Effect of Nursing Intervention on Oral Health Knowledge, Attitude, and Health Behaviors among Pregnant Women

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Abstract **Background:** Good oral health during pregnancy can not only improve the health of pregnant women but also potentially the health of newborn. **Aim:** This study aimed to evaluate the effect of nursing intervention on oral health knowledge, attitude, and health behaviors among pregnant women. **Design:** A quasi-experimental design was utilized. **Sample:** A purposive sample of 188 pregnant women was recruited according to inclusion criteria. The sample was allocated to study and control groups (94 women in each group). **Setting:** The study was conducted at obstetric s and gynecology outpatient clinic affiliated to Benha University Hospital. **Tools of data collection:** 1) a structured interviewing questionnaire which consisted of three parts; demographic characteristics, obstetric history, and pregnant women's knowledge regarding oral health. 2) Pregnant women's attitude towards oral health questionnaire. 3) Pregnant women's oral health behaviors sheet. **Results:** The majority of both groups had poor knowledge and negative attitude regarding oral health. In addition, there were no significant differences in health behaviors scores between both groups (P > 0.05) before intervention. However, one month after intervention, 84.0% of the study group had good knowledge compared with 0.0% of the control group, 78.7% of the study group had positive attitude and only 6.4% of the control group. The health behaviors scores were significantly higher in the study group than the control (P<0.001). **Conclusion:** There is positive effect of nursing intervention in improving the pregnant women's knowledge, attitude as well as health behaviors regarding oral health. **Recommendations:** Provision of oral health education for pregnant women during antenatal care in order to highlight the importance of good oral health.

Keywords: attitude, behaviors, knowledge, nursing intervention, oral health, pregnant

1. Introduction

Pregnancy is a natural process that may create some changes in different body parts including the oral cavity. During pregnancy, changes in the oral cavity can be linked to periodontal disease, which includes gingivitis and periodontitis [1,2] The World Health Organization (WHO) has defined oral health as "a state of being free from chronic mouth and facial pain, oral and throat cancer, oral sores, birth defects such as cleft lip and palate, periodontal disease, tooth decay and loss, and other diseases that affect the oral cavity" [3].

In spite of, considerable improvement in the field of oral health throughout the world, oral health problems still persist both in developed and developing countries [4]. [5] Reported that pregnancy gingivitis is common beginning in the second or third month of pregnancy that increases in severity throughout the duration of pregnancy. Pregnancy gingivitis affects about 30% to 86% of all pregnant women. Approximately 40% to 90% of pregnant women suffer from dental caries in developing countries. Pregnant women are about 3 times more likely to suffer from dental caries than other women.

Several studies have suggested a positive correlation between presence of periodontal disease and risks of preterm birth, low birth weight, miscarriage, preterm labor, and fetal death [6,7,8]. Adverse pregnancy complications include pre-eclampsia, ulcerations of gingival tissue, pregnancy granuloma and tooth erosion. Another concern is the prescription and administration of drugs during pregnancy which may cross the placental barrier and cause teratogenic fetal effects [9].

In addition, poor oral health can not only affect the woman's nutrition and oral health-related quality of life, but may be associated with early childhood caries and long-term systemic disorders for the newborn [10].

Unfortunately, apart from self-maintenance of oral hygiene, pregnant women face several barriers in achieving optimal oral health such as lack of knowledge and value, negative oral health experiences, negative attitudes toward oral health professionals and negative attitudes of dental staff toward pregnant women [11].

Oral health screening is not routine in many antenatal clinics, and there are no standard guidelines which ensure

that all pregnant women are routinely screened, treated, or referred to specialized dental professionals as part of prenatal care. The pregnant women are referred to dentists by obstetricians only when women complain of oral health problems [12].

Additionally, pregnancy is an important period for imparting oral health information and supporting women to adopt positive oral health behaviors [13]. There have been many efforts during the past decade to motivate pregnant women and health care providers towards a better understanding of the importance and safety of oral health care prior to, during and after pregnancy [14].

Midwives have a major role in the perinatal care and are ideally placed to promote oral health for pregnant women [15]. Nurses are one of the main providers of antenatal health care services, and play important roles in increasing awareness of oral health and dissemination of information to pregnant women. In particular, nurses can provide advice on preventive oral health care, including regular dental visits, and can refer pregnant women to dentists for examinations [16].

1.1. Significance of the Study

Oral health intervention during pregnancy has attracted much attention in the context of perinatal maternal health over the last few decades. Maintaining oral health during pregnancy has been recognized as an important public health issue worldwide. Unawareness about the pivotal role of good oral health behavior during pregnancy leads to ignorance of oral health [17].

In Egypt, the study results by World Health Organization showed that utilization of dental services is not at optimal level; 40% of subjects reported that they experienced dental problems at the time of examination but did not see a dentist for treatment. Visiting behaviors of subjects showed that nearly 20% did not consult a dentist for more than 2 years and another 20% had never been to a dentist [18].

Moreover, the researchers observed from the clinical experience that many women lack knowledge and have negative attitude regarding the importance of oral health during pregnancy and do not seek dental care during this time**.** Change in knowledge, attitude, and behaviors of women by providing oral health education is fundamental in maintaining good oral health care Therefore, this study was conducted to evaluate the effect of nursing intervention on oral health knowledge, attitude, and health behaviors among pregnant women.

1.2. Aim of the Study

The study aimed to evaluate the effect of nursing intervention on oral health knowledge, attitude, and health behaviors among pregnant women.

This aim was achieved through the following:
- Assessing pregnant women's knowledge, attitude, and health behaviors regarding oral health.
- Planning, designing and implementing nursing intervention regarding oral health.
- Evaluating the effect of nursing intervention regarding oral health on pregnant women's knowledge, attitude, and health behaviors.

