

## Periodontal health among pregnant women visiting tertiary government hospitals in Patna and its distribution by different background characteristics

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### Abstract

**Background:** To study the association between oral health status and pregnancy in Patna (Bihar).

**Aims and Objectives:** This study aims to examine periodontal status in pregnant women and assess the relationship with parity, socio-economic factors, gestational age, education and oral hygiene behaviour of the women.

**Materials and Methods:** A Hospital based survey was carried out among women attending the antenatal outpatient department in two hospitals, Patna medical college and Nalanda medical college and hospital, to evaluate the periodontal health among pregnant women and its relationship between socio-demographic variables like age, education, income. Periodontal examination was done by CPI probe and oral health status was also recorded using indices (plaque index, by Silness & Loe gingival index, by Loe & Silness, debris index and OHI-S indices by Green & Vermillion)

**Result:** In the present study, of the 365 patients presenting with mild gingivitis, 40.5% were in their 1<sup>st</sup> trimester, 31.2% in 2<sup>nd</sup> and 28.2% in their 3<sup>rd</sup> trimesters. Of the 231 patients with moderate gingivitis, the maximum percentage of patients shifted to the 3<sup>rd</sup> trimester (42.9%), with 36.21% patients in their 2<sup>nd</sup> trimester and only 20.8% in their 1<sup>st</sup> trimester.

**Keywords:** Pregnancy, Gingivitis, and Periodontal disease.

### Introduction

Pregnancy and child birth are special events in women's lives and indeed in the lives of their families. Although pregnancy is a normal physiological process, it may be associated with certain systemic alterations, that can adversely affect the would be mother's health, which in turn would be detrimental for the child she bears. Hence provision of information and adequate knowledge may help the mothers to adopt and maintain healthy practices and life styles which would help the mother to remain healthy herself and also to bring forth a healthy baby. Published studies have shown that the prevalence rate of gingivitis during pregnancy ranges between 30 & 100%.<sup>1</sup>

Gingivitis during pregnancy is characterized by erythema, edema, hyperplasia and increased bleeding. Cases range from mild inflammation to severe hyperplasia and hypertrophy, pain and bleeding. Increased gingival probing depths, increased gingival inflammation, increased gingival crevicular flow, increased bleeding upon probing and increased tooth mobility are the clinical periodontal manifestations described during pregnancy.<sup>2</sup> There is also an increased incidence of pyogenic granulomas during pregnancy at a prevalence of 0.2-9%. The pregnancy tumor or pregnancy associated pyogenic granuloma appears most commonly during the second or the third month of pregnancy.<sup>2</sup>

The signs and symptoms of gingivitis during pregnancy are similar to those in the non-pregnant population. Yet the signs of inflammation have a tendency to be more severe in pregnancy for a similar degree of plaque.<sup>3</sup>

The exact factors leading to developing gingivitis during pregnancy have not been clearly recognized. A change in the periodontium caused by increased endogenous

sex hormones is considered a major aetiologic factor. The main sex hormones affecting the periodontium are oestrogen and progesterone and by the end of last trimester they can reach up to 30 times higher than seen during non pregnant status. These sex hormones have various effects on the microcirculation leading to swelling of endothelial cells, adherence of platelets and granulocytes on vessel walls, formation of microthrombi, and potentially increasing the vascular permeability in gingival tissues and thereby increasing susceptibility to inflammation due to bacterial or even physical irritation.<sup>3</sup>

One of the major alterations in the immune system during pregnancy is partial dampening of the mother's cell-mediated immune responses associated with T-helper type 1 (Th1) lymphocytes. This is accompanied by augmentation of antibody-mediated immune responses by T-helper type 2 (Th2) lymphocytes, which promote replication and stimulation of antibody-producing B cell. Stimulated Th2 cells produce an array of cytokines, such as interleukin-4, interleukin-5 and interleukin-10, that suppress cell-mediated immune responses. Conversely, Th1 cells secrete cytokines, such as interleukin-2, interferon  $\gamma$  and tumor necrosis factor  $\beta$ , that promote cellular immunity. The mechanisms of this partial shift in the Th1/Th2 balance favouring Th2-mediated immune responses are not fully understood, but are partly dependent on changes in progesterone, estrogen and chorionic gonadotropin during pregnancy. In addition, circulating CD25+ CD4+ T-regulatory cells suppress antigen-specific immune responses that are important for maternal immunological tolerance of the presence of fetal antigens.

