Preventive therapy and periodontal status of pregnant women in Lagos University Teaching Hospital

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Abstract

Objective: To determine the effectiveness of applied preventive therapy during pregnancy.
Method: Eighty pregnant women in the first trimester of pregnancy participated in this study. Participants were divided into two groups, the test (42) and control (38) groups. The test group received non-surgical periodontal treatment which consisted of professional prophylaxis (Scaling and Polishing) and OHI. The control group received only OHI during pregnancy and was referred for treatment after delivery. The CPITN & OHI-S indices were used to assess the periodontal and oral hygiene status of the pregnant women.
Result: The periodontal and oral hygiene status of the pregnant women were assessed and evaluated three times. Periodontal treatment resulted in reduction of CPITN and OHI-S scores of the women in the test group. The mean OHI-S in the test group decreased from 1.77±0.34 to 0.69 ± 0.29, while it increased from 1.84 ± 0.65 to 2.13 ± 1.02 in the control group. The mean number of sextants decreased from 4.5 to 1.4 in the test group, while in the control group it increased from 4.0 to 4.5
Conclusion: The intensive regimen of repeated and systematic individualized oral hygiene instructions was able to significantly reduce all clinical signs of periodontal and gingival inflammation in pregnant women.

Key words: Pregnant women, Periodontal status, Preventive measures

Introduction

Pregnant women are particularly more prone to periodontal diseases due to hormonal changes associated with pregnancy. Gingivitis termed "pregnancy gingivitis" is the most common form of periodontal disease in pregnant women. The prevalence of "pregnancy gingivitis" varied from 35% to 100%[1,2]. Pregnancy gingivitis is characterized by increased redness, edema, and higher tendency to bleeding and inflammation that occurs as a result of increased circulating levels of progesterone and its effects on the microvasculature. Furthermore, increased salivary levels of estradiol and progesterone have been correlated with increase in the proportion of P. intermedia in the bacterial flora during pregnancy[3]. This bacterial shift may be due to the opportunistic substitution by P. intermedia and other Bacteroides spp. of progesterone and estrogen for Vitamin K, an essential growth factor[4].

Researchers have found that women with periodontal diseases may be at higher risk for adverse pregnancy outcomes such as preterm labor, low birth weights, as well as preeclampsia[5-7]. The mechanism suggested for this is that periodontal pockets serve as a chronic reservoir for the translocation of bacteria (mostly Gram-negative bacteria, such as Porphyromonas gingivalis and Prevotella intermedia) and their virulent products, which reach the fetal-placental unit through the hematogenic pathway and can trigger premature labor[8,9].

Studies of pregnant women in Nigeria revealed prevalence of periodontal disease of ranging from 52% - 100% indicating a strong need for initiating oral care during early pregnancy[5,10-12]. Because women with pregnancy gingivitis demonstrate increased bleeding and gingival crevicular fluid production, the potential for bacteremias and increased serum levels of pro-inflammatory cytokines. Improving maternal oral hygiene is important for oral health, may reduce systemic pro-inflammatory cytokines and improve maternity outcomes[13]. An intensive approach to plaque removal may be effective to treat pregnancy gingivitis.

This study sought to examine the effectiveness of an intensive oral hygiene regimen on pregnant women in reducing the progression of gingivitis during pregnancy. There is still limited information about the periodontal conditions of Nigerian pregnant women and more representative epidemiologic studies are necessary.

Materials and method

The study was randomized controlled trial of the effectiveness of a preventive program on pregnant women. All women who attended the antenatal clinic of the Lagos University Teaching Hospital (LUTH) within a period of three months and were between ages 20-39 years were invited to participate in the study, and then were assessed for their eligibility to participate. The pregnant women were recruited into the study based on the following criteria: women in the first trimester of pregnancy, without any underlying systemic condition and consenting to participate in the study. The eligible pregnant women were randomized into two groups, intervention (the test) and control groups. Based on the agreement that patient in the test group will receive non-surgical periodontal treatment in the 2nd trimester of pregnancy, while the patients in the control group would receive treatment after delivery. Immediately after the dental examination, the participants were informed of the group allocation.

Written informed consent was obtained from each participant before the randomized group allocation was revealed. Approval for the study was obtained from the Research Ethics committee of Lagos University Teaching Hospital (LUTH).

Questionnaires were tested in the pilot study, revised and reviewed for clarity and comprehension. Information on the socio-demographic characteristics of the study population was obtained by the questionnaire and questions about oral hygiene habits were included.

