IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 13, Issue 12 Ver. I (Dec. 2014), PP 82-86
www.iosrjournals.org

Profile of Staphylococcus Aureus Associated With HIV Patients in University Of Maiduguri Teaching Hospital (UMTH), Maiduguri, Borno State

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Abstract:
Aims: *This study was aimed at determining the characteristic of nasal carriage status of HIV patients. Staphylococcus aureus has emerged as a significant opportunistic pathogen among HIV and AIDS patients in both nosocomial and community settings.*
Methodology and results: *A total of 200 nasal swabs were collected and analysed bacteriologically. Profile of 42 (21.0%) were characterized as Staphylococcus aureus. Gender distribution of HIV positive patients with Staphylococcus aureus infections were 16 (38.0%) males and 26 (61.9%) females respectively. The age group with high positive Staphylococcus aureus (38.09%) was seen among 31- 40years while the least was among 0 – 20years (2.3 %). Staphylococcus aureus exhibited alpha 7(16.7%), beta 22(52.4%) and gamma 22(52.4%) haemolysis on blood agar.*
Conclusion, significance and impact study: *High prevalence of nasal carriage among these patients (21.0%) has been documented. These results provide strategies to prevent systemic infections by eliminating nasal carriage of Staphylococcus aureus. Antibiotic susceptibility pattern of the isolates was high to quinolone drugs. Therefore the use of nasal topical antibiotics as prophylaxis is highly recommended.*
Key words: *Staphylococcus aureus, HIV profile, Maiduguri, Nigeria.*

I. Introduction

Staphylococcus aureus has emerged as a significant opportunistic pathogen among HIV and AIDS patients in both nosocomial and community settings, and recent studies have shown greater frequency and morbidity of this organism among HIV positive individuals (Chacko et al., 2009., Hidron et al., 2010). Clinical manifestations ranged from superficial to systemic disease conditions, responsible for high morbidity and mortality rate (Lowry et al., 1998). Staphylococcus aureus normally localize in the skin and mucous membranes in the nose of healthy humans and about 30% of the normal healthy population are transiently colonised by the organism (Liu., 2009). There are more than 30 species of coagulase negative Staphylococci (CNS). S. epidermidis and S. saprophyticus are the species most often associated with infection but Staphylococcus capitis, Staphylococcus cohnii, Staphylococcus haemolyticus, Staphylococcus hominis, Staphylococcus lugdenensis, S. schleiferi subspecies schleiferi, Staphylococcus simulans and Staphylococcus warneri have also been implicated (Chacko et al., 2009). The unique characteristic of S. aureus isolates is the diverse mechanism of antibiotic resistance and variety of virulence factors responsible for establishment of staphylococcal infections (Lowry et al., 1998). Of the Staphylococcus aureus strain that had attracted public health concern globally is the methicillin-resistant Staphylococcus aureus (MRSA), because of its multi-resistant pattern to all classes of antimicrobial agents and rapid dissemination within hospital environment (Grundmann et al., 2006).

Staphylococcus aureus is an important pathogen in patients with HIV infection. Despite multiple reports on the severity and recurrent nature of S. aureus infection, the factors predisposing patients infected with HIV to S. aureus infection have not been well studied (Bowersox et al., 1999).

Apart from being primary causative agent of nosocomial infections, MRSA isolates are being detected in the community setting in both pediatrics and adult population, termed as Community-associated S. aureus (CAMRSA) (Groom et al., 2001). Due to rapid dissemination of MRSA isolates, it has been reported worldwide. However, the prevalence of MRSA isolates varies with type of health institution, studied population, geographical location and subclinical condition of the patients. In Asia, the prevalence level is approximately 80%, in Europe, 20-35% in US, 20-40% and Latin America, it is up to 70% (Diekema et al., 2001). In sub-

Saharan African, the level is assumed to be high in countries like South Africa, Zimbabwe, Egypt and Algeria, while low in countries like Sudan and Somali (Adesida et al., 2006).

A number of recent investigations have indicated that Staphylococcus aureus is the main aetiological agent of many infections in Nigeria (Anah et al., 2008., Adeleke et al., 2009., Bekibele et al., 2009).

This work was aimed at determining the phenotypic variability of nasal carriage Staphylococcus aureus among HIV patients in UMTH.

