Research Article

Comparative Study of Oral Health and Microbial Flora in Pregnant and Non-Pregnant Women in Ibadan, Nigeria

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ABSTRACT

Many factors have been documented in literature to affect the oral health of pregnant women. The most prevalent of which is gingivitis; an inflammatory lesion of the gum which commonly occurs in the second trimester of pregnancy. Good oral hygiene has however been shown to reduce its prevalence especially during pregnancy. In this cross-sectional comparative study, among 26 pregnant women and 32 non-pregnant age- matched controls, the oral microbial flora was determined and compared in both the cases and the controls. It was found that *Staphylococcus aureus*, *Streptococcus viridans* and Coagulase negative Stphylococcus were the most common organisms in both groups. Neisseria catarrhalis was more commonly found in the pregnant women (30.8%) than in the non-pregnant women (9.4%) while Escherichia coli was more commonly found in non-pregnant women (28.1%) than pregnant women. There were more cases of severe gingivitis in pregnant women who clean their teeth more than once daily (33.3%) as opposed to none in non-pregnant women who clean their teeth more than once a day. It is therefore expected that if pregnant women are educated about oral hygiene practices to attain optimal oral health, inflammatory lesions and other dental diseases attributable to pregnancy could be prevented.

Keywords: *oral microbial isolates, pregnancy, oral hygiene*

INTRODUCTION

Oral health is an integral component of general health and well-being of an individual, and knowledge about the link between disturbance of the oral microflora and systemic health is growing rapidly. (Cullinan *et al*., 2009). Several factors have been documented in literature to affect the oral health including pregnancy (Boggess *et al*., 2006). The numerous physical and physiological changes that occur during pregnancy affect the important body systems and they cause localized physical changes in many parts of the body which may include alteration in the microflora (Gajendra *et al*., 2004; Suresh *et al*., 2004).

The greatest effect of pregnancy in the oral cavity documented in literature is the inflammatory lesions of the gums, that is gingivitis which occur commonly in the second trimester of pregnancy, with an estimated prevalence of about 60-75%. (American Dental Association., 2006). Approximately half of the women with pre-existing gingivitis have notable exacerbation during pregnancy (Hey-Hadaui.; 2002). Dental plaque, a soft creamy film adherent to the teeth which houses about 300-500 bacterial species is often the cause of gingivitis in the pregnant and non-pregnant state. Increase in oestrogen and progesterone during pregnancy especially in the presence of plaque have been implicated in the pathophysiology of gingivitis during pregnancy. (Ifesanya *et al*.; 2010). Other common oral diseases seen in pregnancy include periodontitis, pregnancy epulis and caries. (Pirie *et al*.;2007). The major oral microbial flora implicated in pregnancy are majorly anaerobic gram-negative bacteria and they include Prevotella intermedia, Porphyromonas gingivalis, Treponema denticola, and Actinobacillus actinomycetemcomitans (Kinane.; 2001).

Good oral hygiene has been shown to reduce the prevalence of oral diseases especially during pregnancy (Laine *et al*.; 2002). On the other hand, most of these diseases occur or are exacerbated as a result of poor oral hygiene complicated by hormonal changes and diminished immune response (Gursoy *et al*.; 2008). Poor oral hygiene resulting in accumulation of dental plaque can be controlled by brushing, flossing, scaling, polishing and root planning. These all help to achieve good dental health in pregnancy. (Van Der Weijden *et al*.; 2011).

It is therefore foreseeable that if women know about oral hygiene and what to do to attain optimal oral care, inflammatory lesions and other dental diseases attributable to pregnancy could be prevented. Unfortunately, talk about and demonstration of oral hygiene practices, dental education and routine oral health check-ups are currently not integrated into ante-natal care practices in Nigeria. Also, data on the level of understanding of women about oral hygiene and related practices among pregnant Nigerian women are scarce in literature. This study, therefore, aims to describe the oral health status oral microbial flora and oral health practices in pregnant and non-pregnant women among those attending clinics at the University College hospital, Ibadan, Nigeria.