Initial intervention

All the pregnant women who participated in this study received oral health education. The oral health education included verbal information to the mothers about the causes and prevention of oral diseases, such as periodontal diseases and caries from a dentist. Individualized oral hygiene counseling and instructions with demonstration on how to use the tooth brush were completed for each participant. Participants were given opportunities to ask questions and were asked to demonstrate hygiene techniques until they understood the techniques and demonstrated adequate skills.

Clinical evaluation:

Intra 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 Community Periodontal Index of Treatment Need (CPITN) designed by Ainamo et al and the World Health Organisation[14] the teeth were examined using to the following diagnostic 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 pockets 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 by Greene and Vermillion[15]. For each individual, the debris scores were 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 gives the OHI-S (oral hygiene index score). Based on the score, oral hygiene status was categorized as good (0.0-1.2), fair (1.3-3.0) and poor (3.1-6.0).

Periodontal treatment

The periodontal treatment group received dental scaling and root planning (SRP) from a dentist at the end of the first trimester.

Those in the untreated control group received no periodontal treatment. They were offered treatment after delivery.

Women in both the intervention and control groups were re-evaluated every three months i.e. at the end of the 24th and 36th weeks of pregnancy and the CPI and OHI-S scores recorded.

Follow-up intervention: Home care after tooth cleaning was reinforced with cell phone messages, approximately every two weeks. There were monthly clinical examinations. Oral hygiene instructions, based on clinical findings were reinforced via repeated counseling and demonstration were focused on areas of plaque retention and gingival inflammation that were identified in clinical examination.

All periodontal measurements were performed by one dentist who was blinded to the group allocation of the pregnant women to ensure study reliability. Another dentist was responsible for periodontal therapy and oral health education of the pregnant women. The dental assistant involved in the allocation of the groups was blinded as to which patients were assigned to each group.

Success of dental treatment

The success of periodontal treatment was determined on the basis of the third periodontal examination, taken by the 36th weeks after initial therapy. Successful treatment was characterized by the resolution of gingival inflammation and by the lack of progression of periodontal probing pocket depth. Unsuccessful treatment was characterized by increased inflammation (edematous tissues, bleeding tissues) and increased probing pocket depth in at least three sites.

Data analysis: Data entry and analysis was done using SSPS version 17. Quantitative variables were summarized using ranges, mean and standard deviation. Categorical variables were tabulated, using frequency and percentages. Statistical analysis of means of OHI value was carried out using the T-test while the frequencies of CPITN scores was carried out using fisher's exact test and Chi square test. Level of significance was set at $p < 0.05$

Result

One hundred and twenty patients were initially assessed as eligible, 20 refused to participate and 20 were at the third trimester, when periodontal treatment could not be performed.

Finally 80 pregnant women participated in this study.

Table 1. Demographic characteristics of pregnant women

Variables	Test		Control		Total		
	n	%	n	%	n	%	
Age group (yrs)							
20-24	8	19.0	6	15.8	14	17.5	
25-29	15	35.7	12	31.6	27	33.7	
30-34	13	31.0	13	34.2	26	32.5	
35- 39	6	14.3	7	18.4	13	16.3	P-0.92
Educational status							
Primary	5	12.0	6	15.8	11	13.7	
Secondary	21	50.0	13	34.2	34	42.5	
Tertiary	16	38.0	19	50.0	35	3.8	P-0.36
Employment status							
Unemployment	5	12.0	6	15.8	11	13.7	
Self-employed	22	52.3	19	50.0	41	51.2	
Govt employed	15	35.7	13	34.2	28	35.0	p-0.88
Total	**42**	**53.5**		**38**	**47.5**	**80**	**100**

The distribution of the demographic characteristics of the study population is shown in **(Table 1)**. The mean age of the test group of 42 women was 28.71±4.94 years, while that of control group of 38women was 29.45±5.04years. (p=0.52). Half of the women had tertiary education.

Clinical characteristics of study participants

The percentages of periodontal conditions of the two groups for the first two (2) assessments are shown in **(Table 2**).

The prevalence of periodontal disease (percentage of subjects affected with bleeding, calculus and pockets) in the test and control groups were 85.7% and 81.6% respectively at the 1st assessment. The difference in CPITN scores was not statistically significant (p=0.85).

The 2nd assessment, after the treatment of the test group, revealed a significant improvement of periodontal conditions (p<0.001), while that of the control group showed progressive deterioration of periodontal conditions. (p=0.95) **(Table 2)**.

The result at 1st and 3rd assessments of test and control groups were compared in **(Table 3)**. There was a statistically significant difference in the CPITN scores. Prevalence of periodontal disease was 86% in the test group and 82% in the control group in 1st assessment and was 26% and 84% in the test group and control group in the 3rd assessment respectively. The treatment was 60% successful from the initial assessment to the 3rd in the test group.

