

**Knowledge amongst General and Pediatric Dentists in Providing Dental Care to Pregnant
Adolescents**

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LIST OF ABBREVIATIONS

AAP	American Academy of Pediatrics
AAPD	American Academy of Pediatric Dentistry
ADA	American Dental Association
CDC	Centers of Disease Control and Prevention
DRP	Deep Root Planing
ECC	Early Childhood Caries
FDA	Food and Drug Administration
FL	Fluoride
FMX	Full mouth x-ray
I & D	Incision and Drainage
LA	Local Anesthetic
NCHS	National Center for Health Statistics
MS	<i>Mutans Streptococcus</i>
PA	Periapical x-ray
RCT	Root Canal Treatment

SUMMARY

The objective of this study was to access and describe the attitudes of general and pediatric dentists in providing care for the pregnant adolescent patient. We also aimed to examine practitioners' perceived barriers to providing care. This was done by way of a mailed survey, sent in September 2012 and November 2012. The total number of participating dentists was 100; 52 pediatric dentists and 48 general dentists.

The survey was a modified questionnaire of Heubner et al 2009. Dentists participating in the study were asked questions about their demographics, training, as well as frequency of treatment rendered, if at all, to pregnant adolescents.

It was found that general and pediatric dentists are equally likely to provide routine and emergency care during pregnancy. While dentists varied in what treatments they would provide in each trimester, no statistical difference was found in this variance. The majority of dentists found care in the 2nd trimester most acceptable. Both general and pediatric dentists are equally likely to prescribe FDA recommended drugs during pregnancy; however, pediatric dentists are more likely to prescribe FDA not recommended drugs during pregnancy.

Pediatric dentists are more aware than general dentists of *Mutans streptococci* and its transmission in the first year of life. Pediatric dentists are also more likely to provide counseling to the pregnant adolescent during pregnancy.

SUMMARY (CONTINUED)

Without taking extended training under consideration it was found that Pediatric and general dentists feel equally comfortable working with the pregnant adolescent patient and share an equal view on the perceived barriers to providing care.

1. Introduction

1.1 Background Information

The proportion of American adolescents who are sexually active has decreased in recent years; however, rates are still high enough to warrant concern. Although birth rates have been decreasing steadily for white and black teenagers in recent years, 1996 is the first year that birth rates decreased for Hispanic teenagers. Hispanic adolescents have had the highest overall birth rates and smallest decreases in recent years (CDC; Klein, 2005).

Pregnant adolescents younger than 17 years old have a higher incidence of medical complications involving mother and child than do adult women, although these risks may be greatest for the youngest teenagers (Satin et al., 1997).

In past years pregnancy has been considered a deterrent to dental treatment largely because of the unique physiologic changes that occur in pregnancy as well as the possibility of incurring harm to the developing fetus (Livingston et al., 1998). Pregnancy is a physiological process which involves complex physical and psychological changes that can profoundly affect even healthy women (Tarsitano and Rollings, 1993). The physiological process of pregnancy is characterized by a series of temporary adaptive changes in body structure. These changes are the result of an increased production of various hormones such as estrogen, progesterone, gonadotropins, and relaxin (Kandan et al., 2011). The oral cavity is also affected by these endocrine fluctuations and may present with both transient and irreversible changes.

In recent years there has been an increased interest in the oral health of pregnant patients. Reasons for this can include recent associations made between periodontal disease and

premature birth as well as concerns for women's overall oral health. The physiological changes that accompany pregnancy can lead to gingivitis, periodontitis, and the appearance of benign lesions. Preventive, routine, and emergency care can and should be provided to pregnant patients. Beyond treatment, there is a need for pregnancy specific preventive care and oral health knowledge. Dentists who see adolescents, both general and pediatric should become valued members of the prenatal health care team.

1.2 Purpose of the Study

An assessment of pediatric and general dentists has not been done since the release of recent guidelines by the AAPD. The primary purpose of this study was to assess and describe the attitudes of general and pediatric dentists in providing care for the pregnant adolescent patient. A secondary purpose was to examine practitioners' perceived barriers to providing care.

1.3 Hypothesis

- 1) General dentists are more apt to provide routine and emergency care during pregnancy than pediatric dentists
Sub-hypothesis: As a part of routine treatment, there will be no difference in how general and pediatric dentists prescribe drugs for the pregnant patient.
- 2) General dentists are less aware of the association between high levels of cariogenic bacteria in mothers and the increased risk of ECC in their children than pediatric dentists

- 3) Pediatric dentists are more apt to provide counseling to the pregnant adolescent than general dentists
- 4) A. Pediatric dentists, having received extended training, are more comfortable treating pregnant adolescents and willing to accept them as patients than general dentists.
B. General dentists who have not received extended training are less comfortable working with pregnant adolescents and less willing to accept them as patients.

2. REVIEW OF THE LITERATURE

2.1 Adolescent Pregnancy

During the 1970's the United States underwent a so called "epidemic" of teenage pregnancy (Goldenberg and Klerman, 1995). Despite a general downward trend in the pregnancy rate among teenagers since then, teenage pregnancy continues to attract a great deal of interest (CDC; Kearney and Levine, 2012; Darroch, 2001; Martin et al., 2012; Santelli et al., 2007). In 2011 approximately 329,797 or 4% of teenage girls ages 15-19 gave birth in the United States (CDC). Teens in the United States are far more likely to give birth than in any other developed country in the world, twice as likely to give birth as teens in Canada and 10 times as likely as teens in Switzerland (Kearney and Levine, 2012; Darroch, 2001). These statistics incorporate the almost 40% decline in teenage pregnancy over the past two decades. The overall birth rate dropped 10 percent during 2009-2010, from 37.9 to 34.2 per 1,000 women aged 15-19 (CDC). The current long-term decline began in 1991 and since then the teen pregnancy rate has fallen 45 percent. A recent analysis by the CDC found that if the 1991 teenage birth rates had prevailed from 1992 through 2010, there would have been an additional 3.4 million births to women aged 15-19 in the United States (Hamilton and Ventura, 2012). Currently the number of births to 15 to 19 year olds is the fewest in more than six decades.

The long-term declines in teenage birth rates have been linked to the strong pregnancy prevention messages directed to teenagers (Oringanje et al., 2009). Recently released data from the 2006-2010 National Survey of Family Growth (NSFG) conducted by NCHS have shown

increased use of contraception at first intercourse and use of dual methods of contraception (condoms and hormonal methods) among sexually active male and female teenagers. These trends have likely contributed to the recent birth rate decline (Marinez et al., 2011). Data suggest that declining adolescent pregnancy rates in the United States between 1995 and 2002 were primarily attributable to improved contraceptive use. Decreased sexual activity was responsible for about one quarter (23%) of the decline among 15- to 17-year-olds, and increased contraceptive use was responsible for the remainder (77%) (Santelli et al., 2007).

Despite increasing use of contraception by adolescents, 50% of adolescent pregnancies occur within the first 6 months of initial sexual intercourse (Haffner, 1995). Teen pregnancy and birth is often linked to social and economic disadvantage. Statistics show that just under half of 15-19 year old women lived in families under 200% of the federal poverty level (Darroch, 2001). Women from lower income families are somewhat more likely to become sexually active at a young age and are also less likely to use methods of contraception. One third of parenting adolescents are themselves the product of adolescent pregnancy (Klein, 2005).

Medical complications occur more frequently in pregnant females ages 11-15 than in those ages 20-22. (Fraser et al., 1995; Cooper et al., 1995; Teagle and Brindis, 1998; Reichman and Pagnini, 1997). The pregnant teenager is considered a high risk patient because maternal and infant mortality, anemia, pre-eclampsia and low birth weight babies are more common among this age group (Irvine et al., 1997; Cooper et al., 1995; Rees et al., 1996). Cooper et al demonstrated that it is the very young teenager [(10-15) vs (15 or older)] that was at risk for poor birth outcomes. Others however, show that it is the socioeconomic factors associated with

young age, such as low income, insufficient education, and inadequate prenatal care, are more powerful influences on outcomes than the age of the mother and effects of physical immaturity (Horon et al., 1983; Satin et al., 2007; Reichman and Pagnini, 1997). Frasier et al reported that teenagers have an increased risk of adverse pregnancy outcomes independent of confounding socioeconomic factors.

Adolescence is often described as a time of “crisis”, where the individual struggles with the transition from childhood to adulthood (Irvine et al., 1997). The physiological, emotional, and cognitive changes which occur during adolescence are also experienced during pregnancy. There is evidence that teenage mothers often lose contact with friends, become socially isolated, and are frequently unaware of professional support systems that are available to them (Irvine et al., 1997; Crockenberg, 1986). The pregnant adolescent must cope not only with the “crisis” of pregnancy but also the “crisis of adolescence”. Such physical, emotional and mental disruptions together could affect the health of the teenage mother (Larson, 2004). For many adolescents the crisis of pregnancy poses a willingness to make positive changes. Studies have shown that pregnant adolescents more so than pregnant adults, abstain from or significantly reduce the amount of substance abuse and other negative behaviors during pregnancy (Teagle and Brindis, 1998; Cornelious et al., 1993). This is a crucial time during which counseling should be provided. Medical and dental providers need to be sensitive to the developing psyche of the adolescent when providing advice during pregnancy (Teagle and Brindis, 1998; Irvine et al., 1997).

2.2 Oral health care during pregnancy

The AAPD recommends that all pregnant adolescents seek professional oral health care during the first trimester. It is advised that the dental professional obtain a thorough medical history as well as a comprehensive evaluation which includes the patients dental and diet history, a clinical exam, and a caries risk assessment (AAPD guidelines 2012). The provider should be able to provide counseling and recommendations on topics such as diet, oral manifestations during pregnancy, the relationship between maternal oral health and the health of the baby, the likelihood of *Mutans streptococci* (MS) transmission between mother and baby, and anticipatory guidance on smoking during pregnancy.

2.2.1 Relationship between maternal oral health and fetal health

The study of periodontitis during pregnancy and its effect on pre-term, low birth weight babies is ongoing (AAPD guidelines 2012). There is convincing evidence to suggest that infections affecting the mother during pregnancy may produce alterations in the normal hormone regulated gestation, which could result in premature rupture of membranes and preterm birth (Tarannum and Faizuddin, 2007) . Periodontal infections can be a reservoir for inflammatory mediators which can potentially pose a threat to the placenta and fetus and increase the chance of preterm delivery (Offenbacher et al., 1996). Offenbacher et al suggested that maternal periodontal disease could lead to a seven-fold increased risk of delivery of preterm low-birth-weight infants. Multiple other studies have also demonstrated that periodontitis, if left untreated, can contribute to pre-term, low birth neonates; however, not all studies support this relationship (Bosnjak et al., 2006; Tarannum and Faizuddin, 2007; Mitchell-

Lewis et al., 2001; Jeffcoat et al., 2001). Studies by Deppe in 2010 and Michalowicz in 2006 found that while full mouth periodontal therapy does improve periodontitis it does not significantly alter the gestational age at birth or the birth weight. At this point, we can conclude that there is still controversy in the literature whether periodontitis is as an independent risk factor for adverse pregnancy outcomes.

2.2.2 Preventative plan/ likelihood of MS transmission

The identified link between early childhood caries and the maternal transmission of bacteria has increased efforts amongst dental professionals to promote oral health of women during the perinatal period (Amini and Casamassimo, 2010). *Mutans Streptococci* (MS) is considered to be a part of a group of bacterial organisms which are responsible for the initiation of dental caries. MS is usually transmitted to young children through their mothers, as the primary caretakers, and the risk of transmission increases with high maternal salivary levels of MS (Law et al., 2007). Studies have confirmed the positive relationship between levels of MS in the mothers and increased risk of caries in their children (Kishi et al., 2009; Brambilla et al., 1998). Suppression of the mothers' strep mutans levels by dental rehabilitation and antimicrobial treatments may prevent or delay the infants' acquisition of this cariogenic bacteria. Beginning in the 6th month of pregnancy, a daily rinse of 0.05% NaF and 0.12 % Chlorhexidine can result in a significant reduction in levels of caries causing bacteria (Brambilla et al., 1998). Early intervention in mothers with high levels MS results in lower levels of MS in their children and has shown to reduced caries rate even at age 19. These findings indicate the

need to focus preventive efforts on mothers with high levels of salivary *Mutans Streptococci* to minimize the caries risk in their children (Kohler and Andreen, 2012).