MATERIALS AND METHODS

Study design: This was a hospital-based comparative cross-sectional study involving selection of pregnant and non-pregnant women among those attending ante-natal clinic and infertility clinics, respectively at the Obstetrics and Gynaecology of University College Hospital (UCH), Ibadan, Nigeria.

Study site and study area: University College Hospital (UCH), Ibadan is a foremost tertiary health institution located in Ibadan and receives referrals from south and western states of Nigeria and beyond. The UCH is a tertiary level health facility serving the people of Ibadan city, the neighbouring towns and village in the south west of Nigeria. The study site was the Obstetrics and Gynaecology Clinic University College Hospital, Ibadan. These clinics open daily with patients given scheduled appointment to see specialist consultants. On the average, approximately 50-80 women consult specialists in the two clinics daily.

Sample size: Twenty-six pregnant women in their second trimester and 32 age matched non-pregnant women that were eligible were recruited for this study.

Sampling technique: A convenience sample of eligible women was selected using a non-probability sampling technique. Pregnant women at gestational age between 20-28 weeks and non-pregnant women with similar age distribution were considered eligible. However, women who had clinical and/or laboratory evidence of hypertension, diabetes, sickle cell disorder and immuno-compromised disease were excluded from the study. Participation in the study was voluntary and based on provision of individual informed consent.

Data collection procedure: An interviewer-administered questionnaire, designed by the investigators, was used to obtain information on oral hygiene practices, experiences during index pregnancy, outcome of previous pregnancies and oral hygiene status.

Laboratory procedure: An oral swab was taken using a sterile swab which was ran along the buccal sulcus, and this was inoculated immediately into Thioglycollate broth (MV010) in a sterile pack which was taken to the microbiology laboratory without delay. The organisms were inoculated and incubated anaerobically at 37ºc for 2 days using Blood and Chocolate agar. Upon isolation of organisms, gram staining was carried out which split the isolates into gram-negative and positive bacteria. The complete identification and speciation of all the gram-negative isolates were done using the Analytical Profile Index (API) 20E® and API 20NE® (API® bioMérieux Clinical Diagnostics Kits, USA) identification system in accordance with the standard procedures for bacteria classification. The API® is a miniaturized identification system that contains dehydrated sugars that gives a characteristic color change upon addition and incubation of substrates. Miniaturized reagents are also incorporated in the system. API 20E® identified members of the *Enterobacteriaceae* while API 20NE® identified the non-fermenters and biochemically inert gram-negative rods. Gram-positive cocci were identified biochemically using the catalase test and coagulase test; Pastorex for the isolation of the Staphylococcus species. The results of the swab microbiology were entered into the data form.

Data analysis: Data obtained was analyzed using the statistical package for social science version 22.0 (SPSS, Inc., IL, USA). The frequency distribution and cross tabulations was generated and descriptive statistics such as frequency count, percentages, mean and standard deviation will be used for demographic statistics.

Ethical considerations: Ethical approval was obtained from the University of Ibadan/University College Hospital (UI/UCH) Health Research Ethics Committee. Verbal and informed consent was obtained from the participants in this study. All participants have voluntarily participated in the study and have the right to withdraw from it at any time, without affecting their standard of care.

Data collected/extracted from the study was treated with utmost confidentiality. The name of the patient was not used at any point of the study, but instead designated numbers were used for data collection. All data were kept in a safe place
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RESULTS

There were 58 respondents of whom 26 were pregnant women in the second trimester who were age- matched with a control group of non- pregnant women. Their mean age was 34 years and the age range were 21-30 years; the distribution is as shown in table 1.

Oral swabs were taken for both groups and organism isolated and cultured show that *Escherichia coli,* a pathogenic organism, was the commoner (28.1%) as opposed to 3.8% in the non- pregnant group while *Neisseria Catarrhalis* was commoner in the pregnant group, 9.4% and 30.8% respectively (Table 2).

