

Oral hygiene level and prevalence of gingivitis amongst pregnant women in a Nigerian Teaching Hospital



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Abstract

Objective: The aim of this study was to assess the prevalence of gingivitis among pregnant women attending ante-natal clinic in Aminu Kano Teaching Hospital (AKTH), Kano.

Material and Methods: This was a cross-sectional study involving pregnant women attending ante-natal clinic at AKTH. A convenience sampling technique was used to recruit consenting pregnant women who were continuously enrolled until the calculated sample size was reached. A structured, interviewer-administered questionnaire was used to obtain the socio-demographic and other relevant data. An

intraoral examination was performed by the researcher to assess their oral and gingival health status.

Results: A total of 350 respondents out of the 376 approached participated in the study giving a response rate of 93.1%. A prevalence rate of gingivitis recorded was 82.3%.

Conclusion: Gingivitis is highly prevalent among the pregnant women studied with no significant association between oral hygiene aids used and oral hygiene status. However, there was significant association between oral hygiene status and gingival status.

Keywords: Gingivitis, Oral hygiene, Pregnant women, Prevalence

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Introduction

Pregnancy is a unique time in a woman's life and is associated with complex physiological changes.¹ Many of these changes often occur with normal pregnancy and can impact every organ system, affecting both structure and function. Some of these changes in maternal physiology are secondary to hormonal changes in pregnancy, while others occur as a protective mechanism to support the mother and the developing fetus. Some of these changes include, for example increased maternal fat and total body water, decreased plasma protein concentrations especially albumin, increased blood volume, cardiac output and blood flow to the kidneys and uteroplacental unit and fall in blood pressure.² Other physiologic changes include increased tidal volume, delayed gastric emptying and gastrointestinal motility and altered activity of hepatic drug metabolizing enzymes with possible attendant consequences such as toxicity of those drugs metabolized by the affected enzymes.³

There are also pathological changes that could occur in pregnancy. The most common pathologic changes that can complicate pregnancies include gestational hypertensive disorders (preeclampsia and eclampsia), deep vein thrombosis caused by pregnancy-induced hypercoagulability, anaemia, increased susceptibility to infections and gestational diabetes.⁴⁻⁶

A combination of these physiologic and pathological changes can lead to systemic and local changes in different regions of the body, including the oral cavity.⁶

The storm of hormones which is induced during pregnancy causes changes in the mother's body, and the oral cavity is no exception.⁷ Four oral diseases have been known to affect pregnant women to a greater degree than their non-pregnant counterparts: gingivitis, pregnancy granuloma, periodontitis, and dental caries.⁸

Gingivitis is the inflammation of the gingiva without destruction of the tooth supporting tissues.¹

Lathrop and Thomas also defined gingivitis as inflammation of the gingiva as a response to bacterial plaque on adjacent teeth; characterised by erythema, oedema and fibrous enlargement of the gingiva without resorption of the underlying alveolar bone.⁹

According to the currently acceptable classification of periodontal diseases, pregnancy gingivitis is a gingival disease induced by plaque and modified by systemic factors. Pregnancy gingivitis frequently affects the marginal gingiva and the interdental papilla and it is related to the pre-existing gingivitis.⁷

Pregnancy gingivitis occurs because gingivitis, which goes unnoticed, becomes noticeable during pregnancy as previously inflamed areas become

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enlarged and oedematous and more noticeably discolored with an increased tendency to bleed. This in turn occurs because systemic changes that occur during pregnancy can lead to an increase in the severity of gingivitis.¹ For example, most studies found a positive correlation between an increase in estradiol and progesterone and an overgrowth of *Prevotella Intermedia*.^{10,11}

Alterations in maternal immune-responsiveness expressed in terms of decrease in T8, T4 and B-cells in peripheral blood and gingival tissues as well as decreased neutrophil chemotaxis and depression of cell mediated immunity and phagocytosis in pregnancy have been reported.¹²

