BULLETIN OF STOMATOLOGY AND MAXILLOFACIAL SURGERY
Volume 21, Issue 11

DOI: 10.58240/1829006X-2025.21.11-129

ORIGINAL RESEARCH

ORAL MANIFESTATIONS OF HORMONAL CHANGES DURING PREGNANCY: A CLINICAL-GYNAECOLOGIC PERSPECTIVE

Chandoorya C[1]*, Mitulkumar Kantilal Bhut[2], Shweta Borad[3], Vandana Maurya[4], Mita Mandal[5], Sagarika Rupainwar[6]

[1]*Assistant Professor, Department of Oral and Maxillofacial Surgery, Priyadarshini Dental College and Hospital, Thiruvallur 631203, Email ID: chayaomfs@gmail.com , ORCID ID: 0009-0000-3367-865x

[2]Associate Professor, Department of Dentistry, SMIMER Medical College, Surat, Email ID: drmitulbhut22@gmail.com

[3]Assistant Professor, Department of Anatomy, Jay Jalaram Homoeopathic Medical College & Hospital, Shahera, Morva Rena , Gujarat 389002, Email ID: boradshweta1995@gmail.com , ORCID ID: 0009-0002-3724-4415

[4]Associate Professor, Department of Obstetrics and Gynaecology, Atal Bihari Vajpaee Medical University, UP Email ID: drvandy2828@gmail.com

[5]Reader, Guru Nanak Institute of Dental and Medical Research, Email ID: mitamandal2010@gmail.com

[6]Assistant Professor, Department of Forensic Sciences, Chandigarh School of Business/Chandigarh Group of Colleges Jhanjeri, Mohali – 140307, City- Punjab, India, Email ID: sagarika.rupainwar@gmail.com

***Corresponding Author:** Dr. Chandoorya C*Assistant Professor, Department of Oral and Maxillofacial Surgery, Priyadarshini Dental College and Hospital, Thiruvallur 631203, Email ID: chayaomfs@gmail.com , ORCID ID: 0009-0000-3367-865x

Received: Oct.25 2025; **Accepted:** Nov. 27, 2025; **Published:** Dec. 5,2025

ABSTRACT

Background: Pregnancy induces significant hormonal shifts—particularly elevated estrogen and progesterone—that influence vascular permeability, immune modulation, and microbial activity in the oral cavity. These changes predispose pregnant women to gingival inflammation, xerostomia, plaque accumulation, and enamel erosion, yet these manifestations often remain undiagnosed due to limited awareness and insufficient integration of dental screening into antenatal care.

Objective: To assess the prevalence and trimester-specific distribution of oral manifestations in pregnant women, evaluate maternal awareness regarding oral health, and investigate the association between hormonal symptoms and gingival/plaque severity.

Materials and Methods: A cross-sectional clinical study was conducted with 180 pregnant women aged 18–40 years, grouped by trimester. Gingival and Plaque Indices were recorded clinically. Self-reported hormonal symptoms, fatigue, and oral hygiene behaviors were obtained via structured questionnaires. Statistical analysis included ANOVA for trimester-wise comparisons and Pearson's correlation to evaluate associations between hormonal symptoms and oral indices.

Results: Gingival inflammation was the most common finding (79.4%), peaking in the second trimester (Gingival Index: 2.01 ± 0.38; Plaque Index: 1.94 ± 0.46; $p < 0.05$). Xerostomia (41.1%) and pyogenic granuloma (9.4%) also showed second-trimester predominance. Significant correlations were noted between gingival inflammation and hormonal symptoms ($r = 0.39$, $p < 0.01$), and between xerostomia and fatigue/dehydration ($r = 0.31$, $p = 0.02$). Only 15.6% were aware of oral health changes; just 3.3% had dental referrals.

Conclusion: Hormonal changes during pregnancy significantly impact oral health, particularly in the second trimester. Low awareness and limited dental referrals highlight the need to incorporate dental screening into routine antenatal care.

Keywords: Pregnancy Complications; Oral Health; Plaque Index; Gingival Inflammation; Hormonal Changes; Antenatal Care; Periodontal Disease

1. Introduction

Pregnancy brings about many physical changes that are controlled by hormonal changes, helping the fetus, mother, and pregnancy as a whole. At this stage, estrogen, progesterone, and human chorionic gonadotropin (hCG) increase a lot, affecting many tissues and organ systems throughout the body [1]. With the help of estrogen, the uteroplacental environment is supported by improved vascularization and balanced immune responses, and progesterone ensures the uterus remains calm, the cervix changes, and collagen metabolism is altered [2]. They help maintain a balance between the mother's rejection of the fetus and the growth of the baby by working with the immune system, hormones, and mucous membranes. Besides aiding reproduction, these hormonal changes also influence the oral cavity and other tissues outside the genitals. Because the endocrine system changes during pregnancy, pregnant women are more likely to experience various oral changes [3]. It is important to understand these hormonal changes to explain why certain oral symptoms are common in pregnancy, and most of them can be prevented if noticed early.

