



## Periodontal and gingival changes amongst pregnant women in Lagos, Nigeria

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### Abstract

**Objective:** To assess the periodontal and gingival changes during different stages of pregnancy among women in a Nigerian Teaching Hospital.

**Method:** Fifty three pregnant women attending the ante-natal clinic of the Lagos University Teaching Hospital, (LUTH), were included in the study while, 53 non-pregnant with mean age  $29.40 \pm 3.8$  years, and apparently healthy women with mean age  $30.96 \pm 2.3$  years served as the control. Periodontal and oral hygiene status were assessed using the Community Periodontal Index of Treatment Needs (CPITN) and the Simplified Oral Hygiene (OHI-S) Indices respectively.

**Result:** There were a higher number of sextants with gingival bleeding and shallow pockets among the pregnant women in the 2nd and 3rd trimesters of pregnancy compared to that of the non-pregnant women. The number of sextants with gingival bleeding and shallow pocket however reduced post partum. Thus, in the pregnant women the mean number of sextants with gingival bleeding was 0.9 in 1st trimester, 1.4 in the 2nd trimester, 1.0 in the 3rd trimester and 0.1 postpartum. The mean number of sextants with pocket (code 3) was 0.1 in the 1st trimester, 0.4 in the 2nd trimester, 0.3 in the in 3rd trimester & 0.1 postpartum. Whereas in the non-pregnant group, the mean no of sextants with gingival bleeding was 0.6 at the 1st examination, 0.5 at the 2nd examination and 0.4 at the 3rd examinations and the mean number of sextants with pocket was 0.1 at the 1st examination, 0.2 at the 2nd and 3rd examination. The mean OHI-S score of pregnant women increased from  $2.36 \pm 0.91$  at the beginning of the study to  $3.03 \pm 0.72$  at the end of the study. While the score of the control group increased from  $2.06 \pm 1.1$  to  $2.65 \pm 0.99$ .

**Conclusion:** The OHI-S score, gingival bleeding and pockets were higher in the pregnant than in the non-pregnant women. It is suggested that pregnant women should have routine dental check-up and early management of periodontal disease through adequate plaque control.

**Key words:** Periodontal disease, gingival changes, pregnancy, Nigeria

### Introduction

Periodontal disease is a chronic condition involving the supporting structures of the teeth and is one of the most widespread diseases affecting the human race. It is considered to be one of the commonest dental diseases and is responsible for extensive tooth loss in adult and children<sup>(1,2)</sup>. It reportedly accounts for about 20-30% of all extractions in the developed countries<sup>(3)</sup> and over 80% of teeth lost in subjects older than 30 years in Nigeria<sup>(1)</sup>. The prevalence of periodontal disease in Africa and Asia is high when compared with the developed nations<sup>(4)</sup> and it is reportedly the most common dental disease in Nigeria<sup>(5,6)</sup>. This high prevalence could be attributed to poor oral hygiene practices, low education level, inadequate and inappropriate nutritional intake, systemic condition and even genetic predisposition.<sup>(4)</sup> Susceptibility to severe periodontal disease has been found to be modified by general systemic alterations such as those that occur in blood, metabolic diseases and hormonal imbalance. Amongst the systemic diseases clearly implicated are cyclic neutropenia, drug induced agranulocytosis, diabetes mellitus, acquired

immune deficiency syndrome, sickle cell anemia and pregnancy<sup>(7-10)</sup>.

The occurrence of periodontal disease during pregnancy has been reported in many studies.<sup>(11-15)</sup> Some studies have also reported higher prevalence of gingivitis in pregnant women compared with the non-pregnant counterparts.<sup>(10, 15, 16)</sup> The prevalence of gingivitis in pregnant women has been estimated to be between 30 to 100%<sup>(1)</sup> over the years.

Recent studies have shown that periodontal diseases have the potential to affect pregnancy out comes<sup>(17)</sup>. Severe periodontal diseases in the mother has recently been reported to be associated with the occurrence of preterm birth, preterm low birth weight and low birth weight at full term infant delivery in some population<sup>(18)</sup>. Cases ranging from mild inflammation to severe hyperplasia, pain and bleeding, increased gingival probing depth, increased cervical fluid flow, increased tooth mobility, increased periodontal pocket depth and pregnancy epulis are the clinical manifestation described during pregnancy<sup>(10, 15, 16, 19, 20)</sup>.

