

## Oral Microflora In Different Trimesters Of Pregnancy- An Original Research

Dr. Ambika Hegde<sup>1</sup>, Dr. Sudhakar Srinivasan<sup>2</sup>, Dr. Praveen Kumar<sup>3</sup>, Dr. Rahul VC Tiwari<sup>4</sup>, Dr. Namita shrivastava<sup>5</sup>, Dr. Anil Managutti<sup>6</sup>, Dr. Heena Dixit Tiwari<sup>7</sup>

<sup>1</sup>Assistant Professor, Dept of OBG, Father Mullers Medical College and Hospital, Mangalore.

<sup>2</sup>Associate professor, Department of Dental surgery, Karpagam Faculty of Medical Sciences and Research, Coimbatore, Tamil Nadu.

<sup>3</sup>Senior lecturer, Dept of oral and maxillofacial surgery, Vanachal dental college and hospital jharkhand.

<sup>4</sup>OMFS, FOGS, (MHA), PhD Scholar, Dept of OMFS, Narsinhbhai Patel Dental College and Hospital, Sankalchand Patel University, Visnagar, Gujarat,384315.

<sup>5</sup>Senior lecturer .Department of oral pathology, Vanachal dental college and hospital jharkhand.

<sup>6</sup>Prof.& HOD, Dept of OMFS, Narsinhbhai Patel Dental College and Hospital, Sankalchand Patel University, Visnagar, Gujarat, 384315.

<sup>7</sup>BDS, PGDHHM, Final year Student, Master of Public Health, Parul Univeristy, Limda, Waghodia, Vadodara, Gujrat, India.

---

### ABSTRACT

#### Aim

The purpose of the study was to assess the amount of oral microbiota in various trimesters of pregnancy altering the oral hygiene status.

#### Methodology

A cross sectional study was conducted amongst 70 women in the age group of 18-35 years of age, where they were divided into 4 groups when compared to non-pregnant women, who were taken as a control and periodontal samples were taken from all the participants after proper oral hygiene examination and were subjected to counting of colonies. The CFU/ml was then subjected to descriptive statistical analysis.

#### Results

The amount of CFU/ml was increased in the 1<sup>st</sup> trimester of pregnancy, followed by decreased level in 2<sup>nd</sup> trimester. Comparing patients with healthy periodontal diagnoses (control group), with those who clinically presented disease (gingivitis or periodontitis), it was shown that the mean amounts of total subgingival bacteria observed in latter categories were progressively larger.

#### Conclusion

Amount of bacteria was higher in case of pregnancy in the 1<sup>st</sup> trimester and 3<sup>rd</sup> trimester, which can have negative influence of the oral health of a woman and thus can affect the health of the developing fetus.

**Keywords** Oral microbiome, bacteria, pregnancy, oral health.

---

## INTRODUCTION

Oral health was recently re-defined by the Fédération Dentaire Internationale (FDI) as being a multifaceted condition including the ability to speak, smile, smell, taste, touch, chew, swallow and convey a range of emotions through facial expressions with confidence and without pain, discomfort or disease of the craniofacial complex. The definition further states that oral health is a component of health, including physical and mental wellbeing.<sup>1</sup> Oral health can be achieved by maintaining good oral hygiene. The importance of maintaining good oral hygiene is not just restricted to preventing dental caries and periodontal problems, but improving the overall general health status of an individual.<sup>2</sup> Various studies have shown that there is a direct correlation between oral health and general systemic health of an individual.<sup>3,4,5</sup> Oral health awareness goes a long way toward improving the oral health status of an individual. Maintaining proper oral hygiene and promoting swift treatment of various oral conditions have a positive impact in this regard.<sup>6</sup> However, special consideration is required in terms of oral health in women. The presence of different physiological states such as puberty, pregnancy and menopause should be given added consideration, because these conditions are known to modify the overall health status in women.<sup>7</sup> The importance of oral health in pregnant women is of paramount significance, since it not only has a direct effect on the expecting mother but also on the future of the child.<sup>8</sup> Pregnancy is a transient physiological state which begins following fertilization and lasts roughly around nine months, which can be further divided into trimesters. Pregnancy causes a variety of generalized changes in a woman's body due to the progressive cycle of hormonal influences.<sup>9</sup> The increased hormonal secretion may result in different signs and symptoms which can alter the person's overall health and perceptions. These would then cause systemic changes including the cardiovascular, hematologic, respiratory, renal, gastro-intestinal, endocrine and genitourinary systems.<sup>10</sup> Various localized effects are also seen involving the oral cavity. The effects on the hard and soft tissues of the oral cavity during pregnancy have been well documented.<sup>9,10,11</sup> The most common are the conditions affecting periodontal health and include gingivitis and periodontitis.<sup>8</sup> A reactive growth called 'pregnancy tumor' is commonly seen in the gingiva during pregnancy.<sup>12</sup> The incidence of dental caries also increases due to changes in dietary habits; also common are erosion of teeth due to frequent episodes of nausea and vomiting during pregnancy.<sup>8</sup> Overall, there is an increased incidence of infectious diseases which could have deleterious effects. It should be kept in mind that the pregnancy related effects have a negative impact not only on the mother, but also on the infant if not handled properly.<sup>13</sup> During pregnancy, a woman's hormonal levels change considerably, especially in the levels of progesterone. This can increase her susceptibility to bacterial plaque causing gingivitis which is most noticeable during the second to third trimester of pregnancy. *Porphyromonas gingivalis* showed a positive correlation with progesterone levels in the first trimester and it is believed that Pg favors a sudden elevation of progesterone levels in the first trimester of gestation. Previous studies confirmed that the hormonal changes in pregnant women promote the growth of certain Gram-negative anaerobic bacteria in the oral cavity in particular *Prevotella intermedia*, *Campylobacter rectus* and *Prevotella nigrescens*.<sup>14</sup> When comparing the abundance of seven common bacterial species in the oral cavity of