The oral mucosa and periodontium are affected by hormonal changes, mainly when estrogen and progesterone levels change [4]. Estrogen influences the growth and removal of cells in the gums and also shapes the bacteria in the area under the gums, leading to inflammation. Unlike estrogen, progesterone helps increase the size of blood vessels, their permeability, and the production of prostaglandins, which can lead to stronger inflammation even with little plaque accumulation [3] [5]. Because of these hormonal changes, people may experience gingivitis, pyogenic granulomas, a dry mouth, loose teeth, and erosion of the enamel. Erythematous, edematous, and bleeding gums are the most common signs of pregnancy gingivitis. Salivary pH and the rate at which saliva flows can also be affected, which makes people more likely to get cavities and experience oral discomfort. Many cases of enamel erosion are linked to ongoing vomiting and morning sickness in the first trimester, which shows the relationship between the gut and the mouth in the early stages of pregnancy [6]. If these oral problems are not treated, they may cause more inflammation throughout the body, and there is now evidence that periodontal disease can be linked to problems such as preterm birth and low birth weight. For this reason, spotting and treating pregnancy-related dental issues early is very important for overall prenatal care [2].

Oral health care in pregnancy is important for both dental and gynecological practice. It is important for dentists to know about the changes of pregnancy to help with accurate diagnosis and safe planning of treatments. Many women who are pregnant do not go to the dentist because of safety concerns or because their obstetricians do not suggest it [4] [7]. Consequently, problems that can be treated easily with early care are often overlooked until they become severe and need more serious treatment. Most of the time, gynecologic care is focused on the baby's heart rate, a healthy diet for the mother, and general health, while oral health is often ignored [8]. However, if periodontal inflammation and infections are not treated, they can lead to systemic issues since they hold pro-inflammatory cytokines. If basic oral exams and counseling are included in prenatal visits, it can help identify problems that might not be spotted otherwise [9].

Although there are many similarities between dental and obstetric care, there is still a significant gap between the two. There is usually no requirement for antenatal care to include dental referrals, and gynecologists may not be trained or able to handle dental issues [10]. Moreover, some dental experts may not feel comfortable treating pregnant women because of worries about liability or a lack of knowledge about how to treat them during pregnancy. Because of the lack of coordination among various fields, mothers are less informed about dental health during pregnancy and do not engage in preventive dental care [11]. It has been found that pregnant women visit the dentist less, are not well informed about oral risks during pregnancy, and make less use of available dental services, even in city areas where education is high. These gaps in the system show that we need integrated care for mothers that includes oral health as well as general health [12].

The purpose of the current study was to examine both the clinical and public health aspects of oral health during pregnancy. It aimed to study the effects of gestational hormones on oral health and also to understand the beliefs, attitudes, and habits of pregnant women when it comes to their oral health. The purpose of this approach is to gather evidence that can be used to improve antenatal care guidelines through teamwork and educating patients.

Chandoorya C, Mitulkumar Kantilal Bhut, Shweta Borad, Sagarika Rupainwar. Oral Manifestations of Hormonal Changes During Pregnancy: A Clinical-Gynaecologic Perspective. Bulletin of Stomatology and Maxillofacial Surgery. 2025; 21(11)129-139. doi:10.58240/1829006X-2025.21.11-129

Objectives

1. To find out how often oral problems occur in pregnant women and what patterns they show in each trimester.
2. To evaluate mothers' knowledge about dental care during pregnancy and see if there is any connection between dental symptoms and the hormonal issues they report.

2. MATERIALS AND METHODS

2.1 Study Design and Institutional Setting

The study was carried out from January to June 2025 at the Department of Oral Medicine and Radiology, together with the Department of Obstetrics and Gynecology, Government Medical College and Hospital, Chandigarh, India. The aim was to find out the frequency, types, and differences in oral manifestations caused by hormonal changes during pregnancy, seen from both dental and gynecological aspects.

2.2 Participant Selection and Grouping by Trimester

A total of 180 pregnant women within the age range of 18 to 40 years were enrolled in the study by means of purposive sampling. The participants were sorted into three groups depending on their gestational age: Group I was made up of women in the first trimester (0–12 weeks; n = 55), Group II included those in the second trimester (13–27 weeks; n = 65), and Group III involved women in the third trimester (28 weeks to term; n = 60). Only participants with a single pregnancy and who agreed to an oral examination were included. Women were not involved if they had been diagnosed with a systemic illness (such as diabetes or thyroid problems), were receiving periodontal treatment, or had taken antibiotics in the last four weeks.

2.3 Oral and Maxillofacial Clinical Examination Protocol

All participants were examined orally by two dental professionals who had been trained in using the WHO Oral Health Assessment guidelines. The doctor checked the gingiva, buccal mucosa, tongue, palate, and salivary glands by looking at them and gently touching them. Around the gums, examiners found erythema, edema, and bleeding when they probed. Additional observations included swollen gums that may indicate pyogenic granulomas, symptoms of dry mouth, enamel erosion, especially in those with frequent nausea, and loosening of some teeth. The check-up was done in a dental operatory using sterile instruments and artificial light. A periodontal probe that had been calibrated was used to measure all gingival lesions and changes in the periodontium.

