

Prevalence of Gingivitis in Second Trimester of Pregnancy

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Abstract

Background: There is rare documentation on the prevalence of gingivitis in pregnancy in the least developed countries. The aim of the study is to evaluate the prevalence of gingivitis in the second trimester of pregnancy and assess its relationship with age, parity, education, occupation, gravidity, oral hygiene habit and frequency of brushing.

Methods: An observational descriptive study was conducted among 384 pregnant females in their second trimester in Kathmandu, Nepal. Demographic variables and general information including those related to oral hygiene practices and habits were collected during an interview. Plaque index and Gingival Index was recorded among the patients through full mouth examination at four sites.

Results: The prevalence of gingivitis in the second trimester of pregnancy was 76.3%. Statistically significant relationship was found between gingivitis and gravida and parity. A relation could not be established between gingivitis with age, education, occupation, oral hygiene habit and frequency of brushing.

Conclusions: The prevalence of gingivitis is found to be high in Nepalese pregnant women. Special strategies should be introduced targetting the pregnant women of least developed countries to uplift their periodontal health.

Background

Gingivitis is defined as the “Inflammation of the gingiva”.¹ Gingivitis is essentially a prudent attempt of the human body to wall-off the destructive aspects of the immunologically mediated mechanisms in response to the presence of a biofilm, which enhances the body to cease such perturbing consequences.

Epidemiological studies extrapolate a three dimensional spatial and temporal relation of the existing diseases and provide a framework to construct a prospective data-driven future-oriented plan. Prevalence studies, time and again, has proven itself as a fundamental weapon to translate research science into applied science. The prevalence reflects the burden of a population in terms of life expectancy, morbidity, quality of life and monetary cost.² These studies continue to propagate dynamics in the field of research, which play a pivotal role in the synchronization among the constant shifts in epidemiology, marked in different eras.

Mediocre documentation of the prevalence of gingivitis in comparison to periodontitis, advocates the need to address the issue. The charm of the study regarding prevalence of gingivitis lies in the eminence of its reversibility.³ A stern action should be incorporated in the treatment plan to halt the progression of gingivitis into periodontitis. In regard of this context, prevalence study of gingivitis should be emphasized as it directs a foundation for the abrupt successive action and compels the evaluator to surrender to

foster multifaceted attention for the implicated disease. Additionally, gingival color, gingival bleeding are indubitably more tangible parameters than periodontal pockets.

The study on pregnant females is, moreover, intriguing by the intensity and complexity of the condition of the woman. The physiological changes in the pregnant female is specifically governed by the fluctuations in the level of progesterone and oestrogen. Such effect, in presence of biofilm, is also apparently visible in the gingiva leading to gingivitis.⁴ The spectrum of the etiology of gingivitis in pregnancy also includes an altered immune response, altered subgingival flora and relation with stress and anxiety during pregnancy, resulting in inadequate attention to oral hygiene and contributing to the deterioration in a woman's oral condition.⁵

Possibility of relationships between periodontitis and pregnancy complications such as premature birth (<37 weeks of gestation), low infant birth weight (<2,500 gm) and pre-eclampsia have been suggested in the periodontal archives.⁶ The gravity and magnitude of the study can be further deciphered by the profound statement made by Lopez in 2002 "Pregnancy-associated gingivitis is a preventable and easy to treat disease, and any cost-benefit analysis of the administration of periodontal therapy to pregnant women in order to reduce preterm birth rates would show a high direct cost-benefit saving. However, the real cost saving of reduction in the rate of preterm birth due to periodontal treatment is best represented by the lives of children saved from premature death and biological, social, and economic impairment."⁷

Most studies have reported that gingival inflammation peaks from the second to the eighth month.⁸ The second trimester is traditionally considered more comfortable, because nausea and postural issues are not excessive.⁹ The Obstetric Periodontal Study has also demonstrated that dental treatment is safe when delivered during the second trimester.¹⁰ The risk of pregnancy loss is lower compared to that in first trimester and organogenesis is completed.¹¹ The pregnant uterus is below the umbilicus until 20 weeks gestation and the woman is generally more comfortable than she will be as the pregnancy progresses.¹²

In the third trimester, the uterus can press on the inferior vena cava and pelvic veins, which impedes venous return to the heart. This decrease in venous return can cause a decrease in the amount of oxygen delivered to the brain and uterus.¹³ Postural hypotensive syndrome is a clinical concern and is seen in 15% to 20% of pregnant women when supine.¹⁴ Women who are supine may have nausea or vomiting.

