Attitudes and knowledge of pregnant women about oral health

Lidia Gavic, Ana Maretic, Sanda Putica, Antonija Tadin

Abstract:
BACKGROUND: This cross-sectional study aimed to evaluate attitudes and knowledge regarding oral health and infant oral health among pregnant women.

MATERIALS AND METHODS: The study involved 325 pregnant women in the Republic of Croatia who completed an anonymous online questionnaire (Google forms) from January to June 2019. The questionnaire was divided into three parts. The first part contained questions about the demographic experience about oral health in pregnancy. The second part was related to the knowledge of the relationship between oral health and pregnancy. The third section consisted of questions related to knowledge about the oral health of children at the earliest age. The results were analyzed with descriptive statistics, Spearman correlation analysis, and Chi-square test.

RESULTS: The women are mostly informed about oral health in pregnancy from their dentists (53.54%) and least from their general doctors (4%). In pregnancy, gingival bleeding was observed by 52.31% of respondents and tooth mobility by 12.31%. The Chi-square test found that there was a difference in attitude regarding the age at which they should stop breastfeeding between respondents who had their first pregnancy and those who already had children. Only 9.23% of respondents are aware that breastfeeding can cause tooth decay.

CONCLUSION: Pregnant women in the Republic of Croatia do not have sufficient knowledge, and they are neither aware of the importance of oral health during pregnancy nor infant oral health.

Keywords: Oral health, pregnancy, pregnant women

Introduction

Due to the growth of the fetus and the preparation of the mother’s body for childbirth, many physiological changes occur in the body during pregnancy which can also be manifested in the oral cavity.[1] Oral health plays an important part of general health and as such should be maintained throughout the whole life and thus in pregnancy.[2] Good oral health of pregnant women is essential for their own health and health of the fetus and can reduce the risk of complication in pregnancy.[3] Increased pH of the oral cavity due to vomiting, frequent meals rich in carbohydrates, and poor oral hygiene contribute to the easier development of caries in pregnancy. If left untreated, it can lead to local and systemic complications.[4]

Tooth erosion is a common finding in the oral cavity of pregnant women; they most often occur as a result of morning sickness and vomiting, especially in the first trimester. Another reason for the occurrence of tooth erosion is increased reflux of gastric acid, due to the weakened tone of the lower esophageal sphincter and the increase in intra-abdominal pressure.[5]

Because of increased levels of progesterone and estrogen, the periodontal ligament relaxes so the increased tooth mobility can occur. This condition is reversible and recedes soon after birth.[3] The most common change in the oral cavity during pregnancy...
is gingivitis which affects 36%–100% of pregnant women.\textsuperscript{[6]} It occurs due to increased levels of estrogen and progesterone, changes in the oral flora and a reduce immune response, thus reducing the body’s ability to repair and maintain healthy gingiva tissue. Periodontitis in pregnancy is associated with an increased risk of preterm birth, decreased neonatal birth weight, preeclampsia, and gestational diabetes.\textsuperscript{[6,7]} Periodontal therapies can reduce the rate of unfavorable pregnancy outcomes in women and high risk of pregnancy complications and it can improve the general health of pregnant women.\textsuperscript{[8]}

The most probable mechanism of association between periodontitis and unfavorable pregnancy outcomes is inflammatory response with suppression of local growth factors in the fetoplacental unit.\textsuperscript{[8]} Premature birth is a birth before 37th week of pregnancy. Bacteremia caused by periodontitis stimulates the release of inflammatory cytokines which can cause an increase in the physiological level of prostaglandin E2 (PGE2) in tumor necrosis factor-\textalpha{} in the amniotic fluid leading to early contractions and premature birth.\textsuperscript{[9]} A similar mechanism is thought to cause lower weight at birth (<2500 g). The release of PGE2 restricts placental blood flow and causes placental necrosis as well as intrauterine growth restriction.\textsuperscript{[10]} Preeclampsia is a pregnancy disorder manifested by high blood pressure (≥140/90 mmHg) and proteinuria (≥300 mg).\textsuperscript{[9]} It occurs in 2%–10% of pregnant women, usually after the 20th week of pregnancy and is the main cause of premature birth and slow growth of the child.\textsuperscript{[7]} Periodontitis can affect the development of preeclampsia because periodontal pathogens can cause systemic maternal and placental inflammatory endothelial dysfunction.\textsuperscript{[9]}

Pregnant women with poorer oral health have large amount of \textit{Streptococcus mutans} in their saliva which increases the likelihood of colonization in the newborn’s mouth and the consequent incidence of the early childhood caries, so there is a need to promote oral health during pregnancy and the perinatal period.\textsuperscript{[8]}

The hypothesis of the study was that pregnant women in the Republic of Croatia are not sufficiently aware of the relationship between oral health and pregnancy and the oral health of children at the earliest age.

