

Title: Periodontal status of women receiving antenatal care and its association with their oral health-related behavior and quality of life: A Cross-sectional study

Sarmad Saif^{1,2}, Siti Lailatul Akmar Zainuddin^{1,2*}, Fauziah Jummaat²

¹School of Dental Sciences, Universiti Sains Malaysia, Health Campus, 16150, Kelantan, Malaysia.

²Hospital Universiti Sains Malaysia, USM Health Campus, 16150, Kelantan, Malaysia.

Corresponding and reprint:

Dr. Siti Lailatul Akmar Zainuddin

School of Dental Sciences,
Universiti Sains Malaysia, Health Campus,
16150, Kelantan, Malaysia

E-mail: lailatul@usm.my

Tel: +609-7675846; Fax: +609-7675505

Abstract

The inflammation of the periodontal tissue is positively correlated with the increased levels of primary hormones during pregnancy. Since the levels of these hormones increase substantially during pregnancy, therefore, these extensive hormonal changes may alter periodontal tissue's inflammatory profile, adversely affecting the periodontal status with deleterious effects. Current study was aimed to determine and evaluate the levels of periodontal parameters and the oral health-related quality of life impact during 2nd and 3rd trimester of pregnant women attending the Obstetrics & Gynaecology (O&G) Clinic at Hospital Universiti Sains Malaysia (USM). Seventy five pregnant women with the mean age of 30.5 (± 4.5) years participated in this study. A questionnaire representing different domains of Oral Health Impact Profile (OHIP)–14 items was devised and administered amongst the participants, followed by the examination of periodontal status. The presence of initial signs of periodontal diseases, such as bleeding on probing and increased periodontal pockets, were found amongst almost all of the participants. The mean and standard deviation (SD) of plaque score (PS) and gingival bleeding index (GBI) were recorded to be 49.25% (16.92) and 31.34% (18.04) respectively. The mean periodontal pocket depth (PPD) was found to be 4.1 (0.15) mm and the mean percentage of sites of PPD ≥ 4 mm was 23.5% (13.03). The

prevalence of women who reported any oral health problem impact measured by the OHIP-14 was higher in the 3rd-trimester group. However, there was no significant difference observed between the participant from different trimesters, for both dental examination and the OHIP-14 questionnaire. The essential outcomes from this study may help in crafting programs to educate pregnant women about the significance of oral health and promote the importance to visit oral health care providers during pregnancy.

Keywords: periodontal disease, pregnancy, OHIP-14

1. Introduction

Periodontium, which is a set of specialized tissues containing; periodontal ligaments, gingiva, cementum, and alveolar bone, helps keep the tooth in its alveolar socket. Any change in the periodontium may lead to the pocket formation, recession, or in certain cases both. Either way, these changes (also known as periodontal disease) have destructive effects on the alveolar bone which leads to loss of dentition[1]. Periodontal disease is broadly classified into gingivitis and periodontitis. Initial mild periodontal disease in which only gingival soft tissue is involved is referred to as gingivitis, which is very prevalent and easily treatable with the help of modest and effective oral hygiene maintaining procedures. Worldwide, Gingivitis has impacts on 50-90 percent of the adult population[2]. If the initial signs of this mildest form of periodontal inflammation remain untreated, then, in susceptible individuals, it may extend further deep into the sulcus and it leads to loss of periodontal connective tissue and alveolar bone, hence causing aggressive periodontal disease like periodontitis[3].

The American College of Obstetricians and Gynaecologists (ACOG) defined pregnancy as starting with the embryo implantation in the uterine wall [4]. Pregnancy is a delicate time, where a female's body experiences massive changes of change to create the feto-maternal balance between the growing fetus requirements and the maternal immune system. During this time, the placenta works as a physiological barrier and buffer between the mother and the fetus for the exchange of nutrients and waste products. This exchange is required for fetal growth and simultaneously for healthy growth any maternal immune surveillance which could harm the fetus is suppressed[5]. Along with the physiological changes, pregnancy greatly affects the hormonal profile of an individual. Hormone production such as progesterone levels increases tenfold during pregnancy whereas estrogen levels increase up to 30 times their regular number during the normal

menstrual cycle[6].The increase in progesterone leads to increased vascular permeability, crevicular fluid, and prostaglandin production, which may result in inflammation of the Gingiva [7]. It may also affect the development of local inflammation and inflammatory factors. Such as reduction in the regulation of the production of interleukin-6 and reduction in the resistance of gingival tissues to bacterial challenge[8].Therefore, there exists a strong relationship between pregnancy and the periodontal status of the person, thus pregnancy is considered to have a widespread oral impact [9, 10].

