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DENTAL CARIES AND GINGIVITIS AMONG PREGNANT AND NON-PREGNANT WOMEN IN CHIANG MAI, THAILAND

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ABSTRACT

The aims of this study were to identify dental caries and gingivitis among pregnant women, and to compare it with those in non-pregnant women in Chiang Mai, Thailand. Data were collected from 197 women (94 pregnant and 103 non-pregnant) from June to August, 2008. Dental caries and gingivitis was defined clinically according to the World Health Organization (WHO) diagnostic criteria. Over 74.0% of pregnant women had caries, and 86.2% had gingivitis. There were significant differences between pregnant and non-pregnant women with regard to dental caries (p<0.001) and gingivitis (p=0.021). The pregnant women were 2.9 times more likely to suffer from dental caries (95% confidence intervals (CI), 1.6–5.4), and 2.2 times more (95% CI, 1.1–4.7) from gingivitis compared to non-pregnant women. Farmers (Odd ratio (OR), 7.0; 95% CI, 1.8–26.3), high school graduation (OR, 3.0; 95% CI, 1.2–7.3), and universal health insurance coverage (OR, 2.1; 95% CI, 1.0–4.3) were significant predictors for gingivitis. Only high school graduates were found to be significant predictors of dental caries with an OR of 2.8 (95% CI, 1.2–6.3). Poor oral hygiene (OR, 2.2; 95% CI, 0.8–6.5), lack of knowledge (OR, 2.0; 95% CI, 0.6–6.3), and poor oral hygiene habits (OR, 3.0; 95% CI, 1.1–8.6) were important risk factors for dental caries. Similarly, inadequate oral hygiene status (OR, 24.8; 95% CI, 5.5–112.2), and poor oral health habits (OR, 5.2; 95% CI, 1.1–25.2) were found to be significant risk factors for gingivitis among pregnant women indicating, that most women should be trained in proper oral hygiene practices. Community awareness programs should be conducted to increase women's awareness of such hygienic practices.

Key Words: Dental caries, Gingivitis, Pregnant women, Chiang Mai, Thailand

INTRODUCTION

Good oral health is important across a person's lifespan. Pregnancy is a particularly important time to promote oral health and healthy behavior, including education about the prevention of dental caries and gingivitis. Although decayed teeth and bleeding gums are seldom life-threatening, people suffering from these problems are comparable to those suffering from grave non-communicable diseases.[1)] Oral changes due to the complex physiologic alterations occurring in pregnancy are believed to be related to fluctuations in levels of estrogen and progesterone, leading

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to an increase in oral vasculature permeability and a decrease in host immunocompetence, thereby increasing susceptibility to oral infections.[2] Published studies have shown that the prevalence rates of gingivitis during pregnancy range between 30 and 100%.[3-9]

Although there is little evidence that pregnancy increases the risk of dental caries, some studies have suggested that changes in the oral environment during this period may predispose them to an increased incidence of this dental problem.[10] To date, however, no studies have explored whether the purported combination of oral changes thought to occur during pregnancy (including dietary changes) such as increased consumption of carbohydrates, increased acid in the mouth from vomiting, and reduced salivary production and/or increased acidity of saliva) combine to raise the risk of dental caries in pregnant women. However, evidence to the contrary shows that women's nutrition improves during pregnancy.[11]

On the other hand, reports from the Health Care Centers of Bangkok, Nakornsawan and Yala showed that the prevalence of gingivitis in pregnant women was 98.0%, 86.3% and 98.8%, respectively. The rates of those needing treatment for dental problems such as caries and gingivitis were 86.0%, 97.0%, and 94.8%, respectively.[12] There were approximately 17,000 pregnant women in Chiang Mai, Thailand in 2007. The annual report of the Chiang Mai Public Health Office has observed that 79.0% of the pregnant women went to an antenatal care (ANC) clinic, while only 45.2% visited the dental clinic.[13]

Despite efforts to improve the coverage of dental health care among pregnant women in Chiang Mai community hospitals, little data on the overall oral health of pregnant women in Chiang Mai and Thailand is available. Therefore, the aims of this study were to identify common dental problems, especially caries and gingivitis in pregnant women, and to compare them with those in non-pregnant women in Chiang Mai. The results generated from this study could lead to improvements in dental care programs for pregnant women in Thailand.

