

Original Article

**PATTERN OF ORAL DISEASES AND ASSOCIATED CONTRIBUTING FACTORS IN PREGNANT WOMEN ATTENDING A MATERNITY CENTRE IN DHAKA CITY, BANGLADESH**

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**ABSTRACT**

**Background:** Oral health care in pregnancy is often neglected by women and is also not appropriately addressed by prenatal and other health care providers and justify appropriate attention. The purpose of this cross sectional study was to describe percentage of oral disease occurrence and underlying causes in this sample of pregnant women.

**Methods:** The study included 147 women aged between 15 to 49 years receiving prenatal care at the outdoor department of Azimpur Maternal and Child Health Training Institute in Dhaka, Bangladesh were invited to participate in this study from January 2013 to April 2013. Semi-structured interviews were conducted for data collection. Clinical exam data were recorded using validated scales in a special form.

**Results:** Majority (72%) of the women were between 20 to 24 years. 57% had secondary school education. 88% of the women were unemployed and 52% women had very low family income of BDT ≤10000. More than 90% of the women had good oral hygiene practices. However, 68% liked to have sugary snacks or drinks in between main meals, 7% visited their dentists during pregnancy, only 3% received advice for routine oral health screening from their prenatal care providers and only 4% women started their antenatal check-up during first trimester. All these negative influences might expose expecting mothers to high level of dental caries (54%), dental erosion (52%), gingivitis (100%) and periodontitis (27%). This study also showed that majority of the women acquired oral health information through watching television (61%) or reading newspaper (12%) while only 4% received information from doctors/dentists throughout their lifetime.

**Conclusion:** The undertaken research highlighted the importance of using media in modifying Bangladeshi pregnant woman's behaviours toward oral health. It also emphasizes the need for inclusion of oral health preventive programme as part of pre and postnatal care. Further study in this area on a large scale will facilitate formulation of appropriate oral health policy to achieve satisfactory oral and general health outcomes during pregnancy and ensure optimum oral health conditions of their offspring.

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**Key words:** Pregnancy, oral disease, oral health, oral hygiene, eating habits, dental visits

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**INTRODUCTION**

Oral health disorders are the common public health hazards resulting in considerable morbidity among pregnant women. Pregnancy initiates profound fluctuations of steroid hormones (oestrogen and progesterone) leading to an increase in oral vasculature permeability and decrease in host immunocompetence and thereby, making pregnant women more susceptible to oral infections<sup>1</sup>.

Pregnant women encounter incidence of a series of oral alterations like dental caries, gingivitis, periodontal diseases, dental erosion and pyogenic granuloma or pregnancy epulis comparatively greater than normal<sup>2</sup>. Enamel erosion is evident in majority of the women due to acid reflux through esophagus into the oral cavity secondary to morning sickness during first trimester of pregnancy who

experience excessive nausea, vomiting and heart burn<sup>3</sup>. All these experiences also discourage them to practice oral hygiene<sup>4</sup>. Gingivitis is commonly observed in pregnancy with a prevalence of 60-75%. It normally appears during 2<sup>nd</sup> month of pregnancy with clinical presentations of red, swollen, tender gums and aggravated by altered hormonal concentrations of estrogen and progesterone along with poor oral hygiene reaching its maximum intensity in 8<sup>th</sup> month<sup>2,4,5</sup>. Gingivitis if not addressed properly, can lead to destruction of periodontium and bone supporting the tooth. Eventually, tooth loosen as a result of bone loss and in some cases, it may need to be extracted.<sup>6</sup> (pregnancy and oral health CDC) In the United States, more than 35 million have periodontitis and about 30% of people have genetic predisposition to periodontitis<sup>2,7</sup>. Additionally, periodontal disease is identified as a single factor for tooth extraction, missing tooth or wearing a denture in case of 85% people in rural areas where oral health care services are inadequate. Moreover, periodontitis has also been found to be linked with adverse pregnancy outcomes such as pre-term birth and low birth weight babies<sup>6</sup>. Possible mechanism stated in the previous studies was that researchers noticed elevated levels of inflammatory markers exist in the amniotic fluid of women with periodontitis and pre-term birth compared to healthy control patients. Pre-term birth is a leading cause of neonatal mortality in the United States as well as in South-Asian countries<sup>2</sup>.