Pregnancy-associated adjustments in immune responses are not confined to specific alterations in the

Th1/Th2 balance. Neutrophils in the peripheral circulation of pregnant women exhibit a significant reduction in myeloperoxidase, respiratory burst activities and phagocytosis. Deactivation of neutrophils is enhanced at the maternal-fetal interface where fetal derived trophoblast comes in contact with maternal neutrophils. All of these inhibitory effects on neutrophils are most marked during the second and third trimesters.<sup>4</sup> These pregnancy induced immunological modifications in the mother can indeed increase her susceptibility to a number of infections, including periodontal disease. In fact, it has been reported that during the second trimester of pregnancy the proportion of gram negative anaerobic bacteria in dental plaque increases with respect to aerobic bacteria.<sup>5</sup> All these do explain the development of gingivitis and periodontitis during pregnancy.

### Materials and Methods

A Hospital based survey was carried out among women attending the antenatal outpatient department in two hospitals, Patna Medical College and Nalanda Medical College and Hospital, to evaluate the periodontal health among pregnant women and its relationship between socio-demographic variables like age, education, income

**Sample Size:** 598 pregnant women

### Method and Collection of Data

Pregnant women from two tertiary care hospitals, Patna Medical College and Nalanda Medical College and Hospitals were screened and patient with the following criteria were excluded from the study

1. Patients with any systemic disease, e.g., diabetes mellitus, cardiovascular diseases, HIV infection etc
2. Immunocompromised patients
3. Mentally challenged patients and patients suffering from psychosomatic disorders.
4. Patients who did not want to get involved in this study.

After ethical committee review periodontal examination was done by CPI probe The oral examination was done using a headlight torch as an artificial source of light with a dental mirror and CPI periodontal probe. The examination was done on the participants in sitting position. Periodontal status was assessed using the Community Periodontal Index -CPI (WHO, 1997) while oral hygiene was assessed using Oral Hygiene Index Simplified, OHI-S (Greene and Vermillion, 1964.

The oral clinical examination was carried out by single examiner. (Photograph 1 & 2) The data was recorded by an oral hygienist who accompanied the examiner.

The collection data was tabulated & sent for statistical analysis

### Results

The data obtained from the study was compiled, tabulated and subjected to statistical analysis. A total of 598 pregnant women were evaluated.

#### Distribution of Gingival Index in Pregnant women.

On assessing Gingival Health, it was found that 365(61.04%) of subjects had mild gingivitis, followed by moderate and severe gingivitis in 231(38.63%) and 0 (0%) of the women respectively (Table 1)

#### Association between type of gingival Index and Stage of Pregnancy

Examination of cell frequencies showed that about 61%(365 out of 598) of pregnant women had mild gingival index. According to trimester about 40.5% (114 out of 365), 31.2% (103 out of 365) and 28.2%(148 out of 365) of mild gingival index were observed in first, second, third trimester respectively. 38% (231 out of 598) of pregnant women had moderate gingival index and according to trimester about 20.8% (48 out of 231), 36.4% (84 out of 231) and 42.9%(99 out of 231) of moderate gingival index were observed in first, second, third trimester respectively. Statistically significance association ( $p < 0.001$ ) was found between Gingival Index and stage of pregnancy.(Table 2)

#### Distribution of Plaque Index in Pregnant women

On assessing Plaque Index, It was found that 354 (59.20%) of subjects had grade 1, followed by 242(40.47%) had grade 2. (Table 3)

