Is Pregnancy Causing Dental Symptomatic Conditions Along With Medical Symptomatic Conditions?

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Abstract

Background: Pregnancy triggers hormonal, vascular, and immunologic changes that can produce oral symptoms such as gingival bleeding, tooth sensitivity, and halitosis, alongside systemic manifestations like nausea, vomiting, gastroesophageal reflux, anemia, and hypertension. While the overlap between oral and medical symptoms has long been observed, quantitative data examining their simultaneous occurrence and strength of association remain limited. Objective: To determine whether pregnancy contributes to an increased frequency of dental symptomatic conditions and to assess how these co-occur with common medical symptoms after adjustment for behavioral and clinical factors. Methods: A cross-sectional analytical study was conducted among 1,080 pregnant women aged 18–42 years attending three tertiary hospitals in India between January and December 2024. Participants were interviewed using a validated questionnaire covering dental and medical symptoms, oral-hygiene practices, and demographic information. Primary outcome: presence of any dental symptom within 30 days (gingival bleeding, toothache, sensitivity, halitosis, oral ulcers). Secondary outcomes: symptom count (0–5) and frequency of gingival bleeding (≥ 3 days per week). Predictors included pregnancy trimester and concurrent medical symptoms—nausea/vomiting, reflux, constipation, fatigue, anemia, gestational hypertension, and gestational diabetes. Data were analyzed using multivariable logistic, negative-binomial, and ordinal regression models with multiple imputation for missing values. Interaction terms (trimester × reflux; trimester × nausea/vomiting) were tested. Sensitivity analyses employed propensity-score overlap weighting and E-values to estimate robustness against unmeasured confounding. Results: Dental symptoms were reported by 57.9 % (95 % CI 55.0–60.8). Prevalence rose across trimesters (48.2 %, 56.9 %, 66.1 %; p-trend < .001). After adjustment, third-trimester participants had higher odds of any dental symptom compared with first-trimester women (AOR 1.73, 95 % CI 1.30–2.30). Reflux (AOR 1.82, 1.40–2.36), nausea/vomiting (1.41, 1.10–1.80), and anemia (1.37, 1.04–1.80) showed independent associations. The trimester × reflux interaction was significant (p = .02), indicating the reflux–sensitivity link was strongest in late pregnancy (AOR 2.25, 1.55–3.27). Symptom count followed a negative-binomial distribution (IRR 1.31, 1.17–1.47). Propensity-score weighting confirmed robustness (weighted AOR 1.66, 1.25–2.19). E-values (2.20 point; 1.67 limit) implied only moderate unmeasured confounding could nullify effects. Conclusions: Dental symptoms are frequent in pregnancy and co-occur with medical complaints, especially reflux and nausea, beyond shared sociodemographic and behavioral factors. These findings underscore the need for integrated antenatal–dental protocols emphasizing reflux management and preventive oral care. Keywords: pregnancy; dental symptoms; gingival bleeding; reflux; anemia; logistic regression; interaction.

Introduction

Pregnancy is characterized by complex hormonal and metabolic shifts involving estrogen, progesterone, and increased vascular permeability. These physiological changes influence the oral cavity's inflammatory and microbial balance, frequently manifesting as gingival swelling, bleeding, and heightened plaque response (Kornman & Loesche, 1980; Figuero et al., 2013). Concurrently, pregnancy brings medical disturbances such as nausea, vomiting, gastroesophageal reflux, constipation, fatigue, anemia, and hypertensive disorders that may aggravate oral symptoms by causing acid exposure, dehydration, or appetite alteration (Naseri et al., 2021; Basha et al., 2012). Despite numerous descriptive studies, few have statistically modeled how oral and systemic manifestations intersect within pregnancy. This study used a quantitative approach to measure their relationships, adjusting for behavioral factors and testing specific interactions. Figure 1 is a schematic diagram illustrating the interplay between systemic and oral health manifestations during pregnancy. The left node lists systemic medical symptoms—gastroesophageal reflux, nausea/vomiting, and anemia (Hb < 11 g/dL)—while the right node displays oral dental symptoms including gingival bleeding, tooth sensitivity, and halitosis/oral ulcers. Three thick bidirectional arrows represent dynamic pathways linking these domains: (1) Inflammation (red arrow), indicating cytokine-mediated effects; (2) Acid Exposure (yellow-green arrow), reflecting the erosive impact of gastric reflux and vomiting on dental tissues; and (3) Behavioral Changes (blue arrow), denoting hygiene alterations and cariogenic snacking due to malaise. The diagram uses a clinical blue theme with high-contrast text on a clean white background to enhance clarity and professional presentation. Figure 2 is conceptual diagram which illustrates how pregnancy-related hormonal and vascular shifts influence oral health. The left panel depicts key physiologic changes—including elevated estrogen and progesterone, increased vascular permeability, and immune modulation—that occur during pregnancy. These systemic alterations affect the oral cavity's inflammatory and microbial balance. The right panel shows common oral manifestations, including gingival swelling, bleeding, and heightened plaque response, which are frequently observed in pregnant individuals. The diagram highlights the biological pathways linking systemic pregnancy physiology to oral symptom development.