2.2.3 Dietary considerations

The diet of the pregnant adolescent can affect the health of the child (AAPD guidelines 2012). Pregnant adolescents are likely to exhibit food preferences, eating behaviors, and lifestyle habits that are similar to their non-pregnant peers (Lenders et al., 2000). A recent summary of dietary sources of nutrients among adolescents shows that the diet quality of American adolescents is often poor. Primary sources of macronutrients are often foods lacking nutritional quality. Pregnant adolescents are at increased risk for consuming diets that are low in micronutrients such as iron, zinc, folate, calcium, vitamin A, B6, C, and diets high in energy and macronutrients such as total fat and saturated fat, as well as sugar (Lenders et al., 1994).

Maternal weight gain is considered to be the most important determinant of infant birth weight among adolescents (Stevens-Simon et al., 1993). Early identification of nutritional risk is critical because a significant association between maternal weight gain among adolescents and infant birth weight as early as the first trimester of pregnancy has been reported (Scholl et al., 1991). A study by Lenders et al in 1994 demonstrated that consumption of a diet rich in sugar by low income pregnant adolescents is associated with a significant decrease in birth weight.

Certain adolescent behaviors increase the risk of inadequate nutrition. These include restrictive dieting, unsafe weight-loss practices, skipping meals (especially breakfast), snacking on low-nutrient foods or high-fat foods, excessive consumption of fast foods and imbalanced diets. While teenagers generally know the basics of what constitutes a healthy diet, they often

put a low priority and value on eating healthy (Story, 1987). Since adolescent girls are often concerned about their weight, and with the societal pressure for thinness, it is assumed that pregnant adolescents may resist gaining the recommended amount of weight gain during pregnancy. Stevens-Simon et al assessed weight gain attitudes in 99 racially diverse pregnant 13 to 18 year olds. They found that the majority (83%) of adolescents had a positive attitude toward pregnancy weight gain in the initial stages of prenatal care. Negative weight-gain attitudes were most common among adolescents who were heavy, had symptoms of depression, or perceived their families to be unsupportive.

The dental provider should focus on the adolescents dietary history and their exposure to carbohydrates, especially because of the increased incidence towards snacking, and exposure to acidic and surgery beverages (AAPD guidelines 2012). The dental provider should be able to counsel the adolescent on alternatives to sugary snacks and beverages.

2.2.4 Anticipatory guidance on smoking

Education is an important part of prenatal health care and can have a large impact on the oral health of not only the mother but the child as well.

Low socioeconomic status and lack of parental involvement can place an adolescent at an increased risk for initiating tobacco use (Healthy people 2020). According to the CDC smoking during pregnancy can be associated with adverse outcomes such as ectopic pregnancy, spontaneous abortion, and pre term delivery. The longer the mother smokes during pregnancy the greater the effect on the infant's birth weight. Smoking during pregnancy has also been associated with: higher rates of respiratory illness, middle ear infections, sudden infant death

syndrome (SIDS), asthma, and caries in the primary dentition (Healthy people 2020; Aligne et al., 2003). Studies have shown that pregnant adolescents more so than pregnant adults, abstain from or significantly reduce the amount of substance abuse and other negative behaviors during pregnancy (Teagle and Brindis, 1998; Cornelius et al., 1993). This is a crucial time in which counseling should be provided.

Since the pregnant adolescent may be receptive to information that will benefit the health of her baby (Gaffield et al., 2001) the dental provider can adopt a counseling technique that will focus on the needs of the child at different developmental stages (AAPD guidelines 2012). Studies have found that early oral health counseling started during pregnancy can lead to a sustained and long term improvement of the oral health of children (Murphy and Lew, 2009; Meyer et al., 2010; Brambilla et al., 1998; Gomez and Weber, 2001).

2.2.5 Oral changes secondary to pregnancy

Pregnancy is a time of relative immunocompromise, making patients more susceptible to dental pathology. The numerous physical and the physiological changes that occur during pregnancy affect every major body system and they result in localized physical alterations in many parts of the body, including the oral cavity. Increases in estrogen and progesterone can affect the periodontal microvascularization which can lead to a change in the health of oral tissues (Barak et al., 2003; Kandan et al., 2011). Durlacher et al demonstrated that pregnancy gingivitis could be due to effect of the pregnancy on the gingival tissues, where both estrogen and progesterone receptors are found. Although the exact mechanism of the inflammation is not known, there are alternations in the immune system and changes in the connective tissues.

The key concepts are a decrease in the number of neutrophils, decreased chemotaxis and phagocytosis and a depressed antibody response. There is an increase in the selective growth of the *P.intemedia*, *P.gingivalis* and *Tanerella* species, which has been demonstrated in sub gingival plaque during the onset of pregnancy gingivitis. This increase in organisms may be due to the utilization the hormone progesterone as a source of their nutrition, the changes in the immune system, the local changes in the gingival crevices(such as bleeding gingiva) which provide further nutrients and the increased pocket depths which create a more favorable environment for the anaerobes. The physiologic, anatomic, and hormonal changes that take place during pregnancy can affect the oral cavity and the approach to dental care a practitioner can take. These changes, however, do not make the state of immunocompromise such that the adolescents should be denied dental treatment simply because they are pregnant (Stafford et al., 2008).

Hormonal changes during pregnancy have been associated with changes in the oral cavity both in the hard and soft tissues (Amini and Casamassimo, 2010). Because of increased hormone levels, pregnant patients are at risk for increased sensitivity to bacterial irritants. As a result, up to 100% of pregnant women experience gingivitis (Gaffield et al., 2001). Signs of gingivitis are evident in the 2nd trimester and peak in the 8th month of pregnancy with anterior teeth being more affected than posterior teeth (Hilgers at al., 2003; Amini and Casamassimo, 2010). During the last month of gestation, the gingivitis usually decreases and immediately post partum, the gingival tissues are found to be comparable to that of normal women. Although gingivitis can be transient in many cases, moderate and severe cases require professional

cleaning and use of a chlorhexidine mouth rinse. Appropriate home oral hygiene instructions should be reviewed by the dental provider (Amini and Casamassimo, 2010).

Pregnancy tumors, also called pyogenic granulomas can also result from increased hormone levels and are reported in up to 5% of pregnant females (Hilgers et al., 2003). The lesions are usually painless, appear in the second trimester, and resolve spontaneously upon delivery (Amini and Casamassimo, 2010). This form of pyogenic granuloma usually arises between the maxillary anterior teeth, if the patient is uncomfortable or in pain the pyogenic granuloma can be removed (Livingston et al., 1998).

Nausea and vomiting commonly referred to as morning sickness during the first trimester occurs in 50-90% of all pregnancies. Dental erosion may be seen due to the gastric acid exposure as a result of morning sickness early in pregnancy and reflux later in pregnancy (AAPD guidelines 2012; Amini and Casamassimo, 2010). The AAPD guidelines recommend that patients should rinse with a baking soda and water solution after vomiting in order to neutralize the acidity of the saliva and prevent enamel erosion. Brushing immediately after vomiting should be discouraged to prevent further damage to the demineralized enamel. A fluoridated mouthwash can help with tooth sensitivity resulting from enamel erosion (Livingston et al., 1998; Amini and Casamassimo, 2010).

2.3 Legal Considerations in treating the pregnant adolescent.

Laws concerning consent involving pregnant patients less than 18 years of age differ from state to state. Some states require obtaining parental consent for non-emergency dental services provided to a child under the age of 17 who remains under parental care; however, for

a parent to provide educated consent they must be aware of the pregnancy in order to understand the risks and benefits of the proposed dental treatment. Some states acknowledge the "mature minor doctrine" which is the common-law rule that allows an adolescent who is mature to give consent for medical care (AAPD guidelines 2012). The AAPD states that providers are obligated to be familiar with and abide by the laws specific to where they practice.

2.4 Guidelines on treatment during pregnancy

In past years, pregnancy has been considered a deterrent to dental treatment largely because of the unique physiologic changes that occur in pregnancy as well as the possibility of incurring harm to the developing fetus. Pregnancy is a process which involves complex physical and psychological changes that can profoundly affect even healthy women (Livingston et al., 1998). Although the medical management of adolescent pregnancies is much like adult pregnancies, adolescents can be at higher risk for complications and many dentists may have limited experience with the treatment and management of pregnant patients (Heubner et al., 2009; Pina et al., 2011; Prada de Costa et al., 2010; Stafford et al., 2008). The AAPD and ADA guidelines state that prevention, diagnosis, and treatment of oral diseases (including dental x-rays and use of local anesthesia) is beneficial and can be undertaken at any time during the pregnancy with no additional fetal or maternal risk as compared to not providing care (AAPD guidelines 2012).

2.4.1 Drugs

The major concern of drug administration during pregnancy is the potential teratogenic effect because most drugs cross the placenta by simple diffusion. The consequences of not treating an active infection during pregnancy outweigh the potential risk that can be presented by most of the drugs required for dental care (Moore, 1998). Drugs should be used in pregnancy when they offer a clear benefit to the mother and the least potentially toxic drug should be selected when available. The FDA has defined 5 categories (Pregnancy Risk Classification) of drugs according to the risk they pose to the pregnant mother and the fetus. Drugs are classified into category A- D and X . Category A drugs are those that have been studied in humans and have been shown to be safe for both the mother and fetus. Category A drugs include prenatal vitamins. Category B drugs show no evident risk in humans and include acetaminophen, most antibiotics, and Chlorhexidine rinse. These drugs are safe to prescribe during pregnancy and breastfeeding. The teratogenic risk cannot be ruled out for category C drugs. Category C drugs include aspirin, tylenol with codeine, vicodin, and percocet ; these drugs should be avoided during pregnancy. Category D drugs have demonstrated risk in humans, these include tetracycline and doxycycline. Category X drugs have shown to cause harmful effects to both the mother and fetus. Category X drugs like Halcion are strongly discouraged during pregnancy. Certain drugs like Ibuprofen and Naproxen can change from a category B drug to a category D drug depending on the stage of pregnancy. In dentistry, the use of local anesthetics, with or without vasoconstrictors, is safe for the pregnant or lactating patient. Aspiration before injection should be performed to minimize risk of intravascular injection (Cengiz, 2007). Lidocaine, Prilocaine, and etidocaine all have a FDA “B” ranking. It

should be assumed that all drugs cross the placenta and affect the fetus, and almost all drugs are secreted into the breast milk (Cengiz, 2007; Hilgers et al., 2003). A study by Andrade found that almost one half of all pregnant women received prescription drugs from categories C, D, or X of the United States Food and Drug Administration risk classification system. It is crucial that clinicians understand the effects of medications not only on the mother but the developing fetus.

2.4.2 Use of Nitrous Oxide

Nitrous Oxide does not have a pregnancy risk classification and should not be used without clearance from the patients' obstetrician (Hilgers et al., 2003). The effects of nitrous oxide have been thought to cause blockage of the enzyme methionine synthase, which is involved in DNA synthesis. More recently it has been demonstrated that the problem is multifactorial in origin. In a study conducted by Rowland in 1995, investigators examined participants whose most recent pregnancy was conceived while working full-time as a dental assistant. They reported significantly more spontaneous abortions among women who worked with nitrous oxide for 3 or more hours per week in offices without scavenging equipment than among respondents exposed to nitrous oxide that used scavenging equipment. The recent advances in scavenging systems used in concurrence with nitrous oxide have made the use of nitrous oxide more acceptable in dentistry. Short term therapeutic exposure to nitrous oxide has not been proven to cause adverse effects; therefore it may be used in pregnant patients in the second or third trimester (Cengiz, 2007). Because of the increased risk of pregnancy loss, the use of nitrous oxide is contraindicated in the first trimester (AAPD guidelines 2012). When

administered it should be for a maximum of 30 minutes with at least 50% oxygen administered concurrently. There is no concern with the use of nitrous oxide in mothers who are breastfeeding (Haas et al., 2000).

2.4.3 Radiation

Overestimation of the risk of teratogenicity in the fetus resulting from dental procedures may cause dentists to avoid necessary treatment of the pregnant patient. During pregnancy dental treatment may need to be modified but not withheld, provided that a proper risk assessment is made for both the mother and the fetus (Cengiz, 2007).