MATERIALS AND METHODS

Subjects

In total, 197 women (94 pregnant and 103 non-pregnant) were selected through a purposive sampling method. Pregnant women were selected from community hospitals, and non-pregnant women from communities in the same district of Chiang Mai. Women between 3 and 6 months pregnant were located from the hospital records. Non-pregnant women were sampled from the household list of the Chiang Mai Public Health Office. Data were collected from face-to-face interviews using a structured questionnaire. A mobile unit with a trained dental staff was used to conduct dental examinations of the respondents using a checklist. The aims of the study and assurances of confidentiality were explained to the respondents. Moreover, written informed consent was obtained from all subjects who agreed to take part in the study. Prior to a clinical examination, demographic information on such factors as age, education, occupation, and health insurance were obtained from the participants. Each examiner was trained by a senior examiner in a pilot study lasting one month.

Methods

Dental caries and gingivitis were defined according to the WHO criteria; 'newly developed cavity' (dental caries) and 'gingival bleeding on probing' (gingivitis). The level of dental health care knowledge among pregnant women was measured based on responses to 7 questions. Each correct answer was given one point. If correct answers came to more than 80% of the total score, those pregnant women were considered to possess high levels of knowledge, while those

who scored 80% or less were considered deficient.[14] Dental health care attitudes were also measured using 7 questions, each of which offered 3 choices: agree (3 points), undecided (2 points), disagree (1 point). The respondents were divided into two groups for positive attitude (percentile above 75) and negative attitude (percentile 75 or less). Dental health care behavior was measured by 3 questions about the frequency of dental health check ups and self care, each of which provided 3 answers: regular (3 points), sometimes (2 points), and rarely (1 point). The respondents were divided into two groups by their total score percentile: good behavior (percentile above 75), poor behavior (percentile 75 or less).

Statistical analysis

Percentages were examined using a Chi-square test. A logistical model was applied to calculate the odds ratio (OR) and 95% confidence interval (CI) of risk factors for dental caries and gingivitis. A p-value of <0.05 was considered statistically significant. Data were analyzed using the Statistical Package for Social Science (SPSS), software version 17.

RESULTS

Demographic characteristics by pregnancy status

The demographic characteristics of both pregnant and non-pregnant women are presented in Table 1. In the group aged 25–34 years, both pregnant and non-pregnant women had approximately similar numbers, which were regarded as not statistically significant. As for the occupational factor, almost half of the pregnant and non-pregnant women were office employees. Each occupational group showed almost similar numbers among both pregnant and non-pregnant groups. It was found that most of the women in those 2 groups had graduated from high school (44.7% and 43.7%, respectively), and that almost two-thirds had universal insurance coverage.

Table 1 Demographic characteristics by pregnancy status

Characteristics	Pregnant women (N = 94)		Non-pregnant women (N = 103)		p-value[a]
	Number	(%)	Number	(%)	
Age group (years)					
15–24	43	(45.7)	35	(34.0)	0.074
25–34	41	(43.6)	46	(44.7)	
35 and over	10	(10.6)	22	(21.4)	
Occupation					
Farming	21	(22.3)	26	(25.2)	0.655
Office employee	58	(61.7)	57	(55.3)	
Housewife	15	(16.0)	20	(19.4)	
Education					
Primary school	37	(39.4)	34	(33.0)	0.387
High school	42	(44.7)	45	(43.7)	
College and higher	15	(16.0)	24	(23.3)	
Health insurance					
Universal coverage	60	(63.8)	74	(71.8)	0.228
Others	34	(36.2)	29	(28.2)	

[a]p-value from a Chi-square test.

No differences were observed between pregnant and non-pregnant women with regard to socio-demographics characteristics such as age, occupation, education, and health insurance coverage.

Dental disease by pregnancy status

As shown in Table 2, pregnant women were more likely to have dental caries and gingivitis compared to non-pregnant women. Three-quarter of pregnant women had dental caries, while in the non-pregnant group the percentage of caries was around 50.0%. Moreover, it was found that 86.2% of pregnant women had gingivitis in comparison to 72.8% among non-pregnant women. Thus, significant differences were revealed between pregnant and non-pregnant women with regard to both dental caries and gingivitis.

Predictors of dental caries and gingivitis among pregnant and non-pregnant women

Predictors of dental caries and gingivitis based on logistic regression analyses are shown in Table 3. After adjustments for age, we found that pregnant women were 2.9 times more likely to suffer from dental caries (95% CI, 1.6–5.4, p=0.001). Although we found no significant predictors for gingivitis among the 2 groups of women, pregnant women were 2.2 times more likely to suffer from gingivitis than non-pregnant women (95% CI, 1.1–4.7, p=0.320) after adjusting for age. Farmers were seven times more likely to suffer from gingivitis compared with the housewife group (95% CI, 1.8–26.3, p=0.004). As for educational status, those whose education was limited to primary school were 2.8 more likely to suffer from gingivitis compared with those attending college and beyond (95% CI, 1.1–6.9, p=0.030). However, as for factors of age and health insurance, neither were found to be significant predictors of dental caries or gingivitis.

