Pregnancy Outcomes for Egyptian Primigravidas Women after Antenatal Dental Health Education Program

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Abstract

Background: Educational programs for pregnant women delivered by dentists, and midwives would prevent oral disorders in mothers and also impacting the dental health of offspring. **Aim of the study:** The main aim of this study is to evaluate the effect of antenatal dental health education program on pregnancy outcomes for Egyptian primigravidas women. **Subjects and Methods; Research design:** A prospective interventional case control research design was conducted. **Subjects:** 108 pregnant women who met the inclusion criteria. The sample size was two equal groups and divided into two groups (case and control). **Setting:** The study was conducted at the prenatal clinic at Zagazig University Hospital. **Tools of data collection:** The following four tools were used to achieve the study's purpose: A structured interview questionnaire; a scale for assessing knowledge, practice, and attitude; and an outcome checklist for tracking mother and baby outcomes throughout labor. In addition, prenatal education classes were hold to enhance the pregnancy outcomes. **Results:** According to the study's findings, women who participated in the dental education program had statistically significant positive knowledge, practices and attitudes compared to those in the control group. In the case group, pregnancy outcomes were good and improved after attending dental health program than in control group. **Conclusion:** Designing and implementing an educational program on antenatal oral health had a significant effect on improving pregnancy outcomes. **Recommendation:** Awareness educational program about dental care associated to pregnancy was necessary to be recommended.

Key words: Dental Health Program, Egyptian Primigravidas Women, Pregnancy Outcomes.

Introduction:

Pregnancy is a period of vulnerability because many physiological changes in the body of pregnant women can affect the oral cavity [(1)]. Furthermore, the gestation period presents both physiological and psychological changes that expose the oral cavity to pathologies that can affect the mother's general health, such as hormonal changes that interfere with the oral cavity and aggravating pathologies, such as periodontal disease, gingivitis, and dental caries. Governments worldwide have adopted international recommendations for dental care during pregnancy since oral health is a key indicator of general health, well-being, and quality [(2)].

Gingival inflammation is commonly encountered in the second trimester, and pre-existing periodontitis is aggravated during pregnancy. Furthermore, nutritional changes and the use of cariogenic foods decrease salivary flow, morning sickness, and poor oral hygiene practices in pregnant women, which can contribute to dental caries and tooth erosion. Dental care services were completely avoided throughout pregnancy, and dentists were visited only when they had a toothache or bleeding gums. Pregnant women have a greater frequency of dental caries, gingivitis, and periodontal disease than non-pregnant women [(3)]. In addition, periodontitis has also been associated with poor pregnancy outcomes, such

as pre-term delivery or a low-birth-weight baby [(1)].

Worldwide, 50% of pregnant women experience oral pain and 40% have periodontal disease [(4)]. Periodontal disease is the most common dental condition (30-60%), followed by dental caries and pain (30-40%) [(5)]. Periodontal disease during pregnancy is linked to poor birth outcomes such as preterm birth and low birth weight [(6)]. Pregnant women with untreated oral infections are more likely to develop sepsis, preeclampsia, and miscarriages. The oral health of pregnant women is also linked to the development of early childhood dental caries in their offspring [(7)].

The most frequently reported barriers to dental care utilization during pregnancy were a lack of understanding of the value of oral healthcare, poor beliefs about the safety of dental treatment during pregnancy, and a lack of perceived need for dental care. The World Health Organization (WHO) emphasizes the need to integrate oral health with maternity and child health for efficient prevention and management of oral illnesses. Oral healthcare is a critical component of healthy pregnancy [(7)]. Oral health care is an important component of general health and should be maintained during pregnancy and throughout a woman's lifespan to ensure a healthy pregnancy [(8)].

Additionally, it is also important for many health care professionals, including dentists, dental hygienists, physicians' assistants, public health primary nurses, midwives, obstetricians, and nurse practitioners, to emphasize providing sufficient and timely oral health care to pregnant women, including oral health education programs [(9)]. Therefore, establishing relationships between antenatal care and oral health providers in the community facilitates a collaborative approach to women's oral health needs [(8)].

