



**ORIGINAL RESEARCH PAPER**

**Public Health**

**A COMPREHENSIVE QUESTIONNAIRE-BASED STUDY ON “ORAL HEALTH AWARENESS AMONG PREGNANT WOMEN IN LUCKNOW CITY”**

**KEY WORDS:** Early childhood caries, Oral health education, oral health awareness, Pregnancy

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**ABSTRACT**

**Background:** During pregnancy, hormonal changes can affect the oral cavity and increase the risk of gum disease inflammation, and tooth decay. These issues can potentially harm the health of the developing baby. Therefore, it is crucial for both the mother and child to maintain proper oral health. Mothers need to be aware of the connection between oral health and pregnancy. This study aims to assess women's self-reported oral health and oral health literacy, as well as their level of awareness regarding this connection. **Material and Methods:** The study involved distributing a pretested questionnaire to 200 mothers between the ages of 19 and 44 who gave birth at the government hospitals in Lucknow city. The questionnaire covered topics such as demographics, oral health before and during pregnancy, as well as post-childbirth oral health. **Results:** Research reveals that only 20% of women had received oral examination prior to pregnancy, whereas 38.5% intentionally received dental checkups after confirming their pregnancy. Approximately 24% of the women were not aware of the significance of maintaining proper oral hygiene during pregnancy. During pregnancy, 41.5% of women reported dental complaints, and 30.5% received dental treatment. 68% brushed their teeth twice daily, while 32% observed oral health deterioration during pregnancy. Most of the mothers possessed a good understanding of the significance of maintaining oral health during pregnancy. This was strongly linked with a higher level of education and living in larger cities. The study also revealed that there was a significant connection between higher birth weight and regularly brushing teeth on a daily basis. Younger mothers tended to have more frequent problems with their oral cavity and required more dental treatments during pregnancy. **Conclusions:** The level of awareness among women regarding oral health management is quite low. Obstetricians and pediatricians should ask pregnant women about their dental check-ups both before and after childbirth and educate them about the significance of oral hygiene during and after pregnancy

**INTRODUCTION**

During pregnancy, women go through many physiological and hormonal changes that can affect their oral health and hygiene. Common oral problems during pregnancy include gingivitis, dental erosion, halitosis, and pregnancy epulis. These issues can be linked to adverse pregnancy outcomes such as preterm birth, low birth weight, preeclampsia, gestational diabetes, vulvovaginitis, and premature rupture of membranes. Therefore, it is important to consider the risk of these oral health problems during gestation and childbirth.

Periodontal diseases can negatively impact the quality of life of pregnant women. The most common signs of gingival inflammation are caused by increased estrogen levels, which interfere with cell proliferation and differentiation, as well as keratinization of epithelium. In addition, increased levels of progesterone can affect the permeability of vessels and microcirculation in the gingiva. When combined with oral pathological flora, increased hormone levels and decreased immune responses can cause gum swelling and spontaneous or provoked gingival bleeding. Although plaque levels remain unchanged during pregnancy, gingival inflammation in pregnant women is significantly increased, peaking in the third trimester but reducing only after 3 months postpartum. If left untreated, gingival inflammation can lead to periodontitis, which involves periodontal attachment, bone loss, and the formation of periodontal pockets. It is important for pregnant women to take special care of their oral cavity, especially when experiencing food cravings for sweet food, as this can influence the formation pattern of dental plaque. A healthy diet during pregnancy can have a positive impact on reducing gingival and periodontal inflammation. A sugar-rich diet can increase bacterial load, leading to dental caries, which is a common and costly disease in pregnant women. Researchers have found that dental caries can have far-reaching effects on pregnant women, including depression,

which can be mediated by self-perception about oral health. Pregnant women with dental caries experience, diverse severity of untreated dental caries, tooth loss, and filled teeth may experience higher levels of depressive signals and symptoms.

