Original Article

Knowledge and Attitude of Medical Nurses toward Oral Health and Oral Health Care of Pregnant Women

Suzana Sharif, Norkhafizah Saddki, Azizah Yusoff

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

Abstract

Background: This study assessed the knowledge and attitudes of medical nurses regarding oral health and oral health care of pregnant women.

Methods: This cross sectional study of 133 nurses in the district of Tumpat, Kelantan (Malaysia) used self-administered questionnaires.

Results: Most nurses knew that dental plaque is associated with periodontal disease (97.7%). However, most nurses erroneously believed that tooth decay (86.5%) and excessive sugar consumption (87.2%) led to periodontal disease. About half of the nurses knew about the relationship between periodontal disease of pregnant women and low birth weight (43.6%) and preterm birth (48.9%). Many nurses had the misconception that the developing foetus draws calcium from the mothers' teeth (78.2%). Most nurses had good attitudes toward improving their oral health knowledge (97.0%) and agreed they should help to deliver oral health education to pregnant women (94.0%). Age, length of service as a nurse, and length of service in antenatal care had no effect on the scores for the nurses' knowledge and attitude regarding oral health and oral health care of pregnant women.

Conclusion: Medical nurses had limited knowledge about oral health of pregnant women and had some misunderstandings about oral health, although they had good attitudes. Age, length of service as a nurse, and length service in antenatal care had no effect on the knowledge and attitude scores of the nurses.

Keywords: oral health, pregnancy, nurses, knowledge, attitude

Introduction

Women are more susceptible to oral health problems during pregnancy. This is at least partly because increased levels of oestrogen and progesterone during pregnancy lead to exaggerated gingival tissue response to dental plaque, thereby increasing the risk of gingivitis (1). Pregnancy gingivitis is extremely common, and affects about 30% to 86% of all pregnant women (2,3). Gingivitis can be reversed with good plaque control, but untreated gingivitis may progress to periodontitis, an irreversible progressive destruction of the tooth supporting structures, and this is linked to adverse pregnancy outcomes such as preterm birth and low birth weight infants (4,5).

Dental caries is another common oral health problem during pregnancy. Pregnant women are about 3 times more likely to suffer from dental caries than other women (2). A study of low-income pregnant Hispanic women at the California-Mexico border reported that 93% of respondents had untreated dental caries (6). Although dental caries in such women may have been present before pregnancy, the risks for developing new carious lesions and for existing caries to progress are greater during pregnancy because of sugar cravings and limited attention to oral health during this period (7,8). In addition, frequent vomiting during pregnancy may cause an excessively acidic environment in the oral cavity, and thereby increase dental erosion and make the teeth more susceptible to dental caries (9).

Thus, oral health care should be an important component of antenatal health care. However, previous studies reported the use of oral health care services among pregnant women had a prevalence of only 22.7% to 61.0%, depending on the population (10–13). A previous study in Malaysia indicated that only 34.4% of pregnant women used oral health care services in 2012 (14). Women who do not visit dentists during pregnancy may rationalise this behaviour by saying they do not have any oral health problems, they have insufficient time, they believe that dental

treatment could harm the foetus, or they fear or are dissatisfied with dental services (11,13,15).

Nurses are in a good position to help deliver key oral health messages to pregnant women. In particular, nurses can provide advice on preventive oral health care, including regular dental visits, and can refer pregnant women to dentists for examinations. As such, it is important that nurses have a good basic knowledge of oral health and oral health care, and are willing and able to advise pregnant women. This study examined the knowledge and attitudes of nurses involved in antenatal health care in the district of Tumpat, Kelantan (Malaysia). We also assessed the effect of age, length of service as a nurse, and length of service in antenatal care on the knowledge and attitude scores of these nurses.

Materials and Methods

This cross sectional study surveyed nurses who provide antenatal health care in the Ministry of Health (MOH) Malaysia premises in the district of Tumpat, Kelantan between April and June, 2014. Thirty facilities provide antenatal health care services in this district: 8 health clinics, 20 community clinics, and 2 "Klinik 1Malaysia". All nurses from these facilities were invited to participate in the study.