Apart from that, it is also related to other systemic disease processes including cardiovascular disease, diabetes, Alzheimer disease and respiratory infections which affect women throughout their lifespan.<sup>6</sup> Pregnant women are also at higher risk of dental caries which occurs due to attack of acid into the tooth enamel released from the process of fermentation of dietary carbohydrate by oral bacteria leading to formation of demineralized areas.<sup>2</sup>

Prevalence of dental caries during pregnancy is about 99.38%. This high percentage can be attributable to changing in eating habits during first trimester of pregnancy such as excessive cravings for and frequent consumption of sugar containing snacks while lesser attention to the oral hygiene practice after consumption of this kind of food. This contributes to an increased number of cariogenic microorganisms in the saliva with a drop in salivary pH (inflammation and bleeding gums).<sup>2</sup> Dental caries can also be progressed by dryness of mouth due to hormonal changes which results from inadequate flushing effect of saliva.<sup>4</sup> According to Center for

Disease Control (CDC), 25% of women develop untreated cavities during pregnancy. Additionally, children with exposure to high levels of cavity causing oral bacteria of their mothers are three times more likely to experience cavities as a child and miss their school because of dental pain due to transmission of these microorganisms from the mouth of mother to babies.<sup>6</sup> If dental caries is left untreated, abscess gradually grows into the cavity and spread widely throughout the face and forms cellulitis.<sup>2</sup>

The pyogenic granuloma, also termed as epulis or pregnancy tumor mostly affects 5% of gestating women during 2<sup>nd</sup> trimester of pregnancy.<sup>2,7,10,11</sup> It is a benign inflammatory lesion composed of proliferating capillaries, manifests as an asymptomatic red, smooth or lobulated sessile or pedunculated mass located on the papillary gingival tissues. It is induced by trauma or bacterial plaque which causes retardation of progesterone metabolism and facilitates development of pyogenic granuloma. After delivery, it typically recedes or disappears entirely in some cases.<sup>10,11</sup>

Pregnancy is the time that warrants special precautions with regard to use of medication and dental procedures. First trimester is the embryonic period when the risk of teratogenicity exists.<sup>12</sup> Therefore, dental clinician must assess the risks prior to prescribing any medications as the drug crosses the placenta by simple diffusion.<sup>14</sup> On the other hand, dental procedures such as diagnostic radiography, periodontal treatment, restoration and extraction can be safely performed during the second trimester as the uterus remains below the umbilicus and women feel comfortable till 20 weeks of gestation. In this period, treatment planning should include elimination of potential problems that could arise later in pregnancy or postpartum period.<sup>11,13</sup> Early part of 3<sup>rd</sup> trimester is relatively safer for routine dental care than later part when no elective dental treatment is advisable due to risk of supine hypotensive syndrome of the patient while resting on a supine position on the dental chair which impedes venous return to the heart and ultimately disturbs oxygen supply to the brain and uterus.<sup>12</sup>

A vast body of evidence indicated other factors independent of pregnancy (socio-demographic factors and oral health care utilization) to have significant influences on oral health status of pregnant women.<sup>14</sup> Many studies mentioned the concurrent role of low education, unemployment, income inequality and inadequate dental services in attaining

healthier oral health habits and behaviors. Dental caries and periodontal diseases disproportionately hit economically disadvantaged population. Low family income has also been significantly linked to poor perception of self-oral condition and access to dental services.<sup>15</sup>

Overall, oral diseases are preventable health conditions. Optimal oral hygiene maintenance, healthy dietary behaviour, adequate oral health practice and overcoming barriers to oral health care throughout pregnancy provides opportunity for reducing known risk factors and receiving early treatment resulting in reduced health care costs and improved oral and general health outcomes. Ultimately, restore a good quality of life not only for them but also, their upcoming babies.<sup>8</sup>

Most of the early studies on the epidemiology of oral diseases were limited to adult populations. Very limited resources were available in Bangladesh targeting the oral health of this vulnerable group. This study aimed to evaluate oral disease pattern, distribution of pregnant women as per socio-demographic characteristics, dental cleaning habits, dietary pattern and oral health seeking behavior during pregnancy in a selected hospital of Dhaka city. This will facilitate development of preventive programs related to oral health of pregnant women and provide clinically useful information for future researchers to evaluate actual scenario of oral health conditions of pregnant women in Bangladesh. Extensive research in this area will also help policymakers to adopt a correct course of action to combat the situation efficiently and reduce oral health burden in target population.

