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Evaluation and Assessment of the Impact of Different Periodontal Treatments on Periodontal Health in Pregnant Patient

A Project Submitted to The College of Dentistry, University of Al-Mustaqbal, Partial Fulfillment for The Bachelor of Dental Surgery

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SUPERVISOR CERTIFICATION

I certify that this project entitled

Evaluation and Assessment of the Impact of Different Periodontal Treatments on Periodontal Health in Pregnant Patient

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Dedication

This study is wholeheartedly dedicated to our beloved parents, who have been our source of inspiration and gave us strength when we thought of giving up, who continually provide their moral, spiritual, emotional, and financial support. To our brothers, sisters, relatives, mentor, friends, and classmates who shared their words of advice and encouragement to finish this study. And lastly, we dedicated this book to the Almighty God, thank you for the guidance, strength, power of mind, protection and skills and for giving us a healthy life. All of these, we offer to you.

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In the name of Allah, the Most Merciful, the Most Gracious. All praise is due to Allah; we praise Him, seek His help, and ask for His forgiveness. Thanks, or gratitude, means reciprocating kindness and giving praise to the one who has done good and kind things. The one who deserves thanks and praise from people is Allah. May He be glorified and exalted. I am thankful to Allah, who supplied me with courage, guidance, and love to complete this research. Also, I cannot forget the ideal man of the world and the most respectable personality for whom Allah created the whole universe, Prophet Mohammed (Peace Be Upon Him).

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important ideas and suggestions for our research.

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Abstract

Background: Periodontal diseases are highly prevalent inflammatory conditions that can be exacerbated during pregnancy due to hormonal, immunological, and vascular changes. These alterations increase susceptibility to gingival inflammation and may influence both maternal oral health and overall well-being. Effective and safe periodontal management during pregnancy is therefore essential.

Aim: This study aimed to evaluate and compare the impact of different periodontal treatment approaches on periodontal health among pregnant patients.

Materials and Methods: A clinical observational study was conducted on pregnant patients undergoing periodontal treatment. Clinical parameters assessed included gum bleeding, gingival swelling, pain/discomfort, chewing efficiency, oral cleanliness, halitosis, gingival appearance satisfaction, confidence, oral hygiene maintenance, and overall satisfaction. Descriptive statistical analysis (mean ± standard deviation) was performed to evaluate treatment outcomes.

Results: The findings demonstrated overall improvement in periodontal health following treatment. Most clinical parameters showed low mean values (1.0–1.5), indicating reduced inflammation and satisfactory oral health status. Pain/discomfort exhibited the highest variability (2.5 ± 2.12), reflecting differences in individual response to treatment. One patient demonstrated greater symptom severity, whereas the other showed consistently minimal clinical scores, suggesting variability in treatment response and baseline conditions.

Conclusion: Non-surgical periodontal therapy, combined with oral hygiene instruction, appears effective in improving periodontal health in pregnant patients. Despite variability in individual responses, treatment resulted in reduced gingival inflammation and improved patient-reported outcomes. These findings support the safety and clinical relevance of periodontal care during pregnancy. However, larger studies are required to validate these results and explore potential effects on pregnancy outcomes.

Keywords: Periodontal disease, pregnancy gingivitis, scaling and root planing, maternal oral health, non-surgical periodontal therapy

Aims of study

To evaluate the effect of different periodontal treatment approaches on periodontal health among pregnant patients.

Objectives

1. To assess the periodontal status of pregnant women.
2. To evaluate the effectiveness of different periodontal treatment methods during pregnancy.
3. To compare clinical periodontal parameters before and after treatment.
4. To determine which treatment approach provides the best improvement in periodontal health.

Chapter one
Introduction

1.1 Introduction

Periodontal diseases represent a group of chronic inflammatory conditions affecting the supporting structures of the teeth, including the gingiva, periodontal ligament, cementum, and alveolar bone. These conditions range from reversible gingivitis to irreversible periodontitis, which may ultimately lead to tooth loss if left untreated. Globally, periodontal disease constitutes a major public health concern, ranking among the most prevalent chronic diseases. Epidemiological studies estimate that periodontal disease affects approximately 20–61% of the global population, making it one of the most widespread oral health conditions worldwide (1).

Its multifactorial etiology involves complex interactions between pathogenic bacterial biofilms and host immune responses, modulated by environmental, behavioral, and systemic factors. Pregnancy is a unique physiological state characterized by profound hormonal, immunological, and vascular changes that significantly influence oral health. Elevated levels of estrogen and progesterone during pregnancy have been shown to alter vascular permeability in gingival tissues and modulate the host immune response, thereby increasing susceptibility to periodontal inflammation (2).

These hormonal fluctuations enhance the inflammatory response to dental plaque, even when plaque levels remain unchanged. Consequently, pregnant women are at increased risk of developing gingival conditions, particularly pregnancy gingivitis, which is considered one of the most common oral manifestations during
pregnancy (2).

Pregnancy gingivitis is typically characterized by erythema, edema, bleeding on probing, and increased gingival sensitivity. It usually develops during the first trimester, peaks in the second and third trimesters, and may regress postpartum. However, in some cases, untreated gingivitis may progress to periodontitis, leading to irreversible destruction of periodontal tissues. Studies indicate that the prevalence of pregnancy gingivitis can reach up to 60–75% among pregnant women, highlighting its clinical significance (2).

The pathophysiology of pregnancy-related periodontal changes is primarily attributed to hormonal effects on gingival microcirculation, alterations in subgingival microbiota, and dysregulation of the immune-inflammatory response.

In addition to local oral effects, periodontal disease during pregnancy has been increasingly associated with adverse pregnancy outcomes. A growing body of evidence suggests a potential link between maternal periodontal infection and systemic conditions such as preterm birth, low birth weight, and preeclampsia. The proposed mechanism involves the dissemination of periodontal pathogens and inflammatory mediators, such as prostaglandins and cytokines, into the systemic circulation, which may influence fetal development and pregnancy outcomes (3).

Furthermore, periodontal pathogens have been detected in placental tissues and amniotic fluid, supporting the hypothesis of a biological link between oral infection and adverse obstetric outcomes (5).

Given these associations, the importance of maintaining optimal periodontal health during pregnancy cannot be overstated. Preventive and therapeutic periodontal care plays a crucial role in minimizing oral inflammation and potentially reducing systemic complications. However, the management of periodontal disease in pregnant patients requires careful consideration of both

maternal and fetal safety. Clinical guidelines generally recommend that dental treatment, particularly non-surgical periodontal therapy, be performed during the second trimester, which is considered the safest period for dental interventions (4).

