multiple antibiotics and control of disease transmission by MRSA isolates in hospitals/communities have been recognized as the major challenges as the bacterial population that expresses the resistance phenotype varies according to the environmental conditions. [14]. Therefore, the knowledge of prevalence of MRSA and their current antimicrobial profile become necessary in the selection of appropriate empirical treatment of these infections. [17].

This study aims at determining the prevalence of MRSA amongst health care personals and patients on admission at Maraba Medical Center, Nasarawa State by isolating *Staphylococcus aureus* to determine the MRSA and antibiotic susceptibility pattern.

MATERIAL AND METHODS

Area of Study

The study was carried out at Maraba Medical Center karu, Nasarawa state, which lies between latitude 9^0 2' North and longitude 7^0 35' with an elevation of 448m (1,470ft). Located in the middle belt of Nigeria.

Study Design

The study was conducted between February to May, 2016. Nasal swap samples were collected aseptically at random from 250 health personnel and patients at Maraba Medical Centre Nasarwa State. Chi- Square was used for statistical analysis (X^2).

Ethical Approval

Ethical approval for this study was obtained from the Head of Administration for Medical Superintendent of Mararaba Medical Centre, Nasarawa State.

Isolation And Identification

Nasal swabs that was collected from the anterior nares under strict aseptic precautions was transported to the microbiology laboratory of Maraba Medical Centre and processed for direct gram staining followed by culture on blood agar, manitol salt agar and maconkey agar and incubated at 37^0C for 24 hours. [6]. B-hemolytic colonies on the blood agar plate, the yellow colour on manitol salt agar and pink coloured colonies on maconkey agar were subjected to gram staining, catalase production test and coagulase test by the test tube method. The organism identified as *S. aureus* was further tested for B-lactamase production by the filter paper method (i.e. an iodometric method) [7].

Screening Test For MRSA

A suspension equivalent to 0.5 Mac Farland was prepared from each strain. A swab was dipped and streaked over an area of approximately 2x2.5 cm on the surface of a Mueller-Hinton Agar supplemented with 4% NaCl and Methicillin (Sigma-Aldrich). Plates were incubated overnight at 37^0C. A growth indicates that the strain is methicillin resistant. [2].

Antibiotics Susceptibility Testing

Discrete colonies of isolates on nutrient agar plates were emulsified in 3 – 4 ml of sterile physiological saline and the turbidity adjusted to 0.5 McFarland standards (approximately a cell density of 1.5 x 108 cfu/ml). Using sterile swab sticks, the surface of Mueller Hinton agar (MHA) in a 90 mm diameter plate was inoculated with the bacterial suspension by streaking the surface of agar in three directions, rotating the plate approximately at 60 degree to ensure even distribution. The inoculated plates were allowed to dry for 10 minutes before the antibiotic discs were applied aseptically to the surface of the agar. After 30 minutes of applying the discs, the plates were inverted, and incubated at 35^0 C.

Antibiotics susceptibility testing (AST) pattern were studied by Kirby Bauer diffusion techniques Clinical Laboratory Standards (CLSI). The antibiotic used were amoxicillin (30ug), rocephin (25ug), ciprofloxacin (10ug), streptomycin (30ug), septrin (30ug), erythromyicin (10ug), pefloxacin (10ug), gentamycin (10ug), ampiclox (30ug), zimnacef (20ug), methicillin (5).The diameter of each of the antibiotics were measured using a meter rule . The inhibition zone was interpreted as resistant, intermediate and susceptibility on the basis of the diameter zone of inhibition with a reference to standard as prescribe in the guideline contained in [6]. The inoculum of the isolates equivalent to 0.5. Mc Farlands unit were swabbed onto the Muller-Hinton Agar Plate and then the antibiotic disc was placed on it and incubated for 24hours at 37^0C. The zone of inhibition is interpreted according to the guidelines.

