

PREVENTION OF ORAL HEALTH DISEASE: KNOWLEDGE AND PRACTICES AMONG PREGNANT WOMEN IN KUANTAN, MALAYSIA

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ABSTRACT

Background: Oral disease in association of pregnancy outcome has been long researched. Most pregnant women perceived that oral disease in pregnancy are expected and considered to be normal. **Objective:** This study aims to evaluate the knowledge of pregnant women and their practices towards oral disease. **Methods:** 296 pregnant mothers were recruited from government clinics in Kuantan, Malaysia. A validated and self-administered questionnaire assessing knowledge, attitudes and practices towards oral health was used. Results were analysed by descriptive analysis, chi square test and multiple logistic regression. **Results:** Most respondents showed poor knowledge on oral health problem with its pregnancy outcome (66.6%) and poor attitude about dental health during pregnancy (53.4%). Half of them had good practice on oral health. Tooth cavity (46.3%) and gum bleeding (29.4%) were the commonest problem reported by them. Only one third of the mothers utilize dental service. Higher level of education was associated with better oral health practice [OR:0.02 CI (1.12,3.92)] **Conclusions:** Knowledge on the relationship between oral health and pregnancy outcome is still low among pregnant mothers. Utilization of dental service was also low. High level of education is proven to give better oral health care.

Keywords: Knowledge, practice, oral health, pregnant, Malaysia

INTRODUCTION

Oral health care among pregnant women has always been an important public health issue. It is estimated that oral diseases affect 3.58 billion people worldwide including pregnant women whereby dental carries being the most common oral health problem detected (World Health Organisation. 2018)).

Multiple factors have been postulated to affect oral health in pregnancy (Anil, Alrowis, Chalisserry, Chalissery, Al-Moharib, 2015). Increased levels of circulating progesterone as part of hormonal changes that occur in pregnancy have been attributed to oral health problem among pregnant women. In addition, neglected oral hygiene during pregnancy has also been indicated as the cause for oral health problem (Madiah, Azis, & Abidin, 2016). It is hypothesized that since pregnant women are more susceptible to infections including oral infection along with the hormonal changes that happens, the gingiva is more sensitive to the pathogenic bacteria that is found in dental biofilms (Barak, Oettinger-Barak, Machtei, Sprecher, 2007).

The most common oral health problems reported among pregnant women are periodontal disease and gingivitis (Keirse, Plutzer & Le, 2010; Rakchanok, Amporn, Yoshida, Harun-Or-Rashid, & Sakamoto, 2010). A study done in Thailand showed 86% of pregnant women suffered

from gingivitis while a study in Sri Lanka reported that dental caries were prevalence about 60% of pregnant women (Karunachandra, Perera, & Fernando, 2012; Rakchanok et al., 2010)

The interaction between oral health disease and pregnancy outcome has long been an interest. Studies have shown that gingivitis and periodontal disease have been associated with adverse pregnancy outcome such as prematurity, low birth weight and pre-eclampsia (Bogges, Lieff, Murtha, Moss, Beck 2003; Canakci, Canakci, Yildirim, Ingec, Eltas, 2007). A study done by Canakchi et al. (2007) found that women with pre-eclampsia were more likely to have periodontal disease and periodontal disease affects the severity of pre-eclampsia

Interventional studies have shown that periodontal treatment to women with periodontal disease during pregnancy reduces the incidence of preterm birth and low birth weight (Lopez, Da Silva, Ipinza, 2005). A study done by Tarannum et al. (2007) showed pregnant women who received plaque scaling and plaque control instructions had reduced risk of pre-term birth and low birth weight.

Good oral hygiene practices apart from adequate nutrition and healthy lifestyle play an important role in the general well-being of pregnant women (Anil, Alrowis, Chalisserry, Chalissery, 2015). Therefore, women should routinely be kept posted about the maintenance of good oral health care throughout their life especially during pregnancy. This will minimize the risk of transmission of disease from mother to the baby.