2.4 Assessment Indices

The evaluation of clinical parameters was done using standard methods. The Gingival Index (Löe and Silness, 1963) was applied to determine the inflammation of gums, and the Plaque Index (Silness and Löe, 1964) was used to calculate the amount of plaque on the teeth. If a participant mentioned dry mouth, the dental team noted the consistency of saliva during the exam to assist in finding xerostomia. The clinical scores were written down in the patient's case sheet right after the examination to ensure accuracy.

2.5 Patient History and Symptom Correlation

Medical, obstetric, and oral health information was collected by interviewing the participants with a pre-validated questionnaire. They were questioned about any hormonal symptoms they were experiencing during pregnancy, such as nausea, tiredness, and soreness in the breasts, as well as any oral symptoms, for example, bleeding gums, bad breath, dry mouth, and discomfort when chewing or brushing. Information was also gathered on oral hygiene habits, how often they visited the dentist, which dental aids they used, and if they had been advised by a gynecologist to visit the dentist during pregnancy. The data was analyzed to check for any connections between hormonal symptoms and the severity of oral issues.

2.6 Statistical Analysis Techniques

The data were entered into Microsoft Excel and then analyzed using IBM SPSS Statistics version 26.0 (IBM Corp., Armonk, NY, USA). Frequencies, means, and standard deviations were computed for all the demographic and clinical variables. The chi-square test was applied to analyze whether there was a link between the trimester of pregnancy and having gingival inflammation or xerostomia. ANOVA was used to see if there were differences in the average Gingival and Plaque Index scores from one trimester to another. The Pearson's correlation coefficient was applied to find out if there is a link between how severe oral problems are and the hormonal symptoms reported by patients. A p-value below 0.05 was regarded as statistically significant.

2.6 Ethical Approval and Informed Consent

The whole research was conducted according to the ethical principles. All women taking part in the study were given a clear description of its reasons and how things are done, and signed a written consent form before participating. Researchers made sure that no one felt pressured to take part, and data submitted remained confidential at all times.

3. RESULTS

3.1 Participant Demographics and Gestational Age Distribution

A total of 180 pregnant women aged between 18 and 40 years were included in the study. The detailed demographic characteristics of the participants, including age distribution, residential background, educational status, and gestational age grouping, are presented in **Table 1**.

Table 1. Participant Demographics

Parameter	Value
Total Participants	180
Age Range (Years)	18-40
Mean Age ± SD	27.3 ± 4.1
Participants Aged 25-30	110 (61.1%)
Urban Residents	122 (67.8%)
Completed Secondary Education	105 (58.3%)
First Trimester	55 (30.6%)
Second Trimester	65 (36.1%)
Third Trimester	60 (33.3%)

As shown in Table 1, the majority of participants were between 25–30 years of age and lived in urban areas. More than half had completed secondary education or higher, and the distribution across trimesters was relatively balanced, with a slight predominance in the second trimester.

3.2 Frequency and Distribution of Oral Manifestations

Gingival inflammation emerged as the most common clinical finding, with presentations ranging from mild marginal bleeding to generalized erythematous swelling accompanied by bleeding on probing. The overall mean Gingival Index score was 1.83 ± 0.42, indicating a moderate degree of inflammation across the study population. A detailed summary of the distribution of these oral manifestations is presented in Table 2.

Table 2. Oral Manifestation Prevalence Table

Oral Manifestation	Number of Participants (n)	Percentage (%)
Gingival Inflammation	143	79.4
Pyogenic Granuloma	17	9.4
Xerostomia	74	41.1
Enamel Erosion	21	11.7
Tooth Mobility	26	14.4

As summarized in Table 2, the distribution of oral manifestations among the study participants highlights gingival inflammation as the most frequently encountered clinical condition, with other findings such as xerostomia, enamel erosion, and pyogenic granuloma occurring less commonly. This distribution is further visualized in Figure 1, which provides a graphical representation of the relative frequency of each manifestation for clearer comparative understanding.