Various factors affect oral health during pregnancy, including the level of vitamin D in a patient's serum. Treatment with vitamin D can improve outcomes in infertile women, while deficiency can cause complications[20-28]. Granuloma gravidarum is a condition that commonly appears during pregnancy due to an increase in progesterone levels. It can cause local bleeding while eating and brushing teeth. Pregnant women are also at a higher risk of enamel erosion, leading to hypersensitivity. Maintaining good oral health throughout pregnancy is essential. Healthy behaviors of future mothers depend on socioeconomic factors such as age, place of residence, education level, and number of children. Socioeconomic factors impact the oral health-related quality of life (OHRQoL) and the self-assessment of women's oral health and oral health literacy [29,30] as well as awareness of the relationship between oral health status and pregnancy, are important. The study aimed to assess these factors in postpartum women

**MATERIALS AND METHOD**

The study was conducted by trained personnel who disseminated the questionnaires. In this study, a questionnaire-based survey was prepared and provided to be filled in the paper version or online by women who gave birth in the gynecological ward of the hospital. The questionnaire included 5 general demographic items and 11 questions concerning oral health. The mothers provided answers without any help from the dentists to collect real knowledge, without any suggestions, of women's awareness of their oral health during pregnancy. This study was approved

by the Ethics Committee of the hospital.

**Statistical Analysis**

The following statistical measures were calculated for continuous data: mean (X), median (M), standard deviation (SD), range (min, max), lower quartile (25Q), and upper quartile (75Q). To determine the statistical significance between means for different groups, we used the one-way analysis of variance (ANOVA). For two groups, we used the non-parametric U Mann–Whitney test, and for more than two groups, we used the Kruskal–Wallis test. The homogeneity of variance was determined using the Bartlett’s test.

The frequency data was analyzed for statistical significance using the chi-square test ( $\chi^2_{df}$ ) with Yate’s correction. The degree of freedom was calculated using the formula  $df=(m-1)*(n-1)$ , where m is the number of rows and n is the number of columns. To reject the null hypothesis, a p-value of less than 0.05 was required. The statistical analysis was performed using the EPIINFO Ver. 7.2.3.1 software package.

**RESULTS**

Finally 200 questionnaires were collected from the women aged  $31.9 \pm 5.3$  on an average. There were some questionnaires not fully completed, what could change the number of answers of some questions.

Only 170 mothers gave information about the length of pregnancy which was on average  $38.9 \pm 2.1$  months. And only 172 mothers defined the baby’s birth weight, which was  $3335.7 \pm 508.2$  g on average. The majority of women—61.5% (lack of 1.5% of answers) were from big cities. When education was considered, the majority of mothers had higher education—55.5%, and primary education had only 4.5% of respondents. Natural parturition was declared by 45% of mothers, 48.5% of them had caesarean section however 13 mothers did not answer this question. Nausea during pregnancy was indicated by 40 percent of women, as much as 58.5% did not have this condition and 1.5% of respondents did not answer this question. The data acquired from these general questions are presented in Table 1 Investigated oral related parameters are presented in Table 2

**Table 1 General Questions—Demographical and Clinical Parameters**

Women age	31.9 years, median 32.0 max 44.0 min 19
Week of delivery	38.9 years, median 39.0, max 42.0 min 30,0
Way of delivery	
natural parturition	45.0%
caesarean section	48.5%
lack of answer	6.5%
Place of living	
in small/medium town	23.5%
in big town	61.5%
lack of answer	1.5%
Educational status	
primary education	13%
secondary education	32%
higher education	15.5%
lack of answer	50,5%

**Table 2 Oral Cavity Related Parameters Performing**

Dental examination performing	
Before pregnancy	20%
After confirmation of pregnancy	38.5%
Oral cavity state self-assessment before pregnancy:	
very good	30%
good	51,5%
Nausea during pregnancy	40%
Lack of awareness of the importance of good oral hygiene during pregnancy	24%