Even though oral health knowledge has been explored among pregnant women worldwide, there is limited data that synthesises the oral health knowledge, attitude and practice as well as the specific challenges that affect pregnant women of local setting. Thus, this study aimed to assess the pregnant women's knowledge, attitude and practice towards oral health in Kuantan. Collecting such information is crucial in view to provide valuable insight on the needs of pregnant women for oral care and to develop alternative model of care involving health professionals. This will also help to improve the lacking of dental education and awareness during antenatal care.

METHODS

Study design and setting

This was a cross sectional questionnaire-based study conducted among pregnant women in nine government maternity and child health clinics from June to September 2016 in Kuantan, Pahang, Malaysia. All pregnant women were screened for eligibility and were invited to participate in the study. The inclusion criteria for this study were Malaysian aged more than 18 years old and literate. The exclusion criteria were pregnant women with medical disorders or mental disorders.

Study sample

Sample size was calculated using Open Epi software. Based on the calculation of 95% confidence interval and non-response rate, a sample size of 330 respondents was required. Respondents were selected through convenience sampling. Informed written consent was obtained from eligible respondents with prior explanation of the study and relevant procedures involved.

Study Instruments

A self- administered questionnaire was used to collect data which consisted of four sections; demographic characteristic, questions related to knowledge on oral health and pregnancy, questions related to attitude and practice related to oral health care during pregnancy. An adapted and validated questionnaire from Hiroshima University Dental Behaviour inventory (HUDBI) which has a Cronbach alpha of 0.7 was used to assess attitude and practice.

For knowledge section, respondents were asked to rate their answer from 'yes, no and not sure'. For attitude and practice towards oral health care, respondents were asked to rate their answer using a 5-point Likert scale ranging from 1 (strongly disagree) to 5 strongly agree based on the positive or negative statement. The authors counted all responses to knowledge, attitude and practice and calculated the percentages of that the respondents who answered correctly. The authors also excluded non-responses from the analysis; and considered questions answered with 'not sure' to be incorrect. The scores were then summed up and categorized to good and poor for each component of knowledge, attitude and practice.

Ethical Issues

This study was approved by the Research and Ethical Committee of researchers' institution (IREC 569) and the Medical Research and Ethics Committee (NMRR-15-2206-28605). All respondents had given their written consent. Those who refused to participate received similar standard care of treatment as those who agreed to participate.

Data Analysis

Data was entered into SPSS (Statistical Package for Social Sciences) version 20.0 (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp) and was analysed descriptively in frequency and percentage for knowledge on oral health in pregnancy, attitude and practices on oral health care in pregnancy. Multivariate logistic regression was used to identify factors associated with knowledge, attitude and practice among pregnant women towards oral health. Confidence interval was set at 95% and *p*-value of less than 0.05 was considered as significant.

RESULTS

A total of 330 questionnaires were distributed to but only 296 were returned and completed, giving a response rate of 89.7%. The variables for socio-demographic profile are illustrated in Table 1. The mean age of respondents is 28.7 years, most of them were married (287, 97%), had tertiary education (156, 52.7%) and half of them (51.4%) were employed.

Table 1: Socio-demographic characteristics of respondents

Variables	Frequency (%)
Age	*28.78 (4.97)
Monthly Household Income (RM)	#2500 (2000)
Gestation	2 (2)
Race	
Malay	272(91.9)
Chinese	16(5.4)
Indian	2(0.7)
Others	6(2.0)
Marital status	
Single	7(2.4)
Married	287(97.6)
Highest Education Level	
Primary school	5(1.7)
Lower secondary school	32(10.8)
Higher secondary school	103(34.8)
Tertiary education	156(52.7)
Medical Illness	
Yes	35(11.8)
No	256(86.5)
Working	152(51.4)
Not working	141(47.6)
*mean (SD)	
#median (IQR)	

The Figure 1 describes the common oral health problems that were reported by the respondents. Tooth cavity is the commonest (46.3%) followed by gum bleeding (29.4%) and bad breath (24.3%). Other oral health problems are also reported such as tooth ache (15.4%), swollen gum (8.9%), loose teeth (0.9%) and gum abscess (0.5%).

