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# Candiduria Among Nigerian Women: A Systematic Review

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### ABSTRACT

Candiduria represents the occurrence of *Candida* species in urine samples of patients. Candiduria is a public health problem especially in women who harbor normal flora that may become pathogenic if immunity is compromised. Many women with candiduria are not aware of the condition or its risks. Existing research is limited mostly to urban areas and most work done were not specifically focused on women. Therefore, the present review was to enrich the data bank of information on candiduria among Nigerian women adopting the Cochrane Handbook for systematic reviews of Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) instruction for documenting meta-analyses and systematic reviews. Data relating to candiduria and related works were gathered from various search engines, including Google Scholar, ResearchGate, African Journals Online, and Scopus. Other information regarding the prevalence, mode of transmission, pathogenesis, risk factors, signs and symptoms, prevention and control, as well as treatments of candiduria were also obtained. Fifteen pooled data studies were extracted using the developed systematic review method, which was utilized to analyze the extent of research on candiduria conducted in Nigeria regarding women. Findings by some authors revealed that *Candida albicans* was the most prevalent species found in the urine of most patients, while some Non-albican *Candida* species were also found in candiduria in some patients. Some of the studies reviewed also uncovered some risk factors that predisposed the women to candiduria to include antibiotic use, overstay at the hospital those that undergo surgery, type 2 diabetes patients, elderly patients, HIV infection and catheter patients. The review revealed that the prevalence of candiduria among women in Nigeria has not been enormously studied. Majority of women with candiduria are not also aware of this condition and the risk factors associated with it. Moreover, it was found out that although few researches have been conducted in some developed urban regional areas, though not directly on women, there is no detailed information with regards to candiduria in the rural areas and few of the studies were done in the South-west, South-south, North-west and North-central states of the country with none in the Southeastern states of the country. The study recommends more research on Candiduria in all the geopolitical zones of the country to suggest likely preventive approaches to reduce the rate of infection among women. World Health Organization should capture candiduria as a public health problem. Treatment using drug of choice should be based on the medical conditions of patients involved and antifungal susceptibility tests should be conducted before any prescription to reduce antifungal resistance by the *Candida* and non-albicans *Candida* strains. This crucial step may raise the hope of getting more data on candiduria in Nigeria and possibly controlling it.

**Keywords:** Candiduria, *Candida*, Women, Nigeria.

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## Introduction

Women's genital organs harbor some normal flora which may become pathogenic if the immune system is compromised by some underlying illnesses (Da Silva *et al*, 2025). Women all over the world experience non-sexually transmitted urogenital infections caused by yeast and other agents (Anele *et al*, 2025). Candiduria is not sexually transmitted because being the presence of *Candida* or yeast in urine, often shows colonization or infection coming from endogenous sources rather than sexual transmission (Arya and 2023). Candiduria is the occurrence of *Candida* species in urine samples of patients (Ortiz *et al*, 2018). It is usually asymptomatic in individuals with no seen ailment (Darabian *et al*, 2025)). It can also be seen in diabetic patients, pregnant women and those with urinary implants. Cystitis, epididymorchitis, prostatitis, pyelonephritis and renal candidiasis patients usually show symptoms of candiduria especially among those in intensive care units (Alfouzan and Dhar, 2017; Gajdacs *et al*, 2019). Other infections caused by *Candida* include inflammation of the vagina, oropharyngeal candidiasis, cutaneous candidiasis, candidemia, urinary tract infections and disseminated systemic mycosis are other infections caused by *Candida* (Mba and Nweze, 2020). Several studies have attributed *Candida albicans* as the most prevalent yeast in the urine samples of patients causing candiduria and candidiasis (Taura *et al*, 2013; Kaufmann *et al*, 2000; Akortha *et al*, 2009; Iregbu and Nwajiobi-Princewill, 2013; de Sousa *et al*, 2014; Sanjay *et al*, 2020; Oladugba, 2022; 2025). Following *Candida albicans* in prevalence are *Candida glabrata* and *C. tropicalis* found in urine culture. Other *Candida* species involved in candiduria include *C. krusei*, *C. tropicalis*, *C. parapsilosis* (Kaufmann *et al*, 2000; Akortha *et al*, 2009; Iregbu and Nwajiobi-Princewill, 2013; Taura *et al*, 2013; Iregbu and Nwajiobi-Princewill 2013; Sousa *et al*, 2014; Othman *et al*, 2018; Sanjay *et al*, 2020; Oladugba, 2022). This review will provide information on the prevalence of candiduria among women in Nigeria. It will provide more information on the causative agents, pathogenesis, mode of transmission, risk factors, signs

