

The distribution frequency of *Candida* species in the genitourinary tract among symptomatic individuals in Nigerian cities

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Summary

A clinical survey was carried out in seven cities in the southern part of Nigeria to determine the relative distribution of genitourinary *Candida* species in symptomatic patients reporting for diagnosis and treatment. Seven *Candida* species were identified using the CHROMagar *Candida* method and the API 20C System. *Candida* species were represented by *Candida glabrata* (33.7%), *Candida albicans* (20.1%), *Candida tropicalis* (18%), *Candida guilliermondii* (17.8%), *Candida pseudotropicalis* (5%), *Candida parapsilosis* (5%), and *C. albicans* var. *stellatoidea* (1.2%). The distribution of these species among the various age groups (15-20, 21-25, 26-30, 31-35, 36-40 and 41 plus years) was statistically insignificant. Out of the 517 positive samples, 182 (35%) were found in the age group 26-30 years, while age 41 plus had the lowest frequency (1.2%). The results presented show that *C. albicans*, usually reported to be the most frequently isolated species, is not the main species in the cities studied. With *C. glabrata* in preponderance, the finding supports recent studies reporting that several pathogenic non-*C. albicans* species are now being frequently isolated. The level of social activities, such as drug abuse and sexual promiscuity, may be important in the distribution frequency of *Candida* species in different age groups and locations.

Key words

Candida species, Distribution, Symptomatic patients

Distribución de especies de *Candida* en el tracto genitourinario de individuos con sintomatología en algunas ciudades de Nigeria

Resumen

Se ha realizado un estudio clínico en siete ciudades del sur de Nigeria para determinar la distribución relativa de *Candida* en el tracto genitourinario de pacientes con sintomatología. Se identificaron siete especies de *Candida* mediante el cultivo en CHROMagar *Candida* y el sistema API 20C. Las especies aisladas fueron *Candida glabrata* (33,7% de los aislamientos), *Candida albicans* (20,1%), *Candida tropicalis* (18%), *Candida guilliermondii* (17,8%), *Candida pseudotropicalis* (5%), *Candida parapsilosis* (5%) y *C. albicans* var. *stellatoidea* (5%). La variación de la distribución según el grupo de edad estudiado (15-20, 21-25, 26-30, 31-35, 36-40 y más de 41 años) no era significativa. De las 517 muestras positivas, 182 (35%) procedían del grupo de 26-30 años, mientras que el grupo de más de 41 años era el que menor frecuencia de aislamientos presentaba (1,2%). Los resultados muestran que *C. albicans*, generalmente aislada con mayor frecuencia, no era la más abundante en las ciudades estudiadas. Con *C. glabrata* como especie predominante, nuestros hallazgos apoyan otros informes recientes de que otras especies del género *Candida* patógenas diferentes a *C. albicans* están aislándose con mayor frecuencia. Actividades como el abuso de drogas o la promiscuidad sexual pueden ser factores de importancia que contribuyan en la frecuencia de distribución de la especie de *Candida*.

Palabras clave

Especies de *Candida*, Distribución, Pacientes con sintomatología

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Candida is a member of the class Ascomycetes, predominantly forming unicellular yeast-like cells and in some cases, mycelia [1,2]. *Candida* species are widespread in distribution, ranging from pure saprobes through endosymbionts of animals, to being pathogenic in many animals and humans. *Candida* has also been isolated from soil [3], and the use of molecular approach to determine biodiversity has revealed the presence of many *Candida* species in soil and other environmental samples (Isikhuemhen *et al.* -unpublished). It is usually part of the normal flora in the mouth, vagina, skin and gut of man [3-5], and some like *Candida utilis* are used in food and single-cell protein production. Pathogenic *Candida* infections mainly occur as opportunistic infections due to altered conditions of the host, and at these altered conditions the fungus proliferates faster [6]. *Candida* is found in the vagina of 35% [7] to 50% [5] of healthy women. Under some conditions, such as reduced immunity, prolonged antibiotic therapy, use of drugs, malnutrition, pregnancy, use of oral contraceptives, diabetes and obesity, *Candida* may become pathogenic and cause candidiasis.

Sexual intercourse with infected persons is the most common mode of spread of genital candidiasis [5,8,9]. *Candida* species are the fourth most commonly isolated bloodstream pathogens in the United States hospitals [10]. Many people, especially in developing countries like Nigeria, are uninformed about the factors that can cause *Candida* to become pathogenic, proliferate and result in candidiasis.