The fetus is most sensitive to radiation during organogenesis between the 32nd and 37th day of gestation (Abbott, 2000). Proper radiation techniques including the use of rectangular collimation, lead shielding, E/F speed film, use of a long cone and avoiding re-takes when possible can ensure that radiation exposure to the fetus is so low that it cannot be measured by conventional techniques. The amount of radiation exposure from dental x-rays is very small. Exposures range from 0.038 millisieverts for a bitewing radiograph to 0.15 millisieverts for a full mouth series (AAPD guidelines 2012). The exposure equivalent of 4 bitewings is 7 hours of background radiation (Cegniz, 2007). The risk of reaching a teratogenic threshold dose of radiation with dental radiographs is <0.1%; therefore, dental radiographs should be encouraged if they are a potential benefit to the patient (Gier and Janes, 1993; Giglio et al., 2011; Amini and Casamassimo, 2011; Hilgers et al., 2003; Livingston et al., 1998). Practitioners should consider that if a congenital defect does occur, then people naturally may blame someone or something and they may relate it to dental radiographs. It is worth considering that very few women are

aware they are pregnant within the first eight weeks of pregnancy. Therefore, it is important to take all possible precautions to minimize the risks, including the use of a lead apron for radiation protection, for medico-legal protection and for psychological reasons (Abbott, 2000). Despite clear recommendations on the safety of dental radiographs during pregnancy, many dentists in the United States appear reluctant to take radiographs on pregnant patients. Studies have shown that up to 19% of dentists felt it was unsafe to obtain radiographs in pregnant patients (Prada de Costa et al., 2010; Pina et al., 2011).

2.4.4 Positioning in the Dental Chair

The increase in uterine size throughout pregnancy can cause the uterus to partially obstruct the vena cava and aorta if the mother is in a supine position for an extended amount of time. This may cause a reduction in return cardiac blood supply which can consequently lead to reduced blood pressure as well as reduced placental perfusion. This condition is termed supine hypotensive syndrome and can be prevented by placing the patient on her left side with her right hip elevated 10-12 cm (Tarsitano and Rollings, 1993). It is safe to provide treatment throughout pregnancy; however, as pregnancy progresses the uterus is positioned below the umbilicus and the pregnant patient may be more comfortable between the weeks 14- 20 of gestation (AAPD guidelines 2012)

2.5 Current dental management of pregnant mothers

In recent years there has been an increased interest in the oral health of pregnant patients. Reasons for this can include recent associations made between periodontal disease and premature birth as well as concerns for women's oral health as a goal in itself. The

physiological changes that accompany pregnancy can lead to gingivitis, periodontitis, and the appearance of benign lesions. Preventive, routine, and emergency care can and should be provided to pregnant patients. Beyond treatment, there is a need for pregnancy specific preventive care and oral health knowledge. Dentists who see adolescents, both general and pediatric should become valued members of the prenatal health care team. The results of a study done by Heubner et al show that dentists are willing to make this happen; in addition, amongst the participants in their study there was an overwhelming consensus (91.7%) that dental treatment should be a part of prenatal care. In contrast, several studies have demonstrated limits and barriers to treatment during pregnancy which relate to both patient and provider factors (Gaffield et al., 2001; Pistorious et al., 2003; Heubner et al., 2009; Prada de Costa et al., 2010; Pina et al., 2011; Mangskau and Arrindell , 1996; Stafford et al., 2008; Lee et al., 2010).

2.5.1 Provider perceived barriers

Dental providers themselves provide a barrier to care; many are unsure about the safety of dental procedures in the pregnancy period. A recent study of general dentists in North Carolina demonstrated that while 99% percent of providers agreed that women should receive routine preventive care throughout pregnancy, 9 % of dentists were unsure about the ideal time to provide preventive care (Prada de Costa et al., 2010). Eighteen percent of dentists thought that it was unsafe to obtain radiographs in pregnant patients and 66 % said that elective restorative treatment should be delayed until after pregnancy. Many recent studies demonstrate that dentists feel unsure about how to safely render dental treatment to pregnant

women (Stafford et al., 2008; Pistorius et al., 2003; Heubner et al., 2009). A study by Prada de Costa indicated that one third of surveyed dentists postponed treatment until after pregnancy, while Stafford reported that half of the dentists felt uncomfortable while treating pregnant patients for reasons including the safety of procedures, patient perception of risk, malpractice concerns, and concern that labor might occur during the dental visit. Another survey of medical and dental providers found that most dental providers rated dental prenatal dental care as important; however, thought that x-rays, periodontal surgery, amalgam fillings, and pain medication were dangerous to pregnant women (Stafford et al., 2008). Lee et al demonstrate that although half of the dentists hold incorrect knowledge on the dental treatment of pregnant patients, the majority say they currently provide invasive and periodontal treatments and administer and prescribe drugs to their pregnant patients.

Despite studies having shown that there is nearly a universal agreement that counseling is an important part of prenatal care (Prada de Costa et al., 2010; Pina et al., 2011); a study by Heubner et al found that 71% of general dentists in Oregon reported low compensation by insurance plans as a barrier to them providing counseling to their pregnant patients; 11% said they were “too busy” to add counseling about oral health care for pregnant patients to their practices. These results are similar to a study by Lee et al who found that 72.9% of dentists indicated that compensation by insurance companies was inadequate for the time spent counseling pregnant patients. Another potential barrier to providing counseling was revealed by the Heubner study as a fear of being sued if something goes wrong with a patient’s pregnancy.

Dentists agree that the most common time to provide routine care is during the second trimester. The majority of the dentists agreed that they would provide emergency treatment anytime during pregnancy but cited the second trimester as the most ideal time (Pistorious et al., 2003; Heubner et al., 2009; Prada de Costa et al., 2010; Pina et al., 2011; Heubner et al., 2009; Mangskau and Arrindell, 1996; Stafford et al., 2008; Lee et al., 2010). Obtaining radiographs was the procedure in which providers' beliefs differed most from the recommendation (that a full mouth radiograph can be obtained from a pregnant patient if necessary) (Heubner et al., 2009; Pina et al., 2011; Prada de Costa et al., 2010). Heubner reported that 54% of dentists believed it was never appropriate to obtain a full mouth radiograph. Pina et al. demonstrated that 23% of providers would not take a radiograph on a pregnant patient at 10 weeks of pregnancy who reported pain associated with a decayed tooth and Prada de Costa found that 18.4 % said it was unsafe to obtain radiographs in pregnant patients.

2.5.2 Patient perceived barriers

Patient's perceived barriers to the receipt of dental services during pregnancy include lack of knowledge or misinformation about the safety and importance of dental care for the health of the mother and the fetus. Common reasons cited by patients for their non utilization of dental care during pregnancy include the lack of insurance coverage, safety concerns, and lack of perceived need to seek regular care (Gaffield et al., 2001; Mangskau and Arrindell, 1996). A study by Gaffield et al. demonstrated that among mothers who reported having a dental problem, approximately one half did not seek dental care. In addition they found that

young teenage mothers, mothers on Medicaid and mothers with lower annual house hold incomes were less likely to seek dental care. These findings are similar to those reported by Mangskau et al of North Dakota mothers. Nearly one quarter of mothers in the North Dakota study did not seek dental care either because they had been told by a health care provider not to go while pregnant, they were concerned about local anesthetic, or x-rays affecting their baby. Stafford demonstrated that 54% of pregnant mothers reported a desire to see a dentist while pregnant, however 10% of patients were refused treatment by dentists.

Numerous studies have demonstrated that a gulf exists between what is practiced and what is published. Despite professional publications having addressed the safety of providing pregnant patients with dental care including the use of analgesic medications, nitrous oxide, and x-rays (AAPD guidelines 2012; New York State Dept. of Health 2006; Hilgers et al., 2003), there remains a separation between what is published in the literature and what is practiced in the office.

3. Methodology

3.1 Sample Selection

The sample selection included pediatric and general dentists practicing in the state of Illinois. All members of the Illinois Society of Pediatric Dentists, currently 136 members, were included as well as 225 general dentists randomly selected from a list of Illinois State Dental Society members. General dentists were selected from a list of over 6000 Illinois general dentists. Every tenth dentist from the list was chosen to total 225 general dentists. The exclusion criteria included those dentists that were retired. The goal was to obtain equal responses from general and pediatric dentists. Anticipating a lower response from general dentists, more surveys were mailed to general dentists.

3.2 Study Design

Data was collected by way of a mailed survey, sent in September 2012 and November 2012. A cover letter, survey, and postage paid return address label were included in each envelope. For the first mailing a number was placed in the lower left corner of the return envelope for the purpose of sending a second survey if the first survey was unanswered. The number was used only to eliminate the subject from the second mailing, and was not used to identify the response to the dentist. The first round of surveys was mailed to dentists in September 2012. Seventy-four surveys were obtained through this method. Upon receipt of the survey, the number assigned to the envelope was logged on a separate paper, the survey opened and placed in a pile, and the envelope discarded. Periodically, the surveys were then numbered for data entry purposes. Therefore, it was impossible to associate the dentist with

their responses. Six weeks after the surveys had been mailed, a second mailing of the survey was sent. Twenty-six surveys were obtained through this method.

After data collection was terminated, 101 surveys had been obtained. One hundred of the surveys satisfied the inclusion criteria, 52 from pediatric dentists, 48 from general dentists. Each survey was assigned a number for data entry. Results were entered onto a spreadsheet in SPSS for analysis.

Approval for the study was obtained from the University of Illinois at Chicago Institutional Review Board, approval #2012-0614. See Appendix A.

3.3 Survey Tool

The survey was a modified questionnaire of Heubner et al 2009. Dentists participating in the study were asked questions about their demographics, training, as well as frequency of treatment rendered, if at all, to pregnant adolescents. The same survey was provided for both pediatric and general dentists. See Appendix B. Each survey was preceded by a cover letter explaining the nature of the study, inclusion criteria, anonymity of the survey, and risks and benefits of participating in the study. See Appendix C. The survey tool measured 4 outcome variables: 1) What dental procedures (if any) the subject thought was acceptable during pregnancy 2) The subjects awareness of the association between cariogenic bacteria in mothers and early childhood caries in their children 3) The subjects willingness to provide counseling to the pregnant adolescent 4) The subjects comfort levels and perceived barriers in providing treatment to pregnant adolescents.

3.4 Statistical Analysis

Statistical analyses used were Mann-Whitney, chi square, T- test and binary logistic regression.

4. Results

4.1 Number of respondents and response rates

A total of 361 surveys were sent. After data collection was complete, 100 eligible questionnaires were obtained. One questionnaire was returned from a retired dentist and was not used in data analysis. Seventeen questionnaires were returned to sender. Out of the 136 surveys sent to pediatric dentists, 52 surveys were received for a response rate of 38% among pediatric dentists. Forty-eight out of 207 eligible surveys were received from general dentists for a response rate of 23% among general dentists. The total response rate was 29%.

4.2 Descriptive Data for Responders

The demographic characteristics of the subjects are depicted in figures 1, 2, and 3. The respondents were 54% male and 43 % female (three respondents did not indicate if they were male or female). The majority of general dentist responders were male while the majority of pediatric dentist responders were female. The majority of responders were sole practitioners while the minority had an employment status classified as something other than being a sole practitioner, partner, associate, or public employee. Among general dentists 83 % indicated that they did not receive post graduate training.