Besides oral hygiene, Periodontal disease serves as reservoirs of bacteria and these bacteria can approach the foetus through the placental barrier. Preterm birth [11], low birth weight new-borns [12], increased time to conception [13] and premature rupture of membranes [14] have been attributed to the presence of periodontal disease in pregnant women.

Hence it is necessary to evaluate the periodontal conditions during pregnancy and if required, treatment modalities should be used to encounter the harmful effects of periodontal disease in pregnancy. With respect to health status evaluation through clinical measures, patient centred health status evaluation is equally necessary for health. Moreover, the influence of diseases on a person's functional or psychosocial well-being is commonly assessed and demarcated as health-related quality of life. It is a holistic approach towards knowing the complete manner disease affects the individual. The evaluation of the health-related quality of life is perceived as an crucial part of evaluation programs for public health, health care research, and clinical purposes [15].

Clinical screening programs and a harmonizing perspective on the social, functional and psychological implications of diseases related to oral cavity (such as periodontal disease) during pregnancy is imperative for the planning and evaluation of pregnant women's dental care; this perspective is also crucial in the identification of the issues and concerns of pregnant women [16].

2.Materials and Methods

2.1 Study aims and population

The current study was aimed to evaluate and determine the difference and presence of signs related to periodontal disease at different stages of pregnancy and also to assess oral health impact profile in pregnant women attending Hospital USM, Kelantan, Malaysia. A cross-sectional study was conducted at O&G Clinic, Hospital Universiti Sains Malaysia (USM) in Kota Bharu, Kelantan, Malaysia. The participants were recruited by convenience sampling and the exclusion criteria were

set as, pregnant women with any uncontrolled medical conditions such as blood disorders, hypertension, diabetes mellitus, drug history, and having less than six teeth, could not take part in the study. All participants were recruited voluntarily and informed written consent was taken. Age, ethnicity, and stage of pregnancy were recorded. The assessment of OHRQoL was made by means of the Malaysian version of the Oral Health Impact Profile (OHIP)-14 which has 14 items [17]. The Malaysian OHIP-14 is specifically customized according to the Malaysian population [18]. Participants were instructed to grade the impact of their oral health on 14 key areas of OHRQoL which were collected under seven diverse domains; Functional Limitation, Physical Pain, Psychological Discomfort, Physical disability, Psychological disability, Social disability, and Handicap. These participants were requested to answer that how frequently they experienced difficulties and problems with their teeth, mouth, or dentures (related to 14 items) since the onset of their pregnancy. The approval for protocol used in this study were approved from Human Research and Ethics Committee USM (USM/JEPeM/18010020).

2.2 Oral assessment

All participants were subjected to a full-mouth periodontal examination to determine periodontal status. The parameters used were plaque score (PS) [19], Gingival bleeding index (GBI) [20], periodontal pocket depth (PPD). All measurements were recorded by using the UNC-15 periodontal probe which is 15mm in length with coding at 5th, 10th, and 15th markings.

To observe the presence of PS and GBI, four surfaces of the tooth; Mesial, Distal, Buccal / Labial, and Lingual were observed for the presence of plaque and bleeding on probing (BOP). The total number of dental surfaces with plaque and BOP were calculated and the percentage value for both PS and GBI was devised. Moreover, PPD was measured on six different sites of each tooth namely mesiobuccal, mid buccal, distobuccal, mesiolingual, mid-lingual, and distolingual. Lastly, the diagnosis of periodontal diseases was made clinically as per the American Academy of Periodontology [21].

2.3 Research tool

In this recent literature Malaysian version of the Oral Health Impact Profile (OHIP(M)) questionnaire was quite widely used and adopted accordingly to assess oral health-related quality of life of participants [22]. In current study we used this validated Malaysian version OHIP (M). The questionnaire was first developed by Slade and Spencer for the evaluation of different domains related to the quality of life of patients [23]. OHIP (M) contains fourteen items and seven domains

which are functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap. A two-point Likert scale format that ranges from '0' for 'never', 'hardly ever', 'occasionally' and '2' for 'fairly often' and 'very often' was incorporated in current study to assess the frequency of impact triggered by oral conditions during pregnancy. After evaluation and assessment of responses by the participants the prevalence of impact was determined which is the percentage of respondents reporting one or more impacts 'fairly often' or 'very often' the method used in this study coincide with previous literature[22]. This variable is used because it identifies those domains which more severe and chronic rather than brief or temporary oral health impacts during pregnancy.

