ADA CE Program ARTICLE 1

COVER STORY

Pregnancy outcome after in utero exposure to local anesthetics as part of dental treatment

A prospective comparative cohort study

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ABSTRACT

Background. Dental treatment and use of local anesthetics during pregnancy generally are considered harmless because of lack of evidence of adverse pregnancy effects. Data on the safety of dental treatment and local anesthetics during pregnancy are scant. Dental care is often a reason for concern both among women and their health care providers. The primary objective of this study was to evaluate the rate of major anomalies after exposure to local anesthetics as part of dental care during pregnancy.

Methods. The authors performed a prospective, comparative observational study at the Israeli Teratology Information Services between 1999 and 2005.

Results. The authors followed 210 pregnancies exposed to dental local anesthetics (112 [53%] in the first trimester) and compared them with 794 pregnancies not exposed to teratogens. The rate of major anomalies was not significantly different between the groups (4.8% versus 3.3%, $P = .300$). There was no difference in the rate of miscarriages, gestational age at delivery, or birth weight. The most common 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.

Conclusions. This study's results suggest that use of dental local anesthetics, as well as dental treatment during pregnancy, do not represent a major teratogenic risk.

Practical Implications. There seems to be no reason to prevent pregnant women from receiving dental treatment and local anesthetics during pregnancy.

Key Words. Dental care; pregnancy; local anesthetics; major congenital anomalies.

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Oral health is related closely to general health and to quality of life,[1] and this position is supported by the World Health Organization.[2] General health is important throughout life and particularly during pregnancy. Pregnancy is characterized by physiological and psychological changes, some of which can affect oral health adversely.[3,4] Hence, there is a need to maintain oral hygiene carefully during pregnancy.[5] The mother's oral health during pregnancy is related closely to the oral health of her newborn.[6-12] Bad oral hygiene in pregnancy has been associated with various adverse effects, such as premature delivery, intrauterine growth restriction, gestational diabetes, and preeclampsia.[13-24] Professional authorities in the United States, such as the American Congress of Obstetricians and Gynecologists and the American Academy of Pediatrics, strongly advise pregnant women to continue their usual dental care during pregnancy.[25,26] The American College of Obstetricians and Gynecologists published a

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committee opinion stating that treatment of oral conditions is safe during pregnancy and may be managed at any time during pregnancy, especially conditions that require immediate treatment.[27] Various dental therapeutic aspects raise concern among pregnant women, such as the use of local anesthetics and radiography. Results from animal reproductive studies on lidocaine in rats did not show any increase in birth anomalies.[28,29] Lidocaine and other local anesthetics readily cross human placenta,[30] and minutes after administration, they reach the fetus, which has the ability to metabolize them.[31]

