RESEARCH ARTICLE

EXAMINING THE INCIDENCE OF CANDIDA ALBICANS AND TRICHOMONAS VAGINALIS AMONG PREGNANT WOMEN IN RURAL COMMUNITIES OF KOGI STATE

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Abstract

Candida albicans and Trichomonas vaginalis are Candida albicans and Trichomonas vaginalis are fungal infections that are raising health concerns. The study's objective was to examine the incidence of C. albicans and T. vaginalis infections among pregnant women in the rural communities of Kogi state. A total of three hundred and thirty-six women who attend antenatal care in public health institutions participated in the study. The study samples were pooled from the participants through their consulting physicians. The Analysis conducted on the samples showed that 61.3% of the total samples tested positive for C. albicans, 5.1% tested positive for T. vaginalis, and 33.6% were negative for both infections. However, no co-occurrence was reported. The study concludes that the disease is prevalent in Kogi state and recommends a robust enlightenment approach.

Introduction:

Fungal infections are a public health issue that is currently becoming prevalent in our society and contribute to morbidity and mortality in healthy and immunocompromised individuals, respectively (Richardson & Moyes, 2015; Tong & Tang, 2017). It affects immunocompromised and uncompromised because they can increase under nutrient-rich and nutrient-poor conditions (van Ende et al., 2019). The polymorphic fungus Candida albicans is a member of the average human microbiome (Mayer et al., 2013) and the most common opportunistic fungal infections (Bakhtiari et al., 2019; Kornitzer, 2019). Candida albicans have evolved to persist in the numerous challenging niches of the human body(Nikou et al., 2019). Over the years, evidence has implicated Candida albicans as one of the primary causal agents of health-threatening invasive infections with increased mortality (Chen et al., 2020). Candida albicans is a commensal resident of the human gastrointestinal and genital tracts (Desai, 2018) and the most common cause of nosocomial fungal urinary tract infections (Behzadi et al., 2015). Also, Candida albicans have the potential of invading the gut epithelium barrier via microfold cells and enter the bloodstream (Tong & Tang, 2017).

Vaginal candidiasis is frequent in pregnant women and is associated with sepsis and adverse neonatal outcomes (Ghaddar et al., 2020). Pregnant women are more susceptible to vaginal candidiasis, which may lead to pregnancy complications like abortions, premature birth, low birth weight, and other morbidities (Ocan et al., 2018; Rai et al., 2017).

Trichomonas vaginitis is the most common nonviral sexually transmitted infection with symptoms ranging from foamy vaginal discharge, dysuria, and spotting (Meites et al., 2015; Segal et al., 2018). Trichomonas vaginitis is a
flagellated protozoan that has been associated with the vaginal pathogen and is typically located in the lower genitourinary tract. It has been recovered from the vagina, skin glands, Bartholin glands, and urethra of the female. *Trichomonas vaginalis* is transmitted by sexual contact. Approximately eight percent of female sexual partners of infected males become infected. However, research indicates that it is identified more frequently in pregnant women than in nonpregnant women (Han et al., 2019). *Trichomoniasis* infection is highly associated with the presence of other sexually transmitted diseases (STDs) such as gonorrhea. If contacted before or during pregnancy, this infection can cause serious health problems through preterm labor, premature rupture of the membrane, and neonatal infection (Elgebe, 2003). *Trichomonas vaginalis* has been isolated from the respiratory tract of infants with respiratory disease and the conjunctivae of several infants with conjunctivitis in newborns. Evidence suggests that the infants become infected during vaginal deliveries of infected mothers.

