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Full Length Research Paper

The antibiogram types of *Staphylococcus aureus* isolated from nasal carriers from irrua Specialist teaching hospital, Edo state, Nigeria

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A total of 34 apparently healthy females, whose ages fell within the ranges of 16-30years were randomly selected and screened for *Staphylococcus*, a normal flora, in the nostrils. The antibiogram typing show that strain 0534135 was most sensitive while the most resistant strain was 00500015. The isolates were all sensitive to Gentamycin (100%), while Amplicox (0%) and the Penicillin's (Amoxicillin, Ampicillin and Cloxacillin) (0%) had no strain showing sensitivity. This study has been able to demonstrate a high resolving power strain discrimination as well as delineation.

Key words: *Staphylococcus*, antibiogram, strain delineation.

INTRODUCTION

Staphylococcus is a genus of the family micrococaceae. Though a normal inhabitant of the respiratory tract and even the vagina. *Staphylococcus*, and facultative anaerobe could produce different kinds of major and minor pyogenic infections. The organism however occurs harmlessly as commensal parasites of the anterior nares (Cheesbrough, 2006).

Staphylococcus can survive and grow well in high salt concentrations, the organism produces lipases and esterases that enable them to utilize the lipids of sebaceous secretion as a source of carbon and energy (Mackie and McCartney, 1989).

Also, the carrier rate of pathogenic staphylococci varies from one location and community to another. Staphylococci are the most common of the skin bacteria capable of growing aerobically. Most carriers of *Staphylococcus aureus* shed very few number into the air around them, but a few classified as dispersers, shed at least 1% of the organism depending on the degree of contamination of the skin with staphylococci (Paul *et al.,* 1982).

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Carriers are healthy human or animal host, keeping potentially pathogenic microorganisms without his knowledge and showing no clinical symptoms of illness (Nester *et al.,* 2004). Nasal carriers of *Staphylococcus aureus* are mostly asymptomatic, giving no sign of infection. They may acquire sinusitis and nasal discharge. Carriers' status is of three types viz: persistent, occasional and transient carriers. The persistent carriers are those who keep a particular type of *Staphylococcus aureus* for a long time, occasional carriers sporadically harbor *Staphylococcus aureus* intermittently, while transient are those which harbor one staphylococcal type for a period and then contracts another different type and again harbor same (Mackie and McCartney, 1989). Suffice to add that carriers are prone to skin sepsis and postoperative infection caused by *Staphylococcus aureus* than non-carriers (Cruickshank *et al.,* 1989).

Epidemiologically, patients with lesions discharge *Staphylococcus* into the environment. Large numbers of cocci are disseminated in pus and dry exudates, discharge from infected wounds and burns (Willey *et al.,* 2008; Talaro and Talaro, 2005; Jawetz *et al*., 2004).

Babies who are nasal carriers of an epidemic strain could bring infection from hospitals into homes (Dugid *et al*., 1989). Newborns and infants frequently transmit

Table 1. Criteria used for the identification of *Staphylococcus aureus*

Motility	Cultural characteristics/ Gram reaction	Biochemical tests									
-	Gram +ve Cocci in clusters Diplococcic	Oxidase	Catalase	Coagulase	Indole	Glucose	Lactose	Sucrose	Fructose	Maltose	Mannitol
		-	+	+	-	+,A	+	+	+	+	+

KEY
+/+ve = Positive
- = Negative
A = Acid formation

hospital acquired staphylococci to their mothers during breast feeding, resulting in *Staphylococcus* mastitis in the mother, which may not show clinical manifestation until she leaves the hospital (Bulger and Sherries, 1982).

The aims of this study is to isolate the various nasal strains of *S. aureus* especially the multidrug resistant strains implicated nocosomial infections in index hospital.

MATERIALS AND METHODS

Specimens

A total of 34 nasal exudate samples were collected from apparently healthy female, at Irrua Specialist Teaching Hospital, between January and September 2011, with ages ranging from 16-30 years using sterile swab sticks. The samples were then transported to the laboratory within 2 hours of collection and subsequently processed. Care was taken to ensure no subject had taken antibiotic or used inhaler spray prior to sample collection.

Isolation and Identification

The specimens were inoculated onto mannitol salt agar plate by streaking. Inoculated plates were then incubated aerobically at 37 degree centigrade for 24hours. After 24 hours of incubation, discrete colonies were picked up and Gram stained and further sub-culturing was done and biochemical test carried out (Bauer *et al*., 1996).