Also, the microbial composition of sub-gingival plaque changes during pregnancy. The ratio of gram-negative anaerobic bacteria to aerobic bacteria increases during the second trimester. These changes usually start around the third month of gestation and the severity of the inflammation gradually increases during pregnancy with partial or complete resolution after parturition.¹³

The best possible way to preventing or reducing the severity of the hormone mediated inflammatory oral changes is through adherence to good oral hygiene measures.⁷ Plaque can be controlled by maintaining good oral hygiene practices which is achieved by brushing at least twice daily using toothbrush or chewing stick with the appropriate techniques.¹⁴ In addition, regular visits to the dentist for routine professional cleaning of the mouth aid good oral hygiene. Also, of great importance is individuals' view of their oral health status as it has been shown to affect their oral health seeking behavior.¹⁵

An easily accessible source of health information that leads to knowledge of valuable habits and practices for pregnant women is Ante-Natal Clinics. Ante-natal clinics are run by most hospitals, Primary Health Care Centres and Comprehensive Health Care Centres.

This study was conducted to ascertain the pattern and prevalence of pregnancy gingivitis amongst a subgroup of pregnant women in AKTH, Kano State, as well as associated factors.

By establishing the prevalence of the condition, its importance can be demonstrated. Also, information on this important condition is scarce in Nigeria, more so in North-western Nigeria. Hence, the necessity of this study.

Material and Methods

This was a cross-sectional study conducted amongst consenting pregnant women attending Ante-Natal Clinics at the AKTH, Kano. The

minimum sample size was obtained using the Leslie Fischer's formula for estimating minimum sample size in health studies and it is 376 including the 10% possible attrition rate. Those who were excluded from the study include: Other women at the Ante-Natal Clinic who were not pregnant (including Nurses, Family, Friends and Well-wishers), as well as those that declined informed consent for participation. A convenience sampling technique was used to recruit consenting pregnant women. A structured, interviewer-administered questionnaire was used to obtain the socio-demographic and other relevant data, including their oral hygiene practices. Each woman also received an intraoral examination by the researcher with a mirror and periodontal probe, where their oral and gingival health status was assessed under natural light. Ethical approval was obtained from the AKTH ethical review committee before commencement of the study.

The Simplified Oral Hygiene Index of Greene and Vermillion (1964) was used to measure oral hygiene, while the Gingival Index of Loe and Silness (1963) was used as a measure of gingival health.

Gingival index Silness and Loè (GI) was used for gingival inflammation. The mesial, buccal, distal and lingual gingival units of index teeth were scored separately as shown below:

6	1	4
4	1	6

- The severity of the condition is indicated on a scale of 0 to 3:
- 0- Normal gingivae
- 1- Mild inflammation, slight change in colour, slight oedema, no bleeding on probing
- 2- Moderate inflammation, redness, oedema and glazing. Bleeding on probing
- 3- Severe inflammation, marked oedema, ulceration. Tendency to spontaneous bleeding

The sum of the points given for every separate tooth was divided by 4.

Calculation:

For Individuals

$$GI = \frac{\text{Total scores}}{\text{No of surfaces examined}}$$

For population

$$GI = \frac{\text{Total scores}}{\text{No of subjects examined}}$$

The evaluation of GI score:
 0.1–1.0 = mild gingivitis
 1.1–2.0 = moderate gingivitis
 2.1–3.0 = severe gingivitis

Simplified Oral Hygiene Index (OHI-S) Greene and Vermillion (1964) is a composite index of oral debris score and calculus score which assesses the oral debris and calculus accumulation.

The scores are on a graded scale of 0-3 using six surfaces of six index teeth.

6	1	6
6	1	6

The debris scores are assigned as follows:

- 0 - No debris or stain found.
- 1 - Soft debris or extrinsic stain covering not more than 1/3rd of the tooth surface.
- 2 - Soft debris or stain covering more than 1/3rd but not more than 2/3rd of the exposed tooth surface.
- 3 - Soft debris covering more than 2/3rd of the exposed tooth surface.