## **METHODS**

This study was a cross-sectional investigation, carried out for a period of four months from January to April, 2013. Pregnant women aged between 15 to 49 years who attended prenatal outpatient department in Azimpur Maternal and Child Health Training Institute, Dhaka were enrolled into this study. By applying a non-randomized purposive sampling technique and using a standard written informed consent form, 147 women were recruited in this study. A sample size calculation was undertaken using a formula  $n = z^2pq/d^2$  where  $n$  = required sample size;  $z = 1.96$  at 95% confidence interval;  $p$  = anticipated prevalence of pregnant women with dental diseases (set at 30%)<sup>2</sup>  $q = 1 - p$ ;  $d$  is the desired precision or error allowed in the study (set at 0.05). Thus, based on the computation, 323 subjects were considered necessary. However, due to resource

constraint, it was purposively limited to 147. Those who declined to participate in the study and do not meet the age requirement were excluded from this study. Tools involved face to face interview and clinical examination. To assess reliability and to estimate optimal time for questionnaire completion by the participants, it was pilot-tested on a group of 10 women. Items of the semi-structured questionnaire were drawn from pre-existing standard questionnaire and modified in accordance with the cultural sensitivity of the participants. Instruments used for oral health screening were periodontal probe, dental mirror, caries probe or explorer and excavator. Dental diseases such as periodontitis, dental erosion and aphthous ulcer were confirmed using World Health Organization (WHO) oral health survey's community-based indices. In addition, pregnant mothers' dental caries prevalence was assessed by the DMFT index. Severity of gingivitis was estimated by evaluating gum color, consistency and bleeding during gentle probing and lingual marginal gingiva of six index teeth using Loe and Silness gingival index. Periodontal status was assessed depending on the amount of clinical attachment loss (CAL) and categorized by a scale score of 1 to 4 where 1=No inflammation), slight=1-2 mm clinical attachment loss, moderate=3-4 mm clinical attachment loss or severe= >5 mm clinical attachment loss.<sup>13,14,15</sup> Mothers were invited to seat on a chair. Clinical screening methods specified in the WHO pathfinder survey guidelines. Clinical exam data were recorded in a special form and collected with the questionnaire data at the end of each session. All the collected data were then checked, cross-checked for completeness, accuracy and consistency to exclude missing and inconsistent data. The data were sorted and analyzed by using SPSS version 16 and presented in the form of tables, bars and charts. Descriptive data were expressed in frequency and percentage. Regarding independent variables, the questionnaire had 5 parts: 1) Sociodemographic data (age, educational level, employment status, period of gestation, household family income, number of current pregnancy and stage of pregnancy) 2) Oral hygiene habits (use of teeth cleaning instruments and materials, frequency of teeth cleaning in a week); 3) Dental care behavior (last dental visit, reasons for not visiting dentists during pregnancy, key persons advised for dental check-up during pregnancy) 4) Food habits during pregnancy (frequency of main meal consumption, type of extra meal consumptions in between main meals) 5) Received oral health information, source of oral health knowledge. The research protocol was approved by the Ethical Review Committee of Northern University Bangladesh. Permission was also taken from the superintendent/director of the

selected hospital. All ethical issues were maintained throughout the study.

**RESULTS**

A total of 147 participants were interviewed during a 4-month study period. Table 1 presented sociodemographic background of the expecting mothers and their husbands. About 72% of them belonged to the age group of 20-29 years, 19% to the age group of 15-19 years, 7.5% within the range of 30-34 years and 1.4% were categorized as above 35 years. More than half of the respondents (57%) and their husbands (53%) completed secondary school education. Majority of the respondents (88%) were housewives, 11% were service holders and 1% fell

under the category of day-labourer. 63% husbands of pregnant women were service holders, 29% husbands run business and 8% were categorized as day labourer. More than half (52%) of them had their monthly family income BDT≤10000, 31% had BDT 11000-20000, 16% respondents' monthly earning was BDT 21000-30000 and income level above BDT40000 was found among 1% of the respondents. Regarding number of current pregnancy, 52% of the expectant mothers conceived for the first time. Approximately 70% of child bearing mothers under antenatal care attended the hospital during second trimester, 27% of pregnant women in their 3rd gestational stage and only 4% respondents appeared during first trimester.

