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Original Article

Value of Dental Caries Intervention Procedures in Pregnancy on Fetal Outcome

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Abstract

Background: Oral health hygiene is suggested to affect pregnancy and its outcome, and reciprocally, the pregnancy could aggravate the oral conditions. However, the effect of dental intervention procedures on pregnancy outcome is not well addressed.

Aim of the work: This work was designed to evaluate the effect of dental caries on the pregnancy outcome.

Patients and Methods: This observational prospective study included 100 pregnant women with dental caries. Among them, 51 women underwent dental procedures, while the other 49 refused such treatment. For patient assessment, a complete history was taken, and clinical examinations, laboratory workups, and radiological investigations were performed. Dental history was collected using a pre-prepared questionnaire. Pregnancy was monitored until delivery, and any adverse outcomes were addressed [e.g., intrauterine growth restriction or premature pre-labor rupture of membranes, among others].

Results: Oral hygiene and dental pain were significantly different between study groups, where oral hygiene practices were significantly higher among those with dental procedures. In addition, dental pain significantly increased in cases with dental procedures compared to those without [70.58% vs 32.65%, respectively]. The dental procedures were dental extraction, dental restoration, crown, root canal, and bridge among 19.6%, 39.21%, 29.41%, 11.76%, and 5.88%, respectively. IUGR, PROM, neonatal RDS, and NICU admission were reported among 13.0%, 23.0%, 23.0%, and 18.0%, respectively. There was a reduction of neonatal RDS in patients with dental procedures compared to those without dental procedures [13.7% vs 32.65%, respectively]. Also, there was a significant increase of GA at birth in those with dental procedures compared to those without dental procedures [38.9 ± 1.43 vs 37.1 ± 1.23, respectively]. There was a significant negative correlation between dental procedures and dental pain or discomfort on one side and the IUGR from the other side.

Conclusion: Interventional procedures for dental caries during pregnancy are safe for the mother and her fetus.

Keywords: **Dental Caries; Intrauterine Growth Restriction; Neonatal Intensive Care; Gestational Age.**

INTRODUCTION

Oral health is essential aspect of the overall health and affects it, especially for pregnant women in the prenatal period. However, it is important to not postpone the dental care [procedures] during pregnancy. The periodontal disease was significantly linked to poor pregnancy outcome in previous literature. This association include –but not limited to- preterm birth. However, the exposure of the pregnant women to dental procedures showed inconsistent results regarding association with preterm birth. But these procedures are safe during pregnancy [1,2].

Interventions to provide periodontal treatment to pregnant women yield inconsistent results regarding preterm birth but have established the safety of periodontal therapy during pregnancy [3-6].

Poor oral health adversely affects the overall quality of life. For example, the presence of pain, infection, missing tooth affects the person's way of speak, eating and affect his/her social physical, mental and wellbeing. In addition, the association between oral diseases and chronic condition [e.g., diabetes mellitus and pneumonia] is well-established. Furthermore, the link between oral diseases and adverse pregnancy outcome [e.g., preterm and low birth weight] had been proposed. Gingivitis and periodontitis represented the mildest and more severe forms of the disease respectively. Gingivitis presented by inflammation of the gum, bleeding, redness, tenderness and sensitivity. On the other side, periodontitis is associated with loss of connective tissue and bone support. It usually leads to tooth loss in adults [7-11].

Periodontal disease is developed or worsen if present during pregnancy. This is attributed to hormonal fluctuations. Thus, preservation of good oral health in pregnancy is a critical issue to overall health of the mother and her neonates. Oral examination and professional cleaning of the teeth is advised for pregnant woman during her pregnancy [12- 14].

Previous researches showed that the treatment of dental conditions during pregnancy provide benefits to woman overall oral health. However, little is known about the common dental procedures risk conveyed on the developing fetus. The question is raised due to exposure of the pregnant woman to small doses of radiation [x-ray], exposure to bacteria [during dental polishing or scaling] and exposure to mercury vapor [during amalgam fillings]. The repeated exposure or exposure to high diseases of radiation or mercury can lead to fetal insult [for example of the developing nervous system] or even death. However, the effects of small exposure during routine dental care are largely unknown. In high doses exposure to radiation or mercury can cause fetal death or insult the developing nervous system and lead to delays in the infant's growth or neurodevelopment; however, at the lower doses suspected to occur during routine dental care the effects of such exposures are largely unknown [15-17].

