



Gingival and Periodontal Disease Status among Pregnant Women in a Rural Tertiary Care Hospital in Central India: A pilot study

Dr. Rahul N Gaikwad (BDS, MDS, MPhil, PhD)ϕ*

Abstract:

Background:Periodontitis, a common clinical condition affecting over 30% of some populations, poses a continuous pathogenic and inflammatory challenge due to the large epithelial surface in periodontal pockets. Its prevalence in pregnant women ranges from 5% to 20%, linking severe periodontal disease with pregnancy complications like pre-eclampsia and foetal growth restriction. This study aims to understand the changes in gingival and periodontal status across pregnancy trimesters.

Methodology:This study, conducted at Acharya Vinobha Bhave Rural Hospital, evaluated gingival and periodontal disease status in pregnant women aged 20-35 years. After ethical clearance and permissions, a pilot study determined the sample size, excluding subjects with certain systemic diseases or past periodontal therapy. Data was collected using a standardized proforma, assessing plaque, gingival status, and periodontal health through clinical examinations. The study used convenient sampling, and universal precautions were followed during examinations.

Results:Ninety pregnant women, 30 per trimester, were examined. The study found increasing plaque and gingival index scores from the first to the third trimester, with the highest scores observed in the third trimester. Community periodontal index (CPI) scores ranged from 0-3, with no score above 3 found. There was no significant loss of attachment in any subject. The results indicate a clear deterioration of periodontal health throughout pregnancy.

Conclusion:The study confirms that pregnancy exacerbates periodontal and gingival conditions, worsening from the first to the third trimester. Recognizing these high-risk groups is crucial for non-dental practitioners involved in prenatal care. Future research should focus on the importance of early oral and periodontal examinations and treatments in relation to pregnancy outcomes and systemic inflammation.

Keywords:CPI, Gingival index, periodontal index, pregnancy, Three trimester of pregnancy

DOI Number: 10.48047/nq.2021.19.4.NQ21060

NeuroQuantology 2021; 19(4): 250-255

INTRODUCTION:

At systemic level, due to the large epithelium surface that could be ulcerated in the periodontal pockets, periodontitis is considered as a continuous pathogenic and inflammatory challenge [1]. More than 30% of people in some populations are affected by a relatively common clinical condition known as periodontitis; it has a prevalence of between 5% and 20% in pregnant women[2].

Previous studies have found evidence of an association between severe periodontal disease

during pregnancy and premature birth, other conditions complicating pregnancy, such as pre-eclampsia and foetal growth restriction were found. So, it becomes an important target group where priority is given on oral health care during pregnancy. Data from two single-centre clinical trials suggest that the rate of preterm birth were reduced due to periodontal treatment during pregnancy. However, any satisfied results are not available [3].

Clinical assessments show the presence of gingivitis in women during pregnancy which is

***Corresponding Author:** Dr. Rahul N. Gaikwad [BDS, MDS, MPhil, PhD]

Address:*Department of Community Dentistry and Oral Epidemiology, College of Dentistry, Qassim University, Buraydah, Saudi Arabia. Email: r.gaikwad@qu.edu.sa, Mob No. +966507124373

*ϕAssociate Professor, Department of Community Dentistry and Oral Epidemiology, College of Dentistry, Qassim University, Buraydah, Saudi Arabia. <https://orcid.org/0000-0001-9915-0161>

Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.



known as pregnancy gingivitis, where there is gingival inflammation caused by the presence of plaque and exacerbated by changes of female sex hormone levels during normal pregnancy.[4] Major etiologic factor causing changes in periodontium is due to increased endogenous sex hormones. Oestrogen and progesterone are the main sex hormones affecting periodontium and which get increased up to 30 times higher at the end of last trimester as compared to the non-pregnant status. But the exact factors causing gingivitis during pregnancy are not clear [4]. In many cases, mild to severe inflammation can manifest as either marginal enlargement or tumour like enlargement [5].

During the first and second trimesters, the highest bleeding scores were recorded (Cohen et al. 1969, Samant et al. 1976, O'Neil 1979a). The severity of gingivitis increased significantly during the second and third trimesters (Samant et al. 1976) [6] These conflicting results make it imperative to conduct research in this direction.

Therefore, this area requires further studies that may contribute to a better understanding of status of gingival and periodontal diseases. Hence the present study was undertaken for evaluation of gingival and periodontal status among the three trimesters of pregnancy.

MATERIALS AND METHODOLOGY:

A study was conducted to assess the association between gingival and periodontal disease status among the pregnant woman of 20- to 35-year-old visiting the Obstetrics and Gynecology department of Acharya Vinobha Bhave Rural Hospital, Sawangi (M), Wardha.

