Periodontal Diseases among Pregnant Women in Kuching, Sarawak

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ABSTRACT

Epidemiological and longitudinal studies have shown that pregnancy is associated with increased gingival inflammation and worsening of periodontal status. Prospective studies suggested that periodontal therapy during pregnancy might reduce the risk of adverse pregnancy outcomes and significant periodontal status improvement. The objectives of this study were to evaluate the prevalence of periodontal disease amongst pregnant women, and to compare periodontal conditions before and after non-surgical periodontal therapy. This study was a cross-sectional and intervention study of pregnant women at the Mother and Child Health Clinic, Jalan P. Ramlee, Kuching, who were referred to the Periodontic Unit, Jalan Masjid Dental Clinic, Kuching for further periodontal examination and treatment. All participants were examined and diagnosed with healthy periodontium or diseased periodontium. Sixty women became the subjects and 85% were diagnosed with periodontal disease, while 15% had healthy periodontium. Plaque score (PS) and bleeding score (BS) were evaluated at baseline and at eight weeks. At baseline, all periodontal parameters (mean ± SD) were higher in the diseased periodontium group compared to the healthy group (BS, 39.6 ± 21.5 vs 6.5 ± 3.9; PS, 46.4 ± 30.1 vs 33.5 ± 31.1). After two months, both groups showed improvement in all periodontal parameters; diseased periodontium ($p = 0.001$) and healthy periodontium group ($p = 0.016$). In conclusion, 85% of the participants in this study had periodontal diseases and, the non-surgical periodontal therapy improved the participants' periodontal status. Furthermore, there was no significant adverse pregnancy outcomes reported in this study.

Keywords: Adverse pregnancy outcome; periodontal diseases; periodontal therapy; pregnancy; prevalence

INTRODUCTION

Gingivitis is the most common periodontal condition during pregnancy, affecting 30% to 100% of pregnant women (Loe & Silness, 1963; Steinberg *et al.*, 2013). It has been reported that during pregnancy, there is an increase of estrogen by 10 fold and progesterone by 30 fold (Dellinger & Livingston, 2006). The hormonal changes during pregnancy might exacerbate pre-existing periodontal conditions (Laine, 2002). Neglected oral hygiene with fluctuation of hormones in pregnancy increases the incidence of oral diseases, such as gingivitis (Soory, 2000). It was

characterised by redness, edema and easily bleeding gingiva.

Researchers also suggested an association between periodontitis and adverse pregnancy outcomes, such as low birth weight and premature birth. Offenbacher *et al.* (1996) reported a potential association between maternal periodontal infection and preterm or low-birth-weight infant. Subsequently, numerous studies conducted to explore the association between periodontal disease and adverse pregnancy outcomes. Although pregnancy complications are multifactorial and involve a complex molecular and biological interplay of the mother and fetus, several many studies suggested that periodontal infection may be potentially one of the causes of adverse pregnancy outcomes (López *et al.*, 2002; Xiong *et al.*, 2006; Pitiphat *et al.*, 2008; Kumar *et al.*, 2013).

Previous studies have reported that periodontal treatment during pregnancy is safe and significantly improved periodontal conditions (Offenbacher *et al.*, 2006; Bi *et al.*, 2021). Some studies also showed that periodontal treatment during pregnancy might reduce the risk of adverse pregnancy outcomes (Offenbacher *et al.*, 2006; Al-Zahrani & Alghamdi, 2012; Bi *et al.*, 2021).

The National Oral Health Survey of Adults 2010 reported that 94% of the Malaysian population have periodontal diseases, whereby 18.2% needed advanced periodontal treatment (OHD-MOH, 2013). However, there is no detailed data on periodontal diseases amongst the Malaysian pregnant women.

To date, there were only three studies that has been conducted in Malaysia on the association of periodontal disease and pregnancy. One study had provided additional evidence that pregnant women with periodontitis were significantly higher at delivering low birth weight infants (Saddki *et al.*, 2008). Another study on a selected population in Malaysia showed that the mean

plaque index was correlated with preterm deliveries and low birth weight infants (Taiyeb Ali & Zainal Abidin, 2012). Lastly, a study had reported that plasma C-reactive protein (CRP) levels were significantly higher in pregnant women with periodontal diseases than pregnant women with healthy periodontium but were markedly reduced after undergoing non-surgical periodontal therapy (Ahmad *et al.*, 2018).