Education programs on dental health and disease prevention are critical for women of reproductive age and for pregnant women. The design of a dental care plan for pregnant women, as well as dental prophylaxis, should be developed and guided by institutional clinical authorities. All healthcare providers, including primary care, pediatric dentists, and maternity care providers, consider paying more attention to oral health during pregnancy. These collaborations provide excellent antenatal dental teamwork and promote good pregnancy outcomes as well as a future generation of children free from oral illness implementation of educational program that matches with the community, the women's knowledge, practice and attitude regarding oral health should be considered [(10)]. Therefore, this study aimed to evaluate the effect of an antenatal dental health education program on pregnancy outcomes for Egyptian primigravidas women in Zagazig city.

Significance of the study:

Pregnancy causes changes that can increase the risk of cavity and gum diseases. Poor dental health may affect the oral health of developing baby. Research has shown that there may be a link between periodontal disease and pre-term or low-birth-weight babies [(8)]. The American Dental Association also affirms the importance of oral healthcare during pregnancy. Poor health habits during pregnancy have been linked to premature delivery, preeclampsia, gestational diabetes, and other concerns, and women should routinely be counseled about the maintenance of good oral health habits throughout their lives as well as the safety and importance of oral healthcare during pregnancy [(11)]. Therefore, this study aimed to evaluate the effectiveness of antenatal education programs on pregnancy outcomes in primigravidas women in Egypt.

Aim of the study:

The aim of the study was:

To evaluate the effect of antenatal dental health education program on pregnancy outcomes for primigravidas women.

Research objectives:

The research aims of this study were achieved through the following objectives:

1. Determine the effect of prenatal dental health education sessions on women's knowledge, practices, and attitudes.
2. Evaluate pregnancy outcomes for the case group following participation in an oral health education program.

Research hypothesis:

1. Primigravida women who will receive antenatal dental education sessions will have significantly better knowledge, practice, and attitude toward oral health.
2. Pregnancy outcomes for the primigravidas women in the case group will be better than those of primigravidas women in the control group after conducting the dental health education program.

Subjects and Method:

Research Design:

A prospective interventional case control research approach was conducted at this study.

Research Setting:

This study was conducted at the prenatal clinic of the Zagazig University Hospital in Zagazig city, Egypt. This study was conducted between December 2022 and April 2023, from Saturday to Thursday, with the prenatal clinic opened every day from 9 a.m. to 2 p.m.

Study Subjects:

At the time of data collection, a prospective sample of 108 pregnant women with gestational weeks 24-42 (second and third trimester) were collected. The sample size was divided into two equal groups (n = 54 each) and two groups (case and control).

Based on data from literature [12], considering a level of significance of 5%, and study power of 80%, the sample size can be calculated using the following formula:

$$n = \frac{(Z\alpha/2 + Z\beta)^2 \times 2(SD)^2}{d^2}$$

Where, SD is the standard deviation obtained from a previous study; Zα/2, for 5% this is 1.96; Zβ, for 80% this is 0.84 and for the expected difference. Therefore,

$$n = \frac{(1.96 + 0.84)^2 \times 2(0.92)^2}{(0.5)^2} = 53.1.$$

Based on this formula, the required sample size for each group was 54.

- **Inclusion criteria:**

For the study group were 20-40 years old, attending antenatal care clinics at Zagazig Hospital at the time of data collection, having a gestation period of 24-42 weeks, dental problems (dental caries and gingivitis), and providing informed consent to participate in the study.

- **Exclusion criteria:**

Include pregnant women who required emergency treatment, including those requiring hospitalization, surgery, or serious infection, and those with a history of mental illness were excluded.

The following strategies were employed to reduce the likelihood of social-desirability bias:

- Researchers claim that to obtain honest responses from respondents, the survey's positive responses were left intentionally imprecise.
- Confidentiality: After the questionnaires were completed, participants in our study were guaranteed the confidentiality of their replies.