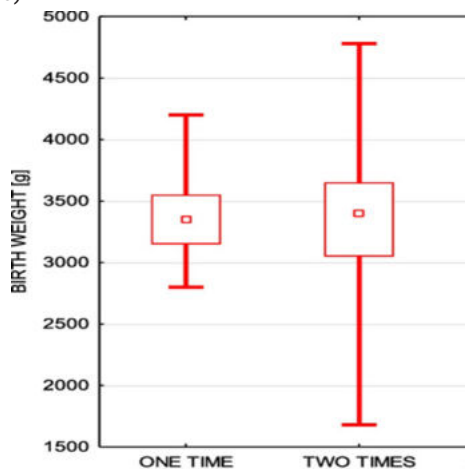
Brushing teeth only once a day	25%
Brushing teeth twice a day	6%
Oral problems during pregnancy	
complains concerning teeth or gums	41.5%
complains concerning dental hypersensitivity	24.5%
gums bleeding	37%
gingival overgrowth/ edema	14.5%
dental treatment	30.5%
deterioration of the oral cavity state	32%

The first question concerning oral health during pregnancy focused on the significance of dental examinations for pregnant women. It was found that only 20% of the women who were surveyed underwent a dental examination before becoming pregnant, while 38.5% had the examination done after their pregnancy was confirmed. A positive correlation was observed between the examination and the women’s level of education (chi-square test = 36.1,  $p \leq 0.001$ ) and living in a big city (chi-square test = 13.7,  $p \leq 0.033$ ). When considering any changes or problems with their teeth or gums during pregnancy, 57% of the women did not notice them. 1.5% of the entire surveyed group did not provide an answer. The women were asked to self-assess their oral health before pregnancy. In this group, 30% described it as very good, and 51.5% as good, which was more common among women with higher education (chi-square test = 14,  $p \leq 0.024$ ). The next 17.5% of respondents reported discomfort with calculus and small caries defects, mainly in the group of women with primary education.

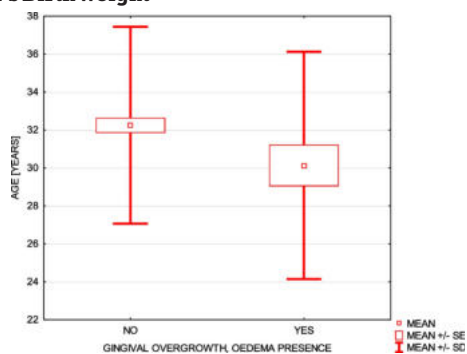
It was observed that there were statistical differences in the assessment of the oral health state of pregnant women and the length of their pregnancy. A longer pregnancy duration was associated with a worse self-assessment of oral health before pregnancy. However, women’s feelings about their oral cavity assessment changed during pregnancy. After childbirth, 20.5% of women described their oral health state as very good, and 47% as good. These states were mainly presented by women with higher education, i.e. 72.5% and 53.19%, respectively. Additionally, 25% of the subjects described feelings of calculus and caries presence, 5.5% indicated their oral health status as bad, and 4 mothers (2%) did not provide their opinion. This was mainly in the group of women with primary and vocational education, but there was no strong statistical significance (chi-square test = 14.1,  $p \leq 0.077$ ).

The study examined women’s awareness about the importance of good oral hygiene during pregnancy. The results revealed that only 16.5% of the women were aware of it before becoming pregnant. During pregnancy, 59.5% of the women received information about the significance of good oral hygiene. The remaining 24% of women were not aware of this knowledge until the end of their pregnancy. In addition, the study found that 68% of the respondents brushed their teeth twice a day, 6% brushed their teeth only once a day, and 4.5% brushed their teeth as much as four times a day. Women with higher education status reported brushing their teeth more frequently with 87.5% of them brushing twice a day. In contrast, women with primary education reported brushing their teeth mainly twice a day, with 70.83% of them brushing twice a day. The difference was statistically significant (chi-square test  $\chi^2 = 20,2$   $p \leq 0,001$ ). The study also found a significant correlation between the frequency of brushing teeth and the birth weight of newborns. Newborns whose mothers brushed their teeth only once a day had a statistically lower birth weight, while newborns of mothers who brushed their teeth two times a day had a higher birth weight. Furthermore, 37% of women reported gum bleeding, and this parameter was found to be correlated with nausea during pregnancy (chi-square test = 10.5  $p \leq 0.001$ ). Gingival local overgrowth during pregnancy was present in 14.5% of women, and it was found to be significantly more common among younger women, women who experienced pregnancy nausea (chi-square test = 3.94  $p \leq 0.047$ ), and women who