and symptoms, treatment and prevention options on candiduria. In spite of the many individual researches x-raying the occurrence and clinical importance of candiduria in different regions across Nigeria, the prevalence of candiduria, especially among Nigerian women remain underexplored. Specifically, there exist significant gaps in the systematic, gender-focused, and nationwide composite of existing data. There is also a dearth of literature on the prevalence of candiduria in rural versus urban settings, implant patients or immunocompromised persons. The study provides a consolidated review of available information on candiduria among Nigerian women. Other information regarding the prevalence, causative agents, mode of transmission, pathogenesis, risk factors, signs and symptoms, prevention and control, as well as treatments of candiduria were also provided.

## Causative Agents

Yeasts of the genus *Candida albicans* and other species are the fungal agents most commonly associated with candiduria (Bashir *et al.*, 2022; Sousa *et al.*, 2014).

## Mode of Transmission

*Candida* causes urinary tract infection (UTI) by hematogenous routes and ascending routes during the catheterization (Gajdacs *et al*, 2019).

## Pathogenesis

*Candida* species cause urinary tract infection either by hematogenous routes from the bloodstream or ascending routes from a focus of *Candida* colonization near the urethra (Alfouzan and Dhar, 2017; Odabasi and Mert, 2020). Most *Candida* infections are the result of overgrowth and subsequent invasion by *Candida* species that inhabit the host's gastrointestinal tract and can also occur as a nosocomial infection of hospitalized patients with catheter (Gajdacs *et al*, 2019).

## Risk Factors for Candiduria

Risk factors to candiduria include advanced age (Gajdacs *et al*, 2019), broad spectrum antibiotics

(Sobel *et al.*, 2011), indwelling urinary catheters (Ogba *et al.*, 2024), diabetes mellitus (Sobel *et al.*, 2011; Ghasemi *et al.*, 2020, Akinjogunla *et al.*, 2020), prior surgical procedures (Fariba and Mahsa, 2021), patients overstay at the hospital admission (Jacobs *et al.*, 2018; Ogba *et al.*, 2024), prolonged administration of corticosteroid (Ghasemi *et al.*, 2020), and prolonged use of radiation therapy (Fariba and Mahsa, 2021), wrong clean up after excretion and delayed excretion (Agada *et al.*, 2021).

### Signs and Symptoms

The signs and symptoms may include fever, chills, flank pain, blood in urine, urgency to urinate, frequency of urination, suprapubic discomfort, and pneumaturia (Tambyah and Maki, 2000).

### Prevention and Control

The most effective way of preventing candiduria is to eliminate the risk factors (Jacob *et al.*, (2017).

### Treatment

In all, before selecting a good antifungal agent, the susceptibility pattern of the *Candida* species isolated must be known. Fluconazole was found to be the most effective antifungal agent for some *Candida* species (; Shetty *et al.*, 2024; Jain *et al.*, 2020).

### Review Methods and Search Strategy

This review developed and used the systematic review protocol using a cross sectional method based on the guideline highlighted by Cochrane handbook for systematic review of interventions (TCC, 2008) and the Preferred Reporting Items for systematic review and meta-analyses (PRISMA) instructions for documenting meta-analysis and reviews described by Moher *et al.*, (2009); Jabaka *et al.*, (2023). The search focused on research articles published from 2013 to 2025 using direct database search through Google scholar, PubMed., ResearchGate, African Journals Online on candiduria, and Scopus.

