

Pregnancy Induced Orofacial Conditions: A Narrative Review of Literature

Dr. Bello A Mohammed (MBBS, FWACS)¹, Dr Mujtaba Bala (BDS, FWACS)², Umar Abdullahi (MBBS FMCP)³, Dr Anas Bawa Tsafe⁴, Dr Abubakar Muhammad Kaura⁵, Dr Sanusi Abubakar Mayana⁶, Oyakilome AKHIMIE⁷, Abidemi Oyaromade⁸, Nazish Parveen Aquil⁹, Dr Ebenezer Abiodun Ajoloko¹⁰, Taofeek Akin Akinniyi¹¹, Dr. Edeji Benedict Chukwuka¹²

¹Department of Obstetrics and Gynecology, Federal Medical Center Gusau, Federal University, Gusau

²Department of Dental & Maxillofacial Surgery, Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria.

³Department of Internal Medicine, Federal Medical Center Gusau, Federal University, Gusau.

⁴Consultant Department of Dental surgery, Federal Medical Center Gusau.

⁵Consultant, Department, Federal Medical Centre, Gusau.

⁶WHO, Kano State

⁷School of Perioperative Nursing, UDUTH

⁸Department of obstetrics and gynecology, Federal medical center, Gusau

⁹Department of Plastic and reconstructive surgery, USUTH, Sokoto.

¹⁰Department of Oral and Maxillofacial Surgery, General Hospital Lagos, Island.

¹¹Department of Oral and Maxillofacial Surgery, Obafemi Awolowo University Teaching Hospitals' Complex.

¹²Ahmadu Sani Yariman Bakura Specialist hospital Gusau.

Received: 05.04.2026 Revised: 15.05.2026

Accepted: 09.06.2026 Published: 28.06.2026

*Corresponding Author: Dr Bala Mujtaba

Email: mujtababala@yahoo.com

Abstract: Pregnancy is associated with profound hormonal, immunological, and metabolic changes that significantly influence the oral and maxillofacial region, predisposing women to a range of orofacial conditions. Elevated levels of estrogen and progesterone alter vascular permeability, collagen metabolism, inflammatory responses, and oral microflora, increasing susceptibility to oral diseases even in the presence of good hygiene. The most common manifestation is pregnancy gingivitis, characterized by erythema, edema, and bleeding, particularly during the second and third trimesters. Benign hyperplastic lesions such as pyogenic granulomas may also develop due to exaggerated inflammatory and vascular responses. In addition to periodontal changes, pregnancy affects salivary composition, oral pH, and dietary habits, increasing the risk of dental caries, tooth erosion, and dentin hypersensitivity. Frequent vomiting and gastroesophageal reflux contribute to enamel demineralization. Other reported conditions include tooth mobility, temporomandibular joint discomfort, aphthous-like ulcers, and altered taste sensation, all of which may impair quality of life. Emerging evidence suggests a possible association between poor maternal oral health and adverse pregnancy outcomes such as preterm birth, low birth weight, and preeclampsia. This narrative review synthesizes evidence from multiple databases over a 30-year period to examine the epidemiology, pathophysiology, clinical features, and management of pregnancy-induced orofacial conditions. It highlights the need for improved awareness, interdisciplinary collaboration, and evidence-based care, while addressing gaps in knowledge and disparities in access to oral healthcare among pregnant women.

Keywords: Pregnancy, Oral Health, Pregnancy Gingivitis, Orofacial Conditions, Periodontal Diseases, Dental Caries.

Citation: Bello A Mohammed. Pregnancy Induced Orofacial Conditions: A Narrative Review of Literature. e Jnl Med Phrm Sci, 2026 Apr-Jun 2(2):14-28.

INTRODUCTION

Pregnancy is a distinctive physiological condition that is marked by significant hormonal, immunological, metabolic, and vascular alterations that affect nearly all the body systems, including the oral and maxillofacial region [1]. As this condition is necessary to sustain pregnancy and fetal development, these systemic changes can predispose women to a continuum of orofacial disorders, both benign and self-limiting, as well as those of clinical importance that need professional care. [2] Orofacial conditions during pregnancy are a highly significant but often poorly understood aspect of maternal health, whose effects extend beyond the health of the pregnant woman to but have an impact on the well-being of the newborn [2, 3, 4]. The substantive increase in the release of the estrogen and progesterone in the course of pregnancy is central to the modulation of oral tissues [5]. These hormones enhance vascular permeability, change

collagen turnover, affect the inflammatory effect and also alter the microflora composition in the mouth [6, 7]. This can lead to the occurrence of exaggerated inflammatory responses to local irritants such as the dental plaque even with no alterations to oral hygiene practices [8]. Moreover, the state of relative immunological accommodation with pregnancy can also influence host reactions to oral pathogens and be among the causes of the occurrence of diseases [9, 10]. The most prevalent orofacial condition that is associated with pregnancy is the gingivitis and has been reported in a significant percentage of pregnant women across the globe [11, 12]. This condition is clinically manifested by erythematous, edematous, and bleeding gingiva, and usually appears or become severe during the second and third trimester [13]. There are also instances where localized hyperplastic lesions like pregnancy tumors (pyogenic granulomas) develop (mostly on the gingiva) and are due to excessive vascular and inflammatory reaction [14]. Despite being benign, such lesions may render pain, bleeding, cosmetic issues, and disability, which may require clinical approach towards management [15, 16]. Furthermore, pregnancy can have an effect on other structures and tissues of the face rather than periodontal changes. Such as changes in the salivary composition and flow, changes in the oral pH, frequency of nausea and vomiting, and dietary adjustments can put pregnant women at risk of developing dental caries, tooth erosion, and dentin hypersensitivity [17, 18]. The repeated occurrence of vomiting and gastroesophageal reflux, especially during the early stage of pregnancy, exposes teeth to gastric acids, which helps in enamel demineralization and erosion [19, 20]. Moreover, pregnancy has been linked to temporary tooth movement, temporomandibular joint pain, aphthous-like ulcers, and alterations in taste sensation, which may have an impact on the oral comfort and quality of life [21]. There is also emerging evidence of a bidirectional correlation existing between maternal oral health and adverse pregnancy outcomes [22]. Periodontal disease has also been examined as a possible risk factor of preterm birth, low birth weight, and preeclampsia possibly intermediated by systemic inflammation and bacteremia [22, 23]. Despite inconsistent results of various researches, the possibility of association highlights the need to consider and treat pregnancy-related oral diseases to support other antenatal services [20]. Although these conditions are clinically relevant, it has been observed that misperceptions and cultural beliefs about dental care during pregnancy in most settings still exist. The fear of damaging the fetus increases the tendency to postpone a visit to a dentist and to leave oral disease untreated, which further exacerbates oral issues during pregnancy. Also, differences in access to oral services, socioeconomic conditions, nutrition, and oral health baseline are associated with the existence of vast disparities in prevalence and severity levels of pregnancy-induced orofacial diseases in different populations [23, 24]. It is thus of great essence that dental practitioners, obstetricians, and other health professionals who deal with maternal care should have a clear understanding of the spectrum, pathophysiology, clinical presentation, and management considerations of pregnancy-induced orofacial conditions. Narrative reviews are important to synthesize the available evidence and shed light on the concepts, as well as to recognize gaps in the knowledge in relation to the areas of the data and methodologies which are heterogeneous. This narrative review will focus on a thorough investigation of the orofacial conditions and diseases that are caused by pregnancy, their epidemiology, biological pathogenesis, clinical manifestations, diagnostic aspects, and the maternal and fetal health outcomes. Through integrating existing literature, the proposed review will contribute to the advancement of awareness and interdisciplinary cooperation, and evidence-based practice to prevent orofacial conditions and manage them in the course of pregnancy.

MATERIALS AND METHODS

STUDY DESIGN

This was a narrative review of literature conducted to present the clinical presentation and management of pregnancy induced orofacial conditions. The narrative format allowed integration of diverse evidence types, including original articles and case reports.

DATA SOURCES

The literature search was conducted across the following databases: PubMed/MEDLINE, Global Health (CABI), Scopus, Google Scholar, African Index Medicus (AIM), and Research Gate. Manual reference screening (snow balling) was also used to identify additional sources.

SEARCH STRATEGY

Search terms included combinations of keywords and Boolean operators such as:

(Pregnancy OR Pregnant women OR Gestation OR Maternal OR Antenatal OR Prenatal OR Eclampsia)

AND

(Oral OR Orofacial OR Dental OR Gingival OR Periodontal OR Maxillofacial OR Salivary gland)

AND

(Disease OR Condition OR Disorder OR Lesion OR Manifestation)

AND

(Cervicofacial infection OR Ludwig's angina OR Necrotizing fasciitis OR Orofacial trauma)

The search covered the period of 30 years from January 1995 to December 2025 and was limited to English-language sources. Peer-reviewed articles, institutional reports, and high-quality grey literature were included.