Antimicrobial susceptibility Testing

This was done by the multi-discs diffusion method. All *Staphylococcus aureus* strains were subjected to testing using the following antibiotics discs at stipulated concentrations. Amoxicillin 10mg, Ampicillin 10mg, Cloxacin 5mg, Augmentin 10mg, Ampliclox 10mg, Flucloxacillin 10mg, Gentamycin 10mg, Streptomycin 10mg, Neomycin 10mg, Co-trimoxazole 25mg, Chloramphenicol 10mg, Tetracyclin 10mg, Lincocin 5mg, Erythromycin 10mg, Azithromycin 5mg, Cephalexin 10mg, Rifampin 10mg, Cefuroxime 10mg, Oflaxacin 5mg, Norfloxacin 5mg, Ciprofloxaxin 5mg . All antibiotics disc were commercially prepared.

Antibiogram Typing

For the determination of the antibiogram type of the isolated strains, the Ajumali's method of Mnemonic coding was adapted. The 21 antibiotics were divided into 7 different groups of 3 antibiotics each, according to their mode of action, similarities, chemical composition as well as clinical indications.

The 3 antibiotics in each group were assigned arbitrary value of 1 for the first antibiotics, 2 for the second antibiotics and 4 for the third antibiotics. A perfect sensitivity for all the 3 antibiotics would be a score of 7; ie, 1+2+4 =7. While, if no sensitivity to the three antibiotics, a score of 0; ie, 0 +0 +0 = 0 is recorded (Orhue, 2004; Flourney, 1982).

RESULTS

A total of 34 samples were analyzed in the course of this study. All samples yielded growth of *Staphylococcus aureus* on Manitol salt agar. Table 1, shows the various biochemical tests as well the cultural characteristics used for the identification on the organism.

Various antibiotics discs were used for the antibiogram typing, with different percentage sensitivity shown to these antibiotics by the isolated strain. The most effective antibiotics were Gentamycin, which recorded 100% sensitivity, Neomycin showed 88.2% sensitivity rate, while Lincocin and Erythromycin also recorded 47.1% and 31.2% respectively. Gentamycin invariably had a score of 7 for all the isolated strains (Table 2).

Table 3 shows the susceptibility rate of isolated *Staphylococcus aureus* strains for the different antibiotics tested. Gentamycin recorded 100% susceptibility for the

Table 2. Antibiogram types of isolates of *Staphylcoccus aureus*

Antibiotics	Amoxicillin	Amplicillin	Cloxacillin	Augmentin	Ampicilox	Flucloxacillin	Gentamycin	Streptomycin	Neomycin	CO-Trimoxazole	Chloramphenicol	Tetreacycline	Lincocin	Erythromycin	Azithromycin	Cephalexin	Rifampin	Cefuroxime	Ofloxacin	Noreloxcin	Ciprofloxacin	
Mgldisc	10	10	5	10	10	10	10	10	10	25	10	10	5	10	5	10	10	10	2	5	5	
Bacterial Strain	1	2	4	1	2	4	1	1	4	1	2	4	1	2	4	1	2	4	1	2	4	
1	-	-	-	+	-	+	+	+	-	-	-	+	+	-	-	+	+	-	+	-	+	0534135
2	-	-	-	-	-	+	+	-	+	-	-	-	+	-	-	-	+	-	-	-	+	0450124
3	-	-	-	-	-	+	+	+	+	-	+	-	-	-	+	-	+	+	-	-	-	0472460
4	-	-	-	-	-	-	+	-	+	-	-	+	+	+	+	-	+	-	+	-	-	0054721
5	-	-	-	-	-	-	+	+	+	+	-	-	-	+	+	+	-	-	+	-	-	0071611
6	-	-	-	-	-	-	+	-	+	-	-	-	-	-	+	-	+	-	-	+	-	0050422
7	-	-	-	-	-	+	+	-	+	-	+	-	+	-	-	-	+	+	+	+	+	0452167
8	-	-	-	-	-	+	+	+	+	+	-	-	-	+	-	+	+	+	+	-	+	0471275
9	-	-	-	-	-	-	+	-	+	-	-	-	-	+	-	+	-	-	+	-	+	0050215
10	-	-	-	-	-	-	+	+	+	-	-	-	+	-	-	-	+	-	-	-	-	0050120
11	-	-	-	-	-	+	+	+	+	-	-	-	+	+	-	-	+	+	-	+	+	0470366
12	-	-	-	-	-	+	+	+	-	-	-	-	-	-	-	-	-	+	+	-	+	0430045
13	-	-	-	-	-	-	+	-	+	-	+	-	-	+	-	-	+	+	+	-	-	0052261
14	-	-	-	-	-	-	+	+	+	+	-	-	+	+	-	+	+	-	+	-	+	0071335
15	-	-	-	-	-	-	+	-	+	-	-	-	-	-	-	+	-	-	+	-	+	0050015
16	-	-	-	-	-	-	+	-	+	-	-	-	+	-	-	+	-	-	-	+	+	0050116
17	-	-	-	-	-	+	+	-	+	-	+	-	-	-	-	-	-	-	+	-	+	0452005
Frequency	0	0	0	5.9	0	47.1	100	41.2	88.2	17.6	23.5	11.8	47.1	47.1	41.2	23.5	41.2	41.2	64.7	35.3	64.7	
Group Cumulative Frequency	0			17.7			76.5			17.6			37.3			47.1			50.9			