**The present study**

Evidence from Nigeria literature shows that *Candida albicans* and *Trichomonas vaginalis* is among the leading cause of infections among women and especially pregnant women (Adeoye & Akande, 2007; Akerele et al., 2002; Bello, 2012; Chigbu et al., 2006; Chuku et al., 2019; Mbakwem-Aniebo et al., 2020; Nnaemeka et al., 2016; Nwosu & Djiyep, 2007; Obijuru & Ogbulie, 2005; Okonko et al., 2012; Udoh et al., 2020). An observation of the awareness of rural women in Kogi state, especially women attending ante-natal care in health institutions about the existence of *Candida albicans* and *trichomonas vaginalis*, shows that *C. albicans* and *T. vaginalis* could be responsible for the widely reported poor health care among pregnant women. Consequently, the scarcely identified *C. albicans* and *T. vaginalis* awareness programs in the state's education programs could be attributed to the lack of documented evidence relating to the distribution of *C. albicans* and *T. vaginalis* in Kogi state. Thus, this present study is aimed to determine the prevalence of infection among pregnant women in the rural communities of Kogi state of Nigeria. Therefore, the study's primary objective is to determine the extent of infection of *candidiasis* and *trichomoniasis* in pregnant women in Kogi state.

**Method:**

Three hundred and thirty-six (n=336) pregnant women attending antenatal care in public health institutions across Kogi state were randomly selected as the study participants. The study was conducted between December 2020 and February 2021. A cross-sectional survey design was adopted. The participant's ages ranged between 30 and 45 years.

**Sample collection and analysis**

The study participants were recruited with the aid of clinicians attending to pregnant patients in the public health centers. A total of three hundred and fifty pregnant women were briefed on the purpose of the study in various ante-natal centers. However, three hundred and twenty-three consented to the study and were given the swab for sample collection. The samples were collected by the ante-natal care provider and were stored adequately for our retrieval. The samples were further subjected to laboratory analysis using the standard procedure similar to Udoh et al. (2020).

**Result:**

| Test result       | N  | %   |
|-------------------|----|-----|
| Candidiasis       | 206| 61.3|
| Trichomoniasis    | 17 | 5.1 |
| Non-infected      | 113| 33.6|
| Total             | 336| 100 |

The above table shows that the total number of infected participants supersedes the non-infected participants. A total of two hundred and six (n=206), representing 61.3% of the study’s total population, tested positive for candidiasis caused by the *C. albicans*. Seventeen (n=17) of the population (5.1%) tested positive for *T. vaginalis*. While one hundred and thirteen (n=113) representing (33.6%) tested negative for both diseases.

**Discussion:**

The primary objective of the current study was to determine the prevalence of *C. albicans* and *T. vaginalis* infections using a sample of women who are attending ante-natal care in the state's public health facilities. A total of three hundred and thirty-six vaginal specimens were pooled from participants through their consulting physicians.
The analysis conducted on the samples showed that in all, two hundred and six of the total vaginal specimens representing 61.3% of the whole samples tested positive for *C. albicans*, while seventeen representing 5.1% tested positive for *T. vaginalis*. However, one hundred and thirteen of the samples representing 33.6% were confirmed negative for neither of the fungi. Consistent with a previous study (Nwosu & Djieyep, 2007), there was no reported co-occurrence of the infection among the participants. However, the finding supported literature affirming the occurrence of this infection in women. For example, (see., Adeoye & Akande, 2007; de Paula Glehn et al., 2016; Mishra & Jain, 2020; Nwosu & Djieyep, 2007; Okonko et al., 2012; Yu et al., 2018). Evidence has shown that *C. albicans* is the primary cause of yeast infection that can be passed to the baby during delivery. More so, *T. vaginalis* has been linked with adverse pregnancy experiences comprising ruptures and preterm birth. However, research has documented several risk factors underlying *C. albicans* and *T. vaginalis* infections, and the probable remedial recommendations have been extensively stated (e.g., Glehn, Ferreira, Da Silva, & Machado, 2016; Konadu, et al., 2019; Abdul-Aziz et al., 2019; Bolumburu, et al., 2020; Gor, 2018). For instance, the high incidence of *C. albicans* and *T. vaginalis* infections is linked to poor personal hygiene and the composition of the female vaginal organ, which favors penetration and the installation of the infection. (Payne et al., 2020).

