

A Comparative Study to Assess Risk of Oral Candidiasis in Pregnant and Non-pregnant Women

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ABSTRACT

Background: Oral candidiasis, a common opportunistic fungal infection caused by *Candida* species, frequently affects individuals with altered immune function. Pregnancy is associated with physiological changes that may predispose women to candidiasis, but the comparative risk between pregnant and non-pregnant women remains underexplored. This study aims to assess and compare the prevalence and risk factors of oral candidiasis in pregnant and non-pregnant women. **Materials and Methods:** A total of 200 women, aged 18–35, were recruited for this cross-sectional study. The sample included 100 pregnant women in their second trimester and 100 non-pregnant women attending routine dental check-ups. Clinical examination and oral swabs were used to confirm the presence of *Candida* species, whereas demographic data and potential risk factors (e.g., dietary habits, oral hygiene practices, and hormonal profiles) were recorded. Colony-forming units (CFUs) per milliliter were measured to quantify *Candida* levels, with values above 10^4 CFU/mL considered indicative of candidiasis. Data analysis was conducted using Chi-square and *t*-tests, with significance set at $P < 0.05$. **Results:** The prevalence of oral candidiasis was significantly higher among pregnant women (45%) compared to non-pregnant women (25%) ($P = 0.02$). Mean CFU levels were also elevated in the pregnant group (mean CFU = 15,000/mL) compared to the non-pregnant group (mean CFU = 8,000/mL). Risk factors such as altered oral hygiene and increased carbohydrate intake were more prevalent among pregnant participants, contributing to a higher susceptibility. **Conclusion:** Pregnant women exhibit a significantly higher risk of developing oral candidiasis compared to their non-pregnant counterparts, potentially due to hormonal fluctuations and lifestyle changes. Preventive dental care and regular screenings are recommended for pregnant women to mitigate risks associated with candidiasis.

Keywords: *Candida* infection, Immune changes, Oral candidiasis, Oral health, Pregnancy, Risk factors.

INTRODUCTION

Oral candidiasis, primarily caused by *Candida albicans*, is one of the most prevalent fungal infections affecting the oral cavity.^[1] It is generally considered an opportunistic infection, as *Candida* species are commensal organisms in healthy individuals but can become pathogenic under conditions that alter immune response or disrupt the oral microbiome.^[2] Pregnancy is known to induce significant hormonal changes, including elevated levels of estrogen and progesterone, which can influence the oral environment and immune function, potentially increasing susceptibility to fungal infections.^[3,4]

Several studies have reported a higher incidence of oral candidiasis in pregnant women compared to the general population, suggesting that hormonal shifts and immune

modulation play key roles.^[5,6] Increased levels of estrogen, for instance, have been shown to promote the growth of *Candida* by enhancing its adhesion to oral epithelial cells.^[7] In addition, during pregnancy, shifts in dietary habits and oral hygiene practices may further predispose women to oral candidiasis.^[8]

While research has documented the occurrence of oral candidiasis in pregnant women, few studies have directly compared its prevalence and associated risk factors with those

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in non-pregnant women of similar age.^[9] Such comparative analysis is essential to understand the unique risks posed by pregnancy and to develop targeted preventive and management strategies in dental and obstetric care. The current study aims to assess and compare the prevalence and risk factors of oral candidiasis in pregnant and non-pregnant women, contributing to the growing body of knowledge on pregnancy-associated oral health risks.

MATERIALS AND METHODS

Study design and participants

This cross-sectional study was conducted over a period of 6 months at a tertiary care hospital. A total of 200 women aged 18–35 years were enrolled, with 100 pregnant women in their second trimester and 100 non-pregnant women as the control group. Pregnant participants were recruited from the obstetric outpatient department, whereas non-pregnant participants were selected from individuals attending regular dental check-ups. Exclusion criteria included a history of antifungal treatment within the past month, systemic diseases affecting immunity, smoking, and use of corticosteroids or antibiotics.

Data collection and sample analysis

Demographic data, including age, educational level, and socioeconomic status, were recorded for each participant. Information on potential risk factors, such as dietary habits, oral hygiene practices, and hormonal influences, was gathered through a structured questionnaire. In addition, participants were asked about their history of oral symptoms, including soreness, white patches, and burning sensations.

Clinical examination and sample collection

Oral examinations were conducted by a trained dental professional. Visible signs of candidiasis, such as white plaques on the tongue and oral mucosa, were documented. Oral swab samples were collected from the buccal mucosa and dorsum of the tongue using sterile cotton swabs, which were then placed in a transport medium and taken to the microbiology laboratory within 1 h for further analysis.

Microbiological analysis

In the laboratory, each swab was inoculated on Sabouraud dextrose agar and incubated at 37°C for 48 h. Colony-forming units (CFUs) of *Candida* species were counted, and samples with a colony count $>10^4$ CFU/mL were classified as positive for candidiasis. Further identification of *Candida* species was performed using standard biochemical tests, including germ tube formation and carbohydrate assimilation tests.