2.4 Statistical analysis

In this current study all data have been analyzed in SPSS version 24.0 and all participant characteristics were evaluated and the descriptive statistics such as mean and standard deviation (SD) for continuous variables, and frequency and percentage for categorical variables were determined. Baseline comparisons of periodontal parameters and impact prevalence of OHIP-14 between the two groups were determined using the independent t-test. Frequency distribution was used for the determination of socio-demographic attributes like lifestyle habits, last dental visit, frequency of tooth brushing for different trimesters. Statistical significance was set at a P-value <0.05 at a 95% confidence interval (CI).

3. Results and Discussions

Pregnancy is a special physiological state characterized by a series of temporary adaptive changes in the body structure as a result of increased reproductive hormone (i.e. estrogen and progesterone) production. Such endocrine actions also affect the oral cavity and may result in transient and irreversible changes, which may be considered pathological [24]. In this study, we assessed the periodontal status in two phases (second and third trimester) of pregnancy and evaluated the perception of pregnant females towards the oral health-related quality of life

3.1 Subjects characteristics

Table 1 summarizes the demographic characteristics, dental service utilization, frequency of brushing daily, and education level of the participants. The mean age (SD) of the participants of this study was 30.5(4.5) years old while the mean age of 2nd-trimester participants was 28.21(5.03) and of the 3rd trimester was 29.70(4.22). The majority of participants were Malays (96%) and among all

the participants, 52% had tertiary or above educational background and 42% had higher secondary or below educational level. About 73% did not visit any of the dental health care providers during the term of their pregnancy and 76% of the participants brush once a day and only 24% of the participants brushed twice daily.

This study further highlights that education doesn't always correlate with good oral hygiene. Despite more than 50% of the sample population having a good educational background only slightly more than 9% have regular appointments with dental health care providers. This could be due to the lack of knowledge about the importance and significance of good oral hygiene practices. As has been reported in the previous studies that due to pregnancy-related reasons there is an impaired capacity for proper brushing and lack of maintenance of good oral hygiene [25]. Furthermore, most pregnant women reported that tooth brushing was nearly impossible because of pregnancy-related nausea [26].

Table 1: Socioeconomic demographic characteristics, educational levels, dental service utilization and frequency of brushing exhibited by the participants.

Demographic characteristics	Subjects		
	2 nd Trimester n=21	3 rd Trimester n=54	Total participants n=75
Age [mean(SD)]	28.21(5.03)	29.70 (4.22)	30.5(4.5)
Race			
Malay, n (%)	20(95.2)	52 (96.3)	72(96)
Non-Malay, n (%)	01 (4.8)	02 (3.7)	03(04)
Educational level			
Higher secondary or below, n(%)	10(47.6)	26(48.1)	36(48)
Matriculation or bachelor degree or above, n(%)	11(52.4)	28(51.9)	39(52)
Brushing			
Once a day n(%)	16(76.1)	41(75.9)	56(76)
Twice a day n(%)	05(23.8)	13(24.1)	18(24)
Dental treatment			
Received n (%)	0(0)	8(14.8)	8(9.9)
Symptomatic n(%)	4(19)	10(18.5)	14(17.3)
Not utilized n(%)	17(81)	36(66.7)	53(72.8)

3.2 Periodontal parameters

The result from table 2 showed that all participants exhibited explicit signs of some forms of periodontal disease (100%). Further identification showed that participants in their second trimester had mean values of 4.1mm (SD0.14), 26.0% (SD18.02), and 47.2% (SD16.58) for PPD, GBI, and PS respectively. The mean total incidence of sites with probing depth ≥ 4 mm was 22.2% (SD13.16) to be present in the second trimester of the participants. The mean values of PPD, GBI, and PS for the participants in their third trimester were calculated to be 4.1mm (SD0.15), 36.7% (SD19.69), and 50.1% (SD17.13) respectively. Whereas, the mean of total sites with probing depth ≥ 4 mm was 24.0% (SD12.87) for the participants in their third trimester. The analysis reveals that PPD, GBI and PS mean have no statistically significant difference between the two trimesters ($p > 0.05$).