gave birth through caesarean section (chi-square test = 8.68 p ≤ 0.013)

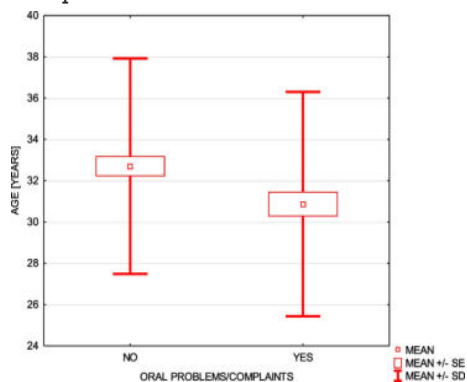


**Fig. 1 Relationship Between The Daily Toothbrushing And Child's Birth Weight**



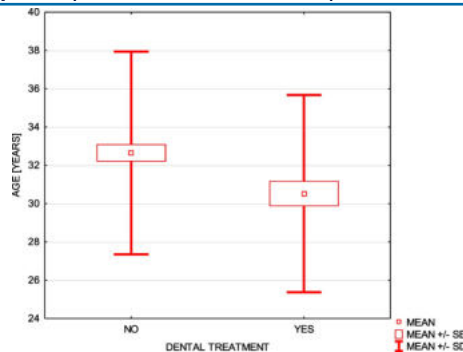
**Fig. 2 Relationship Between The Women's Age And Gingival Overgrowth**

Problems or complaints concerning teeth or gums were statistically more often described by younger women (Fig. 4) and by women experiencing nausea during pregnancy (chi-square test=3.81 p≤ 0.05). The signs of dental hypersensitivity confirmed 24.5% of women and 1% of all women did not answer this question.



**Fig. 3 Frequency Of The Problems Or Complaints Concerning The Oral Cavity During Pregnancy In Relation To The Women's Age**

As much as 30.5% of women had dental treatment during pregnancy and it was significantly more often performed in younger women (Fig. 5), however, 4 women (2%) did not answer this question. In the whole group of respondents, 5% had dental extraction, statistically more often in women living in the countryside (chi-square test = 6.30, p ≤ 0.043). Deterioration of the oral health state after pregnancy concluded 32% of mothers (Table 2).



**Fig. 5 Dental Treatment During The Pregnancy In Relation To The Women's Age**

**DISCUSSION**

Studies across the world have shown that oral health during pregnancy is essential for both the mother and the unborn child's well-being.(3) Despite efforts made by various global organizations, research indicates that both women and healthcare providers lack sufficient knowledge and awareness regarding this matter. (24,26,27)

This study analyzes significant correlations between various parameters of pregnant women. The results obtained are similar to other studies. The healthier behaviors of pregnant women depend on socioeconomic factors, age, place of living, education level, and number of children. (26, 27, 29,30) Only 16.5% of mothers had knowledge of the positive relationship between oral health and pregnancy before pregnancy. While 59.5% received this information during pregnancy, surprisingly, 24% had no awareness of such influences. Women's level of health literacy influences seeking information, procedures, and behaviors important for good health. This phenomenon was observed in this study. 24% of women were not interested in oral health literacy, resulting in underestimated knowledge of the oral health state related to complications