Procedures such as scaling and root planing, plaque control, and oral hygiene instruction are widely accepted as safe and effective during pregnancy when performed with appropriate precautions. Non-surgical periodontal therapy (NSPT), including scaling and root planing, remains the gold standard for managing periodontal disease during pregnancy. These interventions aim to reduce bacterial load, eliminate local etiological factors, and control inflammation. Adjunctive therapies, such as antimicrobial mouth rinses and local drug delivery systems, may also be used to enhance treatment outcomes, although their use must be carefully evaluated in terms of safety (3).

Surgical periodontal procedures are generally postponed until after delivery unless absolutely necessary. Despite the recognized importance of periodontal care during pregnancy, there remains ongoing debate regarding the effectiveness of periodontal treatment in improving both periodontal status and pregnancy outcomes. While several studies have demonstrated significant improvements in clinical periodontal parameters following treatment, the evidence regarding its impact on adverse pregnancy outcomes remains inconclusive. Recent metaanalyses have shown that periodontal treatment can reduce gingival inflammation and improve periodontal health; however, its effect on reducing the incidence of preterm birth and low birth weight is still under investigation (3).

This inconsistency highlights the need for further well-designed clinical studies to clarify the role of periodontal therapy in this population. Moreover, variations in study design, treatment protocols, timing of intervention, and patient characteristics contribute to the heterogeneity of findings in the existing literature. Some studies suggest that early intervention during pregnancy may yield better

outcomes, while others emphasize the importance of preconception periodontal care. Additionally, socioeconomic factors, access to dental care, and patient awareness significantly influence periodontal health status during pregnancy (4).

Therefore, a comprehensive evaluation of different periodontal treatment approaches and their outcomes is essential to establish evidence-based clinical guidelines.

The rationale for the present study arises from the need to better understand the effectiveness of various periodontal treatment modalities in pregnant patients and to identify the most beneficial approaches for improving periodontal health. Given the high prevalence of pregnancy-related gingival conditions and their potential systemic implications, it is imperative to assess the impact of different treatment strategies on clinical periodontal parameters.

This study aims to contribute to the existing body of knowledge by providing a comparative evaluation of periodontal treatment methods and their outcomes in pregnant women. Current approaches to periodontal therapy in pregnant women primarily focus on non-invasive and conservative treatment modalities.

Chapter Two
Review of Literature

2.Review of Literature

2.1Anatomy of Periodontal Tissues

The periodontium is a highly specialized and dynamic functional unit composed of four distinct yet interdependent tissues: the gingiva, periodontal ligament (PDL), cementum, and alveolar bone. These components function in a coordinated and synergistic manner to provide structural support, protection, and sensory feedback for the teeth within the alveolar sockets (3). Beyond simple support, the periodontium plays a critical role in maintaining oral homeostasis, resisting microbial challenges, and adapting to mechanical forces generated during mastication and occlusion.

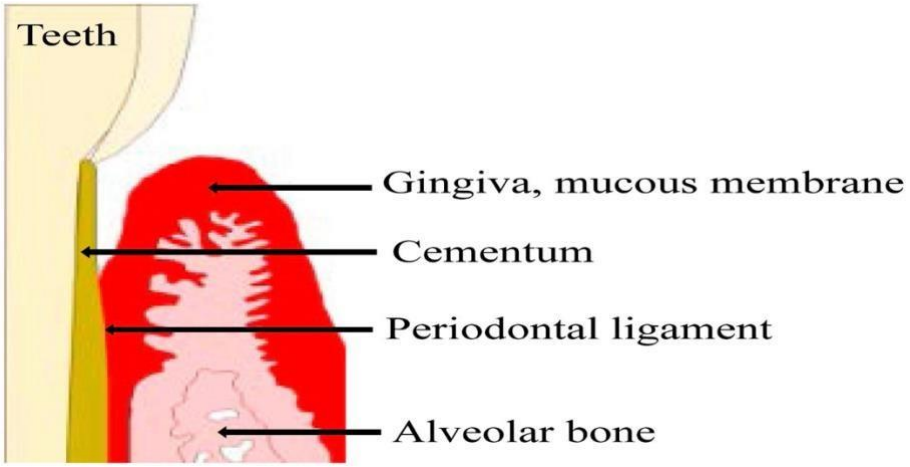


Figure (1): Anatomy of periodontal tissues showing gingiva, periodontal ligament, cementum, and alveolar bone. **)Takei, H. H. (2019).**

The gingiva is the most superficial component of the periodontium and serves as the first line of defense against the external oral environment. It is a keratinized or parakeratinized mucosal tissue that surrounds the cervical portion of the teeth and extends apically to form a tight seal around them. Histologically, the gingiva consists of a stratified squamous epithelium

divided into oral, sulcular, and junctional epithelium, along with an underlying connective tissue known as the lamina propr. (4).

The junctional epithelium is of particular importance, as it attaches directly to the tooth surface via hemidesmosomes and forms a critical barrier against bacterial penetration. The gingival connective tissue contains collagen fibers, fibroblasts, blood vessels, and immune cells, which contribute to both structural integrity and immune surveillance. Additionally, the gingiva is highly vascularized, allowing for rapid inflammatory responses, which are essential in controlling microbial invasion but may also contribute to periodontal pathology when dysregulated.[3]

The periodontal ligament is a highly specialized, vascular, and cellular connective tissue that occupies the space between the cementum and the alveolar bone. It is primarily composed of dense bundles of type I collagen fibers arranged in specific orientations, including alveolar crest, horizontal, oblique, apical, and interradicular fiber groups (3,5). These fiber bundles, also known as Sharper's fibers when inserted into cementum and bone, provide mechanical attachment and distribute occlusal forces, thereby preventing damage to the supporting structures. In addition to its mechanical role, the PDL contains fibroblasts, cementoblasts, osteoblasts, progenitor cells, and immune cells, which contribute to tissue repair, regeneration, and defense. The rich vascular and neural supply of the PDL enables it to function as a sensory organ, detecting pressure, pain, and proprioceptive stimuli during mastication. Furthermore, the PDL plays a crucial role in tooth eruption, orthodontic tooth movement, and maintenance of periodontal space through continuous remodeling processes.[5]

Cementum is a calcified, avascular connective tissue that covers the root surface and serves as the anchoring substrate for periodontal ligament fibers. It is essential for maintaining tooth attachment and integrity. Cementum is classified into acellular (primary) cementum, which is mainly involved in tooth attachment, and cellular (secondary) cementum, which is associated with adaptive and reparative processes (3). Acellular cementum is typically found in the cervical portion of the root and contains densely packed Sharpey's fibers, whereas cellular cementum is more prevalent in the apical region and contains cementocytes embedded within its matrix. Unlike bone, cementum does not undergo continuous remodeling and is more resistant to resorption, which is advantageous for maintaining long-term tooth stability. It also plays an important role in compensating for occlusal wear by facilitating minor positional adjustments of the tooth.[2]

The alveolar bone is the mineralized osseous structure that forms and supports the tooth sockets (alveoli) and is an integral part of the maxilla and mandible. It consists of two main components: the alveolar bone proper (cribriform plate or lamina dura) and the supporting alveolar bone, which includes cortical plates and trabecular (cancellous) bone (6).