Severity of periodontal disease according to the Mean

Table 2. A: Percentage (%) of periodontal condition of the groups of the1st & 2nd assessments.

Assessment	Test group				Control group				p-value
	H	B	C	P	H	B	C	P	
1	14	19	55	12	18	16	53	13	p-0.95
2	69	14	12	5	11	19	55	15	p<0.001
	P<0.001				P=0.79				

B. Severity of periodontal disease according to the Mean Number of Sextants of the groups of 1st & 2nd assessment

Assessment	Test group				Control group				p-value
	H	B	C	P	H	B	C	P	
1	1.5	1.6	2.6	0.3	2.2	1.2	2.4	0.2	p-0.03
2	4.3	1.1	0.5	0.1	1.2	1.7	2.7	0.4	p<0.001
	P<0.001				p<0.00				

H = Healthy B = Bleeding on probing

C = Calculus P = Pocket 4-5mm depth

Table 3. Periodontal condition of participants in the study

A: Percentage (%) of periodontal condition of participants at the 1st and 3rd assessments

Assessment	Test group				Control group				p-value
	H	B	C	P	H	B	C	P	
1st	14	19	55	12	18	16	53	13	p-0.95
3rd	74	9	17	0	16	11	71	5	p<0.001
	P<0.001				p=0.79				

B: Severity of periodontal disease according to the Mean Number of Sextants of participants at the 1st and 3rd assessments

Assessment	Test group				Control group				p-value
	H	B	C	P	H	B	C	P	
1st	1.5	1.6	2.6	0.3	2.2	1.2	2.4	0.2	p-0.03
3rd	4.6	0.6	0.8	0.0	1.6	1.4	2.9	0.1	p<0.001
	p= 0.03				p=0.07				

H = Healthy B = Bleeding on probing

C = Calculus P = Pocket 4-5mm depth

Table 4. Oral hygiene Index Scores (OHIS) of participants assessment

A: Mean Oral Hygiene Index Scores (OHI-S) of cases from 1st & 2nd trimester

Assessment	Test group	Control group	p-value
	±SD	X ±SD	
1st	1.77± 0.34	1.84±0.65	p-0.55
2nd	0.78± 0.19	2.40±1.06	p<0.001
	p<0.001	p<0.01	

B: Mean Oral Hygiene Index Scores (OHI-S) of cases 1st and 3rd assessments

Assessment	Test group	Control group	P value
	Mean, sd	Mean, sd	
1st	1.77± 0.34	1.84±0.65	p-0.55
3rd	0.69 ± 0.29	2.15± 0.66	p<0.001
	p<0.001	p-0.04	

Number of Sextants clinically decreased in the test group from 4.5 to 1.6, while in the control group it increased from 3.8 to 4.4.

The difference between the OHI-S scores of the test and control groups at the 1st assessment was not statistically significant, p =0.55 **(Table 4)**.

A statistically significant difference was found in the OHI-S scores between the two groups at the 2nd assessment (p<0.001).

Comparing the result at 1st and 3rd assessments of control group, mean OHI-S scores decreased slightly from what it was at the 2nd assessment. (p=0.04).

Tooth brushing habit of the women: 35% of the women in test group and 30% of the women in the control group brushed once daily at 1st assessment while 85% of women in test group and 54% in control group brushed twice daily at 3rd assessment.

Tables 2-4, showed that when participants' periodontal health and oral hygiene indices were compared over time, gingival indices improved significantly between visits 1 and 2 and between visits 1 and 3. Substantial improvement in tooth cleaning ability by 3rd assessment was demonstrated by improved mean OHI-S scores (p < 0.001).

Discussion

It has been suggested that pregnant women should be considered an important target group for preventive intervention. This is because of the exacerbation of gingivitis during pregnancy that is widely experienced by pregnant women. Although the gingivitis during pregnancy resolves following parturition without significant loss of periodontal attachment, the prevention of this condition during pregnancy has received considerable attention, not only because the disease could interfere with systemic health but also as a way of improving oral health status of women.