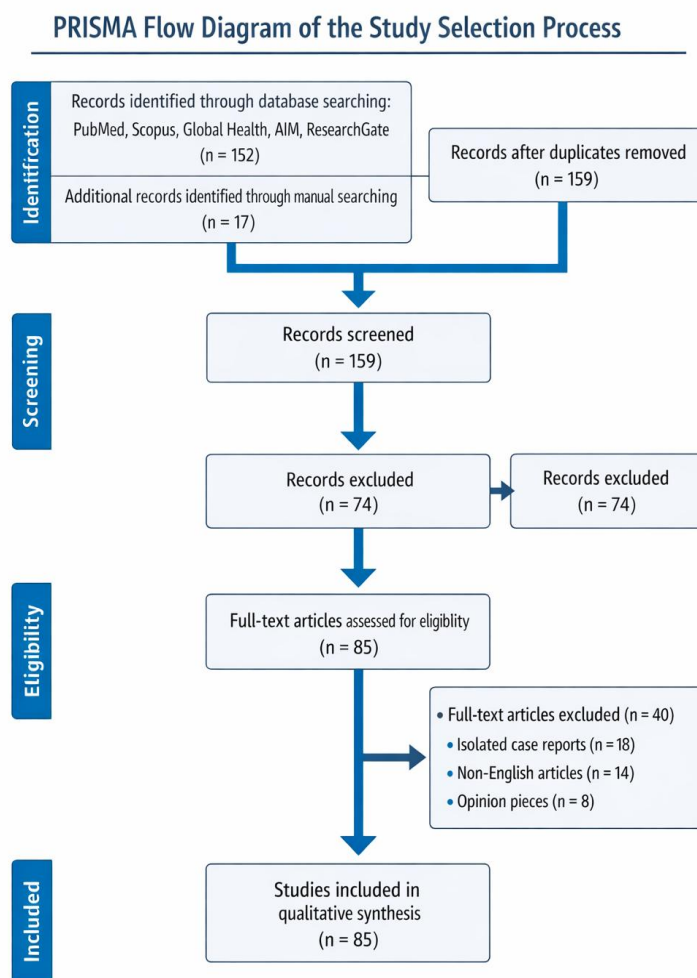


Eligibility Criteria

Inclusion criteria include all articles reporting oral dental and orofacial lesions believed to be pregnancy induced which are peer-reviewed publications from credible institutions. Exclusion criteria include isolated case reports without broader context, articles from non-English sources and non-empirical opinion pieces.

Data Extraction and Synthesis

After title and abstract screening, full-text review was performed. Of 159 articles initially identified articles, 85 articles met the final inclusion criteria. Findings were categorized into eight domains: Each category was described under aetiopathogenesis, clinical presentation, diagnosis, treatment, outcomes and prevention.



RESULTS AND DISCUSSION

Sixteen articles met the inclusion criteria and were analyzed in depth. From the synthesis, recurring thematic domains emerged were organized in to eight categories. Their detail description, management and prevention have also been discussed.

- A. Gingival and periodontal conditions
 - Pregnancy induced gingivitis
 - pregnancy associated periodontitis
 - Pregnancy tumour/granuloma gravidarum
- B. Dental hard tissue disorders
 - Dental caries
 - Dentinal hypersensitivity
 - Dental erosion
3. Oral Mucosal Conditions
 - Pregnancy associated aphthous-like ulcers



- Muco-cutaneous disorders including desquamative gingivitis
 - Oral candidiasis
 - 4. Disorders of the Salivary Gland.
 - Xerostomia (Dry Mouth).
 - Excessive Salivation (Ptyalism Gravidarum)
 - Alterations of Salivary Composition.
 - 5. Temporomandibular Joint Disorders (TMD)-Pregnancy-Associated.
 - 6. Sensory Alterations.
 - 7. Infective and Inflammatory Diseases Worsened by Pregnancy.
 - Periodontal abscesses
 - Pericoronitis
 - Severe odontogenic infections such as cervicofacial space infection, ludwig's angina and cervicofacial necrotizing fasciitis
 - 8. Other conditions such as trauma to the orofacial region secondary to eclampsia, and side effect of supplements used during prgnancy
- Each Category has beendescribed below.

PREGNANCY INDUCED GINGIVITIS

Gingivitis during pregnancy is a typical inflammatory change of the gingival tissues which is a reaction to the endocrine and immunologic shifts of pregnancy instead of a direct effect of the pregnancy [25, 26]. There is a consistent body of evidence to indicate that pregnancy results in more severe gingivitis in pregnant women compared to non-pregnant or postpartum women, despite few or no significant changes in the level of dental plaque [27, 28]. Meta-analytic evidence has demonstrated that the average gingival index scores are relatively very high during the second and third trimester as compared to the first trimester or post-partum period which has indicated a correlation between the advancing gestational age and the increased gingival inflammatory response [29]. The pathophysiology of pregnancy-induced gingivitis can be described as complex and mainly based on hormones [27]. High concentration of estrogen and progesterone in the course of pregnancy cause significant microvascular changes in the gingival tissues that are characterized by raised blood flow, vascular permeability, and subsequent edema that precondition the exaggerated inflammatory reaction to plaque biofilm [30]. They are also immunomodulatory effects of these sex steroid hormones which can down regulate neutrophil activity and change cytokine-mixture in the tissues of the gingiva, and thus, make them more vulnerable to inflammation and tissue degradation when the accumulation of plaque is not significantly increased [31]. Besides modulation of hormones of host tissues, pregnancy has effects on subgingival microbial ecology. Some anaerobic bacteria, especially *Prevotella intermedia*, have been found to grow whereas others not and possibly utilise steroid hormones as growth factors [32]. This selective microbial change also leads to additional gingival inflammation especially in the existence of biofilm. The overall impact of the alterations in the host immunity, vascularity of the gums and microbial flora leads to a more serious clinical image than the one that would be identified by the level of plaque [33, 34]. Gingivitis during pregnancy presents itself with an appearance of erythematous, edematous and friable gums that are readily bled due to gentle probe or brushing [29]. Although these changes have been generalized, it might be more significant in regions where plaque is retained. Notably, the gingivitis induced by pregnancy is generally reversible under proper plaque management and oral health care and it usually heals after the delivery as the endocrine and immunologic parameters go back to pre-pregnancy levels. Nevertheless, when inflammation in the gingiva continues or escalates without any effective intervention, it can also lead to the development of more advanced periodontal pathology such as higher risk of attachment loss which has both maternal oral health and systemic implications [35, 36]. In addition, the relationship between periodontal inflammation in pregnancy and poor pregnancy outcomes including, preterm birth and low birth weight have been examined although the cause and effect relationship and is yet to be established in research [37]. Comprehensively, pregnancy-induced gingivitis is a complex interaction of host immune changes with hormonal variability and periodontal microenvironment [39]. The focus on preventing pregnancy-induced gingivitis is based on the strict oral health practice and incorporation of dental care into the prenatal health [40, 41]. Pregnant women should be encouraged to brush their teeth with soft-bristled tooth brush and fluoridated toothpaste at least three times a day, floss at least one time a day to clear interdental plaque and use alcohol-free antimicrobial rinses as suggested by dental professionals [42, 43]. Periodic visits to a dental professional with at least one dental cleaning appointment during pregnancy, (best in second trimester), enables the removal of deposits that cannot be treated at home in addition to providing an opportunity to provide an individualized oral hygiene education [44, 45, 46]. Food and lifestyle choices are also relevant to the health of gums; restricting the consumption of sweeter foods and drinks can help in lowering the plaque level, and mouth rinsing following vomiting during the morning sickness can also be beneficial in keeping the gingiva and tooth enamel healthy [47, 48]. These preventive measures combined, such as attentive daily oral care, professional care, and enabling dietary and rinsing habits, can alleviate the severity and occurrence of pregnancy gingivitis.

PREGNANCY ASSOCIATED PERIODONTITIS

Pregnancy induced periodontitis is a progressive and destructive periodontal disease, which goes beyond gingival inflammation to include the supporting structures of the tooth, such as periodontal ligament or alveolar bone [49-51]. Periodontitis is whereby the clinical attachment loss and the deepening of the periodontal pockets occur, and this is due to a chronic host response to subgingival biofilm and chronic bacterial challenge [52]. Hormonal effects, especially the high estrogen and progesterone levels in pregnancy can add to the periodontal tissue responses to microbial irritants and may lead to a higher occurrence and severity of periodontitis when the hormonal effects are combined with the presence of local risk factors like presence of plaque and poor oral hygiene [53-55]. It has been noted that the condition occurs in a significant proportion of pregnant women, some systematic reviews have found that periodontitis affects a substantial proportion of the pregnant population and is linked to adverse outcomes, including preterm birth, low birth weight, gestational diabetes and preeclampsia and that possibly occurs through systemic inflammatory mechanisms and translocation of periodontal pathogens or their products. [56-59]. Treatment of pregnancy induced periodontitis focuses on the use of non-surgical periodontal therapy coupled with the preservation of periodontal stability during pregnancy [57]. Non-surgical intervention usually involves scaling and root planing (S and P) which mechanically destabilizes the subgingival biofilm and eliminates the deposits of calculus, and thus it decreases periodontal inflammatory response and bacterial burden [60, 61]. It has been revealed that periodontal therapy in pregnancy is safe both to the mother and baby and can result in clinically significant changes in periodontal parameters, such as decreased probing depth and bleeding on probing, despite inconclusive findings about its potential effects on systemic pregnancy outcomes, such as preterm birth [62]. Periodontal surveillance and individualized treatment regimens ought to be adopted, and most clinicians suggest that periodontal therapy be offered in the second trimester (14-27 weeks) when the mother is most comfortable and the fetus is at less risk of teratogenesis [62, 63]. Mechanical therapy may be supported by adjuncts like educating patients on how to manage their plaque, tailored oral hygiene education, and safe antimicrobial rinses at the right time, among others, to maintain the disease and preserve periodontal health [64]. The basis of preventing pregnancy induced periodontitis lies in preventing periodontal assessment and treatment before entering pregnancy when possible. Prenatal interventions could also increase periodontal stability and slow the course of the current disease in pregnancy, which could contribute to decreasing the number of systemic sequelae. Risk prevention involves detailed periodontal examination during pre-conception, ensuring maximum oral health behavioural improvement through emphasis on effective and attentive plaque removal, frequent professional cleanings, and alteration of the risk factors, including smoking cessation [65-67]. The effect of pregnancy related hormonal changes on periodontal tissues can be alleviated by encouraging patients to keep their periodontal health under control in terms of daily plaque management, regular recall appointments and early detection of periodontal inflammation. [68] These preventive behaviors have to be reinforced continuously throughout pregnancy with the support of an interdisciplinary communication between dental and prenatal healthcare providers to maintain oral and systemic health during the gestation period and beyond.