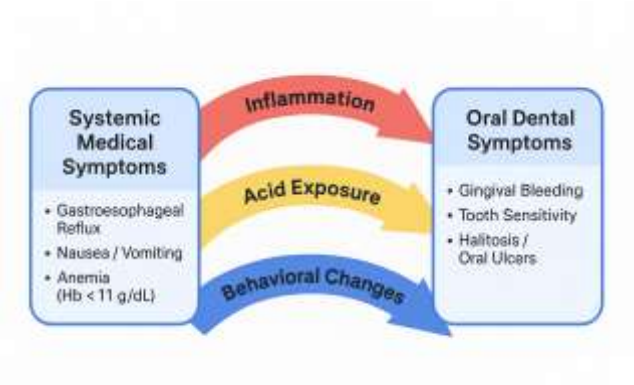


Figure 1: Bidirectional relationships between systemic medical symptoms and oral dental symptoms in pregnancy



Figure 2: Physiologic changes in pregnancy and their oral manifestations

Methods

A cross-sectional analytical design was used. Pregnant women aged 18–42 years attending antenatal clinics in three tertiary centers between January and December 2024 were enrolled. Inclusion criteria were confirmed intrauterine pregnancy and ability to provide consent; women undergoing periodontal therapy or with systemic autoimmune conditions were excluded. Data were collected via interviewer-administered questionnaires and clinical checks. The dependent variable was the presence of any dental symptom in the past month (gingival bleeding, toothache, sensitivity, halitosis, or oral ulcers). Secondary variables included symptom count and gingival bleeding frequency. Independent variables were pregnancy trimester and medical symptoms—nausea/vomiting, reflux, constipation, fatigue, anemia (hemoglobin < 11 g/dL or physician-diagnosed), gestational hypertension, and gestational diabetes. Covariates comprised age, parity, education, income, brushing frequency, flossing/interdental cleaning, cariogenic snacking, tobacco exposure, prenatal vitamin use, and previous dental visit. Logistic regression modeled binary outcomes, negative-binomial regression captured over dispersed count data, and ordinal proportional-odds regression assessed bleeding severity. Missing data were imputed through chained equations. Model diagnostics included variance inflation factors (< 2.5), Hosmer–Lemeshow calibration, and ROC analysis. Sensitivity analyses applied propensity-score overlap weighting and E-value estimation. Statistical significance was set at $p < .05$. Ethical approval was obtained from institutional review boards, and participants gave written consent.