Oral hygiene habits of both groups were recorded in table 3 and table 4 which showed that those who brushed their teeth once daily and those who only used toothbrush and tooth paste to clean their mouths had poorer oral hygiene than those who used mouthwashes as well as toothbrush and tooth paste or other forms of oral hygiene practices such as flossing and chewing stick.

Table 1:
Distribution of respondent's socio-demographic characteristics (N=58)

Characteristics	Frequency (n)	Percentage (%)	Pregnant (n)	Percentage (%)	Non-pregnant (n)	Percentage (%)
Age						
21-30	27	46.6	14	51.9	13	48.1
31-40	27	46.6	10	37.1	17	63.0
40 and above	4	6.9	2	50.0	2	50.0
Tribe						
Yoruba	46	79.3	22	47.8	24	52.2
Hausa	1	1.7	0	0.0	1	100.0
Igbo	7	12.1	2	28.6	5	71.4
Others	4	6.9	2	50.0	2	50.0
Marital Status						
Single	4	6.9	1	25.0	3	75.0
Married	50	86.2	25	50.0	25	50.0
Divorced	3	5.2	0	0.0	3	100.0
Widowed	1	1.7	0	0.0	1	100.0
Occupation						
Civil Servant	9	15.5	3	33.3	6	66.7
Self-employed/Trader	19	32.8	7	36.8	12	63.2
Professional	9	15.5	5	53.6	4	44.4
Unemployed	7	12.1	2	28.6	5	71.4
Hospital worker	7	12.1	5	71.4	2	28.6
Teacher/Lecturer	7	12.1	4	57.1	3	42.9

Table 2:
Distribution of Microorganisms in pregnant and non-pregnant women

	Pregnant Women (%)	Non-pregnant controls (%)
Microorganism found		
Staphylococcus aureus	12(46.2%)	12(37.5%)
Neisseria catarrhalis	8(30.8%)	3(9.4%)
Coagulasenegative Staphylococcus	7 (26.9%)	7(21.9%)
Bacteroides diastasonic	5(19.2%)	5(15.6%)
Streptococcus viridans	4(15.4%)	4(12.5%)
Staph sacrolytic	4(15.4%)	2(6.3%)
Veilonella pervula	2(7.7%)	4(12.5%)
Propionibacterium propionicum	2(7.7%)	2(6.3%)
Klebsiella pneumonia	2(7.7%)	2(6.3%)
Escherichia coli	1(3.8%)	9(28.1%)
Prevotella melaninogenicus	1(3.8%)	2(6.3%)
Others	1(3.8%)	10(31.4%)

The pregnant group exhibited relatively better oral hygiene and less gingivitis than the control group. Though there was a case of severe gingivitis among the pregnant group that used tooth brush and paste more than once daily.

Educational level of the participants is shown in table 5 in which gingivitis (moderate form) was most common among the self-employed and traders in 63.2%. It was also the most common form of the disease recorded in the participants.

Table 3:
Oral hygiene practice compared with grade of gingivitis

	Grade of Gingivitis		
	Mild (%)	Moderate (%)	Severe (%)
Cleans teeth once a day			
Pregnant	8 (61.5%)	6 (60.0%)	2 (66.7%)
Non-pregnant	8 (57.1%)	9 (75.0%)	4 (100.0%)
Cleans teeth more than once daily			
Pregnant	5 (38.5%)	4 (40%)	1 (33.3%)
Non-pregnant	11 (40.7%)	7 (31.8%)	0 (0%)

Table 4:
Oral hygiene agent compared with grade of gingivitis

	Grade of Gingivitis		
	Mild (%)	Moderate (%)	Severe (%)
Cleans teeth with toothbrush and paste only	18(41.9%)	19 (44.2%)	6 (14.0%)
Cleans teeth with toothbrush and paste+ mouthwash	4 (66.6%)	1 (16.6%)	1 (16.6%)
Cleans teeth with toothbrush and paste + dental floss	3(37.5%)	1 (12.5%)	4 (50.0%)
Cleans teeth with toothbrush and paste + and chewing stick	0 (0%)	1 (100.0%)	0 (0%)