THE AIM OF THE WORK

The current work was designed to evaluate the value of dental caries on the pregnancy and fetal outcome.

PATIENTS AND METHODS

This was a prospective observational study conducted in the Department of Obstetrics and Gynecology at Al-Azhar University – Damietta. It included 100 pregnant women with dental complaints, some of whom were subjected to dental interventions while others were not. Among them, 51 women required dental procedures, while the other 49 women refused any dental treatment.

The inclusion criteria were pregnant women with complaint from dental pathology, gestational age 20 to 35 weeks of gestation, with singleton pregnancy, who accepted to participate in the study.

Exclusion criteria: Women with complicated pregnancy, multiple pregnancy, who refused to participate or those with other conditions increasing the risk of IUGR and PROM, were excluded.

Sample Size calculation: This study base on study carried out by **Daniels *et al.*** [18] Epi Info STATCALC was used to calculate the sample size by considering the following assumptions: - 95% two-sided confidence level, with a power of 80%. & α error of 5%, odds ratio calculated= 1.115. The final maximum sample size taken from the Epi-Info output was 92. Thus, the sample size was increased to 100 subjects to assume any drop out cases during follow up.

Ethical considerations: the study was approved by the local research and ethics committee and a written informed consent was obtained from each participant prior to the study.

For patient assessment, a complete history taking, clinical examination, laboratory workup and radiological investigations were performed. The dental history was collected by a pre-prepared questionnaire

Ultrasonographic examination was performed to detect fetal indices of IUGR. Proposed sonographic criteria for diagnosing IUGR included elevated HC/AC ratio, elevated ratio of femur length to abdominal circumference [FL/AC], presence of oligohydramnios without ruptured membranes, presence of advanced placental grade, and others.

All women were followed up to detected pregnancy outcome or Pre labor rupture of membrane.

Evaluation of preterm labor was performed using speculum examination to visualize amniotic fluid passing from the cervical canal and pooling in the vagina. Fern and pH testing of the pooled vaginal secretions can indicate rupture of membranes. The PH of amniotic fluid is 7.1 to 7.3. Fetal fibronectin gets released as a result of the breakdown of the cervical extracellular matrix is also an indicator of preterm labor though, it is a specific but not a sensitive test. If the result is negative, it is strongly indicative of an intact membrane but if positive it does not necessarily indicate premature rupture of membranes.

Data management and Statistical Analysis:

Data collected throughout history, basic clinical examination, laboratory investigations and outcome measures coded, entered and analyzed using Microsoft Excel software. Data were then imported into Statistical Package for the Social Sciences [SPSS version 20.0] [Statistical Package for the Social Sciences] software for analysis. According to the type of data qualitative represent as number and percentage, quantitative continues group represent by mean ± SD, the following tests were used to test differences for significance; correlation by Pearson's correlation or Spearman's. P value was set at <0.05 for significant results.

RESULTS

This is a prospective observational study which included 100 pregnant women with dental complaint. They were divided to those who had dental intervention [51] and those who do not need dental intervention [49].

Regarding patient characteristics, there was no significant differences between those who exposed to dental procedure and those who do not had dental procedures regarding age, residence, irregular menstruation, parity, and mode of previous deliveries [Table 1].

Oral hygiene and dental pain were significantly difference between study groups. The oral hygiene practices and practice were significantly higher among those with dental procedures than those with no dental procedures. In addition, dental pain significantly increased in cases with dental procedures than those without no dental procedures [70.58% vs 32.65%, respectively] [Table 2].

Regarding dental procedures in the first group, it was dental extraction, dental restoration, crown, root canal and bridge among 19.6%, 39.21%, 29.41%, 11.76% and 5.88%, successively [Table 3].

Regarding fetal outcome, IUGR, PROM, neonatal RDS and NICU admission was reported among 13.0%m 23.0%, 23.0% and 18.0% respectively. There was decrease of neonatal RDS in patients with dental than those without dental procedures [13.7% vs 32.65% respectively]. In addition, there was significant increase of GA at birth in those with dental than those without dental procedures [38.9 ± 1.43 vs 37.1 ± 1.23, respectively] [Table 4]. There was significant negative correlation between dental procedures and dental pain or discomfort from one side and the IUGR from the other side. Otherwise, no other significant correlation was reported [Table 5].