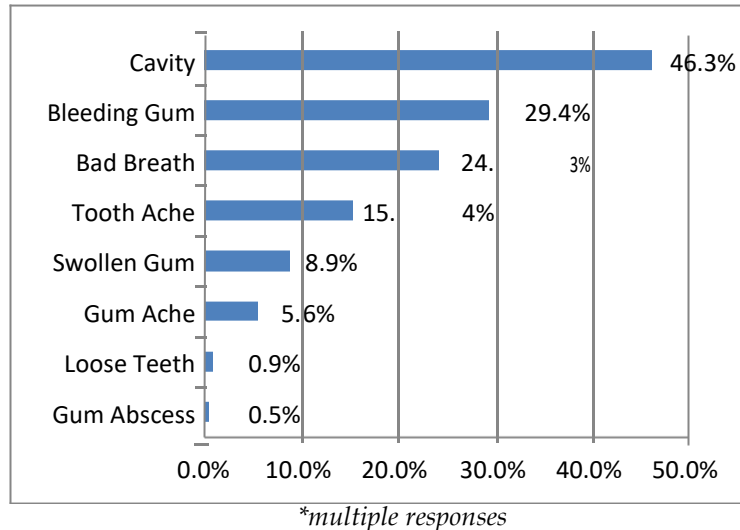


Figure 1: Perceived oral health problems among pregnant mother attending government health clinic in Kuantan District, Pahang.

Knowledge on oral health during pregnancy

Table 2 shows that half of respondents (51.7%) knew that dental carries are common in pregnancy while less than half of them (40.9%) knew that gum disease are also common in pregnancy. Majority of respondents (79.4%) were not aware that gum diseases in pregnancy are associated with foetal morbidity. Most respondents were aware that the dental service in pregnancy is provided for free (70.9%). The mean score for knowledge was 2, attitude was 47 and practice was 42. Out of 296, only 99 (33.4%) had good knowledge and 148 (46.6%) showed good attitude. However, more than half of the respondents 157 (53.0%) had good practice towards dental health.

Table 2. Proportion of responses on knowledge regarding oral health in pregnancy

Item	Respondents' Response	
	Yes Frequency (%)	No Frequency (%)
Do you know that dental carries are common during pregnancy?	153 (51.7)	143(48.3)
Do you know that gum diseases are common during pregnancy?	121 (40.9)	175(59.1)
Do you know about the relationship between the mother's gum problems and the risk of pre-mature and underweight babies?	61 (20.6)	235(79.4)
Do you know that dental treatment in all government clinics are free during pregnancy?	210 (70.9)	86(29.1)

Attitude and Practice towards oral health during pregnancy

The Table 3 shows the responses of respondents toward oral health attitude and health care practice. Majority of them agreed that they do not worry much seeing the dentist (72.3%). Half of the respondents noticed gum bleeding while brushing their teeth (58.8%) while nearly half of them noticed sticky deposits on their teeth (47.3%). Majority of the respondents agreed that they can brush their teeth without using toothpaste (93.9%) and avoid gum disease by brushing alone (82.1%). Majority of respondents disagreed on never been taught professionally to brush their teeth. Most of them brushed their teeth twice a day (88.2%), used fluoridated toothpaste (69.9%) and do not used hard bristle toothbrush (73.6%).