Associations between dental caries and other factors among pregnant women

Table 4 shows the relationship of dental caries with oral hygiene status, dental health care knowledge, attitude, and behavior among pregnant women. Although, there was no significant difference in caries between the poor and good oral hygiene groups, pregnant women with poor oral hygiene were 2.2 times (95% CI, 0.8–6.5) more likely to have caries compared with those in the good oral hygiene group. We found that pregnant women with inadequate knowledge of dental health care were 2.0 times (95% CI, 0.6–6.3) more likely to have caries compared with the knowledgeable group. Though most pregnant women displayed a good dental health care attitude, we could find no significant difference in caries between pregnant women with either a poor or good attitude. However, pregnant women who scored low on dental health care practice were 3 times (95% CI, 1.1–8.6) more at risk of caries than those practicing good dental health care (p=0.037).

Table 2 Dental diseases by pregnancy status

Dental diseases	Pregnant women (N = 94)		Non-pregnant women (N = 103)		p-value[a]
	Number	(%)	Number	(%)	
Caries					
Yes	70	(74.5)	51	(49.5)	< 0.001
No	24	(25.5)	52	(50.5)	
Gingivitis					
Yes	81	(86.2)	75	(72.8)	0.021
No	13	(13.8)	28	(27.2)	

[a]p-value from a Chi-square test.

Table 3 Predictors of dental caries and gingivitis among sampled women

Predictors	Dental caries			Gingivitis		
	OR[a]	(95% CI)[b]	*p*-value	OR	(95% CI)	*p*-value
Pregnancy status						
Non-pregnant women	1	Reference		1	Reference	
Pregnant women	2.9	(1.6–5.4)	0.001	2.2	(1.1–4.7)	0.32
Age group (years)						
>25	1	Reference		1	Reference	
≤25	1.0	(0.5–1.9)	0.992	1.5	(0.7–3.0)	0.311
Occupation						
Housewife	1	Reference		1	Reference	
Farmer	1.7	(0.7–4.5)	0.276	7.0	(1.8–26.3)	0.004
Office employee	1.3	(0.6–3.0)	0.517	2.0	(0.8–5.0)	0.147
Education						
College and higher	1	Reference		1	Reference	
Primary school	1.6	(0.7–3.6)	0.296	2.8	(1.1–6.9)	0.030
High school	2.8	(1.2–6.3)	0.016	3.0	(1.2–7.3)	0.018
Health insurance						
Other	1	Reference		1	Reference	
Universal coverage	1.2	(0.6–2.3)	0.571	2.1	(1.0–4.3)	0.062

[a]OR: Odds ratio; ORs were adjusted for age in pregnancy status, and for age and pregnancy status in other variables.
[b]95% CI: 95% confidence interval.

Table 4 Associations of dental caries with oral hygiene status, dental care knowledge, attitude, and behavior among pregnant women

Factors	Caries		No caries		OR[a]	(95% CI)[b]	*p*-value
	Number	(%)	Number	(%)			
Oral hygiene status							
Good	13	(18.6)	8	(33.3)	1	Reference	
Poor	57	(81.4)	16	(66.7)	2.2	(0.8–6.5)	0.139
Knowledge							
Good	10	(14.3)	6	(25.0)	1	Reference	
Poor	60	(85.7)	18	(75.0)	2.0	(0.6–6.3)	0.237
Attitude							
Good	58	(82.9)	21	(87.5)	1	Reference	
Poor	12	(17.1)	3	(12.5)	1.5	(0.4–5.7)	0.593
Behavior							
Good	35	(50.0)	18	(75.0)	1	Reference	
Poor	35	(50.0)	6	(25.0)	3.0	(1.1–8.6)	0.037

[a]OR: Odds ratio; ORs were adjusted for age in pregnancy status, and for age and pregnancy status in other variables.
[b]95% CI: 95% confidence interval.

Associations between gingivitis and other factors among pregnant women

Table 5 shows the relationship of gingivitis with oral hygiene status, dental health care knowledge, attitude, and behavior among pregnant women. Those with inadequate dental health care knowledge were 1.5 times (95% CI, 0.4–6.4) more likely to have gingivitis compared with

Table 5 Associations of gingivitis with oral hygiene status, dental care knowledge, attitude, and behavior among pregnant women

