



# Investigations of genitourinary candida infections of patients women attending gynecology clinic at sirte clinics complex, Sirte city, Libya

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## A B S T R A C T

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**Keywords:** *Candida Infections - Genitourinary Fungal Infection- patients women.*

**Background:** Candidiasis is an opportunistic fungal infection that occurs due to yeasts of the genus *Candida*, which infects target immobilized individuals with a diminished immune system. It causes infections in the urinary and reproductive systems and is known to be responsible for genital and urinary infections worldwide. *Candida albicans* and *Candida glabrata* are most often responsible for the disease, and both can lead to vaginal candidiasis, including during pregnancy. *Candida* urinary tract infection has been on the rise in recent times, particularly among the hospitalised patients. Often, those people who undergo catheterization suffer from candiduria. In case the vaginal candidiasis is left untreated, then severe complications such as placental inflammation, pelvic inflammatory diseases, and even miscarriage may occur. Aim of study: This study aims to estimate the incidence of genitourinary fungal candidiasis among patients women attending Gynecology clinic at sirte Clinics Complex and identify potential risk factors associated with this condition. Materials and Methods: Sirte, Libya was the local setting of the study which was carried out between May and July 2023. Midstream urine sample was obtained from 100 patients women attending the gynecological clinic. Socio-demographic and clinical information was gathered by means of specially developed questionnaires in a standardised form. Laboratory investigations to diagnose fungal infections in urine involve the use of centrifuges to separate and deposit samples and their components. Sediment is then collected and examined under a microscope to identify fungal cells as well as using gram stain techniques. Specifically, SPSS analytic software was used, and chi-square tests where appropriate. Results: Among 100 samples, 91% tested positive for candida infection, with the highest rates in women aged  $\leq 24$  (42.85%) and 25–34 (28.57%). Diabetes showed a significant correlation with candidiasis (83.51%,  $p = 0.03$ ), and unmarried women had higher infection rates (76.92%). All infected married women had no history of abortion, but multiple pregnancies were significantly associated ( $p = 0.0001$ ). Metronidazole use reduced infection rates ( $p < 0.0001$ ), and common symptoms included vaginal discharge (55.55%) and pain with urination (44.44%).

Conclusion: This study found a high prevalence of urinary fungal infections among women in Sirte during (May–June 2023), with a significant decrease in infection rates with increasing age. The infections were most common in diabetic and unmarried women, while married women with multiple pregnancies had the highest rates. These findings highlight the need for regular screenings and preventive measures. **Recommendation:** Taking into account the study results, it is suggested that structured screening programs for urinary fungal infections in women should be implemented, with special focus on high-risk groups, such as diabetic and pregnant women. Furthermore, public education should be directed to proper hygiene, correct medication use and early medical consultation in efforts of decreasing such infections prevalence.

## 1 Introduction

Candidiasis is a common opportunistic fungal infection caused by yeast from the *Candida* genus, which primarily affects individuals with weakened immune systems (Cronje *et al.*, 1994). It can infect various body areas, including the respiratory, reproductive, urinary, and digestive systems, as well as localized sites like the nails, scalp, and oral cavity (Anaissie *et al.*, 2010). Common species responsible for genital and urinary tract infections include *Candida albicans* and *Candida glabrata*, which can cause vaginal candidiasis, even during pregnancy (Nelson *et al.*, 2013). Less frequently, species like *C. parapsilosis*, *C. pseudotropicalis*, and *C. krusei* may also be implicated (Cronje *et al.*, 1994; Sidrim & Rocha, 2004).

Urinary tract infection (UTI) is a common health issue, with urinary tract candidiasis being a frequent nosocomial fungal infection, affecting 50-72% of women, and a relapse rate of 40-50% (Behzadi & Ranjbar, 2022). Over the past 30 years, *Candida* UTI incidence has significantly increased, becoming the third most common pathogen in urine samples from European hospitals, after *Escherichia coli* and *Enterococcus* (Bouza, 2001). Untreated vaginal candidiasis can lead to serious complications, including miscarriage, prematurity, pelvic inflammatory disease, and infertility (Behzadi & Ranjbar, 2022). Symptomatic *Candida* cystitis is rare in non-catheterized patients, but more common in catheterized patients, with symptoms like bladder irritability, dysuria, and increased frequency (Bougnoux & Aegerter, 2008; Boucher *et al.*, 2020). Factors promoting *Candida* colonization include pregnancy, antibiotic use, poor hygiene, aging, unmarried status, drug use, catheterization, surgeries, and diabetes mellitus (Tahir & Zaynab, 2020). Symptoms often include thick discharge, vaginal pruritus, and burning (Rebecca & Donald, 2022).

