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# Periodontitis As A Risk Factor In Pre-Eclampsia

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***Abstract***
***Aim:*** *To assess the risk association between chronic periodontitis and pre-eclampsia before and after matching for known risk factors of preeclampsia (maternal age, chronic hypertension and multiparity).*
***Methods:*** *232 Primigravida women, 18-35 years of age, with gestation period of more than 20 to 26 weeks without known comorbidities were selected from the outpatient department of Obstetrics and Gynaecology, Zonal hospital, Mandi, H.P. A detailed medical and dental history with information regarding maternal age, demographic area, educational qualification and socioeconomic status and clinical parameters as gingival index (GI), gingival bleeding index (GBI), probing depth (PD), clinical attachment loss (CAL) were recorded.*
***Results:*** *It was observed that more cases of severe( CAL ≥ 5mm)and moderate periodontitis (CAL 3-4mm) were present in pre-eclamptic subjects as compared to non pre-eclamptic subjects (p-value <0.001). It was also observed that women suffering from pre-eclampsia, were 3.14 times more probable to face the periodontal disease than the healthy women (odds ratio OR =3.14).*
***Conclusion:*** *A positive risk association has been observed between periodontitis and pre-eclampsia with women suffering from periodontal disease more probable to face pre-eclampsia than the healthy women.*
***Keywords :*** *Chronic periodontitis, Clinical Attachment Loss, Co-morbidities, Primigravida, Pre-eclampsia*

## I. Introduction

Periodontal diseases are chronic infections of gingiva and its supporting structures caused by periopathogenic microorganisms.[1] Research done in past few decades has suggested associations between periodontal disease and increased risk of systemic diseases such as atherosclerosis, myocardial infarction, stroke, diabetes mellitus, and adverse pregnancy outcomes.[2-5] While limited research is available on periodontitis as a risk factor during pregnancy in relation to pre-eclampsia. Active periodontal diseases during pregnancy may have transient translocation of oral organisms which predisposes a patient to increased amount of bacteraemia during daily activities as mastication, tooth brushing, dental flossing etc.[6] These translocated bacteria reach the utero-placental unit, inciting placental inflammation or oxidative stress early in pregnancy which may ultimately produce placental damage and clinical manifestations of pre-eclampsia.[7] Pre-eclampsia and other hypertensive disorders are most common medical complication of pregnancies affecting 5% to 10% of all pregnancies globally.[ 8] The prevalence of pre-eclampsia in developing countries reaches up to 16.7% and it is estimated to account for about 40% to 60% of maternal deaths in developing countries. WHO estimates the incidence of pre-eclampsia to be seven times higher in developing countries (2.8% of live births).[9] Studies done in northern India have shown the prevalence rates for pre-eclampsia ranging from 33% (Haryana) to 87.5% (Tripura). [10] Considering the effect periodontal diseases may have on pregnancy complications, improving periodontal health before or during the pregnancy may prevent or reduce the occurrences of pre-eclampsia and therefore reduce the maternal and perinatal morbidity and mortality. Thus, the present study was undertaken with an aim to investigate the role of chronic periodontitis as a risk factor to pre-eclampsia.

## II. Materials And Method

### 2.1 Study population

Subjects from the outpatient department of Obstetrics and Gynaecology, Zonal Hospital, Mandi, H.P. were screened for eligibility. Specifically subjects were eligible if they were not having any known comorbidity apart from periodontitis. Subjects were included in study if they fulfilled the following inclusion criteria: primigravida subjects within the age group of 18-35 years, with gestation period within 20 weeks to 26 weeks at the time of enrolment, subjects who have not undergone in vitro fertilization or had spontaneous abortion, who have not undergone any periodontal treatment within past six months and who have not received any antibiotics within last 3 months before study inclusion.

**2.2 General, medical and periodontal examinations**

3 A recent and past medical history, demographic patient characteristics (ethnicity, age, education and
4 gender),

A recent and past medical history, patient characteristics (Maternal age, demographic area, educational qualification, socioeconomic status) were recorded by means of a case history. Gestational age was recorded as per the medical records in which the age was determined by ultrasound or pelvic examination by the gynaecologist. Measurement of blood pressure and tests for proteinuria of all the patients included in the study were recorded by the health worker, as directed by the obstetrician. Periodontal assessments were performed at six sites per tooth and included: gingival index(Loe and Silness 1963)[11], BOP (presence/absence Ainamo& Bay 1975 )[12,13], probing pocket depth (PPD)[14] and clinical attachment level(CAL)[15,16]. At the end of the study, data received from the health worker was collected. The pregnant women were divided into two groups i.e. Group I and Group II based on the data received.

**Group I:** Pre-eclamptic (case)

**Group II:** Non pre-eclamptic (control)

The data thus collected was subjected to statistical analysis.

## III. Statistical Analysis

Statistical analysis was done using IBM SPSS (Software Package Used for Statistical Analysis) STATISTICS version 22.0.