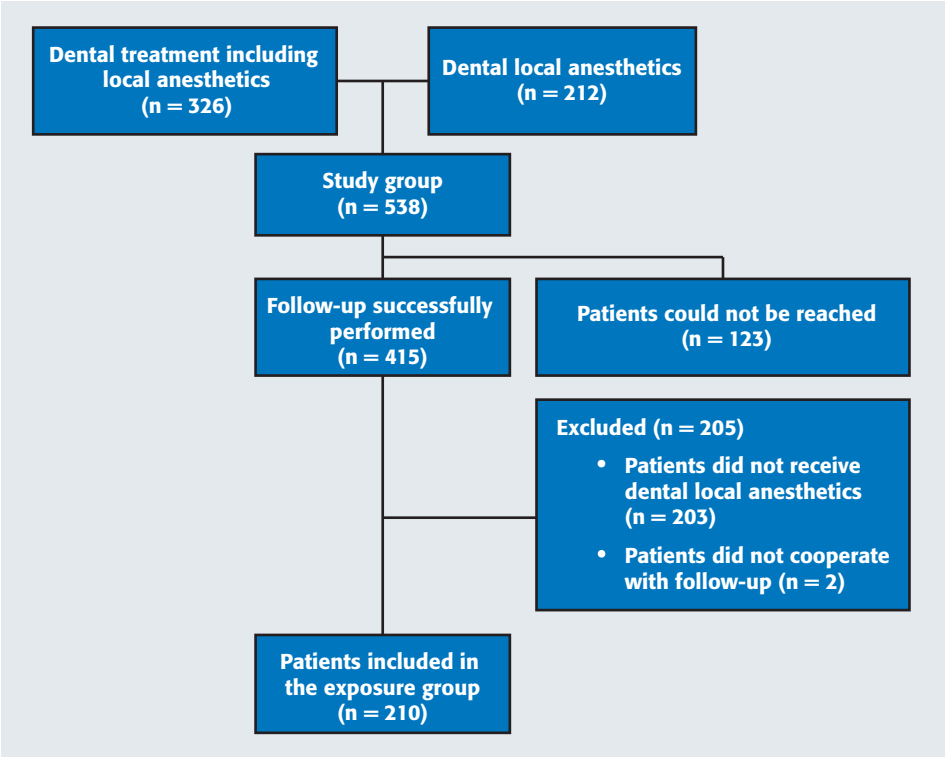

Figure 1. Flowchart of patients included in the exposure group.

A 2% lidocaine dental injection has its anesthetic effect for 1 hour inside the tooth pulp, or 3 to 5 hours in the surrounding tissues, when a vasoconstrictor is used.[32] Lidocaine, prilocaine, and etidocaine are assigned to US Food and Drug Administration pregnancy Category B. Mepivacaine, bupivacaine, and articaine are assigned to US Food and Drug Administration Category C.[33] Epinephrine is a catecholamine, which normally is present in the body, with no clear evidence of an increased risk of malformation when used during pregnancy with local anesthetics.[34] Human pregnancy data on the safety of local anesthetics are scant and include 293 women who were exposed to lidocaine during the first trimester, with no significant increase in the rate of birth anomalies.[34] Concerning x-ray exposure, the US National Council on Radiation Protection & Measurements declared that the risk for birth anomalies after maternal exposure to up to 50 millisieverts or less is negligible.[35,36] Dental radiographs have a low effective dose compared with that of other types of diagnostic radiation and range from 0.005 mSv for intraoral radiography to 0.2 mSv for dental computed tomography.[37] Despite the reassuring considerations, dentists are still reluctant to perform dental treatment in pregnant patients, and women are still reluctant to receive dental treatment during pregnancy.

The primary objective of our study was to evaluate the rate of major congenital anomalies after exposure to local anesthetics as part of necessary dental care during the first trimester of pregnancy compared with that in a group of women counseled for nonteratogenic exposures. A secondary objective was to compare the rate of miscarriages, preterm deliveries, and birth weight between the 2 groups. Another secondary objective was to describe what types of dental treatments pregnant women had received during pregnancy. To our knowledge, this is the first prospective comparative study for evaluation of this medical issue.

METHODS

Between 1999 and 2005, 538 pregnant women contacted the Israeli Teratology Information Service (TIS), either directly or through their health care providers, for information about gestational exposure to dental anesthetics. Figure 1 shows the number of pregnant women who sought information about dental local anesthetics (n = 212) or dental treatment including local anesthetics (n = 326) who were enrolled in this prospective comparative observational study. We were able to contact by phone 415 women, and we excluded those who

ABBREVIATION KEY. CG: Control group. **EG:** Exposure group. **NA:** Not applicable. **TIS:** Teratology Information Service.

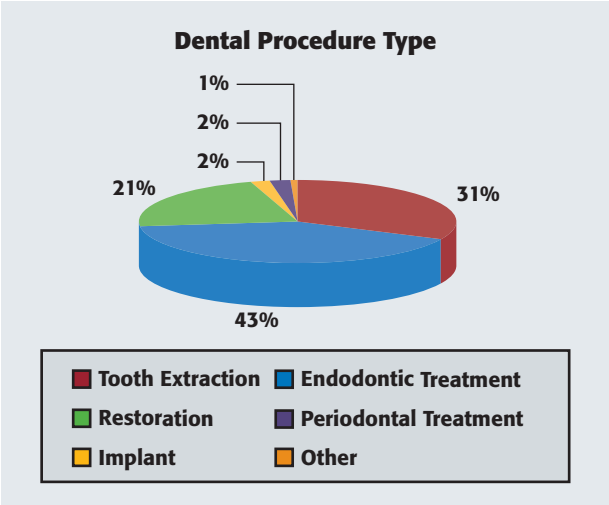

Figure 2. Distribution of the various dental procedures performed in the exposure group women during pregnancy (n = 210).