PREGNANCY TUMOUR/GRANULOMA GRAVIDARUM

Pregnancy tumour also known as pyogenic granuloma or granuloma gravidarum is a benign, hyperplastic vascular lesion, which can occur on the mucosa of the oral cavity, especially on the gingiva of pregnant women [69, 70]. It is histologically characterized by lobular increase in capillary sized vessels in loose connective tissue and though it is called pyogenic, it is not actually pyogenic or a granuloma in the traditional sense of the phrase [71]. The lesion is said to be a reactive non neoplastic proliferation brought about by hormonal effects of pregnancy, local irritation, trauma, or chronic plaque, sex steroids like estrogen and progesterone are believed to increase the angiogenic factors in the gingival tissues [72, 73]. This excessive proliferative reaction causes a reddish, pedunculated/sessile mass during pregnancy, and can range between a few millimetres to more than a centimetre [74]. Gingiva, in particular the maxillary anterior area is the most frequent site of lesion of granuloma gravidarum although lesions may also occur in other intraoral sites [75]. In some series, pyogenic granulomas have been reported to occur in about up to 5 percent of pregnant women; however, the prevalence of these types of granulomas varies considerably across populations and studies [76-78]. Pregnancy tumours have a clinical appearance of well defined exophytic growths, deep red-betish purple in colour and most are ulcerated and highly vascular, which causes them to bleed incessantly when touched gently [77]. They can grow either on any part of the margins of the gums, and could hamper oral functioning, mastication, and oral care in case they are big or symptomatic [76]. These lesions in most instances particularly in small and asymptomatic forms will recede on their own after childbirth as the hormone levels come back to normal and upon conservative management with the focus on better plaque control and oral health can be adequate.

The treatment of pregnancy tumours is based on the intensity of the symptoms and the possible effect on oral functioning [75]. There are asymptomatic lesions that do not compromise the daily activities and may be noted during the pregnancy as reinforcement of meticulous plaque control, dental cleaning with professionals and removal of local irritants to reduce further growth [79]. Large persistent bleeding, painful lesions, lesions that hinder occlusion, and lesions that leave one in a lot of discomfort are those lesions that are surgical in nature; in cases where intervention during pregnancy is needed, it is usually undertaken in the second trimester which happens to be the safest period to have elective dental therapies [80, 81]. Removal can be done by scalpel, laser, cryosurgery or electrocautery, making sure that they go down to the



periosteum and that the adjacent teeth are also scaled to remove sources of irritation and risk of recurrence [82]. Where the excision is not carried out fully or there are residual local irritants, and those lesions excised in pregnancy, the recurrence rate of the same is more frequent than when the lesion is treated after delivery [80]. Consequently, specific surgical treatment is usually not done until after birth, when it is clinically advisable, especially in mild cases, since spontaneous remission may take place after childbirth when hormonal effects subside [83]. Strict upkeep of oral health and dental follow-up are the keystone of both management and prevention as demonstrated that plaque, calculus, and other irritants are removed to keep lesion growth to a minimum as well as to reduce the probability of recurrence.

DENTAL CARIES IN PREGNANCY

Pregnancy is a stage of complicated physiological and hormonal alterations affecting the state of oral health and preconditioning females to the development of hard tissue disorders of the teeth, especially dental caries. High estrogen and progesterone content change the salivary composition, decreasing the salivary pH and buffering capacity which decreases its natural protective role against acidogenic stressors and enhances an oral cariogenic environment [84, 85]. This is augmented by escalating desires of carbohydrate rich diets, regular snacking and in certain instances, poor oral care owing to nausea and vomiting, which altogether augments the danger of caries onset and development [86]. The prevalence of dental caries among pregnant women has always been high in epidemiological studies conducted on different populations. In Tanzania, cross sectional research found a caries prevalence of about 69% among those who attended antenatal clinics and a huge percentage of untreated caries needed restorative treatment [87]. Systematic reviews also suggest that dental caries is in the majority of cases one of the most common manifestations in the oral cavity during pregnancy, it may even surpass periodontal diseases [88]. Clinically, caries first appears as demineralized white spot lesions and subsequently reverse to the development of cavities, which are discoloured with brown or black color and sensitive or painful in case the lesion spreads to dentin [89]. The progression of the untreated caries may result in pulpitis, abscess, and functional impairment, which makes a further complication of maternal well-being [90]. Early lesions are best treated with non-invasive treatments like fluoride therapy and remineralization therapy, but restorative treatment with fillings are safe in pregnancy provided clinically necessary, and the second trimester is sometimes thought to be the safe time to do such procedures [91].

Radiographic examination can be done appropriately without being too aggressive on lead shielding when required in diagnosis and treatment planning [92]. Prevention is prioritized and aim at the fortification of twice-daily dental brushing of the teeth, interdental cleaning, dietary counseling to lessen frequent exposures to sugar, and regular check up at the dental clinic as part of prenatal care [93].

HYPERSENSITIVITY OF DENTINE IN PREGNANCY

Dentinal hypersensitivity (DH) refers to acute, temporary pain occurring as a result of exposed dentin and occurs in response to thermal, tactile, osmotic, or chemical stimuli and in cases where dentinal tubules are patent, and no other dental pathology can be used to explain the symptoms [93]. Although there is no population-specific data on the incidence of DH during pregnancy, the pathogenesis of the disease is strictly connected to enamel loss and gingival recession pathways during pregnancy [94]. There are pregnancy related factors like repeated vomiting as a result of nausea or hyperemesis gravidarum which increases intrinsic exposure to acid resulting in enamel erosion and possible exposing the dentin [95]. Moreover, the periodontal diseases can worsen and resorption due to hormonal effects to reveal root surfaces and expose them to dentinal sensitivity [96]. The hydrodynamic theory offers the best explanation to understand the underlying pain mechanism in DH as the movement of fluids in the dentinal tubules exposed to the environment activates nerve endings to produce sharp pains [97]. Dentinal hypersensitivity has a clinical manifestation, characterized by a sharp, transient, localized pain in the teeth, when exposed to cold, sweet, or acidic stimuli, which cannot be confused with persistent pain of pulpal pathology [98]. Pregnancy management lays emphasis on safe and conservative interventions [99]. Professionally used desensitizing agents, including fluoride varnishes or potassium nitrate containing preparations are helpful in the prevention of neural response and blockage of dentinal tubules [100]. Home care involves the use of desensitizing toothpaste, soft brushing procedures using a soft bristled brush to minimize further enamel abrasion and dental exposure [101]. Prevention methods aim at reducing intrinsic and extrinsic enamel wear through reducing vomiting associated with acid exposure, enhancing optimal oral hygiene practices and controlling factors that contribute to enamel wear like dietary acids [98]. Although DH might not be directly measured in high-pregnancy cohort, the clinical events that trigger it have been extensively reported on when it comes to comparing oral health changes during pregnancy [102].

DENTAL EROSION IN PREGNANCY

Dental erosion can be described as a tooth wear lesion in which acid dissolve the enamel and is especially relevant in pregnancy, where nausea and vomiting are common [103]. In most pregnant women, morning sickness occurs, and in a more severe form - hyperemesis gravidarum - the persistent exposure of teeth to gastric acid can cause a severe demineralization in enamel, particularly on the palatal surfaces of anterior teeth [104]. The shifts in the salivary functionalities which are associated with pregnancy, such as decreased flow rate and lower pH, undermine the natural



buffering capacity of the mouth and therefore undermine the mouth to deal with acidic challenges and thus, erosive processes and consequent hard tissue loss [105]. The prevalence of the clinically identifiable erosion is, therefore, high in women with regular vomiting or reflux, although the prevalence differs between populations and the symptoms severity [106]. In the clinical picture, erosion manifests itself in smooth enamel surfaces, glazed, with the loss of occlusal or palatal features, and there may be an exposure of the dentin and its sensitivity [107]. The condition can be very silent in its early stages but gradually results in functional alterations and aesthetic issues in case the exposure of acids is maintained. The treatment of dental erosion during pregnancy focuses on limiting the acid exposure of the teeth. The basic interventions include the rinsing of the mouth with a neutralizing solution like sodium bicarbonate rinse following vomiting as well as the avoidance of immediate teeth brushing after exposure to acid in order to prevent mechanical erosion of the softened enamel [108, 109]. Topical fluorides and remineralizing agents may be used to increase resistance to enamel and restorative procedures to replenish lost tooth are performed when it is necessary and safe throughout pregnancy [110]. Other preventive measures involve lifestyle and dietary changes to reduce the exposure of intrinsic acids, educating patients on oral health, and integrating routine dental health into prenatal care to identify and intervene on the initial lesions [111].