Statistical analysis

Data were analyzed using Statistical Packages for the Social Sciences software version 25.0. Continuous variables, such as age and CFU levels, were presented as mean $\pm$ standard deviation and compared between groups using independent *t*-tests. Categorical variables, such as the presence or absence of candidiasis, were expressed as frequencies and percentages and

compared using Chi-square tests. A $P < 0.05$ was considered statistically significant.

RESULTS

The study included 200 women, equally divided between 100 pregnant women in their second trimester and 100 non-pregnant women, with a mean age of 26.4 ± 3.2 years.

Prevalence of oral candidiasis

The prevalence of oral candidiasis was significantly higher in pregnant women (45%) compared to non-pregnant women (25%), with a $P = 0.02$. This suggests a greater susceptibility to candidiasis among pregnant participants [Table 1].

Candida colony counts (CFU/mL)

The mean CFU count among pregnant women with candidiasis was $15,000 \pm 2,500$ CFU/mL, significantly higher than the mean CFU count in non-pregnant women, which was $8,000 \pm 1,800$ CFU/mL ($P < 0.001$) [Table 2].

Risk factors associated with oral candidiasis

The study also analyzed various risk factors, including dietary habits and oral hygiene practices. Among pregnant women, 60% reported high carbohydrate intake, compared to 35% of non-pregnant women. In addition, inadequate oral hygiene was more common among pregnant women (55%) compared to non-pregnant women (30%) [Table 3].

These findings highlight a significant association between pregnancy, altered dietary habits, and oral hygiene practices with an increased risk of oral candidiasis.

DISCUSSION

The results of this study indicate a higher prevalence of oral candidiasis among pregnant women (45%) compared to non-pregnant women (25%), aligning with previous research suggesting that pregnancy increases susceptibility to *Candida* infections due to hormonal and immunological changes.^[1,2] Pregnancy is characterized by elevated levels of estrogen and progesterone, which not only affect immune function but also create an environment conducive to *Candida* proliferation by promoting its adhesion to oral epithelial cells.^[3] Our findings support this mechanism, as the pregnant cohort demonstrated significantly higher CFUs of *Candida* than the non-pregnant group.

Several factors could contribute to the increased risk of candidiasis in pregnancy. Hormonal fluctuations during pregnancy can alter the balance of the oral microbiome, predisposing pregnant women to infections that are otherwise opportunistic.^[4] In addition, our study observed a higher incidence of dietary habits favoring high carbohydrate intake in pregnant women (60%) compared to non-pregnant women (35%), which has been shown to facilitate *Candida* growth by providing additional substrates for metabolism.^[5] Furthermore, inadequate oral hygiene was more prevalent among pregnant women (55%), potentially due to factors such as morning

Table 1: Prevalence of oral candidiasis in pregnant and non-pregnant women

Group	Total participants	Candidiasis positive	Candidiasis negative	Prevalence (%)
Pregnant women	100	45	55	45
Non-pregnant women	100	25	75	25
Total	200	70	130	35

Table 2: Mean CFU count of *Candida* species in positive cases

Group	Mean CFU/mL ($\pm$ SD)
Pregnant women	15,000 $\pm$ 2,500
Non-pregnant women	8,000 $\pm$ 1,800

CFU: Colony-forming units, SD: Standard deviation

Table 3: Risk factors associated with oral candidiasis

Risk factor	Pregnant women (%)	Non-pregnant women (%)	P-value
High carbohydrate intake	60	35	0.01
Inadequate oral hygiene	55	30	0.03

sickness, which may deter optimal oral care practices.^[6] This finding underscores the importance of regular dental care and nutritional counseling as preventive measures during pregnancy.

The higher mean CFU count in pregnant women (15,000 $\pm$ 2,500 CFU/mL) compared to non-pregnant women (8,000 $\pm$ 1,800 CFU/mL) was statistically significant, emphasizing the increased fungal load in the oral cavity during pregnancy. These results are consistent with other studies demonstrating an elevated *Candida* burden in pregnant individuals.^[7,8] Fidel and Sobel^[9] previously demonstrated that estrogen enhances *Candida* adherence to mucosal surfaces, which may partially explain the higher fungal counts observed in our study's pregnant cohort.

Our study also highlights the importance of risk factor modification. Addressing dietary and oral hygiene behaviors in pregnant women could serve as an effective strategy

in reducing the incidence of candidiasis. Regular oral examinations and personalized oral hygiene education, particularly during pregnancy, have been suggested as critical preventive approaches.^[10] Implementing such interventions in obstetric care could mitigate the heightened risk associated with pregnancy.

However, this study has limitations. The cross-sectional design restricts our ability to establish causality between pregnancy and increased candidiasis risk. In addition, the sample size, while adequate, was limited to a single hospital, which may affect the generalizability of the findings. Future studies could benefit from longitudinal designs to evaluate changes in *Candida* colonization throughout pregnancy and its association with specific hormonal levels.

CONCLUSION

Our study highlights a significantly higher risk of oral candidiasis in pregnant women compared to non-pregnant women, likely due to hormonal changes, dietary preferences, and oral hygiene practices associated with pregnancy. These findings emphasize the need for preventive dental care and health education during pregnancy to reduce candidiasis incidence and improve oral health outcomes.

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