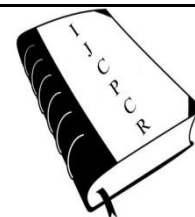




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PREVALENCE OF CANDIDAL INFECTION IN MOTHERS WITH GESTATIONAL DIABETES MELLITUS AT A TERTIARY CARE HOSPITAL IN INDIA

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ABSTRACT

Vulvovaginal candidiasis, marked by curd-like vaginal discharge and itching, causes considerable discomfort for patients. Its incidence rises during pregnancy and may lead to complications such as miscarriage, preterm delivery, and Candida chorioamnionitis. This study aimed to determine the prevalence of vaginal candidiasis in pregnant women. A total of 150 pregnant women were included, and high vaginal swabs were collected from each participant for analysis through gram staining, germ tube test, and culture to diagnose candidiasis. Among the 157 pregnant women analyzed, 50 tested positive for candidiasis, reflecting a prevalence rate of 42.37%. Most cases occurred in multigravida women (70%), those in their second trimester (54%), and within the 26 to 30 age group (64%). Additionally, 60% of the women with candidiasis had identifiable risk factors such as diabetes, prior use of oral contraceptives, intrauterine devices, antibiotics, or a history of candidiasis. In 26 cases, species identification was performed, with *Candida albicans* emerging as the predominant species (69.23%). Given the high prevalence of vulvovaginal candidiasis, especially in developing countries, incorporating routine candidiasis screening into antenatal care protocols is recommended to facilitate early diagnosis and treatment with affordable medications, ultimately improving maternal and fetal health outcomes.

Key words: Pregnancy, Prevalence, Vulvovaginal Candidiasis.

INTRODUCTION

Vulvovaginal candidiasis is caused by an overgrowth of *Candida* yeast species in the vagina and is typically marked by curd-like discharge, itching, and redness (erythema). The female genital tract (FGT) is a potential entry point for various pathogens responsible for both sexually and non-sexually transmitted infections, which may lead to vaginal discharge. This discharge is a common symptom in gynecological clinics and is often the second most frequently reported gynecological issue after menstrual disorders. *Candida* species constitute part of the normal flora in the lower genital tract of 20-50% of healthy, asymptomatic women. Carrier rates are higher among pregnant women, women with diabetes, those treated with broad-spectrum antibiotics, and individuals with

HIV/AIDS. Approximately 75% of all women experience at least one episode of vulvovaginal candidiasis during their lifetime, and around 50% of these cases experience recurrent episodes. Diagnosis typically involves gram staining and culturing of vaginal smears. The incidence of candidiasis is nearly twice as high in pregnant women, particularly in the third trimester, compared to non-pregnant women. Studies estimate that up to 40% of pregnant women worldwide may have vaginal colonization by *Candida* species. Recurrence during pregnancy is common, likely due to elevated estrogen and corticosteroid levels, which can weaken the body's defenses against opportunistic infections.

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Vulvovaginal candidiasis represents a significant health concern for pregnant women, as it can lead to complications such as miscarriage, Candida chorioamnionitis, and subsequent preterm delivery. Premature infants are particularly vulnerable to widespread fungal infections due to their underdeveloped immune systems, posing serious health risks.

During childbirth, *Candida* infection can be transmitted from the infected mother's vaginal tract to the newborn, potentially causing congenital *Candida* infection. Early detection, timely diagnosis, and suitable treatment can improve the health outcomes for both mother and infant. This study, therefore, focused on identifying the primary causative agent of vulvovaginal candidiasis (VVC) and its prevalence among pregnant women. The findings aim to raise awareness about VVC, as many women are unaware of its implications, and to support the prevention of complications such as reinfection, stillbirth, miscarriage, and infertility.

MATERIALS AND METHODS:

The study was conducted in the Departments of Microbiology and Obstetrics & Gynecology at Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry, from August 2020 to December 2020. Using convenient sampling, pregnant women of varying ages, gravidity levels, and pregnancy trimesters were included. The study aimed to assess the prevalence of vaginal candidiasis during pregnancy. Ethical approval was obtained from the university's Ethics Committee. Informed consent was gathered from all participants, followed by a detailed medical history and comprehensive clinical examination. Information on demographics, parity, pregnancy trimester, presence or absence of symptoms like vaginal discharge and itching, diabetes, other risk factors, and prior treatments were collected. The vulva and vagina were examined for signs of inflammation and discharge. Using a sterile speculum, a high vaginal swab was taken with a sterile swab stick, which was immediately placed back in its casing, labeled, and sent for analysis. The swabs underwent gram staining and KOH wet mount examination for microscopic detection of *Candida*. Additionally, swabs were cultured on Sabouraud Dextrose Agar and incubated

at 37°C for 48–72 hours, where they were observed for creamy white yeast colonies. Women with sexually transmitted infections, other infectious conditions, or recent treatment for candidiasis were excluded from the study.