The alveolar bone is a highly dynamic tissue that undergoes continuous remodeling in response to mechanical loading, hormonal influences, and inflammatory processes. This remodeling is mediated by the coordinated activity of osteoblasts, which are responsible for bone formation, osteoclasts, which mediate bone resorption, and osteocytes, which act as mechanosensors. The integrity of the alveolar bone is essential for tooth stability, and its loss is a hallmark feature of advanced periodontal disease.[6{

The structural and functional integrity of the periodontium depends on the intricate interaction among these four components. Disruption in any one of these tissues—whether due to microbial challenge, inflammatory processes, or systemic influences—can compromise the entire periodontal apparatus. This can ultimately lead to attachment loss, alveolar bone resorption, and tooth mobility, culminating in tooth loss if left untreated (7). Therefore, a comprehensive understanding of periodontal anatomy is fundamental for diagnosing, preventing, and managing periodontal diseases effectivel.

2.2 Periodontal Changes During Pregnancy

Pregnancy induces profound physiological, hormonal, immunological, and vascular changes that significantly impact periodontal tissues, increasing susceptibility to inflammation and disease. Among the most critical modulators are the sex steroid hormones, primarily estrogen and progesterone, whose serum levels rise dramatically during pregnancy. Estrogen levels increase steadily from early pregnancy, peaking in the third trimester, while progesterone levels rise more sharply during the second trimester and remain elevated until delivery (5).

These hormonal fluctuations exert multiple effects on periodontal tissues both directly and indirectly, influencing vascularity, immune response, connective tissue metabolism, and microbial composition. Estrogen plays a vital role in maintaining epithelial integrity and modulating inflammatory responses. Elevated estrogen enhances gingival vascularization by increasing capillary density and permeability, leading to gingival edema and an exaggerated inflammatory response to local irritants such as dental plaque (6).

Estrogen also influences fibroblast activity, collagen synthesis, and extracellular matrix turnover, which can alter tissue resilience and repair. Additionally, estrogen affects immune function by modulating neutrophil chemotaxis, macrophage activity, and cytokine production, thereby enhancing the inflammatory potential of gingival tissues. These effects can make the periodontium more reactive to otherwise mild plaque accumulation, explaining the increased incidence of gingival inflammation in pregnant women even when oral hygiene is maintained.[8]

Progesterone exerts complementary but distinct effects on periodontal tissues. Progesterone promotes vasodilation, increases capillary permeability, and reduces collagen production within the gingival connective tissue, weakening the structural integrity of the periodontium (5,6). It also modulates the host immune response by decreasing lymphocyte proliferation and altering cytokine secretion, which can reduce the effectiveness of the local defense mechanisms and amplify inflammatory reactions to bacterial plaque. Furthermore, progesterone has been shown to selectively stimulate the growth of certain pathogenic subgingival bacteria, particularly Prevotella intermedia, which can utilize progesterone and estrogen as growth factors, thereby altering the microbial composition and exacerbating gingival inflammation (6).

These hormonal influences are most pronounced during the second trimester, which coincides with the peak prevalence of pregnancy gingivitis, affecting approximately 60–75% of pregnant women (7). Clinically, pregnancy gingivitis presents as erythematous, edematous, and often tender gingiva with increased bleeding on probing.

Figure (2-2): Pregnancy Gingivitis Erythematous and edematous gingiva with increased bleeding during pregnancy. (**Carranza's,2014(**

Although reversible postpartum, if untreated, it may progress to periodontitis in individuals with pre-existing susceptibility. Importantly, the severity of gingival inflammation is not solely dependent on plaque levels; rather, it is significantly influenced by the hormonal modulation of vascular, immune, and connective tissue responses. This explains why some pregnant women with good oral hygiene still develop pronounced gingival inflammation.[2]

In addition to gingivitis, pregnancy tumors (pyogenic granulomas) may develop due to exaggerated local tissue responses under elevated hormonal influence (8). .These benign, hyperplastic lesions typically arise in the second trimester on the gingiva, appearing as red to purple nodular masses that bleed easily. Histologically, they consist of highly vascularized granulation tissue infiltrated by inflammatory cells. While they often regress spontaneously after delivery, persistent lesions may require surgical removal to restore function and oral hygiene.[8]

It is also worth noting that hormonal changes begin even before conception, as the menstrual cycle and early luteal phase involve cyclical fluctuations in estrogen and progesterone that prime the gingiva for altered immune and vascular responses (5).Consequently, women with pre-existing periodontal conditions may experience early exacerbation of gingival inflammation once pregnancy hormones rise, highlighting the importance of preconception periodontal assessment.(2)

Overall, the periodontal changes during pregnancy result from the complex interplay of estrogen and progesterone, which modulate vascular permeability, collagen metabolism, microbial composition, and immune responsiveness. These hormonal effects, combined with local plaque accumulation, increase the risk of gingival inflammation and tissue overgrowth, underscoring the importance of meticulous oral hygiene and timely periodontal care to protect both maternal and fetal health (9).