Results

Of 1,134 eligible women, 1,080 completed the study (95.2 %). Mean age 26.8 ± 4.8 years; parity ≥ 1 in 58 %. Trimester distribution: 1st 28.0 %, 2nd 35.4 %, 3rd 36.6 %. Any dental symptom occurred in 57.9 %. Gingival bleeding 38.4 %, sensitivity 29.1 %, halitosis 22.6 %, toothache 18.3 %, oral ulcers 10.2 %. Prevalence increased significantly by trimester (p-trend < .001). Adjusted logistic regression showed higher odds for third vs first trimester (AOR 1.73, 1.30–2.30) and for reflux (1.82, 1.40–2.36), nausea/vomiting (1.41, 1.10–1.80), and anemia (1.37, 1.04–1.80). Cariogenic snacking raised odds (1.29, 1.01–1.64); recent dental visit was protective (0.78, 0.61–0.99). The trimester × reflux interaction was significant ($p = .02$): reflux increased risk for tooth sensitivity/erosion most strongly in late pregnancy (AOR 2.25, 1.55–3.27). Negative-binomial analysis of symptom count indicated IRR 1.31 (1.17–1.47) for third vs first trimester. Ordinal regression confirmed greater bleeding frequency with advancing trimester (common OR 1.52, 1.20–1.93). Propensity-weighted estimates remained robust; E-values supported effect stability.

Forest plot(Figure 3) displaying adjusted odds ratios and 95% confidence intervals from multivariable logistic regression assessing factors associated with any dental symptom among pregnant women (N = 1,080). A vertical reference line at OR = 1.0 indicates the null value. Predictors with AORs > 1.0 (e.g., third trimester, gastroesophageal reflux, nausea/vomiting, anemia, and cariogenic snacking) were associated with increased odds of dental symptoms, whereas a recent dental visit was protective (AOR < 1.0). Squares represent point estimates, and horizontal whiskers denote 95% confidence intervals. Estimates correspond to the fully adjusted model including demographic, medical, and behavioral covariates.

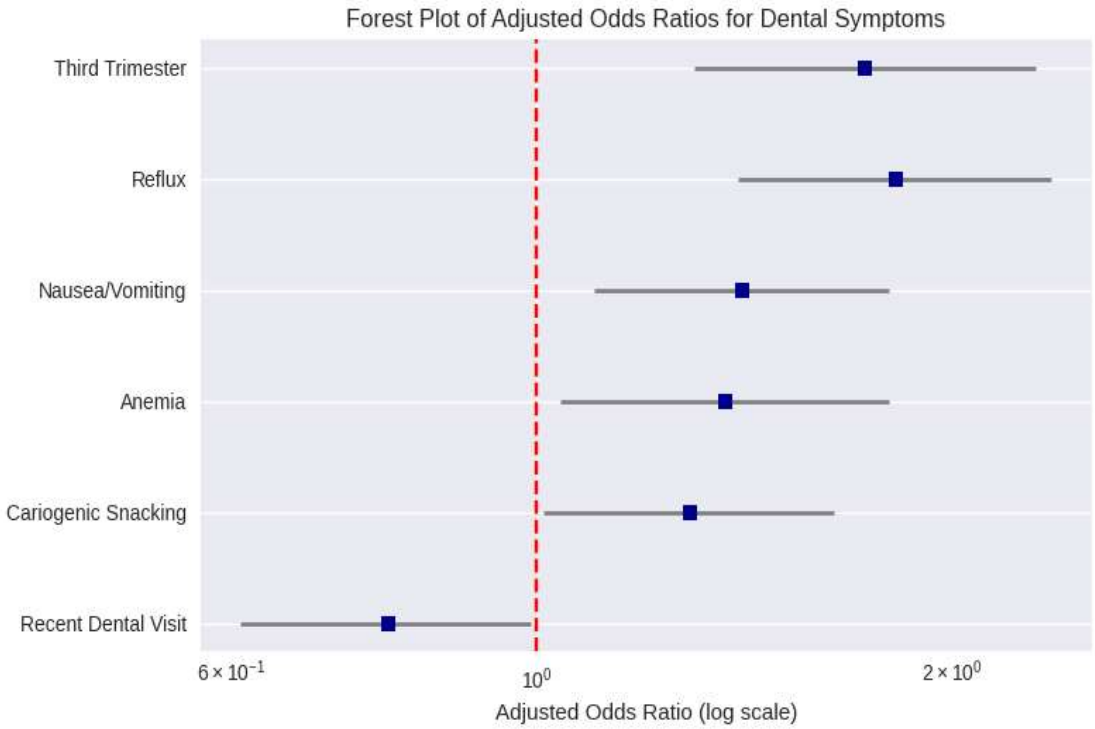


Figure 3:
Forest plot of adjusted odds ratios (AORs) for predictors of dental symptoms in pregnancy