PREGNANCY ASSOCIATED APHTHOUS LIKE ULCERS

Pregnancy results in an extreme hormonal change and immunological regulation that may change the mucosal immunity and epithelial integrity [5, 6]. Though contradicting results have been found in the literature on the frequency of aphthous ulcers during pregnancy, certain authorities observe a rise in the number of recurrent aphthous like ulcers, especially in the first trimester when the estrogen and progesterone levels are the most dramatic [112]. The lesions are clinically presented as shallow painful lesions with erythematous halos and yellow foci and occur mainly on the non keratinized mucosa [113]. These ulcers can affect eating, talking but they normally tend to be self limiting. The approach of the management is mostly supportive, oriented to the use of topical corticosteroids or anesthetics to minimize pain, as well as good oral hygiene to prevent secondary infection [114, 115]. Some of the preventive measures involve lowering the trauma locally, the maximization of nutrition (folate and iron), and alleviation of stress though some particular preventive measures during pregnancy may need a case-to-case evaluation. Early detection and treatment can be facilitated by regular dental check-up in prenatal care.

MUCO CUTANEOUS DISORDERS

Pregnancy may change the equilibrium of the immune system and induce muco-cutaneous disorders including lichen planus, pemphigoid, and lupus erythematosus [116]. Desquamative gingivitis manifested as erythematous, frail tissues of the gum that slough readily can be eminent in areas where mucosal immune relationships are disrupted. Clinically, the affected gingivae are reddish shiny and bleed with minimal trauma in most cases and accompanied by either discomfort or burning [117]. Pregnancy management focuses on the most topical therapeutic use of the safest possible agents usually corticosteroids and the involvement of dermatology where appropriate. Prevention deals with early detection, professional diagnosis, and modification of the currently existing immunomodulatory regimens under the authorization of dental and obstetric care providers.

ORAL CANDIDIASIS

Oral microbial balance can be disrupted by pregnancy immunosuppression and hormonal effects and put people at risk of opportunistic fungi like Candida, but oral candidiasis has been found to be inconsistently prevalent during pregnancy [118]. Oral candidiasis is normally characterized by white curd like plaques which can be wiped off leaving behind erythematous or bleeding mucosa; chronic erythematous or angular cheilitis develops can also be a result [119]. The topical antifungal agents used in management include nystatin or clotrimazole troches and systemic azoles are only used when indicated clearly and after considering the dangers of pregnancy [118]. Prevention involves the use of optimal oral health, reduction of intake of refined sugar that can support the growth of yeast, and curbing other predisposing factors like xerostomia.

SALIVARY GLAND DISORDERS XEROSTOMIA (DRY MOUTH)

The most frequent pregnancy complaint linked to hormonal alterations, fluid imbalance. Xerostomia is clinically characterized by a sticky mouth mucosa, difficulty in mastication, dental caries and mucosa irritation [119]. Some of the management strategies involve taking sips of water, chewing on sugar free gum or lozenges to trigger the production of saliva, and symptomatic management with saliva substitutes [120]. Preventive treatment also stresses on good oral hygiene practices to reverse the deteriorating benefits of saliva, and frequent dental examinations to detect the presence of caries at an early stage [119].

PTYALISM GRAVIDARUM (EXCESSIVE SALIVATION)

This is a condition characterized by excessive salivation in the mouth. The excessive production of saliva usually starts early in pregnancy and usually will resolve on its own after the first or second trimester [121]. Although the etiology



remains rather unknown, higher secretions in the mouth may be uncomfortable and socially awkward [122]. The patients can report frequent drooling, difficulty with swallowing, and sore throat. The management is quite symptomatic and most often is expectoration, small repeated meals and in some cases, the behavioral techniques to control drooling, with little preventive provision because of spontaneous remission [122]. Salivary Composition changes to alterations, Mineral and immunoglobulin levels, salivary flow and make-up, salivary PH, and changes in salivary protein levels are some of the salivary aspects that are affected by pregnancy and are indicative of systemic hormonal effects. They decrease the acid-buffering, and antimicrobial protection properties of saliva, which leads to caries and mucosal diseases, indirectly. There are a risk of enamel demineralization and a tendency to be predisposed to dry mouth, which clinically can be caused by altered saliva. The compromised protective function is compensated by management, which includes salivary stimulation, excellent oral hygiene, topical fluorides, and the prevention of caries using risk-based approaches [121].

TEMPOROMANDIBULAR JOINT DISORDERS (TMD)

Generalized ligamentous laxity is linked to pregnancy and associated with relaxin and other hormones and may have an impact on joint stability, such as the temporomandibular joints (TMJ) [123]. Even though the TMD does not become specific to pregnancy, the symptoms, including jaw pain, clicking, loss of motion, and masticatory muscle tenderness, might be aggravated [124]. Clinical presentation consists of preauricular pain, pain in joints and inability to open the jaws [123]. The management focuses on conservative treatment: education of the patient, soft diet, jaw exercises, occlusal splints (when necessary), but no invasive treatment during pregnancy is provided [125]. The preventive measures are early detection of the parafunctional habits, stress management.

ALTERATIONS OF THE SENSE ORGANS DURING PREGNANCY

The oral sensory perceptions such as taste (dysgeusia) and smell are affected by pregnancy, which may be ascribed to hormonal and neurologic changes. Patients can complain of changes in taste like metallic taste or being extra sensitive to flavors. Such sensory changes may influence food consumption and indirectly influence the oral condition (more cravings, changes in the diet). Clinical treatment is indirect, with counseling on dietary therapy and assurance because these transformations are usually short-term. Preventive care is performed regarding the balanced nutrition and monitoring of such secondary effects as the caries risk caused by diet changes [126].

PREGNANCY-WORSENED INFECTIVE AND INFLAMMATORY DISEASES

Excessive inflammatory reactions and oral susceptibility to infections are mediated by pregnancy related immunomodulation and hormonal effects [127]. Periodontal abscesses and pericoronitis are likely to occur as a result of inflammation or entrapment of bacteria in and surrounding partially erupted wisdom teeth; pain and swelling accompanied by localized infection are characteristic of these diseases [128]. Such infections may develop to deep fascial space and severe odontogenic and deep fascial space infections, unless treated. Pregnancy is a special danger: increased tissue edema and slowing of immunity may mean that local infections spread to cervicofacial space or progress into life-threatening diseases, such as Ludwig angina or necrotizing fasciitis [129]. Severe infections such as Ludwig angina have much faster developing cellulitis of submandibular areas with obstructed airways. Localized infections are treated with local drainage, elimination of causative irritants and the use of adequate antibiotics that do not present harm to pregnancy [130]. In extreme situations, emergency surgery and multidisciplinary treatment are of paramount importance to save the health of mothers and babies. The prevention measures focus on stringent measures of plaque restriction, early intervention of the third molar impaction and proactive care of the teeth during pregnancy.

OTHER CONDITIONS

TRAUMA SECONDARY TO ECLAMPSIA

Orofacial injuries may occur as a result of eclampsia and pre eclamptic seizure, such as soft tissue trauma, fracture of teeth, or loss of the temporomandibular joint. Timely obstetric stabilization is the most significant, and then, the patient ought to be assessed by a dentist and receive proper treatment after being medically stable [131].

PREGNANCY AND THE SIDE EFFECTS OF THE SUPPLEMENTS USED

Oral side effects occur indirectly, i.e. oral iron supplements can give you a metallic taste or cause gastrointestinal reflux which leads to erosion of enamel, but this is normally not problematic. Dental advice should be included in prenatal care whereby clinicians advise patients on how and when to prepare to avoid oral pain and check on complications [132].