1.3. Research Hypothesis

Pregnant women who receive nursing intervention will have improved knowledge, attitude, and health behaviors regarding oral health than those who don't as indicated by pre and post test scores.

2. Subjects and Method

2.1. Design

A quasi-experimental design has been utilized in this study.

2.2. Setting

The study was conducted at obstetrics and gynecology outpatient clinic affiliated to Benha University Hospital.

2.3. Sample

A purposive sample of 188 pregnant women was recruited for the study according to the following inclusion criteria; gestational age between 16 and 24 weeks, absence of disease that might prevent oral care, and absence of pregnancy complications as diabetes and heart disease. Exclusion criteria as follows: women with oral or dental complications were excluded. Women employed in professions related to dentistry. Women received any oral health education from other sources during study.

The sample size was calculated according to Thompson [19] statistical formula

$$n = \frac{N \times p(1-p)}{\left[\left[N-1\times\left(d^2 \div z^2\right)\right]+p(1-p)\right]}$$

Where: N: Population size =1360 according to (Benha University hospital statistical center, [20]. Z: standard value of for confidence level at 95% = 1.96, d is minimum acceptable degree of error which is set at 7%., p = .0.50, and n: sample size for the study was 171.

Considering dropout during the study, the researchers added 10%. Thus, the final sample size consisted of 188 women. Then the sample was allocated to study and control groups' ratio 1:1 (94 women in each group).

2.4. Tools for Data Collection

Three tools were used for data collection.

2.4.1. Tool I: A Structured Interviewing Questionnaire

This tool was designed by the researchers after reviewing related literature, it was written in simple Arabic language and it consisted of three parts
  i. **Part (1)** included demographic characteristics of the studied women as age, educational level, occupation, residence and monthly income.
  ii. **Part (2)** comprised obstetric history such as gravidity, parity, and gestational age.
  iii. **Part (3):** pregnant women's knowledge regarding oral health, it consisted of ten items (physiological changes in oral cavity during pregnancy, effect of

oral disease on pregnancy outcomes, possible causes of caries during pregnancy, the importance of daily tooth brushing, the importance of fluoride and toothpaste, benefits of use dental floss, suitable time of visited dentist during pregnancy, best time to take dental treatment during pregnancy, safe oral health interventions during pregnancy, necessary foods that can affect or maintain oral health during pregnancy).

iv, Knowledge Scoring

Each item was assigned a score of (2) given when the answer was completely correct, a score (1) was given when the answer was incompletely correct and a score (0) was given when the answer was incorrect / do not know. Women' total knowledge score was 20 and classified as the following; poor when total score was < 50%, average when total score was 50% < 75% and good when total score was ≥ 75%.

2.4.2. Tool II: Pregnant Women's Attitude Towards Oral Health Questionnaire

This tool was developed by the researchers after reviewing related literatures to assess pregnant women' attitude pertaining oral health and consisted of (15) statements such as (oral health is an integral part of general health especially in pregnancy, oral health care can be considered to be an important part of prenatal care, poor oral health during pregnancy contributes to maternal / fetal complications ....etc.,).

i. Attitude scoring:

The statements were judged according to a three point Likert scale continuum from agree (3), uncertain (2), and disagree (1), the negative statements are assessed in reverse score. The total attitude score ranged 15 to 45, and graded as the following; negative when total score was < 50%, uncertain when total score was 50% < 75% and positive when total score was ≥ 75%.

2.4.3. Tool III: Pregnant Women's Oral Health Behaviors Sheet

This tool was developed by the researchers after reviewing related literatures to assess health behaviors of pregnant women related to oral health during pregnancy. It included five items (brushing teeth twice daily, using dental floss, using mouthwash, limit sweet foods and beverages between meals, and visiting the dentist regularly).

i. Health behaviors scoring:

Each item was scored (3) when response was always, (2) was sometimes, and (1) was never. The total oral health behaviors score ranged from 5 to 15. The higher the total score indicated the higher level of oral hygiene behavior.

2.5. Tools Validity and Reliability

The study tools were tested for content validity by a jury of three expertises in the obstetrics and gynecological nursing and two in dentistry field. Reliability of tools were tested by using Cronbach's Alpha coefficient test, which revealed that each of the three tools consisted of relatively homogenous items as indicated by the moderate to high reliability of each tool. The internal consistency of knowledge was 0.84; attitude was 0.81 and health behavior was 0.92.

2.6. Ethical Considerations

An informed oral consent was obtained from every woman recruited in the study after explanation of the nature and the aim of the study. The participants were assured that all data are used only for research purpose and each participant was informed of the rights to refuse or withdraw at any time with no consequences. Participants' anonymity and confidentiality were secured. After completion of the research, a designed booklet about oral health during pregnancy was given to the control group for the next pregnancies.

2.7. Pilot Study

A pilot study was carried out on 10% (18 women) of the studied sample to test tools clarity and applicability, and to estimate the time required for filling in the tools. Data obtained from the pilot study were analyzed and accordingly no modifications were done, therefore, women involved the pilot study was included in the main study sample.

2.8. Field Work

The study was carried out from beginning of December 2016 to the end of August 2017, covering a period of nine months. Official approvals and letters to conduct this study were obtained from the Dean of Faculty of Nursing to Director of Benha University Hospital. The researchers visited the previously mentioned setting twice/week (Saturday and Monday) from 9.00 a.m. to 1.00 p.m. The nursing intervention was constructed in four phases: interviewing and assessment, planning, implementation, and evaluation.

2.8.1. Interviewing and Assessment Phase

All pregnant women in both groups were interviewed to collect baseline data, at the beginning of the interview the researchers greeted the woman, introduced themselves to each woman included in the study, explained all information about the study aim, duration, and activities and taken oral consent. Data were collected by the researchers through administration of the tools to each woman. The average time for the completion of each women interview was around 25-40 minutes, divided as (10-15 minutes) for the first tool, (10-15 minutes) for the second tool, and (5-10 minutes) for the third tool.