The calculus scores are assigned as follows:

- 0 - No Calculus present.
- 1 - Supragingival calculus covering not more than one third of the exposed tooth surface.
- 2 - Supragingival calculus covering more than one third but not more than two-third of the exposed tooth surface or the presence of individual flecks of subgingival calculus around the cervical portion of the tooth or both.
- 3 - Supragingival calculus covering more than two-third of the exposed tooth surface or a continuous heavy band of subgingival calculus around the cervical portion of tooth or both the sum of the points given for every separate tooth was divided by number of teeth.

The Simplified Calculus index (CI-S) + Simplified Debris index (DI-S) = Simplified Oral Hygiene index (OHI- S) score for the individual.

The evaluation of debris index and calculus index is given as follows:

- 0.0–0.6 = Good
- 0.7–1.8 = Fair
- 1.9–3.0 = Poor

While that of oral hygiene is given as follows:

- 0.0–1.2 = Good
- 1.3–3.0 = Fair
- 3.1–6.0 = Poor

The data obtained was analysed manually, using Minitab version 14. Categorical data was expressed in simple frequencies and percentages while quantitative data was expressed using measures of central tendency (mean, median, mode, and standard deviation) and presented in the form of tables using Microsoft word and Microsoft excel.

A Chi-square test was used to determine significant differences between two independent variables and a p-value of less than 0.05 was considered significant.

Results

A total of 350 respondents out of the 376 approached consented to participate in the study giving an overall response rate of 93.1%. Some respondents declined consent because they saw no personal benefits to be gained. Others begged off as they were tired.

Age range of respondents was from 17 to 44 years with a mean age of 28.01 ± 5.83 . One hundred and ninety-eight (56.6%) were Hausa, 290 (82.9%) of the respondents were Muslims and 338 (96.6%) of the women were married. [Table 1](#).

Gravidity ranged from 1 to 15 with majority 77.7% (n = 272) of the respondents carrying their 1st to 4th pregnancies. 78 respondents have been pregnant at least five times.

The gestational age of respondents also ranged from 4 weeks to 39 weeks. More than half, 58.3% (n = 204) were in the 3rd trimester.

Two hundred and eighty-seven (80.9%) of the respondents reported no gum related condition. [Table 2](#).

Majority of the respondents (n = 327) clean their mouth with toothbrush and paste, while 11 and 23 use mouthwash and floss as adjuncts respectively. Only a handful of them use local methods of mouth cleaning as 51, 5 and 1 respondents use chewing stick, charcoal and baking soda respectively. [Table 3](#).

Out of the 327 (93.4%) respondents that use toothpaste and brush to clean their mouth, majority, 69.4% (n = 227) brush twice a day while 19% and 11.6% brushes one and more than twice daily respectively. [Figure 1](#).

Only 6.8% (n = 23) of the respondents use floss for their teeth. Majority of this (69.6%, n = 16) use it once daily. [Figure 2](#).

Out of the 350 respondents, 82.3% (n = 288) had gingivitis, making the prevalence of gingivitis to be 82.3%. Gingival index score of the population was calculated as 0.6. Mean gingival score of respondents was 0.56 ± 0.03 . Among these, majority 91.0%.

Table 1 Sociodemographic Variables

	Frequency	Percentage (%)
Age		
<20	13	3.7
20-29	206	58.8
30-39	115	32.9
>40	16	4.6
Ethnicity		
Hausa	198	56.6
Fulani	54	15.4
Igbo	26	7.4
Yoruba	18	5.2
Others	54	15.4
Religion		
Islam	290	82.9
Christianity	60	17.1
Marital status		
Single	1	0.3
Married	338	96.6
Divorced	7	2.0
Widowed	3	0.8
Separated	1	0.3
Educational status		
None	1	0.3
Qur'an only	18	5.1
Primary	20	5.7
Secondary	122	34.9
Tertiary	189	54.0
Occupation		
Unemployed	44	12.6
Full housewife	117	33.4
Business	95	27.1
Civil servant	59	16.9
Others	35	10.0
Husband's occupation		
Unemployed	5	1.4
Business	125	35.7
Civil servant	193	55.1
Others	27	7.8

(n = 262) had mild gingivitis while 6.3% (n = 18) and 2.7% (n = 8) had moderate and severe gingivitis respectively. [Table 4](#).