Pyogenic granuloma has been described as part of the alterations accompanying pregnancy. When present



during pregnancy it is also referred to as pregnancy tumor or gravid granuloma<sup>(21)</sup>. Pyogenic granuloma is a benign reactive inflammatory lesion composed of proliferating capillaries. It arises as a tissue response to various stimuli such as bacteria plaque, trauma and hormonal imbalance. It may be found in the oral cavity and extra orally. In the oral cavity it usually develops in the papillary gingival and less frequently in the labial or cheek mucosa, or tongue. It presents as a smooth or lobulated, sessile or pedunculated red mass. It enlarges rapidly and bleeds easily. The increase in the levels of the sex hormones facilitates the action of local irritants such as trauma and or bacteria plaque thereby influencing the formation of pyogenic granuloma<sup>(22)</sup>. Some authors have reported an increased presence of vascular endothelial growth factor (VEGF) and fibroblastic growth factor (bFGF) in pyogenic granuloma. These they suggested could contribute to the vascularization of pyogenic granuloma<sup>(23)</sup>.

Pregnant women may be more susceptible to periodontal diseases because of the higher concentrations of hormones such as oestrogen and progesterone which can induce hyperaemia, oedema and bleeding in periodontal tissues, thus increasing the risk of bacterial infections<sup>(19)</sup>.

The aim of this study is to assess the periodontal changes among pregnant women attending antenatal clinic in Lagos University Teaching Hospital, Idi-Araba, Lagos. The result would be useful in determining the need for oral health interventions among Nigerian pregnant women.

**Materials and method**

This was a longitudinal case- control study that involved women and was conducted at the antenatal clinic and General Outpatient Department of the Lagos University Teaching Hospital. One hundred and twenty women participated in this study. Subjects were between ages 20-44years and were recruited within a period of three months. Sixty pregnant women who were defined as (the case) were recruited into the study based on the following criteria; women in the first trimester (12th weeks) of pregnancy without any underlying systemic condition and consenting to participate in the study. Out of this 60 pregnant women recruited five of them dropped out due to failure to keep scheduled appointments, refusal to continue and loss of interest. The postpartum visit was completed by 53 women, 2 women moved to other locations and could not be traced. To maintain a 1:1 ratio of pregnant to non-pregnant women, 60 non-pregnant women were also recruited as control group for this study from among women who accompanied their relatives to the general out-patient department based on the criteria that: they had no underlying systemic diseases, not on any drugs steroids and hormones that could affect the periodontal health, not pregnant or planning to be and consenting to participate in the study. However following drop out of 7 pregnant women from the study group, the number of non-pregnant women was also reduced by 7, given 53 non-pregnant women. The method of selection was by balloting. Sampling of the participants was not done as all who consented and met the inclusion criteria were incorporated in the study. Approval for the study was obtained from the Ethical committee of the Lagos University Teaching Hospital.

Information on the socio-demographic characteristics of the study population was obtained verbally and this was

followed by an oral examination to determine the periodontal and oral hygiene status. The pregnant women were examined four times in the 12th, 24th, 38th weeks of pregnancy and 8weeks post-partum, while non -pregnant women were examined on three occasions at three months intervals after the 1st examination.

All the clinical measurements during each visit were carried out by the same investigator in order to minimize error. Oral examinations were performed in a well lit room with participants seated on a chair using a mouth mirror and a CPITN periodontal probe. The periodontal status was assessed using the CPITN index. <sup>(24)</sup> Only ten teeth (the index teeth) were examined. The ten index teeth are

$$\frac{761}{76} \mid \frac{67}{167}$$

The teeth were examined according to the following criteria

- Code 4 - pathological pocket of 6mm or more
- Code 3 - pathological pocket of 4-5 mm
- Code 2 - supra or sub gingival calculus
- Code 1 - gingival bleeding after gentle probing
- Code 0 - no sign of disease

Prevalence of bleeding, calculus and depth of periodontal pocket were assessed and recorded as the percentage of subjects affected. Severity of periodontal condition was assessed by the mean number of sextants having CPITN Code 0, 1, 2, 3, 4.