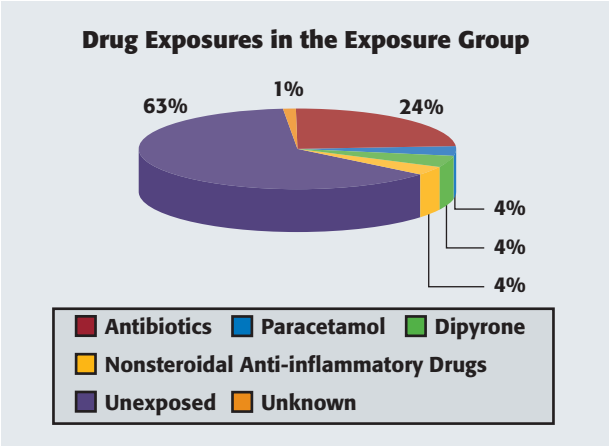

Figure 3. Distribution of additional medications taken by the exposure group women during pregnancy (n = 210).

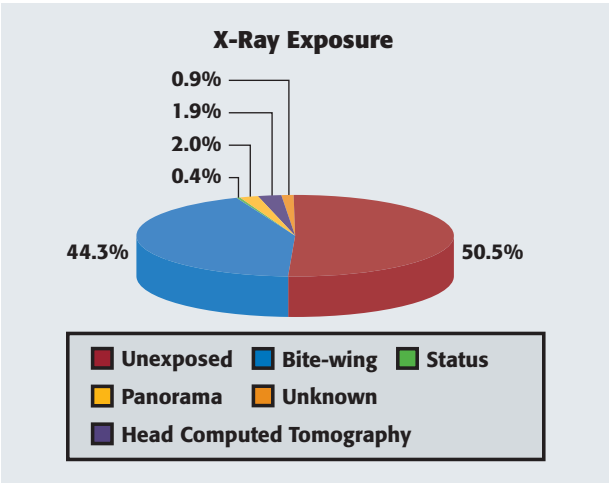

Figure 4. Distribution of exposure to x-ray radiation among the exposure group women during pregnancy (n = 210).

did not meet the inclusion criteria from the study: women who eventually received no dental treatment, women who received dental treatment but without local anesthetics, and women who were not prepared to provide information about delivery outcome (2 women). Ultimately, 210 women met the inclusion criteria, and we followed them up in our study. This sample size enabled detection of a 2.65-fold increase in the percentage of major congenital anomalies compared with that in the control group (CG), assuming a percentage similar to that in the general population (3%).[34]

The CG consisted of 794 pregnant women counseled for nonteratogenic exposure at a 1:3.8 ratio in a similar time frame. We randomly selected this group from the Israeli TIS database according to their exposure and included women who were counseled during pregnancy in regard to exposures known to be nonteratogenic or fetotoxic such as analgesics (paracetamol), topical preparations with negligible systemic exposure, antibiotics (penicillins or cephalosporins), oral contraceptives taken no longer than the fifth week of pregnancy, hair dye, or house-cleaning agents. Details about the planned exposure were collected using a structured questionnaire at the initial contact with the TIS, during pregnancy, and before the pregnancy outcome was known. At initial contact, the women provided verbal consent to participate in the study. The Institutional Review Board of the Hadassah Dental School-Hebrew University approved the study design.

Standardized data collection forms were used to record the following information at the initial contact: maternal demographic data, medical and obstetrical histories, exposure details (type of dental treatment, radiography use, smoking, and timing in pregnancy), and concurrent drug exposures. Pregnancy outcome was sought actively after the expected date of delivery in the exposed and comparison groups. Follow-up was conducted by means of a telephone interview with the mother to obtain details about the pregnancy: gestational age at delivery, birth weight, congenital anomalies, and neonatal complications. In the case of anomalies, an attempt was made to obtain medical records. In addition, all exposures were ascertained; the exposures the women were counseled for were verified to have occurred during pregnancy. Details of the dental treatment, the use of dental anesthetics, the exact timing and duration of treatment, and additional exposures during pregnancy also were ascertained. All neonates in this study were born in hospitals. Our interview was conducted after at least 2 physical examinations performed before discharge.