The prevalence of gingivitis in pregnant women has reportedly ranged from 30% to 100%.^{8,15,16} Researches have revealed the percentage of pregnant women with gingivitis to be 89% in Ghana, 86.2% in Thailand, 97.3% in Brazil and over 66.8% in India.¹⁷⁻²⁰ Studies from the Health Care Centers showed the prevalence of gingivitis in pregnant women as 98.0% in Bangkok, 86.3% in Nakornsawan and 98.8% in Yala.¹⁹

A systematic review done by Figuero et al. revealed non-pregnant women had lower mean gingival index (GI) values than women in their second or third term of pregnancy and a significantly lower GI in pregnant

women in the first term compared with those in their second or third term of pregnancy.²¹

In context of Nepal, the prevalence was found to be 40% in a study done in Sarlahi district, in which the examination had been performed by community-based oral health workers.²² Nepal has been placed in the 15 percent of countries in the world where periodontal conditions of the population are amongst the worst.²³

Regular home care by the patient is very effective in controlling most inflammatory periodontal diseases.²⁴ However, in low socio-economic countries like Nepal, even basic oral hygiene practice becomes difficult because affordability²⁵ and accessibility²⁶ of oral hygiene aids is an issue. More irking is the fact that pregnant women tend to look for other alternatives in case of any oral disease. This includes pharmacy-prescribed allopathic medicine, self-application of clove oil and even *jhar fuk*, a traditional approach where a healer performs a spell to chase “worms” (germs) out of the teeth.²⁶

Attempts have been made to establish a relationship between gingivitis with age, gravida, parity, education and occupation. Increasing severity of gingivitis may be because of the untreated cumulative effect of the disease process over a period of time which is also applicable in terms of age, gravida and parity.^{5,27} Multiparity increases the odd’s ratio of developing pregnancy by 2.47.²⁸ The hierarchized analysis of the periodontal risk factors in the pregnant population shows a lower degree of schooling to be the most significant factor followed by low income, single marital status, obesity prior to pregnancy, multiple births, smoking, and poor oral hygiene.²⁹ Unemployment is likewise associated with increased gingival inflammation scores, plaque scores, periodontal pocket depths and periodontal attachment levels.³⁰

To our knowledge, there is paucity of data in the Nepalese population on the prevalence of gingivitis in the second trimester of pregnancy. The purpose of the present study was to evaluate the prevalence of gingivitis in a sample of pregnant Nepalese women in their second trimester assessed with Gingival Index based on full-mouth observation at four sites. It also aimed to reveal the relationship between gingivitis and a series of demographic variables. The study aims to trigger clinicians to offer their undivided attention to the pregnant patient to detect the disease at its initial stage.

Methods

The observational descriptive study was carried out among 384 pregnant women in their second trimester attending the Antenatal Clinic (ANC) of the Paropakar Maternity and Women’s Hospital, Kathmandu, Nepal between December 2017 to April 2018. Written informed consent was obtained from all selected participants. This study was approved by the Institutional Review Board of National Academy of Medical Sciences, Kathmandu, Nepal and was conducted in accordance with the Helsinki Declaration of 1975, as revised in 2013.

The inclusion criteria were: (1) Pregnant women from age group 15-45 years in their second trimester (2) Patient attending ANC of Paropakar Maternity and Women's Hospital who want to voluntarily participate in the study (3) Dentate patients with at least 16 permanent teeth.

The exclusion criteria were patients with any systemic illness that can influence gingivitis like diabetes mellitus, patient taking antibiotics since 3 months, patients taking drugs which may alter the findings such as antiplatelet drugs, antihypertensives, immunosuppressants, third molars, periodontal pocket >3mm, smokers or tobacco users in any form, individuals not able to carry out effective toothbrushing and patients with any orthodontic appliances.

Demographic variables and general information including those related to oral hygiene practices and habits were collected during the interview. Oral examination was performed in a well-lit ANC with participants seated on a chair by a single examiner. Plaque index (PI) by Silness and Loe(1964)³¹ and Gingival Index by Loe and Silness (1963)⁸ was recorded among the patients. Full mouth examination using four different gingival areas of tooth- distofacial papilla, facial margin, mesiofacial papilla and entire lingual margin was performed, using a mouth mirror and periodontal probe, to record the Gingival Index. The case was defined as a case of gingivitis if the mean gingival index was more than 0.³²

All the meaningful statistics like standard deviations and errors were worked out. Standard normal deviate of 1.96 for a confidence level set at 95% was used, with a prevalence established at 50% and standard error of 0.05, to calculate the sample size. Chi square test was performed for qualitative or categorical variable. p-value was calculated under the predetermined level of significance and CI (confidence interval) of 95%. The data was entered in Statistical Package for the Social Sciences-SPSS version 16.0.

