RESEARCH
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EVALUATING RISK FACTORS AND OUTCOMES OF FUNGAL INFECTIONS IN PREGNANCY: A PROSPECTIVE ANALYSIS

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Abstract
Fungal infections, particularly vulvovaginal candidiasis (VVC), are frequent during pregnancy due to physiological changes like increased estrogen and immunosuppression. This prospective study examines the risk factors contributing to fungal infections in pregnancy and evaluates maternal and neonatal outcomes. A cohort of 300 pregnant women was followed, and the prevalence of fungal infections, key risk factors, and outcomes were analyzed. The study found that 18.4% of participants had fungal infections, primarily caused by *Candida albicans*, with elevated estrogen, previous VVC history, and diabetes as major contributing factors. In untreated cases, complications such as preterm delivery, low birth weight, and neonatal intensive care unit (NICU) admissions were observed. Early diagnosis and appropriate treatment significantly reduced adverse outcomes. This research highlights the importance of timely interventions and comprehensive patient education in reducing the impact of fungal infections during pregnancy.
Keywords: Pregnancy, Fungal infections, Vulvovaginal candidiasis, Risk factors, Neonatal outcomes, Candida species, Antifungal therapy

Introduction

Fungal infections, primarily vulvovaginal candidiasis (VVC), are a common complication during pregnancy, with prevalence estimates ranging from 10% to 40% . Elevated levels of estrogen during pregnancy, along with immune changes, contribute to an environment favorable for fungal growth . The predominant fungal pathogen in these cases is *Candida albicans*, although non-*albicans Candida* species like *C. glabrata* and *C. krusei* are increasingly noted for their resistance to standard antifungal treatments.

The potential adverse effects of untreated fungal infections on pregnancy outcomes make it essential to understand the risk factors and implement timely interventions. Pregnancy-related factors like hormonal changes, antibiotic use, and gestational diabetes further exacerbate the risk of fungal infections . In addition to affecting maternal health, these infections can lead to adverse neonatal outcomes such as preterm birth, low birth weight, and respiratory distress .

The present study aims to explore the prevalence of fungal infections among pregnant women, identify associated risk factors, and evaluate maternal and neonatal outcomes. By comparing treated and untreated cases, this study also examines the effectiveness of clinical management strategies.

Materials and Methods

Study Design and Population:

This prospective study was conducted over 18 months at Chirayu Medical College & Hospital, Central India. A total of 300 pregnant women were included, selected based on their attendance at antenatal clinics. Participants ranged from 18–45 years old and were enrolled at various stages of pregnancy. Exclusion criteria included women with known immunocompromising conditions, such as HIV.

Data Collection:

Vaginal swabs were obtained from all participants and cultured to identify fungal species. Demographic data, obstetric history, and relevant risk factors, such as

antibiotic use, gestational diabetes, and prior VVC history, were collected. Participants were followed throughout their pregnancies, with periodic evaluations for infection status and treatment responses.

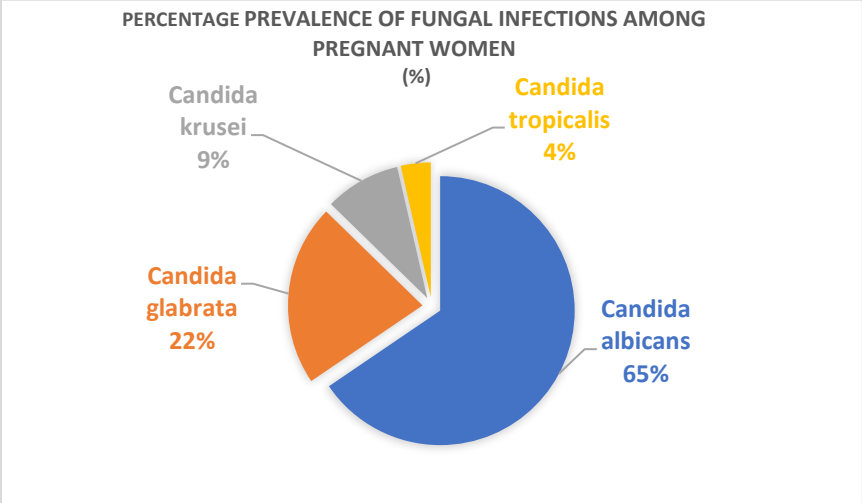
Outcome Measures:

Primary maternal outcomes included the incidence of fungal infections and related complications. Neonatal outcomes, including gestational age at delivery, birth weight, and NICU admissions, were also documented. Statistical analysis was performed using chi-square tests and logistic regression to determine significant risk factors.