Data collection methods were similar in the exposed and comparison groups. The primary variable was major congenital anomalies, defined as structural abnormalities in the offspring that have serious medical, surgical, or cosmetic consequences. We did not consider children with minor anomalies or functional problems without any morphologic changes (for example, umbilical hernia that spontaneously closed) or infants with complications of preterm delivery as having major anomalies. We defined intrauterine tumor and twin-to-twin transfusion syndrome as major anomalies. Cardiac septal anomalies are structural anomalies of the heart, and we considered them as major anomalies in this study, even if spontaneously resolved, unless the closure occurred during the neonatal period.

We defined secondary variables as pregnancy outcome (live infant, miscarriage, induced abortion, and stillbirth), birth complication, weight at delivery, and gestational age at birth. Certified pediatricians masked to the exposure group (EG) classified the anomalies. The analysis of major congenital anomalies was performed among live-born infants, pregnancy losses with confirmed anomalies, and elective termination of pregnancy because of prenatally diagnosed anomalies. These analyses do not include miscarriages. In the case of multiple births, we included each live-born offspring in the analysis. We defined gestational age from the last menstrual period. We defined miscarriage as spontaneous pregnancy loss before or at 20 completed weeks, whereas we defined stillbirth as spontaneous pregnancy loss beyond 20 completed weeks. We defined preterm delivery as birth before 37 completed weeks. All coauthors had access to the study data and reviewed and approved the final manuscript.

We compared categorical variables by using a χ^2 test or Fisher exact test, when appropriate. Continuous data were not distributed normally, and we compared them by using the Mann-Whitney *U* test. Results are expressed as ratios or percentages for dichotomous data. We used medians with interquartile ranges for the continuous data. We performed statistical calculations by using software (SPSS, IBM, or Epi Info, Centers for Disease Control and Prevention). We set statistically significant difference as a *P* value less than .05.

TABLE 1

Comparison of maternal characteristics and obstetrical history between the 2 groups.*

VARIABLE	GROUP		*P* VALUE
	Exposure†	Control	
Age, y, Median (Interquartile Range)	30 (28-33.2)	30 (27-33)	.276
Gestational Age at Contact, wks, Median (Interquartile Range)	11 (7-19)	10 (6-18)	.135
Parity, No. (%)	Total = 204	Total = 755‡	
1	48 (23.5)	200 (26.5)	.392
2-6	146 (71.6)	527 (69.8)	.624
≤ 7	10 (4.9)	27 (3.6)	.383
Living Children, No. (%)	Total = 204	Total = 754	
0	57 (27.9)	243 (32.2)	.241
1	48 (23.5)	226 (30.0)	.071
≤ 2	99 (48.5)	285 (37.8)	.006
Past Miscarriage, No. (%)	Total = 203	Total = 746	
0	150 (73.9)	607 (81.4)	.019
1-2	52 (25.6)	124 (16.6)	.003
≤ 3	1 (0.5)	15 (2.0)	.136
Induced Abortions in the Past, No. (%)	Total = 203	Total = 744	
0	179 (88.2)	668 (89.8)	.509
1	20 (9.9)	64 (8.6)	.579
≤ 2	4 (2.0)	12 (1.6)	.726
Cigarettes Smoked During Pregnancy, No. (%)	Total = 195	Total = 720	
0	182 (93.3)	671 (93.2)	.945
≤ 10 per d	11 (5.6)	33 (4.6)	.540
> 10 per d	2 (1.0)	16 (2.2)	.286

* Due to rounding, not all totals will add up to exactly 100%.
† The exposure group consists of pregnant women who were exposed to local anesthetics as part of dental treatment.
‡ The sum of the numerators is lower than the sum of the denominators because of missing data.