The questionnaires used by Al-Habashneh et al. (16) and Wooten et al. (17) were adapted for use in the current study. There were 23 items that assess knowledge about risk factors for periodontal disease, the signs and symptoms of the disease, possible adverse pregnancy outcomes caused by maternal periodontitis, oral health care during pregnancy, and oral health misconceptions. In addition, the attitudes of the nurses was assessed by 7 items on oral health during pregnancy, oral health screening to identify oral diseases, and training to update oral health knowledge. For the 23 knowledge items, there were 3 possible responses for each item: "yes", "no" and "do not know". The 7 attitude items were each ranked on a 5-point Likert scale: 1 for 'strongly disagree', 2 for 'disagree', 3 for 'neither agree nor disagree', 4 for 'agree' and 5 for 'strongly agree'.

A structured socio-demographic form was used to collect information on age, sex, ethnic group, length of service as a nurse in the MOH sector, and length of service in antenatal care. A participant information sheet explaining the study and an informed consent form were attached to each questionnaire. The Universiti Sains Malaysia Human Research and Ethics Committee (FWA Reg. No: 00007718; IRB Reg. No: 00004494) and the MOH Malaysia Medical Research and Ethics Committee (KKM/NIHSEC/p14-158, NMRR-13-1345-18429) approved this study.

Prior to data collection, the number of nurses working at each clinic was recorded. Questionnaires were packed into individual envelopes, labelled with the clinic names, and sealed. The envelopes were delivered to all 30 clinics with the help of the Medical Health Officer who assigned the task to one office worker. The nurse in-charge at each clinic helped to distribute the questionnaires to all nurses working at the clinic and to collect the questionnaires from the nurses upon completion. The main author collected the questionnaires from each clinic after two weeks.

All data were entered, cleaned, and analysed using IBM SPSS Statistics version 22. Descriptive statistics are expressed as frequencies and percentages for categorical data, and as means and standard deviations for continuous data. An independent t-test was used to compare the knowledge and attitude scores according to the nurses' characteristics. The response to each of the 23 knowledge items was scored as 2 points for a correct knowledge response, 1 point for a "do not know" response, and 0 points for a wrong response. Thus, the total knowledge score ranges from 0 to 46, with a higher score indicating better knowledge. The points for each of the 7 attitude items ranged from 1 to 5; scores for 2 negatively worded attitude statements were re-coded in reverse direction so that a higher score on each item indicated better attitude. Thus, the attitude score ranges from 7 to 35, with a higher score indicating a better attitude. The level of significance was set at 0.05 for two-tailed analysis.

Results

Demographic characteristics

We distributed 152 questionnaires, 133 of which were returned, corresponding to a response rate of 87.5%. Table 1 shows the demographic profiles of the participating nurses. All nurses were female, most (99.2%) were of the Malay ethnic group, and the age range was 29 to 58 years-old with a mean age of 38.3 years (SD 6.66). The mean length of service as a nurse in the MOH sector was 13.6 years (SD 6.13) and the range was 4 to 36 years. About one-third of the nurses (34.6%) had more than 10 years of experience providing antenatal health care services.

Knowledge

Table 2 shows the nurses' knowledge of periodontal disease and oral health care for pregnant women. Most nurses knew that dental plaque (97.7%) and smoking (89.5%) are associated with gum disease. However, many nurses erroneously thought that tooth decay (86.5%) and excessive sugar consumption (87.2%) are associated with gum disease. Approximately one-third (34.6%) knew that genetics influenced periodontal disease and less than half (48.1%) knew that pregnancy is associated with gum disease. Most nurses knew the symptoms of gum disease, particularly bleeding gums (100.0%), swollen gums (99.2%), pain from the gums (94.7%), changes in gum colour (94.7%), and gum abscess (94.0%).

