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CO-OCCURRENCE OF CANDIDA ALBICANS AND STAPHYLOCOCCUS AUREUS IN THE NOSTRILS OF APPARENTLY HEALTHY UNIVERSITY STUDENTS: A CASE STUDY

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ABSTRACT

The aim of this study was to investigate the prevalence of *Candida* and *Staphylococcus* spp. in the nasal cavity of apparently healthy university students. Eighty-six (86) nasal samples from apparently healthy undergraduate students of Ambrose Alli University, Ekpoma were screened with Mannitol agar and Sabrourand's dextrose agar for *S. aureus* and *Candida albicans* respectively. After the incubation period, the microorganisms were isolated and identified through biochemical tests. The data obtained were statistically analysed using SPSS (version 17). Results showed that 74.42% of the apparently healthy students were positive for nostril microbiota. Specifically, 46.51% and 9.30% were positive for *S. aureus* and *C. albicans* respectively. Worrisome is the co-occurrence of *S. aureus* and *C. albicans* in 18.61% of the sampled apparently healthy students. The result of this study highlights the fact that *S. aureus* and *C. albicans* are usually part of the normal flora and may pose no threat in healthy persons. However, co-occurrence of these organisms may otherwise compromise the immune function of individuals.

Keywords: Candida albicans, Staphylococcus aureus, Students,

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INTRODUCTION

The evidence presented in the 2009 International Scientific Forum on Home Hygiene review on the global burden of hygiene-related diseases (Bloomfield et al., 2009) shows that infection outbreaks in the home and everyday life settings, particularly gastrointestinal, respiratory, skin, wound and eye infections, continues to exact a heavy toll on the global health and prosperity. While invasive disease is by far the most acute and severe, the greatest burden of morbidity is due to infections, which are extremely common, often chronic and frequently recurrent (Brown et al., 2013). Available evidence now suggests that respiratory hygiene plays a significant part in limiting the spread of respiratory infections such as colds and influenza (Bloomfield et al., 2011).

Although *Candida* spp. and *Staphylococcus* spp. may usually be seen as normal human microbiota, they can as well act as opportunistic micro organism and produce super infection (Helovuo et al., 1993). Despite antibiotic therapy, these infections occur regularly.

The aim of this study therefore, is to investigate the prevalence of *Candida* and *Staphylococcus* spp. in the nasal cavity of apparently healthy university students.

MATERIALS AND METHODS

Study area: Ambrose Alli University, in Ekpoma, Edo State, Nigeria, is the study area. The institution was established in 1981 by the then governor of Bendel State (now Edo and Delta States), Professor Ambrose Folorunso Alli (1979-1983). It was first known as Bendel State University, then Edo State University, and later changed to Ambrose Alli University (in honor of the Founder -Ambrose Alli). It is an institution owned by the State Government of Edo State, but has the whole country as its catchments area; and as such, the different states of the nation are represented in the student population. The campus, in addition to other facilities, has a Health Center and Student Hostels, but a number of students reside in off-campus hostels and rented apartments in and around Ekpoma town -a semi-urban town.

Ethical consideration: Informed consent was suited for and obtained from each of the student after explaining the aim of the study to them.

Volunteers: A total of 86 healthy adult undergraduate students of the department of Microbiology, Faculty of Natural Sciences, Ambrose Alli University, Ekpoma, Nigeria, volunteered for this study. Their ages ranged from 20 to 30 years.

Inclusion and exclusion criteria: Volunteers for this study were restricted only to those who had not presented symptoms of common cold or catarrh within 3 weeks prior to sample collection. Those with, or have had such symptoms within 3 weeks prior to sample collection were however, excluded.

Sample and Specimen Collection: After giving their written/informed consent, the volunteers completed a questionnaire for demographic data collection.

Two nasal swab specimens were collected from each of the 86 volunteers on October 15th, 2012. The samples collected were then transported to the microbiology laboratory of Ambrose Alli University and analyzed within 24 hours of collection.

Culture and Isolation: The first swab samples were streaked unto mannitol salt agar plates and incubated for 18 – 24 hours at 37^0C. Characteristically golden yellow colour colonies observed after incubation were identified as *S. aureus* and confirmed with coagulase test (Cruickshank *et. al* 1975).

The second swab sample was resuscitated in Sabouraud's dextrose both for 24 hours before inoculation unto Sabouraud's dextrose agar (SDA). Inoculated SDA plates were incubated for up to 72 hours and observed for growth of *Candida* species. Cream to white colonies with diameter of 3 – 5mm were presumed to be colonies of *Candida* species, while confirmatory test was done by germ tube test (Cheesbrough, 2000).

Data analysis: All data were analyzed with SPSS for Windows, version 16.0 (SPSS Inc. Chicago, III, USA). The simple descriptive statistic was done $p < 0.05$.

