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Research Article

Incidence of Candidiasis Amongst Female Students of A Tertiary Institution in Rivers State Nigeria

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Abstract

Candida yeasts are normal flora of the female genital organ but they are held in check by normal body defenses together with other members of the normal flora. However, candidiasis could result when certain predisposing conditions are established. This study therefore investigated the incidence of candidiasis amongst female students of a tertiary institution in Rivers State. Forty (40) female residents in 4 campus hostels designated A, B, C, and D and one off-campus hostel (Control) were sampled using sterile swabs. The swabs were dipped into 10ml sterile normal saline to dislodge the yeasts; after which, aliquots of serially diluted samples were cultured on Sabuoraud dextrose agar (SDA) and incubated at 37°C for 24 - 48 hours. Yeast colonies that developed were counted and recorded, and purified colonies were identified using macroscopy, microscopy, and germ tube techniques. The yeast counts of Campus Hostels ranged from1.2 × 10^5 CFU/ml to 7.2 × 10^5 CFU/ml while counts of the control ranged from 1.9 - 6.2×10^5 CFU/ml. with Mean ± SD and percentage incidences of 4.9 ± 1.86 (25%), 3.4 ± 1.37 (18%), 4.6 ± 1.22 (24%), 2.7 ± 1.19 (14%) and 3.5 ± 1.48 (20%) for A, B, C, D, and control respectively. Incidence of *Candida* species during this study showed that of the 28 *Candida* species isolated, *Candida albicans* were 18 (64%) while other *Candida* species were 10 (25%). In conclusion, *Candida* infections among female hostel residents have been established in this study with *Candida albicans* confirmed to be the most implicated. Also, yeast incidence was different from one hostel to the other which could reflect the sanitary conditions of the hostels. Hence, good sanitation of the toilet systems and proper sanitary practices among the hostel residents should be advocated and effectively implemented due to the public health implication of this study.

Keywords: Incidence; Yeast; Candidiasis; Female; Normal-Flora; Tertiary Institution

Introduction

Candiasis is a common opportunistic fungal infection caused by yeasts, which affects mainly women [1]. It is more common and severe in women with weakened immune systems especially women under pregnancy [2]. The yeast organisms always implicated in candidiasis infection is *Candida* species which are endogenous in human occurring as part of the harmless commensals of the genital gastrointestinal and respiratory tracts, human oral and other surfaces [3].

Establishing *Candida* as the cause of virginitis can be a difficult task because as many as 50% of asymptomatic women do harbour the organisms as part of their endogenous vaginal normal flora, hence limitations of signs and symptoms in the diagnosis of vaginal infection has been recognized [3].

Fungal infection of the female lower genital tract (the valva and the vigina) is called vulvoviginal candidiasis and is caused by *Candida* species [4,5]. *Candida* species that causes vaginitis most often

are *C. albicans, C. glabrata* and *C. tropicalis*. *Candida* species are part of the flora of lower genital tract in 20 - 50% of healthy asymptomatic women. Carrier rates of *Candida* infections are higher in women treated with broad spectrum antibiotics [6], pregnant `and diabetic women [7] and women with HIV/AIDS [8]. *Candida albicans* is both the most frequent colonizer and responsible for most cases of vulvovaginal candidasis [6]. However cases of non-albicans species have been on increase over the last decades with *Candida glabrata* consistently being the leading species [9].

Candida albicans is most frequently implicated in most cases of vulvovaginal candidiasis [6]. The predisposing factors for both albicans and non-albicans candidiasis are pregnancy, diabetes mellitus and the use of broad spectrum antibiotics [33] as well as oral contraceptives with high oestrogen content [5]. Furthermore, poorly supported risk factors include use of sponge, intrauterine devices, diaphragms, condoms, oragenital sex, douching and intercourse [10,11] and diet with high glucose content [12].

Candida albicans and other non-albicans species had been isolated from several clinical specimens from different parts of Nigeria [13-15] as well as different parts of the world [16]. Previous studies had reported candidiasis in patients with underlying malingnancy), meningitis in Australia and in immune compromised patients with multifocal osteomyelitis in Germany. *Candida* species has been reported to cause abscesses in the brain [9] and hematogenous spread in immunocompromised patients and patients with vaginitis [17]. The differences in infections could be due to geographic, ethnic and socioeconomic factors as well as differences in sampling and culturing techniques. Variations may also reflect differences in sexual practice and environmental factors such as hygiene and nutrients [18].

Over the past several decades, the number of fungal infections, caused by yeast has dramatically increased, among them, the imperfect yeast, *Candida albicans* and several related *Candida species* are of foremost importance as opportunistic pathogens in immune compromised hosts and may cause life threatening infections [17]. Their incidence has greatly increased with the introduction of broad-spectrum antibiotics, immunosuppressive corticosteroids and anti-tumor agents [10].

Candida albicans is the yeast pathogen most frequently isolated from patients with virginitis. Recently, other species, including *C. tropicalis, C. glabrata, C. krussei* and *C. parapsilosis*, have been implicated in opportunistic infection of oral pharyngeal candidiasis [19,20]. Previous researcher reported that the incidence of invasive fungal infections have been on increase since 1980, especially in the large population of immune compromised patients and those hospitalized with serious underlying diseases [17].