More than two-thirds of nurses (69.2%) knew that hormonal changes during pregnancy increased the risk for gum disease, but only about half (48.1%) knew that pregnancy is linked with maternal periodontal disease and adverse pregnancy outcomes such as low birth weight babies (43.6%) and preterm births (48.9%). Most nurses knew that the acid produced when bacteria

consume sugars can lead to dental caries (96.2%), and that caries can be prevented by brushing teeth with fluoridated tooth paste (96.2%). However, only half knew about the adverse effects of stomach acid on tooth surfaces (50.4%). Most nurses (78.2%) erroneously believed that the developing foetus draws out calcium from the teeth of a pregnant woman, and some thought that dental treatments during pregnancy may negatively affect the foetus (27.8%).

Attitude

Table 3 shows the nurses' attitudes toward oral health care of pregnant women. Most nurses (99.3%) agreed that oral health examination should be an important component of routine antenatal care. Most nurses (80.4%) also agreed they should be trained to perform oral health screening and be able to identify common oral diseases (90.2%). Likewise, most agreed they should update their knowledge on oral health of pregnant women (97.0%), help to educate pregnant women about oral health (94.0%), and refer pregnant women to dental clinics even when they do not report oral health problems (85.7%). However, a lesser percentage (60.9%) agreed that looking into patients' mouths to detect oral disease is partly their responsibility.

Influence of nurses' characteristics on knowledge and attitude scores

The mean knowledge score was 32.6 (SD 3.34, 95% CI 32.0, 33.1) and the mean attitude score was 28.7 (SD 3.34, 95% CI 28.1, 29.2). Table 4 shows a comparison of the mean knowledge and attitude scores for nurses in different age groups, years of service as a nurse, and years of service in antenatal care. There were no statistically significant associations of knowledge and attitude scores with any of these variables.

Discussion

Oral health care should be an important component of routine health care for pregnant women. Nurses are one of the main providers of antenatal health care services, and play important roles in increasing awareness of oral health and dissemination of information on oral health care to pregnant women. Most nurses in our study correctly identified dental plaque as a factor associated with periodontal disease. Other studies also reported that most health care workers knew that plaque can cause periodontal disease. In particular, almost 80% of physicians in Tehran

Table 1: Demographic characteristics of the nurses (n = 133)

Variable	Frequency (%)
Age group (years)	
≤ 34	44 (33.1)
35−44	69 (51.9)
45−54	13 (9.8)
≥ 55	7 (5.2)
Ethnic group	
Malay	132 (99.2)
Others	1 (0.8)
Length of service as a nurse (years)	
≤ 5	1 (0.8)
6−10	49 (36.8)
11−15	51 (38.3)
≥ 16	32 (24.1)
Length of service in antenatal care (years)	
≤ 5	26 (19.5)
6−10	61 (45.9)
11−15	29 (21.8)
≥ 16	17 (12.8)

Table 2: Knowledge of nurses about periodontal disease and oral health care of antenatal mothers (n = 133)

Knowledge item	Frequency (%)		
	Yes	No	Do not know
Gum disease is caused by/ associated with:			
Dental plaque	130 (97.7)	1 (0.8)	2 (1.5)
Smoking	119 (89.5)	11 (8.3)	3 (2.3)
Tooth Decay	115 (86.5)	9 (6.8)	9 (6.8)
Excess sugar consumption	116 (87.2)	12 (9.0)	5 (3.8)
Genetics	46 (34.6)	57 (42.9)	30 (22.6)
Pregnancy	64 (48.1)	56 (42.1)	13 (9.8)
Symptoms of gum disease include:			
Bleeding gums	133 (100.0)	0 (0.0)	0 (0.0)
Swollen gums	132 (99.2)	0 (0.0)	1 (0.8)
Pain from the gums	126 (94.7)	2 (1.5)	5 (3.8)
Changes in gum colour	126 (94.7)	2 (1.5)	5 (3.8)
Loose tooth	104 (78.2)	16 (12.0)	13 (9.8)
Bad breath	101 (75.9)	26 (19.5)	6 (4.5)
Gum abscess	125 (94.0)	0 (0.0)	8 (6.0)
Hormonal changes in pregnancy increases the risk for gum disease	92 (69.2)	26 (19.5)	15 (11.3)
Pregnant mothers should be advised to stop brushing their teeth if the gums bleed	23 (17.3)	97 (72.9)	13 (9.8)
Gum problems in pregnant mothers may result in adverse outcomes such as:			
Low birth weight babies	58 (43.6)	65 (48.9)	10 (7.5)
Preterm birth	65 (48.9)	57 (42.9)	11 (8.3)
Cleft lip and palate	26 (19.5)	84 (63.2)	23 (17.3)
Acid that cause tooth decay is produced when bacteria react with sugars in carbohydrate	128 (96.2)	2 (1.5)	3 (2.3)
Stomach acids released during vomiting may erode the surfaces of the teeth	67 (50.4)	45 (33.8)	21 (15.8)
Dental treatments during pregnancy may negatively affect the foetus	37 (27.8)	92 (69.2)	4 (3.0)
Brushing teeth with fluoridated toothpaste can help prevent tooth decay	128 (96.2)	4 (3.0)	1 (0.8)
Calcium will be drawn out of mothers' teeth by the foetus	104 (78.2)	25 (18.8)	4 (3.0)