RESULT

Table 2. Frequency Of Occurrence Amongst Positive Male And Female Methicillin Resistant *Staphylococcus Aureus.*

	No Of Positive MRS	Frequency Of Occurrence
Positive		**Percentage (%)**
Male	39	51.32%
Female	37	48.68%
Total	**76**	**100%**

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Total	**76**	**100%**

Table 3. Frequency Of Isolation Of *Staphylococcus Aureus* Based On The Age Of The Workers

AGE GROUPS (YRS)	NO OF SAMPLES COLLECTED	NO OF POSITIVE SAMPLES	PREVALENCE (%)
20-30	35	24	26.7%
31-40	11	6	6.67%
41-50	21	19	21.1%
51-60	43	39	43.3%
61- 70	5	2	2.2%
Total	**115**	**90**	**100%**

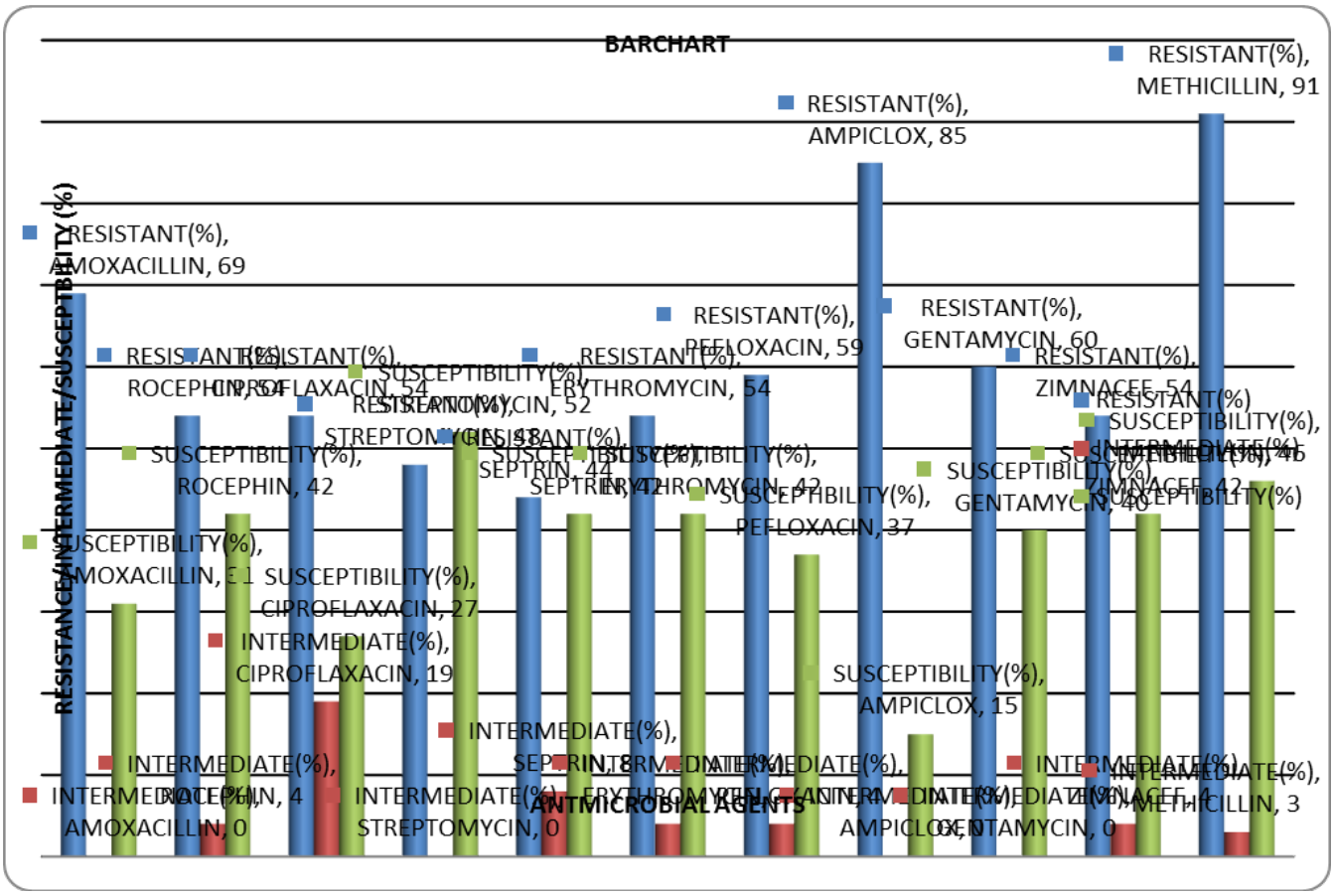
Table 4. Frequency Of Isolation Of *Staphylococcus Aureus* Based On Age Of The Patien