The study found that only 58.5% of women underwent dental examinations before or immediately after pregnancy confirmation. It is important for health professionals to educate pregnant women about the significance of oral health during pregnancy. Oral health literacy among pregnant women is still insufficient. (2) In this study, 41.5% of women reported general oral complaints, and 32% of mothers reported deterioration of their oral cavity during pregnancy. The findings of Ghaffari et al. showed that educational intervention was effective in changing the awareness of pregnant women regarding oral health.(22)

Orthodontic treatment has become increasingly popular nowadays, particularly among young women who seek it for aesthetic reasons. In our investigation, we found that 12.5% of women who underwent the treatment removed their orthodontic braces before pregnancy due to termination of treatment or pregnancy. However, only 5% of significantly younger women continued the treatment during the whole or part of their pregnancy period.(33)

It is recommended to brush teeth twice daily for maintaining proper oral hygiene. A survey revealed that mothers with higher educational status reported brushing teeth at least twice a day. On the other hand, 6% of mothers reported brushing their teeth only once a day, and this was correlated with lower birth weight. In contrast, brushing teeth four times a day was associated with higher birth weight of newborn babies. Our study confirms findings that daily toothbrushing affects oral hygiene and gingival inflammation, which in turn is associated with birth weight. Another study by Gil showed that dental plaque level, evaluated only supragingivally, was positively correlated with periodontal parameters such as

bleeding on probing, periodontal pockets depth and clinical attachment level.(31,33) Moreover, the frequency of toothbrushing was negatively correlated with periodontal pockets depth and clinical attachment level. Furthermore, bleeding on probing and periodontal pockets depth were found as positively correlated with the CRP inflammatory marker, which confirms the fact that periodontal inflammation during pregnancy is the factor of a general importance.

Approximately 37% of pregnant women have reported gingival bleeding, which is positively associated with nausea. During pregnancy, many women experience gingival bleeding and gingival enlargement also. This is due to plaque-induced gingivitis, which is more common in pregnant women due to elevated hormone levels. Hormonal-related gingival inflammation can also lead to the development of gingival pockets, inflammation or pregnancy epulis. (24) Nausea may exacerbate these symptoms. Although studies have found that pregnant women have higher levels of gingival inflammation, the relationship between periodontal disease and adverse pregnancy outcomes is still being investigated. (3,4,6)

Many assessments regarding the oral health status of pregnant women and their knowledge of oral health in relation to pregnancy have been performed in populations from many countries. This topic seems to be very interesting and essential because the data showed an association between oral care and oral health, general health, health of an unborn child, and pregnancy outcomes [3–6]. General health, dental, gynecological, and obstetrician organizations or workgroups worldwide are involved in highlighting and discussing the importance of making pregnant women aware of the significance of their oral health [3, 24]. However, this knowledge and awareness of both women and knowledge providers are not sufficient, which has been presented in published findings [22,24,26,27].

Although this research presents and analyzes only significant correlations between the investigated parameters, in general, the obtained results are similar to the results described in this field. Many studies have shown that the healthier behaviors of future mothers depend on socioeconomic factors such as age, place of residence, education level, and number of children [26, 27, 29, 30]. The average age of the investigated group of women was 31.9 years and 45% of women gave a natural birth. The knowledge of the positive relationship between appropriate oral health and correct course of pregnancy had only 16.5% of mothers before the pregnancy and as much as 59.5% received this information during the pregnancy; however, surprisingly, 24% of women still stated that they did not have any awareness of these influences. In the work of Hom et al. [27], authors found a logical association between the oral health literacy and oral health knowledge. The level of health literacy influences seeking information about health, procedures and behaviors important for the maintenance of good health and this enhances health knowledge. In our study this phenomenon was also present. It should be pointed out that these 24% of women were not interested in oral health literacy, so their knowledge of oral health state related to complications was very low and underestimated.