RESULTS

We prospectively followed up 210 pregnant women who contacted the Israeli TIS for dental treatment in general and use of dental local anesthetics in particular during pregnancy during the years from 1999 to 2005. Of the EG, 112 (53%) were exposed during the first trimester, 94 (45%) were exposed later, and 4 women (2%) were not able to provide the exact time of exposure. In addition to the dental local anesthetics, the women were exposed to various dental procedures (Figure 2). One-half of the women were exposed to diagnostic dental radiography, and 76 (36%) were exposed to other drugs. The most common dental procedure during pregnancy was endodontic treatment (43%) followed by tooth extraction (31%). We included extirpation in the category of endodontic treatment. Periodontal treatment included scaling and other periodontal procedures. Figure 3 presents the distribution of additional medications. Most of the women were not exposed to additional drugs (63%), 24% were exposed to antibiotics, and 12% were exposed to analgesics.

Almost one-half of the cohort was exposed to dental radiography (Figure 4), mostly bite-wing radiography. This type of intraoral radiograph has the most minimal amount of radiation exposure. A full-mouth series (status radiographs) was obtained in 1 pregnant woman.

TABLE 2

Pregnancy outcome comparison between the 2 groups.

PREGNANCY OUTCOME	GROUP		*P* VALUE	RELATIVE RISK (95% CONFIDENCE INTERVAL)
	Exposure* (n = 210)	Control† (n = 792)		
Multiple Pregnancy	3 twin sets	17 twin sets		
Delivery, No. (%)	204 (97.1)	736 (92.9)	.024	1.04 (1.01-1.08)
Stillbirth, No. (%)	1 (0.5)	4 (0.5)	.999	0.94 (0.10-8.39)
Induced Abortion, No. (%)	0 (0)	17 (2.1)	.031	Undefined
Ectopic Pregnancy, No. (%)	1 (0.5)	0 (0)	.210	Undefined
Miscarriage, No. (%)	4 (1.9)	35 (4.4)	.109	0.43 (0.15-1.12)
Gestational Age at Delivery, wks, Median (Interquartile Range)	40 (38-40)	40 (38-41)	.408	NA‡
Birth Weight, Grams, Median (Interquartile Range)	3,300 (3,000-3,500)	3,300 (2,950-3,600)	.675	NA

* The exposure group consists of pregnant women who were exposed to local anesthetics as part of dental treatment.
† Percentages do not add up to 100% due to rounding.
‡ NA: Not applicable

TABLE 3

Major congenital malformation comparison between the 2 groups.

MAJOR CONGENITAL MALFORMATION	GROUP*		*P* VALUE	RELATIVE RISK (95% CONFIDENCE INTERVAL)
	Exposure†	Control		
Overall Major Anomalies Rate, No. (%)	10/208 (4.8)	25/759 (3.3)	.300	1.46 (0.71-2.99)
Major Anomalies Rate After First Trimester Exposure, No. (%)	8/110 (7.3)	25/759 (3.3)	.057	2.21 (1.02-4.77)
Major Anomalies Rate After First Trimester Exposure Without Genetic or Cytogenetic Anomalies and Without Twins, No. (%)	4/105 (3.8)	21/723 (2.9)	.545	1.31 (0.46-3.75)

* The denominators do not include miscarriages.
† The exposure group consists of pregnant women who were exposed to local anesthetics as part of dental treatment.

Demographic data and obstetrical histories. Table 1 presents the comparison between the 2 groups. Significantly more women in the EG had 2 or more children compared with women in the CG (48.5% versus 37.8%, $P = .006$). More women in the EG had a history of 1 or 2 miscarriages (25.6% versus 16.6%, $P = .003$). We found no significant differences between the groups in maternal age, parity, history of induced abortions, gestational age at initial contact, and smoking.