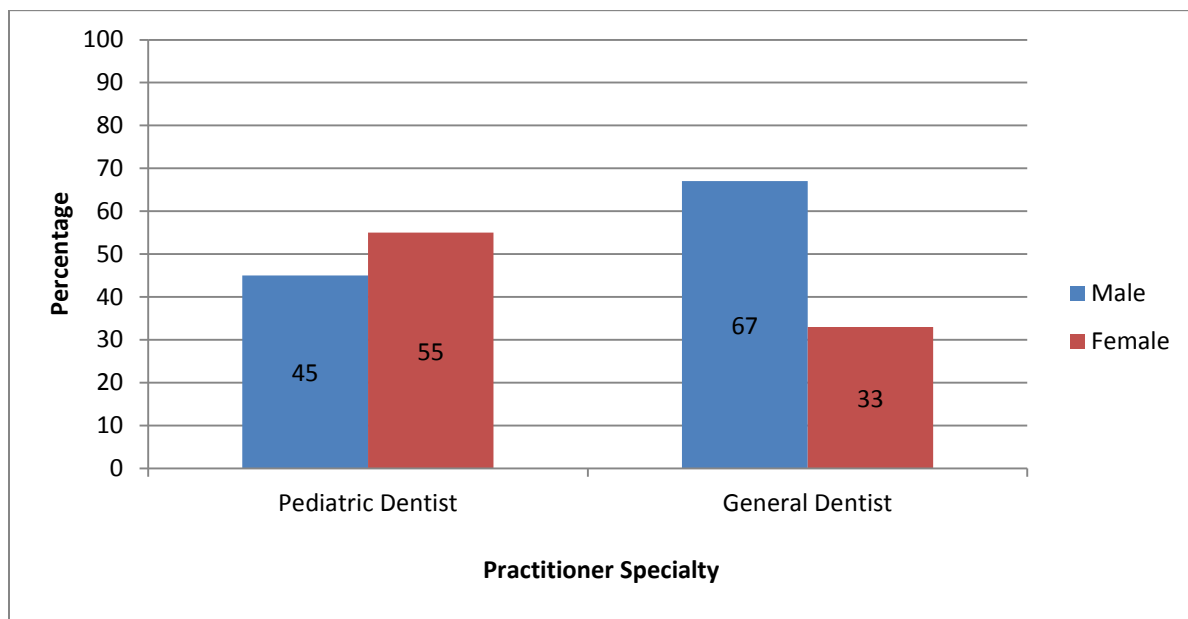


Figure 1. Distribution of sex and specialty among dentist responders to a survey about treating pregnant adolescents, n= 100

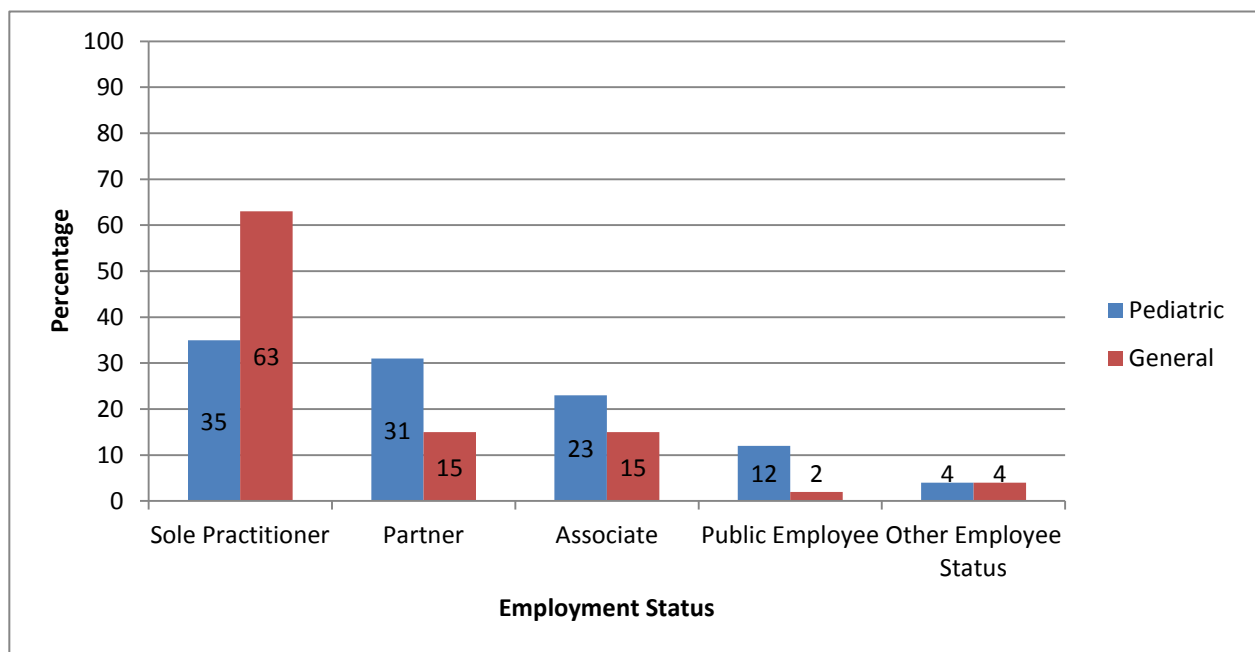


Figure 2. Distribution of employment status among dentist responders to survey about treating pregnant adolescents, n=100

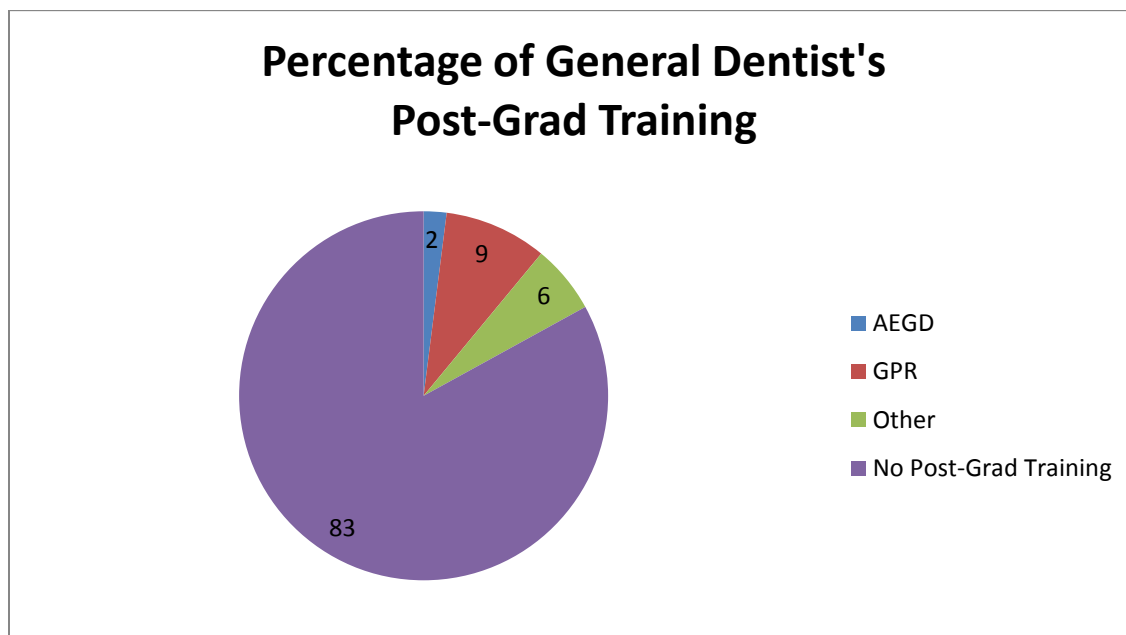


Figure 3. Percentage of general dentists' Post Graduate Training among general dentists responding to a survey about treating pregnant adolescents

4. 3 Accepting a pregnant adolescent as a new patient

Figure 4 notes those participants who would be willing to provide verbal counseling on pertinent issues (oral health and pregnancy, young children's dental development, early childhood caries, and oral hygiene for young children) to the pregnant adolescent patient. The overwhelming majority of participants indicated that they would be willing to accept a pregnant adolescent as a patient and would be willing to provide verbal counseling on the pertinent issues. Pediatric dentists were significantly more likely than general dentists to provide counseling on oral hygiene. The issue least likely to be addressed was early childhood caries. There was no significant difference between pediatric dentists and general dentists ($p > .05$) in counseling provided on topics of dental development, early childhood caries, and oral health care during pregnancy.

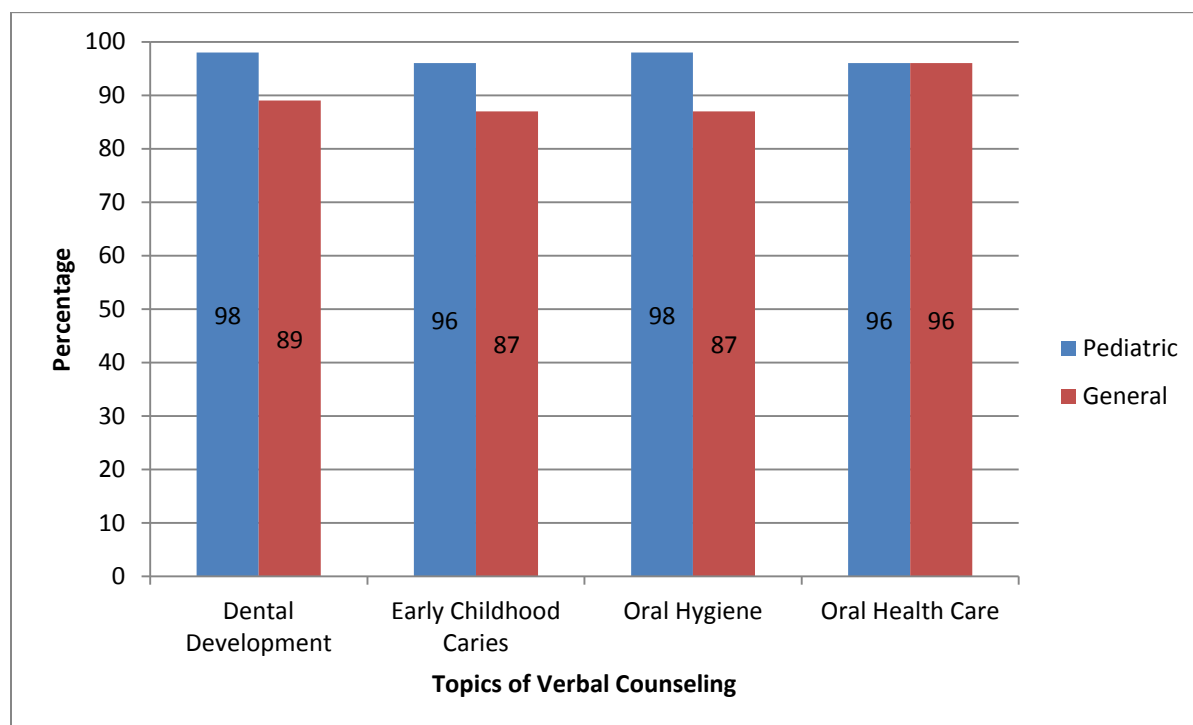


Figure 4. Percentage of dentists who report they would provide counseling on various issues, by specialty. n=100

4.4. Analysis of Hypothesis #1:

General Dentists' vs Pediatric Dentists' views on acceptability of various dental treatments during pregnancy

4.4.1 Acceptability of in office treatments during pregnancy

Figures 5 through 10 display the percentage of dentists, both pediatric and general, willing to provide select dental treatment (deep root planning (DRP), single periapical radiograph (PA), full mouth radiograph (FMX), injection of local anesthetic (LA), single extraction (EXT), root canal treatment (RCT), composite restoration, nitrous oxide (N₂O), fluoride supplement (FL) , incision and drainage (I&D) , temporary filling) during different periods of pregnancy. Figure 10 compares the mean numbers of treatments (out of 11 possible) pediatric and general dentists were willing to provide in each trimester and as an emergency only.

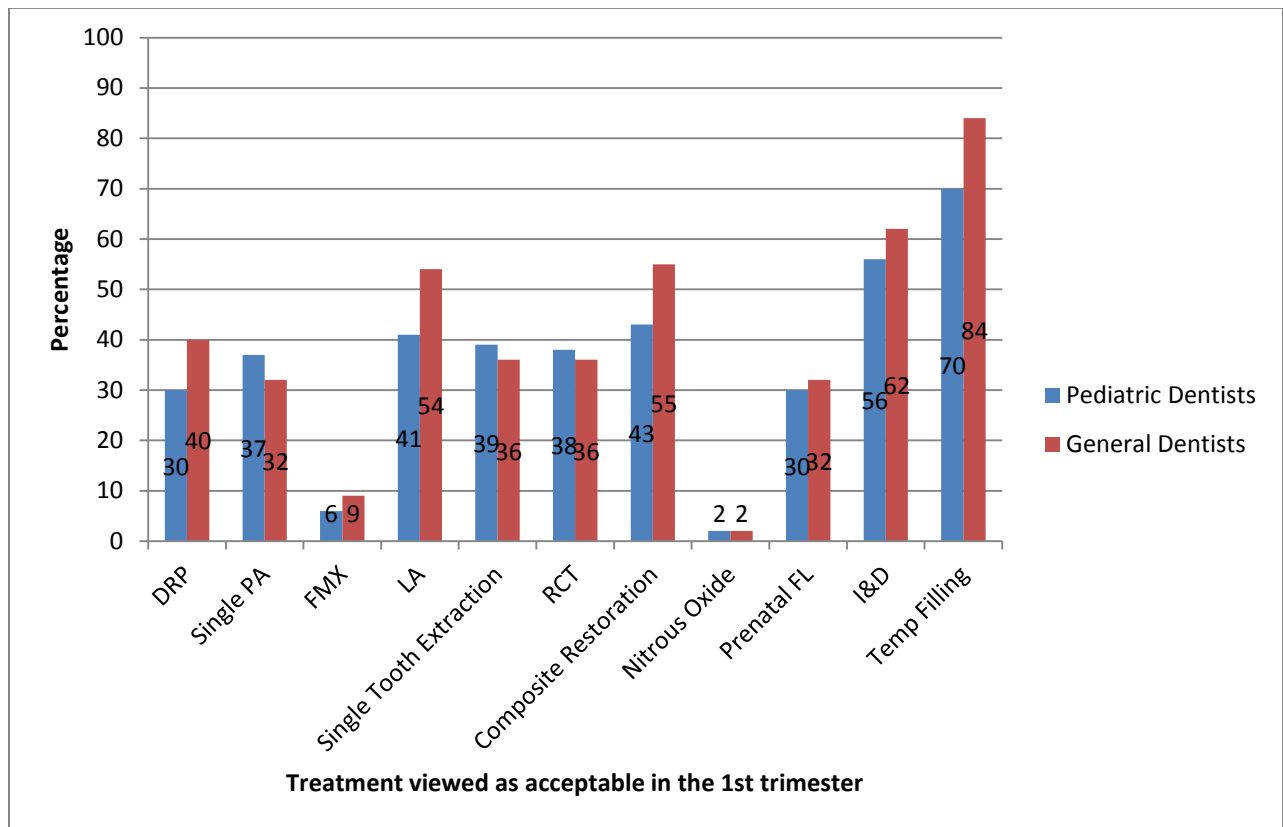


Figure 5. Percentage of dentists who find a variety of treatments acceptable during the first trimester of pregnancy, by specialty. n=100