The oral hygiene status was assessed using the simplified oral hygiene index. <sup>(25)</sup> For this index, only six surfaces were examined for debris and calculus respectively.

$$\frac{61}{6} \mid \frac{6}{16}$$

The surfaces examined in the upper jaw are the buccal surfaces of the right and left first molars and labial surface of the right incisor, while in the lower jaw, the lingual surfaces of the right and left first molars and labial surface of the left incisor were examined. For each individual, the debris score was added together and divided by six, the same method was used to obtain the calculus score. The mean debris score plus the mean calculus score gave the OHI-S (oral hygiene index score).

**Data analysis**

Quantitative variables were summarized using mean and standard deviation. Categorical variables were tabulated, using frequency and percentage. Statistical analysis of OHI value and CPITN scores were carried out using the T-test and chi square. Level of significance was set at p<0.05.

**Result**

Fifty three pregnant women and 53 non-pregnant women completed this study. The mean age of the pregnant women in this study was 29.40 + 3.8 years and for the non pregnant women 30.96 - 2.3 years. More than 90% of the study participants had formal education ranging from post primary to university (**Table 1**).

The prevalence of the periodontal disease was 60% at the 1st examination in the pregnant women and 47% in the non-pregnant women. The percentage of healthy gingiva in the non pregnant women is higher than in the pregnant women. Some of the patients with clean mouth (healthy gingival) did not show any sign of gingivitis throughout the period of study.



The percentages of OHI-S, gingival bleeding, calculus and periodontal pockets were higher in the pregnant women than the non-pregnant women. The highest bleeding and periodontal pockets values were recorded in the 2nd trimester and the value decreased from the third trimester to the post partum (Table 2). Severity of the periodontal disease followed the same trend as the percentage of the disease (Table 3). The differences in percentages and severity were statistically significant in the 2nd and 3rd examinations of the pregnant and non-pregnant women. The proportion of the pregnant women who required periodontal treatment at postpartum examination was (68%) while it was (57%) for the non pregnant women at the 3rd examination (Table 2).

The mean oral hygiene score (OHI-S) among the pregnant women was higher than in non pregnant women. There was a statistically significant difference between the mean OHI score of pregnant and non-pregnant women at the 2nd and 3rd examinations (Table 4).

Six out of the 53 pregnant women (11%) presented with pyogenic granuloma (epulis gravidarum) in the 24th week of pregnancy. The biggest was about 10mm in diameter and was pedunculated with a stalk between 35 and 36, lingually related to 33, 34, 35, and 36 and buccally related to 35 and 36. The smallest was about 2mm in diameter, pedunculated and located between the lower central incisors.

**Table 1. Demographic characteristics of pregnant and non-pregnant women**

Characteristics	Pregnant Freq (%)	Non Pregnant Freq (%)
<b>Age group</b>		
20 - 24	8 (15.0)	3(5.7)
25 - 29	18(34.0)	19(35.8)
30 - 34	23(43.5)	20(37.8)
35 - 44	4 (7.5)	11 (20.8)
<b>Education Status</b>		
None	1(1.9)	0(0.0)
Primary (Low)	0(0.0)	1 (1.9)
Post Primary (Medium)	23(43.4)	20(37.7)
Tertiary (High)	29(54.7)	32 (60.4)
<b>Employment Status</b>		
Unemployed	6 (11.3)	3(5.7)
Self employed	15 (28.3)	14(26.4)
Employed	21(39.6)	27(50.9)
Traders	11(20.8)	9(17.0)
<b>Total</b>	<b>53(100.0)</b>	<b>53(100.0)</b>

**Discussion**

The oral health of pregnant women has been receiving a lot of attention in recent times because of the suggested association between periodontal disease and unfavorable pregnancy outcomes. There is limited information about oral health among Nigerian pregnant women. Thus this study was designed to address the problem. The study participants comprised a large proportion of highly