All the participants of this study were found to suffer from periodontal disease. A study in Amman, Jordan, demonstrated similar results, whereby 100% of the pregnant women had signs of periodontal disease [27]. Whereas, a study in the Raichur district of India also reported 95% of the sample population of primigravidae women to have some signs of periodontal disease [28]. The literature further supports the findings of this study, because work carried out by Jago et al. in Brisbane Australia and Miyazaki et al. in Japan show similar trends, where the majority of the sample population showed signs of one or the other form of periodontal disease. The increased prevalence of periodontal disease could be due to the poor oral hygiene status of the pregnant women that may have aggravated the influence of hormones on the periodontium [29][30][31].

According to our findings, PS, GBI, and mean probing pocket depth have no statistically significant difference between the two trimesters observed. Periodontal disease during pregnancy seemed to be dependent on, but unrelated to, the amount of dental plaque accumulation [32]. As pregnancy is a complicated state both physiologically and psychologically, periodontal disease during pregnancy may also be triggered by stress and anxiety [33].

Table 2: Periodontal parameters of pregnant women.

Parameter	2 nd Trimester Mean (SD) (n=21)	3 rd Trimester Mean (SD) (n=54)	Total Mean (SD) (n=75)	Mean difference (Confidence Interval)	p-value
-----------	--	--	---------------------------------	--	---------

Mean Probing Pocket Depth (PPD)(mm)	4.1 (0.14)	4.1 (0.15)	4.1 (0.15)	0.0 (-0.04,0.08)*	0.6
Total sites with probing pocket depth ≥ 4 mm (%)	22.2 (13.61)	24.0 (12.87)	23.5 (13.03)	-1.8 (-8.18, 4.50)	0.6
Gingival bleeding index (%)	26.0 (18.02)	36.7 (19.69)	31.3 (18.04)	-7.6 (-16.23,1.02)	0.1
Plaque score (%)	47.2 (16.58)	50.1 (17.13)	49.3 (16.92)	-2.9 (-11.17,5.27)	0.5

3.3 OHIP-14

Table 3 represents the prevalence of negative impact on the quality of life of the participants during pregnancy due to oral health conditions in different domains of OHIP-14. Impact prevalence means the total number of participants showing 'fairly often', or 'very often', responses in domains of the OHIP-14 questioner. The total percentage of subjects showing negative impact through OHIP-14 questioners in the 2nd was 14.3% and in the 3rd-trimester participant, it was 25.9% respectively. The most commonly reported negative impacts during pregnancy were within the domains of “physical pain” (20%) and “psychological discomfort” (10.7%).

As oral hygiene plays a vital role in defining the occurrence of periodontal disease, it is very important to determine how well pregnant women perceive their oral health. According to this study total of 22.7% of pregnant women reported a negative impact on their quality of life due to their oral health. In this recent study, it has been witnessed that the pregnant women who are participating frequently reported: “physical pain” (20%) and “psychological discomfort” (10.7%), these two domains of OHIP-14 were previously also reported by Lu et al in his study in 2015. In this previous study it was established that the pregnant participant mostly reported issues related to the domains of “physical pain” (5.6%) and “psychological discomfort” (4.5%) as compared to other domains of OHIP-14[34].

Table 3: Impact prevalence of each OHIP-14 domain during pregnancy

OHIP-14	2 nd Trimester 21(%)	3 rd Trimester 54(%)	Total participants 75(%)	<i>p-value</i>
Function limitation	0(0)	0(0)	0(0)	0
Physical pain	2(9.5)	13(24)	15(20)	0.2
Psychological discomfort	3(14.3)	5(9.3)	8(10.7)	0.7
Physical disability	2(9.5)	4(7.4)	6(8)	1.0
Psychological disability	2(9.5)	4(7.4)	6(8)	1.0
Social disability	0(0)	3(5.6)	3(4)	0.6
Handicap	0(0)	3(5.6)	3(4)	0.6
Impact prevalence	3(14.3)	14(25.9)	17(22.7)	0.2

A study concerning oral health-related quality of life was done in Hong Kong, discussed that the prevalence of negative impact on the psychological domains (discomfort and disability) ranges between 4.0% and 6.3%. There were less prevalent results found in the domains of social disability and handicap when compared with the domains of physical pain, psychological discomfort, and psychological disability these results coincide with our current study[35]. Another similar study was done by Sari EY et al., 2011 show 36% of pregnant women reported the impact of at least one item of oral health impact profile-14 [36]. The results of previous studies may vary with comparison to our study with regards to the racial or ethnic differences in the environmental and cultural changes, but the consensus is there and there is a dire need for different oral health awareness programs to encourage pregnant women to attend dental health care facilities regularly during their gestational period.