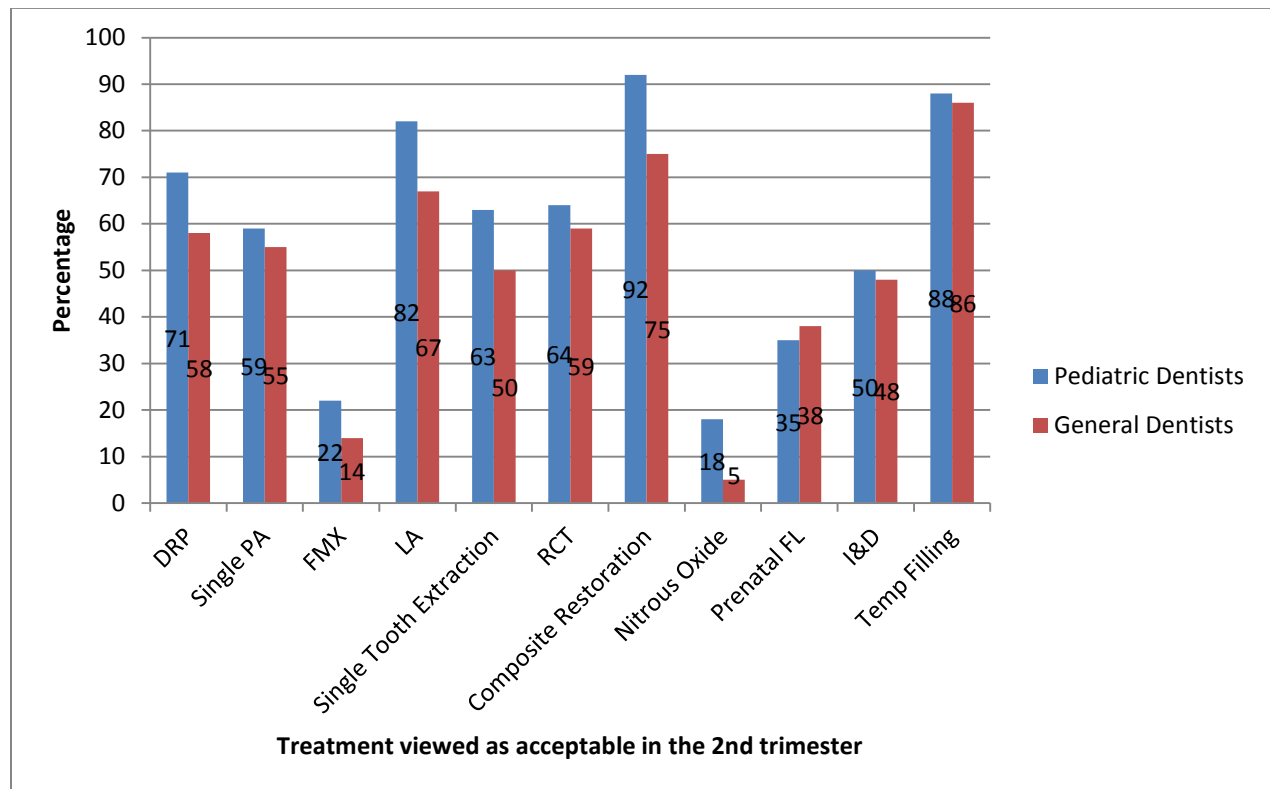


Figure 6. Percentage of dentists who find a variety of treatments acceptable during the second trimester of pregnancy, by specialty. n=100

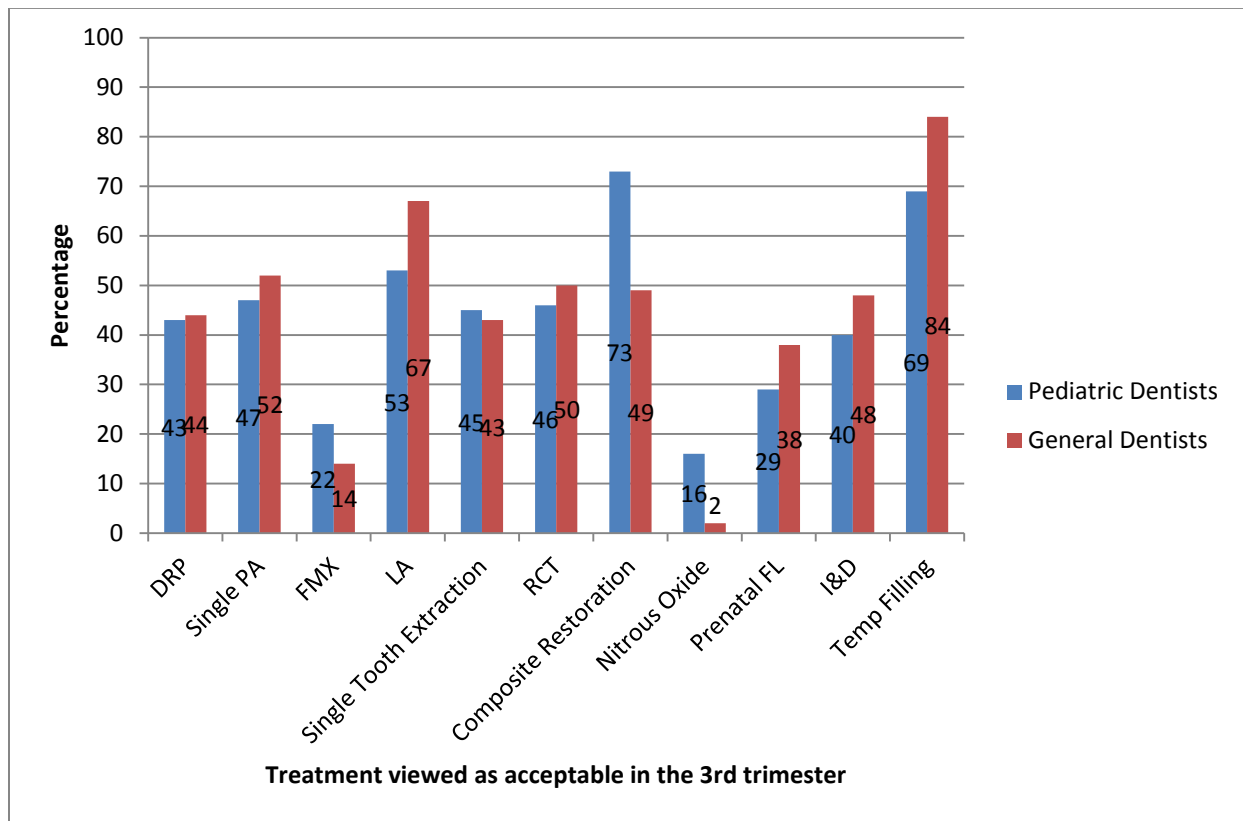


Figure 7. Percentage of dentists who find a variety of treatments acceptable during the third trimester of pregnancy, by specialty. n=100

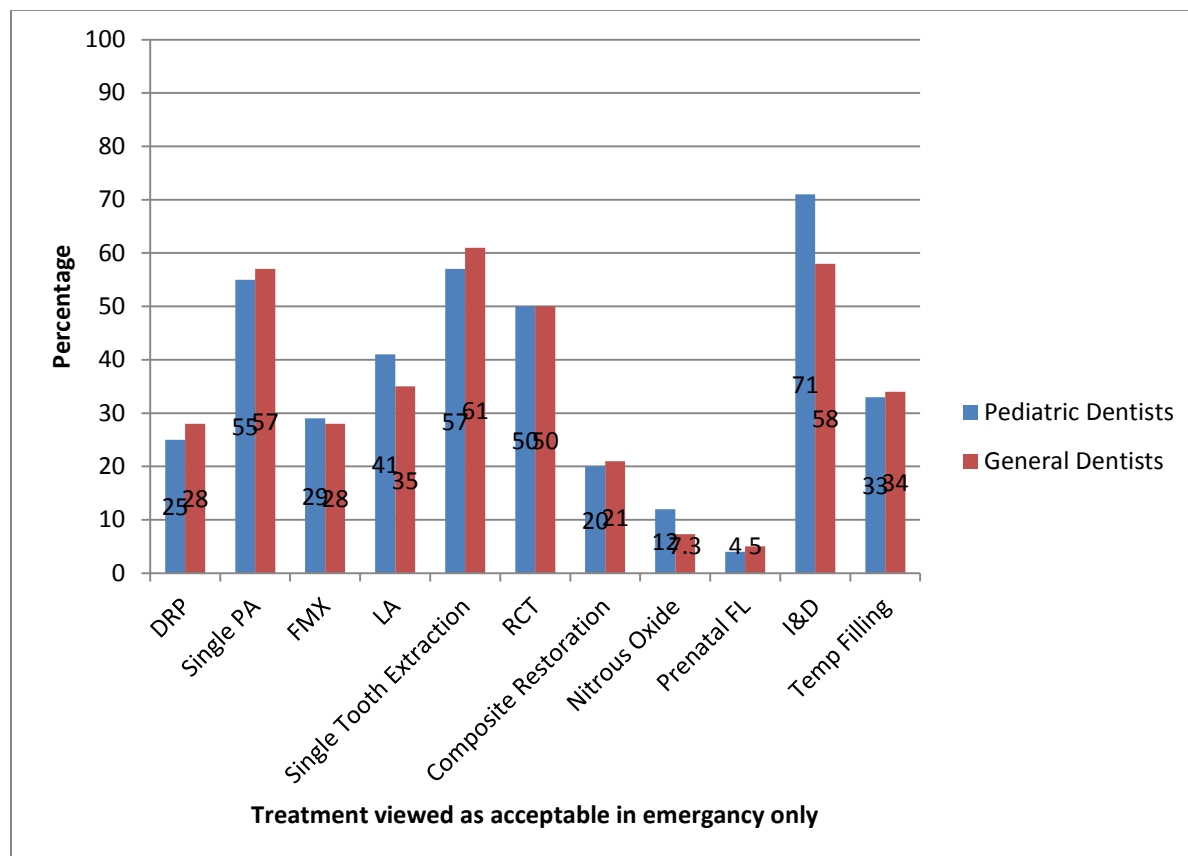


Figure 8. Percentage of dentists who find a variety of treatments acceptable during an emergency situation in pregnancy, by specialty. n=100