and about 83% of nurse practitioners and certified nurse midwives in North Carolina knew about the role of dental plaque in periodontal disease (17,18). On the other hand, most of our nurses erroneously thought that tooth decay and excess sugar consumption were associated with periodontal disease. Similarly, the North Carolina study of nurse practitioners and certified midwives also found that most respondents erroneously thought that tooth decay was associated with periodontal disease (76%) and excessive sugar intake (62%) (17).

Tobacco smoking is another important risk factor for periodontal disease, and most nurses

Table 3: Attitude of nurses toward oral health care of antenatal mothers (n = 133)

Attitude item	Frequency (%)				
	Strongly Agree	**Agree**	**Neither agree nor disagree**	**Disagree**	**Strongly Disagree**
I should be trained to perform oral health screening	37 (27.8)	70 (52.6)	14 (10.5)	12 (9.0)	0 (0.0)
I should be able to identify common oral diseases	45 (33.8)	75 (56.4)	11 (8.3)	2 (1.5)	0 (0.0)
It is not my responsibility to look into my patients' mouth to detect oral health problems	3 (2.3)	32 (24.1)	17 (12.8)	77 (57.9)	4 (3.0)
I should update my knowledge on oral health of antenatal mothers	44 (33.1)	85 (63.9)	4 (3.0)	0 (0.0)	0 (0.0)
I should help to educate antenatal mothers about oral health	45 (33.8)	80 (60.2)	5 (3.8)	3 (2.3)	0 (0.0)
I do not need to refer antenatal mothers to dental clinic if they say they do not have any oral health problems	1 (0.8)	16 (12.0)	2 (1.5)	95 (71.4)	19 (14.3)

Table 4: Comparison of mean knowledge and attitude scores between nurses in different age groups, years of service as a nurse and years of service in antenatal care (n = 133)

Variable	Mean (SD)	Mean difference	t statistic (df)	P value
Knowledge				
Age group (years)				
< 35	31.9 (3.04)	-1.01	-1.657 (131)	0.100
≥ 35	32.9 (3.45)			
Length of service as a nurse (years)				
≤ 10	32.4 (2.92)	-0.23	-0.385 (131)	0.701
> 10	32.7 (3.58)			
Length of service in antenatal care (years)				
≤ 10	32.4 (3.10)	-0.57	-0.931 (131)	0.353
> 10	32.9 (3.76)			
Attitude				
Age group (years)				
< 35	28.5 (3.62)	-0.28	-0.446 (131)	0.656
≥ 35	28.8 (3.22)			
Length of service as a nurse (years)				
≤ 10	28.2 (3.26)	-0.77		
> 10	29.0 (3.38)		-1.293 (131)	0.198
Length of service in antenatal care (years)				
≤ 10	28.3 (3.52)	-0.92		
> 10	29.3 (2.92)		-1.510 (131)	0.133