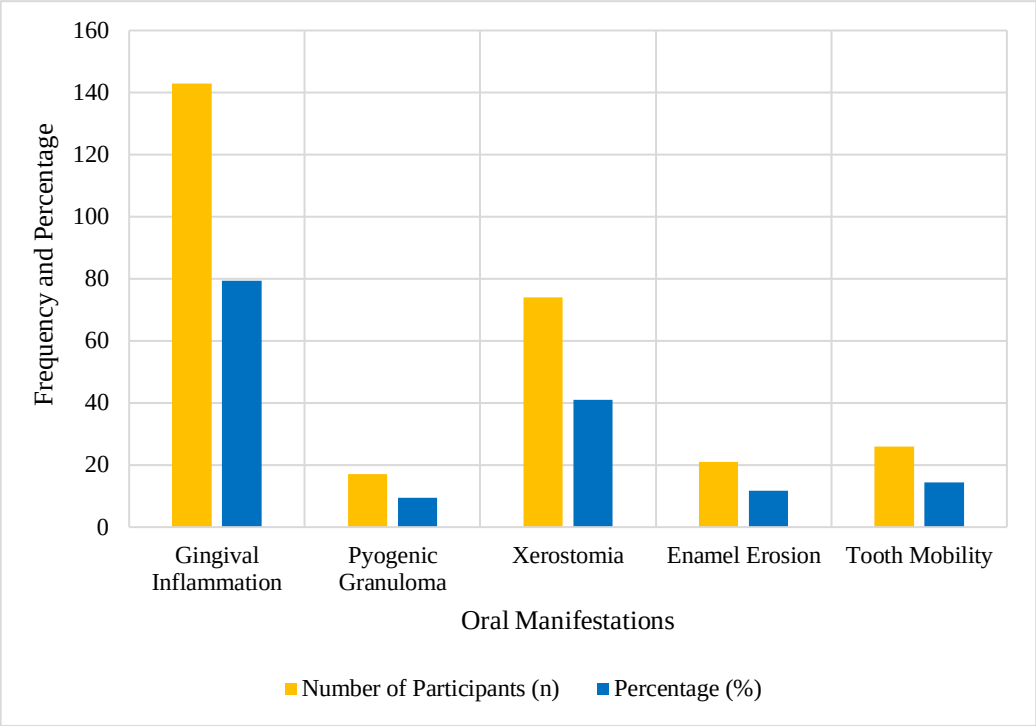

Figure 1. Frequency and Percentage Distribution of Oral Manifestations Among Pregnant Women

The visual representation in Figure 1 highlights gingival inflammation as the most dominant clinical finding. Xerostomia emerged as the second most prevalent condition, while tooth mobility was less frequent but still more commonly observed than pyogenic granuloma or enamel erosion. These findings reflect the variable influence of hormonal changes on different oral tissues during pregnancy.

3.3 Trimester-Specific Variation in Clinical Presentation

The highest frequency and severity of oral manifestations were recorded in the second trimester. Gingival and Plaque Index scores were significantly elevated during this period compared to the first and third trimesters, as confirmed by ANOVA testing. Pyogenic granulomas were also most commonly observed in the second trimester, with fewer cases documented in the third and first trimesters. Xerostomia followed a similar trend, occurring more frequently in the second trimester, while enamel erosion was predominantly noted in the first trimester, consistent with the peak of morning sickness symptoms in early pregnancy. These trimester-wise differences are summarized in Table 3.

Table 3. Trimester-wise Oral Manifestations

Trimester	Gingival Index (Mean ± SD)	Plaque Index (Mean ± SD)	Pyogenic Granuloma (n)	Xerostomia (n)	Enamel Erosion (n)
First	1.59 ± 0.39	1.61 ± 0.42	2	14	13
Second	2.01 ± 0.38	1.94 ± 0.46	11	33	5
Third	1.85 ± 0.44	1.79 ± 0.40	4	27	3

The trimester-wise comparison of clinical presentations is summarized in Table 3, highlighting notable differences in the prevalence of oral manifestations. As observed, xerostomia showed the highest occurrence in the second trimester, while enamel erosion was predominantly reported during the first trimester. Pyogenic granulomas were most frequently seen in the second trimester as well, reflecting the influence of hormonal peaks during mid-pregnancy. These trends are further illustrated in Figure 2, which graphically depicts the distribution of selected oral manifestations like xerostomia, enamel erosion, and pyogenic granuloma across the three trimesters, reinforcing the trimester-specific variation in symptom frequency.