2.8.2. Planning Phase

Based on the results obtained from the assessment phase and relevant review of literature, a booklet about oral health during pregnancy was designed by the researchers. This was prepared in simple Arabic language to suit women' level of understanding and distributed to all recruited women in the study group. As well as, different methods of teaching and instructional media were determined.

2.8.3. Implementation Phase

The study group was divided into ten subgroups and received three educational sessions carried out at waiting

room at pre mentioned setting. Each session included 6 to 9 women and took about 30-40 minutes. The interval between each educational session was two weeks according to their schedule to follow up periods.

At the beginning of the first session; each woman was given a brief explanation of the anatomy of mouth and teeth, physiological changes in oral cavity and factors influencing oral health during pregnancy, effect of oral disease on pregnancy outcomes, the importance of oral health aids as fluoride and dental floss.

At the second session, each woman instructed about instructions concerning regular dentist visit during pregnancy, myths and safety of dental treatment and oral health interventions during pregnancy. In addition, foods related oral health during pregnancy.

At the third session, woman instructed about the importance and types of oral hygiene measures and training on proper techniques of tooth brushing, dental floss and mouthwash for pregnant women.

Each session started with a feedback about the previous session and the objectives of the new session, using simple Arabic language to suit women's level of understanding. At the end of each session, women' inquiries were discussed to correct any misunderstanding. Methods of teaching were used including modified lectures and group discussions. Instructional media included colored poster about oral cavity model, dental floss, film video about oral health care during pregnancy and a prepared booklet.

The control group received the routine antenatal care provided in pre mentioned setting.

2.8.4. Evaluation Phase

The effect of nursing intervention was evaluated after one month of completing sessions by using the same format of tools used in the assessment phase for both groups. Evaluation started first with control group then study group to avoid bias. Sometimes the researchers followed women via telephone.

2.9. Statistical Analysis

Data were verified prior to computer entry. The Statistical Package for Social Sciences (SPSS version 25.0) was used, followed by data analysis and tabulation. Descriptive statistics were applied (mean, standard deviation, frequency and percentages). Test of significance (chi-square, fisher exact test used when the cells have expected count less than 5 and independent t test) were used to test comparison between the groups and to test the study hypothesis. Pearson correlation coefficient was used to test association between studied variables. A statistically significant difference was considered at p-value $\leq$ 0.05 and a highly statistically significant difference was considered at p-value $\leq$ 0.001. While the p-value >0.05 indicated non-significant difference.

2.10. Limitation of the Study

Insufficient national studies investigate the current research topic.

3. Results

Table 1 shows no significant differences between the study and control groups in relation to age, educational level, occupation, residence and monthly income (p > 0.05). It was clear that 48.9% and 45.7% of the study and control groups were aged 25<30 years with a mean age 26.37 $\pm$ 4.25 and 27.44 $\pm$ 4.13years respectively. As regards educational level, 55.3% and 58.5% of the study and control groups attained secondary education. As far as occupation, 58.5% and 63.8% of the study and control groups were housewives respectively. Also, 68.1% of the study and 60.6% of control group live in rural areas. In addition, 84.0% and 88.3% of both groups reported that their monthly income was not enough. These findings mean that both groups were homogenous.

Table 1. Distribution of the pregnant women in the study and control groups according to demographic characteristics (n= 188)

Group Demographic characteristics	Study group n= 94 No. (%)	Control group n=94 No. (%)	X^2/FET	P-value
Age (years)				
20<25	32 (34.1)	28 (29.8)	$3.682^{£}$	0.298
25<30	46 (48.9)	43 (45.7)		
30<35	13 (13.8)	22 (23.4)		
$\geq$ 35	3 (3.2)	1 (1.1)		
Mean $\pm$ SD	26.37 $\pm$ 4.25	27.44 $\pm$ 4.13	t= 1.741	0.083
Educational level				
Basic education	2 (2.1)	5 (5.3)	$1.856^{£}$	0.395
Secondary education	52 (55.3)	55 (58.5)		
University education	40 (42.6)	34 (36.2)		
Occupation				
Working	39 (41.5)	34 (36.2)	0.560	0.454
Housewife	55 (58.5)	60 (63.8)		
Residence				
Rural	64 (68.1)	57 (60.6)	1.136	0.286
Urban	30 (31.9)	37 (39.4)		
Monthly income				
Enough	15 (16.0)	11 (11.7)	0.714	0.398
Not enough	79 (84.0)	83 (88.3)		

t= independent t test   £ =Fisher Exact Test

Table 2. Distribution of the pregnant women in the study and control groups according to obstetric history (n= 188)

Group Obstetric history	Study group n= 94 No. (%)	Control group n=94 No. (%)	X^2	P-value
Gravidity				
Primi	19 (20.2)	15 (16.0)	4.112	0.128
Two	24 (25.5)	37 (39.3)		
Three	51 (54.3)	42 (44.7)		
Parity				
Primi	19 (20.2)	15 (16.0)	3.489	0.175
Two	25 (26.6)	37 (39.4)		
Three	50 (53.2)	42 (44.6)		
Gestational age (weeks)				
Mean ± SD	21.17 ± 2.77	21.73 ± 2.51	t= 1.461	0.146

t= independent t test.