Tools for data collection:

After informed consent was obtained, data were gathered through in-person interviews. The following four tools were used and employed by the researchers during the interviews to gather data:

1. **A structured interview questionnaire** that was structured and asked about the following information: Women's age, residence, education level, and occupation. Data on current gestational age and signs and symptoms of gingival and periodontal disease among pregnant women also collected and obstetric history. In addition, factors that prevent pregnant women from visiting dentists during pregnancy were evaluated, includes 16 items.
2. **Clinical oral examination:** Dental caries experience and periodontal status were assessed using **WHO's Oral Health Surveys Basic Methods** [(13)]. Dental health specialist (Co-author: Dr. Mai Atef Hassan) conducted all oral examinations. The examinations were performed in a suitable room at an antenatal clinic under standardized conditions. Dentition status was assessed using plane mouth mirrors, and the community periodontal index of treatment needs (CPITN) probes.
3. **A self-administered questionnaire** addressing various aspects of expectant mothers' knowledge, practices, and attitudes (A, B, and C parts) about oral health and oral hygiene practices. The questionnaire was prepared by the researchers in English and Arabic. The questions were developed after referring to relevant literature to assess the participants' knowledge, practices, and attitudes. The validity and reliability of the questionnaire were assessed. The final form of the questionnaire was available in English and Arabic and was ready for use by study staff members. This was read to illiterate women.

- **Part A:** Included questions on oral health knowledge. It includes 16 items; knowledge scores range from 0 to 10.

Scoring system:

Scores lower than 50% (lower than 5) are considered poor; scores from 50 to <75% (scores from 5 to 7) are considered fair; and scores that are 75% or higher (scores from 8 or higher) are considered good.

- **Part B:** The following section covers the assessment of the respondents' daily oral health practices and dental health service utilization during pregnancy, which includes 17 items.

Scoring system:

Practice scores ranged from 0 to 14, scores lower than 50% (lower than 7) were considered **poor**, scores from 50 to <75% (scores from 7 to 10) were considered **fair**, and scores of 75% or higher (scores from 11 or higher) were considered **good**.

- **Part C:** The last section contained issues related to dental health attitudes, which were set to survey respondents' attitudes toward oral health, including 13 items. The expectant mothers were asked to indicate their preference as to whether they "strongly agree, agree, neutral, or undecided, disagree, or strongly disagree" in every statement.

Scoring system:

Attitude scores ranging from 0 to 9 and scores lower than 60% (lower than 5) were considered **unsatisfactory**, and scores of 60% or higher (scores from 5 or higher) were considered **satisfactory**.

4. **Outcomes measures** to obtain data on maternal and fetal outcomes at the labor unit including preterm delivery, presence of preeclampsia, and delivery of LBW. Preterm birth was defined as a gestational age <37 weeks. LBW was defined as a birth weight <2.5 kg.

Content validity and reliability:

The researchers reviewed local and international literature to obtain more knowledge about the study and designed the study tools. Five experts in obstetrics and gynecological nursing with community health nursing specialist staff, and one dentist from the Faculty of Dentistry evaluated the instruments for content validity.

Cronbach's alpha values for knowledge, practice, and attitude were 0.902, 0.893, and 0.898, respectively.

Field work:

The recommended modifications were made, and the final form was ready for use. The researchers visited the study site throughout the study period and checked the registration book to identify the pregnant women who met the inclusion criteria. Each woman was individually met by the researchers, who thoroughly explained the purpose of the study to win their acceptance and their written consent.

After approval of the official permission using proper channels of communication was obtained from the director of the previously mentioned study setting, the researchers attended the antenatal clinics in the study setting 3 days per week from 9:00 am to 2:00 pm for 5 months from the beginning of December 2022 to the end of April 2023. A pretest was conducted by distributing the structured questionnaire after sufficient clarification of the purpose of the study for the pregnant participants in each small homogeneous group.