Factors	Gingivitis		No gingivitis		OR[a]	(95% CI)[b]	*p*-value
	Number	(%)	Number	(%)			
Oral hygiene status							
Good	11	(13.6)	10	(76.9)	1	Reference	
Poor	70	(86.4)	3	(23.1)	24.8	(5.5–112.2)	<0.001
Knowledge							
Good	13	(16.0)	3	(23.1)	1	Reference	
Poor	68	(84.0)	10	(76.9)	1.5	(0.4–6.4)	0.552
Attitude							
Good	68	(84.0)	11	(84.6)	1	Reference	
Poor	13	(16.0)	2	(15.4)	1.1	(0.2–5.3)	0.948
Behavior							
Good	42	(51.9)	11	(84.6)	1	Reference	
Poor	39	(48.1)	2	(15.4)	5.2	(1.1–25.2)	0.039

[a]OR: Odds ratio; ORs were adjusted for age in pregnancy status, and for age and pregnancy status in other variables.
[b]95% CI: 95% confidence interval.

the knowledgeable group, although the disparity was not significant. Those with poor oral hygiene were 24.8 times (95% CI, 5.5–112.2) more likely to have gingivitis than those practicing good oral hygiene. There was also a significant difference between pregnant women who exhibited poor health care habits and those in the good dental health care behavior group (p=0.039).

DISCUSSION

The present study revealed that the rates of caries and gingivitis were significantly higher in pregnant than in non-pregnant women. These findings were consistent with those of other studies.[3,15,20] Such dental diseases might be due to an altered immune response or be related to stress and anxiety during pregnancy, resulting in inadequate attention to oral hygiene and contributing to the deterioration in a woman's oral condition.[15] Furthermore, hormonal imbalances have long been reported to be associated with changes in oral health during pregnancy.

Gingival changes during pregnancy have also been well-documented in one Western study.[16] Increases in the rate of both estrogen metabolism by the gingiva and in the synthesis of prostaglandins were found to contribute to the gingival changes observed during pregnancy.[17] Alterations in progesterone and estrogen levels have been shown to affect the immune system and both the rate and pattern of collagen production in the gingiva. Both of these conditions reduce the body's ability to repair and maintain gingival tissues.[18,19] It has been noted that the clinical signs of diseases seen during pregnancy include redness, swelling, and bleeding from the gingiva. There is also a marked increase in estrogen and progesterone levels during pregnancy. Such findings suggest the existence of a relationship which is in agreement with those of many reports in the literature.[3,5,6,20]

Our finding that the prevalence of dental caries was higher in pregnant than in non- pregnant women is in agreement with that of many other studies.[21,22] Kornman and Loeshe reported that one-quarter of the women of reproductive age had dental caries, a disease in which dietary

carbohydrate is fermented by oral bacteria into acid that de-mineralizes enamel.[6] Pregnant women are at a higher risk of tooth decay for several reasons, including increased acidity in the oral cavity, sugary dietary cravings, and inadequate attention to oral health; They are urged to decrease their risk of caries by brushing twice daily with a fluoride toothpaste and avoiding such foods.[23] Patients with untreated caries and associated complications should be referred to a dentist for definitive treatment.[24]

The results of the present study revealed an association between socio-economic factors such as occupation and education, and dental caries and gingivitis. Our results also showed a higher prevalence of gingivitis among those who were farmers and those who had graduated from primary school, which is in agreement with the findings of other studies.[15,25,26] It has been reported that unemployment was significantly associated with increased gingival inflammation.[15] Low socio-economic status reportedly suggested inaccessibility to dental clinics and an unawareness of oral hygiene.[25] A lower level of education was found to be significantly associated with increased gingivitis.[26]

Most of the pregnant women in this current study had poor oral hygiene, as well as an inadequate knowledge and practice of dental health care. We found that habits of poor oral hygiene and dental health care behavior correlated with the risks of gingivitis. Since mothers play a crucial role in demonstrating and passing on proper health habits to their children, pregnant women should be regarded as a prime target group for oral health education.[27]

However, most of the pregnant women in Chiang Mai were completely unaware of the importance of dental heath care.[13] Several myths about the possible causes of dental diseases are common among the women of Chiang Mai. Many of them, for example, believe that dental caries readily occur because of an extensive loss of calcium during pregnancy and childbirth. Even though dental heath care services are covered by health insurance, these women encounter several other obstacles that discourage them from visiting dental hospitals. In some districts of Chiang Mai it takes more than an hour to reach the nearest hospital, which may be one of several reasons inhibiting women from visiting a dental clinic a second time.

In conclusion, dental caries and gingivitis were more prevalent among pregnant than non-pregnant women. Those with a poor oral hygiene status, inadequate knowledge of dental health care, and poor dental hygiene practice were two to three times more at risk of developing those dental diseases. Therefore, women should be offered training in good oral hygiene habits, and community awareness programs should be conducted to increase their awareness of the crucial importance of such habits.

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