**Aim of Study:** This study aimed to investigate the incidence of fungal infection (fungal candidiasis) in the genitourinary system in patients women attending the Gynecology clinic at Sirte Clinics Complex from May, July and June 2023, in addition to trying to

identify some potential factors that may help in the prevalence of infection.

## 2 Materials and Methods

**2.1. Study area:** The study area was the city of Sirte, a Libyan coastal town situated some 450 km east to Tripoli. It is located on the central Libyan shore in a stretch between Tripoli and Benghazi, with an estimated population of 79,631.

**2.2. Study population:** The study was carried out on all females attending the attending Gynecology clinic at Sirte Clinics Complex from May to July 2023.

**2.3. Study sample and collection:** 100 midstream urine samples were collected from patients. Specific instructions were given in such a way that the urine samples would not be contaminated: first washing the external genitalia before urinating-to remove the bath products and industrial products-and then urinating midstream into a sterile collection container by discarding the initial portion of the passed urine. A structured questionnaire that covers different variables, including socio-demographic characteristics (age, marital status, and pregnancy history), Clinical data were collected from clinical examinations, medical records or responsible personnel. Clinical data regarding first trimester abortion in diabetic pregnant women and usage of metronidazole were obtained along with associated symptoms was developed.

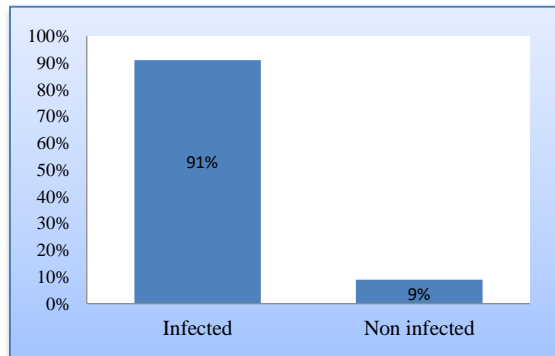
**2.4. Laboratory examination:** The sample was transferred to the laboratory to examine the presence of fungal infection in urine samples in a few steps as follows: Urine samples were placed in the centrifuge at r.p. speed. 3000 for 5 minutes. The preparations were examined by placing the deposit of the urine sample on a glass chip, covered with a cover slip, using light microscope using  $\times 10$  and  $\times 40$  lenses to determine the growth of the emerging oval fungi, which was supposed to be *Candida* (Abadi, 2015).

**2.5. Statistical analyses:** Descriptive statistics were presented as numbers and percentages for categorical variables. Chi-square test or Fisher exact tests were used appropriately for categorical variables, and two-sided  $p \leq 0.05$  was considered as statistical significance.

Statistical analyses were performed by using SPSS statistics software (v 23.0, SPSS)

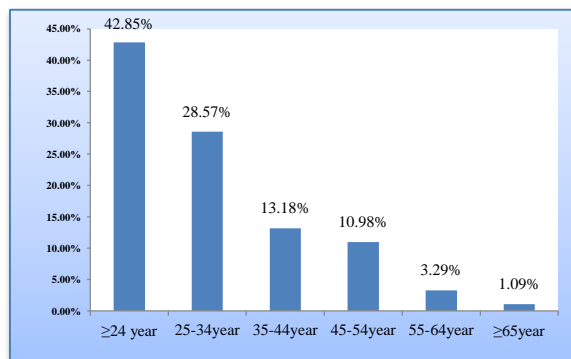
### 3 Results:

The findings of this study, as depicted in Figure 1, revealed that 91% of the samples tested positive for fungal infections, while only 9% were uninfected.