#### Association between type of Plaque Index and Stage of Pregnancy

Examination of cell frequencies showed that about 59.2% (354 out of 598) of pregnant women had Grade1 plaque index. According to trimester about 38.7% (137 out of 354), 32.2%(114 out of 354) and 29.2%(103 out of 354) of Grade1 plaque index were observed in first, second, third trimester respectively 40.5%(242 out of 598) of pregnant women had Grade2 plaque index and according to trimester about 24.4%(59 out of 242), 34.7% (84 out of 242) and 40.9%(99 out of 242) of Grade2 plaque index were observed in first, second, third trimester respectively. Statistically significance association ( $p < 0.001$ ) was found between Plaque Index and stage of pregnancy.(Table 4)

#### Assessment of Oral Hygiene

Majority of subject, 438(73.24%) had fair level of oral hygiene, followed by good oral hygiene in 156(26.09%) and poor oral hygiene in only 4(0.67%) of pregnant women (Table 5)

### Association between type of Oral hygiene Index and Stage of Pregnancy

Examination of cell frequencies showed that about 73.2%(438 out of 598) of pregnant women had fair oral hygiene index. According to trimester about 28.8%(126 out of 438), 33.8%(148 out of 438) and 37.4%(164 out of 438) of fair oral hygiene index observed in first, second, third trimester respectively. 26.1% (156 out of 598) of pregnant women had Good oral hygiene index. Statistically significance association ( $p < 0.001$ ) was found between Oral Hygiene Index and stage of pregnancy using Fisher's exact test (Table 6)

### Distribution of Periodontal Health (CPI Index) in pregnant women

Majority of subjects, 420(70.23%) had Code 2, followed by Code 1 in 176(29.43%), other zero (Table 7)

### Association between type of Periodontal Health (CPI Index) and Stage

Examination of cell frequencies showed that about 70.2% (420 out of 598) of pregnant women had Code 2 CPI index. According to trimester about 10.0% (42 out of 420), 43.1% (181 out of 420) and 46.9%(197 out of 420) of Code 2 CPI index were observed in first, second, third trimester respectively. 29.4%(176 out of 598) of pregnant women had Code 1 CPI index. (Table 8)

### Association between education and Periodontal Health (CPI Index)

49.3%(295 out of 598) of pregnant women had primary education and 35.1%(210 out of 598) were illiterate. Cell frequencies showed that about 47.4%(199 out of 420) of pregnant women with Code 2 had primary education. (Table 9)

### Association between Household Income and Periodontal Health (CPI Index)

Examination of cell frequencies showed that about 56.2% (336 out of 598) of pregnant women had 2001-5000 monthly household income followed by 38.6% (231 out of 598) had 5001-10000 monthly household income. Statistically significance association ( $p < 0.001$ ) was found between household income and CPI Index. (Table 10)

### Association between Age of pregnant women and Periodontal Health (CPI Index)

Examination of cell frequencies showed that about 75.8%(453 out of 598) were in 21-30 age group and about 72.2%(327 out of 453) had 77.9%(327 out of 420) had Code 3. Statistically no significant ( $p = 0.057$ ) association was

found between Age and CPI Index of pregnant women (Table 11)

### Association between Parity of pregnant women and Periodontal Health (CPI Index)

Examination of cell frequency showed that about 45.81%(274 out of 598) pregnant women were from 2nd parity and 35.3% (211 out of 598) were from 3rd parity. Significant association was found ( $P = 0.028$ ). (Table 12)