Table 3. Distribution of the pregnant women in the study and control groups according to knowledge regarding oral health before and after one month of intervention (n=188)

| Groups
Knowledge items | Before intervention | | | | After one month | | | |
	Study group n= 94 No.(%)	Control group n=94 No.(%)	X^2/FET	P-value	Study group n= 94 No.(%)	Control group n=94 No.(%)	X^2/FET	P-value
Physiological changes in oral cavity during pregnancy								
Complete correct answer	20 (21.3)	15 (16.0)	2.307	0.316	66 (70.2)	17 (18.1)	57.896	0.000**
Incomplete correct answer	39 (41.5)	34 (36.2)			23 (24.5)	40 (42.5)		
Don't know	35 (37.2)	45 (47.8)			5 (5.3)	37 (39.4)		
Effect of oral disease on pregnancy outcomes								
Complete correct answer	0 (0.0)	1 (1.1)	1.661$^£$	0.436	69 (73.4)	3 (3.2)	121.442$^£$	0.000**
Incomplete correct answer	14 (14.9)	18 (19.1)			21 (22.3)	19 (20.2)		
Don't know	80 (85.1)	75 (79.8)			4 (4.3)	72 (76.6)		
Possible causes of caries during pregnancy								
Complete correct answer	16 (17.0)	11 (11.7)	4.995	0.082	76 (80.9)	13 (13.9)	94.738$^£$	0.000**
Incomplete correct answer	23 (24.5)	37 (39.4)			18 19.1)	38 (40.4)		
Don't know	55 (58.5)	46 (48.9)			0 (0.0)	43 (45.7)		
The importance of daily tooth brushing								
Complete correct answer	6 (6.4)	5 (5.3)	1.751	0.417	80 (85.1)	9 (9.6)	113.158$^£$	0.000**
Incomplete correct answer	40 (42.5)	32 (34.1)			14 (14.9)	44 (46.8)		
Don't know	48 (51.1)	57 (60.6)			0 (0.0)	41 (43.6)		
The importance of fluoride and toothpaste								
Complete correct answer	3 (3.2)	4 (4.3)	1.810$^£$	0.405	73 (77.6)	7 (7.4)	107.098$^£$	0.000**
Incomplete correct answer	43 (45.7)	34 (36.2)			20 (21.3)	36 (38.3)		
Don't know	48 (51.1)	56 (59.5)			1 (1.1)	51 (54.3)		
Benefits of use dental floss								
Complete correct answer	12 (12.8)	10 10.6)	1.727	0.422	65 (69.2)	15 (16.0)	72.183$^£$	0.000**
Incomplete correct answer	38 (40.4)	31 (33.0)			27 (28.7)	33 (35.1)		
Don't know	44 (46.8)	53 (56.4)			2 (2.1)	46 (48.9)		
Suitable time of visited dentist during pregnancy								
Complete correct answer	1 (1.1)	0 (0.0)	4.400$^£$	0.111	63 (67.0)	0 (0.0)	147.565$^£$	0.000**
Incomplete correct answer	15 (16.0)	7 (7.4)			31 (33.0)	15 (16.0)		
Don't know	78 (83.0)	87 (92.6)			0 (0.0)	79 (84.0)		
Best time to take dental treatment during pregnancy								
Complete correct answer	2 (2.1)	3 (3.2)	2.965$^£$	0.227	81 (86.2)	4 (4.3)	140.635$^£$	0.000**
Incomplete correct answer	28 (29.8)	18 (19.1)			13 (13.8)	21 (22.3)		
Don't know	64 (68.1)	73 (77.7)			0 (0.0)	69 (73.4)		
Safe oral health interventions during pregnancy								
Complete correct answer	4 (4.3)	0 (0.0)	4.246$^£$	0.120	78 (83.0)	6 (6.4)	123.131	0.000**
Incomplete correct answer	8 (8.5)	10 (10.6)			11 (11.7)	13 (13.8)		
Don't know	82 (87.2)	84 (89.4)			5 (5.3)	75 (79.8)		
Necessary foods that can affect or maintain oral health during pregnancy								
Complete correct answer	9 (9.6)	11 (11.7)	1.403	0.496	85 (90.4)	15 (16.0)	107.329$^£$	0.000**
Incomplete correct answer	26 (27.7)	32 (34.0)			8 (8.5)	33 (35.1)		
Don't know	59 (62.8)	51 (54.3)			1 (1.1)	46 (48.9)		

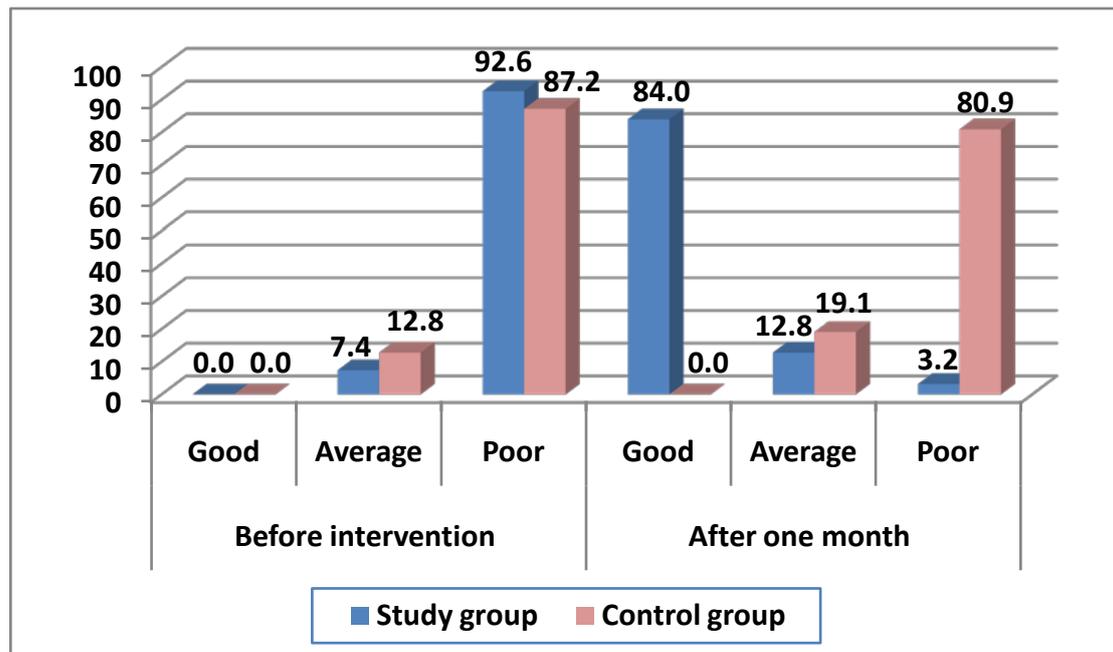**A highly statistical significant difference (P ≤ 0.001) £ =Fisher Exact Test.