## Results and Discussion

S/N	Research Title	Findings	Reference
1	Antifungal Resistance Among Candida Species From Patients with Genitourinary Tract Infection at Muhammad Abdullahi Wase Specialist Hospital, Kano - Nigeria.	The study reported <i>C. albicans</i> as the predominant <i>Candida</i> species causing genitourinary tract infection in women.	(Taura <i>et al.</i> , 2013)
2	Candiduria among HIV- infected patients attending a tertiary hospital Benin city.	The study showed that women were significantly predisposed to having candiduria. There was no reported difference in the prevalence of candiduria in relation to age. <i>C. albicans</i> , <i>C. krusei</i> and <i>C. parapsilosis</i> were incriminated as agents of candiduria.	(Esebelahie <i>et al.</i> , 2014)
3	Trends in prevalence of yeast species associated with urogenital infection in Nsukka Niger: An overview of true <i>Candida</i> species and genotype of <i>Candida albicans</i> hwp1-heterozygous isolates.	The study isolated 129 yeast from 117 patients. <i>Candida albicans</i> was the highest followed by <i>Candida krusei</i> and <i>C. parapsilosis</i> while <i>C. glabrata</i> and <i>C. tropicalis</i> were the least. Candiduria was rated 44.85%.	(Anele <i>et al.</i> , 2025)

- 4 Prevalence and antibiogram characteristics of bacteriuria and candiduria among indigenes of selected parts of Akure North, Ondo State. It shows that candiduria was high among the people of Ipogun-Ayo, Ondo State and *Candida albicans* was implicated. (Bodurinde *et al.*, 2019)
- 5 Prevalence of Candiduria in a University Campus in Central Nigeria. The study revealed that candiduria was high among the female students than the males. *C. tropicalis* was seen more among the female students, while *Candida utilis* (and *Candida albicans* were seen among the male students. *C. tropicalis* was observed as the most common cause of candiduria among students between ages 16 – 20 year-old, followed by 26 – 30 year-olds, and 31 years old. (Tsaku *et al.*, 2019)
- 6 Assymptomatic candiduria among type 1 and 2 diabetes mellitus patient: risk and sociodemographic factors, prevalence, virulence markers and antifungal susceptibility. The study showed that candiduria was more in patients below 40 years of age and that candiduria was seen more in females than males. Non-*Candida albicans* species were more commonly reported compared to *Candida albicans*. (Akinjogunla *et al.*, 2020).
- 7 Prevalence of fungi associated with urinary tract infection: a case Study of Students of the Joseph Sarwuan Tarka University, Makurdi, Benue State. The study reported predominance of fungi urinary tract infection and *Candida albicans* as the most common agent. The study reported antibiotics use, sexual contact and wearing tight fitted nylon and cotton inner wears as the predisposing factors for urinary tract infections caused by fungi. (Agada *et al.*, 2021)
- 8 Antimicrobial resistance among fungi from patients with urinary tract infections in Ojo, Lagos, Nigeria. The study revealed that the most implicated fungi in UTI were *Candida albicans* and *Aspergillus* species. (Dauphin and Oluwole, 2021)
- 9 Prevalence and Antifungal Susceptibility Pattern of *Candida* species Isolated from Patients with Urinary Tract Infections. The research revealed that the most common agent was *C. albicans* followed by the Non-*albicans* species. (Lawal *et al.*, 2021)