4. Conclusion

The prevalence of periodontal disease among the 2nd and 3rd trimesters of pregnancy was 100%. Among them, 22.7% have the impact of at least one OHIP-14 item, with the most commonly reported impacts were within the domains of “physical pain” and “psychological

discomfort". The findings of the study may help in designing programs to educate pregnant women on the necessity of maintaining a healthy periodontal status during pregnancy.

Acknowledgments

The authors would like to express their gratitude to all staff in Gynaecology & Obstetrics Clinic and Dental Clinic, Hospital Universiti Sains Malaysia who were involved during the study. We are indebted to all patients for their kind participation. This study was supported by Research University Grant, Universiti Sains Malaysia (304/PPSG/6316158).

Declaration of Interest

All authors declared no conflict of interest in any form.

References.

1. Suhaimi N, Kamaruzaman N, Taib H, Mohamad WMW, Ghazali WSW. Assessment of periodontal status in patients with rheumatoid arthritis in kelantan, Malaysia: A Preliminary study. *Journal of International Dental and Medical Research*. 2016;9(2):108.
2. Albandar JM, Rams TE. *Periodontol 2000 Global epidemiology of periodontal diseases* 29. Copenhagen, Denmark: Munksgaard Blackwells. 2002.
3. Pihlstrom BL, Michalowicz BS, Johnson NW. Periodontal diseases. *The lancet*. 2005;366(9499):1809-20.
4. Chung GS, Lawrence RE, Rasinski KA, Yoon JD, Curlin FA. Obstetrician-gynecologists' beliefs about when pregnancy begins. *American journal of obstetrics and gynecology*. 2012;206(2):132. e1-. e7.
5. Offenbacher S, Jared H, O'reilly P, Wells S, Salvi G, Lawrence H, et al. Potential pathogenic mechanisms of periodontitis-associated pregnancy complications. *Annals of periodontology*. 1998;3(1):233-50.
6. Zachariassen RD. The effect of elevated ovarian hormones on periodontal health: oral contraceptives and pregnancy. *Women & health*. 1993;20(2):21-30.
7. Amar S, Chung KM. Influence of hormonal variation on the periodontium in women. *Periodontology 2000*. 1994;6(1):79-87.
8. Lapp CA, Thomas ME, Lewis JB. Modulation by progesterone of interleukin-6 production by gingival fibroblasts. *Journal of periodontology*. 1995;66(4):279-84.
9. Tilakaratne A, Soory M, Ranasinghe A, Corea S, Ekanayake S, De Silva M. Periodontal

- disease status during pregnancy and 3 months post-partum, in a rural population of Sri-Lankan women. *Journal of Clinical Periodontology*. 2000;27(10):787-92.
10. Laine MA. Effect of pregnancy on periodontal and dental health. *Acta Odontologica Scandinavica*. 2002;60(5):257-64.
11. Muwazi L, Rwenyonyi CM, Nkamba M, Kutesa A, Kagawa M, Mugenyi G, et al. Periodontal conditions, low birth weight and preterm birth among postpartum mothers in two tertiary health facilities in Uganda. *BMC oral health*. 2014;14(1):42.
12. Cisse D, Diouf M, Faye A, Diadhiou M, Tal-Dia A. Periodontal disease of pregnant women and low weight Newborn in Senegal: a case-control study. *Open Journal of Epidemiology*. 2015;5(01):1.
13. Nwhator S, Opeodu O, Ayanbadejo P, Umeizudike K, Olamijulo J, Alade G, et al. Could periodontitis affect time to conception? *Annals of medical and health sciences research*. 2014;4(5):817-22.
14. Stadelmann PF, Eick S, Salvi GE, Surbek D, Mohr S, Bürgin W, et al. Increased periodontal inflammation in women with preterm premature rupture of membranes. *Clinical oral investigations*. 2015;19(6):1537-46.
15. Lawrence HP, Thomson WM, Broadbent JM, Poulton R. Oral health-related quality of life in a birth cohort of 32-year olds. *Community dentistry and oral epidemiology*. 2008;36(4):305-16.
16. Wandera MN, Engebretsen IM, Rwenyonyi CM, Tumwine J, Åström AN. Periodontal status, tooth loss and self-reported periodontal problems effects on oral impacts on daily performances, OIDP, in pregnant women in Uganda: a cross-sectional study. *Health and quality of life outcomes*. 2009;7(1):89.
17. Saub R, Locker D, Allison P. Derivation and validation of the short version of the Malaysian Oral Health Impact Profile. *Community dentistry and oral epidemiology*. 2005;33(5):378-83.
18. Saub R, Locker D, Allison P, Disman M. Cross-cultural adaptation of the Oral Health Impact Profile (OHIP) for the Malaysian adult population. *Community dental health*. 2007;24(3):166-75.
19. O'Leary TJ, Drake RB, Naylor JE. The Plaque Control Record. *Journal of Periodontology*. 1972;43(1):38-.
20. Rebelo MAB, De Queiroz AC. Gingival indices: state of art. *Gingival diseases-their aetiology, prevention and treatment*: IntechOpen; 2011.
21. Armitage GC. Periodontal diagnoses and classification of periodontal diseases. *Periodontology*