AGE GROUPS (YRS)	NO OF SAMPLES COLLECTED	NO OF POSITIVE SAMPLES	PREVALENCE (%)
1-10	48	34	29.5%
11-20	11	20	17.39%
21-30	5	5	4.35%
31-40	10	8	6.96%
41-50	51	19	16.52%
51-60	5	25	21.74%
61-70	5	4	3.48%
TOTAL	**135**	**115**	**100**

Table 5. Antimicrobial Susceptibility Testing Of *Staphylococcus Aureus* From Patients And Staff Of Maraba Medical Centre.

ANTIMICROBIAL POTENCY	DISK POTENCY(Ug)	RESISTANT (%)	INTERMEDIATE (%)	SUSCEPTIBLE (%)
1. AMOXACILLIN	30	69	0	31
2. ROCEPHIN	25	54	4	42
3. CIPROFLAXACIN	10	54	19	27
4. STREPTOMYCIN	30	48	0	52
5. SEPTRIN	30	44	8	42
6. ERYTHROMYCIN	10	54	4	42
7. PEFLOXACIN	10	59	4	37
8. AMPICLOX	30	85	0	15
9. GENTAMYCIN	10	60	0	40
10. ZIMNACEF	20	54	4	42
11. METHICILLIN	5	91	3	6

Figure 1. The Bar Chat Of Antimicrobial Susceptibility Testing Of *Staphylococcus Aureus* From Patients And Staff Of Maraba Medical Center



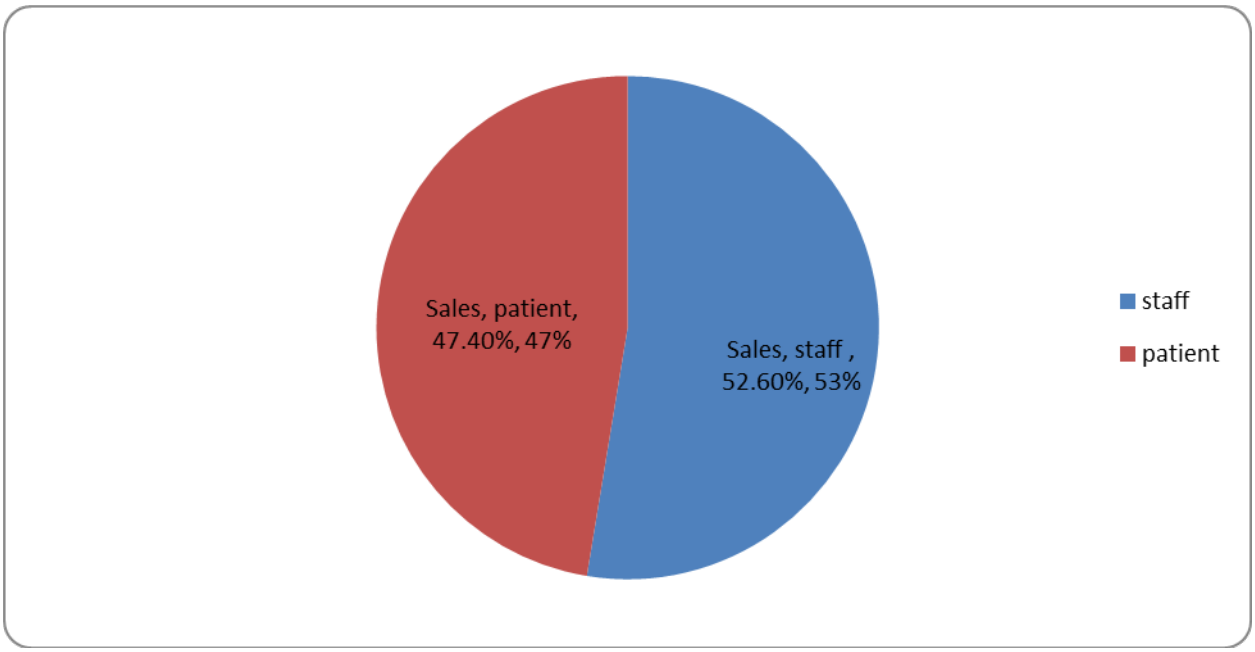


Figure 2. The pie chat of antimicrobial susceptibility testing of *Staphylococcus aureus* from patients and staff of Maraba Medical Center