This study was aimed at documenting the occurrence of *Candida* species within different age groups and the influence of sexual activity on such distribution, in patients with clinical manifestations of genital candidiasis, reporting to hospitals and private medical diagnostic laboratories.

Materials and methods

Collection of samples. Clinical specimens (mainly genital swabs) were collected from patients reporting to hospitals and medical diagnostic laboratories for symptoms of genital candidiasis, i.e., itching and/or frothy vaginal discharge [5,11].

Samples were collected in seven cities located in the southern rainforest and middle belt wooded savanna zones of Nigeria. The cities located between latitudes 5 to 7.5°N and longitudes 3.5 to 7°E were Abeokuta, Benin City, Lagos, Okene, Onitsha, Port Harcourt and Warri. Those from whom samples were collected in hospitals were physician-referred, while in the private laboratories the patients were either physician-referred or self-referred. Information on patient's age was recorded at the time of collection. The ages of the subjects were classified into six categories (15-20, 21-25, 26-30, 31-35, 36-40, 41 and above years). Each collected specimen was examined microscopically by wet preparation direct mount. *Candida*-positive swab samples were put back into their plastic cases containing about 5 ml normal saline. These swabs and the urine samples were maintained at room temperature and used for culture isolation. A total of 902 genital samples were cultured and examined, out of which 517 were positive for *Candida*. Among these samples, 480 were high vaginal swabs (HVS), 22 endocervical swabs (ECS) and 15 urine samples. The number of positive samples from females was 512 and from males, five.

Preparation of cultures. Samples were cultured in the laboratory on Sabouraud glucose agar (SIFIN,

Germany) at 37 °C. The cultures were examined for *Candida* presence after 48 h incubation. *Candida* was identified by its usual spherical-oval cells with terminal, subterminal or multipolar budding, and sometimes hyphae, under the x40 magnifying lens of a light microscope. *Candida* cultures were identified to the species level using CHROMagar *Candida* plates (France) [12,13] and the API 20C System (Analytab Products, USA) [14]. Identified *Candida* cultures were subcultured onto sterile Sabouraud glucose agar in McCartney bottles and stored at 15 °C for use in further studies.

The Duncan multiple range test was used to test the incidence of occurrence between some age groups.

Results and Discussion

The results obtained show that the age bracket 26-30 years had the highest frequency of *Candida* positive samples, followed by the age group 21-25. Age 41 and above recorded the lowest frequency. The highest frequency in the age group 26-30, closely followed by the age group 21-25 (Figure and table 1) supports the report of Ako-Nai *et al.* [9], which found that the age group 20-25 years is the group in which genital candidiasis occurs most frequently. They also suggested a link between the disease and sexual activity. The same factor could have played a role in the group 20-30 years of age, which represents 327 (63.2%) of the cases. This is also in agreement with the finding of Sehgal [15]. This author reported an occurrence of 54% of genitourinary tract infections (including genital candidiasis) in Northern Nigeria to be in the age group 21 - 30 years. Duncan multiple range test showed that there was a significant difference in the frequency of isolation of *Candida* between the age groups 21-25 and 26-30 years at 95% probability. Also, Enweani *et al.* [16] showed that a high number (40.7% of total samples) of asymptomatic female students of the University of Jos, Nigeria, had vaginal candidiasis. These reports point to this age group as a vulnerable group probably due to sexual promiscuity, drug abuse and use of contraceptives.

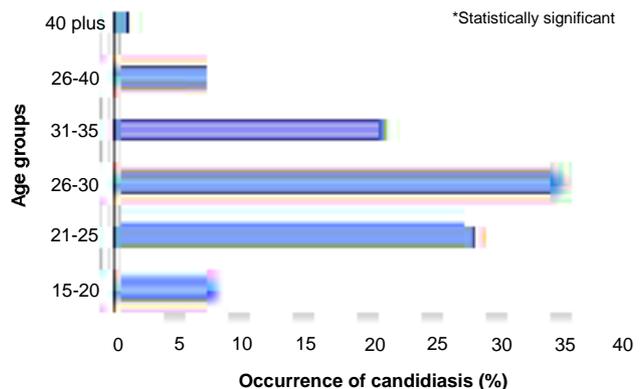


Figure. Frequency of *Candida* positive samples by age of individuals.

Seven *Candida* species were isolated from 517 positive samples out of the 902 total genital samples collected. This shows that not all symptomatic cases were due to *Candida* and agrees with the finding of Bergman and Berg [17].

Table 1. Distribution of *Candida* species within different age groups in 517 patients with genitourinary candidiasis.