Results

The demographic characteristics of the pregnant women are presented in Table 1. The age range of the 384 participants was 15-37 years, with a mean age 24.78(±4.46) years. Majority of the subjects (59.9%) were in the age group ≤25 years. Multipara females formed 52.3% and multigravida formed 58.8% of the study population. 50.5% had completed secondary education and the maximum female participants 79.2% were housewives.

Table 1: General characteristics of participants

Characteristic	Frequency	Percentage
Age	230	59.9
≤25 years	154	41.1
>25 years		
Parity	201	47.7
Primipara	183	52.3
Multipara		
Education	106	27.6
Uneducated	44	11.5
Primary	194	50.5
Secondary	40	10.4
Graduate		
Occupation	304	79.2
Housewife	80	20.8
Others		
Gravidity	161	41.9
Primigravida	223	58.8
Multigravida		
Oral hygiene habit	378	98.5
Toothbrush and toothpaste	6	1.5
Toothpowder and finger	0	0
Others		
Frequency of brushing	2	0.5
None	339	88.3
Once a day	43	11.2
Twice a day		

The mean gingival index obtained was 0.44 ± 0.55 and the mean plaque index was 0.55 ± 0.47 . (Table 2)

Table 2: Gingival and Plaque Index score

Variable	Maximum value	Mean	Standard deviation
GI	2.73	0.44	0.55
PI	2.67	0.55	0.47

Among 76.3% of the patients who had gingivitis, 62.8% showed mild gingivitis, 9.8% revealed moderate gingivitis and only 3.7% had severe gingivitis. The mean gingival index for mild, moderate and severe gingivitis was 0.258, 1.38 and 2.22 respectively. (Table 3)

Table 3: Categorisation according to the severity of gingivitis by Gingival Index

Severity	Frequency(%)	Mean Gingival Index	SD
Mild	241(62.8)	0.258	0.27
Moderate	38(9.8)	1.38	0.258
Severe	14(3.7)	2.22	0.196

The data showed statistically significant relationship between gingivitis with parity and gravida of the pregnant female as shown in Table 4. Other variables such as age, education, occupation and oral hygiene practice did not show any significant relationship with gingivitis.

Table 4: Association between Severity of gingivitis with different parameters

Characteristic	Healthy	Mild	Moderate	Severe	p value
Age	56(24.3%)	145(63.1%)	23(10%)	6(2.6%)	0.61
≤25 years	35(22.7%)	96(62.4%)	15(9.7%)	8(5.2%)	
>25 years					
Parity	55(30.1%)	111(60.6%)	12(6.5%)	5(2.8%)	0.01*
Primipara	36(17.9%)	110(64.7%)	26(13.0%)	9(4.4%)	
Multipara					
Education	8(7.5%)	88(83.1%)	6(5.7%)	4(3.7%)	0.65
Uneducated	12(27.3%)	28(63.6%)	4(9.1%)	0(0%)	
Primary	42(21.6%)	122(62.9%)	22(11.3%)	8(4.2%)	
Secondary	29(72.5%)	3(7.5%)	6(15%)	2(5%)	
Graduate					
Occupation	67(22.1%)	24(30%)	33(10.8%)	9(3%)	0.14
Housewife	195(64.1%)	46(57.5%)	5(6.25%)	5(6.25%)	
Others					
Gravidity	52(32.3%)	97(60.2%)	9(5.6%)	3(1.9%)	0.008*
Primigravida	39(17.5%)	144(64.6%)	29(13%)	11(4.9%)	
Multigravida					
Oral hygiene habit	91(24.1%)	236(62.4%)	7(9.8%)	14(3.7)	0.5
Toothbrush and toothpaste	0(0%)	5(83.3%)	1(16.7%)	0(0%)	
Toothpowder and finger	0(0%)	0(0%)	0(0%)	0(0%)	
Others					
Frequency of brushing	1(50%)	1(50%)	0(0%)	0(0%)	0.94
None	80(23.6%)	211(62.3%)	35(10.3%)	13(3.8%)	
Once a day	10(23.3%)	29(67.4%)	3(7.0%)	1(2.3%)	
Twice a day					