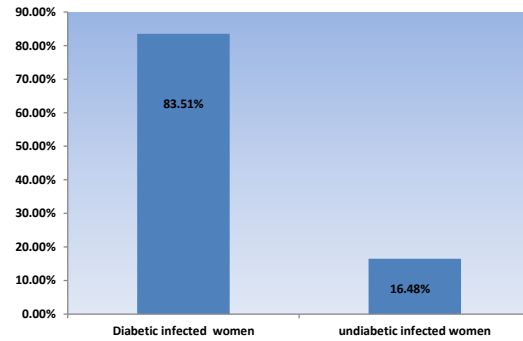
**Figure (1): The prevalence of genitourinary candida infection**

Figure 2 illustrates the distribution of urinary fungal infections (UFIs) across age groups. The highest infection rate was observed in women aged  $\leq 24$  years (42.85%), followed by the 25–34 age group (28.57%). Infection rates declined sharply with increasing age, recorded at 13%, 18%, 10.98%, and 9.01% for the 35–44, 45–54, 55–64, and  $\geq 65$  age groups, respectively.



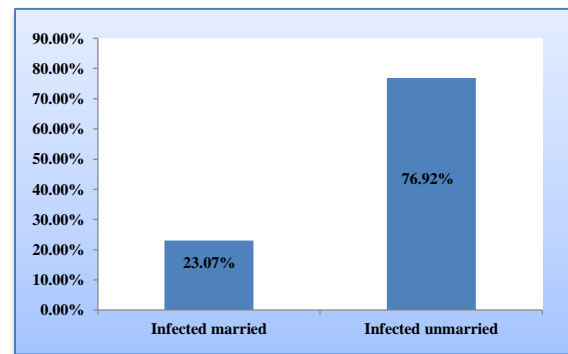
**Figure (2): The distribution of genitourinary candida infection according to age groups**

The results in figure (3) showed a significant increase in infection (83.51%) in women with diabetes, while women without diabetes registered 16.48% ( $p = 0.03$ ).



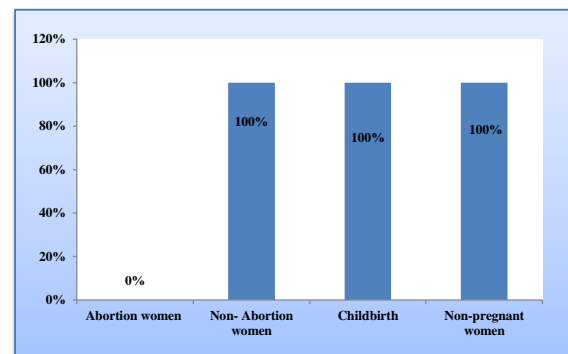
**Figure (3): The incidence of genitourinary candida infection according to diabetic women.**

The results in figure (4) show that the genital candidiasis infection has the highest incidence of unmarried females (76.92%) compared to unmarried females (23.07%).



**Figure (4): The distribution of genitourinary candida infection in female according to material status**

The findings in Figure 5 reveal that all women with urogenital candidiasis had no history of abortion, suggesting that candidiasis may not significantly contribute to pregnancy complications.



**Figure (5): The distribution of genitourinary candida infection in married patient women with abortion and childbirth.**

The results in figure (5) showed that the distribution of genitourinary candida infection in married patient women with childbirth. The prevalence of genitourinary candidiasis in married women's was significantly influenced by childbirth status. As women with more than one child were found to have a significant candidiasis prevalence rate of 100%, previous delivery could therefore be a potential determinant in the progression of Candida infection ( $P = 0.0001$ ).

This study highlights a significant difference in the incidence of genitourinary candidiasis between pregnant and non-pregnant women, with no cases reported among pregnant participants (Fig 5). This raises questions about protective factors during pregnancy.

This study highlights a significant difference in the incidence of genitourinary candidiasis between pregnant and non-pregnant women, with no cases reported among pregnant participants, In contrast, non-pregnant women showed a higher prevalence of candidiasis (Fig 5). In contrast, non-pregnant women showed a higher prevalence of candidiasis.

The findings in Figure (6) indicate a significant inverse relationship between genitourinary Candida infection rates and the use of Flagyl (metronidazole). Flagyl users reported no infections, revealing a statistically significant difference between the groups ( $P < 0.0001$ ).

