



Prevalence of Candidiasis among Pregnant and Non-Pregnant Women in Eleme and Okrika Local Government Areas of Rivers State

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Candidiasis is a common opportunistic fungal infection caused by yeast, which affects mainly women. The prevalence of candidiasis among pregnant and non-pregnant women in two Local Government Areas of Rivers State, Nigeria was investigated. A total of ninety-five women from ages of 18 to 46 years were selected for the study. The aim of this study was to determine the prevalence of vaginal candidiasis among pregnant and non-pregnant women in two Local Government areas of Rivers State. The study population included pregnant and non-pregnant women. Vaginal specimens were collected and cultured on Sabouraud Dextrose Agar (SDA) and also sub cultured on Hi Crome *Candida* differential Agar. The isolates obtained were subjected to gram staining, germ-tube test and sensitivity testing. Nystatin and fluconazole are used as antifungal agent. Identified *Candida*

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species using cultured technique include *Candida albicans*, *Candida glabrata*, *Candida tropicalis* and *Candida parapsilopsis*. Results further revealed a higher prevalence rate of candidiasis in pregnant women 29.4% compared to non-pregnant women 13.68%. Results of distribution of candidiasis according to trimester of pregnancy showed that *Candida albicans* and *Candida glabrata* were more prevalent in pregnant women while the distribution for non-pregnant women showed that *Candida albicans* were the most implicated species that causes vaginal candidiasis. Twenty-six *Candida albicans* species were subjected to germ-tube test and ten isolates were confirmed positive to germ-tube formation. This study showed lower rate of candidiasis in women due to high rate of personal hygiene and medical facilities provided and also the study showed a higher prevalence in pregnant women compare to non-pregnant women. The women at great risk were those between the ages of 26 to 35 years and in their third trimester. *Candida albicans* was the most prevalent vaginal *Candida* species across all age groups and trimesters. Appropriate health education is necessary to reduce candidiasis since poor hygiene can lead to opportunistic infection.

Keywords: *Candidiasis, vaginal candidiasis, Candida albicans, pregnant women and non-pregnant women.*

1. INTRODUCTION

“Candidiasis is an opportunistic infection caused by yeast-like fungus *Candida*. The most common yeast that causes this infection is *Candida albicans*. Candidiasis occurs when the normal number of fungi that reside in the vagina increases enough to cause symptoms. The clinical manifestations of vagina candidiasis are white vaginal discharge, swelling, pruritus, pain, irritation, burning sensation, superficial dyspareunia and dysuria. *Candida albicans* infection occurs in the vast majority of diagnosed cases while infection with other species such as *Candida glabrata* and *Candida tropicalis* occur less frequently” [1]. The female genital provides a satisfactory environment for many pathogenic microorganisms. This health condition can as well be present occasionally even in healthy women. Vaginal candidiasis may be physiological or pathological.

The prevalent rate of invasive fungal pathogens has increased, especially in the large population of immunocompromised patients like the pregnant women and diabetic patients with HIV/AIDS. The pregnant women are more vulnerable to vaginal infection because of alteration in the body as a result of hormonal changes which can increase the level of vaginal candidiasis or reoccurring situation. Approximately 60% of all the pregnant women experience yeast infection and 50% of them suffer recurrent event.

“This disease condition raises a lot of concern because of the threat to the well-being of the mother and child. Several studies have shown

that the prevalence of *Candida* among pregnant women is higher than in non-pregnant women, it tends to increase with the progression of the pregnancy especially from four months to seven months” [2]. “In pregnancy, the carrier rate is higher due to altered PH and sugar content in vaginal secretion. Increase in estrogen level during pregnancy produces more glycogen in the vagina and it has direct effect on yeast cell causing it to grow faster and stick more easily with the wall of vagina” [3]. This disease condition increases especially in the third trimester. This increase seems to be a trend in pregnant population due to increase level of estrogen and corticoids reducing the defence mechanism against such opportunistic infection [2].

Some predisposing factors that increase the risk of contact of moniliasis are pregnancy, prolonged use of broad-spectrum antibiotics, poor personal hygiene, diabetes, use of birth control pills, disorder that weakens the immune system such as HIV, the eating habit of a pregnant women (sugar rich content food) and pregnancy induced hormonal modification that alter the vaginal region to create an enrichment that is more favourable for yeast to grow. However, some health conditions can increase the risk of contacting vaginal candidiasis such as immunocompromised patient that use pregnancy control pills, intravenous catheters, total parental nutrition, cytotoxic chemotherapy and transplantation. Thus, transmission can occur from mother to child during delivery. Transmission occurs from the vagina of an infected mother to newborn giving rise to congenital *Candida* infection [4].