Pregnancy outcome. Table 2 presents a comparison of pregnancy outcome, except for birth anomalies, which will be discussed separately. There were no elective terminations in the EG (0% versus 2.1%, $P = .031$). We found no significant differences in gestational age at delivery and median birth weight. Twins were born to 3 women in the EG. Table 3 shows a comparison of congenital anomalies between the groups. We compared major anomalies in the entire group, in a subgroup exposed to dental treatment and local anesthetics during the first trimester, and after exclusion of genetic and cytogenetic anomalies and twin pregnancies. In this subanalysis, we excluded twins because of a higher risk for anomalies (2 female preterm twins were born in the EG and had cerebral palsy, possibly a complication of prematurity, diagnosed at the age of 8 months). We found no significant increase in the rate of major anomalies in the EG compared with that in the CG in all 3 comparisons. Tables 4 and 5 provide detailed lists of the major anomalies observed in the EG and the CG.

Table 4 presents 10 cases of major malformations, 8 of which involved dental radiography exposure during pregnancy. Eight women were exposed to dental local anesthetics during the first trimester. After removing the cytogenetic anomalies and the twins cases, 4 of 6 women were exposed to both dental anesthetics and radiography. Such a ratio is similar to the ratio of women among the EG who were exposed to both dental anesthetics and radiography (47.3%) in the first trimester. Two cases of genetic or cytogenetic syndromes were diagnosed. One ended as intrauterine death, and the other received a diagnosis of Turner syndrome mosaicism. A female twin pair was born and later received a diagnosis of cerebral palsy; the pregnancy was complicated, with twin-to-twin transfusion syndrome suspected. There was no significant difference in the rate of major anomalies between the 2 groups (3.8% in the EG versus 2.9% in the CG, $P = .545$). The malformations in the EG varied, and we observed no specific pattern.

DISCUSSION

Gaffield and colleagues[38] showed that approximately one-quarter of the questioned women reported to have dental problems during pregnancy; nonetheless, only one-half sought treatment. George and colleagues,[39] in a 2012 review on perception of dental procedures

TABLE 4

List of the major malformations observed in the exposure group.

MALFORMATION TYPE	ADDITIONAL EXPOSURE	WEEK OF EXPOSURE	PREGNANCY OUTCOME	WEEK OF PREGNANCY END	SEX
Corpus callosum agenesis diagnosed at wk 37, sudden infant death syndrome	Status radiographs	4	Labor	41	Female
Inguinal hernia operated on 2 mo after delivery	Bite-wing radiographs, paracetamol, ibuprofen, amoxicillin	4	Labor	38	Female
Unilateral kidney agenesis, diagnosed at ultrasonography	Bite-wing radiographs, amoxicillin	11	Labor	40	Female
Twin-to-twin transfusion syndrome suspected, cerebral palsy diagnosed 8 mo after delivery*†	Bite-wing radiographs	8	Labor	27	Female
Twin-to-twin transfusion syndrome suspected, cerebral palsy diagnosed 8 mo after delivery*†	Bite-wing radiographs	8	Labor	27	Female
Tethered cord, dermal pit or sinus, hairy midline lesion, surgical transection of thickened filum terminale	Bite-wing radiographs, first trimester use of steroids, bromhexine hydrochloride	34	Labor	40	Male
Turner syndrome (lack of X chromosome in 1.5% of cells), diagnosed by means of amniocentesis*	Bite-wing radiographs	6	Labor	42	Female
Cleft lip diagnosed after delivery, operated on at 9 mo, no family history	Celecoxib 200 milligrams twice a day for 5 days, simvastatin	7	Labor	38	Female
Multiple malformations, chromosomal aberrations*	—‡	10	Intrauterine death	24	—
Congenital hypothyroidism of unknown cause	Bite-wing radiographs	16	Labor	39	Female

* Not included in the subanalysis excluding twins or genetic or cytogenetic anomalies.
† For malformations rate, each offspring is counted as 1 case.
‡ Dash indicates that data are not available.

during pregnancy, stated that in Australia, approximately two-thirds of pregnant women do not seek medical advice, even when a dental problem exists; the use of dental services during pregnancy is also low (23-64%) in other countries such as the United States and the United Kingdom. Boggess and colleagues[40] conducted a survey of 599 pregnant women, 422 of whom reported that they did not receive routine dental care during pregnancy.