* represents significant association between the parameters

Correlation(r) between PI and GI was obtained to be 0.63, indicating a positive association between plaque index and gingival index. (Figure 1)

Discussion

The prevalence of gingivitis in the second trimester of pregnancy was 76.3%. This finding is consistent with that of studies done in India, where the prevalence was found to be 66.8% to 99%.^{33,34} In contrary to our study, in a previous research done in Nepal, the prevalence of gingivitis in pregnant women was found to be 40%.²² The results may differ because of the difficulty in comparisons of periodontal researches as variations exist in the index system, the population description, the sites examined and even the definition of gingivitis. Such inter-study variabilities among different researches impedes an unequivocal conclusion about the parameter considered under observation.

Bleeding gums has been reported as the most common problem in pregnant females in Nepal.^{38,39} Lack of proper dental health knowledge, low socioeconomic and educational level and neglect of oral health could be the factors responsible for this high percentage of gingivitis. Majority of the population in Nepal do not go anywhere for dental treatment and consultation with medical practitioners is more common than visit to a dentist.⁴⁰ Unfortunately, only 59.4% of the medical practitioners agree that periodontal problems could affect pregnancy outcomes⁴⁰ and only 12% of women acknowledge that poor oral health may contribute to low birth weight babies.³⁸

The plaque index in our study was found to be 0.55. Pregnant women may find tooth brushing to be nearly impossible, especially in premolar & molar areas because of the pregnancy-related nausea.³⁵ A significant connection between pregnancy-related vomiting and increased gingival inflammation has been reported in a study where the authors have speculated impaired capability for proper brushing to be the main culprit.⁵ In addition, during pregnancy there are alterations in mindset and behavior with the propensity towards lack of personal care.³⁶

Age

The data showed that there is no association between age and severity of gingival index as seen in a previous study.²⁹ This may be due to the fact that the sample in the study consisted mostly of young women. However, this result is in contrast to other studies^{22,37} in which the authors have suggested that aging is a natural process which results in changes in host immunity which may cause the loss of periodontal support tissue.²⁹

Gravidity

The severity of gingivitis showed an association with the gravida of the female patient. The findings in our study impersonates with another study done in Nepal²². Only a minority of pregnant women seek care for bleeding gums in the absence of pain.²⁶ They would rather brush their teeth with medicated toothpaste or wait for the problem to self-resolve thus carrying the disease in the next pregnancy.²⁶

Pregnant women with two or more previous births (multigravida) have significantly higher GI scores compared with those with one previous birth.⁵ Gravidity plays a role in periodontal pathosis but its effect becomes apparent only with the passage of time.⁴² However, researches with contrasting results also exist, where repeated pregnancies had undefined effect on the periodontal health status.^{29,43}

Parity

The study showed an association between gingival index and parity. Similarity was seen in a study conducted among Ugandan women.⁴⁴ This was interpreted as accumulated tissue destruction across time rather than an intrinsic parity related abnormality. Contradicting result has been reported by Onigbinde et al.³⁷

Education

Lower educational status may directly lead to lower access to and utilization of dental services, low-degree of periodontal health awareness and negligence of oral hygiene.³⁷ The level of education forms a scaffold for the knowledge of periodontal health. The level of oral health awareness, attitude and behavior is seen to improve with the level of education.²⁶ Lack of education is accountable for the belief that dental treatment during pregnancy might have a detrimental result on pregnancy outcome.²⁸ However, in our study, there was no association between gingival index and education level of the patient. Previous studies have shown no significant differences in bleeding index scores and mean probing depth among different levels of education.^{37,45} Age may act as a confounding factor in this context as young mothers may be more enthusiastic to learn and build a healthy attitude towards oral hygiene maintenance.⁴⁶

Occupation

The present study showed no association between occupation and gingivitis as seen in earlier study.⁴⁵ On the contrary, literature also demonstrates gingivitis to be more in housewives.³⁴ It has been suggested that lower standard of living worsens the periodontal status, irrespective of the measure used to assess it.⁴⁴

Oral hygiene habit

The data showed that maximum number of the females used toothbrush and toothpaste and a very few used toothpowder and finger. Other means used in Nepal such as datiwani,^{22,25,48} charcoal²⁵, salt²⁵, ash²⁶, green crushed guava leaves⁴⁹ were not reported. Most women brushed once daily as seen in Nepal.^{38,39,47,48} Our study showed no association between gingival index and oral hygiene habit or frequency of brushing.