in our study correctly recognised this risk factor. Smoking is well known as one of the strongest modifiable factors for periodontal disease in adults (19,20). About 1.0% (100,000) women in Malaysia smoke tobacco (21). A study of 408 female students in private higher learning institutions in Kuala Lumpur and Selangor reported that 18.6% of the students were current smokers and the mean age at initiation of smoking was 15.9 years (22). Thus, it is important for nurses to obtain histories of cigarette smoking from their pregnant patients and to educate them about the harmful effects of cigarette smoking on general health, oral health, and health of the developing foetus. The antenatal record book currently used by the MOH does not have a section to record smoking status. We highly recommended this important information be incorporated into the maternal health record.

Only few nurses in our study knew about the role of genetics as a risk factor for periodontal disease (34.6%). Studies in the 1990s reported that twins had similar clinical manifestations of periodontal disease and were first to document a role of genetics in periodontal disease (23). This issue is still being investigated, which may explain why most nurses in our study did not know about the role of genetics in periodontal disease.

Most nurses in our study correctly identified the early symptoms of periodontal disease, which usually begins with gingivitis and manifests as bleeding gums, swollen gums, changes in gum colour, and gum pain. These early symptoms can be easily detected with a simple mouth examination and history taking because patients with gingivitis commonly complain of tender gums that bleed during tooth brushing or flossing. Nurses with knowledge of the symptoms of periodontal diseases can help perform oral screening of pregnant women so there can be appropriate preventive measures or prompt referral to dentists. More importantly, early treatment can prevent gingivitis from progressing to periodontitis and reduce the risk of more serious consequences for the mother and baby. However, we found that about 17% of nurses thought that pregnant women should stop brushing if their gums bleed and about 10% of nurses did not have any opinion on this topic. This is a serious problem, because bleeding gums is an early symptom of periodontal disease and if tooth brushing is stopped, gingival inflammation can progress to periodontitis.

About 70% of the nurses in our study knew that hormonal changes during pregnancy increase the risk for gum diseases, but less than half were aware of the possible link between maternal periodontitis and adverse pregnancy outcome. As such, efforts should be made to increase the nurses' awareness of this relationship. In addition, nurses can easily convey this message to pregnant women under their care. A study of physicians in northern Jordan showed that respondents who knew about the connection between oral health problems and pregnancy outcomes were significantly more likely to advise their patients to visit dentists during pregnancy (16). Similarly, a study in Malaysia reported that pregnant women who knew of the association between poor maternal oral health and adverse pregnancy outcomes were more likely to visit dentists during pregnancy (15). It is therefore obvious that nurses and pregnant women should be aware of the association between periodontitis and adverse pregnancy outcome.

More than half of pregnant women experience nausea and vomiting during the first trimester of pregnancy (24). Besides interfering with activities of daily living, these problems may increase the risk for dehydration, poor weight gain, and even weight loss. Additionally, the gastric acid in vomit can cause extensive erosion of tooth surfaces. However, only about half the nurses in our study knew that vomiting can make teeth more sensitive to sweet, hot or cold foods, and susceptible to dental caries. Nausea and vomiting are common problems during pregnancy, so it is important for nurses to know about their effects on oral health and to advise pregnant women accordingly.

Nausea and vomiting during pregnancy are often associated with food craving, particularly for fruits, fruit juices, and other sweet foods and drinks (25). Frequent consumption of simple carbohydrates may increase a pregnant woman's risk of dental caries. Nurses can advise women who experience cravings for sugary foods to opt for healthy non-cariogenic snacks instead, such as fresh fruits, vegetables, and dairy products, which are healthier for the woman and the developing foetus. Most nurses in our study knew that tooth decay is caused by the reaction of acid-producing bacteria following consumption of fermentable carbohydrates. Additionally, more than 95% of the nurses knew that brushing of teeth with fluoridated toothpaste can prevent tooth decay. This is not surprising because information about the relationship between dental caries and sugars and the protective role of fluoride has been widely disseminated to the public via advertisements for oral health care products and through the mass media.