Numerous studies showed the importance and significance of periodontal health during pregnancy. It has not only a direct effect on pregnant women but also affects the baby's development. Therefore, oral and periodontal health has been considered an essential part of the routine antenatal examination all over the world. The objectives of this study were to evaluate the prevalence of periodontal disease among pregnant women in Kuching, Sarawak, Malaysia and to compare periodontal conditions in healthy and diseased periodontium amongst pregnant women before and after non-surgical periodontal therapy.

MATERIALS AND METHODS

This study was a cross-sectional and intervention study. The participants were selected amongst the pregnant women who attended the Mother and Child Health Clinic at Jalan P. Ramlee in Kuching, Sarawak for their antenatal check-ups. Pregnant women who fulfilled a set of inclusion and exclusion criteria were invited to participate in this study. Informed and written consents were obtained from all the participants. The participants were referred to Periodontic Unit, Jalan Masjid Dental Clinic, Kuching, for further periodontal examination and treatment.

The inclusion criteria of the study were pregnant women with the gestational age of between 12 and 24 weeks and should have at least 20 teeth present, excluding

third molars, and should be aged between 18 and 40 years old. Exclusion criteria were those who were smoking, had drug abuse history, gestational diabetes, pregnancy-induced hypertension, and those who had the periodontal treatment done in the past three months.

The study was registered with the National Medical Research Register, Ministry of Health Malaysia [Ref. no.: NMRR-15-2367-25966 (IIR)] and was approved by the Medical Research and Ethics Committee (MREC), Ministry of Health Malaysia [Ref. no.: (14)KKM/NIHSEC/P16-574].

Sample Size Calculation

The estimated number of pregnant women referred to Mother and Child Health Clinic, Jalan P. Ramlee, Kuching within a year was 150 cases. The estimated prevalence of periodontal disease among pregnant women was about 85% based on a previous study (Uwambaye *et al.*, 2021). The sample size was derived from a formula to determine a prevalence for a population (Daniel & Cross, 2019). Therefore, the sample size required for this study was 85 participants, based on 95% confidence interval and the prevalence at 85% out of 150 cases in a year.

Medical Records, Dental History and Demographic Data

The participants' medical records were taken from the Mother and Child Health Clinic at Jalan P. Ramlee. The information included a history of any previous pregnancy, expected due date (EDD), patient's medical status, gestational diabetes and pregnancy-induced hypertension in the current pregnancy.

Periodontal Parameters

Two examiners conducted periodontal examinations throughout the study. The inter-examiner reproducibility was assessed by carrying out clinical periodontal parameters data collection on four

participants. Each participant was evaluated twice in one visit, over a two-hour interval. The data collected were analysed for reproducibility using intra-class correlation coefficient for periodontal probing depth (PPD) and clinical attachment level (CAL) and the kappa analysis for bleeding and plaque score. The reproducibility agreement for PPD was 0.84, CAL was 0.85, bleeding score was 0.85, and plaque score was 0.88. The agreement of $\geq$ 0.70 was acceptable.

All dental variables were assessed at six of each tooth present, excluding third molars. The periodontal assessment was carried out at the baseline visit and at eight weeks review visit. Clinical measurements of periodontal parameters included: Plaque score (O'Leary *et al.*, 1972), bleeding on probing (BOP) score (Ainamo & Bay, 1975), PPD and CAL.

Subsequently, the participants were diagnosed with healthy periodontium or diseased periodontium. The diseased periodontium group included gingivitis and chronic periodontitis cases. The diagnosis was based on the clinical criteria as described by a classification agreed upon in the 1999 International Workshop for a Classification of Periodontal Diseases and Conditions (Armitage, 1999). Healthy periodontium; BOP score of $\leq$ 25% and no sites of attachment loss. Diseased periodontium indicated gingivitis with BOP score of $\geq$ 25% and without attachment loss. Chronic periodontitis indicated BOP score of $\geq$ 25% with the presence of at least five teeth with PPD $\geq$ 4 mm and with CAL $\geq$ 2 mm at the same site.

Clinical Intervention

Oral hygiene instruction, scaling and polishing was carried out for participants, who were diagnosed with healthy periodontium subjects. Meanwhile, oral hygiene instruction, scaling and root debridement (SRD), and polishing were conducted for diseased periodontium participants.

The SRD was completed in a single visit for all participants with a diseased periodontium group. Supragingival and subgingival scaling were done using an ultrasonic scaler. Root debridement was done at PPD ≥ 5 mm using the Gracey curettes. Later, full mouth polishing was done using a rubber cup and prophylaxis paste.