### Discussion

The present study aims to estimate the oral hygiene, gingival and periodontal status and to explore the association of various socio-demographic factors on the oral hygiene status of pregnant women visiting tertiary government hospitals in Patna. The tertiary government hospitals of Patna Medical Collage and Hospital and Nalanda Medical College and Hospital were chosen, as both of these hospitals cater to a vast number of patients coming from a wide range of socio-economic backgrounds regularly. The socio-demographic data collected was based on subjective information provided by the patients. The periodontal health status was recorded by a single trained examiner to eliminate inter examiner bias. patient with the following criteria were excluded from the study. Patients with any systemic disease, e.g., diabetes mellitus cardiovascular diseases HIV infection etc, Immuno compromised patients, Mentally challenged patients and patients suffering from psychosomatic disorders, (because diabetes has been unequivocally confirmed as a risk factor for periodontitis. The risk of periodontitis is increased by approximately threefold in diabetic individuals compared with non diabetic individuals. Epidemiological studies have established that periodontitis is a risk factor for cardiovascular disease (CVD). The prevalence of CVD in patient with periodontitis is 25%-50% higher than in healthy individuals. HIV infection in adults is linked with the expression of various type of periodontal lesion which include specific form of gingivitis and periodontal disease. Oral mucosal lesions found in nearly 50% of all immune compromised pateints. Mentally challenged patients has been associated with changes in behavioural, neurophysiological and neuroendocrinological factors and though to be one of the leading cause of disability. There are various evidences that mentally compromised pateints and periodontitis may also be related).

Numerous published studies have shown that the prevalence rates of gingivitis during pregnancy range between 30 & 100%.<sup>1</sup> The present cross-sectional study corroborates this data, with 61.05% of pregnant women presenting mild gingivitis and 38.63% of women having moderate gingivitis. Out of 598 women examined only 2(0.33%) presented with normal gingiva (GI =0), whereas severe gingival inflammation (GI=3) was found in none. Both the patients with normal gingivae were in their first trimesters. The results of the present study also support earlier reports, confirming that gingival index score

increases with increasing age and trimesters. The mean GI score in 1<sup>st</sup> trimester was  $1.23 \pm 0.44$ , which increased to  $1.42 \pm 0.49$ , in the 2<sup>nd</sup> trimester, and subsequently to  $1.49 \pm 0.50$  in the 3<sup>rd</sup> trimester. Trakmadla et al observed a similar trend where the mean score in the 1<sup>st</sup> trimester was  $1.0 \pm 0.42$ , which rose to  $1.12 \pm 0.30$  in the 3<sup>rd</sup> trimester.<sup>5</sup>

During pregnancy, gingival inflammation increases significantly from the 1<sup>st</sup> to the 3<sup>rd</sup> trimesters, with a maximum increase in 2<sup>nd</sup> trimester.<sup>6</sup> The results of the present study supports this issue, confirming that gingival index score increases (moderate) significantly with trimesters.

The same study conducted by Tarkamadla in 2007 has shown that GI score increases with increasing age of pregnant women. The present study has supported this finding, with the mean GI of  $1.26 \pm 0.44$  in the youngest age group and  $1.59 \pm 0.51$  in the oldest one.

In the present study, of the 365 patients presenting with mild gingivitis, 40.5% were in their 1<sup>st</sup> trimester, 31.2% in 2<sup>nd</sup> and 28.2% in their 3<sup>rd</sup> trimesters. Of the 231 patients with moderate gingivitis, the maximum percentage of patients shifted to the 3<sup>rd</sup> trimester (42.9%), with 36.21% patients in their 2<sup>nd</sup> trimester and only 20.8% in their 3<sup>rd</sup> trimester. Thus it can be said that according to the present study, the severity of gingival inflammation increases with the increase in trimesters of pregnancy. The above data becomes more significant when it is associated with the data on OHI of these women.

Silness and Loe determined that the correlation between the amount of dental plaque and the severity of gingivitis was higher post-partum than during pregnancy, & concluded that "some other factor" was involved in the etiology of pregnancy gingivitis. Hormonal and vascular changes associated with pregnancy can exaggerate the response of the gingival to bacterial plaque.<sup>7</sup>

The present study corroborates the above, as 73.24% of the women examined were found to have fair oral hygiene, whereas poor oral hygiene was encountered only in 0.67%.