Results

Table 1: Prevalence of Fungal Infections Among Pregnant Women

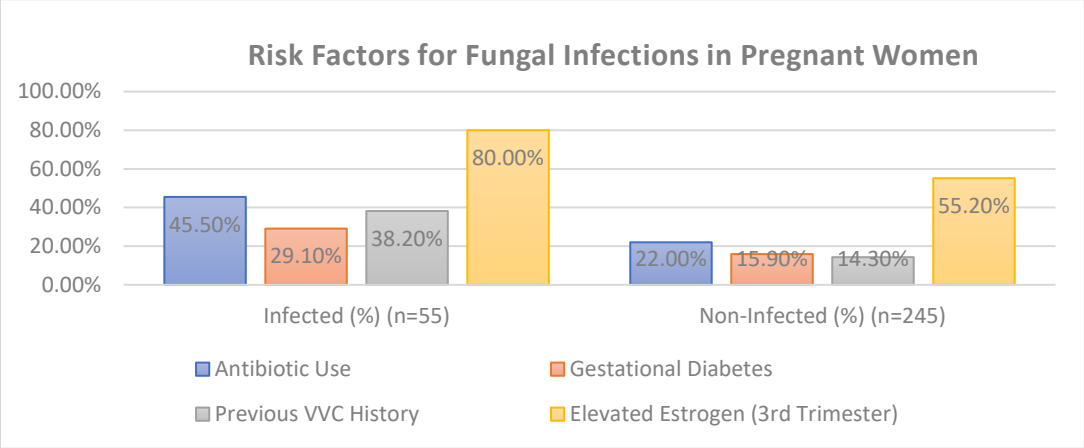
Fungal Species	Number of Cases (n=55)	Percentage (%)
Candida albicans	36	65.5%
Candida glabrata	12	21.8%
Candida krusei	5	9.1%
Candida tropicalis	2	3.6%



Of the 300 women included in the study, 55 (18.4%) were diagnosed with fungal infections. *Candida albicans* was the most commonly isolated species, followed by non-*albicans Candida* species such as *C. glabrata* and *C. krusei*.

Table 2: Risk Factors for Fungal Infections in Pregnant Women

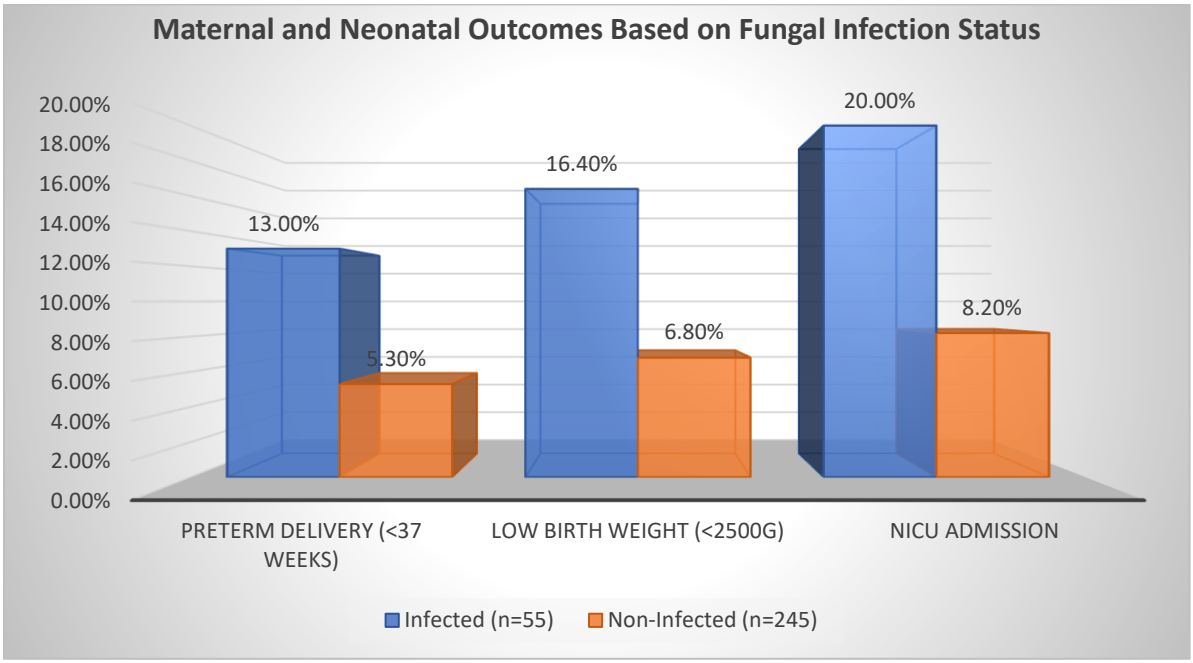
Risk Factor	Infected (%) (n=55)	Non-Infected (%) (n=245)	P-Value
Antibiotic Use	45.5%	22.0%	<0.001
Gestational Diabetes	29.1%	15.9%	0.03
Previous VVC History	38.2%	14.3%	<0.001
Elevated Estrogen (3rd Trimester)	80.0%	55.2%	0.02



Antibiotic use, gestational diabetes, previous history of VVC, and elevated estrogen levels were identified as significant risk factors for fungal infections in pregnancy.