For the germ tube test, 500 µl of human serum was transferred into a small test tube. A yeast colony from the SDA plate was inoculated into the serum using a sterile wire loop. The tube was then incubated at 35–37°C for 2–3 hours. A drop of the serum yeast culture was transferred to a glass slide using a Pasteur pipette, covered with a cover slip, and examined under 10X and 40X magnification for tube-like extensions from the cells.

RESULTS:

Prevalence of Candidiasis in the Study Population

A total of 157 pregnant women were clinically suspected of having vulvovaginal candidiasis by a gynecologist. Of this group, 35% were confirmed to have vulvovaginal candidiasis, as illustrated in Figure 2.

Age-Wise Distribution of Positive Cases

The highest prevalence of positive cases was observed in the 21–25 years age group, accounting for 40.44%, followed by the 26–30 years age group, which represented 32.58% of cases.

Frequency Distribution of *Candida* Isolates

Out of 89 isolates collected, 85 were identified as *Candida* species, while the remaining isolates could not be identified. Among the 85 *Candida* isolates, *C. albicans* was the most common species, accounting for 57 isolates (64.04%), followed by *C. glabrata* with 11 isolates (12.35%), *C. dubliniensis* with 9 isolates (10.11%), *C. tropicalis* with 5 isolates (5.61%), and *C. krusei* with 3 isolates (3.37%). *C. albicans* was found to be the predominant cause of candidiasis, followed by *C. glabrata*.

Distribution of Candidiasis by Gestational Period

The majority of cases occurred during the second trimester, with 47 cases (55%), followed by the first trimester, with 29 cases (34.11%). This data is presented in Figure 3.

Figure 1: Prevalence of candidiasis among pregnant woman.

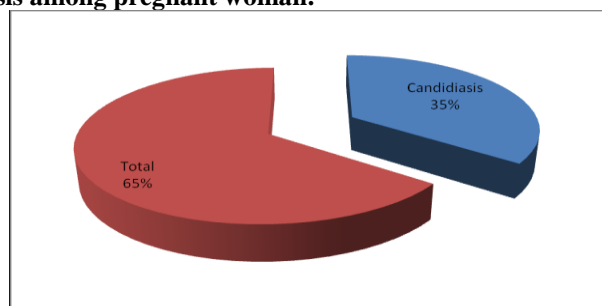
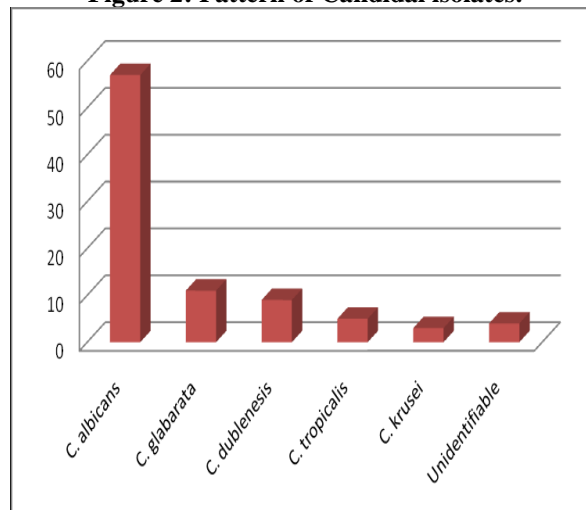
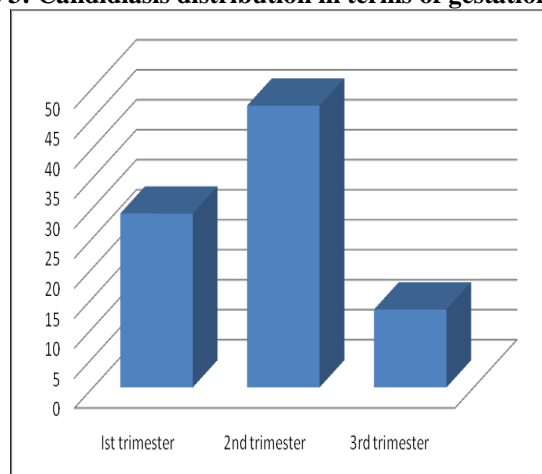


Figure 2: Pattern of Candidal isolates.**Figure 3: Candidiasis distribution in terms of gestation period.**

DISCUSSION:

Candidiasis is the most common opportunistic fungal infection, accounting for 90% of infectious vaginitis cases (Hedayati & Shafiei, 2010; Adad et al., 2001). Increased levels of reproductive hormones, such as progesterone and estrogen, during pregnancy create favorable conditions for infection. Progesterone weakens the anti-candida activity of neutrophils (Adad et al., 2001), while estrogen reduces the effectiveness of vaginal epithelial cells to inhibit *Candida albicans* growth and lowers immunoglobulin levels in vaginal secretions, increasing susceptibility to vaginitis (Anorlu et al., 2004). This study identified a 35% prevalence of vulvovaginal candidiasis (VVC) among pregnant women. Comparatively, a similar study by Nurat et al. (2015) at LAUTECH Teaching Hospital in Ogbomoso reported a 25% prevalence rate, aligning with the 26% prevalence in Ibadan (Anorlu et al., 2004) but almost double the 14% reported in Burkina Faso. Such differences could be due to geographic, ethnic, and socioeconomic factors, as well as

variations in sampling and culturing techniques. Additionally, lifestyle factors, hygiene, and nutrition may contribute to these disparities (Hansen et al., 2004; Busetti et al., 2007). The prevalence noted in this study exceeds the 30.7% reported in Jamaica (Kamara et al., 2000) and the 30% reported in Nnewi, Nigeria (Okonkwo & Umeanaeto, 2010), reflecting an upward trend in VVC among pregnant women.

The high prevalence of vaginal candidiasis may lead to pregnancy complications, including miscarriage, preterm birth, low birth weight, and other morbidities. This study observed the highest rates of VVC in the 21-25 age group (40.44%), followed by the 26-30 age group (32.58%), findings consistent with those of Nurat et al. (2015). Younger women, who are often more sexually active, may have lower vaginal defenses against *Candida* species (Kent, 1991), with behaviors such as contraceptive use (especially emergency pills) and frequent antibiotic use contributing to infection susceptibility. Misuse of antibiotics can also result in drug resistance, reducing

treatment effectiveness for vaginal candidiasis and contributing to higher infection rates in this age group. This study also noted that as women age, VVC prevalence declines. Women aged 41-45, closer to menopause, tend to be less sexually active and rarely use contraceptives, while reduced estrogen and corticosteroid levels enhance vaginal immunity.

The study highlights that *C. albicans* (64.04%) was the most prevalent organism causing VVC in pregnant women, followed by *C. glabrata*, a pattern consistent with studies by Nurat et al. (2015), Samuel et al. (2015), Akortha et al. (2009), and Nelson et al. (2013). Pregnant women are more prone to Candida infections due to heightened vaginal sensitivity during pregnancy, making infections significantly more frequent. High levels of estrogen, a key factor, foster Candida colonization (Sobel, 2012). The hormonal environment during pregnancy creates conditions favorable to Candida growth, with progesterone suppressing neutrophil activity and estrogen diminishing epithelial cell resistance (Aslam et al., 2008). Many women with chronic recurrent candidiasis first experience the infection during pregnancy. Additionally, emotional stress and immune suppression during pregnancy increase the likelihood of Candida overgrowth and pathogenicity (Nelson et al., 2013).

This study found candidiasis to be most common in the second trimester (55%), followed by the first trimester (34.11%), aligning with Nurat et al. (2015), who reported 54.3% in the second trimester, and studies by Deepa et al. (2014) and Oyewole et al. (2013), which noted the highest incidence in the second trimester. This study also found that VVC was significantly more prevalent in women with

symptoms ($p = 0.001$), similar to findings by Kanagal et al. (2014), where 82% of Candida-positive women were symptomatic ($p < 0.01$). In contrast, this study observed that VVC was more common in women without traditional risk factors such as diabetes, prior candidiasis, antibiotic use, contraceptive use, intrauterine devices, or HIV/AIDS, a finding that was not statistically significant ($p = 0.125$). This contrasts with Kanagal et al. (2014), who reported that 60% of VVC-positive pregnant women had such risk factors, a statistically significant result.

CONCLUSION:

This study concludes that vulvovaginal candidiasis prevalence among pregnant women is rising, particularly in the 21-25 age group and those in their second trimester. *Candida albicans* was the most prevalent causative agent, though non-*albicans* species were also present, suggesting their increasing role as opportunistic pathogens in immunocompromised individuals. Additionally, symptomatic VVC was more frequent in women who were illiterate and unemployed. Early detection and diagnosis may improve clinical outcomes for pregnant women. Standard treatment for VVC includes antifungals like Nystatin, Amphotericin B, and Imidazoles, though these may cause side effects, and resistance to imidazoles is increasing. Thus, culture-positive women should receive appropriate, side-effect-free treatment to prevent infection transmission to the newborn and secondary infections in the mother. Comprehensive sexual education for pregnant women is essential to prevent Candida infections, and routine maternal health checkups should be conducted to ensure early diagnosis and timely intervention.

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