The educational sessions for studied group: The researchers separated the antenatal education group participants into small groups, each of which consisted of 10 pregnant women. There were three weekly sessions of 45 to 90 minutes each using the appropriate teaching methods and aids. Each session started with a summary of what was given in the previous session and the objectives of the new session to ensure that pregnant women recognized the contents of the educational sessions. The first part was to provide a theoretical background on knowledge about oral health care during pregnancy, including one session.

The second part was to provide practical sessions about the practices and attitudes of pregnant women regarding oral health care during pregnancy, such as different methods of oral hygiene, false attitudes associated with oral health, and correction. In addition, the relationship between good oral health care and pregnancy outcomes included two sessions. There was one last session to start and end the antenatal dental health education program on pregnancy outcomes for the revision of all sessions to ensure motivation and reinforcement to enhance the effectiveness of the educational program on the participants' knowledge, practices, and attitudes regarding oral health during pregnancy.

The contents of education classes were presented in table 5.

The health education dental care program sessions were implemented through various teaching methods, such as short lectures, interactive group discussions, brain-storming, demonstrations, re-remonstration, and role-play.

The researchers prepared illustrative comprehensive instruction media such as hand booklets in simple Arabic language, and Posters, PowerPoint presentations, were used to conduct antenatal dental care education classes. Data on knowledge, practices and attitudes

were collected at the conclusion of the third class.

Power-point presentations, posters, and hand booklets were giving to the participants to be used later and to help in awarding other relative personnel. The contents included well-formed information about oral health care during pregnancy, including the definition, signs and symptoms, causes, risk factors, treatment, adverse effects, preventive measures for periodontitis, and the importance of dental care during pregnancy. **Evaluation Phase:** The final post-intervention educational test was performed immediately after the end of the educational session, and after four months of administering the educational session, follow-up was performed using the same pretest tool.

The control group received routine antenatal care and was exposed to all conditions of the antenatal education group except for the antenatal education sessions. Information was gathered from the control group at the same time as the antenatal appointments.

Pilot study:

A pilot study was carried out on 10 percentage of the overall sample size to check the tools for clarification, applicability, and viability, and then the required adjustments were made.

Administrative and Ethical considerations:

Oral and written consent was obtained from the women who wanted to participate in this study. All procedures, including the human members, were in accordance with the ethical principles of the institutional and/or national research committee, as well as the 1964 Helsinki Declaration and its later corrections, or tantamount moral measures. This study was approved by the ethic committee. The anonymity, confidentiality, and privacy of the participants were assured and voluntary participation and the right to refuse to participate in the study were assured at any time during the study period. This clinical trial was affirmed by Ethical Committee with the ethical number was **Zu.Nur.REC#:0060**.

Statistical analysis:

All statistical analyses were performed using SPSS for windows version 20.0 (SPSS, Chicago, IL, USA). Continuous data were normally distributed and expressed as the mean ±standard deviation (SD). Categorical data are expressed as numbers and percentages. One-way analysis of variance (ANOVA) test was used to compare more than two variables with continuous data. The chi-square test (or Fisher's exact test when applicable) was used to compare variables with categorical data. The correlation co-efficient test was used to test for correlations between two variables with continuous data. The reliability (internal consistency) of the questionnaire used in this study was calculated. Statistical significance was set at ($p < 0.05$).

Results:

Table 1 shows the distribution of the women investigated based on their demographic variables. The mean ± SD values for age were 24.7 ± 3.7 and 25.6 ± 4.0, respectively. Furthermore, no discernible difference in university education levels existed between 55.5% of the women in the case group and 42.5% of the women in the control group. According to the same table, nearly two-thirds (59.3%) of the women in the experimental group were housewives, with 53.7% coming from rural regions, compared to (70.4%) the housewives and 61.1% lived in rural area in the control group.