Mean debris and calculus indices were 0.57 ± 0.13 and 0.25 ± 0.19 respectively. The mean oral hygiene index was 0.81 ± 0.11 . Majority of the study participants (87.4%, n = 306) had good oral hygiene, 9.2%

Table 2 Pregnancy related factors

	Frequency	Percentage (%)
Gravidity		
1-4		77.7
5-8	67	19.1
>9	11	3.2
Gestational age		
1 st trimester	26	7.4
2 nd trimester	120	34.3
3 rd trimester	204	58.3
Experienced any gum condition?		
Yes	67	19.1
No	283	80.9

(n = 32) had fair oral hygiene and 3.4% (n = 12) had poor oral hygiene. [Table 5](#).

There was no statistically significant association between the oral hygiene aids used by the respondents, and their gingival scores with a p-value of 0.220. [Table 6](#).

Also, there was also no statistically significant association between the frequency of brushing and oral hygiene status (p-value = 0.838). [Table 7](#).

The brushing frequency of the study participants is not statistically significant in relation to the gingival score (p-value = 0.336). However, there was a statistically significant association between oral hygiene status and gingival condition of the respondents (p-value = 0.00). [Table 8](#) and [table 9](#).

Discussion

This study was carried out among pregnant women attending ante-natal clinic, AKTH to assess the prevalence of gingivitis. The age distribution showed that

58.8% of the respondents were between the ages of 20 to 29 years with a mean age of 28.01 years. This is similar to the results obtained by Ifesanya.¹⁵ where most of the respondents (68.4%) were between 21 to 30 years with a mean of 25.35 years.¹⁵

Majority of the respondents were Muslims (82.9%) and over a half (56.6%) of them were Hausa. The ethnic and religious distribution in this study area reflects a typical composition of the metropolitan area of the state.

Majority of the respondents have had some form of education, most having either secondary (34.9%) or tertiary education (54%). While 5.1% and 5.7% had Qur'anic and primary education respectively.

Table 3 Oral hygiene aids used by the respondents

Cleaning method	Frequency	Percentage
Western method		
Toothpaste only	0	0
Toothbrush only	0	0
Toothbrush & paste	327	93.4
Adjuncts		
Floss	23	6.6
Mouthwash	11	3.1
Local methods		
Chewing stick	51	14.6
Charcoal	5	1.4
Baking soda	1	0.3

Table 4 Gingival status using gi (loe and silness)

Gingivitis	Frequency (N = 288)	Percentage (%)
Severity		
Mild	262	91.0
Moderate	18	6.3
Severe	8	2.7

Table 5 Oral hygiene status of respondents

Grade	Frequency	Percentage
Simplified debris index		
Good	231	66.0
Fair	109	31.1
Poor	10	2.9
Simplified calculus index		
Good	311	88.9
Fair	34	9.7
Poor	5	1.4
Simplified oral hygiene index		
Good	306	87.4
Fair	32	9.2
Poor	12	3.4

Table 6 Association between oral hygiene aids used with oral hygiene status

	OHI-S SCORE			Total
	Good	Fair	Poor	
Brush & paste	160	136	32	328
Others	7	11	4	22
	167	147	36	350

$\chi^2 = 3.024$, DF = 2, P-Value = 0.220

Table 7 Association between frequency of brushing with oral hygiene status

	OHI-S			Total
	Good	Fair	Poor	
Once	29	25	8	62
Twice	122	105	23	250
	16	17	5	38
Total	167	147	36	350

$\chi^2 = 1.437$, DF = 4, P-Value = 0.838

Table 8 Association between brushing frequency with gingival score

		GI SCORE			Total
		Mild	Moderate	Severe	
Brushing Frequency	Once	26	28	8	62
	Twice	126	109	15	250
	> Twice	16	19	3	38
		168	156	26	350