Statistical Analysis

The Statistical Package for the Social Sciences (SPSS) version 12.0.1 for Windows was used to perform the data analyses. Descriptive statistics were used to describe the participants' demographics data and numerical data analysis was used to describe the clinical parameters. The descriptive statistics and numerical data were expressed as percentage ± standard deviations (SD) and mean ± SD. Independent samples test and paired sample test were used to analyse the significant difference between the test and control group, before and after the treatment. A normality test was conducted

to check the assumption before conducting statistical analysis. The statistical significance was set at a p-value of ≤ 0.05.

RESULTS

Demographic Data

A total of 60 participants were volunteered for this study and examined. The mean age of the participants was 30.62 ± 3.39 (years). Table 1 shows the age by category of participants in this study. There was no significant difference in age for participants who were healthy and those who had diseased periodontium. Table 2 shows the ethnicity of participants involved in this study.Periodontal Parameters

Out of the 60 participants, 51 participants (85.0%) were diagnosed with periodontal diseases, which was further categorised as gingivitis (36.7%) and chronic periodontitis (48.3%) (Table 3).

Table 1 The age of participants with healthy and diseased periodontium

Variables	Healthy periodontium (n = 9)	Diseased periodontium (n = 51)	p-value
Age (years) mean	33 ± 3.9	30.2 ± 5.5	0.128[a]
Age category (years), no of participants (%)			
18–20	0 (0.0)	2 (23.9)	
21–30	2 (22.2)	25 (49.0)	
31–40	7 (77.8)	24 (47.1)	

Notes: [a] t-test was applied. Normality assumption is fulfilled.

Table 2 The participants' ethnicity involved in the study

Ethnicity	No. of participants (%) n = 60
Malay	25 (41.7)
Iban	10 (16.7)
Chinese	14 (23.7)
Bidayuh	8 (13.3)
Punan	1 (1.7)
Kenyah	1 (1.7)
Kedayan	1 (1.7)

Table 3 The diagnosis of periodontal conditions among the participants

Diagnosis	Number of participants (%) n = 60
Healthy periodontium	9 (15.0)
Diseased periodontium	51 (85.0)
Gingivitis	22 (36.7)
Chronic periodontitis	29 (48.3)

Table 4 shows at baseline the full mouth plaque score (FMPS) for healthy and diseased periodontium participants were 33.5% and 46.4%, respectively. The full mouth bleeding score (FMBS) was 6.5% for healthy periodontium participants and 36.9% for participants with diseased periodontium. Therefore, the statistical analysis showed there were significant differences in FMBS scores between the healthy and diseased periodontium participants.

At the follow-up visit (after eight weeks), FMPS for healthy and diseased periodontium subjects were 24.1% and 18.6%, respectively. The FMBS was 5.4% in healthy periodontium participants and 16.6% in participants with diseased periodontium. Therefore, there were significant differences in FMBS between the healthy and diseased periodontium participants.

There were also statistically significant reductions in FMPS and FMBS for participants with healthy and diseased periodontium at the eighth week.

Healthy periodontium participants showed 100% of PPD at 1–3 mm. Meanwhile, for participants with diseased periodontium showed 87.5% PPD was at 1–3 mm, 12.2% of PPD at 4–5 mm, and 2.1% of PPD at 6–7 mm. Statistical analysis showed that there was a significant difference between the groups at baseline (Table 5).

At follow-up visit, participants with diseased periodontium showed 87.5% of PPD at 1–3 mm, 12.2% of PPD at 4–5 mm, and 0.3% of PPD at 6–7 mm. There was a significant reduction in PPD in participants with diseased periodontium after SRD.

Table 4 Full mouth plaque and bleeding score at baseline and eight weeks

Variables	Healthy periodontium ($n = 9$)	Diseased periodontium ($n = 51$)	p-value (intergroup)
Full mouth plaque score, FMPS % (mean ± SD)			
Baseline	33.5 ± 31.1	46.4 ± 30.1	0.234[a]
8 weeks	24.1 ± 17.7	18.6 ± 11.0	0.217[a]
p-value (intragroup)	**0.025**[b]	**0.001**[b]	
Full mouth bleeding score, FMBS% (mean±SD)			
Baseline	6.5 ± 3.9	36.9 ± 21.5	**0.001**[a]
8 weeks	5.4 ± 3.7	16.6 ± 9.7	**0.001**[a]
p-value (intragroup)	**0.016**[b]	**0.001**[b]	

Notes: [a] t-test was applied; [b] Paired t-test was applied. Normality assumption is fulfilled.