**Table 1: Socio-demographic characteristics of pregnant women**

<b>Age (years)</b>	<b>Frequency</b>	<b>%</b>
15-19	28	19
20-24	67	46
25-29	39	26
30-34	11	8
above 35	2	1
<b>Educational Level</b>	<b>Frequency</b>	<b>%</b>
Illiterate	7	5
Primary	33	22
SSC	83	57
HSC	12	8
Graduate or Above	12	8
<b>Occupation</b>	<b>Frequency</b>	<b>%</b>
Housewives	129	88
Employed	18	12
<b>Husband's Education</b>	<b>Frequency</b>	<b>%</b>
Illiterate	7	5
Primary	27	19
SSC	77	53
HSC	13	9
Graduate or Above	23	16
<b>Monthly Family Income</b>	<b>Frequency</b>	<b>%</b>
<10000	76	52
11000-20000	45	31

21000-30000	24	16
Above 40000	2	1
Total	147	100
<b>Number of Current Pregnancy</b>	<b>Frequency</b>	<b>%</b>
First	79	54
Second	55	37
Third or more	13	9
Total	147	100
<b>Period of Gestation</b>	<b>Frequency</b>	<b>%</b>
First trimester	6	4
Second trimester	101	79
Third trimester	40	27
Total	147	100

Regarding oral hygiene maintenance, it is observed that 60% of the respondents had cleaned their teeth once daily while 27% of them twice a day. A significant portion (94%) of them preferred to use toothbrush as a means of brushing their teeth. On the other hand, a small portion of the participants had the

habit of using finger (5%) and meswak (1%) respectively. With regard to the use of tooth cleaning materials, 95% of the respondents considered toothpaste while 4% and 1% of them were found in favour of tooth powder and charcoal use.

**Table 2: Distribution of the respondents by tooth cleaning habits**

<b>Tooth cleaning instrument</b>	<b>Frequency</b>	<b>%</b>
Finger	7	5
Meswak	2	1
Toothbrush	138	94
Total	147	100
<b>Tooth cleaning material</b>	<b>Frequency</b>	<b>%</b>
Charcoal	5	4
Tooth powder	2	1
Tooth paste	140	95
Total	147	100
<b>Frequency of tooth cleaning in a week</b>	<b>Frequency</b>	<b>%</b>
Occasional	19	13
Once/day	88	60
twice/day	40	27
Total	147	100

While assessing the dental care of the target population, it is revealed that only 6% of women with oral problems screened for oral health during prenatal period. 63% of them had no record of visiting dentists throughout their lifetime, 12% had history of oral health check-up a year ago and in case of 18% women, length of seeking oral health care was observed as 2 years or more. This table also provides information about main person advised for oral health examination to women in pregnancy. It is noticed that majority of the women decided by themselves to visit dental office for oral health check-up and

surprisingly, only 3% of the participants were recommended for oral health assessment by a prenatal care provider. Other than that, 20% of the women mentioned parents or husband who encouraged for dental check-up during this special period. Additionally, it is noticed from the table that 61% of respondents obtained dental health related information through television, 12% received from doctors or dentists. A negligible proportion of the expecting mothers gained information on oral health after reading newspaper (4%) or other sources (2%).

**Table 3: Distribution of the respondents by dental care behavior during pregnancy**

<b>Last dental visit</b>	<b>Frequency</b>	<b>%</b>
Never been to a Dentist’s office	92	63
1 year ago	18	12
2 years or more	28	19
Prior/During pregnancy	9	6
Total	147	100
<b>Reasons for not visit dentist during pregnancy</b>	<b>Frequency</b>	<b>%</b>
Afraid of the dentist	1	5
No need	4	48
No time	1	1
Financial reasons	1	11
Unaware of oral health recommendations in pregnancy	2	28
Total	9	100
<b>Key person advised for dental check-up in pregnancy</b>	<b>Frequency</b>	<b>%</b>
Self	99	67
Prenatal care provider	4	3
Parents or Husbands	29	20
Others	15	10
Total	147	100

It is mentionable from the table that 80% of the participants obtained oral health information. Out of them, a good section (61%) gained oral health information through watching television, a

considerable portion (12%) acquired through reading newspaper while it is surprising to mention that a negligible portion received from doctors or dentists (4%).