In this study, it was found that 58.5% of women had a dental examination before or right after their pregnancy was confirmed. These women had a higher educational status and lived in a big city. Another study by Llena et al. also confirmed that women with better knowledge of oral health tend to have higher education and live in a bigger city. As much as 81.5% of women described their oral cavity status before pregnancy as very good or good, and this group of women also had higher education. However, 24% of mothers reported a lack of awareness of the importance of proper oral hygiene during pregnancy, and 19.5% of them considered dental examination to be unnecessary. It is important for health

professionals to raise awareness of the necessity of good oral health during pregnancy and share their knowledge with pregnant women. Suri et al. compiled an online questionnaire, with the help of both dentists and obstetricians, to evaluate the knowledge of obstetricians about the association of periodontitis with preterm birth and birth weight. The study found that more than 70% of respondents had proper knowledge of this issue, but only 40% of them recommended dental examination and only 47% advised women to take care of their oral health during pregnancy. Despite the majority of obstetricians and gynecologists having proper knowledge of the importance of oral health during pregnancy, they do not always provide this information to their patients. In addition, they do not require their patients to provide confirmation of dental examination during pregnancy. However, such an examination is not only recommended but should be required at early pregnancy at the latest or be an integral and obligatory part of pregnant care. In this study, discomfort with calculus or small caries defects during pregnancy was reported by 18.5% of women, mainly those with primary and vocational education. Oral complaints concerning teeth or gums during pregnancy were reported by 41.5% of women, including gingival bleeding and the feeling of gingival overgrowth. It is interesting to note that oral problems were significantly more common in younger women, and worse self-assessed oral health was more often related to longer pregnancy time. The association between periodontitis and preterm birth is still not clear, and the data are inconsistent. In our study, we did not find any correlations between worse self-assessed oral health state and preterm birth. A systematic review and current meta-analysis carried out by Manrique-Corredor et al. with the participation of 10,215 women from America, Europe, Asia, and Africa found a positive correlation between these parameters in 60% of 20 evaluated studies. However, the authors underlined the variability of the studies in terms of the diagnosis of periodontitis and the presence of other risk factors as covariables.

Nowadays, orthodontic treatment is very popular, especially among young women, sometimes also because of esthetic reasons [33]. In our investigation 12.5% of women removed the orthodontic braces before the pregnancy as a result of termination of treatment or because of pregnancy. Only 5% of women who were significantly younger were under this treatment during the whole or part of the pregnancy period.

During pregnancy, up to 37% of women experience gingival bleeding which is positively correlated with nausea. Another common complaint is gingival enlargement, which occurs in 14.5% of women. Hormonal-related gingival inflammation causes these symptoms, not periodontal disease. The relationship between gingivitis and pregnancy outcomes is inconclusive, with some studies finding a correlation, while others do not. A positive correlation between CRP level and periodontal parameters has been found, but the impact of periodontal treatment on adverse pregnancy outcomes is equivocal.

The study found that 30.5% of pregnant women who received dental treatment were younger. Rural women were more likely to undergo tooth extraction. Some dentists avoid treating pregnant women due to liability concerns, but not treating them may result in higher unpredicted liability. Doctors and dentists should educate pregnant women about dental exams and proper oral hygiene practices. The study's limitation was self-reported oral cavity parameters, but it helped avoid bias.

**CONCLUSIONS**

The relation between the longer duration of pregnancy and self- assessed worse oral health before pregnancy has been shown. This particularly concerned women with lower educational status. A correlation between daily tooth

brushing and birth weight of newborns was found. Health-related behaviors and life-style of future mothers depend on socio-economic factors. Doctors should identify groups of women at increased risk (women with lower economic status, living in the countryside) and provide better education and medical care. The knowledge of women about the impact of oral health on the development of pregnancy and the fetus is still insufficient. In addition to educational activities that aim at increasing women's knowledge of the impact of the oral health state on the development of pregnancy, gynecologists should inquire whether pregnant women have done the appropriate examination.

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**Declarations:** Ethics approval and consent to participate

This study was approved by the hospitals in Lucknow city. Patient data was collected through a questionnaire and no personal information was obtained. Informed consent was obtained from all patients.

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