Table 3: Maternal and Neonatal Outcomes Based on Fungal Infection Status

Outcome	Infected (n=55)	Non-Infected (n=245)	P-Value
Preterm Delivery (<37 weeks)	13.0%	5.3%	0.04
Low Birth Weight (<2500g)	16.4%	6.8%	0.03
NICU Admission	20.0%	8.2%	0.02

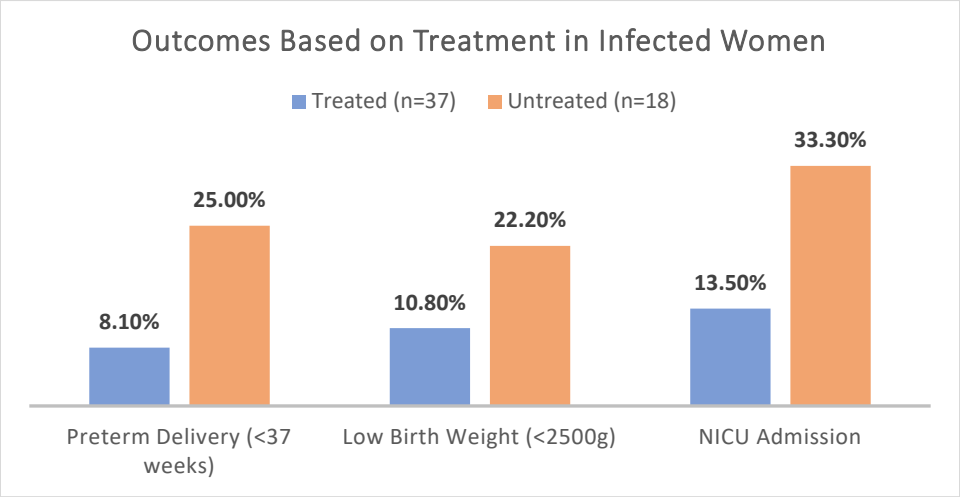


Infected women had significantly higher rates of preterm delivery, low birth weight, and NICU admissions compared to non-infected women.

Table 4: Outcomes Based on Treatment in Infected Women

Outcome	Treated (n=37)	Untreated (n=18)	P-Value
Preterm Delivery (<37 weeks)	8.1%	25.0%	0.02
Low Birth Weight (<2500g)	10.8%	22.2%	0.05

NICU Admission	13.5%	33.3%	0.03



Treated women had lower rates of preterm delivery, low birth weight, and NICU admissions compared to untreated women, underscoring the importance of early antifungal therapy.

Discussion

The results of this study demonstrate the high prevalence of fungal infections, particularly vulvovaginal candidiasis, in pregnant women and the significant impact these infections can have on both maternal and neonatal outcomes. Our findings corroborate previous research indicating that *Candida albicans* is the most frequently isolated pathogen, accounting for 65.5% of infections. Non-*albicans Candida* species, such as *C. glabrata* and *C. krusei*, which accounted for 30.9% of infections, are particularly concerning due to their resistance to standard antifungal therapies.

When comparing our results with other studies, such as the one conducted by Sobel et al., which reported a global rise in non-*albicans Candida* infections, our findings align with the increasing prevalence of these species during pregnancy . Additionally, our study shows similar risk factors for fungal infections, such as antibiotic use, gestational diabetes, and elevated estrogen levels, which are consistent with the work of Denning et al., who identified these variables as significant contributors to recurrent VVC in pregnant women .

Interestingly, our data suggest that antibiotic use is a major risk factor for fungal infections, as women who used antibiotics during pregnancy had a nearly two-fold higher risk of developing VVC. This finding is comparable to previous studies by Cole et al., which highlighted the role of antibiotics in disrupting vaginal flora and promoting fungal overgrowth .

One of the most critical aspects of this study is the analysis of maternal and neonatal outcomes based on fungal infection status and treatment. Women with untreated fungal infections were at a significantly higher risk of preterm delivery and low birth weight, which is consistent with the findings of He et al. who reported similar adverse outcomes in cases of recurrent VVC . Additionally, timely antifungal treatment markedly improved maternal and neonatal outcomes, reducing the rates of preterm birth and NICU admissions. This reinforces the conclusions drawn by Farr et al., who emphasized the importance of early intervention and patient education in managing VVC during pregnancy .

Comparatively, the success of antifungal treatment in our study mirrors findings in other regions, but with slightly lower effectiveness against non-*albicans Candida* species, further supporting the need for targeted therapy for resistant strains as noted by Muzny et al. . Moreover, our study identifies elevated estrogen as a key factor, consistent with the hormone's role in increasing susceptibility to VVC and exacerbating infection severity, as outlined by He et al. .

In summary, this study provides robust evidence that fungal infections, particularly VVC, pose a serious risk during pregnancy. Early diagnosis and tailored antifungal therapy are crucial in mitigating these risks, especially in cases involving non-*albicans Candida* species. The findings from this study align with global trends but also highlight the importance of localized risk factor management and patient-specific treatment strategies.

Conclusion

Fungal infections during pregnancy, particularly vulvovaginal candidiasis, are common and can have severe consequences if left untreated. This study identifies key risk factors, including antibiotic use, elevated estrogen, and gestational diabetes, and underscores the importance of early diagnosis and intervention to improve maternal and neonatal outcomes. The findings suggest that targeted antifungal therapy is effective in reducing complications and highlight the need for continuous patient education and monitoring during pregnancy to prevent adverse outcomes.

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