**Table 2. Percentage (%) periodontal condition of pregnant women of Control and Test Groups at the 1st assessment.**

Freq	1st examination				2nd examination				3rd examination				Post Partum			
	H	B	C	P	H	B	C	P	H	B	C	P	H	B	C	P
Pregnant (5)	53	40	11	43	6	25	17	49	9	23	13	56	8	32	4	59
Non - pregnant (6)	53	53	7	36	4	47	6	41	6	43	5	46	6	43	5	46
P values	p=0.486				p=0.031*				p=0.050*				p = 0.555			

Note H: Healthy, B: Bleeding, C: Calculus, P: Pocket of 4-5mm depth

**Table 3. CPITN Mean Number of Sextants for the pregnant and non pregnant women from 1st Examination to the last.**

Freq	1st examination				2nd examination				3rd examination				Post Partum			
	H	B	C	P	H	B	C	P	H	B	C	P	H	B	C	P
Pregnant 53	2.8	0.9	2.2	0.1	1.7	1.4	2.5	0.4	1.5	1.0	2.7	0.3	2.5	0.3	3.1	0.1
Non - pregnant 53	3.3	0.6	2.0	0.1	3.0	0.5	2.3	0.2	2.8	0.4	2.6	0.2	2.8	0.4	2.6	0.2
P values	P=0.112				p=0.000**				p=0.000**				p = 0.419			

Note H: Healthy, B: Bleeding, C: Calculus, P: Pocket of 4-5mm

**Table 4. Mean Oral Hygiene Index Scores (OHI-S) of women studied**

Trimesters	Pregnant	Non pregnant	P value
	$\bar{X} \pm SD$	$\bar{X} \pm SD$	
1st	2.36 ± 1.14	2.06 ± 0.91	0.1373
2nd	2.78 ± 0.49	2.33 ± 1.05	0.0056**
3rd	3.03 ± 0.72	2.65 ± 0.99	0.0244*

educated women which is probably because the study was conducted in an urban center.

The findings in this study confirm earlier reports that periodontal tissues are more susceptible to gingival inflammation during pregnancy and that the severity increases progressively throughout pregnancy with a reduction post- partum<sup>(10, 15, 16)</sup>. In this study the mean numbers of sextants with bleeding, calculus and periodontal pockets were higher in the pregnant women than the non pregnant women. The mean number of sextants with gingival bleeding and pockets were observed to be highest in the 2nd trimester of pregnancy and there was a subsequent reduction post partum to a level close to that observed among the non pregnant women. The explanation for the changes seen in the pregnant women could be due to elevated levels of circulating estrogen and progesterone during pregnancy, that peak at the eight month, and then starts to decrease in the ninth month<sup>(10)</sup>. These hormones contribute to enhanced vascular permeability which results in enhanced gingival exudates. Sex hormones especially progesterone and oestradiol in high concentration can increase prostaglandin synthesis, especially PGE2 produced by lipopolysaccharides stimulated human monocytes which



increase the inflammatory reaction<sup>(26)</sup>. Korman and Loesche<sup>(27)</sup> reported that the gingival inflammation during the 2nd trimester of pregnancy resulted from an alteration of the sub gingival flora to a more anaerobic state. They stated that increased proportions of *Prevotella intermedia* was concomitant with an increase in gingivitis and elevated serum levels of estrogen and progesterone in pregnancy. This concomitant increase in *P. intermedia* is most pronounced in the second trimester and correlates with increased gingivitis scores. They postulated that both hormones, estrogen and progesterone, can substitute for naphthoquinone, which is an essential growth factor for *P. intermedia*<sup>(28)</sup>.