Table 5:
Occupation/ Level of Education compared with grade of gingivitis

	Grade of Gingivitis		
	Mild (%)	Moderate (%)	Severe (%)
Civil Servant	4 (44.4%)	3(33.3%)	2 (22.2%)
Self-employed/Trader	6 (31.6%)	12 (63.2%)	1 (5.3%)
Professional	8 (88.9%)	1 (11.1%)	0 (0.0%)
Unemployed	3 (50.0%)	2(33.3%)	1 (16.7%)
Hospital worker	4(57.1%)	1 (14.3%)	2 (28.6%)
Teacher/Lecturer	2 (33.3%)	3 (50.0%)	1 (16.7%)

DISCUSSION

A total of 58 women participated in the study. 63% were within the age group 31 to 40 years of age.

This pilot study demonstrated that *Staphylococcus aureus*, *Streptococcus viridans*, Coagulase negative Staphylococcus were the most common organisms found in both groups (Pregnant and non-pregnant women). *Neisseria catarrhalis* was more commonly found in pregnant women (30.8%) than non-pregnant women (9.4%), while *Eschericha coli* was more commonly found in non-pregnant women(28.1%) than pregnant women (3.8%). Non-pregnant women also had a higher percentage (31.4%) of other varying organisms such as Peptostreptococcus, Propionibacterium acnes, Streptococcus mitis, and Streptococcus australis.

A previous study published in 2015 by Okoje-Adesomoju *et al* carried out among rural women in Ibadan showed the presence in the second trimester of high Klebsiella spp (26.7%) and E.coli (28.4%) but level of *Staphylococcus aureus* (24.0%) and *Streptococcus viridans* (42.8%) which was high and significant. These organisms were also relatively high in the present study. However, Staphylococcus aureus was almost double the percentage finding in the rural setting while Streptococcus viridans, a normal oral commensal was lower in the urban population. (Okoje-Adesomoju *et al*, 2014)

The percentages of respondents who had gingivitis were about the same in both pregnant and non-pregnant states. However, there was a significant difference in the percentage of non-pregnant women who clean their teeth once a day (100.0%) and those that clean their teeth more than once daily (0%) as there was no case of severe gingivitis found among them; compared to pregnant women who still had a case of severe gingivitis among those who clean their teeth more than once daily (33.3%). This supports studies that have shown that the prevalence of gingivitis is higher in pregnancy. (Barak *et al*.; 2003).

The percentages of respondents who clean their teeth with toothbrush and paste + mouthwash had the least number with severe gingivitis (16.6%) while patients who clean their teeth with toothbrush and paste+ dental floss (50.0%) had the highest percentage of respondents with severe gingivitis. This is similar to a study done by N. Sharma *et al* in 2004 to test the adjunctive benefit of an essential oil- containing mouth rinse in reducing plaque and gingivitis in patients who brush and floss regularly which confirmed that the adjunctive use of an essential oil containing mouth rinse provides a clinically significant and beneficial approach to reducing plaque and gingivitis. (Sharma *et al*.; 2004).

Professionals had the least percentage of patients presenting with severe gingivitis (0.0%) while respondents who were self-employed/traders had the highest percentage of patients presenting with moderate gingivitis (63.2%). This demonstrates that there is a direct relationship between educational status and oral hygiene. This is also true for a study done by Paulander *et al* in 2003 to evaluate the association between educational level and dental disease, treatment needs and oral hygiene habits in 35, 50, 65 and 75-year olds which showed that in all age groups, lower educational level had fewer intact tooth surfaces and a significantly poorer occlusal function. (Paulander *et al*.; 2003.

In conclusion, there is a significant difference between the oral microflora found in pregnant women and non-pregnant women. Cleaning the teeth more than once a day also helps to decrease the incidence of gingivitis and its severity. Toothbrush and paste when combined with the use of mouthwash has also proven to be more effective than other combinations. Educational status is contributory to oral hygiene status as lower educational level has a negative effect on oral hygiene status and vice-versa.

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