Before conducting the study, ethical clearance was obtained from the Institutional Ethical Committee of DMIMSU, Sawangi (M), Wardha and even necessary permission to carry out the study was obtained from the concerned authorities and Head of Department of Obstetrics and Gynecology after explaining the procedure and purpose of study clearly. A single examiner and recorder were used for the entire period of the study for whom the training and calibration of was done prior to the start of the study.

Pilot study was conducted among 30 patients with first, second and third trimester of pregnancy of 20-35 years of age to assess the

feasibility and to calculate the sample size. Based on the results of the pilot study, some minor modifications were made in the proforma and sample size was calculated. A minimum sample of 30 cases in each trimester of pregnancy who fulfilled inclusion and exclusion criteria were included for final study. Pilot study subjects are not included in the main study. Written consent was obtained from the patients after explaining the procedure and purpose clearly. Patients diagnosed with pregnancy aged between 20-35 years were included while patients suffering from systemic diseases- chronic infectious disease, renal diseases, thyroid dysfunction, diabetes, liver diseases, malignant disease or are on cancer chemotherapy, patients with ischemic heart diseases along with other cardiac diseases on immunosuppressant drugs, steroids and who have received periodontal therapy in past 6 months were excluded

Data collection was done by using standardized proforma and cases were selected by using convenient sampling methodology. Information related to demographic profile and socioeconomic status, medical history, dental history, oral hygiene practices, diet was collected.

Oral examination includes recording of the number of teeth present, teeth absent due to periodontal disease and mobility of teeth. Presence of plaque status was assessed by using Plaque Index while gingival status was assessed by using Gingival Index and Periodontal health status was recorded by using community periodontal Index. 5-10 patients were examined each day and each patient took 15-20 minutes for examination. The clinical examination was carried out by the examiner following "Universal Precautions".

The statistical analysis was carried out by the statistical software SPSS version 25.0 after the data had been loaded into the Microsoft excel spreadsheet. When comparing the mean values of the three groups, the ANOVA test was utilized, whilst the chi-square test was utilized to analyze the frequency differences between the three groups. If the p-value was less than 0.05, then it was regarded to be statistically significant.

RESULTS:

A total of 90 pregnant women were examined,



in which 30 pregnant women were included in each trimester. Table 1 shows the mean age in years in 1st trimester is (25.2±2.6), in 2nd trimester is (23.9±2.4), in 3rd trimester is (26.1±2.9). Women in 2nd trimester (48±26.7) has given more dental visit as compared to women in 1st and 3rd trimester.

Table 2 reveals the mean plaque index and gingival index. The highest plaque score was seen in 3rd trimester (1.17± 0.48) followed by (1.08±0.35) and (1.03±0.4) in 2nd and 1st trimester respectively. Gingival index score is significantly high in 3rd trimester (1.17±0.48) as

compared to 1st and 2nd trimester(0.75±0.44), (0.82±0.44) respectively.

Table 3 shows community periodontal index and loss of attachment of the subjects. Among the various subjects examined CPI score 0-3 was only found and score above 3 was not found. Out of these maximum subjects of Score 1 were in 1st trimester (32±17.8), score 2 in 2nd trimester (34±18.9) and Score 3 in 3rd trimester (12±6.7). Loss of attachment score above 1 was not found in any of the subject. Highest frequency of Score 0 was in 3rd Trimester (58±32.2) and equal number were recorded in 1st and 2nd trimester (50±27.8).

TABLE NO. 1: Demographic Data of study participants

Variables		Trimester		
		First Trimester	Second Trimester	Third Trimester
Age		25.2 ± 2.6	23.9 ± 2.4	26.1 ± 2.9
Dental Visit	0(yes)	40 (22.2)	48 (26.7)	36 (20)
	1(no)	20 (11.12)	12 (6.7)	24 (13.3)
Type of cleaning	Toothbrush	50 (27.8)	44 (24.4)	32 (17.8)
	Finger	8 (4.4)	16 (8.9)	28 (15.6)
	Others	2 (1.1)	0 (0)	0 (0)

TABLE NO. 2: Plaque and gingival index among three trimesters of pregnancy

Index	Trimester	Mean	SD	F value	P value
PI	First Trimester	1.03	0.4	1.714	0.183
	Second Trimester	1.08	0.35		
	Third Trimester	1.17	0.44		
GI	First Trimester	0.75	0.44	14.810	0.00
	Second Trimester	0.82	0.40		
	Third Trimester	1.17	0.48		