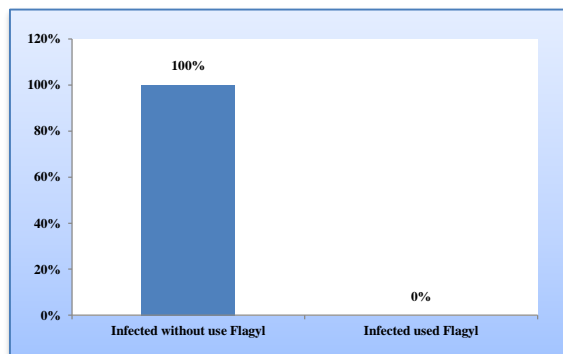


Figure (6): The distribution of genitourinary candida infection in women according to use Flagyl (metronidazole)

Figure (7) highlights the clinical signs observed in women with genitourinary Candida infections. Vaginal discharge was reported by 55.55% of respondents, making it a more prominent symptom compared to itching and urination pain, which were reported by 44.44%.

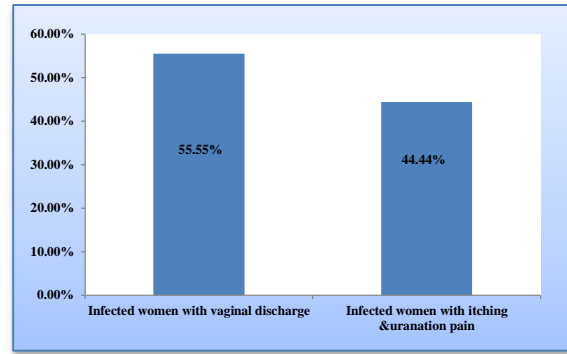


Figure (7): The distribution of genitourinary candida infection in women according to clinical symptoms.

#### 4 Discussion

This high prevalence of fungal infections , highlights the critical need for monitoring candidiasis and its impact on urogenital health. Contributing factors may include transmission from partners, inadequate awareness of infection sources, poor personal hygiene, diabetes, and the urinary system's predisposition to fungal growth. Additionally, hormonal changes and immune alterations during and after pregnancy can increase susceptibility to candidiasis, as noted by (Taher: 2020). These results emphasize the importance of regular screening, particularly for patients exhibiting signs of urinary tract inflammation, to enable early detection and management.

The infection rates declined sharply with increasing age. These findings align with Sobel (2007), who identified higher infection risks among younger women of childbearing age due to hormonal activity and sexual exposure. Similarly, Kaufman *et al.* (2000) noted increased infections in younger individuals linked to antibiotic use, while postmenopausal women had lower rates due to reduced hormone levels. Ibrahim *et al.* (2016) also suggested that atypical or undiagnosed symptoms in older women may contribute to the lower reported prevalence in these age groups.

The present results show that diabetes can change the nature of the urogenital system and provide an environment suitable for excessive growth of candidiasis types. The results of this study correspond to several findings of previous research, which confirmed that diabetes in women increases the chance of developing candidiasis infection. From this studies study Malla *et al.* (2012), the results of which showed that increasing blood sugar and urine for women increases the growth rate of candida, as well as the Kaufman study and others. (2000) which indicated that

infection recurrence rates are usually higher among people with diabetes.

The results reveal that genital candidiasis infection is more prevalent among unmarried females compared to their married counterparts. Differences in hormonal levels, particularly during the menstrual cycle, can have an impact on women's susceptibility to candidiasis infection (Kauffman *et al.*, 2000); This may not be true for unmarried women, i.e. there may be higher rates of candidiasis for them. Many previous studies have indicated that single women have more susceptibility to candidiasis infections than married women, with the Sobel study (2007) demonstrating that single women were relatively higher in the infection rate than married women.

The current findings indicating that candidiasis may not have a significant impact on pregnancy complications. This aligns with Kaufman *et al.* (2000), who noted that while candidiasis causes discomfort and symptoms, it does not necessarily increase abortion rates. Proper treatment and follow-up care appear critical in mitigating potential risks, as emphasized by Sobel (2007), who highlighted the importance of early detection and management of vaginal infections during pregnancy to safeguard maternal and fetal health.