Table 5 PPD at baseline and eight weeks

PPD	Healthy periodontium ($n = 9$)	Diseased periodontium ($n = 51$)	p-value (intergroup)
Baseline			
% sites with PPD 1—3 mm	100.0%	73.9%	**0.004**[a]
% sites with PPD 4—5 mm	0.0%	24.7%	**0.004**[a]
% sites with PPD 6—7 mm	0.0%	2.1%	0.094[a]
8 weeks			
% sites with PPD 1—3 mm	100.0%	87.5%	0.063[a]
% sites with PPD 4—5 mm	0.0%	12.2%	0.059[a]
% sites with PPD 6—7 mm	0.0%	0.3%	0.442[a]
p-value (intragroup)		**0.001**[b]	

Notes: [a] t-test was applied; [b] Paired t-test was applied. Normality assumption is fulfilled.

DISCUSSION

The present study revealed that the prevalence of periodontal diseases was high among pregnant women in Kuching, Sarawak, at 85% with 36.7% diagnosed with gingivitis and 48.3% with periodontitis. The findings of this study are comparable to other studies (Vogt *et al*., 2012; Hess *et al*., 2017), which found prevalence rates of 47% and 48.6% for periodontitis, respectively. However, in contrast, Hess *et al*. (2017) found a lower prevalence of gingivitis at 24.3%. These discrepancies are most likely due to variations in measuring methods and periodontitis disease definitions. Hess *et al*. (2017) used Ramfjord's Periodontal Disease Index to classify periodontitis and gingivitis (Ramfjord, 1967). This index only assesses teeth and sites in part, which may lead to an underestimation of disease prevalence (Sheiham & Striffler, 1970).

Furthermore, the present study showed that periodontal treatment before 28 weeks of gestation in pregnant women, mainly in the diseased periodontium, resulted in a significant decrease in FMPS, FMBS and PPD. This is agreeable with other studies that periodontal treatment is safe and has substantially improved periodontal health after non-surgical periodontal therapy (Wimmer & Pihlstrom, 2008; Sharma *et al*., 2009; Al-Zahrani & AlGhamdi, 2012).

Previous studies have also reported that periodontal therapy, which reduces the bacterial load in the oral cavity, may reduce the incidence of preterm birth and low birth weight infants (Sharma *et al*., 2009; Corbella *et al*., 2012). However, several studies reported no effect of periodontal therapy on adverse pregnancy outcomes, but there was an improvement in periodontal health (Polyzos *et al*., 2010; Oliveira *et al*., 2011; Michalowicz *et al*., 2013).

Despite the inconsistent findings, early detection and treatment of periodontal diseases may minimise the adverse pregnancy outcome incidence. Oral health education and promotion are the best ways to prevent oral diseases and their consequences on pregnancy (Albert *et al.*, 2014). In the case of periodontal disease during pregnancy, periodic treatment of the patient should be focused more on controlling the disease, which might reduce the adverse pregnancy outcomes (Offenbacher *et al*., 2006; Radnai *et al*., 2006; Corbella *et al.*, 2012). Promoting early detection and treatment of periodontal disease in young women before and during pregnancy will benefit to mother's general health and the new-born infant. Furthermore, it might affect the health care cost spent on the mother and the new-born infant and also affect the emotional burden of the parents.

Study Limitations

The sample size was relatively small, which might cause the inability to detect significant differences in specific parameters, such as pregnancy outcomes and could lead to selection bias. The selected participants might not represent the general population, as they involved only an urban population in Kuching, Sarawak.

Recommendations for Future Study

It is recommended that future studies include multi-centre studies with a larger sample population and those subjects with other confounding factors for adverse pregnancy outcomes. Multiple regression analysis should be conducted to find out the strength of correlation of periodontal disease on adverse pregnancy outcomes compared to other confounding factors.

CONCLUSION

The results of this prospective interventional periodontal disease during pregnancy indicated that the prevalence of periodontal diseases in pregnant women is 85% in Kuching, Sarawak. The non-surgical periodontal therapy with intensive oral

hygiene education and motivation has improved the periodontal status of pregnant women in Kuching, Sarawak.

ACKNOWLEDGEMENTS

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