Candida species belong to the normal microbiota of an individual mucosal cavity, gastrointestinal tract and vagina [15] and are responsible for various clinical manifestations from mucocutaneous over growth to blood stream infections [21]. The yeast is commensal in healthy humans and may cause systematic infection in immune-compromised situation due to their great adaptability to different host niches. The genus is composed of a heterogeneous group of organism, and more than 17 different *Candida species* are known to be etiological agents of human infections. Reports have it that more than 90% of invasive infections are caused by *Candida albicans, C. glabrata*, *C. tropicalis* and *C. krussei* [22].

The expanding population of immune compromised patients that use intravenous catheters, total parental nutrition, invasive procedures, and increasing use of broad spectrum antibodies, cytotoxic chemotherapies and transplantation are factors that contribute to the increases in candidiasis [23]. Pathogenicity of *Candida species* is attributed to certain virulent factors such as the ability to evade host defense, adherence, biofilm formation on tissue and medical devices, production of tissue-damaging hydrolytic enzymes [24].

Candida infections affect both men and women but women are more particularly susceptible to infections with *C. albicans* especially when they undergo stress due to poor diet, lack of sleep, illness or pregnancy [20,25,26]. A higher prevalence of virginitis is more often seen in pregnant women than in those not pregnant. The high incidence of virginal candidiasis during pregnancy can be explained by changes in the hormonal status of pregnant women resulting in increase in glycogen stored in the vaginal epithelium and by the depressed cellular immunity observed in pregnancy. The incidence increases during gestation [20,25,26].

Vulvovignal candidiasis is a prevalent opportunistic mucosal infection caused predominantly by *C. albicans*, although it is a virginal commensal. *C. albicans* can become a pathogen being a harmless infectious agent but in excessive growth could result in thrust characterized by intense irritation and soreness of the vulva accompanied by a thick, white chessy vaginal discharge. Growth of vaginal spe-

cies is suppressed by other microbiota [26]. However, if anything upsets the normal microbiota, *Candida* may multiply rapidly and produce candidiasis.

Several studies had been done in many countries of the world. In Greek, a research was carried out to evaluate candidiasis among female population and pregnant women and *C. albicans* was isolated more often among the pregnant group. Also, in India, research was carried out to determine the frequency of *Candida* species in women of different age groups as well as to suggest the criteria for the diagnosis of vulvoviginal candidiasis. Of the diseases of public health concern in Nigeria is the prevalence of virginal candidiasis among women and so requires periodic attention at different domain.

This study therefore was carried out to evaluate the incidence of candidiasis amongst female students of a tertiary institution with the view to predicting the public health significance of occurrence of *Candida* yeasts among the students population.

Materials and Methods

Study area

The study area was Port Harcourt in Rivers State, Nigeria. Sampling location was a tertiary Institution. Five sampling sites were chosen which represent four campus female hostels, A, B, C and D, and one Off-campus female hostel around the University campus to serve as control site.

Collection of samples

High vaginal swabs were randomly collected using sterile swab sticks to heavily swab inside the vagina, and immediately after swabbing, the swab stick was put into the swab tube to avoid external contamination. A total of 8 students were sampled from each site to give sample size of 40 students. The swab samples were taken to the Laboratory of the Institution for analysis within 2 hours of collection.

Media used

Sabouraud dextrose agar was used for cultivation of yeast organisms. The agar was prepared according to the manufacturer's instructions and the composition of the agar is: dextrose 40g, peptone 10g, agar 15g, distilled water I liter, pH 5.6. Normal saline was used as diluents and prepared according to the manufacturer's instructions. Sodium chloride was used for the preparation of the normal saline with the following composition: Sodium chloride 8.5g, distilled water I litre.

Cultivation of yeasts

For the purpose of cultivation of yeast organisms, serial ten-fold dilution of each swab samples was done by adding 10ml of sterile normal saline to the swab tube and properly shaken to dislodge the yeast organisms from the swab into the solution. From the initial solution, further serial dilutions were carried out up to 10^{-3} dilutions. After which, aliquot (0.1 ml) from the final dilution (10^{-3}) of each sample was transferred onto the surface of dried sterile SDA plates. The inoculum was spread plated evenly on the surface of the agar medium and the inoculated plates were incubated at 37^0C for 24 - 48 hours. After incubation, the yeast colonies were counted and recorded accordingly; colony morphology of *Candida* species were studied and noted. Suspected *Candida* species were sub-cultured onto fresh sterile SDA plates for purification and incubated at 37^0C for 24 - 48 hours.

Characterization of yeast isolates for identification

Pure isolates of *Candida* species were characterized and identified by gram staining, macroscopy by observing the colonial characteristics, microscopy using wet preparation, and germ tube production technique.