non-pregnant women, early pregnancy, mid-pregnancy, and late pregnancy, the total viable microbial counts in all stages of pregnancy were higher than those of the non-pregnant women, especially in early pregnancy, and levels of the pathogenic bacteria *Porphyromonas gingivalis* and *Aggregatibacter actinomycetemcomitans* in the subgingival plaque, were significantly higher during the early and middle stages of pregnancy, compared to the non-pregnant group. These results were further reinforced in an additional study, showing higher levels of *A. actinomycetemcomitans* in the second and third trimesters of pregnancy compared to non-pregnant women. Additionally, *Candida* levels were significantly higher during middle and late pregnancy compared to non-pregnant women, further demonstrating a higher prevalence of periodontal pathogens in pregnancy. While some efforts have been made to elucidate mechanisms by which pregnancy leads to changes in the oral composition, these pathways remain unclear. It has been suggested that progesterone and estrogen affect the microbiota during pregnancy, but these effects have not been fully deciphered nor directly proven, other than the finding that estrogens enhance *Candida* infections. It is likely that the overall immune state during pregnancy plays a role leading to increased oral microbial load.<sup>15</sup>

#### **AIM OF THE PRESENT STUDY**

The purpose of the study was to assess the amount of oral microbiota in various trimesters of pregnancy altering the oral hygiene status.

#### **METHODOLOGY**

A cross sectional study was conducted amongst 70 women. Informed consent was obtained from all individual participants included in the study. Inclusion criteria were defined as healthy women between the age of 18 and 35 years with normal singleton pregnancy confirmed by ultrasonography at time of sampling. The control group consisted of healthy non-pregnant patients in the same age group with regular menstrual cycles who did not use a hormonal contraceptive method in the 3 months prior to the study. High risk pregnancies were excluded based on medical and radiological observations.

Women were divided into 3 groups according to gestational age.

Group 1 (n = 19) - first trimester of gestation (up to 98 days)

Group 2 (n = 21) - second trimester of gestation (between 99 and 196 days)

Group 3 (n = 15) - third trimester of gestation (from 197 days)

Group 4 (n = 15) - non-pregnant women (control group).

All patients were interviewed, then underwent periodontal clinical examination and blood collection for hormonal assessment only once. The periodontal examination was carried out and subgingival sample was collected in the transfer media under sterile conditions.

The plaque deposit isolated were grown in sabaroud's agar and were monitored for 36 hours for growth of micro-organisms. The number of colonies were noted as CFU/ml and were counted using automatic colony counting systems. Descriptive statistical analysis were carried out using SPSS 25.0. standard deviation, mean was calculated with p value <0.05 as significant.

## RESULTS

The mean age of participants was  $24.67 \pm 1.26$  years, with no difference between groups ( $p = 0.704$ ). The amount of CFU/ml was increased in the 1<sup>st</sup> trimester of pregnancy, followed by decreased level in 2<sup>nd</sup> trimester. Comparing patients with healthy periodontal diagnoses (control group), with those who clinically presented disease (gingivitis or periodontitis), it was shown that the mean amounts of total subgingival bacteria observed in latter categories were progressively larger. When we grouped all the pregnant women, also can be noticed that the total amount of subgingival bacteria had an influence on clinical diagnosis ( $p = 0.006$ ). (Table 1)