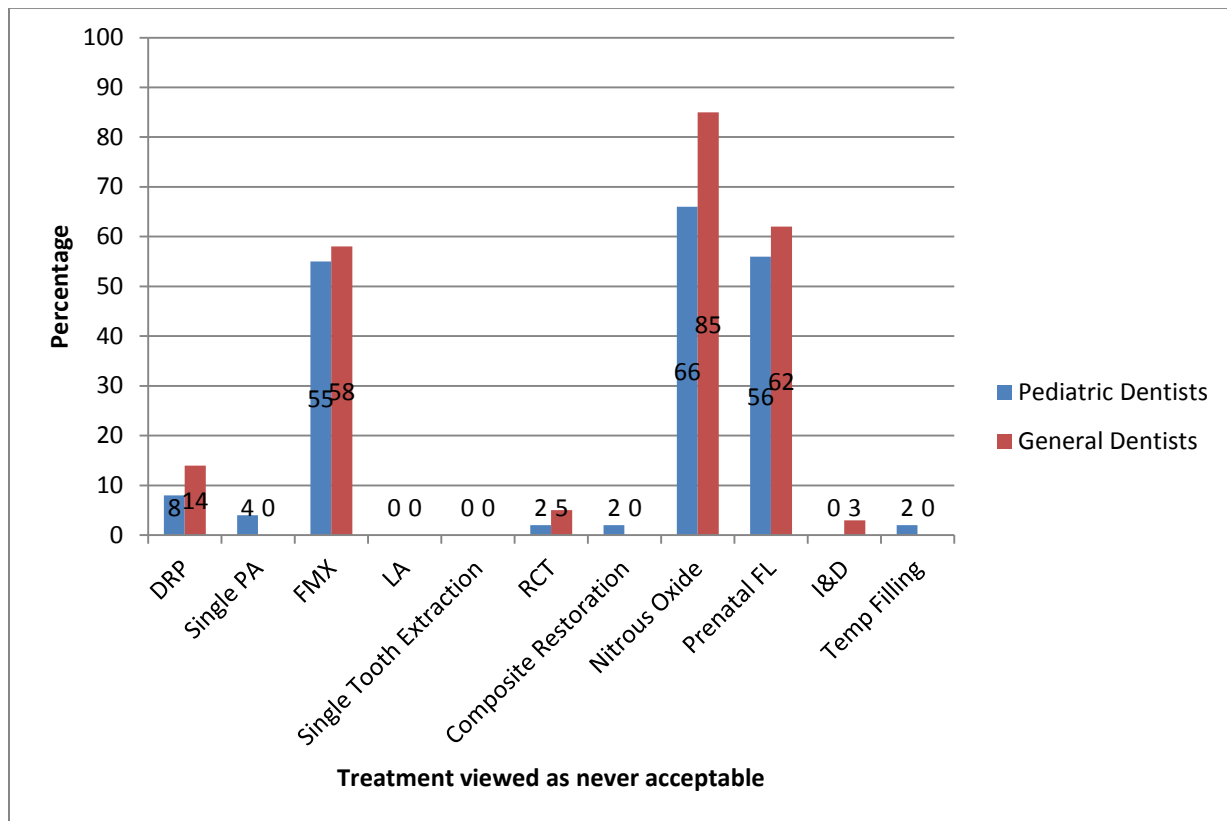


Figure 9. Percentage of dentists who find a variety of treatments as never acceptable pregnancy, by specialty. n=100

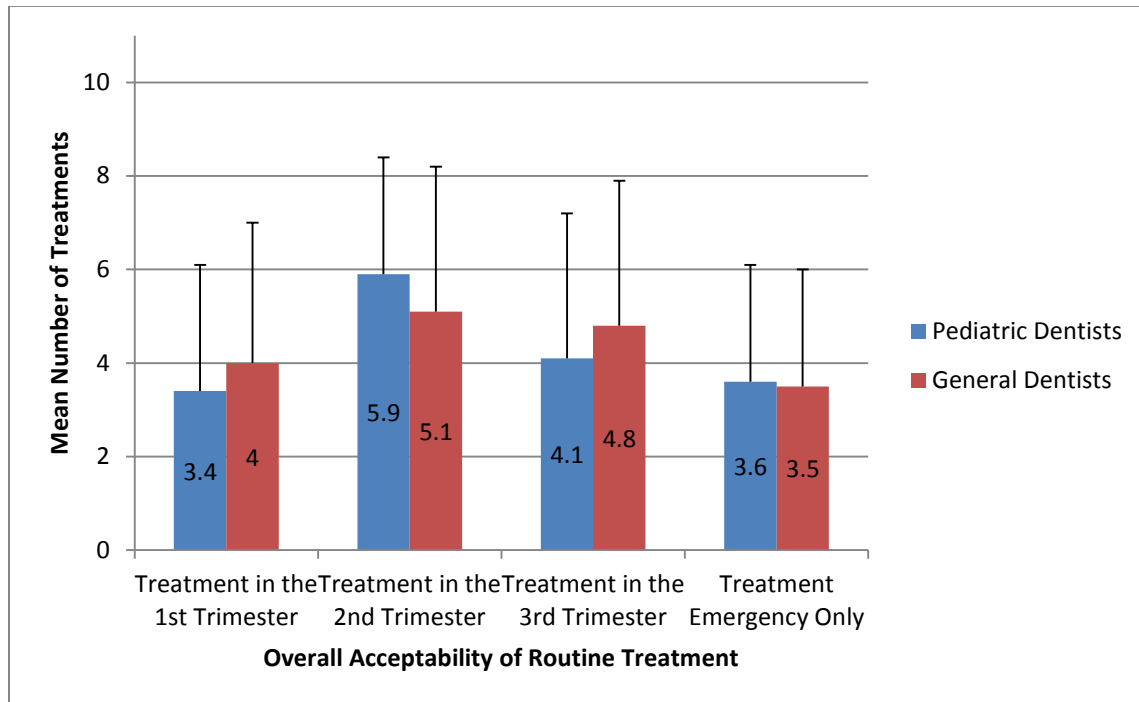


Figure 10. Mean and standard deviation of totaled number of treatments (out of 11) pediatric and general dentists were willing to provide in each trimester as well as emergency only, by specialty. n=100

There is no significant difference (Mann Whitney U, T-test, $p>0.05$) between general and pediatric dentists in how often they would provide various treatments (deep root planning (DRP), single periapical radiograph (PA), full mouth radiograph (FMX), injection of local anesthetic (LA), single extraction (EXT), root canal treatment (RCT), composite restoration, nitrous oxide (N₂O), fluoride supplement (FL), incision and drainage (I&D), temporary filling) in the 1st, 2nd, 3rd trimesters, in an emergency situation or if they would never provide a treatment. There is no significant difference (T test, $p>0.05$) between general and pediatric dentists in the amount of treatments they found acceptable in each trimester or an emergency situation. There is no significant difference between pediatric and general dentists in what specific treatment they find acceptable in each trimester or in an emergency only or never situation. As a whole, the frequency of treatment rendered by both groups of dentists increased from the first to the second trimester and decreased again in the third trimester. We can conclude that both pediatric and general dentist found treatment to be most acceptable in the 2nd trimester.

4.4.2 Acceptability of certain medications during pregnancy

Analysis with t- tests demonstrated no significant difference in how pediatric and general dentists would prescribe “FDA recommended” drugs ($p>0.05$). There was a significant difference in how pediatric and general dentists would prescribe “Not FDA recommended” drugs ($p<0.05$) with pediatric dentists more often prescribing “bad” drugs.

Figure 11 denotes the percentage of incorrectly prescribed (FDA not recommended) drugs by both pediatric and general dentists.

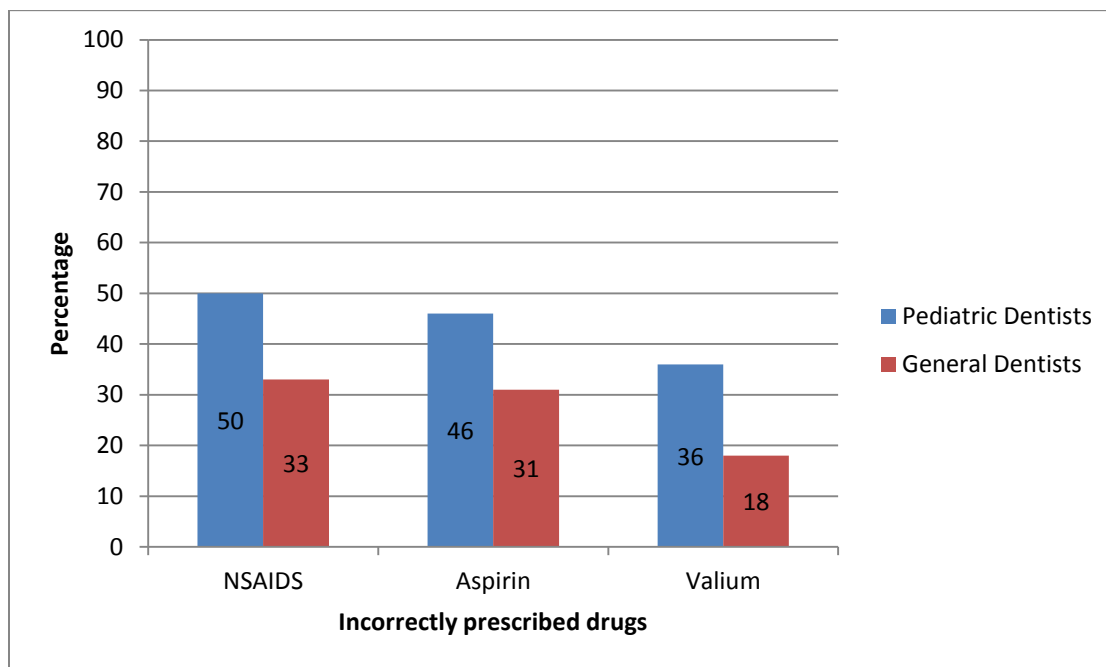


Figure 11. Percentage of dentists' who incorrectly prescribe "not recommended" drugs during pregnancy, by specialty. n=100

4.5 Analysis of Hypothesis #2:

General dentists are less aware of the association between high levels of cariogenic bacteria in mothers and the increased risk of ECC in their children than pediatric dentists

Figure 12 demonstrates awareness of the dentists' perception of the association between high levels of cariogenic bacteria in mothers and increased risk of early childhood caries in their children. There is a significant difference (T-test $p < 0.05$) between general dentists and pediatric dentists in their awareness of *Mutans Streptococci* transmissibility. General dentists are less aware than pediatric dentists of MS and its transmission in the first year of life (hypothesis supported) There is a significance difference(T-test, $p < 0.05$) in how pediatric and general dentist view the link between caries in mom and caries in baby. General Dentists are less aware than pediatric dentists of the association of caries in the mother and increased risk of caries in their children.

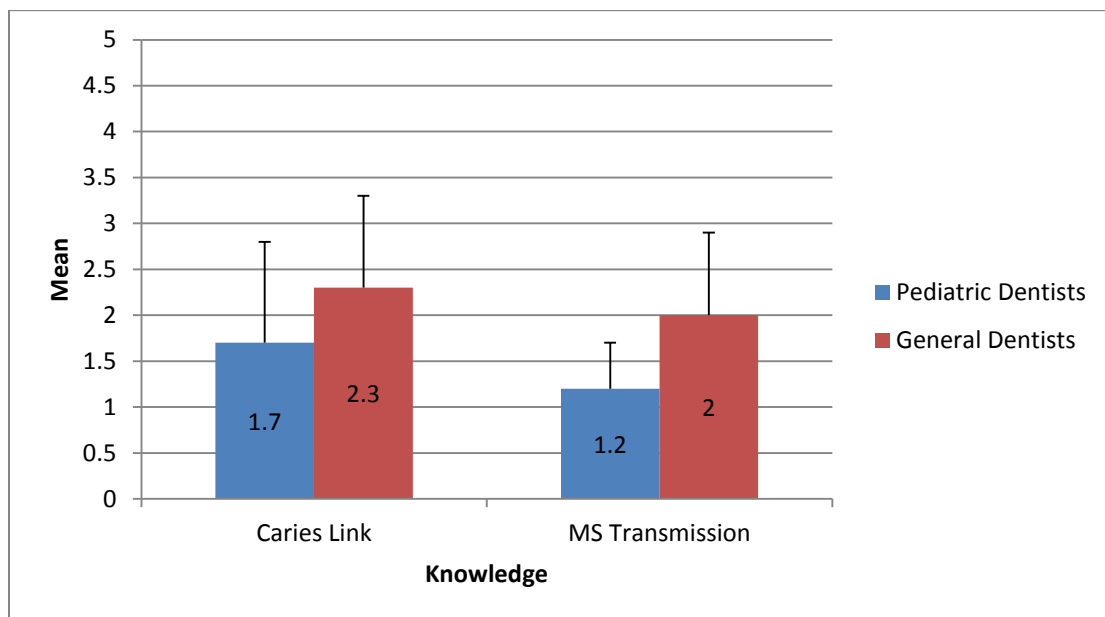


Figure 12. Mean of and standard deviation of general and pediatric dentists' endorsement of caries Link and MS transmission on a 5 point Likert scale, by specialty. n=100

4.6 Analysis of Hypothesis #3:

Pediatric dentists are more apt to provide counseling to the pregnant adolescent than general dentists

Table I compares Pediatric and General dentists' willingness to provide pre natal oral health counseling to pregnant adolescent patients. The inter item reliability of Counseling about potentially cariogenic diet and counseling on how tooth decay can affect the patients baby correlated (Chronbach's alpha= .782), so the two items were summed into one variable "counseling". Pediatric dentists were significantly more likely to provided prenatal counseling than general dentists (T test, $p < 0.05$).