Table 3: Respondent’s response on attitude and practice towards oral health during pregnancy

Items	Agree Frequency (%)	Disagree Frequency (%)
1.I don’t worry much about visiting the dentist	214* (72.3)	80(27)
2.My gums tend to bleed when I brush my teeth	174(58.8)	122 (41.2)
3.I worry about colour of my teeth	71 (24.0)	225 (76.0)
4.I have noticed some white sticky deposits on my teeth	140 (47.3)	156 (52.7)
5.I think that I cannot help having false teeth when I am old	236(79.7)	60 (20.3)
6.I am bothered by the colour of my gums	168 (56.8)	128 (43.2)
7.I think my teeth are getting worse despite my daily brushing	253(85.5)	43 (14.5)
8.I think I can clean my teeth without using toothpaste	278(93.9)	18 (6.1)
9.I worry about having bad breath	32 (10.8)	264 (89.2)
10.It is impossible to prevent gum disease with tooth brushing alone	53 (17.9)	243 (82.1)
11.I don’t feel I’ve brushed well unless I brush with strong strokes	169(57.1)	127 (42.9)
12.I feel I sometimes take too much time to brush my teeth	198(66.9)	98 (33.1)
13.I have had my dentist tell me that I brush very well	108 (36.5)	188 (63.5)
14.I am satisfied with the appearance of my teeth	96 (32.4)	200 (67.6)
15.I put off going to the dentist until I have a toothache	75(25.3)	221 (74.1)
16.I use a child-sized toothbrush	19(6.4)	277 (93.6)
17.I brush each of my teeth carefully	227 (76.7)	69 (23.3)
18.I have never been professionally taught how to brush	73(24.7)	223 (75.3)
19.I often check my teeth in a mirror after brushing	218 (73.6)	78 (26.4)
20.I have used a dye to see how clean my teeth are	10 (3.4)	286 (96.6)
21.I brush my teeth twice daily or more	261 (88.2)	35 (11.8)
22.I use mouthwash on regular basis	75 (25.3)	221 (74.7)
23.I smoke cigarettes	11(3.7)	285 (96.3)
24.I use a toothbrush which has hard bristles	78(26.4)	218 (73.6)
25.I use a fluoridated toothpaste	207 (69.9)	89 (30.1)

*missing data

bold- correct responses for the items

Of 296 respondents, more than half of them (66.6%) did not visit the dentist during this current pregnancy. The most common reason for visiting a dentist was routine dental check-ups (37.2%) followed by dental problems (31.8%).

Table 4 shows the predictors of good knowledge, attitude and practice toward oral health during pregnancy. Respondents with higher level of education are two times more likely to have good practice towards oral health compared to lower level of education (p=0.02). However, the authors found no significant association with age, race, gestation, monthly household income and occupational status.

Table 4: Factors associated with knowledge, attitude and practice among respondents.

	Knowledge			Attitude			Practice		
	aOR	(95%CI)	P value	aOR	(95%CI)	P value	aOR	(95%CI)	P value
Age	1.04	(0.96,1.13)	0.318	0.99	(0.91,1.07)	0.708	1.01	(0.93,1.09)	0.856
Race									
Malay	1.54	(0.49,4.79)	0.460	0.51	(0.15,1.70)	0.270	0.34	(0.10,1.19)	0.091
Non-Malay	1			1			1		
Gestation	0.94	(0.73,1.22)	0.629	0.88	(0.68,1.15)	0.344	0.92	(0.70,1.20)	0.528
Monthly Household Income (RM)	1.00	(1.00,1.00)	0.143	1.00	(1.00,1.00)	0.354	1.00	(1.00,1.00)	0.143
Education Level									
Secondary education and Below	1.53	(0.80,2.89)	0.196	1.37	(0.73,2.56)	0.324	2.10	(1.12,3.92)	0.020
Higher education	1			1			1		
Occupation Status									
Working	0.86	(0.45,1.64)	0.639	1.04	(0.56,1.94)	0.900	1.18	(0.63,2.22)	0.611
Not Working	1			1			1		

DISCUSSION

This study showed that the knowledge on oral health disease and its adverse pregnancy outcome is poor among the respondents. This is consistent with other studies whereby a study done in Saudi Arabia showed 91% of the population studied did not know that oral disease is associated with pre-term birth (Al-Swuailem, 2015). On the contrary, a study done by Al Habashnesh et al. in Iowa USA revealed that half of their pregnant mothers (57%) were not aware of gum disease is associated with pregnancy outcome (Al Habashneh, Guthmiller, Levy, Johnson, Squier, 2005). This present study reflects that the pregnant mothers in our population are still lacking knowledge regarding oral disease and pregnancy outcome. This probably because we do not emphasize much on oral health education program during routine antenatal visits. Much joint effort from healthcare providers and society is needed to improve the knowledge during antenatal care.