Table: Summary Of Management and Prevention of Pregnancy Induced Orofacial Condition

Condition / Group	Management During Pregnancy	Prevention Before Pregnancy
1. Gingival & Periodontal Conditions		
Pregnancy-induced gingivitis	Professional plaque removal and monitoring; reinforce oral hygiene; safe	Treat existing gingival disease; periodontal evaluation; establish effective



	dental cleanings are recommended during pregnancy.	plaque control and professional cleaning before conception.
Pregnancy-associated periodontitis	Scaling/root planing when indicated; increase frequency of periodontal monitoring; coordinate care with obstetric provider; treat infections promptly.	Comprehensive periodontal assessment and treatment; eliminate deep pockets and infection; reinforce risk-factor management preconception.
Pregnancy tumour/granuloma gravidarum	Conservative management unless interfering with function or bleeding; surgical excision if necessary, after careful assessment.	Eliminate chronic local irritation and plaque; optimal periodontal health before pregnancy to reduce risk.
2. Dental Hard Tissue Disorders		
Dental caries	Definitive restorations when needed; topical fluoride; diet modification; manage acid exposure after vomiting with rinses (e.g., baking soda).	Complete restorative care before conception; risk assessment and caries prevention (fluoride, diet counselling).
Dentinal hypersensitivity	Desensitizing toothpaste/agents; gentle brushing with soft toothbrush; avoid brushing immediately after acid exposure.	Identify erosive risk factors and enamel exposure; treat defects; reinforce proper hygiene technique.
Dental erosion	Rinse with neutralizing solutions after acid exposure (e.g., vomiting); topical fluoride varnish; dietary counseling.	Manage reflux/acid exposure; dietary advice; strengthen enamel before pregnancy.
3. Oral Mucosal Conditions		
Pregnancy-associated aphthous-like ulcers	Topical corticosteroids or anesthetics for pain relief; maintain excellent hygiene; monitor secondary infection.	Identify and treat recurrent aphthous triggers; correct nutritional deficiencies (folate, iron) where present.
Muco-cutaneous disorders (desquamative gingivitis)	Safe topical anti-inflammatory therapy under guidance; interdisciplinary care with dermatology; minimize trauma.	Diagnose and stabilize autoimmune mucocutaneous conditions preconception; optimize systemic therapy.
Oral candidiasis	Topical antifungals as first-line therapy (nystatin/clotrimazole); maintain oral dryness and hygiene; systemic agents only if necessary and safe.	Screen and treat candida colonization; optimize oral environment (reduce sugar intake, manage xerostomia).
4. Salivary Gland Disorders		
Xerostomia (dry mouth)	Hydration; sugar-free gum/lozenges; saliva substitutes; rigorous hygiene to reduce caries risk.	Assess salivary dysfunction; counsel on hydration and risk factors; modify medications that reduce flow.
Excessive salivation (ptyalismgravidarum)	Symptomatic management (frequent expectoration, small meals, comfort measures).	Not reliably preventable; general oral hygiene education to minimize irritation.
Alterations in salivary composition	Reinstate meticulous hygiene given lowered buffering; fluoride support; diet management.	Optimize oral health; manage salivary disorders ahead of pregnancy.
5. Temporomandibular Joint Disorders (TMD)		
	Conservative therapy: jaw exercises, soft diet, warm/cold packs, stress management; occlusal appliances cautiously.	Screen for parafunctional habits; counsel on posture and jaw relaxation techniques preconception.
6. Sensory Alterations		
	Reassurance and supportive advice for taste/smell changes; dietary guidance; monitor nutritional intake.	Evaluate sensory changes; balanced diet to minimize cariogenic food cravings and risk.
7. Infective & Inflammatory Diseases		
Periodontal abscesses	Drainage and antibiotics safe in pregnancy (with obstetric consult); debridement; pain management.	Eliminate localized infection; periodontal therapy; oral hygiene education.
Pericoronitis	Debridement/irrigation; chlorhexidine; pain control; extraction postpartum if	Evaluate and manage impacted third molars; targeted hygiene.



	recurrent.	
Severe odontogenic infections (e.g., cervicofacial space infection, Ludwig's angina, necrotizing fasciitis)	Emergency multidisciplinary care: airway protection, safe antibiotics, surgical drainage if required; coordinate with obstetric team.	Treat deep caries/abscesses pre-pregnancy; risk assessment of potential deep infections.
8. Other Conditions		
Trauma from eclampsia	Stabilize medically first; treat orofacial trauma once stable; focus on airway and fetal safety.	Optimize overall health; manage hypertension/pre-eclampsia risk before conception.
Side effects of supplements	Monitor side effects (e.g., nausea → acid exposure); counsel on oral hygiene and neutralizing rinses post-vomiting.	Review supplement use; counsel on impacts on oral pH and enamel; optimize fluoride and diet.

CONCLUSION

Pregnancy-induced orofacial conditions represent an important component of maternal health, arising from complex hormonal, immunological, vascular, metabolic, and behavioral changes during gestation. This narrative review demonstrates that pregnancy may increase susceptibility to a broad spectrum of conditions, including gingivitis, periodontitis, pregnancy-associated granuloma, dental caries, dentinal hypersensitivity, dental erosion, mucosal disorders, salivary disturbances, temporomandibular joint symptoms, sensory alterations, and oral infections. These conditions can adversely affect oral comfort, nutrition, function, and quality of life, while periodontal inflammation has also been investigated in relation to adverse pregnancy outcomes, although causal relationships remain uncertain.

Early identification, preventive oral hygiene, appropriate dental treatment, dietary counselling, and regular professional monitoring are therefore essential throughout pregnancy. Preconception dental assessment may further reduce existing disease and potential complications. Effective management requires close collaboration between dental and obstetric healthcare professionals, particularly for periodontal disease and serious odontogenic infections.

Overall, integrating oral healthcare into routine antenatal services can promote maternal oral health and support comprehensive pregnancy care. Greater awareness, improved access to dental services, and continued research are needed to address existing knowledge gaps and healthcare disparities.

Support: Nil

Conflicts of interest: Nil

Acknowledgement: We hereby transfer, assign, or otherwise convey all copyright ownership, including any and all rights incidental thereto, exclusively to the journal, in the event that such work is published by the journal.

Ethical Statement: None

REFERENCES

- Silva AS, Fernandes MP, Berdianu N, Sousa HS, Cunha F. Ludwig's Angina in a Pediatric Patient: A Case Report. *Cureus*. 2025 Mar 25;17(3):e81131. doi: 10.7759/cureus.81131.
- Kovalev V. A Severe Case of Ludwig's Angina with a Complicated Clinical Course. *Cureus*. 2020 Apr 16;12(4):e7695. doi: 10.7759/cureus.7695.
- Okoje VN, Ambeke OO, Gbolahan OO. Ludwig's angina: Analysis of cases seen at the University College Hospital Ibadan. *Ann Ib Postgrad Med*. 2018 Jun;16(1):61-68.
- Kathleen M, Maryam G. Case report: Pregnancy complicated by Ludwig's angina requiring delivery. *Infect Dis Obstet Gynecol*. 2010;2010. doi: 10.1155/2010/158264.
- Pucci R, Cassoni A, Di Carlo D, Della Monaca M, Romeo U, Valentini V. Severe odontogenic infections during pregnancy and related adverse outcomes: case report and systematic literature review. *Trop Med Infect Dis*. 2021;6(2):106. doi: 10.3390/tropicalmed6020106.
- Hartnett E, Haber J, Krainovich-Miller B, Bella A, Vasilyeva A, Kessler JL. Oral health in pregnancy. *J Obstet Gynecol Neonatal Nurs*. 2016;45(4):565-573. doi: 10.1016/j.jogn.2016.04.005.
- Bala M, Kaura MA, Tsafe AB, Adigun OI, Ahmadu LL. Spread of odontogenic infection in puerperium: a case report and review of literature. *J Oral Res Rev*. 2025;17:67-70.
- Braimah RO, Ibikunle AA, Taiwo AO, Tunau K. Ludwig's angina in pregnancy and puerperium: case series in an academic hospital, Sokoto, Northwest Nigeria. *Saudi J Health Sci*. 2017;6:130-133.
- Traore I, Beogo R, Coulibaly TA, Some DA, Traore AI, et al. Ludwig angina in pregnancy: treatment outcome in 12 patients and review of literature. *Int J Clin Oral Maxillofac Surg*. 2019;5(1):5-9. doi: 10.11648/j.ijcoms.20190501.12.