II. Materials And Methods

Study Area

The study was carried out in the University of Maiduguri Teaching Hospital, located at Maiduguri, the capital of Borno State, bordered by 3 countries, Republic of Cameroon to the East, Chad to the Northeast, Niger to the North. Maiduguri is a cosmopolitan town which is inhabited by various ethnic groups.

Study Population

A total of 200 HIV-positive patients attending PEPFAR accredited clinic at the University of Maiduguri Teaching Hospital were recruited into the research study. Consent forms were administered for this study. Study questionnaire were administered on identified HIV patients that signed the consent forms. Demographic information on the questionnaire included, age, sex, duration of diagnosis, type of drug and other associated clinical details.

Sample Collection

The nasal swab was taken by inserting a sterile swab into the patients' anterior nares and gently rotated. The nasal swab were properly labeled and taken to the laboratory for analysis.

Microbiological Analysis and Identification

All samples (nasal swabs) were analysed bacteriologically as described by Esan et al., (2009).

Characterization of Staphylococcus aureus:

DNase Test

DNase test was performed according to the method previously described by Kateete et al., (2010).

Haemolytic activity

The haemolytic activity testing of Stapylococcus aureus isolates was performed according to the method previously described by Jimenez et al., (2008).

-Lactamase test

The β-lactamase test was performed using the tube based iodometric method as previously described (Oncel et al., 2004).

Detection of methicillin-resistant Staphylococcus aureus

Mannitol salt agar was prepared and performed according to previously described method by Arora et al., (2010).

Antibiotic susceptibility profiles

The in-vitro susceptibility of Staphylococcus aureus isolates to various routine antimicrobial drugs was tested by the standard disc diffusion technique using guidelines established by NCCLS., (2002).

API Staph-Ident System

Identification of Staphylococcus aureus was based on conventional criteria (including the coagulase tube test and the API Staph system [ATB32 Staph, BioMérieux, Marcy-l'Etoile, France]). API staph – Identification test was performed as documented by Christof et al., (2001).

Statistical analysis

All data was entered into a Microsoft excel sheet. The analysis was conducted using the statistical package for social sciences (SPSS) program, version 17.1. Chi-square test was used for comparison of the different variables and the correlation between all the tests performed. A p value of <0.05 was considered to be statistically significant.

Ethical clearance

Ethical clearance was obtained from UMTH research committee and Principal investigator of PEPFAR before the commencement of the study.

III. Results

Demographic Information

Of 200 nasal swab samples analysed, 92 (46.0%) were from males and 108 (54.0%) females. Forty-two (21.0%) of 200 nasal swabs were positive for S. aureus by both tube coagulase and DNase test respectively. Of the 42(21.0%) S. aureus positive nasal swabs, 16 (38.09%) were males and 26 (61.9%) were females, and duration of HIV diagnosis were within 2weeks and 10years. The age grouping of the patients with nasal carriage for S. aureus as presented in Table 2, showed high frequency within 31 – 40 years (38.09), followed by 21 – 30 years (35.7%) and least percentage among 0 – 20 years (2.3%). Table 3: showed the phenotypic characteristic of S. aureus isolated.13(30.9%) exhibited α-haemolysis, 7 (16.7%) β-haemolysis and 22 (52.4%) γ-haemolysis.

The antibiotic susceptibility pattern of the S. aureus, showed that 78.6% isolates were sensitive to Ciprofloxacin (CPX).

Table 1. Sex distribution of patients with Staphylococcus aureus infection

SEX	TEST SAMPLES(%)	NO. POSITIVE(%)
MALE	100 (50.0)	16 (16)
FEMALE	100 (50.0)	26 (26
TOTAL	200 (100)	42 (42)

Table 2. Age group distribution of patients with Staphylococcus aureus infection

Age group (years)	Frequency (%)
0 – 20	**1 (2.30)**
21 – 30	**15 (35.7)**
31 – 40	**16 (38.09)**
41 – 50	**8 (19.04)**
51	**2 (4.76)**
Total	**42 (100)**

Table 3. Profile of Staphylococcus aureus isolates in the HIV positive patients

Biochemical parameter	Catalase	Coagulase	Haemolysis			DNase
No. tested	42	42	42	42	42	42
No. positive	42	42	13	7	22	42

IV. Discussion

Staphylococcus aureus are both commensal organism and versatile pathogen capable of causing a wide range of human diseases resulting in high morbidity and mortality in tropical Africa. Over the past two decades, there has been an increase in the rate of infection and diseases caused by S. aureus particularly MRSA throughout the world (Sadaka et al., 2009). The situation is even more alarming among patients with reduced immunity such as those undergoing chemotherapy or surgery, children, elders and patients with HIV and AIDS.