Most of the respondents were aware that dental care is available for free of charge but interestingly only a third of them uses the service during this current pregnancy. The findings were almost similar found by Saddki et al., George et al. and Thomas et al. where only 29% and 30% utilized the free dental service respectively (George et al., 2013; Saddki, Yusoff, & Hwang, 2010; Thomas, Middleton, 2008). On the contrary, a study done in Brunei showed

more than half (55.9%) of their pregnant women visited a dentist which is almost similar to a study done in Iowa USA about 49% (Bamanikar & Kok Kee, 2013) (Al Habashneh, Guthmiller, Levy, Johnson, Squier 2005) . This could probably be because most respondents thought that dental care is not important during pregnancy and the possibility of time limitation to visit the dentist. Healthcare providers should encourage pregnant women to visit their dentist as oral health care is safe and important throughout pregnancy.

The commonest oral health problems reported by the respondents are tooth cavity followed by gum bleeding. This result is similar to a study done by Saddki et al. (2010). A study in Australia showed that bleeding gum (60%) was the commonest reported oral problem followed by tooth cavity (41.5%) and toothache (16.9%) (George et al., 2013). This indicates that oral diseases are common during pregnancy where it is often neglected by pregnant mothers to visit dental services for treatment. Studies have shown many women with dental symptoms did not seek treatment or postponed treatment after delivery (Keirse, & Plutzer &, 2010; Vamos,, Merrell,, Livingston,, Dias,, Detman,, Louis,, & Daley, 2019). Pregnant women should be reassured that dental treatment including x-rays and medication are safe during pregnancy.

Good attitude or oral habits and practice are important in achieving good oral health. This study reflects that most respondents did not fear visiting the dentist. This could be possibly explained that most respondents have experienced seeing a dentist during the school periodic dental examination program that has been implemented in government schools in Malaysia since 1970 which is similar to Saddki et al. findings (Saddki et al., 2010). Fear seeing the dentist is cited as one of the barriers to utilization of dental service during pregnancy (Bahramian, Mohebbi, Khami, & Quinonez, 2018) .

Moreover, majority of the respondents agreed with the statement that they might need to use denture when they grew old. This indicates that probably these respondents might not be receiving the right information regarding oral health and pregnancy. In a qualitative study done by Bahramian et al. (2018), they that there are mothers who have false belief where they thought losing a tooth is expected with each pregnancy. In addition, good oral practice and hygiene might not be practiced fully by these respondents. This is reflected by many of them agreed that brushing alone could prevent gum disease and cleaning their teeth without using toothpaste. Hence, oral health education should be an integral part during antenatal care and re-emphasized during each pregnancy.

Regarding practice towards oral care, this current study revealed most respondents agreed that they brush their teeth more than twice a day and used fluoridated toothpaste. This finding is similar in a study done in Pakistan where almost all of the studied mothers brushed their teeth twice a day (Sukkarwalla, Tanwir, & Khan, 2015). The American College of Obstetrics and Gynaecology (ACOG) also recommends brushing teeth using fluoridated toothpaste in order to prevent dental carries (American College of Obstetrics and Gynaecology, 2013)

Our study also revealed that most of the respondents disagreed that they used hard bristled toothbrush. This could possibly be explained that due to physiological changes during pregnancy, the gum is more sensitive and is easily to bleed, thus pregnant mothers are more likely to choose soft to medium bristled toothbrush. A study done in Sudan found that using a medium bristled toothbrush compared to soft and hard bristled toothbrush is better in removing plaque (Khalil, 2017). However, most dentists recommend using soft bristle toothbrush since it is less irritating to the gums and does not damage the tooth enamel.