## DISCUSSION

Based on the concept that the presence of bacterial biofilms is the primary factor in the development of gingivitis and periodontal disease<sup>3</sup>, in this study we observed that the total amount of subgingival bacteria positively correlated with an overall worsening of clinical diagnosis in pregnant women ( $p = 0.006$ ). So, a higher load of periodontopathogenic microorganisms, capable of supplanting host protection mechanisms, leads to the onset and progression of the disease. During gestation, the effects of elevated estrogens and progesterone on the gingival vasculature could explain an increased occurrence of edema, erythema, increased crevicular fluid, and bleeding. High levels of steroids are associated with increased vascular permeability in the gingival sulcus and possibly explain the exacerbation of crevicular fluid secretion in this situation<sup>10</sup>. Hugoson<sup>11</sup> reported that the signs of gingivitis begin to manifest in the second month of gestation, worsening until the 8th month, with later regression occurring after the birth and was thus correlated with the hormonal levels. In the qualitative evaluation of the periodontopathogenic bacteria, we observed that *Tanerella forsithya* was more frequently observed among first-trimester pregnant women when compared to those in the third-trimester and nonpregnant women, with a decrease in their abundance observed during pregnancy. This periodontopathogenic bacterium, in turn, was associated with an increase in cases of gingivitis among pregnant women.

## CONCLUSION

In this study, the periodontal clinical diagnosis was positively correlated with the quantification of the subgingival microbiota during gestation. Amount of bacteria was higher in case of pregnancy in the 1<sup>st</sup> trimester and 3<sup>rd</sup> trimester, which can have negative influence of the oral health of a woman and thus can affect the health of the developing fetus.

## REFERENCES

1. Glick M, Williams DM, Kleinman DV, Vujcic M, Watt RG, Weyant RJ. A new definition for oral health developed by the FDI world dental federation opens the door to a universal definition of oral health. *J Am Dental Assoc.* 2016;147(12):915-7. DOI:10.1016/j.ajodo.2016.11.010
2. Hein C, Williams RC. The impact of oral health on general health: Educating professionals and patients. *Current Oral Health Reports.* 2017;4(1):8-13. DOI:10.1007/s40496-017-0124-4
3. Azarpazhooh A, Leake JL. Systematic review of the association between respiratory diseases and oral health. *J Periodontol.* 2006;77:1465-82. DOI:10.1902/jop.2006.060010
4. Mealey BL, Oates TW. Diabetes mellitus and periodontal diseases. *J Periodontol.* 2006;77:1289-303. DOI:10.1902/jop.2006.050459
5. Winning L, Linden GJ. Periodontitis and systemic disease. Association or Causality? *Curr Oral Health Rep* 2017;4. DOI:10.1007/s40496-017-0121-7

6. Arigbede AO, Babatope BO, Bamidele MK. Periodontitis and systemic diseases: A literature review. *J Indian Soc Periodontol.* 2012;16(4):487-91. DOI:10.4103/0972-124X.106878
7. Kessler JL. A literature review on women's oral health across the life span. *Nursing for Women's Health* 2017;21(2):108-21. DOI:10.1016/j.nwh.2017.02.010
8. Laine MA. Effect of pregnancy on periodontal and dental health. *Acta Odontol Scand.* 2002;60(5):257-64. DOI:10.1080/00016350260248210
9. Gupta R, Acharya AK. Oral health status and treatment needs among pregnant women of Raichur District, India: A population based cross-sectional study. *Scientifica* 2016;Article ID 9860. DOI:10.1155/2016/9860387
10. Hemalatha VT, Manigandan T, Sarumathi T, Aarthi Nisha V, Amudhan A. Dental Considerations in Pregnancy-A Critical Review on the Oral Care. *Journal of Clinical and Diagnostic Research: JCDR.* 2013;7(5):948- 53. DOI:10.7860/JCDR/2013/5405.2986
11. Shamsi M, Hidarnia A, Niknami S, Rafiee M, Karimi M. Oral health during pregnancy: A study from women with pregnancy. *Dental Res J.* 2013;10(3):409-10. DOI:10.4103/1735-3327.115134
12. Gondivkar SM, Gadbaile A, Chole R. Oral pregnancy tumor. *Contemporary Clinical Dentistry.* 2010;1(3):190-2. DOI:10.4103/0976-237X.72792
13. Rainchuso L. Improving oral health outcomes from pregnancy through infancy. *J Dent Hyg.* 2013;87(6):330-5.
14. Massoni, R.S.S., et al., 2019. Correlation of periodontal and microbiological evaluations, with serum levels of estradiol and progesterone, during different trimesters of gestation. *Sci. Rep.* 9, 11762.
15. Fujiwara, N., Tsuruda, K., Iwamoto, Y., Kato, F., Odaki, T., Yamane, N., et al. (2015). Significant increase of oral bacteria in the early pregnancy period in Japanese women. *J. Investig. Clin. Dent.* doi:10.1111/jicd.12189

## TABLES

**Table 1- Periodontopathogens quantification**

Groups	Number (n)	Mean CFU/ml	SD	P value
I	19	561.991	1.320.099	<b>0.013</b>
II	21	410.656	1.244.766	0.652
III	15	134.774	372.516	0.186
IV	15	114.705	422.722	0.515

\*SD= standard deviation, p <0.05 is significant