10. Balaji VCR, Vani K. Ludwig's angina during pregnancy: a case report. *Indian J Dent Res.* 2024 Jan-Mar;35(1):104-106. doi: 10.4103/ijdr.ijdr_839_23.
11. Trahan MJ, Nicholls-Dempsey L, Richardson K, Wou K. Ludwig's angina in pregnancy: a case report. *J Obstet Gynaecol Can.* 2020 Oct;42(10):1267-1270. doi: 10.1016/j.jogc.2020.03.014.
12. Kamath AT, Bhagania MK, Balakrishna R, Sevagur GK, Amar R. Ludwig's angina in pregnancy necessitating premature delivery. *J Maxillofac Oral Surg.* 2015 Mar;14(Suppl 1):186-189. doi: 10.1007/s12663-012-0410-6.
13. Mukherjee S, Sharma S, Maru L. Poor dental hygiene in pregnancy leading to submandibular cellulitis and intrauterine fetal demise: case report and literature review. *Int J Prev Med.* 2013 May;4(5):603-606.
14. Soltero R, Mercado-Alvarado J. Successful conservative management of Ludwig's angina in advanced pregnancy. *Bol Asoc Med P R.* 2009 Jul-Sep;101(3):42-43.
15. Niederhauser A, Kirkwood D, Magann EF, Mullin PM, Morrison JC. Ludwig's angina in pregnancy. *J Matern Fetal Neonatal Med.* 2006 Feb;19(2):119-120. doi: 10.1080/14767050500439368.
16. Abramowicz S, Abramowicz JS, Dolwick MF. Severe life threatening maxillofacial infection in pregnancy presented as Ludwig's angina. *Infect Dis Obstet Gynecol.* 2006;2006:51931. doi: 10.1155/IDOG/2006/51931.
17. Rajeev S, Panda NB, Batra YK. Anaesthetic management of Ludwig's angina in pregnancy. *Int J Obstet Anesth.* 2009 Jan;18(1):96-97. doi: 10.1016/j.ijoa.2008.08.004.
18. Osunde O, Bassey G, Ver-Or N. Management of Ludwig's angina in pregnancy: a review of 10 cases. *Ann Med Health Sci Res.* 2014 May;4(3):361-364. doi: 10.4103/2141-9248.133460.
19. AL Ghabra Y, Brizuela M, Winters R, et al. Ludwig angina. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK482354/>
20. Rasteniene R, Aleksejuniene J, Puriene A. Dental treatment needs and health care-seeking behaviours of patients with acute odontogenic infections in Lithuania. *Int Dent J.* 2015 Aug;65(4):188-195. doi: 10.1111/idj.12168.
21. Akinbami BO, Akadiri O, Gbujie DC. Spread of odontogenic infections in Port Harcourt, Nigeria. *J Oral Maxillofac Surg.* 2010 Oct;68(10):2472-2477. doi: 10.1016/j.joms.2010.01.019.
22. Sands T, Pynn BR, Katsikeris N. Odontogenic infections: part two. Microbiology, antibiotics and management. *Oral Health.* 1995 Jun;85(6):11-14, 17-21.
23. Kinzer S, Pfeiffer J, Becker S, Ridder GJ. Severe deep neck space infections and mediastinitis of odontogenic origin: clinical relevance and implications for diagnosis and treatment. *Acta Otolaryngol.* 2009 Jan;129(1):62-70. doi: 10.1080/00016480802008181.
24. Hramyka A, Wiczorkiewicz A, Bargiel J, Sliwinski K, Gasiorowski K, Marecik T, et al. Management of odontogenic infections in pregnant patients: case-based approach and literature review. *Pathogens.* 2025 Oct 9;14(10):1024. doi: 10.3390/pathogens14101024.
25. Fomete B, Agbara R, Omeje KU, Oguntayo AO. Odontogenic cervicofacial infection in pregnancy: a need for oral care. *J Family Reprod Health.* 2021;15:1-7.
26. Soma-Pillay P, Nelson-Piercy C, Tolppanen H, Mebazaa A. Physiological changes in pregnancy. *Cardiovasc J Afr.* 2016 Mar-Apr;27(2):89-94. doi: 10.5830/CVJA-2016-021.
27. Moghimi M, Baart JA, Karagozoglu KH, Forouzanfar T. Spread of odontogenic infections: a retrospective analysis and review of the literature. *Quintessence Int.* 2013 Apr;44(4):351-361. doi: 10.3290/j.qi.a29150.
28. Lingani M, Zango SH, Valea I, Samadoulougou S, Sanou MA, Sorgho H, et al. Prevalence and determinants of anaemia among pregnant women in a high malaria transmission setting: a cross-sectional study in rural Burkina Faso. *Pan Afr Med J.* 2024 Jan 3;47:2. doi: 10.11604/pamj.2024.47.2.40612.
29. Stephen G, Mgongo M, Hussein Hashim T, Katanga J, Stray-Pedersen B, Msuya SE. Anaemia in pregnancy: prevalence, risk factors, and adverse perinatal outcomes in Northern Tanzania. *Anemia.* 2018 May 2;2018:1846280. doi: 10.1155/2018/1846280.
30. Mor G, Cardenas I. The immune system in pregnancy: a unique complexity. *Am J Reprod Immunol.* 2010 Jun;63(6):425-433. doi: 10.1111/j.1600-0897.2010.00836.x.
31. Canas M, Fonseca R, De Filippis A, Diaz L, Afzal H, Day A, et al. Ludwig's angina: higher incidence and worse outcomes associated with the onset of the coronavirus disease 2019 pandemic. *Surg Infect (Larchmt).* 2023 Nov;24(9):782-787. doi: 10.1089/sur.2023.163.
32. Kornman KS, Loesche WJ. The subgingival microbial flora during pregnancy. *J Periodontal Res.* 1980 Mar;15(2):111-122. doi: 10.1111/j.1600-0765.1980.tb00265.x.
33. Wu M, Chen SW, Jiang SY. Relationship between gingival inflammation and pregnancy. *Mediators Inflamm.* 2015;2015:623427. doi: 10.1155/2015/623427.
34. Figuero E, Carrillo-de-Albornoz A, Martin C, Tobias A, Herrera D. Effect of pregnancy on gingival inflammation in systemically healthy women: a systematic review. *J Clin Periodontol.* 2013 May;40(5):457-473. doi: 10.1111/jcpe.12053.
35. Gursoy M, Pajukanta R, Sorsa T, Kononen E. Clinical changes in periodontium during pregnancy and post-partum. *J Clin Periodontol.* 2008 Jul;35(7):576-583. doi: 10.1111/j.1600-051X.2008.01236.x.



36. Tilakaratne A, Soory M, Ranasinghe AW, Corea SM, Ekanayake SL, De Silva M. Periodontal disease status during pregnancy and 3 months post-partum, in a rural population of Sri-Lankan women. *J Clin Periodontol.* 2000 Oct;27(10):787-792. doi: 10.1034/j.1600-051x.2000.027010787.x.
37. Kim AJ, Lo AJ, Pullin DA, Thornton-Johnson DS, Karimbux NY. Scaling and root planing treatment for periodontitis to reduce preterm birth and low birth weight: a systematic review and meta-analysis of randomized controlled trials. *J Periodontol.* 2012 Dec;83(12):1508-1519. doi: 10.1902/jop.2012.110636.
38. Murakami S, Mealey BL, Mariotti A, Chapple ILC. Dental plaque-induced gingival conditions. *J Clin Periodontol.* 2018 Jun;45(Suppl 20):S17-S27. doi: 10.1111/jcpe.12937.
39. American College of Obstetricians and Gynecologists. Committee Opinion No. 569: Oral health care during pregnancy and through the lifespan. *Obstet Gynecol.* 2013 Aug;122(2 Pt 1):417-422. doi: 10.1097/01.AOG.0000433007.16843.10.
40. Silk H, Douglass AB, Douglass JM, Silk L. Oral health during pregnancy. *Am Fam Physician.* 2008 Apr 15;77(8):1139-1144.
41. Hartnett E, Haber J, Krainovich-Miller B, Bella A, Vasilyeva A, Kessler JL. Oral health in pregnancy. *J Obstet Gynecol Neonatal Nurs.* 2016;45(4):565-573. doi: 10.1016/j.jogn.2016.04.005.
42. Boggess KA, Edelstein BL. Oral health in women during preconception and pregnancy: implications for birth outcomes and infant oral health. *Matern Child Health J.* 2006 Sep;10(5 Suppl):S169-174. doi: 10.1007/s10995-006-0095-x.
43. Michalowicz BS, DiAngelis AJ, Novak MJ, Buchanan W, Papapanou PN, Mitchell DA, et al. Examining the safety of dental treatment in pregnant women. *J Am Dent Assoc.* 2008 Jun;139(6):685-695. doi: 10.14219/jada.archive.2008.0250.
44. Daalderop LA, Wieland BV, Tomsin K, Reyes L, Kramer BW, Vanterpool SF, Been JV. Periodontal disease and pregnancy outcomes: overview of systematic reviews. *JDR Clin Trans Res.* 2018 Jan;3(1):10-27. doi: 10.1177/2380084417731097.
45. George A, Shamim S, Johnson M, Ajwani S, Bhole S, Blinkhorn A, Ellis S. How do dental and prenatal care practitioners perceive dental care during pregnancy? Current evidence and implications. *Birth.* 2012 Sep;39(3):238-247. doi: 10.1111/j.1523-536X.2012.00543.x.
46. Naseem M, Khurshid Z, Ali Khan H, Niazi F, Zohaib S, Sohail M. Oral health challenges in pregnant women: recommendations for dental care professionals. *Saudi J Dent Res.* 2016;7(2):138-146. doi: 10.1016/j.sjdr.2015.11.002.
47. Laine MA. Effect of pregnancy on periodontal and dental health. *Acta Odontol Scand.* 2002 Oct;60(5):257-264. doi: 10.1080/00016350260248210.
48. Tonetti MS, Greenwell H, Kornman KS. Staging and grading of periodontitis: framework and proposal of a new classification and case definition. *J Periodontol.* 2018 Jun;89(Suppl 1):S159-S172. doi: 10.1002/JPER.18-0006.
49. Papapanou PN, Sanz M, Buduneli N, Dietrich T, Feres M, Fine DH, et al. Periodontitis: consensus report of workgroup 2 of the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions. *J Periodontol.* 2018 Jun;89(Suppl 1):S173-S182. doi: 10.1002/JPER.17-0721.
50. Chapple ILC, Mealey BL, Van Dyke TE, Bartold PM, Dommisch H, Eickholz P, et al. Periodontal health and gingival diseases and conditions on an intact and a reduced periodontium: consensus report of workgroup 1 of the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions. *J Periodontol.* 2018 Jun;89(Suppl 1):S74-S84. doi: 10.1002/JPER.17-0719.
51. Pihlstrom BL, Michalowicz BS, Johnson NW. Periodontal diseases. *Lancet.* 2005 Nov 19;366(9499):1809-1820. doi: 10.1016/S0140-6736(05)67728-8.
52. Raber-Durlacher JE, van Steenberghe TJ, Van der Velden U, de Graaff J, Abraham-Inpijn L. Experimental gingivitis during pregnancy and post-partum: clinical, endocrinological, and microbiological aspects. *J Clin Periodontol.* 1994 Sep;21(8):549-558. doi: 10.1111/j.1600-051x.1994.tb01172.x.
53. Mealey BL, Moritz AJ. Hormonal influences: effects of diabetes mellitus and endogenous female sex steroid hormones on the periodontium. *Periodontol 2000.* 2003;32:59-81. doi: 10.1046/j.0906-6713.2002.03206.x.
54. Loe H, Silness J. Periodontal disease in pregnancy. I. Prevalence and severity. *Acta Odontol Scand.* 1963 Dec;21:533-551. doi: 10.3109/00016356309011240.
55. Offenbacher S, Katz V, Fertik G, Collins J, Boyd D, Maynor G, et al. Periodontal infection as a possible risk factor for preterm low birth weight. *J Periodontol.* 1996 Oct;67(10 Suppl):1103-1113. doi: 10.1902/jop.1996.67.10s.1103.
56. Polyzos NP, Polyzos IP, Zavos A, Valachis A, Mauri D, Papanikolaou EG, et al. Obstetric outcomes after treatment of periodontal disease during pregnancy: systematic review and meta-analysis. *BMJ.* 2010 Dec 29;341:c7017. doi: 10.1136/bmj.c7017.
57. Corbella S, Taschieri S, Francetti L, De Siena F, Del Fabbro M. Periodontal disease as a risk factor for adverse pregnancy outcomes: a systematic review and meta-analysis of case-control studies. *Odontology.* 2012 Sep;100(2):232-240. doi: 10.1007/s10266-011-0048-8.