Our study also found that high education level is associated with good oral practice, which is similar to a study done by Afshar et al. (2017) . These findings may be explained by the fact that with good education level, pregnant mothers have more access to better source of knowledge and better utilization of dental service.

LIMITATIONS

A few factors may limit the generalization of the findings in this study. This study was conducted in government health clinics thus the findings may not reflect pregnant women attending private dental clinics. A thorough dental examination should have been done in order to find the agreement between the perceived oral health problem and actual dental problem. In spite of its limitation, this has added to our understanding regarding the knowledge as well as practice of pregnant mothers towards oral health during pregnancy.

CONCLUSION

This study has shown that the knowledge regarding oral disease and adverse pregnancy outcome is still poor among pregnant mothers despite good practice towards oral health care. It also highlights the poor attendance of antenatal mothers to dental service despite them having symptoms of tooth and oral disease. This issue needs to be addressed by strengthening the front-liners in healthcare in being creative to disseminate oral care knowledge to antenatal mothers. This will ensure better adherence to dental follow up since oral health program for antenatal mother has been implemented in 1990 (Ministry of Health, 2004). Further studies need to be done in order to validate the pregnant mothers' ideas, concern and expectation towards dental health. Nevertheless, barriers from healthcare professionals such as doctors and midwives are also important to improve the system.

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CONFLICT OF INTEREST

None to declare

REFERENCES

Afshar SAK, Hakimehoseynrezaei, Najmi F, M. (2017). Self-reported oral health behavior among pregnant women (Kerman, Iran). *IOSR Journal of Dental Medical Sciences*, 16, 85– 88.

Al-Swuailem, A. S. (2015). Knowledge of periodontal disease in expecting mothers and its association with utilization of dental services in Riyadh, Saudi Arabia. *Pakistan Oral & Dental Journal*, 35(2).

Al Habashneh R, Guthmiller JM, Levy S, Johnson GK, Squier C, D. D. (2005). Factors related to utilization of dental services during pregnancy. *J Clin Periodontol*, 32, 815–821.

American College of Obstetrics and Gynaecology. (2013). Committee Opinion: Oral Health Care during pregnancy and through the life span. Retrieved from <https://www.acog.org/Clinical-Guidance-and-Publications/Committee-Opinions/Committee-on-Health-Care-for-Underserved-Women/Oral-Health-Care-During-Pregnancy-and-Through-the-Lifespan?IsMobileSet=false>