“Several studies have shown that vaginal candidiasis in pregnant women might be associated with increased risk of complications such as premature rupture of membrane, congenital cutaneous candidiasis, subsequent preterm labour, morbidity in pregnant women population, abortion, emotional stress and suppression of immune system which step up the risk of *Candida* species over growth and become pathogenic” [5].

The aim of this study was to determine the prevalence of vaginal candidiasis among pregnant and non-pregnant women in two Local Government areas of Rivers State.

2. MATERIALS AND METHODS

2.1 Study Area

The study was carried out in Eleme and Okrika Local Government Areas in Rivers State. Sampling location are Eleme and Okrika general hospitals.

2.1.1 Sample collection

High vaginal swabs were randomly collected using sterile swab sticks to heavily swab inside the vagina and immediately the swab sticks were replaced in their casings and labeled appropriately. A total of ninety-five high vaginal swabs samples were randomly collected from subjects attending Eleme and Okrika General Hospitals. Care was taken not to contaminate the samples by moving them immediately to the Microbiology Laboratory of Rivers State University, Port Harcourt before two hours for analysis.

2.1.2 Media used

Saboraud Dextrose agar (SDA) was used for the cultivation of organism. The agar was prepared according to manufacturer's instruction. Also Hi Crome *Candida* differential Agar was also used; for identification of *Candida* species by colour, shape and appearance.

2.1.3 Cultivation of organism

Samples were cultured on Saboraud Dextrose agar (SDA) containing two percent Chloramphenicol for fungal isolation. Inoculated plates were incubated at 37°C and examined after 48hrs for cream colored pastry colonies and

budding yeast cells suggestive of *Candida* species. Isolates from SDA were sub-cultured on HiCrome *Candida* differential agar (HiMedia, India) and incubated at 37°C for 48hrs. Colonies on HiCrome *Candida* differential agar were identified by colour, appearance and shape. This test was used for presumptive identification of *C. albicans*, *C. tropicalis* and *C. glabrata*. Agar well diffusion method was used to evaluate the antimicrobial activity of fluconazole and nystatin. The agar plate surface was inoculated by spreading a volume of microbial inoculums over the entire agar surface. Then a hole with a diameter of 6mm-8mm was pinched aseptically with a sterile cork borer and some volume of antifungal agent at desired concentration was introduced into the well. The agar plates are incubated under suitable conditions depending on the test microorganism. The antifungal agent diffuses in the agar medium and inhibits the growth of the microbial strain tested.

2.2 Biochemical Characterization

These tests were carried out according to CLSI [6] method. *Candida* spp were differentiated from other yeasts and were identified to species level using Gram stain, microscopy, antimicrobial susceptibility testing and germ-tube formation.

3. RESULTS

A total number of ninety-five samples were collected for isolation and identification of *Candida* species from both symptomatic and asymptomatic pregnant and non-pregnant women. Out of these, fifty patients were pregnant women while forty-five were non-pregnant women. The distributions of different *Candida* species were shown in Fig. 1. The age group showing the highest number of positive candidiasis was from 26 to 35 years age group Fig. 2. In the trimesters of pregnancy the carrier rate was high in the third trimester Table 1.

3.1 Antibiotic Susceptibility of *Candida* spp.

Invitro Susceptibility patterns of *Candida* species to Fluconazole (150 mg) and Nystatin(100 mg) was shown in Plate 1. Nystatin showed diameter of inhibition of 25 mm, 18 mm and 12 mm against *C. albican*, *C. glabrata*, and *C. tropicalis* respectively. Fluconazole showed diameter of inhibition of 18mm, 15mm and 10mm against. *C. albicans*, *C. glabrata*, and *C. tropicalis* respectively. Result revealed that nystatin is an effective curative agent.