There was no difference between the test and control groups of CPI and OHI-S scores at the base line assessment. The result of the periodontal condition observed was characterized by moderate prevalence of bleeding, high prevalence of calculus deposits and low prevalence of shallow pockets. These findings are consistent with the reports of Margret et al[16]and Umoh et al[5]. Periodontal conditions were evaluated for the two groups 3 months after the initial assessment. There was an improvement of periodontal conditions of the test group was observed, p>0.001, while the control group showed deterioration of periodontal conditions. Similar tendency was observed by, Ingrida et al[17], Sant'ana et al[18]and Sadatmansouri et al[19]. The study confirmed the importance of oral debris as the cause of gingivitis during pregnancy and that gingival inflammation reduced when there was effective plaque removal and healthy gingivae remained healthy throughout pregnancy with effective plaque control[20]. The deterioration of periodontal conditions in the control group was due to the fact that increase in hormonal levels during pregnancy accentuates gingival response to plaque and modifies the resultant clinical picture[20]. The increase in progesterone results in greater vascular permeability, gingival edema, crevicular fluid levels and prostaglandin production, which may lead to gingival inflammation. In addition, may affects the development of local inflammation, reducing regulation of interleukin-6 production and rendering gingival tissues less resistant to inflammatory challenges caused by bacteria. These hormones serve as essential growth factors for Prevotella-intermedia, which show a marked increase in the subgingival plaque during pregnancy[3].

Estrogen receptors (ER) have been identified on gingival epithelium and periodontal ligament[22] and the direct effects of pregnancy hormones on periodontal tissues[23]may account for gingival inflammation during pregnancy.

There was oral health education programme at specific time for all the pregnant women in this study, so that the women could be motivated to maintain good oral hygiene throughout pregnancy. This agreed with a study by McCann and Bonci[23], who stated that application of preventive measures for pregnant women should include provision of knowledge about measures which will help to keep good oral hygiene. This was necessary because it was believed that the initial improvement in attitude and habits could became poorer as the pregnancy progresses[24]. Also because it was found out by Cardenas and Ross[25] in the study of the Effects of an Oral Health Education Program for Pregnant Women, that most pregnant woman are able to retain information on oral health for about a month[25]. In the 3rd trimester, patients tend to be sedentary and even simple tasks, for example, home care takes more effort and tends to be neglected[26]. Oral health knowledge does not necessarily relate to better health behavior but people who assimilate this knowledge and feel a sense of personal control over their health are more likely to adapt self-care practices[27].

The oral hygiene status of the women in the control group, at the 3rd assessment improved with a reduction in the mean OHI-Scores. This was similar to the study of Tadakamadal et al[28], but contrary to the study of Ingrida et al[17] . Improved oral hygiene in the pregnant women in the control group may have been due to improved motivation through the repeated oral health education, toward self-care and personal health during pregnancy. In addition to this is that the women are being more sensitive and desirous of offering their babies the best as the pregnancy progressed[28].

The combined approach of the nonsurgical intervention and individual oral hygiene instruction was effective in significantly reducing the CPI and OHI-S values in the pregnant women. This was similar to the report of Jeffcoat, et al[29]. This indicated that improved plaque removal was adequate to improve the clinical signs of plaque-induced gingivitis modified by pregnancy. The regimen of the nonsurgical intervention, oral hygiene and its importance and monthly individualized oral hygiene instructions may have more effectively decreased pregnancy gingivitis. Success of periodontal preventive therapy was probably due to patient compliance with oral hygiene and maintenance regimen, as suboptimal patient compliance could compromise ideal results. Also awareness of overall health benefits may have influenced the positive outcome.

Tooth brushing habits was assessed for all the women at the 1st assessment. It was observed that majority of the women claimed that they brush once daily. There was no significant difference between groups. Oral skills of both groups were insufficient. At the3rd assessment, after instructions on oral hygiene were given and profession hygiene procedures applied, a significant difference was obtained in the result of the test and control groups. Eighty two percent of women in the test group indicated that they brush twice a day and 54% in the control group. This showed positive change in the attitude and behavior of the women. This was similar to the other studies[17, 30].

A limitation of this study is related to the small sample size. This is because many of the pregnant women do not come to the clinic in their 1st trimester, they report in the 2nd and 3rd trimesters; 120 patients were initially assessed as eligible, 20 refused to participate and 20 were at the third trimester, when periodontal treatment could not be performed. The main reasons for refusal or exclusion were: getting back to work, fear of being treated during pregnancy or missing scheduled visits. Other large samples population researches have suggested that periodontal treatment resulted in improvement or stabilization of periodontal conditions[17, 29, 30].

Conclusion

An intensive regimen of repeated and systematic individualized oral hygiene instructions was able to statistically significantly reduce all clinical signs of periodontal and gingival inflammation in pregnant women. Pregnancy may allow a unique opportunity for motivation to change oral hygiene behaviors with an intense, individualized education.

Therefore intense, individualized routine periodontal treatment (scaling and root planning plus oral hygiene instruction) should be encouraged in women with periodontal disease that are pregnant or planning to become pregnant.

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