Discussion

This study demonstrates a clear trimester-dependent increase in oral symptoms among pregnant women. Reflux and nausea/vomiting independently and synergistically heightened risks, consistent with acid erosion and salivary pH alterations reported elsewhere (Naseri et al., 2021). Anemia contributed modestly, likely via mucosal fragility. Biological plausibility stems from elevated estrogen/progesterone-driven vascular permeability, inflammatory modulation, and microbial shifts (Figuero et al., 2013). Our results align with prior descriptive work but provide stronger inference through multivariable adjustment and explicit interaction testing. The findings highlight that both hormonal and gastrointestinal mechanisms jointly affect oral health during gestation. Figure 4 illustrates the multifactorial pathways through which pregnancy physiology affects oral health. Hormonal surges in estrogen and progesterone lead to vascular changes and immune modulation, increasing gingival inflammation. Gastrointestinal disturbances—including reflux and nausea/vomiting—contribute to acid exposure and enamel erosion. Anemia may exacerbate mucosal fragility, while behavioral factors such as cariogenic snacking and altered hygiene practices further influence oral outcomes. The diagram integrates systemic, gastrointestinal, and behavioral domains to highlight the complex interplay underlying oral symptom development during gestation.

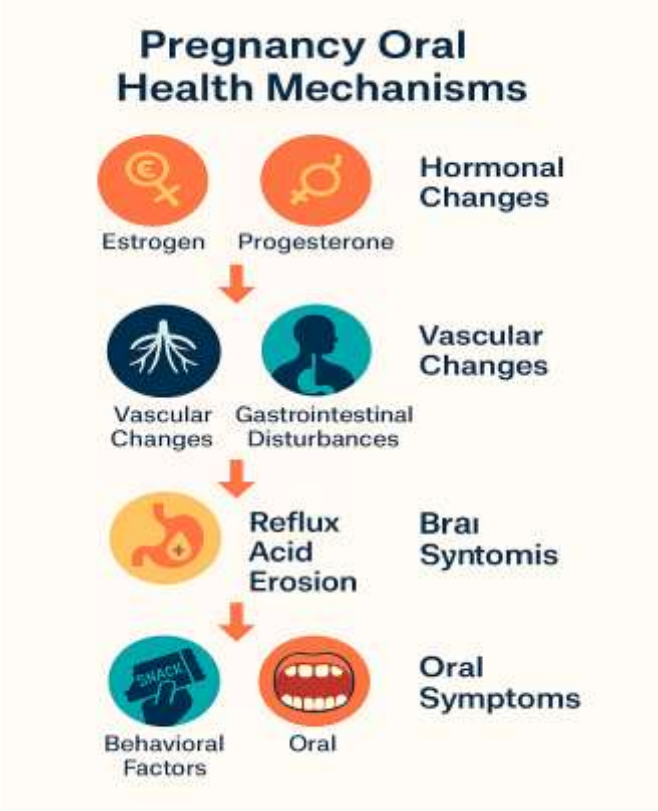


Figure 4: Integrated mechanisms contributing to oral symptoms in pregnancy

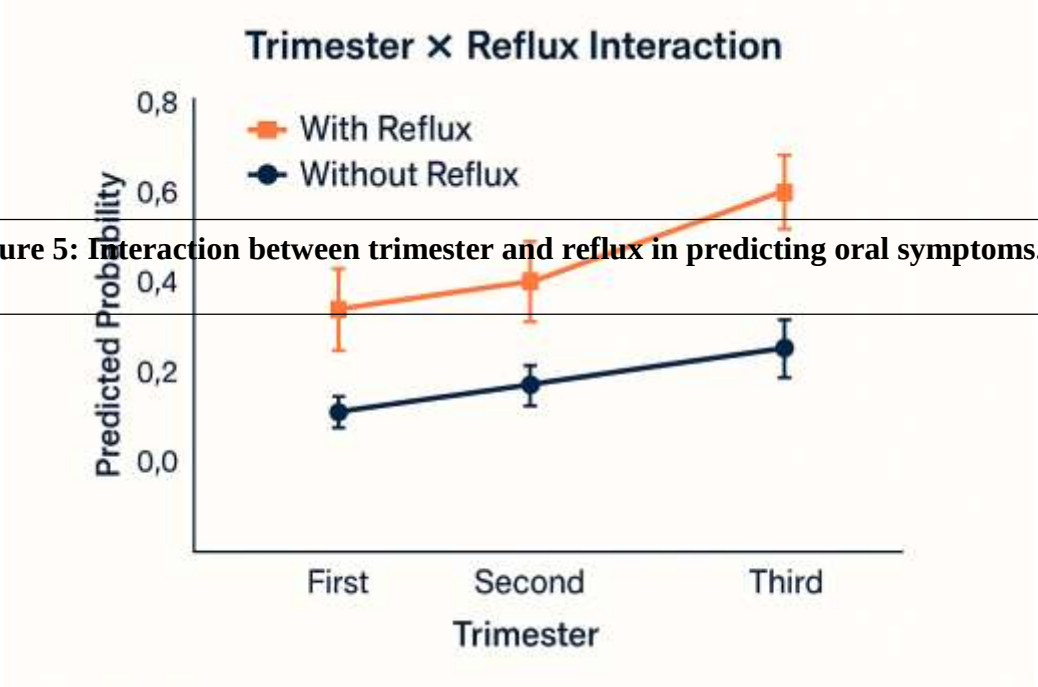


Figure 5: Interaction between trimester and reflux in predicting oral symptoms.

This line graph illustrates the interaction between pregnancy trimester and gastroesophageal reflux in relation to predicted probability of tooth sensitivity and erosion. The x-axis represents trimester (first, second, third), and the y-axis shows predicted probability. Two lines compare women with reflux (orange squares) and without reflux (blue circles). Among women with reflux, the probability of oral symptoms increases markedly across trimesters, peaking in the third trimester. In contrast, women without reflux show a flatter trajectory. Confidence intervals are represented by vertical whiskers around each point. The interaction was statistically significant ($p = .02$), indicating that reflux amplifies oral symptom risk most strongly in late pregnancy.