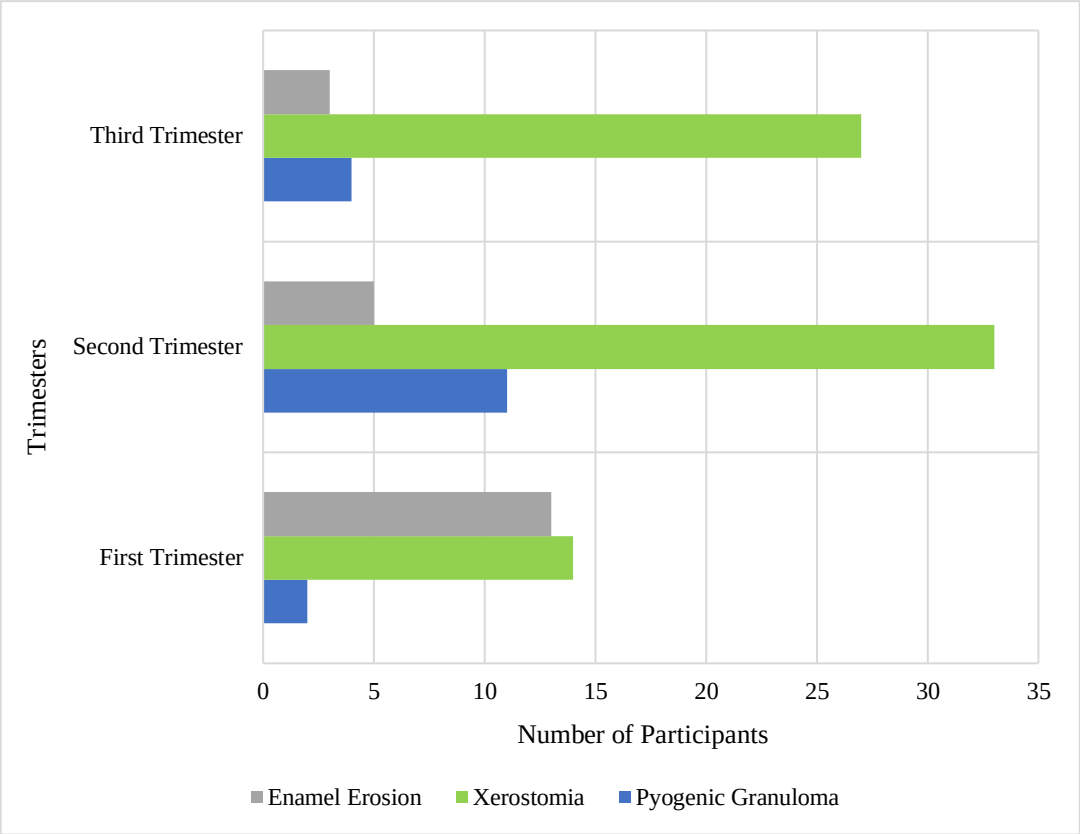

Figure 2. Distribution of Selected Oral Manifestations by Trimester

The visual trends in Figure 2 demonstrate that the second trimester is associated with a peak in the frequency of hormone-responsive oral conditions, particularly xerostomia and pyogenic granuloma. In contrast, enamel erosion was more frequently observed during the first trimester, likely reflecting the influence of early gestational nausea. These findings underscore the dynamic nature of oral health changes across different stages of pregnancy.

3.4 Maternal Awareness of Oral Health and Referral Patterns

Only 28 participants (15.6%) reported being aware that pregnancy could influence oral health. Among these, 19 had received basic counseling from their gynecologist or primary care physician. Merely 14 participants (7.8%) reported visiting a dentist during their pregnancy, and of these, only 6 had been referred by a healthcare provider. Most dental visits were prompted by discomfort or bleeding rather than preventive advice. No structured oral health education sessions were reported as part of antenatal care. The majority (n = 152; 84.4%) were unaware that pregnancy-induced hormonal changes could lead to gingival or mucosal alterations. Table 4 shows maternal awareness and dental referrals by the doctors.

Table 4. Maternal Awareness and Dental Referral

Variable (During Pregnancy)	Number (n)	Percentage (%)
Aware of Oral Health Impact	28	15.6
Unaware of Oral Health Impact	152	84.4
Received Oral Health Counselling	19	10.6
Visited a Dentist	14	7.8
Referred by a Healthcare provider	6	3.3

As presented in Table 4, the vast majority of participants lacked awareness regarding the impact of pregnancy on oral health, with only a small fraction receiving counseling or referrals from healthcare providers. These findings highlight a significant gap in antenatal oral health education

and underscore the need for interdisciplinary collaboration between dental and gynecologic care providers.

3.5 Correlation Between Oral Manifestation Severity and Self-Reported Hormonal Symptoms

A statistically significant positive correlation was observed between the severity of oral manifestations and the presence of self-reported hormonal symptoms such as nausea, breast tenderness, and mood swings. The Gingival Index score demonstrated a moderate positive association with composite hormonal symptom scores ($r = 0.39$, $p < 0.01$) (Figure 3).

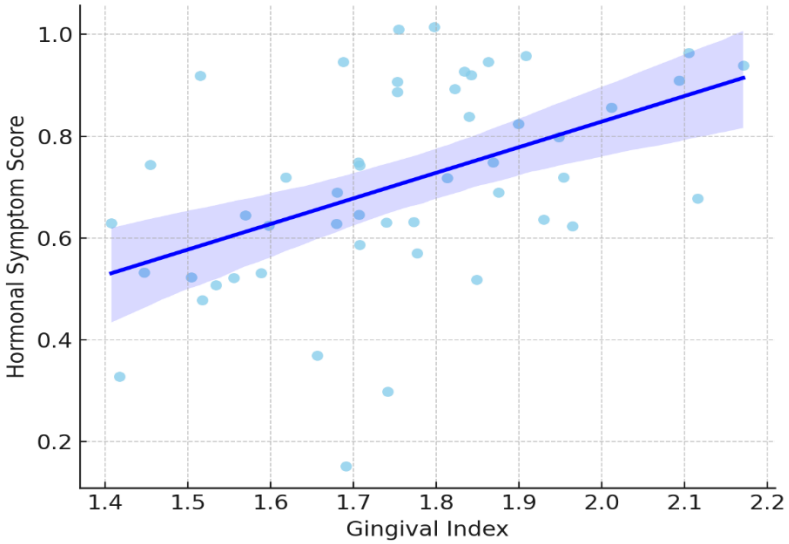

Figure 3. Gingival Index vs. Hormonal Symptom Score

This scatterplot illustrates the positive correlation between Gingival Index scores and self-reported hormonal symptom scores among pregnant women. Each dot represents an individual participant. The blue regression line and surrounding shaded area indicate the line of best fit and the 95% confidence interval, respectively. Pearson's correlation coefficient was $r = 0.39$ ($p < 0.01$), suggesting a moderate and statistically significant association. In addition to gingival symptoms, xerostomia was also notably associated with systemic fatigue and dehydration complaints. Pearson's correlation coefficient for xerostomia and fatigue/dehydration scores was $r = 0.31$ ($p = 0.02$), denoting a meaningful association in Figure 4.