Dentists also may be reluctant to treat pregnant women. According to results from a German study in which a questionnaire was distributed among 702 dentists, 35% postponed treatment until after delivery, and 14% opposed any use of local anesthetics. Almost one-half declared that they would not treat pregnant women unless they completed the first trimester. Approximately one-quarter did not use any radiography, and only one-tenth performed all required medical treatment.[41] Pertl and colleagues[42] showed that only 58% of dentists declared that they would treat pregnant women with local anesthetics. A questionnaire was distributed among 116 dentists in Connecticut to examine their willingness to treat pregnant women. Approximately one-half of them admitted they "feel uncomfortable to treat pregnant women."[43] Results from a survey conducted in Ohio showed that only 44% of pregnant women received dental treatment during pregnancy and that 10% of women reported that their dentist refused to treat them during pregnancy.[44] Data regarding the safety of dental treatment and local anesthetics during pregnancy are insufficient.

In our study, we found no significant increase in the rate of major anomalies. The prevalence of major anomalies in both arms of our study is compatible with the general population risk.[45,46] Pregnancy itself does not cause gingivitis or periodontitis. However, pregnant women tend to increase their carbohydrate consumption, and do so more frequently during the day, which may increase their risk of cariogenic activity. In addition, pregnant women have difficulties with toothbrushing because of various factors: bleeding gingivae, which is common during pregnancy (higher levels of estrogen and progesterone in the gingival tissue increase blood flow and blood vessel permeability); morning sickness; and gag reflex.[4] One may assume that as the number of pregnancies increases, the environmental and behavioral risks for dental problems also increase. In contrast, Radnai and colleagues[47] found that parity had no effect on periodontal status and cariogenic activity among 169 women examined within the first 3 days after delivery.

The most common dental procedures among pregnant women were endodontic treatment (43%) and tooth extractions (31%), procedures that mostly are performed for pain relief. This finding seems to suggest that pregnant women tend to avoid regular treatment types such as tooth restorations and dental hygiene visits and eventually receive more urgent types

TABLE 5

List of the major malformations observed among the control group.

MALFORMATION TYPE	EXPOSURE TYPE	PREGNANCY OUTCOME	WEEK OF PREGNANCY END	SEX	AGE OF INFANT AT FOLLOW-UP (MO)
Undescended testes, operated on at age 2 y	None	Labor	41	Male	–*
Congenital dislocation of hip (developmental dysplasia of hip), use of pillow until age 8.5 mo, torticollis	Prepregnancy pelvic radiography	Labor	38	Male	10
Cardiac murmur, ventricular septal defect closed spontaneously at age 11 mo, breath holding spells improving	Dipyrone, amoxicillin clavulanate, papaverine hydrochloride	Labor	40	Female	10
Congenital dislocation of hip (developmental dysplasia of hip), Pavlik harness for 1.5 mo, no improvement	Desoren, ciprofloxacin	Labor	39	Female	10
Hemophilia B diagnosed after birth	Measles, mumps, and rubella vaccine; polio vaccine	Labor	36	Male	10
Inguinal hernia diagnosed at age 5 wks, operated on	Phenylephrine and dimethindene maleate	Labor	42	Male	10
Right kidney in pelvis	Naratriptan, ibuprofen	Labor	40	Female	2
Inguinal hernia, operated on at age 4 mo	Triamcinolone acetonide, dimethindene maleate	Labor	39	Female	18
Ventricular septal defect muscular small, does not require surgery	Fexofenadine	Labor	39	Male	2
Patent ductus arteriosus (echocardiography at age 3 d), not completely closed at 1 mo	Chlorhexidine antiseptic 0.2%, salicylic acid 2%, isoconazole nitrate	Labor	41	Female	–
Ventricular septal defect	Diclofenac	Induced abortion	26	–	–
Atrial septal defect, diagnosed at age 1 mo by mother, cyanotic when crying	Calcium carbonate	Labor	40	Female	6
Grade 5 left urinary reflux, mild coronal hypospadias, urethral stenosis	Cefuroxime	Labor	38	Male	3
Hypospadias	Doxycycline	Labor	38	Male	9
Ichthyosis	None	Induced abortion	26	–	–
Congenital hypospadias, operated on twice	None	Labor	41	Male	20
Multiple cardiac and hepatic malformations, intestinal obstruction	None	Induced abortion	19	–	–
Congenital heart defect, unspecified cardiac malformation	Fusidic acid 2% at wk 22 of gestation	Induced abortion	24	–	–
Abortion after amnionitis, postmortem examination showed gastroschisis	None	Spontaneous abortion	17	–	–
Ventricular or atrial septal defect diagnosed at age 1 mo	Prepregnancy mammography	Labor	40	Female	14
21-Hydroxylase deficiency (salt losing) and G6PD deficiency	Paracetamol	Labor	38	Male	20
Ovarian cyst	Betamethasone and gentamicin (ear pain)	Labor	39	Female	15
Bilateral cleft lip and palate, polydactyly (6 toes at least unilateral), cervical cysts	None	Induced abortion	17	–	–
Congenital cataract (unilateral)	Dextromethorphan hydrobromide at 3 mo gestation, mouthwash at 3 mo gestation	Labor	36	Male	17
Abdominal neuroblastoma; diagnosed at age 5.5 mo	None	Labor	39	Female	14