Probing depth is a very important index for diagnosis of periodontal disease and any increase in it can be considered as a sign of periodontal destruction. There were no subjects with pocket depths as deep as 6-8mm in this study. Our findings in this study support other reports, which suggested the periodontal pocket formation during pregnancy occurred mainly due to gingival swelling and loosening of the gingival tissues around the teeth caused by inflammation so allowing the probe to penetrate deeper within the tissues<sup>(29, 20, 21)</sup>. There were no periodontal tissue destructions because the clinical attachment levels (CALs) among the pregnant women remained unchanged. This is in agreement with earlier reports<sup>(15, 16, 19, 29)</sup>. Although the increase in periodontal pocket depth may represent reversible changes previously documented in pregnant women,<sup>(30)</sup> increases in attachment loss suggested irreversible periodontal damage. Moss et al<sup>(31)</sup> reported risks for the occurrence and progression of gingivitis or periodontitis during pregnancy and observed that sites with periodontal pocket depth and bleeding on probing (BOP) had a greater probability of suffering increase in periodontal pocket depths and clinical attachment levels (CALs) during pregnancy.

The oral hygiene score was high in both groups but higher in the pregnant than in the non pregnant women in this study. This demonstrates the precarious state of the oral hygiene in these women population, confirming the evidence for oral hygiene (plaque) being a risk factor for periodontal disease in the non-pregnant just as the pregnant women<sup>(32)</sup>. Pregnant women may be more susceptible to periodontal diseases because of the higher concentrations of oestrogen and progesterone which caused exaggeration of gingival changes to plaque and other plaque retentive factors<sup>(19)</sup>.

It was observed in this study, that the patients with clean mouth (healthy gingival) did not show any gingivitis throughout the period of study. This is in agreement with previous studies<sup>(14, 20)</sup> Pregnancy does not alter healthy gingiva, but may affect the severity of previously inflamed gingiva. In some cases the inflamed gingiva forms a discrete mass referred to as pregnancy tumour<sup>(15)</sup>. Gingival inflammation reduced when there was effective plaque control, while healthy gingiva remained healthy throughout pregnancy with effective plaque control<sup>(33-35)</sup>.

In this study spontaneous reduction in the sizes of the epulis occurred following child birth. The subjects were recalled for review. Where there was complete reduction, scaling and polishing was done to remove all form of irritants for the complete elimination of residual

inflammatory lesions. In some of the subject, there was reduction in the sizes of the epulis, but the masses still interfered with the subjects ability to chew, speak and was causing serious esthetic problems so they were excised completely 6 weeks after delivery.

One of the limitations of this study was the sample size and this was due to the longitudinal nature of the study. Follow up was generally difficult because most of the patients failed to show up on the appointed days for one reason or the other and as a result, had to be excluded from the study. However, the sample size used in this study is still larger than most other longitudinal studies done in the past where the group size had varied within 16-47<sup>(10, 15, 16, 20)</sup>. Also, the different clinical measurements used resulted in a difference in the number of teeth examined. The inclusion of certain index teeth or all the teeth makes it difficult to have an objective comparative evaluation of earlier observations with this study. Nonetheless this study is unique because most published data on pregnancy gingivitis in Nigeria were obtained by cross sectional studies<sup>(11, 12, 13)</sup>. This makes evaluation of the periodontal changes in pregnancy difficult.

### Conclusion

Based on the findings in this study, it can be concluded that periodontal and oral hygiene status of the pregnant women was higher than that of the non pregnant women. Periodontal changes in pregnancy are caused by bacteria plaque just as in the non pregnant women. Pregnancy accentuates the oral tissues response to plaque and modifies the resultant clinical picture due to the role played by increased levels of progesterone and oestrogen in exacerbating the gingivitis<sup>(36)</sup>. The incidence of periodontal diseases can be reduced by a decrease in plaque accumulation. Oral hygiene plays an important role in the aetiology and prevention of periodontal disease. It is therefore suggested that pregnant women should have routine dental check-up and early management of periodontal disease. There should be oral health education and adequate plaque control by brushing, flossing, and professional prophylaxis (scaling and polishing). These will arrest the progression of the disease and allow pregnant women to achieve an optimal level of dental health throughout pregnancy. Since mothers play a crucial role in establishing proper health habits in their children, women, especially pregnant women, should be regarded as a prime target group for oral health education. The involvement of oral health workers in routine antenatal care would be helpful.

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