58. Merchant AT, Das Gupta R, Akonde M, Reynolds M, Smith-Warner S, Liu J, et al. Association of chlorhexidine use and scaling and root planing with birth outcomes in pregnant individuals with periodontitis: a systematic review and meta-analysis. *JAMA Netw Open*. 2022 Dec 1;5(12):e2247632. doi: 10.1001/jamanetworkopen.2022.47632.
59. Cobb CM. Clinical significance of non-surgical periodontal therapy: an evidence-based perspective of scaling and root planing. *J Clin Periodontol*. 2002;29(Suppl 2):6-16. doi: 10.1034/j.1600-051x.29.s2.4.x.
60. Claffey N, Egelberg J. Clinical characteristics of periodontitis in relation to the response to treatment. *J Clin Periodontol*. 1995 Feb;22(2):102-108. doi: 10.1111/j.1600-051x.1995.tb00126.x.
61. Michalowicz BS, Hodges JS, DiAngelis AJ, Lupo VR, Novak MJ, Ferguson JE, et al. Treatment of periodontal disease and the risk of preterm birth. *N Engl J Med*. 2006 Nov 2;355(18):1885-1894. doi: 10.1056/NEJMoa062249.
62. Zanata RL, Fernandes KB, Navarro PS. Prenatal dental care: evaluation of professional knowledge of obstetricians and dentists in the cities of Londrina/PR and Bauru/SP, Brazil, 2004. *J Appl Oral Sci*. 2008 May-Jun;16(3):194-200. doi: 10.1590/s1678-77572008000300009.
63. Iheozor-Ejiofor Z, Middleton P, Esposito M, Glenny AM. Treating periodontal disease for preventing adverse birth outcomes in pregnant women. *Cochrane Database Syst Rev*. 2017 Jun 12;6(6):CD005297. doi: 10.1002/14651858.CD005297.pub3.
64. Suresh L, Radfar L. Pregnancy and lactation. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2004 Dec;98(6):664-674. doi: 10.1016/j.tripleo.2004.07.015.
65. Giglio JA, Lanni SM, Laskin DM, Giglio NW. Oral health care for the pregnant patient. *J Can Dent Assoc*. 2009 Jan;75(1):43-48.
66. Lopez NJ, Da Silva I, Ipinza J, Gutierrez J. Periodontal therapy reduces the rate of preterm low birth weight in women with pregnancy-associated gingivitis. *J Periodontol*. 2005 Nov;76(11 Suppl):2144-2153. doi: 10.1902/jop.2005.76.11-S.2144.
67. Boggess KA, Edelstein BL. Oral health in women during preconception and pregnancy: implications for birth outcomes and infant oral health. *Matern Child Health J*. 2006 Sep;10(5 Suppl):S169-174. doi: 10.1007/s10995-006-0095-x.
68. Jafarzadeh H, Sanatkhan M, Mohtasham N. Oral pyogenic granuloma: a review. *J Oral Sci*. 2006 Dec;48(4):167-175. doi: 10.2334/josnusd.48.167.
69. Harisinh Parmar, Vishal Gheewala, Nileshkumar Bhatt, Chirag Shah. Pyogenic granuloma - report of cases with varied clinical presentations. *J Indian Acad Oral Med Radiol*. 2012;24(1):49-53.
70. Regezi JA, Sciubba JJ, Jordan RCK. *Oral Pathology: Clinical Pathologic Correlations*. 7th ed. St. Louis: Elsevier; 2017.
71. Gondivkar SM, Gadbail AR, Chole R, Karjodkar FR. Oral pregnancy tumor. *Contemp Clin Dent*. 2010 Jul;1(3):190-192. doi: 10.4103/0976-237X.72792.
72. Neville BW, Damm DD, Allen CM, Chi AC. *Oral and Maxillofacial Pathology*. 4th ed. St. Louis: Elsevier; 2016.
73. Tae-Yang Lim, Jaehyun Song, Kwang-Yoon Jung. Pyogenic granuloma gravidarum: a case report and literature review. *Case Rep Dermatol*. 2019;12(Suppl 1):e225803.
74. Sills ES, Zegarelli DJ, Hoschander MM, Strider WE. Clinical diagnosis and management of hormonally responsive oral pregnancy tumor (pyogenic granuloma). *J Reprod Med*. 1996 Jul;41(7):467-470.
75. Mubeen K, Chandrashekhar H, Kavitha M, Bhatt SA. Oral pyogenic granuloma and its management: a report of three cases. *Int J Dent Case Rep*. 2012;2(2):24-28.
76. Marla V, Sarkar S, Dutta S, Ramasamy SK. Pathogenesis of pyogenic granuloma - a challenge to the clinician. *J Clin Diagn Res*. 2016 Jun;10(6):ZE01-ZE05. doi: 10.7860/JCDR/2016/18167.7968.
77. Bhat AR, Naveen H, Sridhara S, Venkatesh A. The prevalence, etiology, symptoms, and treatment of pregnancy-induced orofacial conditions - an original research. *J Pharm Bioallied Sci*. 2021 Nov;13(Suppl 2):S1557-S1560. doi: 10.4103/jpbs.JPBS_224_21.
78. Al-Khateeb TL, Hamasha AA. Prevalence of oral pyogenic granuloma in Jordanian dental patients. *J Contemp Dent Pract*. 2006 Aug 1;7(4):1-10.
79. Reyes BA, Reyes-Colon L, Saavedra DV, Torres-Lagares D. Surgical management of oral pyogenic granuloma - a case report. *J Dent Oral Health*. 2018;4(5):1-4.
80. Fatahzadeh M, Schwartz RA. Oral Kaposi sarcoma: a review and update. *Int J Dermatol*. 2013 Jun;52(6):666-672. doi: 10.1111/j.1365-4362.2011.02378.x.
81. Ghodpage PS, Modak A, Bhutada N, Bhutada S. Laser management of pyogenic granuloma - report of three cases. *J Indian Soc Periodontol*. 2015 Jan-Feb;19(1):107-110. doi: 10.4103/0972-124X.145807.
82. Jiang N, Chen MM, Zhong LP. Oral pyogenic granuloma. *Head Neck*. 2022 Jan;44(1):255-260. doi: 10.1002/hed.26861.
83. Silk H, Douglass AB, Douglass JM, Silk L. Oral health during pregnancy. *Am Fam Physician*. 2008 Apr 15;77(8):1139-1144.
84. Laine M, Pienihakkinen K. Salivary buffer effect in relation to late pregnancy and postpartum. *Acta Odontol Scand*. 2000 Feb;58(1):8-10. doi: 10.1080/000164800279480.