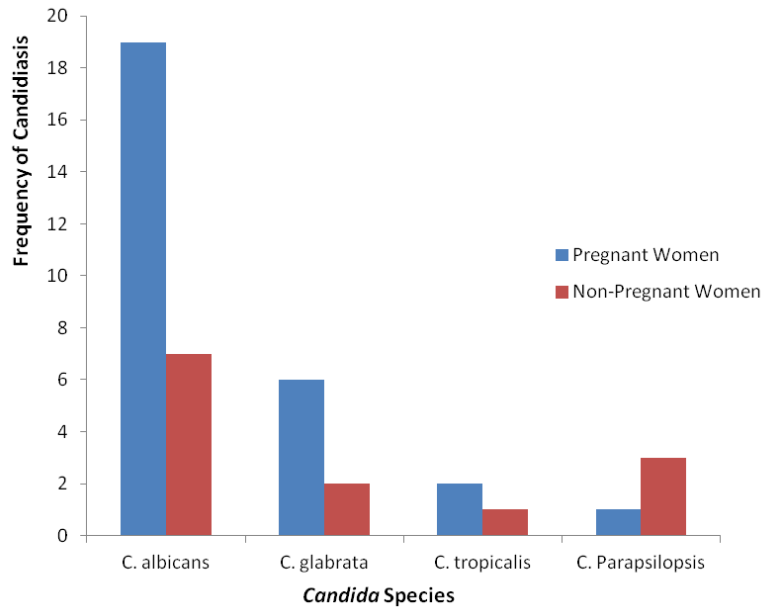


Fig. 1. Percentage of isolated *Candida* species among pregnant and non-pregnant women

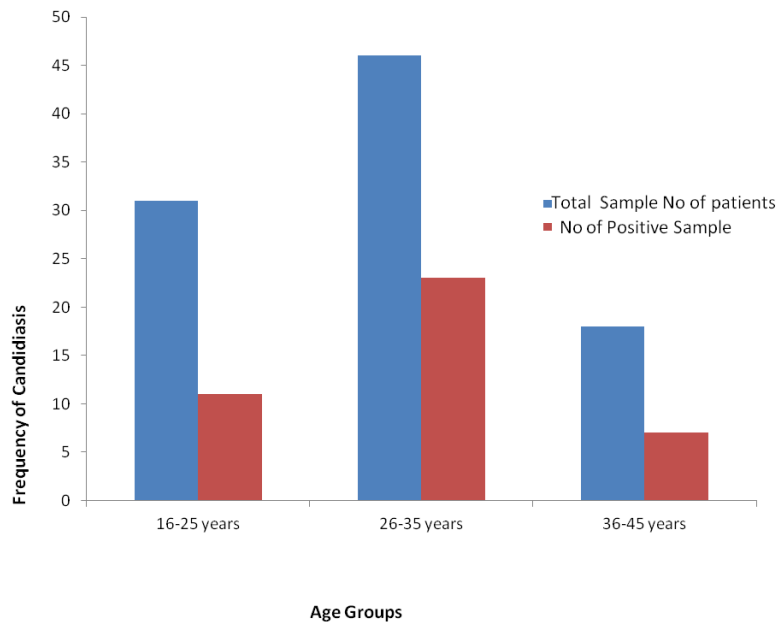


Fig. 2. Percentage of isolated *Candida* positive sample among age groups of pregnant and non-pregnant subjects

Table 1. Distribution of *Candida* species according to trimesters of pregnancy

Trimesters	Distribution of <i>candida</i> species				Total
	<i>C. albicans</i>	<i>C. glabrata</i>	<i>C. tropicalis</i>	<i>C. parapsilosis</i>	
1st trimester	2	0	0	0	2
2 nd trimester	5	2	0	0	7
3 rd trimester	12	4	2	1	19
Total	19	6	2	1	28