The results reveal that childbirth status plays a significant role in the prevalence of genitourinary Candida infection among married women, with infection observed exclusively in those with more than one child. This suggests that prior childbirth may be a key factor in the progression of Candida infection. There exist numerous studies that confirm the fact that delivery affects the vaginal microbial flora and enhances vulnerability to infections. As Sweeney *et al.* (2020) note, the change in hormones and alteration of vaginal flora during and following pregnancy may predispose them to several infections, including Candida. Increased levels of estrogen during pregnancy can alter glycogen levels in the vaginal epithelium, hence predisposing overgrowth of Candida. On the other hand, the absence of reported infections among women without children could imply a lower exposure to risk factors associated with childbirth, such as hormonal fluctuations and changes in the vaginal environment.

This study highlights a significant difference in the incidence of genitourinary candidiasis between pregnant and non-pregnant women, with no cases reported among pregnant participants (Fig 5). This raises questions about protective factors during pregnancy. Sobel (2007) suggested that hormonal changes, particularly elevated estrogen levels, can modify the vaginal environment, promoting the growth of beneficial bacteria and inhibiting Candida

overgrowth. Similarly, Ghosh *et al.* (2018) noted that pregnancy-related hormonal shifts enhance the vaginal micro biota's protective role against pathogens.

In contrast, non-pregnant women showed a higher prevalence of candidiasis, potentially due to factors such as lifestyle habits, menstrual cycles, and hormonal contraceptive use. These factors can disrupt the vaginal micro biome, creating conditions favorable for Candida growth, as observed by Sweeney *et al.* (2020).

The present results showed significant inverse relationship between genitourinary Candida infection rates and the use of Flagyl (metronidazole). metronidazole is primarily effective against anaerobic bacteria and protozoa, its impact on fungal overgrowth suggests a potential protective role. Sobel (2007) noted that metronidazole might alter vaginal flora, creating a barrier against Candida overgrowth. Similarly, Ghosh *et al.* (2018) observed micro biome changes linked to reduced fungal infections, and Sweeney *et al.* (2020) highlighted its protective effect in cases of bacterial vaginitis, which often increases the risk of Candida infections. These findings underscore the potential utility of metronidazole in managing Candida-related conditions.

This results suggests that vaginal discharge may be a more reliable indicator of Candida infections. These findings align with Sobel (2007), who noted that thick white discharge is a characteristic symptom of ovarian candidiasis. Similarly, Ghosh *et al.* (2018) observed that while itching is a common symptom, it is less frequently reported compared to vaginal discharge. This study reinforces that discharge is the most prevalent clinical sign among affected women, while itching and urination pain, though significant, are less common.

## 5 Conclusions

This study demonstrates a high prevalence of genitourinary candidiasis among patients women in Sirte City, with 91% of screened samples testing positive for Candida. Women aged  $\leq 24$  years, unmarried individuals, and those with diabetes (83.51% of infected cases) were identified as high-risk groups. Multiparous women also showed increased susceptibility, suggesting a link between prior pregnancies and infection risk. However, no association was found between a history of abortion and candidiasis, indicating it may not contribute to adverse reproductive outcomes. Metronidazole use was associated with a reduced risk of Candida infections, suggesting potential protective effects. The most common symptoms were abnormal vaginal discharge (55.55%) and itching or pain during urination (44.44%).

These findings underscore the need for targeted screening and early detection, especially in younger, unmarried, and diabetic women. Routine urine cultures in clinical practice could aid in early diagnosis and prevention of complications. Further research is needed to confirm the protective role of metronidazole against candidiasis.

Based on the findings of this research, the following recommendations are proposed: Healthcare providers in Sirte City should prioritize screening and early treatment of genitourinary *Candida* infections, particularly among high-risk groups such as young, diabetic, and unmarried women. Timely diagnosis and intervention can prevent complications and support urogenital health. Further studies are needed to explore the protective role of specific drugs, such as metronidazole, in managing *Candida* infections and maintaining a healthy vaginal micro biome.

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**Conflict of interest:** The authors declare that there are no conflicts of interest

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