- Anil S, Alrowis RM, Chalisserry EP, Chalissery VP, Al-Moharib HS, A. -S. A. (2015). Oral health and adverse pregnancy outcomes. *Emerging Trends in Oral Health Sciences and Dentistry. INTECH (Intechopen.Com)*, 631–662.
- Bahramian, H., Mohebbi, S. Z., Khami, M. R., & Quinonez, R. B. (2018). *Qualitative exploration of barriers and facilitators of dental service utilization of pregnant women : A triangulation approach*. 1-11.
- Bamanikar, S., & Kok Kee, L. (2013). Knowledge, attitude and practice of oral and dental healthcare in pregnant women. *Oman Medical Journal*, 28(4), 288–291. <https://doi.org/10.5001/omj.2013.80>
- Barak S, Oettinger-Barak O, Machtei EE, Sprecher H, O. G. (2007). Evidence of periopathogenic microorganisms in placentas of women with preeclampsia. *Journal of Periodontology* 78:670-676., 78, 670–676.
- Bogges KA, Lief S, Murtha AP, Moss K, Beck J, O. S. (2003). Bogges KA, Lief S, Murtha AP, Moss K, Beck J, Offenbacher S. *Obstetrics and Gynecology* 1, 101(15), 227–231.
- Canakci V, Canakci CF, Yildirim A, Ingec M, Eltas A, E. A. (2007). Periodontal disease increases the risk of severe pre-eclampsia among pregnant women. *Journal of Clinical Periodontology*, 34, 639–645.
- George, A., Johnson, M., Blinkhorn, A., Ajwani, S., Bhole, S., Yeo, A. E., & Ellis, S. (2013). *The oral health status , practices and knowledge of pregnant women in south-western Sydney*. 26–33. <https://doi.org/10.1111/adj.12024>
- Karunachandra, N. N., Perera, I. R., & Fernando, G. (2012). *Oral health status during pregnancy : rural – urban comparisons of oral disease burden among antenatal women in Sri Lanka*. 1–11.
- Keirse, M. & Plutzer, K. (2010)., & Le. (2010). Women's attitudes to and perceptions of oral health and dental care during pregnancy. *J Perinat Med*, 38(1), 3-8.
- Khalil, W. A. (2017). *Comparing Effectiveness of Soft , Medium and Hard Bristle Tooth Brushes on Oral Hygiene*. 6(7), 1897–1901. <https://doi.org/10.21275/ART20175619>
- Lopez NJ, Da Silva I, Ipinza J, G. J. (2005). Periodontal therapy reduces the rate of preterm low birth weight in women with pregnancy-associated gingivitis. *L Journal of Periodontology* 76:2144-2153, 76, 2144–2153.
- Madiah, N., Azis, N., & Abidin, K. Z. (2016). Original article knowledge, attitudes and practice behaviours of healthcare professionals on association between periodontal disease and preterm and / or low birth weight infants: a malaysian study. *Malaysian Journal of Public Health Medicine*, 16(1), 45–52.
- Ministry of Health, O. H. D. (2004). *Oral Healthcare for Antenatal Mothers* (Vol. 2004). Retrieved from ohd.moh.gov.my
- Rakchanok, N., Amporn, D., Yoshida, Y., Harun-Or-Rashid, M., & Sakamoto, J. (2010). Dental caries and gingivitis among pregnant and non-pregnant women in Chiang Mai, Thailand. *Nagoya Journal of Medical Science*, 72(1-2), 43–50.
- Saddki, N., Yusoff, A., & Hwang, Y. L. (2010). Factors associated with dental visit and barriers to utilisation of oral health care services in a sample of antenatal mothers in

Hospital Universiti Sains Malaysia. *BMC Public Health*, 10, 75. <https://doi.org/1471-2458-10-75> [pii]\r10.1186/1471-2458-10-75

Sukkarwalla, A., Tanwir, F., & Khan, S. (2015). Assessment of knowledge, attitude and behavior of pregnant women in Pakistan towards oral hygiene - A cross-sectional study. *SMU Medical Journal*, 1604(2), 50-66.

Sukumaran Anil, Raed M. Alrowis, Elna P. Chalisserry, Vemina P. Chalissery, H. S. A. and A. F. A. -S. (2015). Oral Health and Adverse Pregnancy Outcomes. In *Emerging Trends in Oral Health Sciences and Dentistry* (pp. 631-662). <https://doi.org/10.13140/2.1.5009.7448>

Tarannum F, F. M. (2007). Effect of periodontal therapy on pregnancy out- come in women affected by periodontitis. *Journal of Periodontology* 78:2095-2103. [121], 78(121), 2095-2103.

Thomas NJ, Middleton PF, C. C. (2008). Oral and dental health care practices in pregnant women in Australia: a postnatal survey. *BMC Pregnancy Childbirth*, 8(13).

Vamos, C. A., Merrell, L., Livingston, T. A., Dias, E., Detman, L., Louis, J., & Daley, E. (2019). "I Didn't Know": Pregnant Women's Oral Health Literacy Experiences and Future Intervention Preferences. *Women's Health Issues.*, 1-7.

World Health Organisation. Fact sheet:Oral health. (2018).