\section*{Materials and Methods}

\subsection*{Study design and setting}

This was a cross-sectional study conducted from January to June 2019 through online questionnaires (Google forms) among the pregnant women in the Republic of Croatia.

\subsection*{Study participants and sampling}

The inclusion criteria were pregnant women who have approved their participation in the research by a written consent. The exclusion criteria were not pregnant women or pregnant women who had not approved their participation.

\subsection*{Data collection tool and technique}

The online questionnaire was distributed through the social platform Facebook. Since Facebook is the largest social network in Croatia, questionnaire distribution on the pregnancy forum was the easiest way to rapidly obtain representative survey data. According to the data of Croatian bureau of statistics in 2018 year, the 36945 children were born.\textsuperscript{[14]} Thus, sample size was calculated with the confidence level of 95%, margin of error 5%, and population proportion of 80% and was 245.

The questionnaire was completely anonymous. All respondents were informed about the purpose of the study and they signed a written consent before completing the printed questionnaire. Those respondents who completed the online questionnaire confirmed their voluntary participation by completing the questionnaire itself.

The questionnaire was divided into three parts. The first part contained questions about the general demographic data of the respondents and their own experience about oral health in pregnancy. The second part was related to the knowledge toward the relationship between oral health and pregnancy. The questionnaire from the study of Hashim and Akbar was adapted and supplemented with new questions.\textsuperscript{[15]} Cronbach’s alpha coefficient of internal consistency for this questionnaire translated into Croatian was 0.719, which implied a very good reliability.\textsuperscript{[16]} The third section consisted questions related to knowledge about the oral health of children at the earliest age. This part was taken from the study by Di Giuseppe \textit{et al.},\textsuperscript{[17]} it was modified and has been translated and validated into Croatian in 2017.\textsuperscript{[18]} The both forms used close-ended questions.
The arithmetic means of all the answers given were
determined as the boundary between the insufficient
and sufficient knowledge of the respondents.19 For each
correct answer, the respondents got 1 point. The final
sum for the second part could range from minimum of
zero to maximum of 7 points. Similarly, the final sum for
the third part ranged from 0 to 9 points.

All correctly completed questionnaires were entered
into the database and analyzed using the software
package SPSS (IBM Corp., Armonk, New York). Descriptive statistics were used to determine basic statistical parameters (mean, standard deviation, median, and minimum and maximum values). Spearman correlation analysis was used to determine the relationship between individual variables. Differences in responses related to the attitudes of pregnant women considering whether they already have children or not were examined by the Chi-square test. The level of significance was set at 0.05.

Ethical consideration
The research was approved by the Ethics Committee
of the medical faculty of the University of Split (Class:
003-08/19-03/0003; Reg. No.: 2181-198-03-04-19-0024),
which confirmed that the study was in full accordance
with ethical principles including World Medical
Association Declaration of Helsinki.

Results
The study involved 325 pregnant women aged
18–43 years. The mean age was 28.86 ± 4.78, and median
was 29. There was no missing data.

The degree of pregnancy of the respondents ranged
from the 5th to the 40th week (mean 25.21 ± 8.92 weeks).
This was the first pregnancy for 188 women (57.85%),
while 137 of them (42.15%) stated that they already
have children.

Table 1 represents respondents’ answers on how they get
informed about the relationship between oral health and
pregnancy, as well as dental treatments they consider
safe during the pregnancy.

| Attitudes about safety of treatments during the pregnancy | n (%) |
|---------------------------------------------------------|------|
| Routine teeth cleaning | 320 (98.4) |
| Production of fillings or crowns | 72 (21.15) |
| Periodontal treatment | 99 (30.46) |
| Extractions | 31 (9.54) |
| Intraoral/extraoral radiograms | 5 (1.54) |

Source of information about relationship of oral health and pregnancy

| Source of information | n (%) |
|-----------------------|------|
| Dentist | 174 (53.54) |
| Gynecologist | 75 (23.08) |
| Family physicians | 13 (4) |
| Books, journals, brochures | 105 (32.31) |
| Internet | 164 (50.46) |

Table 2: Answers of pregnant women about the relationship between oral health and pregnancy

| Agree, n (%) | Disagree, n (%) |
|-------------|----------------|
| Pregnancy increases the risk of gingiva inflammation | 207 (63.69) |
| There is a connection between dental and gingival health and pregnancy | 231 (71.08) |
| Gingivitis/periodontitis can affect the outcomes of pregnancy | 102 (31.38) |
| Periodontal disease can lead to premature birth and low birth weight | 92 (28.31) |
| Local anesthesia is safe for pregnant women | 180 (55.38) |
| The second trimester is the safest for dental treatments | 224 (68.92) |
| Periodontal disease can lead to high blood pressure in pregnancy | 82 (25.23) |
The average score of the second part of the questionnaire was 3.44, while the average score of the third part of the questionnaire was 5. About 34.48% of respondents \((n = 156)\) showed sufficient knowledge about the relationship between the oral health and pregnancy, while 67.38% \((n = 219)\) demonstrated sufficient knowledge about the oral health of children at the earliest age.