TABLE NO.3: Periodontal status among study participants

		Trimester		
		First Trimester	Second Trimester	Third Trimester
High CPI	0(healthy)	0 (0)	8 (4.4)	0 (0)
	1(bleeding)	32 (17.08)	16 (8.9)	22 (12.2)
	2(calculus)	24 (13.3)	34 (18.9)	26 (14.4)
	3(4-5mm pocket)	4 (2.2)	2 (1.1)	12 (6.7)
LOA	0(0-3mm)	50 (27.8)	50 (27.8)	58 (32.2)
	1(4-5mm)	10 (5.6)	10 (5.6)	2 (1.1)

DISCUSSION:

Periodontal health has been examined thoroughly throughout pregnancy, however much of the evidence provided is still contentious [4]. Much of the material comes from cross-sectional studies, making it impossible to analyse the exact association between pregnancy and periodontal disorders.

The rate of pregnancy gingivitis varies widely according to the study, ranging from roughly 30% up to 100% and some studies showed that it was significantly higher during pregnancy as compared to non-pregnant women. [7, 8]

Periodontal health relies on a delicate equilibrium of various elements, including as the immune response of the individual, the

collection of oral bacteria species, certain external influences, and the host's inflammatory reaction. [9-11] The production of inflammatory mediators exacerbates the growth of periodontal disease and the degradation of periodontal health. [12] Pregnant patients experienced a greater impact on their quality of life due to oral health difficulties compared to non-pregnant women. This was reflected in a higher mean oral health impact score (OHIP) for the former group. [13] The objective of this study was to evaluate the correlation between the condition of the gums and periodontal disease among pregnant women aged 20 to 35 years. The average age in years during the first trimester was seen to be 25.2 ± 2.6 , during the second trimester it was 23.9 ± 2.4 , and during the third trimester it was 26.1 ± 2.9 . Those in the second trimester (48 ± 26.7) have a higher frequency of dental visits compared to those in the first and third trimesters. Gupta et al conducted a study in India in 2016 to evaluate the oral health of pregnant women across the three trimesters. The study found that in the first trimester, 8.2% of women had a healthy periodontium, which reduced to 3% in the third trimester. [13] In contrast to the findings of Butt et al., [9] their study revealed a rise in the proportion of women having a healthy periodontium as gestational age advanced, specifically 4.5% in the first trimester and 13.6% in the third trimester. Their study additionally indicated that the prevalence of bleeding gums among women in their first trimester was 10.3%, which decreased to 6.9% for those in the third trimester. [13] Another study revealed that non-pregnant women exhibit superior gingival health compared to pregnant women, with 66.66% of pregnant women experiencing poor gingival health, in contrast to 0% of non-pregnant women. [14]

A recent study has indicated that the greatest occurrence of gingivitis was observed in the latter two trimesters of pregnancy. [6] Al-Rayyan et al.'s study [4] revealed that the prevalence of gingivitis was greater during the third trimester of pregnancy (32.1%) compared to the first trimester (26.8%). Fernando & Jiffry observed a progressive rise in gingivitis from the initial trimester to the final trimester, reaching its highest level in the seventh month of pregnancy. Subsequently, there was a notable

decrease in the severity of gingivitis during the last month of pregnancy. [15]

In this study, we observed that the highest plaque score was observed during the third trimester (1.17 ± 0.48), followed by the second trimester (1.08 ± 0.35) and the first trimester (1.03 ± 0.4). The gingival index score was considerably higher in the 3rd trimester (1.17 ± 0.48) compared to the 1st and 2nd trimester (0.75 ± 0.44) and (0.82 ± 0.44) respectively.

In Gursoy et al.'s study, [6] the highest plaque scores were observed during the first trimester of pregnancy. Subsequently, the scores decreased with each visit, reaching the lowest values during lactation. This discovery deviates from the majority of prior studies. The Hawthorne effect is unlikely to have had any significant impact in this study, as the scale and oral health instructions were provided just once during recruitment. Furthermore, the values of VPI dropped with each subsequent visit over the 2-year follow-up period. However, the primary cause for this phenomenon is likely attributed to the diverse metrics used to assess oral deposits. In their cross-sectional investigation, Silness & Loe (1964) [16] observed that the plaque index, measured specifically from selected index teeth, progressively increased from the second month to the eighth month of pregnancy. However, in a study conducted by Raber-Durlacher et al. (1994), [17] the plaque index was found to be almost the same at every stage of pregnancy and after giving birth.