Figure 1. Distribution of pregnant women in the study and control groups according to total knowledge score regarding oral health before and after one month of intervention (n=188)

Table 4. Distribution of the pregnant women in the study and control groups according to their attitude (agree) towards oral health before and after one month of intervention (n=188)

Groups	Before intervention				After one month			
	Study group n= 94	Control group n=94	X^2/FET	P-value	Study group n= 94	Control group n=94	X2/FET	P-value
Attitude items	No. (%)	No. (%)			No. (%)	No. (%)		
I consider oral health is an integral part of general health especially during pregnancy.	18 (19.1)	27 (28.7)	4.325	0.115	82 (87.2)	33 (35.1)	55.544	0.000**
Oral health care can be considered to be an important part of prenatal care.	9(9.6)	7(7.4)	3.235	0.198	90 (95.7)	16 (17.0)	120.122$^£$	0.000**
Poor oral health during pregnancy contributes to maternal / fetal complications.	3 (3.2)	5 (5.3)	2.155	0.340	79 (84.0)	9 (9.6)	110.883	0.000**
I concerned that pregnancy can cause oral cavity diseases.	0 (0.0)	2 (2.1)	4.810$^£$	0.090	75 (79.8)	5 (5.3)	108.250	0.000**
Visiting the dentist regularly during pregnancy is essential.	1 (1.1)	4 (4.3)	3.062 $^£$	0.216	64 (68.1)	6 (6.4)	77.077	0.000**
Think that visiting the dentist is only necessary when I am experiencing pain.	70 (74.5)	73 (77.7)	2.086	0.352	26 (27.7)	68 (72.3)	61.786	0.000**
Early detection and timely intervention are crucial aspects for pregnant women oral health.	7 (7.4)	6 (6.4)	4.929	0.085	69 (73.4)	8 (8.5)	84.086	0.000**
Dental procedures can be safely performed throughout the period of pregnancy with certain precautions.	2(2.1)	0 (0.0)	2.296$^£$	0.317	77 (81.9)	1 (1.1)	127.451$^£$	0.000**
Dental treatments during pregnancy may negatively affect the fetus.	84 (89.4)	89 (94.7)	3.478$^£$	0.176	36 (38.3)	84 (89.4)	54.999$^£$	0.000**
Nutrition of pregnant woman has a crucial role in baby's oral health.	42 (44.7)	46 (48.9)	2.048	0.359	88 (93.6)	52 (55.3)	39.269$^£$	0.000**
It is important to limit frequent consumption of sugary foods and snacking during pregnancy for better oral health.	29 (30.9)	24 (25.5)	1.386	0.500	74 (78.7)	28 (29.8)	57.257$^£$	0.000**
It is not safe for pregnant women to get routine dental care such as cleanings	81(86.2)	76 (80.9)	1.612$^£$	0.447	25 (26.6)	79 (84.0)	64.977	0.000**
Oral health during pregnancy affects the dental growth of baby later on.	14 (14.9)	19 (20.2)	2.953	0.228	72 (76.6)	22 (23.4)	59.921	0.000**
Believe that I am responsible for preventing my teeth loss during pregnancy.	15 (16.0)	11 (11.7)	3.120	0.210	65 (69.1)	13 (13.8)	81.034$^£$	0.000**
It is important to follow oral health care behaviors for enhancing pregnant woman' self-confidence.	30 (31.9)	26 (27.7)	4.720	0.094	92 (97.9)	33 (35.1)	83.648$^£$	0.000**

** A highly statistical significant difference (P ≤ 0.001)   £ =Fisher Exact Test.

Table 2 reveals no statistically significant differences between both groups regarding obstetric history of gravidity, parity, and gestational age (p > 0.05). The mean gestational age of the study and control groups was 21.17 ± 2.77 and 21.73 ± 2.51 weeks respectively. These findings confirm that both groups were homogenous

Table 3 displays that, there was no statistically significant differences between the study and control groups before intervention regarding all knowledge items about oral health (p > 0.05). Meanwhile, a significant improvement was observed in the study group after one month of intervention compared with before intervention (70.2% versus 21.3%), (73.4% versus 0.0%), (80.9% versus17.0 %), (85.1% versus 6.4%), (77.6% versus 3.2%), (69.2% versus 12.8%), (67.0% versus 1.1%), (86.2% versus 2.1%), (83.0 % versus 4.3%), and (90.4% versus 9.6%) had complete correct answer about physiological changes in oral cavity during pregnancy, effect of oral disease on pregnancy outcomes, possible causes of caries during pregnancy, the importance of daily tooth brushing, the importance of fluoride and toothpaste, benefits of use dental floss, suitable time of visited dentist during pregnancy, best time to take dental treatment during pregnancy, safe oral health interventions during pregnancy, and necessary foods that can affect or maintain oral health during pregnancy respectively, a highly statistically significant difference between the both groups (p<0.001).

Figure 1 illustrates that the majority of the study and control groups 92.6% and 87.2% had poor knowledge regarding oral health before intervention respectively. However, after one month of intervention a significant increase in overall oral health knowledge score of the study group where 84.0% had good knowledge compared with 0.0% of the control group.