**Spearman correlation analysis**

Spearman correlation analysis indicated a positive correlation between the age of the respondents and the fact that it was not the first pregnancy \((R = 0.249, P < 0.001)\). In addition, the age of the respondents is positively correlated with getting the information on 
the relationship between oral health and pregnancy from books, magazines, and brochures \((R = 0.171, P = 0.002)\). The knowledge about preeclampsia correlated positively with the age of the respondents \((R = 0.158, P = 0.004)\) and the fact that it was not a first pregnancy for the respondents \((R = 0.127, P = 0.023)\). The attitude that the child should start brushing teeth as soon as the first tooth erupts is positively correlated with the fact that the respondent already has children \((R = 0.135, P = 0.015)\). A slight positive correlation was observed between the higher stage of pregnancy and noted gingiva bleeding \((R = 0.122, P = 0.028)\). The attitude that the child should be taken for the first dental examination around the 1st year of life is positively correlated with the attitude that the child should start brushing teeth as the soon tooth erupt \((R = 0.221, P < 0.001)\) and with the attitude that breastfeeding can cause carious \((R = 0.122, P = 0.028)\). The result of knowledge about the relationship between oral health and pregnancy positively correlated with the result of knowledge of oral health of children of the earliest age \((R = 0.287, P < 0.001)\).

**Chi-square test**

The Chi-square test showed that there was a difference in the attitude about when the child should begin to brush teeth between the respondents who had their first pregnancy and those who already had children \((P = 0.017)\). There is a higher proportion of pregnant women with children who know that a child should start brushing teeth as soon as the first one erupts, in comparison to those who had their first pregnancy \([Table 4]\).

The Chi-square test found no difference in the attitude that breastfeeding causes caries between the group of women who were pregnant for the first time during the study who already had children \([P = 0.802; Table 4]\).

**Discussion**

The aim of this study was to assess the knowledge of pregnant women about the importance of maintaining oral health. When it comes to the knowledge about the oral health and pregnancy, 52% of the respondents answered below the average score of 3.44. This means that 52% of respondents have insufficient knowledge on the topic. The results of this study are close to the results of a study conducted by Mousa et al., which showed that 65% of pregnant women has high level of knowledge about oral health in pregnancy.\(^{[20]}\) On the other hand, when the oral health of the children at the earliest age is considered, 67.38% of respondents answered above the average score of 5.35. This shows sufficient knowledge on the topic. Pregnant women with higher score in the second part also scored higher in the third part \((R = 0.287, P < 0.001)\).

In this study, 71.08% of pregnant women consider that there is a connection between the health of teeth and gingiva with pregnancy, as opposed to the study conducted in Nigeria.\(^{[21]}\) In that study, 81.8% of pregnant women do not know for the connection between oral illness and pregnancy.

However, only 28.31% of pregnant women knew that periodontal disease could cause premature birth and lower birth weight. In the study conducted by Alwaedi and Al-Jundi, an even lower number of pregnant women, only 5.1%, believed that there is a connection between periodontitis and premature birth.\(^{[22]}\)

Pregnant women stated that they get the most information about the connections between oral health and pregnancy from their dentist (53.54%). Those responses are in line with the results obtained from a survey conducted among pregnant women in Poland.\(^{[23]}\) The older the pregnant women are the more information they get from books, magazines, and brochures \((R = 0.171, P = 0.002)\). Only 25.85% of pregnant women stated that their gynecologist advised them to have a dental examination. Similar results were observed in a study by Gaszyńska et al., according to which most pregnant women go for a dental visit on their own initiative, and only 3% of them are advised by a gynecologist.\(^{[23]}\)
During pregnancy, 52.31% of the respondents noticed gingival bleeding and 12.31% noticed by tooth mobility. Similar results were observed by Nagi et al. in their study, where 50.1% of pregnant women showed gingival bleeding and 25% had tooth mobility.[24] Furthermore, those results are in accordance with those obtained in the study of Payal et al. where 60% of pregnant women had some dental problems, mostly gingival bleeding.[25]

In this study, 68.92% of pregnant women knew that the second trimester is the safest period for the dental procedure. Similar results were obtained in the above-mentioned study by Nagi et al.[24] The ideal period for the dental procedures is the beginning of the second trimester (14[24]–20[24] week of pregnancy). At this stage, there is no risk of teratogens, nausea, and vomiting which are lowered, and the uterus is not yet large enough to cause discomfort.[3]