The association of socioeconomic status with gingival inflammation score in pregnant women has been demonstrated by Taadakamadla et al in 2007. The present study has confirmed this aspect also. The monthly household income of the pregnant women has been shown to be in direct proportion to their GI, with patients having less than 2000/- monthly income having a GI as high as  $1.6 \pm 0.54$ , whereas those having a monthly income between 10,001-25000/-, had a mean GI of  $1.24 \pm 0.43$ . A single patient was examined whose monthly family income exceeded 25000/-. Her GI was recorded as 0. The association of socioeconomic status with GI scores may be attributed to inaccessibility of dental clinics, unawareness as well as inability to afford proper oral hygiene aids.

Educational background of the pregnant women also affected their GI scores, with a mean GI of  $1.68 \pm 0.47$  recorded in illiterate women, which decreased significantly with increasing qualifications. This is in direct agreement with a study on 200 pregnant women in Jordan by Tanni et al in 2003.<sup>8</sup> The relationship between GI and educational

levels reflect lower awareness of the importance of oral hygiene in educated women.

Thus it can be said that gingival inflammatory symptoms are aggravated during pregnancy and are related to increased age, lower levels of education and lower economic status. Thus periodontal preventive programmes for pregnant women can be initiated and should particularly be directed towards these specific groups of women, in whom greater inflammatory symptoms may be expected, which in turn would diminish other adverse health outcomes of the mother and the baby, including PLBW babies.

In the present study, CPI index was used to determine the degree of destruction of the periodontal tissues. Majority of subjects (70.23%) had CPI code 2, whereas, only 0.17% presented with code 3 & 0% with code 4. These findings suggest that the increase of pocket depth during pregnancy is caused by enlargement of gingival tissues rather than periodontal destruction. Cohen et al (1971) reported that there was no significant loss of attachment during pregnancy. The result of the present study also indicates that pregnancy does not cause periodontal destruction. This is in direct agreement with a study conducted by Miyazaki H. in Japan in 1991 and also with that by I Vasiliaukiene in 2003 in Lithuania.<sup>9</sup> Both these studies used CPI index for estimation of periodontal tissue destruction in pregnant women and had come up with similar results.

The present study has also shown that with increase in parity of the pregnant women, there has been an increase in the percentage of subjects in CPI Code 2. While 60.7% of uniparous women were found in Code 2, the values in Code 2 became 66.1%, 75.8%, 79.6% and ultimately 100%, as parity increased to 2,3,4 and finally above 4. This data may be interpreted as that the more number of times a woman becomes pregnant, the greater accumulation of calculus and other plaque retentive factors are seen. This may be due to lesser amount of time available to the mother for her own oral hygiene care as the number of her children increases! But this data has not been supported by a study done by BaydaA, Yas at Baghdad in 2012, where dental plaque and calculus accumulations were almost similar in primigravidae and multigravidae women.<sup>10</sup>

The results of the present study are limited, as they represent a small fraction of the present population of Patna. At the same time these results may be considered as a starting data for the above mentioned population, as this was the first time that any data on periodontal health of pregnant women of Patna has been collected.

The present study being a cross sectional-one, its result can be affected by a large number of variables which have not been taken into consideration. Although patients with systemic diseases have been exempted from the study, other parameters like usage of contraceptives, smoking etc have not been considered. In longitudinal studies these can be standardized and kept constant.

In view of the above discussion, long-term longitudinal studies with larger sample sizes are recommended for the future.

## Conclusion

A hospital based cross sectional survey was carried out among women attending the antenatal outpatient departments in two hospitals in Patna in order to evaluate the periodontal health among pregnant women and its relationship with sociodemographic variables. The data obtained from the study has shown that 61.04% of the subject had mild gingivitis, followed by moderate and severe gingivitis in 38.63% & 0% of the women respectively. Increase in sociodemographic variables like educational qualification and monthly household income resulted in decreased gingivitis. This being the first-ever data from the state hospitals of Patna, Bihar, more such studies are recommended

**Conflict of Interest:** None.

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