Age group	<i>C. albicans</i> no. (%)	<i>C. glabrata</i> no. (%)	<i>C. tropicalis</i> no. (%)	<i>C. pseudotropicalis</i> no. (%)	<i>C. guilliermondii</i> no. (%)	<i>C. parapsilosis</i> no. (%)	<i>C. albicans</i> var. <i>stellatoidea</i> no. (%)	Total in age group no. (%)
15-20	9 (22.9)	10 (25)	10 (25)	0	11 (27.5)	0	0	40 (7.7)
21-25	28 (19.3)	61 (42.1)	29 (20)	3 (2.1)	20 (13.8)	4 (2.8)	0	145 (28)
26-30	41 (22.5)	69 (37.9)	29 (15.9)	11 (6)	23 (12.6)	9 (4.9)	0	182 (35)
31-35	19 (17.6)	26 (24.1)	15 (13.9)	8 (7.4)	33 (30.6)	7 (6.5)	0	108 (21)
36-40	6 (16.7)	8 (22.2)	9 (25)	3 (8.3)	4 (11.1)	2 (5.6)	4 (11.1)	36 (7)
41 plus	2 (33.3)	1 (16.7)	1 (16.7)	0	1 (16.7)	0	1 (16.7)	6 (1.2)

Table 2. Distribution of *Candida* species in 517 genitourinary candidiasis patients in different geographical regions.

Cities	<i>C. albicans</i> no. (%)	<i>C. glabrata</i> no. (%)	<i>C. tropicalis</i> no. (%)	<i>C. pseudotropicalis</i> no. (%)	<i>C. guilliermondii</i> no. (%)	<i>C. parapsilosis</i> no. (%)	<i>C. albicans</i> var. <i>stellatoidea</i> no. (%)	Total in city no. (%)
Abeokuta	4 (3.8)	14 (8)	4 (4.3)	0	10 (10.9)	0	0	32 (6.2)
Benin	24 (22.9)	31 (17.7)	20 (11.4)	4 (16)	23 (25)	6 (27.3)	1 (20)	109 (21)
Lagos	26 (24.8)	39 (22.3)	23 (24.7)	6 (24)	13 (14.1)	5 (22.7)	2 (40)	114 (22)
Okene	7 (6.7)	4 (2.3)	1 (1.1)	0	2 (2.2)	3 (13.6)	0	17 (3.3)
Onitsha	12 (11.4)	17 (9.7)	10 (10.8)	5 (20)	13 (14.1)	4 (18.2)	0	61 (11.8)
Port Harcourt	21 (20)	32 (18.3)	14 (15.1)	5 (20)	21 (22.8)	0	0	93 (18)
Warri	11 (10.5)	38 (21.7)	21 (22.6)	5 (20)	10 (10.9)	4 (18.2)	2 (40)	91 (17.6)

C. glabrata had the highest frequency of occurrence (Table 1). This is in contrast to earlier reports [16,18], which found that *C. albicans* was the most frequent species. Enweani *et al.* [19] reported the percentages of *C. albicans*, *C. glabrata*, *C. tropicalis*, *C. pseudotropicalis*, *C. guilliermondii* and *C. albicans* var. *stellatoidea*, isolated from HVS in 500 volunteers in Edo State, to be 38.4%, 1.0%, 2.2%, 4.0%, 2.4%, and 3.0%, respectively. Our results from Benin City, the Capital of Edo State (22.9%, 17.7%, 11.4%, 16.25%, and 20%, respectively), for the above isolates are significantly different from those of Enweani *et al.* [19]. This may have resulted from the difference in population types. Enweani *et al.* [19] sampled women who use contraceptives. The use of contraceptives is a factor that can influence the types and distribution frequency of *Candida* species [1,3,6,14,16,18]. A high rate of frequency of *C. guilliermondii* was recorded. This might have been due to the effect of drugs, which have predisposed the human body to colonization by this not-too-common species. *C. glabrata* also had the highest occurrences in the age groups 21-25 years (42%) followed by the age group 26-30 years (37.4%). The distribution of the various *Candida* species among the different age groups was statistically insignificant.

Lagos, Benin, Port Harcourt and Warri had high frequencies of *Candida* species. Okene recorded lower frequencies (Table 2). These cities with high frequencies are highly populated, with a lot of social activities (like drug abuse and sexual promiscuity), which could promote

the spread of candidiasis. On the other hand, Okene is a muslim-dominated city thus socio-cultural factors might have affected the number of patients who sought medicare.