TABLE I

COUNSLING PROVIDED DURING PREGNANCY

	Ped	Gen	P value
counseling	1.3(0.5)	1.7(0.7)	P<0.002

- 1- strong agree, 2-agree, 3-neutral, 4-disagree, 5-strongly disagree

4.7 Analysis of Hypothesis #4:

a. Pediatric dentists, having received extended training, are more comfortable treating pregnant adolescents and willing to accept them as patients then general dentists.

b. General dentists who have not received extended training are less comfortable working with pregnant adolescents and less willing to accept them as patients.

The fourth hypothesis consisted of two parts one of which examined the correlation between dentists who had received extended training (pediatric dentists, and general dentists with extended training) and dentists who had not received extended training. There was not sufficient data collected from general dentists with extended training and thus part b of this

hypothesis was not tested. T- tests were used to analyze responses to Likert scale questions on pediatric and general dentists level of comfort in providing treatment to pregnant adolescents as well as views on some perceived barriers to care. Figure 13 demonstrates both pediatric and general dentists' comfort levels in providing treatment to pregnant adolescents as well as looking at dentists perceived barriers to care. There were no differences found among the dentists' attitudes towards treating pregnant adolescents.

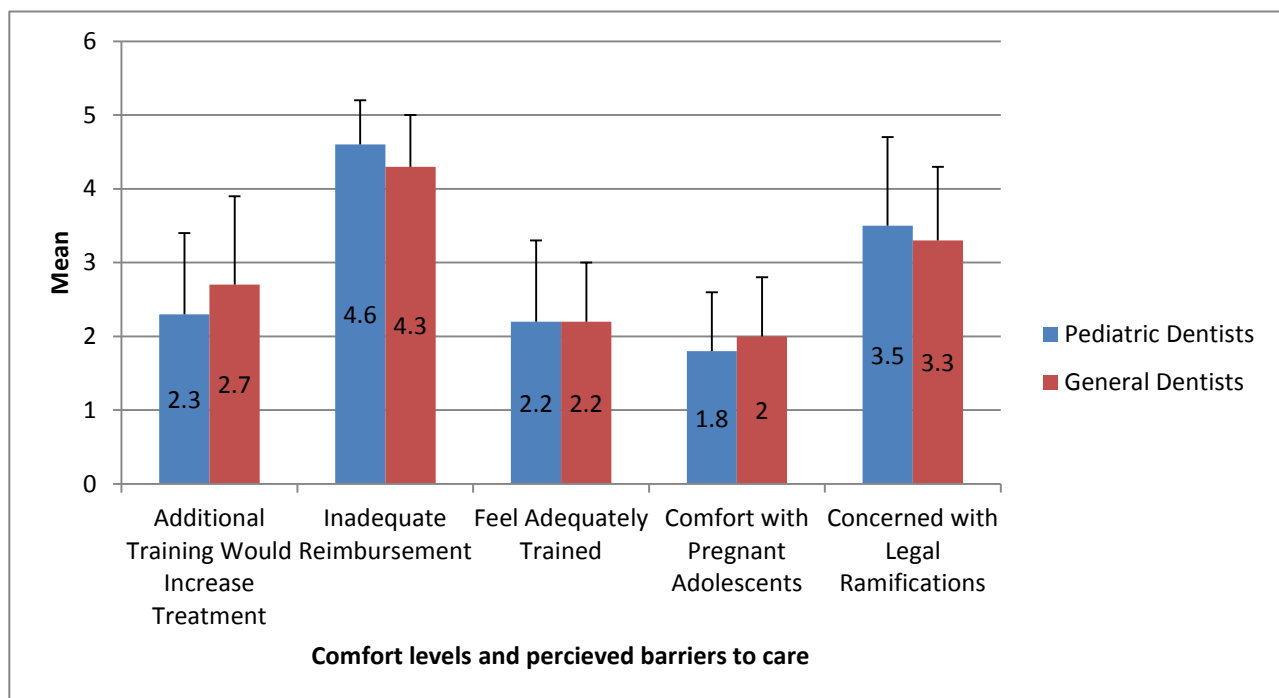


Figure 13. Means and standard deviations of general and pediatric dentists' rankings of comfort levels and perceived barriers to providing dental treatment to the pregnant adolescent on a 5 point Likert scale, by specialty. n=100

5. Discussion

5.1 Strengths and Limitations of the Study

Despite numerous recent studies investigating the different attitudes and practice philosophies of both dentists and ob-gyns to the dental treatment of pregnant women, none have investigated the difference between pediatric and general dentists' knowledge and approach to the dental treatment of pregnant adolescents. Both general and pediatric dentists are the providers of oral health care for adolescents and it is important that both groups play a role. One of the strengths of this study is that it accessed and described the attitudes of both general and pediatric dentists in providing care for the pregnant adolescent patient and also looked at the dentists perceived barriers to providing treatment.

The study was conducted only among general and pediatric dentists in Illinois and its findings are not representative of all pediatric and general dentists. The response rate for pediatric dentists was 38%. Although acceptable this response rate was lower than anticipated. The response rate for general dentists was 23%. This was much lower than the anticipated response rate. It is possible that pediatric dentists who do not see a large number of adolescents did not feel comfortable answering a survey on pregnant adolescents. This could also be true for the sample of general dentists resulting in the overall low response rate. Another reason for the low response rate among general dentists could be that the mailing list from the Illinois State Dental Society for general dentists included specialized dentists. It is possible that specialists, having received the survey, did not return it. A better method would be to include a question in the survey asking dentists to check a box for another specialty and return the survey. In this way we could track the number of dentists who were specialists as

well as increase the response rate. For dentists that reported willingness to treat pregnant adolescent patients, most questionnaires were returned with all questions answered. This indicates that the questionnaire design appears to be straightforward. One reason for the low response rate could be that the survey was time consuming to complete. The readability of the tables required time and organized thought to be able to complete. Despite this low response rate, almost equal numbers of questionnaires were collected for both pediatric and general dentists and differences between the groups were found.

A limitation of this study was the population that was surveyed. Many of the dentists were in the private practice sector. As research has shown, teenage pregnancy is both a result and cause of socioeconomic disadvantage and the majority of pregnant adolescents are found in the low socioeconomic sector (Darroch , 2001). These teens may not be seeking dental care in the private practice setting but more likely in public health clinics where dental care may be provided at a reduced or no cost. The dentists surveyed in this study may not see a large population of pregnant teens and therefore may not be as familiar with the appropriate care necessary. Future studies would benefit from the exploration of dental treatment in the public health setting as well as looking into the socioeconomic status of the adolescent seeking dental care during pregnancy.

5.2 Summary and Significance of Findings

The current study demonstrated that general and pediatric dentists are equally likely to provide routine and emergency care during pregnancy. Both pediatric and general dentists found treatment to be most acceptable in the 2nd trimester. Although both general and

pediatric dentists were equally likely to prescribe FDA recommended drugs during pregnancy, pediatric dentists were more likely to prescribe FDA not recommended drugs during pregnancy.

General dentists were less aware than pediatric dentists of *Mutans Streptococci* and its transmission in the first year of life. One reason for this may be that pediatric dentists receive extensive training in their residency programs on the initiation of dental caries, the manifestation of early childhood caries, as well as infant oral health care. Pediatric dentists are trained to encourage the first dental visit by age 1 and provide anticipatory guidance to parents. This topic is one that has recently come up to the forefront with agencies such as the AAPD, ADA, and AAP advocating and promoting the first dental visit by age 1. One of the main reasons is to provide the necessary guidance on early MS transmission. The concept should be familiar to all dentists especially because the literature (Kohler and Andreen, 2012) shows that early intervention in mothers with high levels MS can result in lower levels of MS in their children and reduced caries rate even at age 19. These findings indicate the need for all dentists to be familiar with this process in order to provide the appropriate recommendations to their pregnant adolescent patients. Because both pediatric and general dentists see a high population of adolescents it is essential that they be equally well versed on the topic. The findings from this study suggest that general dentists require more training in this area. One way to encourage such training would be to offer more continuing education courses focused on anticipatory guidance that are geared toward the general dentists.

Pediatric dentists were more likely than general dentists to provide counseling to the pregnant adolescent during pregnancy. Pediatric dentists are very comfortable with counseling on topics such as the transmission of *Mutans Streptococci* and how tooth decay in the mother

can affect the child, thus are more likely to address them in everyday practice. Studies have shown that adolescents more so than adults are willing to abstain from negative behaviors make positive changes during pregnancy (Teagle and Brindis, 1998; Cornelious et al., 1993). This demonstrates that for an adolescent, pregnancy is a crucial time during which counseling should be provided. A large scope of the pediatric dental practice is providing anticipatory guidance on oral hygiene, oral health, trauma, as well as development. This may again reflect a greater emphasis on anticipatory guidance and preventive counseling in the treatment philosophies of pediatric versus general dentists. Recent literature has shown that while general dentists agree that prenatal counseling is important the majority hold concerns which prevent them from spending the time providing the essential counseling (Heubner et al., 2009). The findings from this study can bring forth two suggestions. The first is that general dentists receive more training, whether in undergraduate or post graduate education programs. Potentially with increased knowledge and comfort general dentists may be more willing to provide the necessary counseling. Once an adolescent becomes pregnant, the adolescent and/or her guardian may think that they can no longer seek treatment with a pediatric dentist. The second suggestion to take from this study is to encourage a pregnant adolescent continue to see their pediatric dentist for treatment as well as the necessary support and counseling.

Pediatric and general dentists were equally comfortable working with the pregnant adolescent patient and shared an equal view on the perceived barriers to providing care.

5.3 Results of this Study compared to Previous Studies

This study unlike others in the literature made a comparison between pediatric and general dentists focusing on their knowledge of the pregnant adolescent. Both pediatric and general dentists provide treatment to the adolescent population and it is important that we understand their knowledge on rendering care during pregnancy. The dentists in this study recognized the need for adolescent pregnant patients to receive dental care, and were willing to treat them, in accordance with the current standards of care.

As with past studies, dentists responding to this study identified the second trimester as the best time to render dental treatment during pregnancy (Heubner et al., 2009; Prada de Costa et al., 2010; Stafford et al., 2008). This is in accordance with the recommendations published by the ADA and AAPD which state that it is safe to provide treatment throughout pregnancy; however, as pregnancy progresses the uterus is positioned below the umbilicus and the pregnant patient may be more comfortable between the weeks 14- 20 of gestation (AAPD guidelines 2012).

Obtaining radiographs was the procedure in which providers beliefs differed most from the recommendations put forth by both the ADA and AAPD. The results are also comparable to previous studies. As reported by Heubner et al, just over 50% of both pediatric and general dentists in the current study found it unacceptable to ever obtain a full mouth radiograph series. This is not in accordance with the AAPD recommendations which state that a full mouth radiograph can be obtained from a pregnant patient if necessary (AAPD guidelines 2012).

A disappointing finding in this study was that up to 50% of pediatric dentists would incorrectly prescribe drugs from category C (NSAIDs, Aspirin) and D (Valium) of the United States Food and Drug Administration risk classification system. This finding can be compared to a study by Andrade who found that one half of all pregnant women are receiving prescription drugs from categories C, D, or X. These findings are alarming in that these medications can negatively affect not only the mother but also the fetus. It is crucial that clinicians understand the effects of medications they are prescribing.

A previous study by Lee et al reported that the majority of dentists find inadequate compensation as a barrier to providing pre natal counseling to their pregnant patients. Conversely our findings show that neither pediatric nor general dentists were concerned with inadequate reimbursement. A 2009 study by Heubner et al demonstrated that just under half of the dentists surveyed were concerned with legal ramifications if something was to go wrong with the pregnancy. Our study did not support this finding in that both pediatric and general dentists did not find the concern with legal ramifications as being a barrier to care. The dentist's surveyed in the Heubner study were only from Oregon and the dentists surveyed in the current study were only from Illinois, so this result could be because of geographical differences or differences in each state's laws.

5.4 Implications for Future Research

The treatment of pregnant patients, more specifically adolescents, has recently been brought to the forefront by the release of guidelines by New York State and the AAPD. Both general and pediatric dentists are the providers of oral health care for adolescents and it is

important for both groups to play a role. This study has highlighted areas in the treatment of pregnant adolescents by both pediatric and general dentists that need further investigation.