**Table 4: Distribution of the respondents by source of information on oral health**

<b>Obtained oral health information</b>	<b>Frequency</b>	<b>%</b>
Yes	117	80
No	30	20

Total	147	100
<b>Source of oral health information</b>	<b>Frequency</b>	<b>%</b>
TV	90	61
Newspaper	18	12
Doctor/Dentist	6	4
Others (specify)	3	2
Total	117	79

Food habit of the sample population was examined during pregnancy and it is exposed that 94% of the women preferred to eat meals two times in a day. About half of the women had the habit of eating snacks three times or more daily in between main

meals. In addition to this, 68% of the expectant mothers were willing to take sugary snacks or drinks in between main meals, 18% preferred to consume fruit or milk or egg and 14% liked to have fast food.

**Table 5: Distribution of the respondents by food habit during pregnancy**

<b>Frequency of having snacks in between meals</b>	<b>Frequency</b>	<b>%</b>
Did not have	6	4
Once a day	41	28
Twice daily	49	33
Three times or more daily	51	35
<b>Frequency of main meal consumption</b>	<b>Frequency</b>	<b>%</b>
Once a day	0	0
Twice daily	138	94
Three times daily	9	6
<b>Type of extra meal consumption</b>	<b>Frequency</b>	<b>%</b>
Sugary snacks/drinks	100	68
Fast food	21	14
Fruits/Milk/Egg	26	18
Total	147	100.0

Table 6 shows high prevalence of dental diseases observed in this study population during pregnancy. This study revealed that 100% of the respondents experienced gingivitis, 54% had dental caries and 52% suffered from dental erosion, 27% from

periodontitis and aphthous ulcer was seen in 16% of women. No significant association ( $p > .05$ ) was recorded between sociodemographic characteristics (age, education, occupation, family income) and their oral problems.

**Table 6: Distribution of the respondents by pattern of oral diseases**

<b>Dental diseases</b>	<b>Frequency</b>	<b>Percentage</b>
Dental Caries	80	54

Gingivitis	147	100
Periodontitis	39	27
Apthous Ulcer	23	16
Dental erosion	77	52

**DISCUSSION**

The results of the study have shown that most of the study population (72%) were young pregnant women represented age group of 20-29 years. This finding is very closer to the findings of a study carried out by Lithuanian Department of Statistics Lithuanian cities and by the National Center for Health Statistics in the USA.<sup>19</sup>

It is also found from the study that educational status of pregnant women was not satisfactory. This finding is quite different from the finding of a study conducted by Abiola et al. in 2011 in Nigeria.<sup>20</sup> Additionally, more than 80% of the women were not employed which differs from a study carried out by Alina Pūrienė et al. in 2011 in Lithuania.<sup>19</sup>

Owing to lack of oral health knowledge and autonomy, pregnant women need to take permission from their spouse before seeking dental health care which was responsible for growing negative attitude towards oral health and they bear the consequences of poor oral health secretly from day to day. This silent suffering created substantial oral health burden on them. Husbands of the child bearing mothers also had low levels of education although they could be utilized as a valuable resource in modifying oral

health attitude of the expecting mothers. This finding also suggests that multilevel educational intervention program addressing the personal, social, economic and organizational factors should be designed targeting not only pregnant women and their family members but also health care providers to promote the importance and safety of dental care during this special period, influence oral health status of expecting mothers and alleviate the problem at the grassroots level.

An inspiring outcome from this study was that majority of the respondents regardless of education and employment status preferred toothbrush and toothpaste for tooth cleaning, an indication of good oral hygiene maintenance. Additionally, 11% of the respondents had the habit of brushing their teeth and 5% using mouth rinse products after vomiting. However, larger proportion of women (68%) in this study gave priority to consume sweetened food or

drink in between main meals, a danger for oral disease initiation. This result was in line with the finding of a study conducted by J. Murray et al. in 2003 which showed that high frequency of intake of both sugars and sugar rich foods or drinks can contribute to dental caries.<sup>21</sup> The relationship between nutrition and oral health is often overlooked during pregnancy as most dieticians and pediatricians lack in training to provide preventive or therapeutic oral health recommendations as well as inability of the dentists to administer appropriate nutrition interventions due to lack of dietary counseling skills.<sup>22</sup>

Hence, these might be the reasons that dental caries (54%), dental erosion (52%) and gingivitis (100%), periodontitis (27%) were found very prevalent in this study population. As transmission of dental infection from mother to infant is widely recognized, more women at risk for dental diseases should be identified by health care personnel possibly prior to or during pregnancy to restore optimum oral health by motivating them to practice good oral hygiene habits to avoid exposure to oral bacteria. A cohort study carried out by Mitchell-Lewis et al. in 2001 compared periodontal status of 213 women where a group of women received periodontal intervention prior to delivery whether another group received the intervention after delivery. The outcome suggests reduced risk of preterm, low birth weight babies among pregnant women.<sup>23</sup>