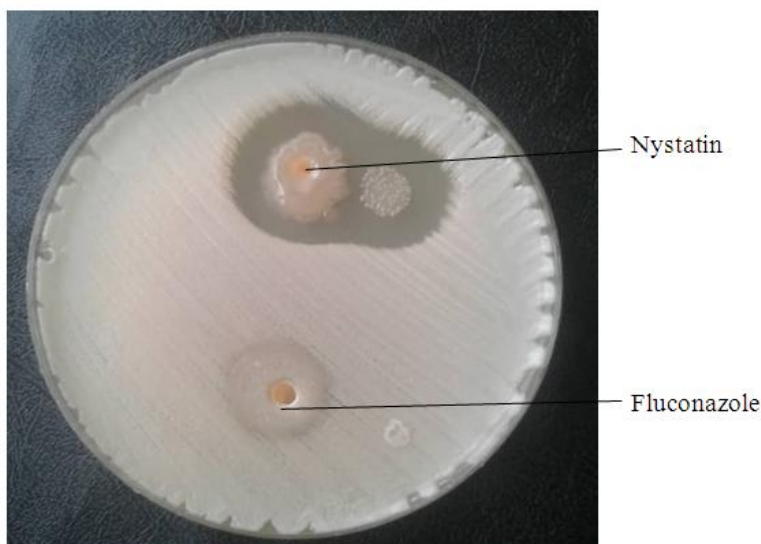


Plate 1. Antifungal susceptibility pattern using nystatin and fluconazole

4. DISCUSSION

This study investigated the prevalence of vaginal candidiasis among pregnant and non-pregnant women attending Eleme and Okrika General Hospitals over the period of six months. Three *Candida* species identified during the study were *C. albicans*, *C. glabrata* and *C. tropicalis*. These *Candida* species are pathogens and have been shown to cause infections in non-pregnant women and immunocompromised patients such as pregnant women [7]. *C. albicans*, *C. glabrata*, *C. tropicalis*, *C. parapsilosis*, *C. krusei* and *C. guilliermondi* basically constitute the genera of *Candida*. These species have been implicated in candidiasis with low prevalence in previous studies [1]. The study of Nelson *et al.* [8] showed “29.79% prevalence of vaginal candidiasis among pregnant women and 12.6% among non-pregnant women. This finding is in agreement with this research because the prevalence of vaginal candidiasis among pregnant and non-pregnant women are 29.47% and 13.68%, respectively”. The high prevalence of vaginal candidiasis among pregnant women may be due to many different reasons including suppression of the immune system due to the pregnancy, prolonged and misuse of antibiotics which lead to the destruction of good and beneficial bacteria resulting to reduction of vaginal immunity could have also contributed to the increase of the prevalence of the infection.

The highest prevalence of vaginal infections among pregnant and non-women was noted in the

age group 26 to 35 years. This observation in this study is consistent with reports of previous workers. Sehgal *et al.* [9] which reported a higher incidence rate within age group 26 to 35 years in Benin City. This reports documented that the age group is vulnerable probably, due to sexual promiscuity, drug abuse and use of contraceptives. A lower prevalence of the infection in pregnant women was reported within the age group 36 - 45 years and over 46 years age group with prevalence rates of 12% and 2%, respectively. This finding is in line with a previous report by Okungbowa *et al.* [10] which reported “a prevalence rate of 10% and 2% within the age groups of 36 to 45 and over 46 years, respectively. They reported that it was probably due to the possible increase in vaginal immunity with age”.

Susceptibility of nystatin to *Candida* species was analyzed as follows: nystatin was sensitive in 17 (41.5%) patients, susceptibility dose dependent in 5 (12.2%) patients and resistant in 19 (46.3%) patients with vaginal candidiasis.

Susceptibility of fluconazole to *Candida* species was analyzed as follows: fluconazole was sensitive in 10 (24.3%) patients, susceptibility dose dependent in 13 (31.7%) patients and resistant in 18 (43.9%) patients with vaginal candidiasis.

Antifungal susceptibility pattern showed that nystatin has the highest activity against fluconazole with a diameter of zone of inhibition of 25 mm, 18 mm and 12 mm against *C. albicans*, *C.*

glabrata, and *C. tropicalis* respectively. Fluconazole showed activity with diameter of zone of inhibition of 18 mm, 15 mm and 10 mm against *C. albicans*, *C. glabrata*, and *C. tropicalis* respectively. The percentage susceptibility of antifungal agent revealed that of the forty one isolates subjected to antifungal susceptibility testing, seventeen were sensitive to nystatin and ten were sensitive to fluconazole. This study further revealed that nyastatin had recorded the highest efficacy as a curative agent [11,12]. Some other study reported that *Candida* species were resistant to fluconazole, ketoconazole and econazole [13]. In the study of Akortha *et al.* (2011) 50% of *Candida* species were shown to be resistance to fluconazole. These results, however contradict the report of A-Aali, [14] who stated that *Candida* species were highly susceptible to fluconazole.

The germ-tube profile of the isolates showed that of the twenty-six isolates examined ten showed positive germ-tube formation while sixteen showed negative result. A short hyphal (filamentous) extension arising laterally from a yeast cell with no constriction at the point of origin shows positive result while no hyphal extension arising from a yeast cell or a short hyphal (filamentous) extension with constriction at the point of origin shows negative result .

5. CONCLUSION

Vaginal candidiasis was common in pregnant women in the third trimester and in the age group 26 to 35 years. It also occur less in non-pregnant women in the age bracket 26 to 35 years. This study showed lower rate of candidiasis in women due to high rate of personal hygiene and medical facilities provided; the study showed some prevalence in pregnant women because of the increase in estrogen level as a result of hormonal modification in pregnancy. *Candida albicans* was the most prevalent *Candida* species across all age groups and trimesters.

ETHICAL APPROVAL AND CONSENT

Well informed written consent was taken from each of the participant and ethical committee approval was also taken before start of the study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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