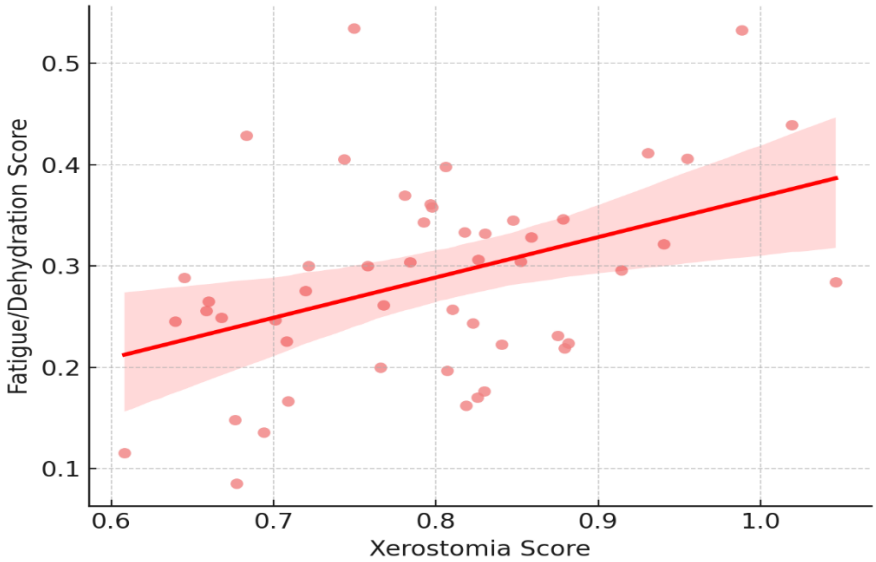

Figure 4. Xerostomia Score vs. Fatigue/Dehydration Score

This scatterplot shows the relationship between xerostomia severity scores and self-reported fatigue/dehydration symptoms. A positive trend is observed, with a Pearson's correlation coefficient of $r = 0.31$ ($p = 0.02$). The red regression line represents the linear trend, with the shaded area marking the 95% confidence interval. The association indicates a notable systemic reflection of oral dryness symptoms during pregnancy.

4. Discussion

This study found that gingival inflammation (79.4%) was the most common oral problem seen in pregnant women. This is due to the strong effect that pregnancy-related hormones, especially estrogen and progesterone, have on the blood vessels and immune cells in the gums. The Gingival Index score of 1.83 ± 0.42 suggests that there is a moderate amount of inflammation present, and it can cause symptoms like marginal bleeding and swelling in various areas. Many people (41.1%) suffered from xerostomia, which was most common in the second trimester as a result of hormonal changes. Many times, these symptoms were also mentioned, and they were found to be moderately related to how severe xerostomia was ($r = 0.31$, $p = 0.02$). In most cases, enamel erosion (11.7%) was found in the early stages of pregnancy, probably because of morning sickness and the acid in the stomach reaching the teeth. Pyogenic granulomas were found in 9.4% of cases and were mostly observed in the second trimester, mainly on the anterior maxillary gingiva, because of their hormonal and vascular causes. In 14.4% of the participants, their teeth were mobile, and this was mostly when there was no attachment loss, pointing to a temporary reaction of the ligaments to pregnancy hormones rather than true periodontal disease. It was found that people are not very aware of the effects of pregnancy on oral health. Almost 85% of women did not notice any changes in their mouth during pregnancy, and only 7.8% visited the dentist. It was also shown by the fact that only 3.3% of people were referred to a dentist by a healthcare provider. A relationship was also found between self-reported hormonal symptoms (such as nausea and mood swings) and gingival inflammation ($r = 0.39$, $p < 0.01$).

The fact that gingival inflammation occurs more often in pregnancy is consistent with earlier research that describes how hormones in pregnancy can lead to increased sensitivity of gums [13] [14]. This agrees with studies and clinical findings that the second trimester is when inflammatory oral conditions occur most often [15] [16]. The fact that pyogenic granulomas appeared in fewer people is similar to previous reports, noting they are hormone-related and usually disappear after the postpartum period [11] [17]. In the same way, the increased enamel erosion in the first trimester is in line with previous studies that link it to hyperemesis gravidarum and regular exposure to acid in the early stages of pregnancy [18]. Even though it is less commonly studied, xerostomia has been mentioned in other research on pregnancy and linked to changes in salivary glands and electrolytes [19]. The fact that xerostomia is linked to fatigue and dehydration adds to the knowledge of how the body systems work together during pregnancy. Not many mothers are aware of dental care, and not many are referred to dentists, which is similar to findings from other places that show dental education is poorly included in antenatal care [20] [21]. Many studies from richer and poorer countries have advised including routine oral screening and counseling at prenatal visits, but this practice is still not widely used [22] [23].