2000. 2004;34(1):9-21.

22. Saub R, Locker D, Allison P, Disman M. Cross-cultural adaptation of the Oral Health Impact Profile (OHIP) for the Malaysian adult population. *Community dental health*. 2007;24(3):166.
23. Slade G. Derivation and validation of a short-term oral health impact profile (OHIP-14). *Community Dentistry and Oral Epidemiology University of north Carolina, USA*. 1997.
24. Diaz-Guzman L, Castellanos-Suarez J. Lesions of the oral mucosa and periodontal disease behavior in pregnant patients. *Medicina oral, patologia oral y cirugia bucal*. 2004;9(5):434-7; 0-3.
25. Taani D, Habashneh R, Hammad M, Batieha A. The periodontal status of pregnant women and its relationship with socio-demographic and clinical variables. *Journal of oral rehabilitation*. 2003;30(4):440-5.
26. Krüger MSdM, Casarin RP, Gonçalves LB, Pappen FG, Bello-Correa FO, Romano AR. Periodontal health status and associated factors: findings of a prenatal oral health program in South Brazil. *International journal of dentistry*. 2017;2017.
27. Nassrawin N, Barakat M. Prevalence of gingival disease in a population of pregnant women. *JRMS*. 2002;9(2):12-5.
28. Gupta R, Acharya AK. Oral health status and treatment needs among pregnant women of Raichur District, India: A population based cross-sectional study. *Scientifica*. 2016;2016.
29. Jago J, Chapman P, Aitken J, McEniery T. Dental status of pregnant women attending a Brisbane maternity hospital. *Community dentistry and oral epidemiology*. 1984;12(6):398-401.
30. Miyazaki H, Yamashita Y, Shirahama R, Goto-Kimura K, Shimada N, Sogame A, et al. Periodontal condition of pregnant women assessed by CPITN. *Journal of clinical periodontology*. 1991;18(10):751-4.
31. Taani DQ, Habashneh R, Hammad MM, Batieha A. The periodontal status of pregnant women and its relationship with socio-demographic and clinical variables. *J Oral Rehabil*. 2003;30(4):440-5.
32. Armitage GC. Development of a classification system for periodontal diseases and conditions. *Annals of periodontology*. 1999;4(1):1-6.
33. Onigbinde O, Sorunke M, Braimoh M, Adeniyi A. Periodontal status and some variables among pregnant women in a Nigeria tertiary institution. *Annals of medical and health sciences research*. 2014;4(6):852-7.
34. Lu H-X, Xu W, Wong MCM, Wei T-Y, Feng X-P. Impact of periodontal conditions on the

quality of life of pregnant women: a cross-sectional study. *Health and Quality of Life Outcomes*. 2015;13(1):67.

35. Ng SKS, Leung WK. Oral health-related quality of life and periodontal status. *Community Dentistry and Oral Epidemiology*. 2006;34(2):114-22.
36. Sari EY, Saddki N, Yusoff A, editors. Oral health-related quality of life among pregnant women at Hospital Universiti Sains Malaysia. *Proceedings of The Annual International Conference, Syiah Kuala University-Life Sciences & Engineering Chapter*; 2011.