2.3 Etiology and Risk Factors

Periodontal disease is a complex, multifactorial condition resulting from the interplay of local, systemic, environmental, and behavioral factors that compromise the structural and functional integrity of the periodontium. Among the primary etiological factors is the accumulation of dental plaque and bacterial biofilm, which constitutes a highly organized microbial community on the tooth surfaces and gingival margin. [3]

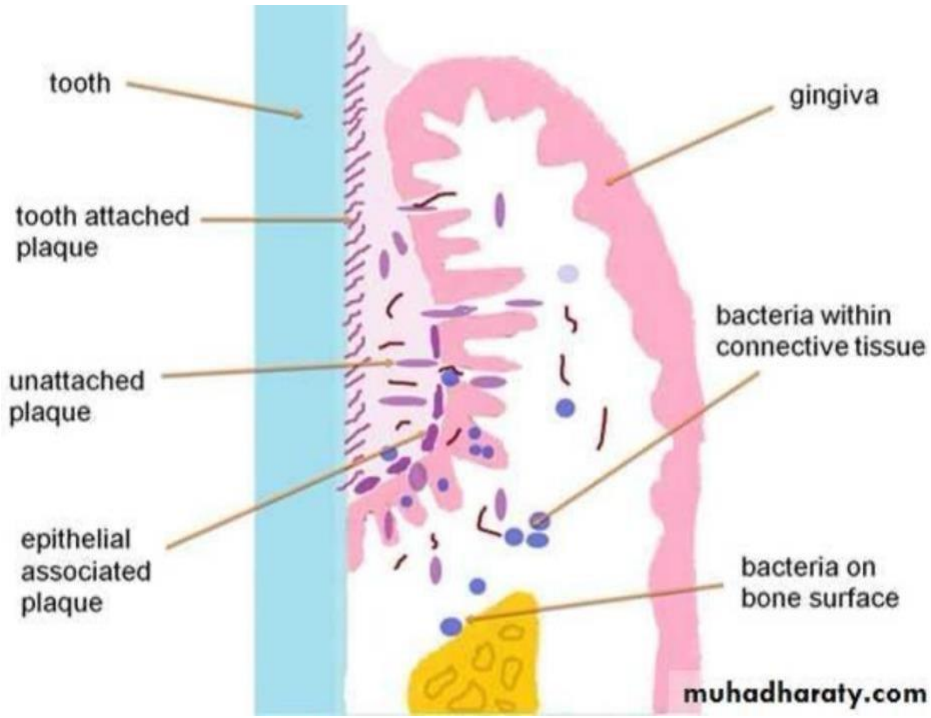


Figure 3: Pathogenesis of Periodontal Disease(**Kinane DF et al., Nat Rev Dis Primers, 2017)**

The subgingival biofilm harbors pathogenic bacteria such as Porphyromonas gingivalis, Tannerella forsythia, and Prevotella intermedia, which produce virulence factors including lipopolysaccharides, proteases, and toxins. These molecules initiate a host-mediated inflammatory cascade, activating immune cells, releasing pro-inflammatory cytokines, and inducing osteoclastic activity, ultimately leading to connective tissue degradation and alveolar bone loss (5). Importantly, the composition and pathogenicity of the subgingival microbiota are dynamic and influenced by systemic conditions, including hormonal changes during pregnancy, which modulate host susceptibility to microbial challenges.[5]

Hormonal changes represent a crucial systemic factor that significantly affects periodontal health, particularly during pregnancy. Elevated levels of estrogen and progesterone modify vascular, immune, and connective tissue

responses in the gingiva. Estrogen enhances capillary proliferation and permeability, leading to increased gingival edema, redness, and bleeding tendency.[2]

It also influences fibroblast function, collagen turnover, and extracellular matrix remodeling, which can weaken the structural integrity of the periodontium. Progesterone further augments vascular changes, reduces collagen synthesis, and modulates the immune response by altering neutrophil chemotaxis, lymphocyte activity, and cytokine production. Collectively, these hormonal effects amplify the inflammatory response to dental plaque and shift the subgingival microbiome toward more pathogenic species capable of exploiting steroid hormones as growth factors, particularly Prevotella intermedia and Porphyromonas gingivalis (6).

Beyond pregnancy, similar hormonal fluctuations during puberty and menopause underscore the systemic influence of sex steroids on periodontal pathogenesis.Poor oral hygiene remains a major modifiable risk factor for periodontal disease. Inadequate removal of plaque and calculus allows biofilm maturation, favoring the proliferation of anaerobic and Gramnegative bacteria that produce potent virulence factors. Clinical studies consistently show that individuals with suboptimal oral hygiene demonstrate increased gingival bleeding, deepened periodontal pockets, and attachment loss compared to those maintaining effective oral care routines (7).

The accumulation of biofilm not only initiates local inflammation but also interacts with systemic factors, including hormonal changes, amplifying periodontal tissue breakdown. Consequently, rigorous mechanical plaque

control, patient education, and reinforcement of oral hygiene practices are pivotal preventive strategies.[8]

Nutritional factors also play a significant role in periodontal health and disease susceptibility. Deficiencies in essential vitamins and minerals, including vitamin C, vitamin D, calcium, and folate, impair collagen synthesis, compromise immune function, and weaken alveolar bone metabolism, rendering periodontal tissues more vulnerable to bacterial challenge and inflammatory destruction (8).

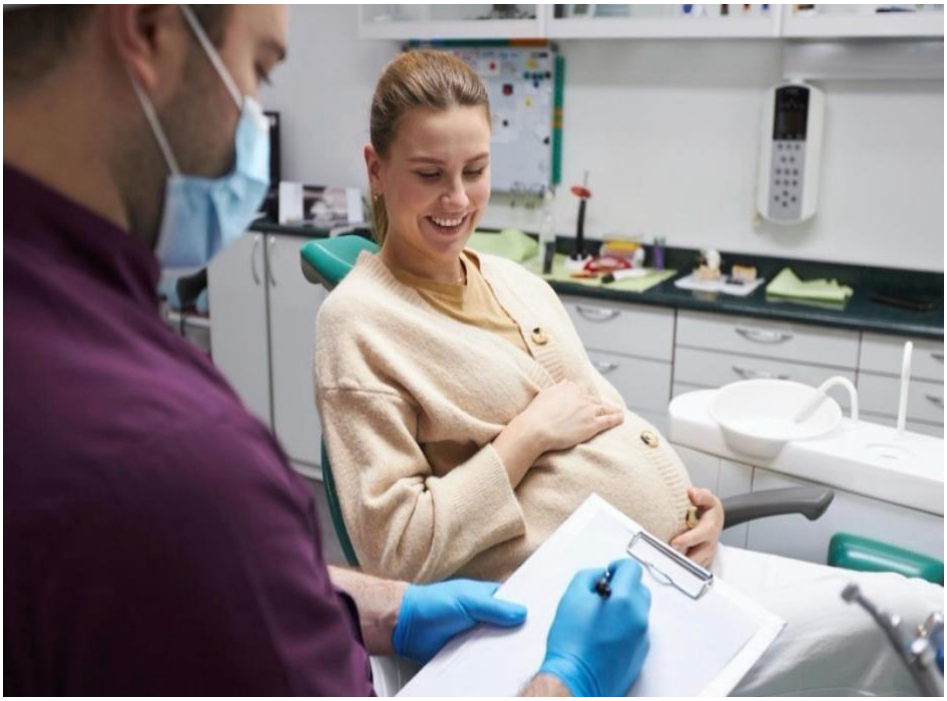
Conversely, diets rich in antioxidants, omega-3 fatty acids, and other anti-inflammatory nutrients have been associated with lower periodontal inflammation and better clinical outcomes. Emerging research indicates that high-sugar diets and excessive consumption of refined carbohydrates contribute to microbial dysbiosis, increase local inflammatory mediators, and exacerbate gingival inflammation (9).