**Practical implication**

The study contributes to the infectious disease literature by providing evidence of the prevalence of *albicans* and *T. vaginalis* infections in Kogi state. The study also provides valuable data to the Maternal and Child Survival Program (MCSP) of the United States Agency for International Development (USAID), which aims to improve maternal, newborn, and child health outcomes and other relevant health promotion agencies.

**Conclusion:**

The present study was aimed to examine the prevalence of *C. albicans* and *T. vaginalis*. Consequently, the findings showed that the incidence of the infections persists in the study parameter. It is concluded that *C. albicans* and *T. vaginalis* infections as a public health concern are pervasive among pregnant women in the rural communities of Kogi state. Perhaps, this revelation is novel given the unavailability of documented data. Thus, it is recommended that robust enlightenment programs be instituted to inform women about the infection and overcome it. Furthermore, as Nsofor et al. (2016) noted, the public should be enlightened on the dangers of tight underwear and indiscriminate use of antibiotics as measure to decrease the incidence of the disease.

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**References:**

1. Abdul-Aziz, M., Mahdy, M., Abdul-Ghani, R., & al., e. (2019). Bacterial vaginosis, vulvovaginal candidiasis, and trichomonas vaginitis among reproductive-aged women seeking primary healthcare in Sana'a city, Yemen. BMC Infectious Disease.
2. Adeoye, G. O., & Akande, A. H. (2007). Epidemiology of *Trichomonas vaginalis* among women in Lagos Metropolis, Nigeria. Pakistan Journal of Biological Sciences, 10(13). https://doi.org/10.3923/pjbs.2007.2198.2201
3. Akerele, J., Abuhulimen, P., & Okonofua, F. (2002). Prevalence of asymptomatic genital infection among pregnant women in Benin City, Nigeria. African Journal of Reproductive Health, 6(3). https://doi.org/10.2307/3583261
4. Bakhtiari, S., Jafari, S., Taheri, J. B., Kashi, T. S. J., Namazi, Z., Iman, M., & Poorberafeyi, M. (2019). The effects of cinnamaldehyde (Cinnamon derivatives) and nystatin on *Candida albicans* and candida glabrata. Open Access Macedonian Journal of Medical Sciences, 7(7). https://doi.org/10.3889/oamjms.2019.245
5. Behzadi, P., Behzadi, E., & Ranjbar, R. (2015). Urinary tract infections and candida albicans. Central European Journal of Urology, 68(1). https://doi.org/10.5173/ceju.2015.01.474
6. Bello, O. (2012). Prevalence of Vaginal Pathogens Associated with Genital Tract Infections in Ogun State, Nigeria. British Microbiology Research Journal, 2(4). https://doi.org/10.9734/bmrij/2012/1481
7. Bolumburu, C., Zamora, V., Muñoz-Algarra, M., Portero-Azorín, F., Escario, J. A., & Ibáñez-Escribano, A. (2020). *Trichomoniasis in a tertiary hospital of Madrid, Spain (2013–2017): prevalence and pregnancy rate, coinfections, metronidazole resistance, and endosymbiosis*. Parasitology Research volume, 1915–1923.
8. Chen, H., Zhou, X., Ren, B., & Cheng, L. (2020). The regulation of hyphae growth in Candida albicans. In Virulence (Vol. 11, Issue 1). https://doi.org/10.1080/21505594.2020.1748930
9. Chigbu, L. N., Aluka, C., & Eke, R. A. (2006). Trichomoniasis as an indicator for existing sexually transmitted infections in women in Aba, Nigeria. Annals of African Medicine, 5(1). https://doi.org/10.4103/0331-3131.84218

10. Chuku, A., Yami, A. L., & Bukola, A. (2019). Prevalence of Candida Species from Cases of Vulvovaginitis in Women using Contraceptives in Four Selected States of North Central Nigeria. Journal of Advances in Microbiology. https://doi.org/10.9734/jamb/2019/v18i330174

11. de Paula Glehn, M., Sá Ferreira, L. C. E., da Silva, H. D. F., & Machado, E. R. (2016). Prevalence of *Trichomonas vaginalis* and *Candida albicans* among Brazilian women of reproductive age. Journal of Clinical and Diagnostic Research, 10(11). https://doi.org/10.7860/JICDR/2016/21325.8939