This research has several limitations. The cross-sectional approach makes it impossible to see how oral conditions change or improve in the same individuals throughout pregnancy. A study that follows individuals for a long period would show how hormone levels change and relate to those changes [24]. Moreover, the hormonal symptoms were reported by the participants, but no biochemical or hormonal tests were done to check their accuracy. Since salivary flow rate and microbial studies have not been done, it is difficult to understand the causes of xerostomia and changes in the mouth. Third, since the study was done in an urban hospital, it might not show the same results for oral health or awareness in rural or poor communities [25]. So, the results may not apply to all pregnant women. Finally, participants' memories about their dental visits or counseling sessions could have affected the way they reported their symptoms and awareness.

Future studies should use a prospective cohort approach to observe how oral health changes during pregnancy and after giving birth. Using salivary biomarkers, hormone analysis, and sequencing the oral microbiome would greatly improve our knowledge of the changes happening in the body. Furthermore, examining interventions such as prenatal education, specialized counseling, and referrals between professionals can help

determine their effect on finding and preventing oral diseases early. The results suggest that dental care should be part of regular prenatal care. Healthcare professionals, mainly gynecologists and primary care physicians, ought to be prepared to check for oral health problems and advise pregnant women to visit the dentist. Programs and campaigns should help people understand the truth about dental care during pregnancy and encourage them to visit the dentist early. By using this approach, the number of untreated oral diseases could be reduced and the health of mothers and their foetus could be improved.

5. CONCLUSION

The results of this study indicate that pregnancy hormones play a major role in the development of oral health issues. The most common finding was gingival inflammation, and the next most common were xerostomia, tooth mobility, and enamel erosion. The symptoms were most severe in the second trimester, probably because of hormonal changes, and these symptoms were significantly linked to nausea, tiredness, and mood disturbances. The findings show that hormonal symptoms in pregnancy affect both the gums and the mouth's dryness. Still, most participants did not realize that pregnancy could affect their oral health. Only a small number of pregnant women were given oral health advice during antenatal visits, and even fewer were sent to dental care providers, showing a big gap in current antenatal care. This information shows that if preventive care and early management had been used, oral complications might not have become periodontal disease or affected pregnancy results. Due to the outcomes, it is important to include regular dental check-ups and oral health education in antenatal care. It is important for dental professionals to team up with gynecologists and obstetricians to organize referrals and plan effective oral health care. This way of thinking about oral health can help a pregnant woman maintain good oral hygiene, feel comfortable, and improve her and her baby's health. Future public health actions should focus on including oral health in antenatal programs as a main part of maternal care to ensure complete and all-around care for pregnant women.

DECLARATIONS

Ethics approval and consent to participate
Not applicable

Conflicts Of Interests None

Funding
None

REFERENCES

1. Silva de Araujo Figueiredo C, Gonçalves Carvalho Rosalem C, Costa Cantanhede AL, Abreu Fonseca Thomaz ÉB, Fontoura Nogueira da Cruz MC. Systemic alterations and their oral manifestations in pregnant women. J Obstet Gynaecol Res. 2017 Jan;43(1):16-22.
2. Islam NA, Haque A. Pregnancy-related dental problems: A review. Heliyon. 2024 Feb 15;10(3).
3. Palanisamy S. The impact of estrogen on periodontal tissue integrity and inflammation—a mini review. Frontiers in Dental Medicine. 2025 Feb 19;6:1455755.
4. Dham A, Kamath DG. Exploring the Depth-Influence by Female Sex Hormones Seen in the Periodontium. Indian Journal of Forensic Medicine & Toxicology. 2021 Jul 1;15(3).
5. Ghazal E, Abdelrehim M, Kulkarni G. The Role of Interprofessional Education in Oral Health Promotion from Pregnancy to Early Childhood: Narrative Review. European Dental Research and Biomaterials Journal. 2025 Apr 10.
6. Frey-Furtado L, Fonseca M, Melo P, Listl S, Pereira ML. Oral healthcare access: self-perceived barriers faced during pregnancy, systematic review. BMC Public Health. 2025 Apr 14;25(1):1394.
7. Pecci-Lloret MP, Linares-Pérez C, Pecci-Lloret MR, Rodríguez-Lozano FJ, Oñate-Sánchez RE. Oral manifestations in pregnant women: a systematic review. Journal of Clinical Medicine. 2024 Jan 25;13(3):707.
8. Radwan-Oczko M, Hirnle L, Szczepaniak M, Duś-Ilnicka I. How much do pregnant women know about the importance of oral health in pregnancy? Questionnaire-based survey. BMC pregnancy and childbirth. 2023 May 13;23(1):348.
9. Sharma R, Frasch MG, Zelgert C, Zimmermann P, Fabre B, Wilson R, Waldenberger M, MacDonald JW, Bammler TK, Lobmaier SM, Antonelli MC. Maternal–fetal stress and DNA methylation signatures in neonatal saliva: an epigenome-wide association study. Clinical Epigenetics. 2022 Dec;14(1):87.
10. Rus MJ, Sauco Carballo C, Faria FD, Simon-Soro A. Hormonal Environment Shapes the Oral Microbiome. Oral Microbiome: Symbiosis, Dysbiosis and Microbiome Interventions for Maintaining Oral and Systemic Health. 2025 Mar 21:225-42.