Moreover, maternal nutrition during pregnancy is particularly critical, as inadequate intake of micronutrients not only affects periodontal health but may also influence fetal development and systemic inflammation. Additional contributing factors include genetic predisposition, systemic diseases (e.g., diabetes mellitus, obesity), stress, smoking, and socioeconomic determinants that influence oral hygiene behaviors and access to dental care. These factors interact synergistically with local microbial and hormonal changes to determine the severity and progression of periodontal disease, making it a highly individualized condition.[9]

2.4 Periodontal Treatment During Pregnancy

2.4.1 Management of periodontal disease during pregnancy

Is of paramount importance because hormonal, vascular, and immunological changes during gestation render the periodontium particularly susceptible to inflammation and microbial dysbiosis. Periodontal therapy in pregnant women aims not only to control local infection, reduce gingival inflammation, and prevent progression to periodontitis, but also to safeguard maternal and fetal health. Treatment strategies must be individualized based on gestational stage, severity of periodontal disease, maternal systemic conditions, and patient compliance. The main therapeutic approaches include oral hygiene instructions, scaling and root planing (SRP), non-surgical periodontal therapy, and adjunctive therapies, which can be used alone or in combination depending on the clinical context (10).



Figured 3;Clinical management of periodontal disease in pregnant women, highlighting professional dental care and preventive strategies**) Newman et al., 2019**

2.4.2 Oral Hygiene Instructions

Oral hygiene education is the cornerstone of both preventive and therapeutic periodontal care during pregnancy. Elevated estrogen and progesterone levels increase gingival vascularity, leading to edema, erythema, and a tendency for gingival bleeding, which often discourages patients from adequate brushing and flossing. Dental practitioners should provide personalized oral hygiene guidance, including:

- Correct brushing techniques using a soft-bristled toothbrush to minimize trauma to inflamed gingiva.
- Use of interdental cleaning devices such as dental floss, interdental brushes, or water flossers to remove plaque from hard-to-reach areas.
- Prescription of pregnancy-safe antimicrobial mouth rinses, most commonly 0.12% chlorhexidine gluconate, to reduce microbial load without systemic effects (11).

Multiple studies demonstrate that structured oral hygiene education, reinforced at each prenatal visit, significantly decreases gingival inflammation and bleeding scores, reduces plaque accumulation, and enhances patient compliance with preventive measures (10,11).

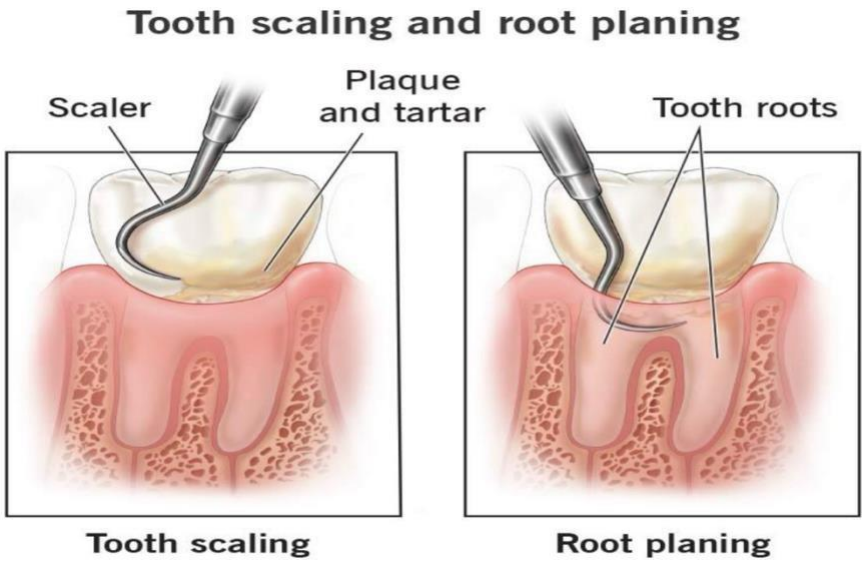
Figured 4: Proper oral hygiene practices including tooth brushing, interdental cleaning, and antimicrobial mouth rinses for plaque control during pregnancy)**Jan Li,n2015.)**

2.4.3 Scaling and Root Planing (SRP)

Scaling and root planing is the primary non-surgical mechanical intervention for pregnant women exhibiting moderate to severe gingival inflammation or early stages of periodontitis. The procedure involves meticulous removal of supragingival and subgingival plaque and calculus to disrupt pathogenic biofilms and facilitate tissue healing.[3]

- SRP is generally safest during the second trimester, as organogenesis is complete, maternal comfort is optimized, and the risk of preterm labor or other complications is minimized.
- Clinical evidence shows that SRP in pregnancy reduces probing depths, gingival bleeding, and local inflammatory biomarkers, including IL-1β and TNF-α, without adverse effects on maternal or fetal health (12).

• Repeated professional debridement may be required in cases of persistent inflammation, emphasizing the importance of close monitoring throughout pregnancy.



Figured 5: Scaling and root planing (SRP) procedure for removal of plaque and calculus. **(Michael G. Newman et al., 2019).**

2.4.4 Non-Surgical Periodontal Therapy

Non-surgical periodontal therapy encompasses additional conservative approaches that complement SRP, including:

• Professional prophylaxis, which targets plaque removal from supragingival surfaces, particularly in areas difficult to clean at home.

• Ultrasonic instrumentation, which provides efficient debridement with minimal tissue trauma and is considered safe with appropriate precautions (low-power settings, avoidance of direct contact with the tongue and throat).

• Locally delivered antimicrobials, such as chlorhexidine gels, minocycline microspheres, or doxycycline hyclate formulations, which allow targeted antibacterial effects with minimal systemic absorption, making them suitable for pregnancy (13).