Table [1]: Characteristics of the study groups

Variable		Dental Procedure [51]	No dental Procedure [n=49]	p
Age [years]	Mean±SD	28.6± 4.78	28.4±4.87	0.83
Residence [n,%]	Urban	28 [54.9%]	26 [53.1%]	0.85
	Rural	23 [45.1%]	23 [46.9%]	
Irregular menstruation	[n,%]	6 [11.8%]	8 [16.3%]	0.51
Gravidity	Mean±SD	1.86±1.13	2.18±1.14	0.159
Parity	Mean±SD	1.37±1.05	1.67±1.04	0.151
Previous CS [N,%]	0	18 [35.3%]	16 [32.7%]	0.821
	1	23 [45.1%]	21 [42.9%]	
	2	7[13.7%]	10 [20.4%]	
	3	3 [5.9%]	2 [4.1%]	
NVD [n,%]	0	32 [62.7%]	23 [46.9%]	0.17
	1	15 [29.4%]	18 [36.7%]	
	2	3 [5.9%]	8 [16.32%]	
	3	1 [1.96%]	0 [0.0%]	

Table [2]: Oral hygiene and dental pain among study groups

		Dental Procedure [51]		No dental Procedure [n=49]		Total [100]	P value
Oral hygiene practices during Pregnancy	Yes	39	76.47%	15	30.6%	54[54%]	<0.001
	No	12	23.52%	34	69.3%	46 [46%]	
Oral hygiene practice	Brushing teeth	39 [76.47%]		13 [26.5%]		52 [52%]	<0.001
	Flossing teeth	28 [54.90%]		4 [8.16%]		32 [32%]	<0.001
Dental pain or discomfort during pregnancy [n,%]		36 [70.58%]		16 [32.65%]		52[52%]	<0.01

Table [3]: Type of dental procedures done in the first group

	Statistics [n=51]	
	N	%
Dental extraction	10	19.6
Dental restoration	20	39.21
Crown	15	29.41
Root canal	6	11.76
Bridge	3	5.88

NB: One patient may have more than one procedure.

Table [4]: Fetal outcome among study groups

	Dental procedure [51]	No dental procedure [49]	Total	P value
IUGR [n,%]	5 [9.8%]	8 [16.32%]	13[13%]	0.33
PROM[n,%]	9 [17.64%]	14 [28.57%]	23[23%]	0.28
GA at birth [week] [mean±SD	38.9 ± 1.43	37.1 ± 1.23	37.9 ± 1.5	<0.001
Neonatal RDS [n,%]	7 [13.7%]	16 [32.65%]	23[23%]	0.02*
NICU admission [n,%]	7 [13.72%]	11[22.45%]	18[18%]	0.25

Table [5]: Correlations between dental procedures, oral hygiene practices and dental pain or discomfort during pregnancy with fetal outcomes .

Variable	Dental procedures		Oral hygiene practices		Dental pain or discomfort	
	r	p	r	p	r	p
IUGR	***-0.348***	***<0.001****	-0.091	0.368	**-0.311**	**0.002***
PROM	-0.130	0.198	-0.068	0.503	-0.046	0.652
GA at delivery	0.054	0.591	0.066	0.513	0.010	0.921
Distress needs NICU	-0.149	0.140	-0.002	0.986	0.068	0.504

DISCUSSION

Dental caries is highly reported diseases among pregnant women and is the dental most prevalent dental infection globally. It exerts effects on the mother quality of life and pose an economic burden [19].

Inadequate education, poor oral health, poor diet and hormonal fluctuations may be responsible for increased dental caries among pregnant females [20].

Dental caries in pregnant women is 2.9 times more than non-pregnant females. In addition, pregnant women are more prone to develop gingivitis. In addition, oral health of pregnant mother can affect the developing fetus and neonate [21-23].

This work was designed to assess the value of dental caries procedures in pregnant and its potential effects on pregnancy outcome. It included 100 women [51 submitted to dental interventions and the other 49 did not exposed to dental procedures]. Both groups were comparable regarding patient age, residence, menstrual history, and other obstetric data [gravidity, parity and mode of delivery in the previous pregnancy].

These results are in line with **Deghatipour *et al.*** [19]. They aimed to assess the effectiveness of some interventions for dental caries. They included 436 pregnant women [study group] and 200 as the control group. The mean age was 27.05±5.43 and 27.98±5.76 in the intervention and control groups, respectively. Education was reported for about the half of included women, and majority of women in both groups were from low- and middle-income territories.