Table 4 reveals that, before intervention there was no statistically significant differences between the study and control groups (p > 0.05), the minority of both group agreed upon positive statements towards oral health during pregnancy. Meanwhile, the most of both groups agreed upon negative statements (think that visiting the dentist is only necessary when experiencing pain, dental treatments during pregnancy may negatively affect the fetus, and it is not safe for pregnant women to get routine dental care such as cleanings). On the contrary after one month of intervention, there was improvement in all attitude items towards oral health and a highly statistically significant difference was observed between both groups (p<0.001).

Figure 2 shows that less than three quarters of both groups had negative attitude, while only 4.3% and 1.1% of the study and control groups had positive attitude towards oral health before intervention respectively. However, after one month of intervention the positive attitude changed to 78.7% of the study group and 6.4% of the control group.

Table 5 reflects that before intervention, 2.1 % and 0.0 % the study and control groups respectively always brushed teeth twice daily 1.1% and 2.1% always using mouthwash respectively, 16.0% and 9.6% always limit sweet foods and beverages between meals respectively, and none of both groups always use dental floss and visit the dentist regularly, with no statistically significant differences between the study and control groups in relation to oral health behaviors among pregnant women (p > 0.05). On the other hand, after one month of intervention there was improvement in the study group 52.2%, 5.3%, 4.3%, 62.8%, and 3.2% compared with 0.0%, 0.0%, 3.2%, 11.7%, and 0.0% related to brushing teeth twice daily, using dental floss, using mouthwash, limit sweet foods and beverages between meals, visiting the dentist regularly respectively. There was statistically significant difference was observed between both groups in relation to oral health behaviors of pregnant women except using dental floss (p > 0.05).
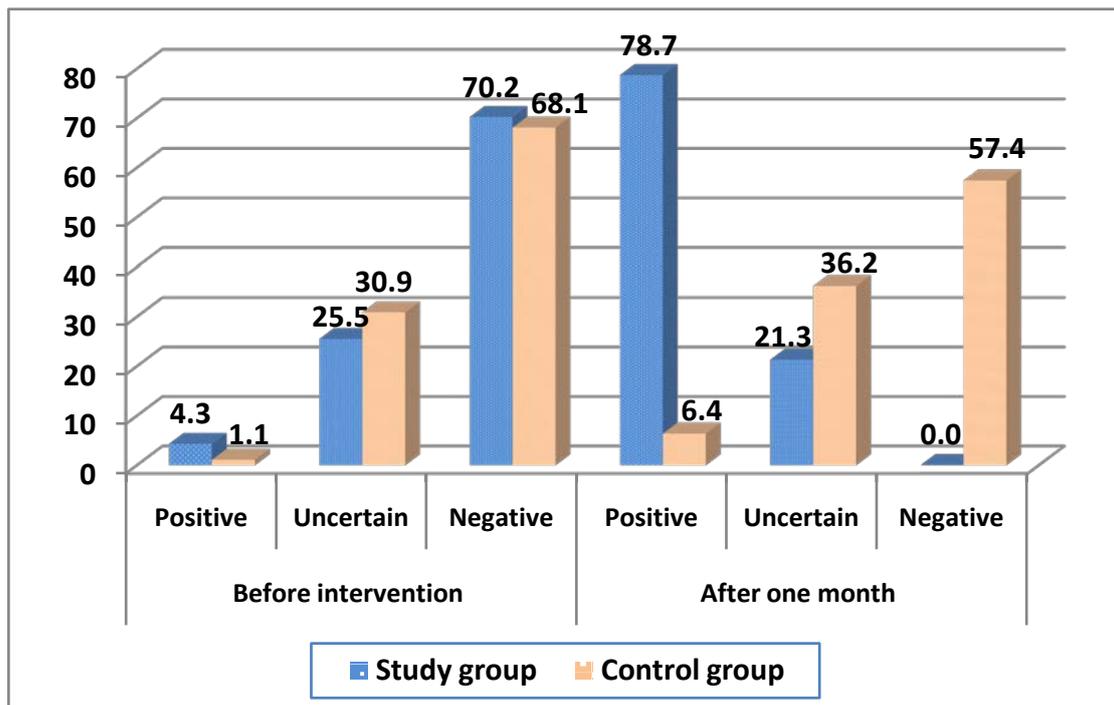

Figure 2. Distribution of the pregnant women in the study and control groups according to total attitude score towards oral health before and after one month of intervention (n=188)

Table 5. Distribution of pregnant women in the study and control groups according to oral health behaviors before and after one month of intervention (n=188)

Groups Health behaviors items	Before intervention		X²/FET	P-value	After one month		X²/FET	P-value
	Study group n= 94 No.(%)	Control group n=94 No.(%)			Study group n= 94 No.(%)	Control group n=94 No.(%)		
Brushing teeth twice daily								
Always	2 (2.1)	0 (0.0)		0.225	49 (52.2)	0 (0.0)		
Sometimes	11 (11.7)	16 (17.0)	2.983£		38 (40.4)	17 (18.1)	115.352£	0.000**
Never	81 (86.2)	78 (83.0)			7 (7.4)	77 (81.9)		
Using dental floss			1.464£					
Always	0 (0.0)	0 (0.0)			5 (5.3)	0 (0.0)		
Sometimes	12 (12.8)	7 (7.4)		0.226	13 (13.8)	10 (10.6)	5.791£	0.055
Never	82 (87.2)	87 (92.6)			76 (80.9)	84 (89.4)		
Using mouthwash							8.166£	0.017*
Always	1 (1.1)	2 (2.1)	3.830£	0.147	4 (4.3)	3 (3.2)		
Sometimes	14 (14.9)	6 (6.4)			22 (23.4)	8 (8.5)		
Never	79 (84.0)	86 (91.5)			68 (72.3)	83 (88.3)		
Limit sweet foods and beverages between meals							90.564	0.000**
Always	15 (16.0)	9 (9.6)	3.775	0.151	59 (62.8)	11 (11.7)		
Sometimes	18 (19.1)	12 (12.8)			30 (31.9)	16 (17.0)		
Never	61 (64.9)	73 (77.6)			5 (5.3)	67 (71.3)		
Visiting the dentist regularly			1.849£	0.174			9.033	0.011*
Always	0 (0.0)	0 (0.0)			3 (3.2)	0 (0.0)		
Sometimes	4 (4.3)	1 (1.1)			10 (10.6)	2 (2.1)		
Never	90 (95.7)	93 (98.9)			81 (86.2)	92 (97.9)		