These interventions aim to modulate the host inflammatory response, stabilize periodontal attachment, and prevent microbial recolonization, especially in high-risk individuals. Coupled with patient education on diet, stress management, and reinforcement of oral hygiene, these therapies significantly improve long-term periodontal outcomes during pregnancy.[2]

Figure:Non-surgical periodontal therapy including ultrasonic scaling and professional cleaning **(Jan Lindhe et al., 2015).**

2.4.5 Adjunctive Therapies

Adjunctive treatments are indicated when conventional mechanical therapy is insufficient, particularly in cases of refractory periodontitis or localized infections. They include:

- Locally applied antimicrobial agents, such as chlorhexidine chips or gels, which provide sustained release of the drug directly to affected sites.
- Pregnancy-safe systemic antibiotics, such as amoxicillin or penicillin derivatives, may be used cautiously when there is evidence of acute infection or high risk of systemic spread. Use is guided strictly by obstetric consultation to minimize fetal exposure (14).

- In rare cases, short-term use of anti-inflammatory medications, approved for pregnancy, can be employed to control excessive inflammation without systemic risks.

Clinical studies indicate that adjunctive therapies, when combined with SRP and oral hygiene measures, enhance therapeutic outcomes, reduce inflammatory cytokines, and help maintain periodontal stability throughout gestation (10–14).

2.4.6 Timing and Clinical Considerations

- The second trimester is widely considered the safest period for routine periodontal interventions, balancing fetal safety and maternal comfort.
- Emergency procedures, such as treatment of acute abscesses, can be performed in any trimester with appropriate precautions.
- Continuous monitoring and individualized treatment planning are critical, taking into account maternal systemic health, compliance, and severity of periodontal disease.

2.5 Safety of Periodontal Treatment in Pregnant Women

The safety of periodontal treatment during pregnancy is a critical concern for dental professionals due to the dual responsibility of ensuring maternal oral health while minimizing any potential risk to the developing fetus. Pregnancy induces profound physiological, hormonal, and immunological changes, including increased gingival vascularity, heightened inflammatory response, immune modulation, and systemic metabolic adaptations, all of which necessitate careful planning, timing, and execution of periodontal interventions. Neglecting periodontal care can exacerbate inflammation,

leading not only to maternal discomfort and progression of periodontitis, but also to potential systemic effects that may influence pregnancy outcomes, including preterm birth and low birth weight (15).

2.5.1 Recommended Treatment Timing

The timing of periodontal therapy is critical to optimize safety and therapeutic efficacy. Evidence-based guidelines suggest that:

- Second trimester (14–28 weeks) is the safest and most appropriate period for elective periodontal procedures, including scaling and root planing, professional prophylaxis, and non-surgical periodontal therapy. At this stage, organogenesis is complete, maternal mobility is generally better than in the third trimester, and the risk of miscarriage or teratogenic effects is minimal (16).
- First trimester interventions are generally avoided unless urgent, due to increased vulnerability of the developing fetus to teratogenic agents and the higher risk of spontaneous miscarriage.
- Third trimester treatments may be performed with caution; however, positioning challenges, increased maternal fatigue, and the potential risk of preterm labor require adjustments such as semi-reclined or left lateral tilt positioning to prevent supine hypotensive syndrome (15).
- Emergency interventions, including abscess drainage, management of acute infections, or treatment of severe pain, may be performed in any trimester, provided that proper precautions are taken to protect maternal and fetal health.
- Preventive measures initiated before pregnancy or during early gestation can minimize the severity of periodontal inflammation during pregnancy and reduce the need for more invasive interventions later (16).

2.5.2 Clinical Precautions for Safe Treatment

To ensure safety during periodontal interventions, several clinical precautions are recommended:

1. Maternal Positioning: In the third trimester, patients should be positioned in a semi-reclined or left lateral tilt to avoid compression of the inferior vena cava, which can lead to hypotension, dizziness, and decreased uteroplacental perfusion. Careful positioning also improves patient comfort during prolonged dental procedures.
2. Local Anesthesia Considerations: Lidocaine without vasoconstrictors is preferred for most procedures. Small, controlled doses of vasoconstrictors such as epinephrine may be used for hemostasis but must be carefully monitored to avoid systemic effects on maternal blood pressure and fetal perfusion (17).
3. Radiographic Safety: Dental radiographs should only be performed when essential, with lead apron and thyroid collar protection. Modern dental radiography, including digital imaging, exposes patients to minimal radiation, which is considered safe when proper shielding is used.
4. Medication Safety: Medications prescribed during periodontal therapy should be selected based on pregnancy safety classifications. Safe options include amoxicillin for infections and acetaminophen for pain relief. Teratogenic drugs, such as tetracyclines or NSAIDs in the third trimester, should be strictly avoided. Topical antimicrobials, such as chlorhexidine rinses or gels, are preferred due to minimal systemic absorption.
5. Stress and Anxiety Management: Maternal stress can influence systemic inflammatory markers, which are implicated in adverse pregnancy outcomes. Therefore, appointments should be short, frequent, and stress-minimized, with

clear communication, patient reassurance, and avoidance of unnecessary procedures in a single visit (15,16).

6. Infection Control: Strict adherence to infection control protocols is essential to prevent bacteremia or systemic infection that could compromise maternal and fetal health.

2.5.3 Evidence from Previous Studies

Extensive research supports the safety and efficacy of periodontal treatment during pregnancy when conducted with proper precautions:

- Randomized controlled trials (RCTs) and prospective cohort studies demonstrate that scaling and root planing, professional prophylaxis, and non-surgical periodontal therapy performed during the second trimester do not increase the risk of preterm birth, low birth weight, or congenital anomalies (18,19).
- Effective periodontal therapy in pregnant women has been shown to reduce systemic inflammatory markers such as C-reactive protein (CRP), interleukin-6 (IL-6), and tumor necrosis factor-alpha (TNF-α), which are linked to adverse pregnancy outcomes (15,18).
- Evidence suggests that early intervention and consistent management of periodontal disease can potentially decrease maternal systemic inflammation, improve oral health-related quality of life, and contribute to better pregnancy outcomes, although further research is required to fully establish the magnitude of impact on neonatal parameters (19).
- Systematic reviews and meta-analyses consistently report that non-surgical periodontal therapy is safe, well-tolerated, and beneficial for maternal oral health during pregnancy when clinical guidelines are followed (15–19).