85. Naseem M, Khurshid Z, Ali Khan H, Niazi F, Zohaib S, Sohail M. Oral health challenges in pregnant women: recommendations for dental care professionals. *Saudi J Dent Res.* 2016;7(2):138-146. doi: 10.1016/j.sjdr.2015.11.002.
86. Mmari SB, Mwakagile M, Ngowi BJ, Shayo P, Minja IK. Dental caries status and treatment need among pregnant women attending antenatal clinics in Dar-Es-Salaam region, Tanzania. *BMC Oral Health.* 2024 Sep 4;24(1):1039. doi: 10.1186/s12903-024-04744-2.
87. Silk H, Douglass AB, Douglass JM, Silk L. Oral health during pregnancy. *Am Fam Physician.* 2008 Apr 15;77(8):1139-1144.
88. Fejerskov O, Nyvad B, Kidd E, editors. *Dental Caries: The Disease and Its Clinical Management.* 3rd ed. Oxford: Wiley Blackwell; 2015.
89. Boggess KA. Oral health in women during preconception and pregnancy: implications for birth outcomes and infant oral health. *Matern Child Health J.* 2008 Nov;12(Suppl 1):74-78. doi: 10.1007/s10995-007-0273-3.
90. Hersh EV, Moore PA. Adverse drug interactions in dentistry. *Periodontol 2000.* 2008;46:109-142. doi: 10.1111/j.1600-0757.2008.00251.x.
91. American Dental Association Council on Scientific Affairs. The use of dental radiographs: update and recommendations. *J Am Dent Assoc.* 2006 Sep;137(9):1304-1312. doi: 10.14219/jada.archive.2006.0385.
92. Giglio JA, Lanni SM, Laskin DM, Giglio NW. Oral health care for the pregnant patient. *J Can Dent Assoc.* 2009 Jan;75(1):43-48.
93. West NX, Lussi A, Perrez J, Hellwig E. Dentin hypersensitivity: pain mechanisms and aetiology of exposed cervical dentin. *Clin Oral Investig.* 2013;17(Suppl 1):S9-S19. doi: 10.1007/s00784-012-0887-x.
94. Aboud ME, Aboud MNE. Oral health in pregnancy: review. *Open J Stomatol.* 2019;9:78-90. doi: 10.4236/ojst.2019.95009.
95. Tonetti MS, Jepsen S, Jin L, Otomo-Corgel J. Impact of the global burden of periodontal diseases on health, nutrition and wellbeing of mankind: a call for global action. *J Clin Periodontol.* 2017 May;44(5):456-462. doi: 10.1111/jcpe.12732.
96. Brannstrom M. Dentin sensitivity and aspiration of odontoblasts. *J Am Dent Assoc.* 1963 Sep;66:366-370. doi: 10.14219/jada.archive.1963.0079.
97. Canadian Advisory Board on Dentin Hypersensitivity. Consensus-based recommendations for the diagnosis and management of dentin hypersensitivity. *J Can Dent Assoc.* 2003 Apr;69(4):221-226.
98. Bozzo M, Chua-Gocheco A, Einarson A. Safety of skin care products during pregnancy. *Can Fam Physician.* 2011 Jun;57(6):665-667.
99. Orchardson R, Gillam DG. Managing dentin hypersensitivity. *J Am Dent Assoc.* 2006 Jul;137(7):990-998. doi: 10.14219/jada.archive.2006.0321.
100. Addy M. Dentine hypersensitivity: new perspectives on an old problem. *Int Dent J.* 2002;52(Suppl 5):367-375. doi: 10.1002/j.1875-595x.2002.tb00936.x.
101. Oztekin A, Oztekin C. Dentin hypersensitivity: a narrative review. *Cumhuriyet Dent J.* 2021;24(1):93-100. doi: 10.7126/cumudj.868780.
102. Bartlett DW, Lussi A, West NX, Bouchard P, Sanz M, Bourgeois D. Prevalence of tooth wear on buccal and lingual surfaces and possible risk factors in young European adults. *J Dent.* 2013 Nov;41(11):1007-1013. doi: 10.1016/j.jdent.2013.08.018.
103. Verstraeten N, Lernout T, De Smedt S, Vanobbergen J. Enamel erosion in pregnancy: a systematic review of the literature. *Clin Oral Investig.* 2014;18(4):915-923. doi: 10.1007/s00784-013-1138-8.
104. Bokaie M, Farajzadegan Z, Omid A, Najimi M. The effect of pregnancy on oral health: a systematic review. *J Isfahan Dent Sch.* 2018;13(6):477-490.
105. Jiang H, Shu Z, Tian J, Zhao Y. Dental erosion in pregnancy. *Int J Oral Dent Health.* 2021;7(134). doi: 10.23937/2469-5734/1510134.
106. Jaeggi T, Lussi A. Prevalence, incidence and distribution of erosion. *Monogr Oral Sci.* 2006;20:44-65. doi: 10.1159/000093350.
107. Moynihan P. The role of diet and nutrition in the etiology and prevention of oral diseases. *Bull World Health Organ.* 2005 Sep;83(9):694-699.
108. Dawes C. Salivary flow patterns and the health of hard and soft oral tissues. *J Am Dent Assoc.* 2008 May;139(Suppl):18S-24S. doi: 10.14219/jada.archive.2008.0351.
109. Walsh LJ, Tsang AKL. Management of dentine hypersensitivity through the pharmacological desensitization of intradental nerves. *J Dent.* 2010;38(Suppl 1):S41-S50. doi: 10.1016/j.jdent.2010.05.016.
110. Meurman JH, Murtomaa H. Effect of effervescent vitamin C preparations on bovine teeth and on some salivary factors. *Scand J Dent Res.* 1986 Dec;94(6):491-499. doi: 10.1111/j.1600-0722.1986.tb01799.x.
111. Akintoye SO, Greenberg MS. Recurrent aphthous stomatitis. *Dent Clin North Am.* 2014 Apr;58(2):281-297. doi: 10.1016/j.cden.2013.12.002.
112. Scully C, Gorsky M, Lozada-Nur F. The diagnosis and management of recurrent aphthous stomatitis: a consensus approach. *J Am Dent Assoc.* 2003 Feb;134(2):200-207. doi: 10.14219/jada.archive.2003.0134.



113. Altenburg A, Zouboulis CC. Current concepts in the treatment of recurrent aphthous stomatitis. *Skin Therapy Lett.* 2008 Dec;13(10):1-4.
114. Baccaglini L, Lalla RV, Bruce AJ, Bhatt DL, Stasney CR, Brennan MT, et al. Urban legends: recurrent aphthous stomatitis. *Oral Dis.* 2011 Nov;17(8):755-770. doi: 10.1111/j.1601-0825.2011.01840.x.
115. Bornstein MM, Hakimi B, Perucchini D, Lustenberger C, Liewehr DJ, Treister NS. Oral mucosal manifestations in pregnancy. *Quintessence Int.* 2013 Nov-Dec;44(10):747-760. doi: 10.3290/j.qi.a29887.
116. Holmstrup P, Plemons J, Meyle J. Non-plaque-induced gingival conditions. *J Periodontol.* 2018 Jun;89(Suppl 1):S28-S45. doi: 10.1002/JPER.17-0523.
117. Terezhalmay GT, Naylor GD. Oral Candida infections in pregnancy. *J Oral Med.* 1987 Oct-Dec;42(4):250-256.
118. Challacombe SJ, Naglik JR. The effects of HIV infection on oral mucosal immunity. *Oral Dis.* 2006 May;12(3):282-297. doi: 10.1111/j.1601-0825.2006.01219.x.
119. Villa A, Connell CL, Abati S. Diagnosis and management of xerostomia and hyposalivation. *Ther Clin Risk Manag.* 2015 Jan 20;11:45-51. doi: 10.2147/TCRM.S76282.
120. Thaxter Nesbeth K, Samuels LA, Nicholson Daley C, Gossell-Williams M, Nesbeth DA. Ptyalism in pregnancy - a review of epidemiology and practices. *Eur J Obstet Gynecol Reprod Biol.* 2016 Sep;204:97-101. doi: 10.1016/j.ejogrb.2016.07.482.
121. Haidari M, Nankali A, Loghmani S. Hypersalivation (Ptyalism) in pregnant women and its impacts on their social and personal daily activities. *J Clin Gynecol Obstet.* 2012;1(2-3):40-43.
122. Yengopal V, Naidoo S. Do oral lesions associated with HIV affect quality of life? *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2008 Jan;105(1):66-73. doi: 10.1016/j.tripleo.2007.09.001.
123. Lora IP, Gomes GH, Lagana DC, Falcon-Antenucci RM, Pellizzer EP. Temporomandibular disorders and pregnancy: an epidemiological study. *Rev Odontol UNESP.* 2016;45(1):14-20. doi: 10.1590/1807-2577.04115.
124. Friction J. Myogenous temporomandibular disorders: diagnostic and management considerations. *Dent Clin North Am.* 2007 Jan;51(1):61-83. doi: 10.1016/j.cden.2006.10.002.
125. Nagler RM, Hershkovich O. Sialochemical and gustatory analysis in patients with oral sensory complaints. *J Pain.* 2004 Feb;5(1):56-63. doi: 10.1016/j.jpain.2003.10.002.
126. Figuero Ruiz E, Prieto Prieto I, Bascones Martinez A. Oral changes during pregnancy. *Med Oral Patol Oral Cir Bucal.* 2006 Apr 1;11(2):E107-E113.
127. Lindhe J, Karring T, Lang NP, editors. *Clinical Periodontology and Implant Dentistry.* 5th ed. Oxford: Blackwell Munksgaard; 2008.
128. Pucci R, Cassoni A, Di Carlo D, Della Monaca M, Romeo U, Valentini V. Severe odontogenic infections during pregnancy and related adverse outcomes: case report and systematic literature review. *Trop Med Infect Dis.* 2021;6(2):106. doi: 10.3390/tropicalmed6020106.
129. Hramyka A, Wiczorkiewicz A, Bargiel J, Sliwinski K, Gasiorowski K, Marecik T, et al. Management of odontogenic infections in pregnant patients: case-based approach and literature review. *Pathogens.* 2025 Oct 9;14(10):1024. doi: 10.3390/pathogens14101024.
130. Karnad DR, Guntupalli KK. Neurologic disorders in pregnancy. *Crit Care Med.* 2005 Oct;33(10 Suppl):S362-371. doi: 10.1097/01.CCM.0000182777.58804.40.
131. Sifakis S, Pharmakides G. Anemia in pregnancy. *Ann N Y Acad Sci.* 2000;900:125-136. doi: 10.1111/j.1749-6632.2000.tb06223.x.