12. Desai, J. v. (2018). *Candida albicans* hyphae: From growth initiation to invasion. In Journal of Fungi (Vol. 4, Issue 1). https://doi.org/10.3390/jof4010010

13. Elgebe, J. (2003). Antiviral Caffeoyl Ester from *Spondias Mombin*. Phytochemistry Journal.

14. 31(23), 79-83

15. Ghaddar, N., Anastasiadis, E., Halimeh, R., Ghaddar, A., Dhar, R., Alfozuan, W., Yusef, H., & el Chaar, M. (2020). Prevalence and antifungal susceptibility of *Candida albicans* causing vaginal discharge among pregnant women in Lebanon. BMC Infectious Diseases, 20(1). https://doi.org/10.1186/s12879-019-4736-2

16. Glehn, M. P., Ferreira, L. C., Da Silva, H. D., & Machado, E. R. (2016). Prevalence of *Trichomonas vaginalis* and *Candida albicans* among Brazilian Women of Reproductive Age. Journal of clinical and diagnostic research.

17. Gor, H. B. (2018, Dec 4). What causes vaginitis? Medscape.

18. Han, C., Li, H., Han, L., Wang, C., Yan, Y., Qi, W., Fan, A., Wang, Y., & Xue, F. (2019). Aerobic vaginitis in late pregnancy and outcomes of pregnancy. European Journal of Clinical Microbiology and Infectious Diseases, 38(2). https://doi.org/10.1007/s10096-018-3416-2

19. Konadu, D. G., Owusu-Ofori, A., Yidana, Z., Boadu, F., Iddrisu, L. F., Adu-Gyasi, D., . . . Asante, K. P. (2019). Prevalence of vulvovaginal candidiasis, bacterial vaginosis and trichomoniasis in pregnant women attending antenatal clinic in the middle belt of Ghana. BMC Pregnancy Childbirth.

20. Kornitzer, D. (2019). Regulation of *Candida albicans* hyphal morphogenesis by endogenous signals. Journal of Fungi, 5(1). https://doi.org/10.3390/jof5010021

21. Mayer, F. L., Wilson, D., & Hube, B. (2013). *Candida albicans* pathogenicity mechanisms. In Virulence (Vol. 4, Issue 2). https://doi.org/10.4161/viru.22913

22. Mbakwem-Aniebo, C., Osadebe, A. U., Athanasony, E., & Onkonko, I. O. (2020). Prevalence of Candida spp. and age-related disparities amongst women presenting with vaginitis at the obstetrics and gynecology (O&G) clinic in a tertiary hospital in Port Harcourt, Nigeria. African Health Sciences, 20(1). https://doi.org/10.4314/ahs.v20i1.9

23. Meites, E., Gaydos, C. A., Hobbs, M. M., Kissinger, P., Nyirjesy, P., Schwebke, J. R., Secor, W. E., Sobel, J. D., & Workowski, K. A. (2015). A Review of Evidence-Based Care of Symptomatic Trichomoniasis and Asymptomatic *Trichomonas vaginalis* Infections. Clinical Infectious Diseases, 61. https://doi.org/10.1093/cid/civ738

24. Mishra, S., & Jain, A. (2020). Co-infection of *Candida albicans* and *Trichomonas vaginalis* among Pregnant Women in Tertiary Care Hospital. International Journal of Current Microbiology and Applied Sciences, 9(9). https://doi.org/10.20546/ijcmas.2020.909.378

25. Nikou, S. A., Kichik, N., Brown, R., Ponde, N. O., Ho, J., Naglik, J. R., & Richardson, J. P. (2019). *Candida albicans* interactions with mucosal surfaces during health and disease. Pathogens, 8(2). https://doi.org/10.3390/pathogens8020053

26. Nnaemeka, A. M., Iyoku, U. U., & Oluwabusuyi, O. J. (2016). Co-infection of *Trichomonas vaginalis* and Candida albicans among women of childbearing age in Ebonyi LGA, Ebonyi State, Nigeria. Asian Journal of Microbiology, Biotechnology, and Environmental Sciences, 18(4).