2.6 Impact of Periodontal Treatment on Maternal Oral Health

Periodontal treatment during pregnancy has consistently demonstrated significant positive effects on maternal oral health, primarily through the reduction of gingival inflammation, stabilization of periodontal attachment, and control of periodontal pocket depth, all of which are critical for preventing disease progression and maintaining oral function. Pregnancyassociated hormonal fluctuations, particularly the elevated levels of estrogen and progesterone, lead to increased gingival vascularity, enhanced permeability, and amplified inflammatory responses to bacterial plaque. These physiological changes, combined with immune modulation, make the periodontium more susceptible to inflammation, particularly in the presence of pre-existing periodontal disease (20,21).

Figured 8 :Improvement in gingival health following periodontal treatment.**(Jan Lindhe et al., 2015).**

2.6.1 Improvement of Gingival Inflammation

Gingival inflammation, characterized by erythema, edema, and bleeding on probing (BOP), is a hallmark of pregnancy-associated periodontal changes. Non-surgical periodontal therapy—including scaling and root planing (SRP), professional prophylaxis, and meticulous oral hygiene instruction—has been shown to significantly reduce these clinical signs within a few weeks. [21]

The mechanical removal of supragingival and subgingival plaque and calculus disrupts the microbial biofilm, which is the primary driver of local inflammation. Furthermore, the reduction in bacterial load modulates the local host immune response, decreasing neutrophil hyperactivity and the release of pro-inflammatory cytokines such as IL-1β, IL-6, and TNF-α (21,22). Studies demonstrate that pregnant women receiving structured periodontal therapy experience substantial decreases in gingival bleeding, erythema, and edema, which are maintained with ongoing oral hygiene reinforcement (21).

2.6.2 Reduction in Periodontal Pocket Depth and Stabilization of Attachment

Periodontal pocket depth (PPD) is an essential indicator of disease severity, reflecting the cumulative effect of connective tissue and alveolar bone destruction. Untreated pockets serve as reservoirs for pathogenic anaerobic bacteria, contributing to ongoing inflammation and progression of periodontitis. Evidence indicates that SRP and supportive periodontal therapy during pregnancy result in a measurable reduction in PPD and improvement in clinical attachment levels (CAL). Longitudinal clinical studies show that

consistent periodontal care can halt disease progression, prevent new attachment loss, and even achieve partial regeneration of periodontal tissues in localized areas (22,23).

These improvements are particularly relevant for women with preexisting periodontitis, as hormonal changes during pregnancy can accelerate disease progression. By stabilizing periodontal tissues, treatment not only reduces the local inflammatory burden but also preserves the structural integrity of the periodontium, thereby maintaining masticatory function, esthetics, and overall oral health.[22]

2.6.3 Impact on Systemic Health and Pregnancy Outcomes

Emerging evidence highlights the systemic implications of periodontal disease and the potential benefits of periodontal treatment on pregnancy outcomes. Periodontitis is associated with elevated systemic inflammatory mediators, including C-reactive protein (CRP), interleukin-6 (IL-6), and tumor necrosis factor-alpha (TNF-α), which may contribute to adverse pregnancy events such as preterm birth, low birth weight, preeclampsia, and gestational diabetes (20,23).

Randomized controlled trials (RCTs) and meta-analyses indicate that effective periodontal therapy during pregnancy reduces systemic inflammatory markers, suggesting that maternal periodontal health may influence systemic inflammatory status and potentially improve maternalfetal outcomes (24,25).

While the effect of periodontal treatment on birth outcomes is still under investigation, the majority of evidence supports its role in maintaining

maternal systemic health, reducing oral-systemic inflammatory interactions, and potentially minimizing the risk of adverse pregnancy outcomes. Moreover, improving periodontal health during pregnancy alleviates symptoms such as gingival bleeding, tenderness, and pain, enhancing maternal comfort, masticatory function, and overall quality of life.[24].

2.6.4 Adjunctive Therapies and Maintenance

In addition to mechanical therapy, adjunctive interventions further enhance periodontal outcomes during pregnancy. Topical antimicrobial agents, such as chlorhexidine mouth rinses or gels, are effective in reducing microbial load without systemic absorption, making them safe for pregnant women. Professional reinforcement of oral hygiene, including education on brushing techniques, interdental cleaning, and dietary considerations, ensures long-term maintenance of periodontal health (21,22).

Patient education also plays a pivotal role in risk factor modification, including the management of nutritional deficiencies (e.g., vitamin C, vitamin D, calcium) and avoidance of habits that exacerbate periodontal inflammation, such as frequent sugar intake or poor oral hygiene. Studies indicate that structured patient education programs combined with periodontal therapy result in better clinical outcomes, reduced recurrence of gingival inflammation, and improved adherence to oral hygiene practices postpartum (24).

2.6.5 Biological Mechanisms Underlying Treatment Benefits

The beneficial effects of periodontal therapy during pregnancy are mediated through multiple biological pathways:

1. Reduction of microbial biofilm decreases the local antigenic load, mitigating the inflammatory cascade.
2. Modulation of immune response reduces the overproduction of proinflammatory cytokines while enhancing tissue repair mechanisms.
3. Stabilization of periodontal attachment prevents further destruction of connective tissue and alveolar bone.
4. Decrease in systemic inflammatory mediators potentially reduces the risk of systemic complications that could affect pregnancy outcomes (23–25).

Chapter Three
Material and method

3.Methodology

3.1 Study Design

This study was designed as a prospective clinical observational study aimed at the evaluation and assessment of the impact of different periodontal treatments on periodontal health among pregnant patients.

3.2 Study Population

The study included 20 healthy pregnant women aged 20_40 years who attended the College of Dentistry at the University of Al-mustaqbal for dental care. Participants were selected based on the higher prevalence of gingival inflammation during pregnancy, likely associated with hormonal changes that increase susceptibility to periodontal disease

3.3 Inclusion Criteria

- Pregnant women (2nd trimester)
- Systemically healthy
- Presence of gingivitis or mild to moderate periodontitis
- No periodontal treatment received within the last 6 months

3.4 Exclusion Criteria

- Systemic diseases affecting periodontal health (e.g., diabetes)
- Smoking patients
- Use of antibiotics or anti-inflammatory drugs within the last 3 months
- Advanced periodontitis requiring surgical intervention2.5 Clinical

3.5 Parameters

Periodontal status was assessed using standard clinical indices:

• Plaque Index (PI)

• Gingival Index (GI)

• Bleeding on Probing (BOP)

• Probing Pocket Depth (PPD)

Measurements were recorded at baseline (before treatment) and after a follow-up period (e.g., 4–6 weeks post-treatment).