## III. Results

500 pregnant subjects were screened and a total of 232 subjects met the inclusion criteria. Following observations were made. It was found that there was more percentage of subjects of chronic periodontitis in higher age (> 30yrs ) groups than in lower age group (< 30 yrs), higher percentage of subjects belonged to rural area compared to urban areas, lesser percentage of subjects had higher education in Group I compared to Group II. ( TABLE 1,2,3).

**Table 1**: Percentage distribution of subjects in Group I and Group II in terms of maternal age

| **Maternal Age** | **Group** | |
|---|---|---|
| | **Group I** | **Group II** |
| **< 30 yr** | 35.73% | 63.66% |
| **□ 30 yr** | 64.27% | 36.34% |

**Table 2**: Percentage distribution of subjects in Group I and Group II in terms of Demographic area

| **Demographic area** | **Group** | |
|---|---|---|
| | **Group I** | **Group II** |
| **Urban** | 29.74% | 25.52% |
| **Rural** | 70.26% | 61.18% |

| **Educational Status** | **Group** | |
|---|---|---|
| | | |
| **University** | 33.62% | 23.7% |
| **School** | 66.38% | 76.3% |

**Table 3**: Percentage distribution of subjects in Group I and Group II in terms of Educational status

It was observed that there was higher mean gingival score in Group I as compared to that in Group II p< 0.001(TABLE 4)**.**

**Table 4:** Comparison of mean gingival score between Group I and Group II

| Group | Mean | SD | p-value | Significance |
|---|---|---|---|---|
| **Group I** | 1.767 | 0.2928 | | |
| **Group II** | 1.258 | 0.2824 | <.001 | HS |

SD : Standard deviation ; $p < 0.001$ Highly Significant (HS) Higher mean percentage of sites with bleeding on probing in subjects with chronic periodontitis was observed in Group I as compared to Group II $p \leq 0.001$(TABLE 5)

**Table 5:** Comparison of mean percentage of sites with bleeding on probing between Group I and Group II

| Group | n | Mean Score ± SD | p-value | Significance |
|---|---|---|---|---|
| **Group I** | 29 | 65.87± 18.66 | <0.001 | **HS** |
| **Group II** | 203 | 33.31±18.06 | | |

n = no. of subjects; SD : Standard deviation ; $p \leq 0.001$ Highly-Significant (HS)
Higher mean pocket depth scores in subjects with chronic periodontitis in Group I as compared to that in Group II $p \leq 0.001$.(TABLE 6)

**Table 6:** Comparison of mean pocket depth scores (mm) of Group I and Group II

| | Group I mean±SD | Group II mean±SD | Mean difference | Std error | p-value | Sig |
|---|---|---|---|---|---|---|
| **Pocket depth** | 3.7±0.66 | 2.56±0.78 | 1.14 | 0.16 | <0.001 | HS |

n=no. of subjects, SD: Standard deviation, Std error: Standarderror,$p \leq 0.001$,Sig;Significance; HS: Highly significant

Group I had higher percentage of subjects with clinical attachment loss in 3-4 and $\geq$ 5mm groups as compared to Group II. It was also found that women suffering from pre-eclampsia, were 3.14 times more probable to face the periodontal disease than the healthy women (odds ratio OR =3.14) (TABLE 7).

**Table 7:** Comparison of percentage of subjects with clinical attachment loss in Group I and Group II

| Clinical attachment loss | Group I (n=29) | Group II (n=203) | OR |
|---|---|---|---|
| **1-2mm** | 27.58% | 29.14% | |
| **3-4mm** | 31.03% | 13.22% | 3.14 |
| **□ 5mm** | 17.24% | 0.99% | |

n = no. of subjects; OR: Odds ratio

## IV. Discussion

The current study aimed to investigate the association between chronic periodontitis and pre-eclampsia in 232 primigravida subjects but without any selfreported comorbidities. The results showed a possible risk association between the two. In particular, it was found that

**Group I** had more percentage of subjects in higher age group while **Group II** had more percentage of subjects in lower age group. This may be explained by the fact that older women may be at increased risk for abnormalities during the course of pregnancy, perhaps secondary to the physiology of aging which was because of the decreased myometrial efficiency.The failure of uterine vasculature to adapt to the increased hemodynamic demands of pregnancy as women age is a proposed explanation.[17] Study done by **Poon L** et al also supported the fact that the risk for pre-eclampsia increased by 4% for every year over the age of 32 years.[18] The results of our study are in accordance with the study done by **Patricia A. et al.[19]**

In the present study, subjects in pre-eclamptic and non-preeclamptic group were compared in terms of demographic area. It was found that there were more percentage of subjects who belonged to rural area in **Group I** than in **Group II**. Lack of regular health care during the preconception, antenatal, and inter conception periods in rural areas could be one of the reasons for the more number of cases from rural area in the pre-eclamptic group.[20]