Conclusion

Proper diagnosis of symptomatic cases for genitourinary candidiasis should be done since symptoms might be due to causes other than *Candida* or a combination of *Candida* and other factors. This study has shown that *C. glabrata* is more predominant in the surveyed area than *C. albicans*, which is usually reported in literature to be the commonest species in man. A wider survey across the entire country, involving both symptomatic and apparently healthy individuals, will reveal more information on the frequency of different *Candida* species in Nigeria. We want to, by this communication, bring our findings to the knowledge of the Nigerian authorities and agencies that can help funding further research we are conducting on epidemiology, conventional and molecular identification, phylogeny and drug resistance among isolates of *Candida* spp.

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References

1. Carlsen G. The *Candida* Yeast Answer. Provo, Candida Wellness Center, 2001.
2. Stafford P. Dimorphism in *Candida albicans*, Part I. Educational Instructional Library, American Society for Microbiology, 2000.
3. Greenwood D, Slack RCB, Peutherer JF. Medical Microbiology. A guide to microbial infections: pathogenesis, immunity, laboratory diagnosis and control (14th ed). London, Churchill Livingstone, 1992.
4. Grigoriu D, Delacretaz J, Borelli D. Medical Mycology. Lausanne, F. Hoffmann-La Roche & Co Limited, 1987.
5. Mabey D, Richens J. Sexually transmitted diseases. In: Cook G (ed.) Manson's Tropical Diseases (20th ed). Educational Low-Priced Books Scheme, 1996: 323-349.
6. Konnikov N. Fungal resistance and the relevance of susceptibility. Proceedings of The Meeting of the American Academy of Dermatology. March 19-24, New Orleans, 1999.
7. Elegbe IA, Botu M. Direct microscopical versus cultural method in screening for candidiasis among non gravid Nigerian women. Mycopathologia 1982; 79: 137-139.
8. Ogunbanjo BO. Isolation of yeast from male contacts of women with vaginal candidosis. Genitourin Med 1988; 64: 135-136.
9. Ako-Nai AK, Kassim OO, Adeniram MO, Taiwo O. A study of urinary tract infections at Ile Iife, Nigeria. East African Med J 1993; 70: 10-14.
10. Jones RN, Marshall SA, Pfaller MA. Nosocomial enterococcal blood stream infections in the SCOPE program: antimicrobial resistance, species occurrence, molecular testing results, and laboratory testing accuracy. Diagn Microbiol Infect Dis 1997; 29: 95-102.
11. Konje JC, Otolorin EO, Ogunniyi JO, Obisesan KA, Ladipo OA. The prevalence of *Gardnerella vaginalis*, *Trichomonas vaginalis* and *Candida albicans* in the cytology clinic at Ibadan, Nigeria. African J Med and Med Sci 1991; 20: 29-34.
12. Pfaller MA, Houston A, Coffmann S. Application of CHROMagar Candida for rapid screening of clinical specimens for *Candida albicans*, *Candida tropicalis*, *Candida krusei* and *Candida glabrata*. J Clin Microbiol 1996; 34: 58-61.
13. Houang ET, Chu KC, Koehler AP, Cheng AF. Use of CHROMagar Candida for genital specimens in the diagnostic laboratory. J Clin Pathol 1997; 50: 563-565.
14. Rex JH, Pfaller MA, Barr AL, Nelson PW, Webb CD. Antifungal susceptibility testing of isolates from a randomized multicenter trial of fluconazole versus amphotericin B as treatment of non-neutropenic patients with candidemia. Antimicrob Agents Chemother 1995; 39: 40-44.
15. Sehgal SC. Epidemiology of male urethritis in Nigeria. J Trop Med Hyg 1990; 93: 151-152.
16. Enweani IB, Ogbonna CI, Kozak W. The incidence of candidiasis amongst the asymptomatic female students of the University of Jos, Nigeria. Mycopathologia 1987; 99: 135-141.
17. Bergman JJ, Berg AO. How useful are symptoms in the diagnosis of candidal vaginitis? J Fam Pract 1988; 16: 509-511.
18. Gughani HC, Nzelibe FK, Gini PC, Chukudebelu WO, Njoku-Obi AN. Incidence of yeasts in pregnant and non-pregnant women in Nigeria. Mycoses 1989; 32: 131-135.
19. Enweani IB, Gughani HC, Okobia R, Ojo SB. Effect of contraceptives on the prevalence of vaginal colonization with *Candida* species in Edo State, Nigeria. Rev Iberoam Micol 2000; 18: 171-173.