Ghaffari *et al.* [24] also reported results for 135 pregnant women [68 in the study and 67 in the control groups]. Their mean age was 27.2±6.1 and 26.0±4.9 years in the intervention and control groups respectively, with no significant differences between groups as in the current work.

Furthermore, our results are in accordance with **Mital *et al.*** [25] who reported no significant differences between intervention and control groups regarding residence, education, parity and occupation.

In the current work, there was highly statistically significant difference between the two groups regarding oral hygiene practices during pregnancy. **Saravanan *et al.*** [26] reported risk factors affecting pregnant dental caries. These include age, food habits and oral hygiene practices, with significant differences. These results are supported by the current work.

In another study **Mital *et al.*** [25] studied relationship of dental caries with oral hygiene status, dental health care among pregnant women, found that there was no significant difference in caries between the poor and good oral hygiene groups, pregnant women with poor oral hygiene were 1.5 times more likely to have caries compared with those in the good oral hygiene group.

The current work results showed that, dental pain significantly increased in cases with dental procedures than those without no dental procedures [70.58% vs 32.65%, respectively].

These results are consistent with **Kruger *et al.*** [27] who aimed to determine the prevalence of dental pain during pregnancy. A total of 315 pregnant women were enrolled in the study among them 173 [54.9 %] pregnant women reported dental pain during pregnancy and 142 [45.1%] had not any dental pain with no significant difference between the two studied group [p>0.05].

In agreement with our study was a cross-sectional population-based study done by **Bastos *et al.*** [28] conducted on pregnant women. The authors reported no significant correlations between dental pain and gestational age, a toothache prevalence of 17.7 % among non-institutionalized urban residents of both sexes aged ≥20 years. Other studies found that, from 25.8% to 44 % of pregnant women reported dental pain experience [29-31].

Regarding dental intervention, our results are in line with **Hagai *et al.*** [32] who reported that, the commonest types of dental treatment were endodontic treatment [43%], tooth extraction [31%], and tooth restoration [21%]. Most women [63%] were not exposed to additional medications. Approximately one-half [51%] of the women were not exposed to dental radiography, and 44% were exposed to radiation, mostly bite-wing radiography.

In another study **Kruger *et al.*** [27] reported caries activity in 218 [69.6 %] pregnant women, gingival bleeding in 246 [84.2 %] women and visible plaque in 220 [81.8 %] women. The mean numbers of decayed, missed and filled teeth were 4.25 ± 4.128, 2.35 ± 3.360, and 5.22 ± 5.319, respectively.

Regarding fetal outcome, 13 cases had IUGR, 23 had PROM. The mean gestational age at birth was 37.9 ± 1.5 weeks of gestation, 23 patients had neonatal respiratory distress and 18 patients had NICU admission.

Along with these findings, a previous study by **Daniels *et al.*** [18] showed that, dental care was not associated with gestational prematurity or birth weight problem.

In the current work, there were significant negative correlations between IUGR and dental procedure occurrence. While, other outcomes showed no correlation in dental procedure. There were negative correlations between IUGR and dental pain or discomfort during pregnancy this may be due to patient with dental pain sought dental procedure. However, there was no significant correlation between dental pain or discomfort during pregnancy, PROM, gestational age at delivery and distress NICU admission.

Hagai *et al.* [32] followed 210 pregnancies exposed to dental local anesthetics [112 [53%] in the first trimester] and compared them with 794 pregnancies not exposed to teratogens. There was no difference in the rate of miscarriages, gestational age at delivery or birth weight.

In addition, **Michalowicz *et al.*** [33] showed that women who receive fillings or who undergo extractions or root canal treatment during the second trimester of pregnancy do not experience higher rates of adverse birth outcomes compared with women who do not undergo these dental treatments.

This study has several limitations. First, the relatively small sample size may limit the generalizability of the findings. Second, the observational nature of the study does not allow for establishing causality between dental procedures and pregnancy outcomes. Third, the decision to undergo dental treatment was based on patient preference rather than random allocation, which may introduce selection bias. Finally, the study did not account for other potential confounders such as nutritional status, socioeconomic factors, and oral microbiota, which could influence both oral health and pregnancy outcomes. Future studies with larger, randomized populations and longer follow-up are recommended to confirm and expand upon these findings.

In conclusion, our results suggested that, doing of dental caries procedure during pregnancy is safe for pregnant and fetal outcome. All these findings require confirmation by larger, more powered study with larger sample size.

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