Results

Candida species occurred in varied numbers among the individuals sampled. Ranges of the yeast counts ($x10^5$cfu ml^{-1}) in the five sampling sites were: Off-Campus hostel 1.9 - 6.2, hostel A 2.4 - 7.2, hostel B 1.9 - 6.0, hostel C 2.8 - 6.1 and hostel D 1.2 - 2.9. Mean counts in each site were: Off-Campus hostel 3.5 ± 1.48 (20%), hostel A 4.9 ± 1.86 (25%), and hostel B 3.4 ± 1.37 (18%), hostel C 4.6 ± 1.22 (24%) and hostel D 2.7 ± 1.19 (14%). Twenty eight (28) yeast species were isolated with 18 species being *Candida albicans* and ten (10) being other *Candida* species.

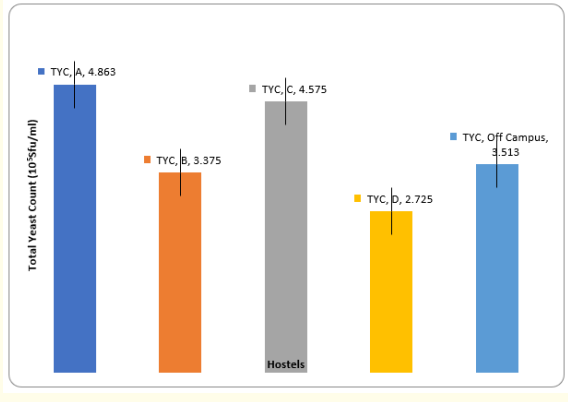

Figure 1

Discussion

The fact that candida infection of the female genital trait is one of the commonest sexually transmitted diseases and the most singular cause of vaginal discharge, it is well understood and calls for a more radical approach to its management. Vaginal candidiasis is an all-female disease especially those of the child-bearing age and pregnant women between the eyes of 18 and 25 years. This study focused on the occurrence of *Candida* species amongst female students with the view of establishing candidiasis infection among the students. Results showed that counts of *Candida* organisms were high in all of the individual cases. The lowest counts were obtained in hostel D whereas the highest counts were observed in hostel A. Mean counts of yeasts showed that hostel A had the highest yeast counts with 25% occurrence followed by hostel C with 24%, off-campus hostel 20% and hostel B had 18% occurrence with the least mean percentage counts of 14% in hostel D. The results showed that hostel A had highest counts of yeast organisms closely followed by hostel C next by off-campus hostel, hostel B whereas hostel D had the least yeast counts. However, yeast counts in this study were generally high in all the sampling sites which established candidiasis among the female student population sampled.

Of the 40 samples analyzed, 30 were non-pregnant women and 10 samples were pregnant women. All the thirty (30) non-pregnant women sampled were found to be infected with candidiasis due to high counts of yeasts. The 10 pregnant women also had high counts of *Candida* organisms which established *Candida* infection among the pregnant women. This study agreed with previous researchers who reported that candidiasis was more prevalent among pregnant women and women of active sexual age usually 18 to 35 years. For the thirty non-pregnant cases that had infection, the reason could be that their sexual practice and nutrition, predisposed them to infection by yeasts.

There is no exact known infectious dose of *C. albicans*. However, previous experiment conducted with mouse showed the infective dose (optimal inoculum) for *C. parapsilosis* was $0.9x10^5$cfu per mouse. The outcome of post mortem and histopathological examination presented fungal-specific lesions in multiorgans especially in kidneys, characterized by inflammation, micro-abscesses and fungal infiltration. The CFU counts were consistent with the histopathological changes in tissues. The yeast counts recorded in this study were higher than the infective dose reported by the previous researcher [27] which presents *Candida* infection.

Results of characterization of *Candida* species in this study showed that *Candida albicans* had the highest occurrence 64% compared to the other *Candida* species which had 36% occurrence lower than *Candida albicans*. Previous diagnosed cases showed that *Candida albicans* infection occurred in the vast majority of the patients while infections with other species occurred less frequently [28]. This is mostly due to the fact that a C. *albicans* infection stems from the commensal population of the organism in the human microflora. Candidiasis is caused by the abnormal growth of *C. albicans* which is usually due to an imbalance in the environment. Events that can spark an imbalance may include antibiotics use, which can decrease the amount of *Lactobacillus* bacteria which in turn decreases the amount of acidic products and the pH of the vagina. Other events are pregnancy, uncontrolled diabetes, impaired immune system and virginal irritation [29-32]. *C. albicans* are able to take advantage of the conditions and out-compete the normal microflora resulting in candidiasis or yeast infection.

In conclusion, this study established infection of candidiasis among the student population sampled. The study also revealed that *Candida albicans* was the most frequently occurring yeast implicated in the yeasts infection while the occurrence of the non-albicans species was less prevalent. Both non-pregnant and pregnant women had high incidence of the yeast infection due to high yeast load observed during the study. Generally, the incidence of candidiasis was high among female students throughout the period of this study. This could be due to poor sanitation of the students' toilet systems as well as poor personal hygiene. Many practitioners believe that nylon underwear and tight insulating clothing predispose to vaginal candidiasis by increasing the temperature and moisture of the vagina. This could also be the case in this study. Of public health concern is the high incidence of *Candida* species observed among the female students in this study. The findings of this investigation established the public health risk of *Candida* infection among the female inmates of the sampled hostels.

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