Table 2 shows that there was a statistically significant difference in the obstetrical history of the two groups. In the experimental group, 70.4% of women were between 25 and 34 weeks of pregnancy, compared to 83.3% in the control group. In the experimental group, 46.3% of women reported swollen gums, compared to 55.6% of women in the control group. Other signs and symptoms of gingival

and periodontal disease found in pregnant females were bleeding per gum (27.7%) and loose teeth (11.1%) in the case group compared to bleeding per gum (18.5%) and loose teeth (9.3%) in the control group. Furthermore, in this table, the primary variables that prevent the investigated sample from visiting the dentist during pregnancy were fear and anxiety, a lack of time, the high cost of dental services, and a transportation difficulty, and the differences were statistically significant between two groups ($p < 0.05$*).

Table 3 reveals that low knowledge (68.5%), fair knowledge (24.1%), and excellent knowledge (7.4%) were reported prior to the delivery of the oral health program in the case group. The control group had poor knowledge (70.4%), reasonable understanding (22.2%), and excellent knowledge (7.4%). Variations in knowledge, practice, and attitude levels before the education program administration were not statistically significant between the control and case groups.

Table 4 reveals that after receiving an education program, the investigated women had statistically greater knowledge, excellent practice, and a positive attitude than the control group. Following the delivery of the dental health program, the case group had poor (11.1%), fair (18.5%), and good knowledge (70.4%). Regular care revealed that the control group had poor knowledge (59.2%), fair knowledge (27.8%), and excellent knowledge (13.0%).

Figure 1 depicts the pregnancy outcomes following the provision of an education program for the case group and usual treatment for the control group. The outcomes were as follows: No adverse outcomes, preterm labor, preeclampsia, and LBW birth in the case group (79.6%, 11.1%, 5.6%, and 3.7, respectively). In the control group, the pregnancy outcomes included no adverse outcomes (0.0%), preterm labor (48.1%), preeclampsia (16.7%), and LBW (35.2%). The differences in pregnancy outcomes between the two groups analyzed were statistically significant ($p < 0.001$).

Discussion:

Research on enhancing women's awareness of oral health care in Africa is uncommon because of the lack of priority. Various studies have revealed that maternal oral health is poor, and that oral hygiene in pregnant women is hampered by various additional obstacles to achieving optimal oral health. Thus, educating pregnant women about oral health can be an effective approach for delivering dental health education to the entire population, beginning at the individual level and progressing to family and community levels [(14)].

In this study, the mean ± SD for age in the case and control groups were between 20-40 years. Furthermore, there was no discernible difference between the university education levels of the women in the case group and the women in the control group. This is congruent with research conducted by **Abd El-Kader** [(15)]. This explains the reproductive age and why people were interested in participating in this study.

The current study aimed to improve pregnant women's knowledge, practice, and attitude towards dental healthcare and pregnancy outcomes; which was significantly improved because there were statistically significant improvements in women's knowledge of dental care and improved pregnancy outcomes compared to primiparous women who received routine antenatal care. Following the intervention session, most of the participating women corrected their understanding. This might be attributed to the use of simple and clear language in educational sessions, the suitable teaching techniques, and multimedia aids.

This was consistent with a study conducted in India that emphasized

how periodontitis affects maternal health and pregnancy outcomes, stating that there is a need for more forceful awareness sessions to help spread the message of periodontitis pregnancy adverse effects and the importance of oral health hygiene to establish proper healthy habits and prevent oral disease [16]. Similarly, the necessity of educational programs was highlighted during an investigation of pregnant women's oral health hygiene in Brazil and its relationship with lifestyle health practices [17].

Similarly, this study was in accordance with the studies done in **Sudan (Khartoum)**, **Fayoum (Egypt), Assuit (Egypt), and Benha (Egypt)** [18-21] on pregnant women. These studies concluded that pregnant women's oral health education should be improved, and oral health preventative programs should be implemented to improve pregnancy outcomes, such as premature labor, which is associated with poor oral health. Therefore, maternal periodontal diseases may constitute a non-genital source of entry into the circulatory system for bacteria, with the potential to impair fetal-maternal health.