Emphasis should be placed on a control of the active disease and elimination of potential problems which could emerge later during in pregnancy or during the immediate postpartum period. Extensive reconstructions or surgical procedures are to be delayed after delivery.[26] In this study, pregnant women in the higher stage of pregnancy more often noticed gingival bleeding than those in the lower stage (R = 0.122, P = 0.028). These results coincide with the results obtained in the study conducted by Dinas et al., according to which the symptoms of gingivitis were noticed by pregnant women in the second (44.2%) and third (44.2%) trimesters.[27]

During pregnancy, X-rays should be avoided, especially in the first trimester as the fetus is most sensitive.[26] According to different studies, radiation exposure of <5 rad is not associated with an increase of fetal abnormalities or pregnancy loss. The estimated exposure of the fetus when an X-ray is taken amounts to 0.0001 rad. Therefore, 50,000 takes are required to reach the cumulative limit dose limit of 5 rad.[31] However, dental radiographs of pregnant women should be taken only when necessary, with mandatory appropriate protection in terms of lead apron and thyroid collar.[26]

The American Academy of Pediatrics recommends breastfeeding during the first 6 months of a child’s life. After the first 6 months to 1 year, appropriate supplementary food should be introduced. Children who are breastfed for more than 12 months have an increased risk for the development of the early childhood caries due to nocturnal and frequent breastfeeding.[28,29] The flow of saliva during night is reduced so the contact of the cariogenic solution of breast milk with the tooth surface is prolonged.[28] In this study, only 9.23% of respondents were aware that breastfeeding can cause caries. There is no statistically significant difference between the women with first pregnancy and those who already have children [P = 0.802; Table 4].

According to the American Academy of Pediatric Dentistry guidelines, a child’s teeth should be brushed as soon as the first tooth erupts.[30] In this study, women who already have children were more aware about it than those with first pregnancy [P = 0.017; Table 4].

The American Dental Association and the American Academy of Pediatric Dentistry recommend that the child’s first dental check-up should be performed 6 months after the eruption of the first tooth, no later than the first birthday.[31] 41.23% of respondents of this study know that a child should be taken for a first dental check-up around the 1st year of life. However, 52.23% mistakenly believe that the right time for the first check-up is when all deciduous teeth erupt. A study conducted in India showed an even worse level of knowledge of pregnant women about the time of the child’s first visit to the dentist, according to which only 22.3% of respondents knew that the child’s first dental visit should be when first teeth erupt.[32]

Considering the results of this research, it is important to emphasize the need for better education of pregnant women but also of all women who plan a pregnancy. Dentists should do everything in their power to raise the awareness about the importance of oral health during the pregnancy and the perinatal period. They should give pregnant women instructions on the proper implementation of oral hygiene, as well as educate them

Table 4: The attitudes of pregnant women given the fact that they already have children

| The attitude | Do you already have children | Chi-square test |
|--------------|-----------------------------|-----------------|
|              | No, n (%) | Yes, n (%) |                      |
| When should parent/guardians start brushing children’s teeth |                          |                 |
| When the first tooth erupts | 143 (44) | 119 (36.62) | χ²=8.112, df=2 |
| When all deciduous teeth erupt | 43 (13.23) | 15 (4.62) | P=0.017 |
| When first caries appears | 2 (0.62) | 3 (0.92) |                 |
| Breastfeeding may cause caries |                          |                 |
| No | 170 (52.31) | 18 (5.54) | χ²=0.063, df=1 |
| Yes | 125 (38.46) | 12 (3.69) | P=0.802 |

χ²=chi-square, df=degree of freedom, P<0.05
about the possible oral changes during pregnancy and the connection between periodontitis and unwonted pregnancy outcomes. Furthermore, the study showed that a small number of pregnant women are referred by a gynecologist for a dental examination. Thus, additional communication between a gynecologist and a dentist is crucial. In this way, gynecologists would become more aware of the importance and safety of dental treatment in way so they could explain and recommend it to pregnant women.

Limitation and recommendation
This study has a certain limitation. Since this was the study with online data collection, it is based on volunteer sampling instead of probability sampling.[33] Furthermore, the study involved only pregnant women who use a computer and sought information on the home page where the survey was linked. Despite that, according to Lefever et al., the relatively large number of volunteer respondents gives confidence to the data’s general reliability.[33] The recommendation for the future research is to include the pregnant women who do not have the access to the Internet. Furthermore, it would be desirable to make a clinical oral examination of pregnant women which would help to compare their subjective oral health condition with the objective one. New research on this topic could include the education of pregnant women, after which their knowledge of the topic would be re-examined. This would show the real need for education of pregnant women in the Republic of Croatia.

Conclusion
Preventive programs should be created on the global level and implemented by each country adapted by their own needs. In this way, not only the oral health of pregnant women would improve but also the oral health of the child would be protected and preserved.

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Conflicts of interest
There are no conflicts of interest.

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