An interesting avenue of new research would be to see what pediatric dental residents are learning about the treatment of pregnant patients in their residency programs. The current study did point to discrepancies in treatment practices between pediatric and general dentists. Future consideration should be given to whether advanced education beyond a dental degree will influence a dentist's knowledge and/or willingness to accept and treat a pregnant patient. The current study did not have a large enough sample size to be able to make this comparison and it remains a point of interest.

6. CONCLUSIONS

- General and pediatric dentists are equally likely to provide routine and emergency care during pregnancy.
- General and pediatric dentists are equally likely to prescribe FDA recommended drugs during pregnancy; however, pediatric dentists are more likely to prescribe FDA not recommended drugs during pregnancy.
- General dentists are less aware than pediatric dentists of *Mutans Streptococci* and its transmission in the first year of life.
- Pediatric dentists are more likely than general dentists to provide counseling to the pregnant adolescent.
- Pediatric and general dentists feel equally comfortable working with the pregnant adolescent patient and share an equal view on the perceived barriers to providing care.

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APPENDICES

APPENDIX A

UNIVERSITY OF ILLINOIS
AT CHICAGO

Office for the Protection of Research Subjects (OPRS)
Office of the Vice Chancellor for Research (MC 672)
203 Administrative Office Building
1737 West Polk Street
Chicago, Illinois 60612-7227

Exemption Granted

July 24, 2012

Agata Lefere, DMD

Pediatric Dentistry

801 S Paulina

M/C 850

Chicago, IL 60612

Phone: (989) 714-5349 / Fax: (312) 413-8006

RE: Research Protocol # 2012-0614

"Knowledge and Barriers amongst General and Pediatric Dentists in Providing Dental Care to Pregnant Adolescents"

Sponsors: None

Dear Dr. Lefere:

Your Claim of Exemption was reviewed on July 24, 2012 and it was determined that your research protocol meets the criteria for exemption as defined in the U. S. Department of Health and Human Services Regulations for the Protection of Human Subjects [(45 CFR 46.101(b))]. You may now begin your research.

APPENDIX A (CONTINUED)

<u>Exemption Period:</u>	July 24, 2012 – July 24, 2015
Performance Site(s):	UIC
Subject Population:	Adult (18+ years) subjects only
Number of Subjects:	500

The specific exemption category under 45 CFR 46.101(b) is:

(2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

You are reminded that investigators whose research involving human subjects is determined to be exempt from the federal regulations for the protection of human subjects still have responsibilities for the ethical conduct of the research under state law and UIC policy. Please be aware of the following UIC policies and responsibilities for investigators:

1. Amendments You are responsible for reporting any amendments to your research protocol that may affect the determination of the exemption and may result in your research no longer being eligible for the exemption that has been granted.
2. Record Keeping You are responsible for maintaining a copy all research related records in a secure location in the event future verification is necessary, at a minimum these documents include: the research protocol, the claim of exemption application, all questionnaires, survey instruments, interview questions and/or data collection instruments associated with this research protocol, recruiting or advertising materials, any consent forms or information sheets given to subjects, or any other pertinent documents.
3. Final Report When you have completed work on your research protocol, you should submit a final report to the Office for Protection of Research Subjects (OPRS).
4. Information for Human Subjects UIC Policy requires investigators to provide information about the research protocol to subjects and to obtain their permission prior to their participating in the research. The information about the research protocol should be presented to subjects in writing or orally from a written script. When appropriate, the following information must be provided to all research subjects participating in exempt studies:
 - a. The researchers affiliation; UIC, JBVMAC or other institutions,
 - b. The purpose of the research,
 - c. The extent of the subject's involvement and an explanation of the procedures to be followed,
 - d. Whether the information being collected will be used for any purposes other than the proposed research,

APPENDIX A (CONTINUED)

- e. A description of the procedures to protect the privacy of subjects and the confidentiality of the research information and data,
- f. Description of any reasonable foreseeable risks,
- g. Description of anticipated benefit,
- h. A statement that participation is voluntary and subjects can refuse to participate or can stop at any time,
- i. A statement that the researcher is available to answer any questions that the subject may have and which includes the name and phone number of the investigator(s).
- j. A statement that the UIC IRB/OPRS or JBVMAC Patient Advocate Office is available if there are questions about subject's rights, which includes the appropriate phone numbers.

Please be sure to:

→ Use your research protocol number (listed above) on any documents or correspondence with the IRB concerning your research protocol.

We wish you the best as you conduct your research. If you have any questions or need further help, please contact me at (312) 355-2908 or the OPRS office at (312) 996-1711. Please send any correspondence about this protocol to OPRS at 203 AOB, M/C 672.

Sincerely,

Charles W. Hoehne, B.S., C.I.P.
Assistant Director, IRB # 2

Office for the Protection of Research Subjects

cc: Indru C. Punwani, Pediatric Dentistry, M/C 850

Sahar Alrayyes, Pediatric Dentistry, M/C 850

APPENDIX B

1. Have you completed any of the following post graduate training programs? (check all that apply)
 - a. ☐ AEGD
 - b. ☐ GPR
 - c. ☐ Pediatric Dentistry
 - d. ☐ I have not completed a postgraduate training program
 - e. Other _____ (please specify)
2. I am
 - a. Male
 - b. Female
3. Which ONE of the following best describes your CURRENT employment status
 - a. Sole practitioner
 - b. Partner in a complete or limited partnership
 - c. Associate in an incorporated dental practice
 - d. Public employee (state or government)
 - e. Other _____
4. In all your practices combined, please estimate the percentage of patients you saw in the last year in each of the following age groups (% should add up to 100%)
 - a. Birth to 14 years _____%
 - b. 15-19 years _____%
 - c. 20-34 years _____%
 - d. 35-44 years _____%
 - e. 45 years or older _____%
5. If a pregnant adolescent presented in your practice would you accept them as a patient?
 - a. Yes
 - b. No
6. If a pregnant adolescent presented in your practice would you provide verbal counseling on the following subjects?
 - a. Oral healthcare and pregnancy Y/N
 - b. Young children's dental development Y/N
 - c. Early childhood caries Y/N
 - d. Oral hygiene for young children Y/N

APPENDIX B (CONTINUED)

7. Do you provide health relate educational brochures in your waiting area/on your website, or give education brochures to patients directly, on the following subjects?
- | | |
|--|-----|
| a. Oral healthcare and pregnancy | Y/N |
| b. Young children's dental development | Y/N |
| c. Early childhood caries | Y/N |
| d. Oral hygiene for young children | Y/N |
8. During which period of pregnancy are the following treatments ACCEPTABLE
(Circle all that apply)

	1 st Trimester	2 nd Trimester	3 rd Trimester	Emergency Only	Never
Deep root planing					
Single PA xray					
Full mouth series					
Injection of local anesthetic					
Single tooth extraction					
Root canal therapy					
Composite restoration					
Nitrous Oxide Sedation					
Prenatal Fluoride Supplements					
Incision and drainage					
Temporary filling					

APPENDIX B (CONTINUED)

9. Which of the following medications, in your opinion, should NOT be prescribed for a pregnant adolescent patient? (Check all that apply)

	1 st Trimester	2 nd Trimester	3 rd Trimester
NSAIDS			
Acetaminophen			
Aspirin			
Pain medicine with codeine (Vicodin)			
Valium			
Chlorhexidine			
Antibiotics			

10. For each of the following statements please indicate the extent to which you agree or disagree:

	Strongly Agree	Agree	Neither Agree/ Disagree	Disagree	Strongly Disagree
It is worth my time to counsel pregnant patients about their potentially cariogenic prenatal diet.					
The link between dental caries in mothers and dental caries in babies is too tenuous for me to warn my patients.					
It is worth my time to counsel pregnant patients about how tooth decay can affect their baby.					
<i>Streptococcus mutans</i> is predominantly acquired from mothers' saliva and transmission may occur as early as the first year of life.					

APPENDIX B (CONTINUED)

11. Have you taken any CDE courses that include the following topics?

- | | |
|---|-----|
| a. Early childhood caries | Y/N |
| b. Periodontal disease in pregnant patients | Y/N |
| c. Oral hygiene for pregnant patients | Y/N |
| d. Sedation | Y/N |

12. In your dental education on the following topics, which topics included a clinical component?

	I received no training in this subject	My training had no clinical component	My training included a clinical component
Early childhood caries			
Periodontal disease in Pregnant patients			
Oral hygiene for pregnant patients			
Sedation			

13. Additional training would increase my willingness to provide treatment for pregnant adolescents.

Strongly Agree Agree Neutral Disagree Strongly Disagree

14. I currently do not see pregnant adolescents because I am concerned about inadequate reimbursement.

Strongly Agree Agree Neutral Disagree Strongly Disagree

15. I feel like I have adequate training in providing oral health care for the pregnant adolescent.

Strongly Agree Agree Neutral Disagree Strongly Disagree

16. I feel comfortable working with pregnant adolescents.

Strongly Agree Agree Neutral Disagree Strongly Disagree

17. I am concerned with the possible legal ramifications of treating pregnant adolescents.

Strongly Agree Agree Neutral Disagree Strongly Disagree

APPENDIX B (CONTINUED)

18. How interested are you in accepting pregnant adolescents into your practice?

- a. Very Interested
- b. Somewhat interested
- c. Neutral
- d. Somewhat not interested
- e. Not interested at all

19. What resources, if any, would be helpful for seeing pregnant adolescent women in your practice
(check all that apply)

- a. ____ web based training
- b. ____ live lecture
- c. ____ hands on workshop
- d. ____ In office training

*Survey adapted from Heubner et al. 2009

APPENDIX C

Dear Colleagues,

My name is Agata Lefere and I am a second year pediatric dental resident at the University of Illinois at Chicago. I am conducting research to learn more about the treatment practices among pediatric and general dentists in regards to treating pregnant adolescent patients. I would like to invite you to participate in this research project by answering the attached survey.

There are no known risks for your participation. The survey will take a few minutes to complete and we will ask for no identifiers. The information collected will provide us with beneficial information on how dentists are currently treating and counseling the pregnant adolescent patient. Your help in this project will be valuable in helping us achieve our goal to serve pregnant adolescents with excellent quality care and to understand current treatment practices.

If you agree to participate in this study, please complete the attached questionnaire. Taking part in this study is voluntary. You do not have to answer any questions that make you uncomfortable. If you have any questions, concerns, or complaints about the research study, please contact me at (989) 714-5349 or at alefer2@uic.edu. You may also contact my research advisor, Sahar Alrayyes at salray1@uic.edu.

If you have any questions about your rights as a research subject, please contact the Office for the Protection of Research Subjects of University of Illinois at Chicago at (312) 996 1711 or 1-866-789-6215 (toll-free) or e-mail OPRS at uicirb@uic.edu.

Sincerely,

Agata Lefere, DDS

Pediatric Dentistry Resident

Sahar Alrayyes, DDS, MS

Faculty, UIC College of Dentistry

VITA

NAME: Agata E. Lefere

EDUCATION: B.A Biology, Kalamazoo College, Kalamazoo, Michigan, 2005.

Doctor of Dental Medicine, University of Pennsylvania School of Dental Medicine, Philadelphia, Pennsylvania, 2009.

M.S., Oral Sciences, University of Illinois at Chicago, Chicago, Illinois, 2013.

Specialty Certificate, Pediatric Dentistry, University of Illinois at Chicago, Chicago Illinois, 2011-2013

EXPERIENCE: Teaching Assistant
Department of Pediatric Dentistry, University of Illinois at Chicago, 2011-2013.

Pediatric Dental Associate
APPLE DENTAL CARE, Chicago, IL

- Part-time Associate. Competent in pediatric dental care.
Dec 2012- May 2013

General Dentist
HEALTHY SMILES DENTAL CARE, Lansing Michigan Health Dept, Lansing, Michigan.

- Full-time Associate. Competent in pediatric dental care.

Resident
Advanced Education in General Dentistry, University of Michigan, Ann Arbor, Michigan.

- Competent in all aspects of dentistry.

AWARDS & HONORS: Achievement Award in Pharmacology and Therapeutics. University of Pennsylvania, Philadelphia, PA. 2009
Herman Segal Emergency Care Award. University of Pennsylvania, Philadelphia, PA. 2009
Kalamazoo College Scholarship Recipient, 2001-2005

PROFESSIONAL MEMBERSHIP: American Academy of Pediatric Dentistry
American Dental Association
Michigan Dental Association