Certain misconceptions about oral health

were common among the nurses in our study. More than one-quarter of them thought that dental treatment could negatively affect the foetus and more than three-quarters believed that the developing foetus absorbs calcium from the teeth of the mother. In fact, dentists can safely perform essential treatments during pregnancy to stop disease progression and prevent more serious problems (26). Elective treatments such as tooth bleaching, minor surgeries, or fabrication of prosthodontic devices are usually deferred until after parturition, not because they are harmful to the foetus but because many women may be uncomfortable lying in a supine position during these long procedures. Moreover, the foetus does not absorb calcium from the teeth of its mother, but mainly obtains calcium from the mother's diet; if the mother's dietary intake of calcium is inadequate, the foetus will draw calcium from the mother's bones, not teeth (27). It is imperative that these misconceptions are corrected because nurses must be able to deliver accurate evidence-based health messages to their patients.

The nurses in our study had positive attitudes toward oral health care of pregnant women. In particular, most nurses agreed that oral health examinations are an important component of routine antenatal care. Most nurses also agreed that they should be able to identify common oral diseases and educate pregnant women about oral health. Primary health care services in Malaysia are delivered through a two-tier model: (a) health clinics that serve up to 20,000 people and (b) community clinics that serve about 2,000 to 4,000 people (28). Both levels provide health care services to pregnant women. In addition, antenatal care is also delivered at "Klinik 1Malaysia", a health sub-centre introduced in 2010. Considering that health clinics provide most oral health care services, nurses at community clinics and "Klinik 1Malaysia" who have the skills to perform oral examinations and the knowledge to identify oral diseases can help to screen pregnant women for referral to dentists at the health clinics. Nurses can also help to deliver oral health care messages to pregnant women. Thus, it is reassuring to note that most nurses in our study agreed that they should update their knowledge about oral health of pregnant women and should be trained to perform oral screening. They also agreed they should refer a pregnant woman to a dental clinic even if the woman does not complain of oral health problems. This is in compliance with the MOH guidelines on oral health care for pregnant women, which recommend medical doctors and nurses refer all newly pregnant women to dental

clinics for oral health examinations and education (29).

In this study, the knowledge and attitude scores of the nurses were not associated with nurse age, length of service as a nurse in the MOH sector, and length of service in antenatal care. Other studies of health care providers that investigated the influence of socio-demographic characteristics on knowledge and attitude have had inconsistent results. For example, a study of health care providers in France on awareness of cytomegalovirus infection during pregnancy showed that obstetrician age was associated with mean knowledge score (30). Similarly, a study of health care providers in Iran reported a significant relationship between age and knowledge of hepatitis C virus infection (31). Other research reported that age and years of employment as a health care worker were associated with the attitudes of health care providers (31). On the other hand, one study reported that neither age nor the number of years working were associated with the level of knowledge or attitudes of nurses regarding pain management of hospitalised patients (32). These discrepancies are probably due to large differences in the study populations.

Conclusion

In conclusion, the nurses in the present study had limited knowledge about oral health and oral health care of pregnant women. Certain misunderstandings about oral health were common, although most nurses had good attitudes regarding the importance of oral health care of pregnant women. Age, length of service as a nurse, and length of service in antenatal care had no effect on the nurses' knowledge and attitude scores. Nevertheless, the results of this study should be interpreted with caution because we only recruited nurses from one district of Malaysia, all of whom worked at public health care facilities. Thus, the external validity of our results is limited. Nonetheless, we recommend development of an oral health education intervention program to improve nurses' knowledge and attitudes regarding oral health during pregnancy and oral health care for pregnant women, and we suggest the testing of this program in a controlled community trial.

Acknowledgement

Authors' Contributions

Conception and design, final approval of the article, critical revision of the article for important intellectual content: SS, NS, AY
Analysis and interpretation of the data, drafting of the article: SS, NS
Provision of study materials or patients, collection and assembly of data: SS
Statistical expertise: NS
Administrative, technical, or logistic support: AY

Correspondence

References

16. Al Habashneh R, Aljundi S, Alwaeli H. Survey of medical doctors attitudes and knowledge of the association between oral health and pregnancy outcomes. *Int J Dent Hyg*. 2008;**6(3)**:214–220. doi: 10.1111/j.1601-5037.2008.00320.x.