DISCUSSION

Generally, MRSA has become a global nosocomial pathogen with attendant therapeutic problems which could be due to its possible rapid spread and capacity to acquire resistance to commonly used antibiotics. In this study Table 2 shows highest rate of MRSA carriage was found in medical staff, 40 (52.6%), which is higher than results in another study with a carriage rate of 27.2% in medical staff [16]. Hospitalized patients had a carriage rate of 36% (36/76) which is higher than that of a study conducted in Kwazulu-Natal which had a rate of 21% [23].

The frequency of occurrence of MRSA in male (51.2%) is higher than the female (48.6%) Table 1. The frequency of occurrence of MRSA is higher in staff (52.6%) than patient (47.4%) probably due to long stay in the hospital compared to patients who stay in the hospital for 2-3 days to staff who work in the hospital for 5-7yrs, this findings agrees with study done by [4]. Also workers within the age range of 20-30yrs, 31-40yrs, 41-50yrs and 51-60yrs accounted for a percentage of 26.7%, 6.67%, 21.1%, 43.3% respectively. It is however, seen that the age range of 51-60yrs has the highest no of prevalence rate of 43.3%, which disagrees with a study conducted amongst students in the university of Port Harcourt [1] who recorded a prevalence rate of 35.3% in the age range of 20-24 and 25% in the age range of 25-29. From this study it can be seen that there is a significant difference in the age range of 51-60yrs as compare to other work reviewed.

A prevalence rate of 21.4% of nasal carriage rate of MRSA by medical unit) highlights the awareness level of the staff on implementation of preventive measures against nosocomial infections such as regular washing of hands with disinfectant, proper periodic surveillance of health facilities. The prevalence rate (30%) gotten from this study is higher than that obtained in the study conducted [21]. This could be probably due to lack of adequate precautions such as improper sanitation and personal hygiene of the patients and staff of the hospital and very limited infection control applications.

A high prevalence of MRSA resistance to most of the antibiotics used is of primary importance particularly among health care providers who may transmit these strains to patients during care delivery. The high frequency of occurrence of MRSA resistance to antibiotics in this study was in accordance with other studies (Figure 1). As reported, the highest rates of antibiotic resistance was observed in methicillin (91%) and gentamicin (60%), followed by pefloxacin (59%) and erythromycin (54%). The high level of resistance to these drugs in this study may probably be attributed to the abuse of antibiotic; this has being reported by [4]. Some of these antibiotics are broad-spectrums which are frequently used for the treatment of other bacterial infections. [7]. Thus, confirming other work

done that the isolates may have been exposed to the antibiotics resulting in the development of resistance against them [10], hence the result of pattern of resistance proved that the organism is resistant to different antibiotics used in this study.

CONCLUSION.

Considering the percentage frequency of MRSA in this study (i.e. 30%) and the consequent resistant to this group of antibiotics and the relatively high frequency of occurrence in staff to patient ratio, it would be appropriate if the hospital management conduct periodic surveillance check of MRSA amongst clinical staff especially those that attend to fibril patients to avoid the outbreak of nosocomial infections.

RECOMENDATIONS

This study has further establish that *S. aureus* is a major causative agent for nosocomial infections, proper infection control measure should be put in place in our hospitals from primary to tertiary institutions especially in the institution where this study was carried out. Therefore it is recommended that;

1. Periodic surveillance of MRSA should be encouraged in the health faculties.
2. Sterilization on antibiotics abuse should be done to enlighten people on the dangers of this habit.
3. Proper sterilization of the hospital environment should be done regularly.

In addition to all these recommendations further study is needed to define the optimum use of the antibiotics as single agents or in combination therapy for MRSA colonization and infection.

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