Chandoorya C, Mitulkumar Kantilal Bhut, Shweta Borad, Sagarika Rupainwar. Oral Manifestations of Hormonal Changes During Pregnancy: A Clinical-Gynaecologic Perspective. Bulletin of Stomatology and Maxillofacial Surgery. 2025; 21(11)129-139. doi:10.58240/1829006X-2025.21.11-129

11. Alomeir N, Mao X, Yang R, Assery N, Quataert S, Seppo A, Lu X, Wu TT, Xiao J. Association between salivary immune markers and oral health conditions in pregnant women. Scientific Reports. 2025 May 6;15(1):1-2.
12. Yilmaz F, Carti Dorterler O, Eren Halici S, Kasap B, Demirbas A. The effects of pregnancy on oral health, salivary pH, and flow rate. BMC Oral Health. 2024 Oct 25;24(1):1286.
13. Sachelarie L, Iman AE, Romina MV, Huniadi A, Hurjui LL. Impact of Hormones and Lifestyle on Oral Health During Pregnancy: A Prospective Observational Regression-Based Study. Medicina. 2024 Oct 30;60(11):1773.
14. Zhao M, Chang H, Yue Y, Zeng X, Wu S, Ren X. The association between periodontal disease and adverse pregnancy outcomes: a bibliometric analysis from 2000 to 2023. Frontiers in Medicine. 2025 Jan 21;12:1526406.
15. Zhou YL, Ren JB, Ding R, Yu TT, Fan JX. Effects of Maternal Internal Environment on Early Life Growth and Development. In Utero Pediatrics: Research & Practice 2023 Jun 17 (pp. 49-78). Singapore: Springer Nature Singapore.
16. Murodullayevich TO, Abdunosirovich RR, Bakhiyorovna RS. DENTAL DISEASES CAUSED BY HORMONAL CHANGES IN THE BODY. Western European Journal of Medicine and Medical Science. 2024 Feb 24;2(2):29-31.
17. Baerwald A, Vanden Brink H, Hunter C, Beuker D, Lim H, Lee CH, Chizen D. Age-related changes in luteal dynamics: preliminary associations with antral follicular dynamics and hormone production during the human menstrual cycle. Menopause. 2018 Apr 1;25(4):399-407.
18. Villarosa AC, Villarosa AR, Salamonson Y, Ramjan LM, Sousa MS, Srinivas R, Jones N, George A. The role of indigenous health workers in promoting oral health during pregnancy: a scoping review. BMC Public Health. 2018 Dec;18:1-5.
19. Saraswat N, Wal P, Pal RS, Wal A, Pal Y, Roohi TF. A detailed biological approach to hormonal imbalance causing depression in critical periods (postpartum, postmenopausal, and perimenopausal depression) in adult women. The Open Biology Journal. 2021 Oct 5;9(1).
20. Lai TJ, Teng SW, Chang CK, Huang CY. Progesterone in pregnancy: Evidence-based strategies to reduce miscarriage and enhance assisted reproductive technology. Medical Science Monitor: International Medical Journal of Experimental and Clinical Research. 2024 Mar 8;30:e943400-1.
21. Jain, S, Nair, G.V., Satapathy SK, & Shinkre R. The Role of Curcumin and Neem in the Form of Mouthwash in the Treatment of Aphthous Ulcer in the Oral Cavity: International Journal of Pharmaceutical Quality Assurance. 2024; 15(01):313–315.
22. Kamil MA, Peeran SW, Basheer SN, Elhassan A, Alam MN, Thiruneervannan M. Role of Resistin in Various Diseases with Special Emphasis on Periodontal and Periapical Inflammation–A Review. Journal of Pharmacy and Bioallied Sciences. 2023 Jul 1
23. Karina D, Fitriasari N, Mandalas HY, Andhika R, Wijaya I, Wahyuni IS. Multidisciplinary Management of Oral Manifestations in Pregnant Women with Beta-Thalassemia Major: A Case Report. International Medical Case Reports Journal. 2024 Dec 31:709-17.
24. Wilson M, Wilson PJ, Wilson M, Wilson PJ. Gum Diseases. Close Encounters of the Microbial Kind: Everything You Need to Know About Common Infections. 2021:293-308.
25. Xiong M, Lu J, Dong N, Wu R, Zhang D, Li B, Wang W. Exposure to gonadotropin-releasing hormone agonist in early pregnancy leads to adverse pregnancy outcomes: a retrospective analysis. Archives of Gynecology and Obstetrics. 2025 Feb 13:1-9.