Results of this study indicate a high prevalence of gingivitis among the pregnant females, which shows the oral hygiene methods employed by them is not effective. Nepal has one of the lowest dentist-

population ratios among South Asian countries with only 2 dentists per 100,000 population.⁵⁰ This low number of dental professionals are unable to treat these conditions adequately. The treatment is also hindered by limited access to qualified providers.²⁶

The results of this study may have implications for the periodontal health services aimed at the pregnant women in Nepal. Gingivitis is a risk factor for preterm low birth weight and periodontal treatment significantly reduces this risk.⁷ Nationwide preventive programs should be planned and implemented to improve the oral hygiene level among pregnant women.

The limitation of the study includes the ethnically and demographically heterogenous sample. The research fails to address important parameters such as socio-economic status, stature of the female, weight of the female, effect of vitamin and iron supplementation and nutritional status.

The authors recommend oral health screening of pregnant women on a regular basis. Community oriented, culturally sensitive and socially acceptable educational programs should be introduced for periodontal health promotion. To increase the validity of the study, multicentric studies should be encouraged to accommodate larger data. Study with larger sample size including wider age range of participants could represent the entire population.

Conclusions

The prevalence of gingivitis in the second trimester of pregnancy was found to be 76.3%. Statistically significant relationship was found between gingivitis and gravida and parity. Gingivitis being both preventable and readily treatable, early detection should be reinforced and intervention should be conducted as early as possible. The authors would also like to emphasize the need of behavior changes in oral hygiene practice. Besides assessing the prevalence of gingivitis, the study also succeeded in motivating the obstetricians and the medical staffs for oral inquiry and early referral. The pregnant women received an opportunity to eliminate fears regarding safety of dental treatment and become aware about infant oral health care. Fostering good oral health in women during pregnancy is an ideal early intervention and good public health policy.

List Of Abbreviations

ANC: Antenatal Clinic, GI: Gingival Index, PI: Plaque Index.

Declarations

Ethics approval and consent to participate: Written informed consent was obtained from all selected participants and from the guardians for participants under 16 years old. This study was approved by the Institutional Review Board of National Academy of Medical Sciences, Kathmandu, Nepal.

Consent for publications: Not applicable

Availability of data and materials: The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests: The authors declare that they have no competing interests

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Authors' contributions: RS, SP and GB have made substantial contributions to conception and design of the study. RS has been involved in data collection and data analysis. RS, SP and GB have been involved in data interpretation, drafting the manuscript and revising it critically and have given final approval of the version to be published.

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Figures

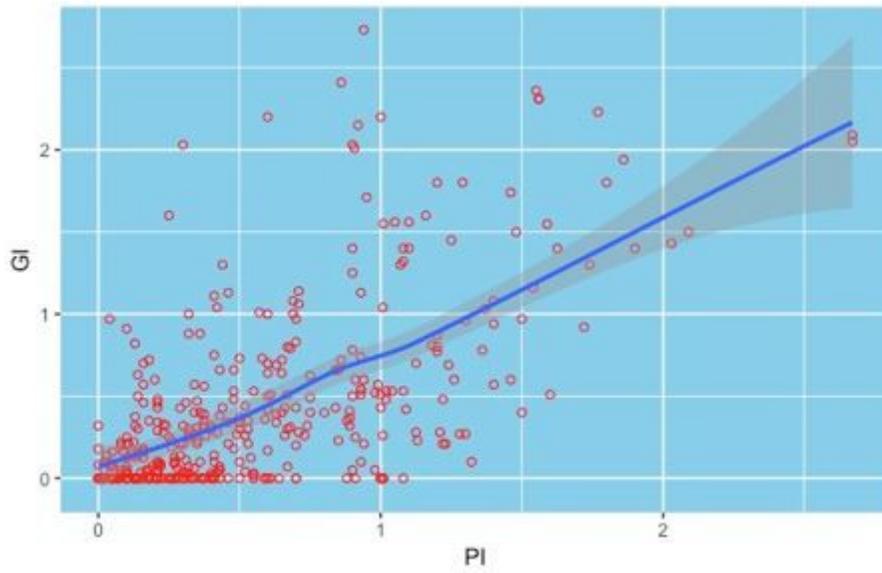


Figure 1

Scatter plot showing positive relation between gingival index and plaque index