ANTIBIOTICS RESISTANT PATTERN OF *Staphylococcus aureus* ISOLATES AMONG UNDERGRADUATES STUDENTS OF DELSU ASABA CAMPUS

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Abstract: *Staphylococcus aureus* is widespread in hospitals and communities among patients due to the increasing resistance to several antibiotics. This study was planned to determine the prevalence and antibiotics resistant pattern of *Staphylococcus aureus* from the nasal nares of healthy undergraduate students in Delta State University Asaba campus. Nasal samples totalling one hundred were collected from female and male undergraduates who voluntarily participated in this study. Standard bacteriological and identification techniques were used for the isolation of *Staphylococcus aureus.* Antibiotic susceptibility pattern of the bacteria isolates was performed according to Kirby Baeur disc diffusion procedure. Our results revealed 21.0% prevalence of *Staphylococcus aureus* made up of 8.0% females and 13.0% males. The antibiotic susceptibility showed that erythromycin was 33.3% followed by ampiclox 61.9%, ciprofloxacin 95.2%, streptomycin and ceftriaxone 90.5% each in ascending order respectively. The antibiotic resistance showed that ciprofloxacin was the least resistant 4.8% followed by streptomycin and ceftriaxone 9.5% each, ampiclox 38.1% and erythromycin 66.7% in ascending order, respectively. The result obtained, therefore indicates the importance of investigating *Staphylococcus aureus* colonization of nasal mucosa in order to ascertain the level of antibiotic susceptibility to the infection and thus develop intervention strategy as well as treatment possibilities. This study has established the prevalence of antibiotic resistant *staphylococcus aureus* among undergraduate students in Asaba campus.

Keywords: Colonization, nasal nares, *Staphylococcus aureus*, susceptibility

Introduction

The emergence of resistant strains of *Staphylococcus aureus* is a global predicament especially in the field of clinical medicine (Rich, 2005). Healthy persons could asymptomatically carry *Staphylococcus aureus* for few weeks to several years (Irum *et al*., 2013; Weese *et al*., 2004). *Staphylococcus aureus* is the second most isolated human pathogen that is associated with several infections. It is a leading cause of hospital and community acquired infections and has been observed in cases of infections in healthy persons (Kome *et al.*, 2017). The world health organization proclaimed that resistance to antibiotics is a fast rising public health menace of great concern that has threatened the accomplishment of modern medicine. Bacteria strains resistant to multiple antibiotics are regarded as multidrug resistant (Centers for Disease Control and Prevention, 2013). Genes that are responsible for resistance to antibiotics, just like the antibiotic themselves are as well ancient. The *Staphylococcus aurues* disease and their mortality were highly reduced with the use of penicillin in the early 1940s. This was short lived with the emergence of penicillin resistant *Staphylococcus aureus* (PRSA) producing beta-lactamase. The beta-lactamase enzyme inactivates the penicillin antibiotics (Ajoke *et al.*, 2012). Previous studies have shown that methicillin, a beta-lactamase resistant beta-lactam, provided new treatment options for PRSA infections. However, the emergence of methicillin resistant *Staphylococcus aureus* (MRSA) that is cross resistant to all beta-lactams hindered the treatment alternative for *Staphyloccal* infection (Ugwu, *et al.*, 2016). The use antibiotics in any form can result to increased selective pressure in a given bacteria population to allow these resistant bacteria to flourish and the susceptible bacteria then die off. Due to increase in resistance to antibiotics there is therefore need for a greater need for alternative treatment (Donadio *et al*., 2010). This severe menace can no longer be a prediction for the future; it has been observed to be happening right now in every part of the world and has the possibility to affect any age bracket in any nation (WHO, 2014). The extensive spread of antibiotic use both within and outside medicine is playing a noteworthy role in the emerging of resistant bacteria (Goossens *et al*., 2005). In several countries, antibiotics are usually sold as over the counter drugs without prescription which could result to formation of resistant strains. Some practices such as antibiotics use in livestock feed to promote faster growth (Ferber, 2002) this extreme usage has turn into one of the top contributions to the development of antibiotic resistance (Anderson *et al*., 2003).