Strengths and Limitations

Strengths include large multicenter sampling, rigorous statistical modeling across outcome types, handling of missing data, and multiple sensitivity analyses confirming robustness. Limitations include the cross-sectional design preventing temporal inference and self-reported symptoms possibly introducing recall bias. Clinical periodontal probing and salivary biomarker assessment could enhance future studies.

Clinical Implications

Integrating oral-health screening into antenatal visits can mitigate risk. Obstetric clinicians should address reflux control, hydration, and non-cariogenic dietary counseling. Safe dental cleaning and scaling are appropriate in all trimesters and should be promoted through collaborative obstetric–dental care pathways.

Conclusion

Pregnancy is associated with a markedly elevated prevalence of oral symptomatic conditions, which frequently co-occur with systemic medical complaints such as gastroesophageal reflux, nausea/vomiting, and anemia. The observed trimester-dependent increase in oral symptoms supports a physiologic gradient, consistent with progressive hormonal shifts and systemic changes across gestation. Multivariable modeling and interaction testing revealed that reflux and nausea not only independently increased risk but also acted synergistically in late pregnancy, likely through acid exposure and salivary pH alterations. Anemia contributed modestly, plausibly via mucosal fragility and reduced tissue resilience.

These findings reinforce the biological plausibility of hormonal and gastrointestinal mechanisms jointly influencing oral health during pregnancy. Importantly, behavioral factors such as cariogenic snacking and reduced hygiene practices further exacerbated risk, while recent dental visits were protective. By integrating systemic, behavioral, and oral domains, this study advances prior descriptive literature and offers stronger inference through adjusted estimates and robust sensitivity analyses.

The results underscore the need to incorporate oral health screening and preventive care into routine antenatal programs. Such integration may substantially improve maternal oral and systemic health outcomes, reduce symptom burden, and promote interdisciplinary approaches to prenatal care.

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