In our investigation, we observed that only CPI scores ranging from 0 to 3 were present among the different participants investigated, while scores above 3 were not observed. The highest number of individuals achieved a Score 1 during the 1st trimester, with an average of 32 ± 17.8 . Score 2 was most prevalent during the 2nd trimester, with an average of 34 ± 18.9 . Score 3, on the other hand, was most common during the 3rd trimester, with an average of 12 ± 6.7 . None of the subjects had a loss of connection score above 1. The highest occurrence of a score of 0 was observed during the 3rd trimester, with an average of 58 ± 32.2 . An equal number of occurrences were recorded during the 1st and 2nd trimesters, with an average of 50 ± 27.8 .

The primary cause for the elevation in the PI

score during pregnancy is the interaction of female sex hormones.[18] Oestrogen, a hormone that undergoes fluctuations throughout pregnancy, is thought to make women more susceptible to gingivitis. Oestrogen causes the gums to become inflamed, swollen, and sensitive, making them prone to easy bleeding. If plaque is not eliminated, existing gingivitis can increase significantly during pregnancy.[19] In 2016, Soroye et al. conducted a study on 445 pregnant participants. Among the entire study population, 379 subjects, which corresponds to 85.2%, were diagnosed with pregnant gingivitis.[20] In order to demonstrate the impact of female sex hormones on the worsening of periodontal disease, Tilakaratne et al. conducted a study in 2000. The study found that those who used contraceptives had a notably higher degree of inflammation in their gums compared to those who did not use contraceptives.[21]

The prevalence of periodontitis in pregnant women exhibits substantial variation in the scientific literature, ranging from 0.6% to 47.0%. This variability appears to be influenced by sociodemographic and environmental factors, as well as the specific stage of pregnancy. [22-24] An increased prevalence of PI in the first trimester of pregnancy compared to the second and third trimesters is often observed in association with GB. Some researchers have proposed that this may be attributed to vomiting and challenges in keeping proper dental hygiene. [25, 26] Nevertheless, gingival symptoms might worsen during pregnancy regardless of the presence of plaque-induced inflammation (PI) due to the heightened vulnerability of the periodontium to hormones associated with pregnancy. This, in turn, raises the likelihood of developing periodontal disease, namely gingivitis and periodontitis.[27, 28]

CONCLUSION:

The results of our study confirm the notion that pregnancy has an impact on the worsening of periodontitis and gingivitis, with the condition deteriorating from the first trimester to the third trimester. Non-dental practitioners participating in the care of pregnant women should possess knowledge about and be able to recognise these high-risk groups. This will

enable them to refer these individuals to a dentist and/or adopt early preventive steps to guarantee optimal oral health throughout pregnancy. Future research should prioritise investigating the significance and effects of early oral and periodontal examination, treatment, and the progression and outcome of pregnancy, particularly in relation to the potential role of periodontal diseases in causing low-grade systemic inflammation.

REFERENCES:

1. Àgueda A, Echeverría A, Manau C. Association between periodontiti in pregnancy and preterm or low birth weight: Review of the literature. *Med Oral Patol Oral Cir Bucal*. 2008 Sep; 13(9):E609-15.
2. Nikolaos P Polyzos, Obstetric outcomes after treatment of periodontal disease during pregnancy: systematic review and meta-analysis ,*BMJ* 2010;341:c7017
3. Bryan S. Michalowicz, Treatment of Periodontal Disease and the Risk of Preterm Birth *N Engl J Med* 2006; 355:1885-94.
4. Ehab Al-Rayyan, Nader Masarwa, Muwafaq Barakat , Murad Momani, Reem Khudair. Frequency of Gingivitis in Pregnancy: A Comparative Study between First and Third Trimesters of Pregnancy.
5. Akila Ganesh¹, Navin Anand Ingle², Preetha Elizabeth Chaly³, V. Chandrasekhara Reddy. A Survey On Dental Knowledge and Gingival Health of Pregnant Women Attending Government Maternity Hospital, Chennai.
6. Gu`rsoy M, Pajukanta R, Sorsa T, Ko`no`nen E. Clinical changes in periodontium during pregnancy and post-partum. *J Clin Periodontol* 2008; 35: 576-583. doi: 10.1111/j. 1600-051X.2008.01236.x.
7. Taani D, Habashneh R, Hammad M, et al. The periodontal status of pregnant women and its relationship with socio-demographic and clinical variables. *Journal of Oral Rehabilitation* 2003; 30: 440-445.
8. Rakchanok N, Amporn D, Yoshida Y, et al. Dental caries and gingivitis among pregnant and non-pregnant women in Chiang Mai, Thailand. *Nagoya J Med Sci* 2010; 43-50.
9. Butt H, Khan N, Piracha MH. Periodontal