17. Wooten KT, Lee J, Jared H, Boggess K, Wilder RS. Nurse practitioner's and certified nurse midwives' knowledge, opinions and practice behaviors regarding periodontal disease and adverse pregnancy outcomes. *J Dent Hyg*. 2011;**85(2)**:122–131.

18. Rabiei S, Mohebbi SZ, Patja K, Virtanen JI. Physicians' knowledge of and adherence to improving oral health. *BMC Public Health*. 2012;**12**:855. doi: 810.1186/1471-2458-1112-1855.

19. Johnson GK, Guthmiller JM. The impact of cigarette smoking on periodontal disease and treatment. *Periodontol* 2000. 2007;**44**:178–194. doi: 10.1111/j.1600-0757.2007.00212.x.

20. Kinane DF, Chestnutt IG. Smoking and periodontal disease. *Crit Rev Oral Biol Med*. 2000;**11(3)**:356–365. doi: 10.1177/10454411000110030501.

21. Institute for Public Health. *Report of the Global Adult Tobacco Survey (GATS) Malaysia, 2011*. Kuala Lumpur (MY): Ministry of Health Malaysia; 2012.

22. Manaf RA, Shamsuddin K. Smoking among young urban Malaysian women and its risk factors. *Asia Pac J Public Health*. 2008;**20(3)**:204–213. doi: 10.1177/1010539508316973.

23. Michalowicz BS. Genetic and inheritance considerations in periodontal disease. *Curr Opin Periodontol*. 1993:11–17.

24. Festin M. Nausea and vomiting in early pregnancy. *BMJ Clin Evid*. 2009;**3**:1405.

25. Weigel MM, Coe K, Castro NP, Caiza ME, Tello N, Reyes M. Food aversions and cravings during early pregnancy: association with nausea and vomiting. *Ecol Food Nutr*. 2011;**50(3)**:197–214. doi: 10.1080/03670244.2011.568906.

26. Michalowicz BS, DiAngelis AJ, Novak MJ, Buchanan W, Papapanou PN, Mitchell DA, et al. Examining the safety of dental treatment in pregnant women. *J Am Dent Assoc*. 2008;**139(6)**:685–695. doi: 10.14219/jada.archive.2008.0250.

27. Kovacs CS. Calcium and bone metabolism in pregnancy and lactation. *J Clin Endocrinol Metab*. 2001;**86(6)**:2344–2348. doi: 10.1210/jcem.86.6.7575.

28. World Health Organization. *Malaysia health system review*. (Health Systems in Transition, Vol. 2 No. 1 2012). Geneva (CH): World Health Organization; 2012.

29. Ministry of Health Malaysia. *Oral healthcare for antenatal mothers*. Kuala Lumpur (MY): Oral Health Division, Ministry of Health Malaysia; 2004.

30. Cordier AG, Guitton S, Vauloup-Fellous C, Grangeot-Keros L, Benachi A, Picone O. Awareness and knowledge of congenital cytomegalovirus infection among health care providers in France. *J Clin Virol*. 2012;**55(2)**:158–163. doi: 10.1016/j.jcv.2012.06.022.

31. Joukar F, Mansour-Ghanaei F, Soati F, Meskinkhoda P. Knowledge levels and attitudes of health care professionals toward patients with hepatitis C infection. *World J Gastroenterol*. 2012;**18(18)**:2238–2244. doi: 10.3748/wjg.v18.i18.2238.

32. Yaakup H, Eng TC, Shah SA. Does clinical experience help oncology nursing staff to deal with patient pain better than nurses from other displines? Knowledge and attitudes survey amongst nurses in a tertiary care in Malaysia. *Asian Pac J Cancer Prev*. 2014;**15(12)**:4885–4891. doi: 10.7314/APJCP.2014.15.12.4885.