Dental care during pregnancy was also explored and it was worth noting that majority of the women (63%) never consulted with their dentists throughout their lifetime and only a small portion (7%) visited their dentists prior to or during pregnancy. Major causes behind this were self-negligence (48%) and lack of knowledge of oral health recommendations from prenatal care providers (28%). One survey conducted by Mansour K. et al. on oral health knowledge and practice of 140 patients in three hospitals of Jubail area, Saudi Arabia found that 67% people visited the dentist once they had dental problems and 8% never visited a dentist. Chief barriers to dental visits mentioned were inability to make time, absence of dentists in the area, fear and affordability.<sup>24</sup>



Another similar survey done in the US also showed that majority of the women did not visit dentists during pregnancy, half of the women who reported oral problems did not seek care as they believed poor oral health during pregnancy as normal or fear that getting dental treatment poses risk for the fetus.<sup>25</sup> It is also observed from our findings that very few women (3%) were counseled for routine oral health screening by their prenatal care providers during antenatal visits which indicates a need to educate healthcare personnel further about the linkage between oral health and pregnancy outcomes. Additionally, this study also pointed out the role of parents and husbands in modifying oral health seeking behavior of pregnant women as 20% of women checked their oral health after they were encouraged by their parents and husbands. Women in our study acquired knowledge about oral health mainly from television and newspaper. These media seem to be a useful and suitable tool in disseminating oral health education messages to pregnant women in Bangladesh. This result was consistent with a study conducted in Sudan where the main source of knowledge of mothers who were aware of dental care was television and radio.<sup>26</sup>

Most of the women (69%) interviewed in this study started their antenatal check-up in 2nd gestational stage. Chai and Ngeow in 1998 mentioned that gastric acids associated with morning sickness along with eating pattern such as an increase in the frequency of carbohydrates or craving for more cariogenic foods initiate enamel demineralization.<sup>27</sup> Study conducted by E. Murray et al. in 2000 showed that almost three-quarters of all women suffer from nausea and in case of 1 out of 10 women the condition persists beyond first trimester.<sup>28</sup>

Therefore, collaboration between prenatal care providers and dentists are required to implement optimal oral health conditions of the pregnant women.

## **CONCLUSION**

This study involved a sample of pregnant women from one maternity hospital. Hence, the results cannot be generalized to all pregnant women in Bangladesh. The findings of high levels of oral disease experience and poor socio-demographic status and dental check-up highlight the need to integrate effective oral health educational interventions and counseling into the antenatal counseling programs including family members to raise oral health awareness and perceived dental care needs among pregnant women and their family.

Comprehensive oral examination should be made compulsory in every antenatal check-up as part of general physical examination. Prenatal care plan should also note whether the women is under the care of a dentist or a referral is made. Antenatal care providers should be adequately trained to encourage all pregnant women to abide by oral health professionals' recommendations regarding proper oral hygiene techniques, to continue to seek oral care and eat healthy foods and reassure them that use of dental radiographs, pain medication and local anesthesia are safe throughout pregnancy. This study also suggests to formulate suitable oral health policy to achieve better oral health outcomes in this vulnerable group.

## **REFERENCES**

1. Health. Dry Mouth During Pregnancy; 2012. Retrieved from <https://health.visualstories.com/dry-mouth-during-pregnancy>
2. Silk H, Douglass AB, Douglass JM, Silk L. Oral health during pregnancy. *American family physician*. 2008 Apr 15;77(8):1139-44.
3. Hughes SC, Levinson G, Rosen MA, Shnider SM, editors. *Shnider and Levinson's anesthesia for obstetrics*. Lippincott Williams & Wilkins; 2002.
4. Laine MA. Effect of pregnancy on periodontal and dental health. *Acta Odontol Scand*. 2002;60(5):257-64. DOI:10.1080/00016350260248210
5. 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; Article ID 9860. DOI:10.1155/2016/9860387
6. Center for Disease Control and Prevention. Oral Health: Pregnancy and oral health; 2012. Available from <https://www.cdc.gov/oralhealth/publications/features/pregnancy-and-oral-health.html>
7. Mukherjee PM, Almas K. Orthodontic considerations for gingival health during pregnancy: a review. *International journal of dental hygiene*. 2010 Feb;8(1):3-9.
8. American College of Obstetricians and Gynecologists. Oral health care during pregnancy and through the life span. Committee Opinion No. 569. *Obstet Gynecol*. 2013 Aug;122(2):417-22.