- 10 Prevalence of *Candida* species responsible for urinary tract infections among in-patients in Murtala Muhammad specialist hospital, kano, Nigeria. The study reported higher prevalence of *Candida* isolates among females compared to males. The risk factors for candidal growth were commonly observed in patients with prolonged administration of antibiotics, over stay in hospital and those that undergo surgery. (Bashir *et al.*, 2022)
- 11 Identification and Antifungal Susceptibility Profiles of Yeast Urogenital Tract Infection among Women in Benin City, Nigeria. The research found out that the prevalence of candiduria was higher than vaginal candidiasis is 63.33%. It reported that the most predominant yeast seen in the urine genital specimens was *C. albicans*. (Oladugba, 2022)
- 12 Diagnosis and Epidemiology of Urinary *Candida* Species in HIV-Positive Patients in a Nigerian Reference Medical Centre. The study revealed that there was higher n females (68.0%) than in males (48.5%). All (100.0%) HIV-positive patients older than 74 years were infected (Awujo *et al.*, 2023)
- 13 The study of *Candida albicans* among Diabetic patients attending Some selected hospitals in Sokoto. The survey revealed that women had higher prevalence of candiduria than the males and they were more vulnerable to candiduria. (Idu *et al.*, 2023)
- 14 Prevalence and antifungal susceptibility of *Candida* species from patients attending Rivers State University Teaching Hospital, Nigeria. The result revealed that the most common yeast isolated from the specimen was the *Candida albicans* and that fluconazole and ketoconazole were most sensitive against the isolates. (Girah *et al.*, 2024)
- 15 Catheter associated *Candiduria* among in-patients accessing care in a Tertiary Health Institution in Calabar, Nigeria. The result revealed that was candiduria was prevalent at 25.7% in the population studied and that the most dominant yeast was the non-albican (*Candida glabrata*). (Ogba *et al.*, 2024)

The study revealed that the most common causative agent of candiduria among women in Nigeria was *Candida albicans* (Taura *et al.*, 2013; Esebelahie *et al.*, 2014; Bodurinde *et al.*, 2019; Tsaku *et al.*, 2019; Agada *et al.*, 2021; Dauphin and Oluwole, 2021; Lawal *et al.*, 2021; Bashir *et al.*, 2022; Oladugba *et al.*, 2022; Anele *et al.*, 2025). The non-*albicans Candida species* such as *Candida glabrata*, *C. tropicalis*, were responsible for candiduria (Akinjogunla *et al.*, 2020; Dauphin and Oluwole, 2021; Lawal *et al.*, 2021; Ogba *et al.*, 2024). The females were more affected with candiduria more than the male subjects (Esebelahie *et al.*, 2014; Tsaku *et al.*, 2019; Akinjogunla *et al.*, 2020; Bashir *et al.*, 2022; Oladugba, 2022; Idu *et al.*, 2023; Awoju *et al.*, 2023). This may be as a result of the nature of the female genitalia and the proximity of their genitalia to the anus. The risk factors associated with candiduria were commonly observed in patients with prolonged administration of antibiotics, over stay in hospital and those that undergo surgery (Jacobs *et al.*, 2018; Bashir *et al.*, 2022; Ogba *et al.*, 2024), type 2 diabetes patients (Sobel *et al.*, 2011; Akinjogunla *et al.*, 2020; Ghasemi *et al.*, 2020), elderly patients (Akinjogunla *et al.*, 2020; Awoju *et al.*, 2023), HIV infection (Awoju *et al.*, 2023), catheter patients (Ogba *et al.*, 2024).

## Conclusion and Recommendations

The review revealed that the prevalence of candiduria among women in Nigeria has not been enormously studied. Majority of women with candiduria are not also aware of this condition and the risk factors associated with it. Moreover, it was found out that although few studies have been conducted in some developed urban regional areas with few directly on women, there is no detailed information with regards to candiduria in the rural areas. Moreover, it was found out that the few studies on candiduria were done in the South-west, South-south and North-central and far North-west part of the country. *Candida albicans* was revealed to be the most common cause of candiduria in the subject. The risk factors associated with candiduria were commonly observed in patients with prolonged administration of antibiotics, over

stay in hospital, those that undergo surgery, type 2 diabetes patients, elderly patients, HIV infection and catheter patients. The review also found out that women had high prevalence of candiduria than men in the few studies done and reviewed. There is need for more research on candiduria among women in Nigeria and awareness creation on the risk factors. World Health Organization should capture candiduria as a public health problem. More also, there is the need for Government backed interventions including Center for Disease Control and Prevention (CDC), spearheaded by researchers, to properly carry out extensive sensitization and investigate the distribution of candiduria in each state of the country in order to lay the necessary foundation to eliminating this health condition. Treatment using drug of choice should be based on the medical conditions of patients involved and antifungal susceptibility tests should be conducted before any prescription to reduce antifungal resistance by the *Candida* and non-*albicans Candida* strains. This crucial step may raise the hope of controlling candiduria in Nigeria.

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