- and Gingival Health of Pregnant Women in Comparison to Non-Pregnant Women. Pakistan Armed Forces Medical Journal. 2022 May 1;72(2):551-4.
10. NP L. Bartold PM. Periodontal Health. J Periodontol 2018; 89(1): s9-s16.
 11. Gupta S, Shrestha B, Gupta N, Tuladhar A, Kc S, Dhama B. Periodontal Health Status and Pregnancy Outcomes: A Survey in Medical Doctors. J Nepal Med Assoc 2018; 56(210): 565-571.
 12. Afacan B, Öztürk VÖ, Paşalı Ç, Bozkurt E, Köse T, Emingil G. Gingival crevicular fluid and salivary HIF- 1 α , VEGF, and TNF- α levels in periodontal health and disease. J Periodontol 2019; 90(7): 788-797.
 13. Gupta R, Acharya AK. Oral health status and treatment needs among pregnant women of Raichur District, India: A population based cross-sectional study. Scientifica (Cairo) 2016; 9860387.
 14. Kashetty M, Kumbhar S, Patil S, Patil P. Oral hygiene status, gingival status, periodontal status, and treatment needs among pregnant and nonpregnant women: A comparative study. J Indian Soc Periodontol 2018; 22(2): 164.
 15. Fernando T, Jiffry M. Prevalence of gingivitis amongst pregnant women in an urban population in Sri-Lanka. Sri-Lanka Dental Journal 1991; 21: 24-48.
 16. Lo'e, H. & Silness, J. (1963) Periodontal disease in pregnancy. I. Prevalence and severity. Acta Odontologica Scandinavica 21, 533- 551.
 17. Raber-Durlacher, J. E., van Steenberghe, T. J. M., van der Velden, U., de Graaff, J. & Abraham-Inpijn, L. (1994) Experimental gingivitis during pregnancy and post-partum: clinical, endocrinological, and microbiological aspects. Journal of Clinical Periodontology 21, 549-558.
 18. Ambardar Y, Vaidya SM, Chandel L. Assessment of oral health status during pregnancy. National Journal of Physiology, Pharmacy and Pharmacology. 2021;11(8):806-9.
 19. Hugoson A. Gingivitis in pregnant women. A longitudinal clinical study. Odontol Revy 1971;22:65-84.
 20. Soroye MO, Ayanbadejo PO. Prevalence of gingivitis and perception of gingival colour among pregnant women attending the antenatal clinic of Lagos University Teaching Hospital, IdiAraba. J Orofac Sci 2016;8:53-8.
 21. Tilakaratne A, Soory M, Ranasinghe AW, Corea SM, Ekanayake SL, de Silva M. Effects of hormonal contraceptives on the periodontium, in a population of rural Sri-Lankan women. J Clin Periodontol 2000;27:753-7.
 22. Thomas C, Timofeeva I, Bouchoucha E, Canceill T, Champion C, Groussolles M, Arnaud C, Vayssière C, Nabet C, Laurencin-Dalieux S. Oral and periodontal assessment at the first trimester of pregnancy: The PERISCOPE longitudinal study. Acta Obstetrica et Gynecologica Scandinavica. 2023 Apr 26.
 23. Yunita Sari E, Saddki N, Yusoff A. Association between perceived Oral symptoms and presence of clinically diagnosed Oral diseases in a sample of pregnant women in Malaysia. Int J Environ Res Public Health. 2020;17:7337.
 24. Vogt M, Sallum AW, Cecatti JG, Morais SS. Factors associated with the prevalence of periodontal disease in low-risk pregnant women. Reprod Health. 2012;9:3.
 25. Taani DQ, Habashneh R, Hammad MM, Batieha A. The periodontal status of pregnant women and its relationship with socio-demographic and clinical variables. J Oral Rehabil. 2003;30:440-445. 47.
 26. Krüger MS M, Casarin RP, Gonçalves LB, Pappen FG, Bello-Correa FO, Romano AR. Periodontal health status and associated factors: findings of a prenatal Oral health program in South Brazil. Int. J Dent. 2017;2017:1-6.
 27. Figuero E, Carrillo-de-Albornoz A, Herrera D, Bascones-Martínez A. Gingival changes during pregnancy: I. influence of hormonal variations on clinical and immunological parameters. J Clin Periodontol. 2010;37:220-229
 28. Saadaoui M, Singh P, Al KS. Oral microbiome and pregnancy: a bidirectional relationship. J Reprod Immunol. 2021;145:103293.