*A statistical significant difference (P ≤ 0.05)   £ =Fisher Exact Test
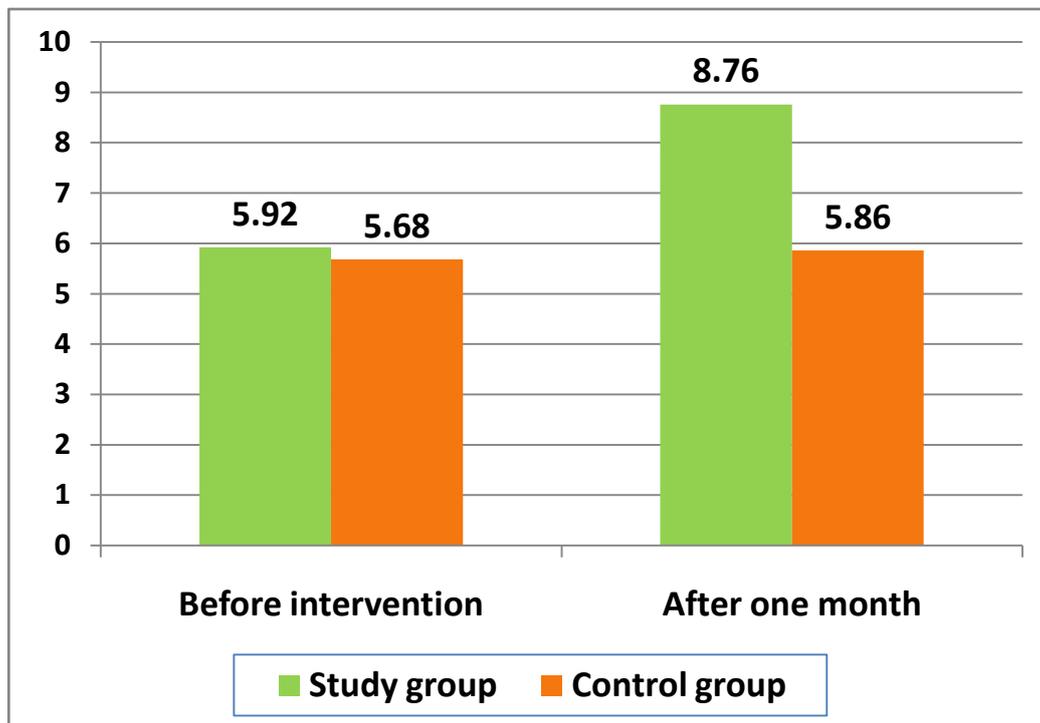**A highly statistical significant difference (P ≤ 0.001).

$(t_1= 1.680; p_1 0.095)$ $(t_2= 17.994; p_2=0.000)$

Figure 3. Mean score of total oral health behaviors score among the study and control groups before and after one month of intervention (n=188)

Figure 3 illustrates that the mean of oral health behaviors scores in both groups was 5.92 for the study group, and 5.68 for the control group before intervention, there was no statistically significant differences between two groups (t= 1.680; p=0.095). Meanwhile, after one month of intervention remarkably increased 8.76 for the study group compared with 5.86 for the control group which showed a statistically significant difference between both groups (t= 17.994; p=0.000).

Table 6. Correlation coefficient between total knowledge, attitude and health behaviors scores regarding oral health of both groups before and after one month of intervention (n=188)

Variable		Total knowledge score			
		Before intervention		After one month	
		r	p	r	P
Total attitude score	**Study group (n= 94)**	0.623	0.000**	0.648	0.000**
	Control group (n= 94)	0.547	0.000**	0.581	0.000**
Total health behaviors score	**Study group (n= 94)**	0.518	0.000**	0.533	0.000**
	Control group (n= 94)	0.542	0.000**	0.549	0.000**
		Total attitude score			
		Before intervention		After one month	
		r	p	r	P
Total health behaviors score	**Study group (n= 94)**	0.622	0.000**	0.637	0.000**
	Control group (n= 94)	0.578	0.000**	0.589	0.000**

** A highly statistical significant difference ($P \leq 0.001$).

Table 6 clarifies a positive highly statistically correlation between total knowledge, attitude and health behaviors score regarding oral health of the both groups before and after one month of intervention ($P < 0.001$).

4. Discussion

Pregnancy is a time when women may be more motivated to make health changes. Maintaining good oral health during pregnancy is important, apart from reducing the risk of adverse pregnancy outcomes. Prevention of oral and dental problems during pregnancy is possible when pregnant women express appropriate knowledge, attitude and practice and seek dental treatment at right time. Various health promotion interventions should be carried out during pregnancy in order to motivate and educate pregnant women on importance of good oral health [21]. Therefore, this study was carried out to evaluate the effect of nursing intervention on oral health knowledge, attitude, and health behaviors among pregnant women.

As regards demographic characteristics, the current study finding showed no significant difference between the study and control groups in relation to age, educational level, occupation, residence and monthly income. These findings confirm that both groups were homogenous. These findings are in the same line with [22]. who reported no significant difference between case and control groups in demographic characterization as age, level of education, monthly family income and status of job (p >0.05). It was clear that less than half of the both groups were aged 25<30 years with a mean age 26.37 ± 4.25 and 27.44 ± 4.13 years respectively. This is similar to [23], who found about 37% of the participants were in the age group between 25 and 30 years.