Preterm delivery and preeclampsia have been linked to maternal inflammation. Periodontal disorders have been linked to premature births and preeclampsia in several studies. Streptococcus mutans is the principal causative agent of dental caries is Streptococcus mutans. Consequently, untreated dental caries may lead to further inflammatory issues, which may have impact pregnancy outcomes. Similarly, we hypothesized that dental caries would be linked to preterm delivery and preeclampsia via an infectious mechanism; however, we discovered no such link, which contradicts previous research [22].

In the current study, the primary variables preventing the examined sample from visiting the dentist during pregnancy were fear and anxiety, lack of time, high cost of dental services, and transportation issues; the differences were statistically significant between the two groups ($P < 0.05$). These findings are similar to those published by **Khalaf et al.** [20], who indicated that lack of information or sufficient access to healthcare institutions that disseminate optimal oral health and hygiene during pregnancy might be the likely cause. This study emphasizes the need to educate expecting mothers because they are responsible for their own health as well as the health of their children.

Finally, pregnant women should be taught about the link between periodontal disease and adverse pregnancy outcomes, and should be encouraged to undergo frequent dental checkups. Furthermore, doctors and health centers should undertake nutritional education programs for pregnant women, with a focus on women from rural regions. In addition, if a woman is contemplating pregnancy or is pregnant, she should undergo frequent check-ups and treatments for tooth caries, without the need for dental treatment. Future plans should also incorporate oral health literacy into children's school curricula, allowing them to become literate adults in the long term [21].

Conclusion:

The majority of the women who participated in the study had little awareness of the relationship between poor oral health and pregnancy outcomes. The design and implementation of an educational program on the subject resulted in a substantial increase in the participants' level of knowledge, practice, and attitude towards it. The changes in pregnancy outcomes between the two groups were statistically significant, with improved pregnancy outcomes compared within the study group.

Recommendations:

Based on the study findings, the study is recommending the following:

1. Conducting awareness educational program about dental care and periodontitis that associated to pregnancy outcomes was necessary to be implemented as a component of the services that provided to the pregnant women in the antenatal care clinics should mainly involve women from all residence area particularly in Egypt's rural communities.
2. Reinforce routine oral health maintenance and dental visits twice a year, as research shows poor dental health could affect the general oral health of developing baby.
3. Insure of health coverage for dental services during pregnancy by applying a health education campaigns during prenatal care, to increase awareness of oral health among pregnant women and improve oral health practices and attitudes as well as those referrals can be made.
4. Nursing programs and curriculum need to change to prepare and train nursing graduates with core competencies of oral health access to care issues as they are the main oral health educators and care providers at the deferent primary health care settings of the communities.
5. Advocate for broader oral health coverage of women before, during, and after pregnancy through oral health promotion programs for pregnant women and should use available and appropriate ways, creative, consistent and comprehensive communication strategies.
6. Further researches may be conducted to study the same problem using large samples of the women with long-term follow-up.

Table 1: Comparison of the demographic characteristics between case and control groups

Variables	Case		Control		Chi-Square	
	n	%	n	%	X^2	P
Age (Years)						
20 – 25	36	66.6	30	55.6		
26 – 30	13	24.1	16	29.6		
31 – 35	5	9.3	8	14.8	1.548	0.461
Mean ± SD	24.7 ± 3.7		25.6 ± 4.0		1.187	0.238
Residence						
Rural	29	53.7	33	61.1		
Urban	25	46.3	21	38.9	0.606	0.436
Educational status						
Illiterate	4	7.4	7	13.0		
Primary	5	9.3	7	13.0		
Secondary	15	27.8	17	31.5		
University	30	55.5	23	42.5	2.201	0.532
Occupation						
Housewife	32	59.3	38	70.4		
Employee	22	40.7	16	29.6	1.462	0.227

Data are presented as n (%). X2; Chi-square test, P value based on Mont Carlo exact probability, and * P<0.05 (significant).