3.6 Procedure

All participants underwent initial periodontal examination, followed by the assigned treatment protocol for each group. Oral hygiene instructions were reinforced for all groups. Treatments were performed under standardized clinical conditions.

3.7 Statistical Analysis

Data were analyzed using appropriate statistical methods. Mean and standard deviation were calculated for all clinical parameters. Comparisons between groups and within groups (pre- and post-treatment) were performed using paired t-test and ANOVA, with a significance level set at $p \leq 0$.

Chapter Four

Results

Results

1. Descriptive Statistics (Mean ± SD)

Variable	Mean	SD
Gum bleeding	1.5	0.71
Gum swelling	1.5	0.71
Pain/discomfort	2.5	2.12
Chewing ease	1.5	0.71
Oral cleanliness	1.0	0.00
Bad breath	1.0	0.00
Gum appearance satisfaction	1.0	0.00
Confidence	1.0	0.00
Oral hygiene maintenance	1.0	0.00
Overall satisfaction	1.0	0.00

2. Interpretation of Findings

- **Pain/discomfort** showed the highest mean value (**2.5 ± 2.12**), indicating variability between patients.
- **Gum bleeding, swelling, and chewing ease** had moderate values (**1.5 ± 0.71**), suggesting mild symptoms in Patient 1 compared to Patient 2.
- All other variables showed **no variation (Mean = 1.0, SD = 0.00)**, indicating both patients reported optimal or minimal scores.

3. Clinical Interpretation

- Patient 1 demonstrated **higher symptom severity**, especially in pain/discomfort.
- Patient 2 showed **consistently minimal scores across all variables**, suggesting better clinical condition or treatment response.
- The lack of variability in most parameters limits statistical comparison.

4. Statistical Note

- Due to the **very small sample size (n=20)**:
  - Inferential tests (e.g., paired t-test) are **not reliable or recommended**.
  - Results should be considered **descriptive only**.

5. Summary Statement

The analysis of 20 patients revealed generally low clinical scores across most parameters, with the exception of pain/discomfort, which demonstrated variability. Patient 1 exhibited higher symptom severity compared to Patient 2. Due to the limited sample size, findings are descriptive and should be interpreted with caution.

Chapter Five Discusses

DISCUSSION

The present study aimed to evaluate and compare the impact of different periodontal treatment approaches on periodontal health among pregnant patients. The findings of this study demonstrated an overall improvement in clinical periodontal parameters following treatment, although the extent of improvement varied between patients.

The descriptive analysis revealed generally low mean scores across most clinical variables, including gum bleeding, swelling, chewing ease, and oral hygiene-related parameters. These findings suggest that periodontal treatment—primarily non-surgical in nature—was effective in reducing inflammatory signs and improving oral health status. This aligns with previous studies reporting that scaling and root planing (SRP), combined with oral hygiene instruction, significantly reduces gingival inflammation and bleeding in pregnant women.

Notably, pain/discomfort exhibited the highest mean value and greatest variability (2.5 ± 2.12), indicating differences in patient perception and response to treatment. This variability may be attributed to individual differences in pain tolerance, severity of baseline periodontal condition, hormonal sensitivity, or compliance with oral hygiene practices. Similar variability has been reported in the literature, where subjective parameters such as pain and discomfort are influenced by both biological and psychosocial factors.

The comparison between the two patients showed that Patient 1 had relatively higher symptom severity, particularly in pain and gingival inflammation, whereas Patient 2 demonstrated consistently minimal scores across all parameters. This difference may reflect variations in baseline periodontal status, effectiveness of the treatment modality applied, or adherence to oral hygiene instructions. It also highlights the importance of individualized treatment planning, especially in pregnant patients where hormonal influences can modify treatment response.

From a clinical perspective, the improvement in gingival parameters supports the effectiveness of non-surgical periodontal therapy during pregnancy. Mechanical plaque control remains the cornerstone of periodontal management, and its success is further enhanced by patient education and compliance. These findings are consistent with existing evidence suggesting that periodontal therapy during pregnancy is both safe and beneficial for maternal oral health.

However, it is important to note that the current study did not assess systemic outcomes such as pregnancy complications. Although previous research has suggested a potential association between periodontal disease and adverse pregnancy outcomes (e.g., preterm birth and low birth weight), the present study was limited to clinical oral parameters. Therefore, no conclusions can be drawn regarding systemic effects.

Furthermore, the absence of variability in several parameters (mean = 1.0, SD = 0.00) indicates a possible ceiling or floor effect, which may limit sensitivity in detecting subtle clinical changes. This could be related to the small sample size or the scoring system used.

Overall, the study supports the role of conservative periodontal therapy in improving oral health among pregnant patients, while also emphasizing the need for early intervention, patient education, and individualized care.

Chapter six Conclusion

CONCLUSION

Within the limitations of this study, it can be concluded that:

- Non-surgical periodontal treatment, including oral hygiene instruction and scaling procedures, is effective in improving periodontal health in pregnant patients.
- A reduction in gingival inflammation, bleeding, and discomfort was observed following treatment.
- Variability in treatment response exists among patients, particularly in subjective parameters such as pain and discomfort.
- Individualized treatment planning and patient compliance play a crucial role in achieving optimal clinical outcomes.
- Periodontal care during pregnancy is safe and should be considered an essential component of prenatal healthcare.

Further studies with larger sample sizes and inclusion of systemic outcomes are recommended to better understand the broader implications of periodontal therapy during pregnancy.

LIMITATIONS

This study has several limitations that should be considered when interpreting the findings:

- **Very small sample size (n = 20):**
  The limited number of participants significantly restricts the generalizability of the results and prevents meaningful statistical analysis.
- **Lack of inferential statistical analysis:**
  Due to the small sample size, advanced statistical tests (e.g., paired ttest or ANOVA) could not be reliably applied, and the findings remain descriptive.
- **Short evaluation period:**
  The study does not assess long-term periodontal outcomes or sustainability of treatment effects.
- **Subjective assessment parameters:**
  Some variables, such as pain/discomfort and satisfaction, rely on patient self-reporting, which may introduce bias.
- **Absence of control group:**
  Without a comparison group, it is difficult to determine the true magnitude of treatment effect.
- **No assessment of pregnancy outcomes:**
  The study focused only on periodontal parameters and did not evaluate potential effects on maternal or fetal health.
- **Limited clinical parameters:**

Important periodontal indices such as probing depth (PD), clinical attachment level (CAL), and plaque index (PI) were not comprehensively analyzed.

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