RESULT

Table 1 shows the frequency and distribution of the 86 nasal samples screened. Male subjects accounted for 48.84% of the population, while female made up the remaining. Overall, 74.42% of the screened samples were positive for nasal infections. Specifically, 46.51% and 9.30% were positive for *S. aureus* and *C. albicans* respectively, while 18.61% were positive for both *S. aureus* and *C. albicans* co-infection.

Table 2 shows the nasal infection based on gender difference in the positive nasal screened samples. Males (76.19%) were more likely to present with nasal infections than females (72.73%). However, females (54.55%) ranked high with *S. aureus* infection than males (38.10%), while males (16.67%) ranked high with *C. albicans* infection than females (2.27%). Also, males (21.43%) ranked high with co infection of *S. aureus* and *C. albicans* than females (15.91%). Nevertheless, the gender difference in nasal infections was statistically not significant.

Table 1. Frequency distribution of the nasal screened samples for infections

Screened nasal samples	Frequency	Percentage (%)
Total screened samples	86	100.0
Number of male	42	48.84
Number of female	44	51.16
Number positive for nasal infections	64	74.42
Number negative for nasal infection	22	25.58
Number positive for *S. aureus*	40	46.51
Number positive for *C. albicans*.	8	9.30
Number positive for co-infections	16	18.61

Table 2: Distribution of positive cultures of *S. aureus* and *C. albicans* from students according to gender

Gender	Frequency	Number positive for infections	Positive for S. aureus	Positive for C. albicans	Positive for S. aureus and C. albicans
Males	42	32 (76.19%)	16 (38.10%)	7 (16.67%)	9 (21.43%)
Females	44	32 (72.73%)	24 (54.55%)	1 (2.27%)	7 (15.91%)

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DISCUSSION

The present study showed that nasal infections are common with *S. aureus* having the greatest impact in student population. Carriage of *S. aureus* in the nose appears to play a key role in the epidemiology and pathogenesis of infection and its prevalence and incidence is reported to vary according to the population studied. According to Kluytmans et al. (1997), nasal carrier of *S. aureus* in different population ranges from 19.0 to 55.1% in the general population; 16.8 to 56.1% amongst health care workers; 14.3 to 52.5% amongst hospitalized patients; 11.1 to 76.4% amongst patients with diabetes; 14.3 to 84.4% amongst patients with renal failure; and 26.9 to 54.7 amongst HIV patients. In fact, *Staphylococcus aureus* has been recognized as an important disease pathogen in humans and an increasing number are caused by methicillin resistant *S. aureus* (MRSA) strains, which are now most often, multi-resistant, making therapeutic management more problematic (Rybak and LaPlante, 2005). In this regard, the prevention of staphylococcal infections has become more pertinent.

Although *Candida albicans* are considered as normal flora found in the mouth, throat, intestines and genitourinary tracts of most humans (Stanley, 2003), the low prevalence (9.30%) nasal *Candida albican* infection amongst students calls for attention. This is sequel to the fact that *C. albicans* is considered the main etiologic agent of candidosis an opportunistic infection, associated with local and systemic predisposing factors (Cannon et al., 1995; Neville et al., 1995). It has also been implicated in opportunistic mycoses and in systemic candidiasis, and has as well being isolated in 3% of reported cases of endocarditis (Jawetz et al., 1998). *C. albicans* are commonly found in the palate of total denture users, median rhomboid glossitis, immuno-compromised patients and those on treatment with antibiotics (Samaranayake and MacFarlane, 1990; de Paiva Martins et al., 2002).

Of interest also, is the co-occurrence of *Candida* and *Staphylococcus* in the screened nasal samples of apparently healthy students. The emerging trend in reported cases of *Candida* and *Staphylococcus* meningitis necessitates a rational screening for nasal *Candida* and *staphylococcal* species (Frans et al., 2003). Note however, that in this regard, there is paucity of information on populations like university undergraduates expected to practice high personal hygine, as most studies have been on hospitalized subjects whose infections are usually nosocomial (Benisheikh et al., 2012; Samuel et al., 2010).

Nevertheless, *S. aureus* and *C. albicans* are normal flora of the nostrils and usually pose no threat of infection, except in immune-compromised individual. However, unnecessary abrasions in a nostril with a heavy bacterial load of Staphylococci or aggravation by dissemination of polymorphonuclear lymphocytes containing viable Staphylococci in the region of the dangerous triangle of the nose may lead to hematogenous spread to the meninges of the brain, and invariably results in meningitis (Arrese *et al*., 2004; Kanev and Sheehan, 2003; Vajramani *et al*., 2005; Aimun *et al*., 2009).

Finally, the co-occurrence of *S. aureus* and *C. albicans* in the nostrils of individuals exposed to broad septrum antibiotics or highly active anti–mycotic agents, could lead to antimicrobial drug resistance and the survival of either of the species in high numbers. Thus, clinicians are advised to include screening tests for *C. albicans* in cases of chronic sinusitis and even in cases of otitis infection.

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AUTHOR(S) CONTRIBUTION

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