Table 2: Comparison of the obstetric history and barriers of receiving dental care during pregnancy between case and control groups

Items		Case		Control		Chi-Square	
		n	%	n	%	X^2	P
Obstetric history	**Current gestational age (Weeks)**						
	< 25	9	16.7	7	13.0		
	25 – 34	45	83.3	38	70.4		
	35 or More	0	0.0	9	16.6	9.840	0.007*
	Signs and symptoms of gingival and periodontal disease among pregnant females						
	Swelling gum	25	46.3	30	55.5		
	Bleeding gum	15	27.7	10	18.5		
	Loose teeth	6	11.1	5	9.3		
	Pus formation	3	5.6	5	9.3		
	No problems	5	9.3	4	7.4	2.157	0.707
	Factors that hinder the expecting women from visiting the dentist during pregnancy						
	Lack of time	15	24.2	26	23.2	4.757	0.029*
	Cost of dental services	13	20.9	23	20.5	4.167	0.041*
	Fear and anxiety	22	35.5	34	30.4	5.571	0.018*
	Transportation problem	8	12.9	17	15.2	4.216	0.040*
	Habit	4	6.5	12	10.7	4.696	0.030*

N.B: The participants chose more than one answers regarding (factors hinder the women from visiting the dentist).

Data are presented as n (%). X2; Chi-square test, P value based on Mont Carlo exact probability, and * P<0.05 (significant).

Table 3: Comparison of pre-intervention knowledge, practice and attitude between case and control groups

Variables	Case		Control		Chi-Square	
	n	%	n	%	X^2	P
Knowledge Level						
Poor Knowledge	37	68.5	38	70.4		
Fair Knowledge	13	24.1	12	22.2		
Good Knowledge	4	7.4	4	7.4	0.053	0.974
Practice Level						
Poor Practice	39	72.2	42	77.8		
Fair Practice	11	20.4	7	13.0		
Good Practice	4	7.4	5	9.2	1.111	0.574
Attitude Level						
Negative Attitude	44	81.5	47	87.0		
Positive Attitude	10	18.5	7	13.0	0.628	0.428

Data are presented as n (%). X2; Chi-square test, P value based on Mont Carlo exact probability, and * P<0.05 (significant).

Table 4: Comparison of the knowledge, practice and attitude between case and control groups at post-intervention

Items	Case		Control		Chi-Square	
	n	%	n	%	X^2	P
Knowledge Level						
Poor Knowledge	6	11.1	32	59.2		
Fair Knowledge	10	18.5	15	27.8		
Good Knowledge	38	70.4	7	13.0	40.145	<0.001**
Practice Level						
Poor Practice	8	14.8	35	64.8		
Fair Practice	12	22.2	10	18.5		
Good Practice	34	63.0	9	16.7	31.670	<0.001**
Attitude Level						
Negative Attitude	13	24.1	43	79.6		
Positive Attitude	41	75.9	11	20.4	33.379	<0.001**

Data are presented as n (%). X2; Chi-square test, P value based on Mont Carlo exact probability, and * P<0.05 (significant).