27. Nsofor, C. A., Obiju, C. E., & Ohalete, C. V. (2016). High Prevalence of *Candida albicans* Observed in Asymptomatic Young Women in Owerri, Nigeria. Biomedicine and Biotechnology, Vol. 4, 2016, Pages 1-4, 4(1).

28. Nwosu, C. O., & Djiejeyep, N. A. (2007). Candidiasis and trichomoniasis among pregnant women in a rural community in the semi-arid zone, North-eastern Nigeria. West African Journal of Medicine, 26(1). https://doi.org/10.4314/wajm.v26i1.28296

29. Obiajuru, I., & Ogbulie, J. (2005). Comparative study of the prevalence of sexually transmitted diseases between pregnant and non-pregnant women in Imo State, Nigeria. Global Journal of Pure and Applied Sciences, 11(3). https://doi.org/10.4314/gjpas.v11i3.16512
30. Ocan, M., Tumushabe, B., Nakawunde, H., Droma, J., Waiswa, G., Kirya, K., Baluku, H., & Rwandembo, W. M. (2018). Prevalence and Antifungal Susceptibility of Vaginal Candida albicans among Pregnant Women Attending Arua Regional Referral Hospital, West Nile Region of Uganda. Acta Scientific Microbiology, 1(6).
31. Okonko, I., Okerentugba, P., Adejuwon, A., & Onoh, C. (2012). Prevalence of sexually transmitted infections (STIs) among attendees of Lead City University Medical Centre in Ibadan, South-Western, Nigeria. Archives of Applied Science Research, 4(2).
32. Payne, V. K., Cécile, T. T., Cedric, Y., Nadia, N. A., & José, O. (2020). Risk Factors Associated with Prevalence of Candida albicans, Gardnerella vaginalis, and Trichomonas vaginalis among Women at the District Hospital of Dschang, West Region, Cameroon. International Journal of Microbiology.
33. Rai, M., Poudel, T. P., Gurung, K., Neupane, G. P., & B.C., D. (2017). Prevalence of Candida albicans in Genital Tract of Pregnant Women Attending Antenatal Clinic of Nepalgunj Medical College Hospital. Journal of Nepalgunj Medical College, 15(2). https://doi.org/10.3126/jngmc.v15i2.22818
34. Richardson, J. P., & Moyes, D. L. (2015). Adaptive immune responses to Candida albicans infection. Virulence, 6(4). https://doi.org/10.1080/21505594.2015.1004977
35. Segal, A., Ali, S. R., & Goldberg, J. (2018). Trichomonas in amniotic fluid leading to chorioamnionitis with intact membranes: A case report. Journal of Reproductive Medicine, 63(2).
36. Tong, Y., & Tang, J. (2017). Candida albicans infection and intestinal immunity. In Microbiological Research (Vol. 198). https://doi.org/10.1016/j.micres.2017.02.002
37. Udoh, U. V., Erem, K. M., Ama, I. G., Kiran, E. I., Onyema, A. S., & Nwofoke, U. B. (2020). The Prevalence of Candida albicans and Trichomonas vaginalis among First-Year Female Students of a Tertiary Institution in Southeastern Nigeria. Asian Journal of Medicine and Health. https://doi.org/10.9734/ajmah/2020/v18i530201
38. van Ende, M., Wijnants, S., & van Dijck, P. (2019). Sugar sensing and signaling in Candida albicans and Candida glabrata. In Frontiers in Microbiology (Vol. 10, Issue JAN). https://doi.org/10.3389/fmicb.2019.00099
39. Yu, F., Tang, Y. T., Hu, Z. Q., & Lin, X. N. (2018). Analysis of the vaginal microecological status and genital tract infection characteristics of 751 Pregnant Women. Medical Science Monitor, 24. https://doi.org/10.12659/MSM.909051.