In relation to educational level, more than half of both groups attained secondary education. This disagreed with the study conducted by [22]. where 40% of the studied women had middle school education. As far as occupation, more than half of the study and control groups were housewives. This contradicted with [24], who found that most of pregnant women were housewives. In addition, more than two-thirds of the study group and less than two-thirds of control group were living rural areas. Also, most of both groups reported that their monthly income was not enough.

Furthermore, the findings of the present study illustrated no statistically significant differences between the both groups regarding obstetric history in the term of gravidity, parity, and gestational age (p > 0.05). The mean gestational age of the study and control groups was 21.17 ± 2.77 and 21.73 ± 2.51 weeks respectively. These findings mean that the both groups were homogenous. This is contradicted with [25], who found that the mean duration of pregnancy was 25.2 weeks at the first visit.

Concerning the pregnant women's knowledge regarding oral health, the finding of the current study revealed that the majority of the both groups had poor knowledge regarding oral health before intervention. This may be attributed to the women had not received any instructions on oral health care before or during pregnancy. This finding was comparable to study by [26], who stated that 22.9% of the participants exhibited adequate overall oral health knowledge. This is in accordance with [27], who found that most pregnant women had limited knowledge about oral health care during pregnancy at baseline.

This is also consistent with [28] showed that pregnant women's knowledge and awareness regarding oral health was poor. Most women were unaware of the potential consequences of neglecting oral hygiene during pregnancy. This result disagreed with [29] who reported that the mean percentage of total correct knowledge was 79.1% which indicated that the pregnant women had good knowledge about maternal and infant oral health, especially relating to good oral hygiene habits during the perinatal period.

However after one month of intervention, there was a significant improvement in overall oral health knowledge of the study group where most of them had good knowledge compared with none of the control group. This improvement may be due to women were interested with the given topic and recognized the importance of oral health care during pregnancy. This indicated the effectiveness of nursing intervention. This finding is in accordance with results of [25] who found that the mean overall correct scores for the pre-test was 12.9 (53.75%),

post-test was 20.9 (87.08%) and follow-up test was 20.17 (84.05%). and follow-up test after four weeks from first visit was 20.17 (84.05%). In addition, [30,22] displayed that pregnant women' oral health knowledge before the intervention was not different in both groups. While, knowledge of pregnant women in the intervention group at 2 and 4 months after intervention showed significant increases compared to the control group.

With regard to oral health attitude, the results of the current study illustrated that less than three quarters of both groups had negative attitude, while minority had positive attitude towards oral health before intervention. This could be attributed to poor women's knowledge influenced women's attitude towards oral health. Contradictory finding was reported by [31] who found that most of the pregnant women displayed positive attitudes to oral health, where 65.8% considered oral health should be a priority. Majority of the pregnant women 83% agreed that women should have a dental checkup during pregnancy.

On the contrary, after one month of intervention the positive attitude changed to more than three quarters of the study group and less than one tenth of the control group. This change indicates nursing intervention effect on the attitude of pregnant women pertaining to oral health. This finding is in the same line with [32] who reported a significant difference between scores of attitude achieved by the control and intervention groups at the end of the study. [33] reported in a systematic review that oral health education is effective in improving the oral health.

Regarding oral health behaviors, the findings of the current study revealed no statistically significant difference between two groups before intervention whereas the minority and none of both groups always perform healthy behaviors like brushing teeth twice daily, using mouthwash, limit sweet foods and beverages between meals, using dental floss and visiting the dentist regularly. This may be due to oral health is often neglected by pregnant women. Similar results were reported by [34] who found that none of the pregnant women ever used dental floss and only a few (1.4%) had heard about it. [35] observed that there was even lower utilization of dental services during pregnancy as reported by 22% of pregnant women. These findings are contradicted with [36] who mentioned that more than half of pregnant women in Turkish (201; 57%) brushed teeth more than once a day and almost all (327; 93%) brushed at least once a day, whereas 28 (8%) participants used dental floss or 11 (3%) used mouth rinse. This is may be due to the difference of cultures.

Meanwhile, after one month of intervention a significant increase in the oral health behaviors scores were noted in the study group compared with little increase among the control group which showed a statistically significant difference between both groups. This could be attributed to improvement in knowledge and attitude was motivated to improve oral health behaviors. As well as, these findings may point out women perceived that oral health during pregnancy to be important to overall health and their fetus, which may have provoked the behaviors changes.

The present findings are supported by [37] who pointed out the effect of oral health education by DVD designed during pregnancy in improving oral health behaviors. Furthermore, [38,39] pointed out there was no significant difference in the mean score of behavior between the two groups. However after intervention, the mean score of behavior significantly higher in the educated group than the controls immediately and 2 months after the education program (P<0.05).

Furthermore, there was a positive highly statistically correlation between total knowledge, attitude and health behaviors score regarding oral health of both groups before and after one month of intervention. This is may be due to women's knowledge about oral health certainly affect their attitude and healthy behaviors. These findings are consistent with the study done by [23] who concluded that there was a partial positive correlation (r = 0.307; P < 0.05) between knowledge and practices. Contradictory findings were reported in a recent study by [38] stressed that there was no relationship between changes in knowledge, attitude, and behavior scores in the study groups (P > 0.05).

5. Conclusion

The results of the present study indicated the positive effect of nursing intervention in improving pregnant women's knowledge, attitude as well as health behaviors regarding oral health. Therefore, the study hypothesis was supported.

6. Recommendations

Based on the findings of the current study, the following recommendations can be suggested:

- Provision of oral health education for pregnant women during antenatal care in order to highlight the importance of good oral health.
- Pregnant women must be educated about the importance of maintaining good oral health behaviors.

Future researches:

- Developing an oral health education program to improve maternity nurses' knowledge and attitude regarding oral health during pregnancy
- Replication of the research on a large probability sample is recommended to achieve more generalization.

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