Table 3. Susceptibility Rate of isolated *Staphylococcus aureus* of Different Antibiotics

Antibiotics	Frequency	Susceptibility rate %
Amoxicillin	0/17	0%
Ampicillin	0/17	0%
Cloxacillin	0/17	0%
Augmentin	1/17	5.9%
Amplicox	0/17	0%
Floxapen	8/17	47.1%
Gentamycin	17/17	100%
Streptomycin	7/17	41.2%
Neomycin	15/17	88.2%
Co-trimoxazole	3/17	17.6%
Chloramphenicol	4/17	23.5%
Tetracycline	2/17	11.8%
Lincocin	8/17	47.1%
Erythromycin	7/17	41.2%
Azithromycin	4/17	23.5%
Cephalexin	7/17	41.2%
Rocephin	11/17	64.7%
Cefuroxime	6/17	35.3%
Perfloxacin	11/17	64.7%
Norfloxacin	4/17	23.5%
Ciprofloxacin	11/17	64.7%

17 isolated strains, Neomycin had 88.2% susceptibility which Perfloxacin and Ciprofloxacin had susceptibility rate of 64.7% each.

DISCUSSION

The carriership rate for the population under study is 50%. This correlates with the report of Paul *et al.* (1982); which indicated that approximately 10-75% of a healthy female population harbours haemolytic *Staphylococcus*, while a carrier as high as 40-70% was estimated for pathogenic *Staphylococcus*, among hospital personnel.

The reported carrier rate of the pyogenic Gram-positive organism in healthy individuals vary from one community to the other, depending on the level of hygiene and general sanitation as well as the knowledge of the transmission of infection of the organism.

The difference in carrier rate may also be influenced by the sensitivity of the methods employed for the cultivation, isolation and identification of the suspected organism.

Though *Staphylococcus aureus* is a normal flora of the human body, such as the skin, scalp and even the upper respiratory tract; the fact that the organism is isolated from healthy individuals, may be attributed to the fact that the isolated strain is capable of producing disease (Silvana *et al*., 2005).

The relative lower percentage nasal carriership of the study population may be attributed to high hygienic standard and awareness of disease prevention as well their ages which were in the range of 16-30years; with the age used to determine the prevalence of *Staphylococcus aureus* in humans, as sebaceous gland is not fully functional in childhood, but gradually increase in functionality up to puberty (Willey *et al*; 2008).

From the antibiogram typing, strain 0534135 is the most sensitive while strain 0050015 is the most resistant. The isolates were all sensitive to Gentamycin and equally were all resistant to Amoxicillin, Ampicillin, Cloxacillin and Amplicox as shown in Table 3.

Finally, the high resolving power of the antibiogram typing method, using many antibiotics has been elucidated, as no two isolates were of the same antibiogram type (Momoh *et al*., 2012).

Conclusion

There is a worldwide increase in the prevalence of *Staphylococcus aureus* with a corresponding increase in hospitalization of carriers, though the reasons for hospitalization may vary, the need to protect others remain paramount to health care providers though, the isolated strains from this study showed varying degree of resistance to the select antibiotics, it is important to note that all the isolates were sensitive to gentamycin, a cheap and easily accessible drug in the study locality. On the other hand, all 17 isolated strains, were resistant to amoxicillin, ampicillin and cloxacillin, all common over the counter drugs in the study locality; indicative of an apparent case of drug resistance and loss of therapeutic effect of these drugs that need further investigation.

Antibiogram typing is an important aspect of microbial sensitivity, as all organisms do not respond to different drugs in exactly the same way. From the results of this study, Gentamycin still has a key role to play in *Staphylococcus* therapeutics, Neomycin is also recommended. However, combined therapy is advocated where applicable.

It is recommended that periodic laboratory investigations and treatment is carried out on hospital personnel, student and others working closely with animals, in order to reduce infection rates in our communities.

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