9. Sacco G, Carmagnola D, Abati S, Luglio PF, Ottolenghi L, Villa A, Maida C, Campus G. Periodontal disease and preterm birth relationship: a review of the literature. *Minerva stomatologica*. 2008 May;57(5):233.
10. Diaz-Guzman LM, Castellanos-Suárez JL. Lesions of the oral mucosa and periodontal disease behavior in pregnant patients. *Medicina oral, patología oral y cirugía bucal*. 2004;9(5):434-7.
11. Mishkin DJ, Johnson KE, Javed T. Dental diseases. *Principles and Practice of Medical Therapy in Pregnancy*. Stamford, Connecticut: Appleton and Large. 1998:1093-5.
12. Cunningham FG, Gant NF, Leveno KJ, Gilstrap LC, Hauth JC, Wenstrom KD. *Williams obstetrics* 21st ed. Toronto: McGraw-Hill. 2001;29:743-55
13. Dorn SO, Gartner AH. Case selection and treatment planning. *Pathways of pulp*. St. Louis, Missouri: Mosby. 1994:60-76.
14. Payal S, Kumar GS, Sumitra Y, Sandhya J, Deshraj J, Shivam K, Parul S. Oral health of pregnant females in central India: Knowledge, awareness, and present status. *Journal of education and health promotion*. 2017;6.
15. Barbieri W, Peres SV, Pereira CD, Peres Neto J, Sousa MD, Cortellazzi KL. Sociodemographic factors associated with pregnant women's level of knowledge about oral health. *Einstein (São Paulo)*. 2018;16(1)
16. Wiebe CB, Putnins EE. The periodontal disease classification system of the American Academy of Periodontology-an update. *Journal-canadian dental association*. 2000 Dec;66(11):594-9.
17. Armitage GC. Development of a classification system for periodontal diseases and conditions. *Ann Periodontol*. 1999 Dec;4(1):1-6. doi: 10.1902/annals.1999.4.1.1. 14
18. American Academy of Periodontology Task Force Report on the Update to the 1999. Classification of Periodontal Diseases and Conditions. *J Periodontol*. 2015 Jul;86(7):835-8. doi: 10.1902/jop.2015.157001. Epub 2015 May 27. 15
19. Alina Pūrienė et al. Accessibility of information about oral health and dental care to pregnant women in Vilnius. *Acta Medica Lituanica*. 2011;18(1): 23–29)
20. Abiola A, Olayinka A, Mathilda B, Ogunbiyi O, Modupe S, Olubunmi O. Oral Health Knowledge and Practices of Pregnant Women in a Nigerian Teaching Hospital. *African Journal of Reproductive Health* December 2011;15(4): 14-19.)
21. Murray J. Developing the concept of prevention—evidence-based dentistry. *The Prevention of Oral Disease*. 2003 Jun 5:261. 19
22. Stewart C. Food and nutrition guidelines for healthy pregnant and breastfeeding women: a background paper. Ministry of Health; 2006.
23. Mitchell-Lewis D., Engebretson, S., Chen J., Lamster I., Papapanou P. Periodontal infections and pre-term birth: early findings from a cohort of young minority women in New York. *European Journal of Oral Sciences* 2001; 109: 34-39.
24. Assery MK, Al-Saif KM. A survey of dental knowledge in Al-Jubail antenatal clinic population. *Saudi Dent J*. 1993 Jan;5(1):13-6.
25. Ressler-Maerlender J, Krishna R, Robison V. Oral health during pregnancy: current research. *Journal of women's health*. 2005 Dec 1;14(10):880-2.
26. Ibrahim HM, Mudawi AM, Ghandour IA. Oral health status, knowledge and practice among pregnant women attending Omdurman maternity hospital, Sudan. *EMHJ-Eastern Mediterranean Health Journal*. 2016;22(11):802-9.
27. Chai WL, Ngeow WC. Dental care for pregnant patients: a reappraisal. *Annals of Dentistry University of Malaya*. 1998 Dec 31;5(1):24-8. 2
28. Enkin M, Keirse MJ, Neilson J, Crowther C, Duley L, Hodnett E, Hofmeyr J. *A guide to effective care in pregnancy and childbirth*. Oxford: Oxford university press; 1995 Mar.