* Dash indicates that data are not available.

of treatments. Most women (63%) were not exposed to other medications, and 24% of the women took antibiotics. On the basis of the data that 74% of the women needed endodontic treatment or tooth extraction, both conditions often associated with pain or infection, it is surprising that most did not take any

analgesics. As in previous studies, in our study only approximately one-half of the EG were exposed to radiation, mostly to bite-wing radiography. Not surprisingly, we found no influence on the delivery outcome, supporting the pregnancy safety of low-dose diagnostic radiography.

Michalowicz and colleagues[48] reported on the pregnancy outcomes in 351 women who received dental and periodontal treatment during pregnancy. In this study, the CG was 823 women who had periodontitis and received periodontal but not dental treatment. The study conclusion was that there is no association between essential dental treatment and increased risk of experiencing serious medical adverse events or adverse pregnancy outcomes.[48] Their study differs from ours in several important ways. First, they collected data from several centers, but we collected our data from a single center. Data collection in a single center is less susceptible to potential biases. Second, both their study and CGs of pregnant women had periodontitis, a fact that could have biased the results. In contrast, in our study, only 4 of the 210 EG women (1.9%) had periodontitis, and our CG was from the same TIS population and without dental problems. In addition, most of their recruited study participants were African American and Hispanic pregnant women, who are at higher risk of experiencing adverse pregnancy outcome,[49,50] whereas in our study the recruited women were almost completely of the white race.

Our study has various advantages and limitations. The pregnant women or their health care providers made the contact with the Israeli TIS regarding dental care and local anesthetics during pregnancy, providing prospective data collection on exposure and minimizing potential biases that often can be associated with retrospective studies. The sample size exposed to dental treatment and local anesthetics during pregnancy is larger than in most of the studies conducted so far. We performed follow-up at a single center by using a uniform questionnaire, a procedure designed to minimize potential biases. As for the study limitations, the data of this study were based on a TIS population, which may not represent the general population and may be less diverse. Other limitations of the study are reliance on maternal interview as a source for outcome data in most cases, a nonrandomized unmatched design, limited power to detect specific rare anomalies, and lack of data about severity of dental disease activity. Because of ethical considerations, randomized controlled trials often are not feasible in pregnancy. In our study, we did not distinguish between the types of local anesthetics used. However, lidocaine holds the maximum market share among local anesthetics in the United States.[51] In Israel, the most commonly used local anesthetic is lidocaine with epinephrine; other less frequently used local anesthetics are mepivacaine or articaine.

CONCLUSION

Within the study limitations that permit detection of a 2.65-fold increase, the results showed no indication that exposure to dental care and local anesthetics during pregnancy is associated with increased risk for major anomalies. The gestational age at delivery and birth weight were similar between groups. Therefore, we can conclude that women should not be deprived of dental care with anesthetics during pregnancy. The results do not support that such exposures should be a source for concern to the pregnant women or their attending physicians, who should recommend that pregnant women continue their important routine dental treatment. Dentists also should encourage women and provide them with confidence regarding dental treatment during pregnancy. ■

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