$\chi^2 = 4.559$, DF = 4, P-Value = 0.336

Table 9 Association between oral hygiene score with gingival scores

	GINGIVAL SCORE			Total
	Mild	Moderate	Severe	
Good	116	50	1	167
Fair	52		8	147
Poor	0		17	36
Total	168	156	18	350

$\chi^2 = 141.801$, DF = 4, P-Value = 0.00

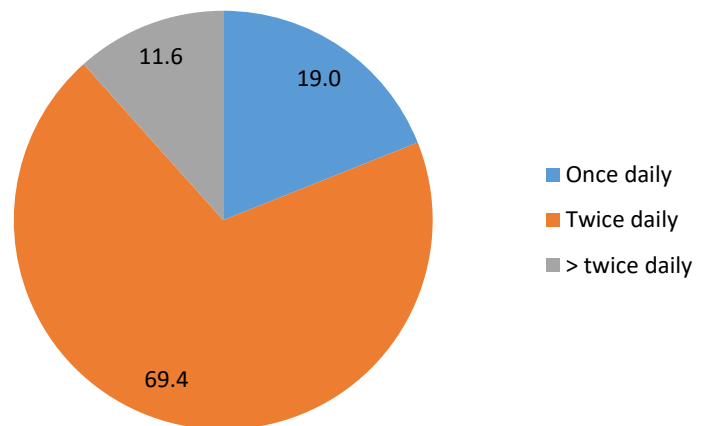


Figure 1 Respondents' frequency of toothbrushing

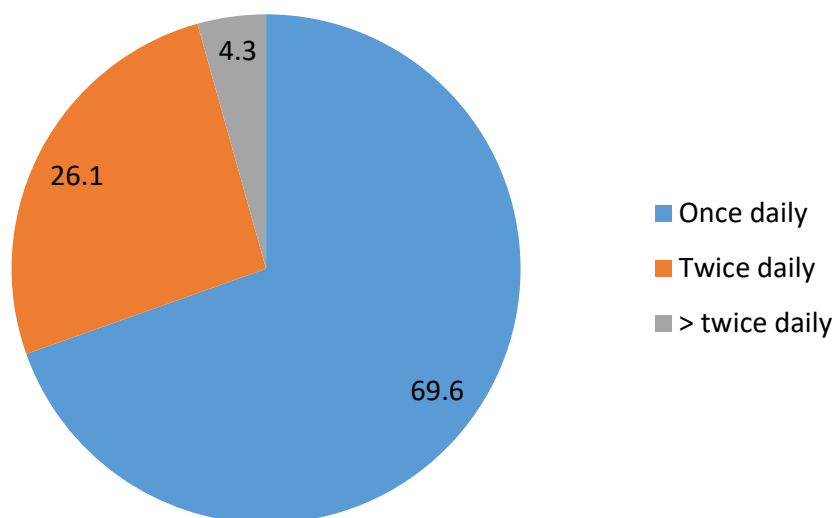


Figure 2 Respondents' frequency of flossing

were civil servants and 12.6% had no employment. The remaining 10% were students, tailors, caterers etc. This is in contrast to findings in a similar study by Ifesanya et al.¹⁵ where most of the respondents had only secondary (59.8%) and primary (36%) education respectively with only a few having tertiary education (1.7%).

Most of the respondents were married (96.6%) with the remaining (3.4%) being unmarried (single, widowed, divorced or separated). This is also in consistent to findings by Ifesanya et al.¹⁵ where 392(96.8%) were married and 13(3.2%) were single.

Gravidity of the respondents ranged from 1 to 15 with a majority (77.7%, $n = 272$) of the respondents carrying their 1st-4th pregnancies. This is also similar to findings by Ifesanya¹⁵ where 63.5% of women were carrying their 2nd-4th pregnancies. Seventy-eight (22.29%) respondents have been pregnant at least five times. The gestational age of respondents also ranged from 4 weeks to 39 weeks with a mean of 26.49 ± 8.03 . More than half, (58.3%, $n = 204$) were in the 3rd trimester.