Staphylococcus aureus is usually a flora of the skin but can cause opportunistic infections which range from skin and soft tissue infections, pneumonia, mucositis, bone/joint infections, endocardiatis, and bacteraemia, to life threatening infections of necrotising fasciitis, septicaemia and toxic shock syndrome (Van Belkum, 2009).

Staphylococcus aureus is known to lead the cause of human infections universally in community and hospitals settings. It is commonly found inside the nostril, intestine, vagina and throat. *Staphylococcus aureus* make up part of the usual micro biota, and most regular body site for its isolation is the anterior nares (Wertheins *et al*., 2005). The nasal carriage rates of *Staphylococcus aureus* usually vary, and depend on the observed population. Earlier study revealed that 32.40% of the population examined aged from 1 to over 65 years is normally colonized by *Staphylococcus aureus* (Manious *et al*., 2006). This study is therefore aimed at the determination of the prevalence and antimicrobial resistance of isolated strains of nasal *Staphylococcus aureus* among healthy undergraduate students of Delta State University Asaba Campus.

Materials and Methods

Study area

This present study was carried out between July and September, 2018 in Asaba campus of Delta State University.

Materials

Materials used include test tubes, wire loop, light microscope conical flask, beaker, cotton wool, aluminium foil, weighing balance spatula, microscope slides, cover glass, Petri dishes, bijou bottles, auto clave, incubator, clean white tile, hand gloves, lead acetate paper. Media used include mannitol salt agar, nutrient agar, nutrient broth, Mueller Hinton agar. Reagents used include safranine, lugol-iodine, ethanol, phenol red, peptone water, crystal violent glucose, sucrose, dextrose and lactose, normal saline, hydrogen peroxide, plasma serum (blood serum).

Sample collection

A total of one hundred (100) nasal specimens, using sterile swab were collected from apparently healthy undergraduate's students by random sampling technique after informed consent. The specimens were transferred to the Department of Microbiology Laboratory of Delta State University for analysis.

Bacteria culture and identification

Swab specimens were inoculated on Mannitol salt agar and incubated at 37ºC for 24 h. The identification of *Staphylococcus aureus* was performed in accordance with standard laboratory protocols as described by Cheesbrough (2006).

Antibiotic sensitivity determination

Antibiotic sensitivity profile of the isolates was carried out according to Kirby-Bauer agar diffusion method Cheesbrough (2006).

Result and Discussion

Human anterior nares have been known to be the main habitat of opportunistic and commensal pathogens such as *Staphylococcus* epidermis, *Staphylococcus aureus* and *Moraxella spp* (Wos-Oxley *et al*., 2010). From our study, Table 1 shows 21% prevalence of *Staphylococcus aureus* from the nasal nares of subjects studied. This is in agreement with the findings of Gordon and Lowry (2008) who reported that *Staphylococcus aureus* colonizes the moist squamous epithelium in the anterior nares of 20% of human population. Nasal colonization is an important risk factor for the pathogenesis of *Staphylococcus aureus* infection as earlier opined by Kluytams *et al*. (1997), Cole *et al.*(2001) and Peacock *et al.*(2001). *Staphylococcus aureus* transmission to nares is usually by contaminated hands and other surfaces where they may thrive for some months. Carriage rates in healthy adults persistent carriers, 60% intermittent carriers, while 20% never carry the organism. Humans are therefore an important reservoir for Staphylococcus infection (Foster, 2004). Von-eiff *et al*. (2001) and Van-Belkum *et al*. (2009) in their separate studies revealed that *Staphylococcus aureus* nasal carriage has a vital role as sources of invasive infections in hospital and community settings. The *Staphylococcus aureus* colonization in individuals differs because of the differences in the host immunity, gender, age and environmental factors as earlier stated by Garcia-Rodriguez and Fresnadillo-Martinez (2002). Thus, the isolation of *Staphylococcus aureus* could be due to the level of contamination arising from the habitat of the students, low personal hygiene and poor health education which still persist in many African countries including Nigeria and the community where the institution studied was located. This study evaluated 100 undergraduate student nasal swab isolates detecting the colonization of *S. aureus* and out of the 100 students, 21 were tested positive to *Staphylococcus aureus* out of which 13 were males and 8 were females the occurrence of *S. aureus* in this undergraduate students could be due to the level of contamination arising from the habitat of the students, low personal hygiene and poor health education which still persist in many African countries. Also the emergence of methicillin resistant *Staphylococcus aureus* is a major factor in the treatment options for *Staphyloccal* infections as earlier stated by Ugwu *et al*. (2016). This is because methicillin resistant *Staphylococcus aureus* can colonize healthy people at a lower rate of about 1-8% which represent a potent and increased prevalence risk factor for *Staphylococcus* infection (Rasamiravaka *et al.*, 2013).