The prevalence of nasal carriage of Staphylococcus aureus documented in this finding (21.0%) is similar to previous studies but however considered low when compared to other findings in North Central (Abuja, 78%) and SouthEastern (Aba, 80%) Nigeria as documented by Onunuga et al., 2005. The anterior nares are the main ecological niche for Staphylococcus aureus and the natural history of nasal carriage of Staphylococcus aureus in HIV-infected patients has not been well delineated.

The differences in the prevalence level as observed in our study might be related to the number and clinical condition of the patients, and the duration of study. This is further emphasized by the gender distribution of Staphylococcus aureus among HIV patients with high positive nasal carriage of 42% (males 16% and females 26%). The distribution of nasal carriage of S. aureus has been documented (Hidron et al., 2010) by the behavioral influence, social, environmental, biologic, HIV host-specific risk factors, and probably, a combination of all these play a significant role in explaining the increased prevalence and incidence identified with female patients investigated. High prevalence of Staphylococcus aureus was observed among the age group 21- 40 years and this may be due to activities like nose picking. This further buttresses the findings of Christof et al., (2001) who reported persistent nasal carriage of Staphylococcus aureus in children. Although nasal carriage of S. aureus has been suggested as the source of subsequent infections, previous studies were limited to single hospitals (Mest et al., 1994., Weinke et al., 1992., Ena et al., 1994) or to defined patient groups such as patients infected with the human immunodeficiency virus or receiving hemodialysis (Chow and Yu, 1989., Holton et al., 1991).

Intake of the ARD has little or no effect on the nasal carriage of Staphylococcus aureus as the highest number of isolates was recorded among those on ARD intake for over five years. The least number of isolates came from those on ARD for less than a year.

The reason for the higher colonization rates observed are unclear, but could include factors such as frequent contact with both health care and community settings and frequent exposure to antibiotics, leading to a greater likelihood of becoming colonized with resistant strains. Some authors argued that this increased susceptibility to colonization with S. aureus could be HIV-specific because of depleted immunity (Sharpiro et al., 2000).

S. aureus is the most frequent cause of both community and hospital-acquired bacteremia in HIV-positive patients (Pedro-Botet et al., 2002., Stroud et al., 1997) and MRSA can explain 32%–67% of cases of S. aureus bacteremia among HIV patient population as previously reported (Tumbarello et al., 2002., Senthilkumar et al., 2001., Uche and Forrest, 2006).

Phenotypic tests are costly in resource limited settings but the mainstay in the diagnosis of staphylococcal infections, in which coagulase tests are usually confirmatory (Christof et al, 2001) as reported in our study. Phenotypic characteristic investigated included production of hemolytic activities among other tests as in the assessment of the virulence factors documented in a similar study by Samie and Shivambu (2011) and antibiotic susceptibility (Esan et al, 2009).

There is no single phenotypic test (including the tube coagulase test) that can guarantee reliable results in the identification of Staphylococcus aureus.

Therefore, the ideal identification of Staphylococcus aureus clinical isolates requires a battery of tests such as API Staph. Modern methods of molecular typing, which are highly discriminatory are also recommended. These data will improve on the identification of Staphylococcus aureus in clinical specimens.

V. Conclusions

In the light of the forgoing, therefore, the finding of this study has opened up the epidemiological pattern of Staphylococcus aureus in HIV AIDS patients in the study area. Similarly, it is believed that information generated from the study could serve as a guide in clinical management of HIV/AIDS patients with S. aureus infection and baseline for further epidemiological studies. Some of the risk factors for colonization among HIV-infected patients suggest immunologic and virologic control, as well as the use of prophylasis as control or protective measures.

Conflict of interest: The authors declared no conflict of interest.

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