Only 19.1% ($n = 67$) of the respondents reported gum related condition in the current pregnancy, while 80.9% ($n = 287$) reported no gum related condition. This is in contrast to findings by Ifesanya et al.¹⁵ where 140 (34.6%) women reported gingival conditions in their pregnancy. These were in the form of swelling, bleeding or pain from their gums.

Sixty-two women (18.9%) brushed their teeth once daily, 250 (69.4%) brushed twice, while 38 (11.6%) brushed more than twice. The most commonly used brushing aids used was the toothbrush and toothpaste reported by 327 (93.4%), while 51 (14.6%) of the women used chewing stick, 5 (1.4%) of the women used charcoal, and 1 (0.3%) cleaned her mouth with baking soda. Only 23 (6.6%) and 11 (3.1%) of the women used adjuncts

such as floss and mouthwash respectively. This is similar to a study conducted by Ifesanya et al.¹⁵ in South- Western Nigeria where most of the women 361 (89.1%) used toothbrush and toothpaste, 43(10.6%) of the women used chewing stick while 1 (0.2%) cleaned her mouth with cotton-wool and salt. In this study, more than half (66.2%, $n = 267$) of the women brushed their teeth once daily, while about a third brushed twice.

A combination of physiologic and pathological changes can lead to systemic and local changes in different regions of the body, including the oral cavity during pregnancy. These changes can increase susceptibility to gingival diseases and dental caries.³

Pregnancy has been associated with a high prevalence of gingivitis. This observation is corroborated by this study in which a prevalence of 82.3% was found, a value comparable to 86.2% reported in Thailand by Rakchnok et al.⁸

Some other authors such as Chanduaykit et al,¹⁶ Ababneh et al,¹⁷ and Ifesanya et al.¹⁵ made similar observations, reporting a prevalence of 86.2%, 97% and 100%, respectively. This high prevalence of pregnancy gingivitis has been ascribed to the altered immune response to stress and anxiety as well as hormonal imbalances known to be associated with pregnancy.¹³ The altered host physiology tends to accentuate normal inflammatory reaction to plaque accumulation, leading to rapid deterioration of the oral condition. However, the degree of severity of pregnancy-related gingivitis appears to be largely determined by the individual's oral hygiene rather than the mere existence of pregnancy.⁷ This fact may account for the observation of mild gingivitis in a large majority — about 74% of the participants in this study, compared to a similar study conducted at the obstetrics clinic of King Hussein Medical Center in Jordan where about 74% (268) of 360 pregnant women studied had moderate to severe grades of gingivitis. This is due to the fact that most of them had moderate to heavy grades of supra-gingival plaque accumulation.¹⁸ This studied population however presented better oral hygiene. Only about 10% of the participants in this study expressed moderate to severe gingivitis.

There was no statistically significant association between the oral hygiene aids used and the oral hygiene status of the respondents ($P = 0.22$). There was also no significant relation between the brushing frequency and the oral hygiene status ($P = 0.84$) and gingival condition ($P = 0.34$) of the pregnant women. This is similar to findings by Ifesanya et al.¹⁵ where the severity of gingivitis neither vary significantly with the types of tooth brushing used ($P = 0.83$) nor did it vary with the frequency of tooth brushing ($P = 0.15$).

Pearson Chi-Square test on individual gingival and oral hygiene scores showed statistically significant variation between oral hygiene and gingivitis ($P = 0.00$). This is similar to observations made by authors such as Ifesanya et al.¹⁵ Mital et al.¹⁸ as well as Elrishi et al.³

Conclusion

The prevalence of gingivitis among the pregnant women is high possibly due to lack of awareness creation during ante-natal care about oral hygiene measures to be taken by the pregnant women. The oral hygiene score has direct influence on the gingival condition, as the oral hygiene score increased, the gingival condition worsened.

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Conflict of Interest

The authors report no conflict of interest.

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