Table 1: Gender distribution of nasal carriers of *Staphylococcus aureus*

Gender	No. Examined	No. (%) positive	% Prevalence
Males	50	13 (26.0)	13.0%
Females	50	8 (16.0)	8.0%
Total	100	21 (21.0)	21.0

Table 2: Antibiotics susceptibility of *Staphylococcus aureus* isolated from the nasal nares of subjects

Antibiotics	No. of samples positive for *S. aureus*	No. (%) susceptible	No. (%) resistant
Erythromycin	21	7 (33.3)	14 (66.7)
Streptomycin	21	19 (90.5)	2 (9.5)
Ampiclox	21	13 (61.9)	8 (38.1)
Ceftriaxone	21	19 (90.5)	2 (9.5)
Ciprofloxacin	21	20 (95.2)	1 (4.8)

Table 2 shows that *Staphylococcus aureus* was most sensitive to Ciprofloxacin (95.2%), followed by Streptomycin and Ceftriaxone (90.5%) each, Ampiclox (61.9%) and Erythromycin (33.3%) respectively in descending order. It however showed highest resistance to Erythromycin (66.7%) followed by Ampiclox (38.1%), Streptomycin and Ceftriaxone (9.5%) each and least resistance to Ciprofloxacin (4.8%), respectively.

Staphylococcus aureus exhibits remarkable versatility in its susceptibility towards antibiotics and the capability of these bacterium to cause human diseases have not diminished even with the availability of antibiotics (Obiazi *et al*., 2007). Edem *et al.* (2013) observed that the *Staphylococcus aureus* isolated was resistant to ciprofloxacin and erythromycin. This is contrary to our study in which our isolate was highly sensitive ciprofloxacin but resistant to erythromycin. The high resistance of isolates from the present study to the commonly prescribed antibiotics demonstrates the urgent need for proper management of antibiotic use. Sapkota *et al.* (2010) have earlier stated that Nigeria has a high rate of antibiotics misuse as well as high prevalence of self medication. This is in no exception to the environment studied. This further confirm the work of Okeke *et al.* (1999) and Ojo *et al.* (2009) who reported that misuse of antibiotics is a main course of antimicrobial resistance while misuse and self-medication are factors identified as being responsible for the antibiotic resistant bacteria emergence. Although there was a high sensitivity to streptomycin, cetriaxone and ciprofloxacin, the high cost of these drugs and the route of administration do not put them in the group of first choice of antibiotics for treatment or self medication.

Conclusion

The present study therefore indicates the significance of investigating *Staphylococcus aureus* colonization of the nasal mucosa in order to ascertain the level of antibiotic susceptibility of *Staphylococcus aureus* infection.

Conflict of Interest

Authors declare that there is no conflict of interest reported on this work.

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