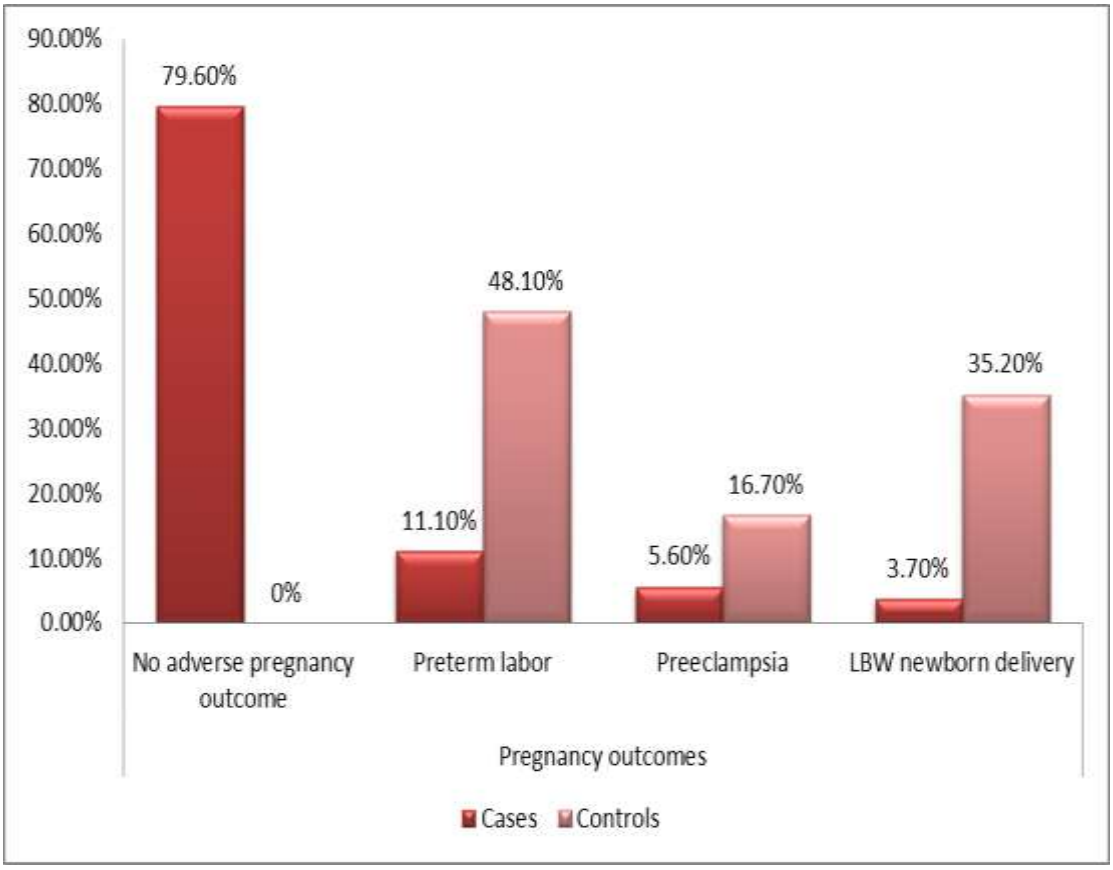

Figure (1): Pregnancy outcomes between case and control groups

Table 5: Outline for a 3-weeks antenatal dental health education sessions

Weeks	Contents	Objectives
▪ **First class (1st Week)**	Knowledge about oral health care during pregnancy	**1.** Introduce everyone to one another and foster rapport. **2.** Describe the goals of Antenatal dental health education sessions. **3.** Introduction to pretest questionnaires to assess Knowledge level. **4.** Illustrate the different methods of oral hygiene as (brushing teeth, using dental floss, mouth fresheners and using mouth wash). **5.** Describe the safe period during pregnancy for management of oral disease. **6.** Discuss the effect of radiation on pregnancy. **7.** Distribute posttest.
▪ **Secondly class (2nd Week)**	Practice and attitude regarding oral health care during pregnancy	**1.** Review content from class one. **2.** Introduction to pretest questionnaires to assess practice and attitude level. **3.** Perform the different methods of oral hygiene as (brushing teeth, using dental floss, mouth fresheners and using mouth wash). **4.** Identify the false attitude associated with oral health and correct it **5.** Perform post-test to determine the effectiveness of education program.
▪ **The third class (3rd Week)**	Relation between good oral health care and pregnancy outcomes	**1.** Review the main items of the previous class. **2.** Distribute pretest. **3.** Determine the factors that hinder the pregnant women from visiting dentist. **4.** Explain the adverse pregnancy outcomes associated with bad oral hygiene. **5.** Illustrate the reasons for adverse pregnancy outcomes. **6.** Administer posttest, finally.

Designed by researchers of the main manuscript after revision national and international related articles; this table designed according to education classes that given to pregnant women.

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