In the present study, subjects in pre-eclamptic and non-preeclamptic group were compared in terms of educational qualification. It was found that there was lesser percentage of subjects with higher education in both **Group I** and **Group II**. This could be explained by the fact that low education was considered as stressor (with limited costs and decision-making power) that resulted in susceptibility and poor pregnancy and childbirth outcomes.Women with higher education level had the ability to obtain, process, and understand the health information such as ante natal care, birth spacing, the signs of complications, and nutrition during pregnancy. These women were more confident to ask or discuss with professionalhealth workers. Higher education also increased self-esteem and empowerment for the women in decision-making.[21]

In the present study, gingival index given by **Löe and Silness (1963)** was evaluated for both the groups. On comparison there was higher mean gingival score in **Group I** as compared to that in **Group II** which was found to be highly statistically significant. This can be due to the fact that common inflammatory conditions such as gingivitis which are precipitated by the buildup of plaque biofilms, cause the periodontal vasculature to proliferate and dilate, providing a greater surface area that facilitates the entry of microorganisms into the bloodstream. This may lead to bacteremia and endotoxemia. Often, these bacteremias which are short-lived and transient, lead to seeding of organisms in different target organs, resulting in subclinical, acute, or chronic infections. This enhanced inflammatory state related to increased cytokine synthesis cause endothelial dysfunction form the basis of the pathogenesis of preeclampsia **(Catarino et al)[**22]

In the present study the Gingival Bleeding Index (GBI), by **Ainamo & Bay (1975)** was evaluated for both the groups. On comparison there was a higher mean percentage of bleeding score in subjects with chronic periodontitis in **Group I** as compared to **Group II** which was found to be highly statistically significant. This can be explained on the basis that many studies have postulated that the effect of periodontitis on the development of adverse pregnancy outcomes may stem from the hematogenic translocation of inflammatory mediators and bacterial products to the fetalplacental unit. [23-26] Since bleeding on probing (BOP) is a clinical parameter which reliably portrays current inflammatory changes associated with periodontal diseases a higher mean bleeding score in **Group I** in our study indicates a possible risk association of chronic periodontitis with preeclampsia. The findings in our study are in accordance with the findings reported by **Oettinger-Barak et al.[**27]

In the present study the mean probing depth (mm) was evaluated for **Group I** and **Group II**. **Group I** showed higher mean probing depth score than **Group II** and the mean difference between the two groups was found to be highly statistically significant. This may be due to the fact that periodontal pockets not only act as a reservoir for bacterial niches but also serve as a renewing reservoir for spillover of proinflammatory cytokineswhich can enter the circulation and induce and perpetuate systemic effects.[28,29]

In the present study, clinical attachment loss was evaluated for Group I and Group II. The severity of periodontitis was characterised based on the amount of clinical attachment loss as, slight, moderate or severe periodontitis[1]. More patients with both severe and moderate periodontitis were observed in **Group I** than in **Group II**, and more patients with mild periodontitis in **Group II** as compared to **Group I**. It was also found that Group **I** had higher mean of clinical attachment loss as compared to **Group II** and this difference was found to be statistically highly significant. This can be due to the reason that CAL is one of the clinical signs of existence of periodontal diseases indicating the presence of putative periodontal pathogens within periodontal tissues. Periodontal disease may provide a chronic burden of endotoxin and inflammatory cytokines, by causing increased amount of bacterimia during daily activities( mastication, tooth brushing, dental flossing ). This serves to initiate and exacerbate atherogenesis and thrombogenesis, burdening placenta in pregnant women, increasing their risk of developing preeclampsia. This explains the highly significant relation of our parameter (CAL) in the preeclamptic group with OR (Odds Ratio) of 3.14that is women suffering from preeclampsia, had higher severity of periodontal disease.. Similar OR's have been reported in studies done by **Boggess KA** (2.1)[8], **Canakci et al.** (OR 3.47)[30] **Varshney et al** (OR 4.33)[31], **Silva et al** (OR 8.28).[32 ] The higher number of subjects of severe periodontitis in the pre-eclamptic group supports the hypothesis that chronic periodontitis infection increases the risk of developing preeclampsia in pregnant women.The findings of our study are consistent with the findings of **Boggess et al[8] Canakci et al[**30], **Contreras et al[**33], **Cota et al [**34] and **Siqueira et al**.[35**]**

The present study was carried out to assess the risk association between chronic periodontitis and pre-eclampsia. The study however considers a selective sample of subjects, those visiting the department of Obstetrics and Gynaecology, Zonal hospital, Mandi, H.P and may not thus truly represent the trends in the community as a whole. So, a larger more representative sample may have to be studied for more direct correlations.

## V. Conclusions

Based on the results of the current study, we can conclude that risk association was found between periodontitis and pre-eclampsia. In the present study it has been found that women suffering from periodontal disease were more probable to face pre-eclampsia than the healthy women. But Further clinical studies with larger sample size are required to assess the risk association of periodontitis with preeclampsia.

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[37]. A reference list MUST be included using the following information as a guide. Only cited text references are included. Each reference is referred to in the text by a number enclosed in a square bracket (i.e., [3]). References must be numbered and ordered according to where they are first mentioned in the paper, NOT alphabetically.
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