

Is there association between severe early childhood caries and weight at 25-28 weeks of fetal life? A longitudinal pilot study

Hamidreza Poureslami DDS, MSc¹, Ahmad Enhesari MD, MSc², Zahra Salari DDS, MSc³, Hamid Sharifi DVM, PhD⁴, Parnian Poureslami⁵

Original Article

Abstract

BACKGROUND AND AIM: Severe early dental caries in childhood is one of the health problems. This study was performed to determine the association between weight at 25 and 28 weeks of fetal life and severe early childhood caries (S-ECC) at 1.5-2 years of age among some of children in Kerman, Iran.

METHODS: In this longitudinal study, 100 pregnant mothers and their newborns examined via sonography for fetus weight and clinically for dental caries, using International Caries Detection and Assessment System (ICDAS) criteria. Variables, including fetus weight and presence or absence of signs of S-ECC, were recorded in a checklist. Data were analyzed using t-test.

RESULTS: The mean fetal weight of 10 children with signs of S-ECC at 25-28 weeks of fetal life was 752.4 g. However, this mean was 898.05 g for 35 children, who did not have any signs of S-ECC. The difference between the two groups was statistically significant.

CONCLUSION: It appears there is an association between the rate of changes in fetal weight at 25-28 weeks of gestational age and occurrence S-ECC. Due to the fetal weight can be effective on thickness as and hardness of enamel developed on deciduous maxillary incisors, therefore, the fetal weight can be associate to the occurrence of S-ECC in these teeth after birth.

KEYWORDS: Fetal Life; Severe Early Childhood Caries; Weight

Citation: Poureslami H, Enhesari A, Salari Z, Sharifi H, Poureslami P. **Is there association between severe early childhood caries and weight at 25-28 weeks of fetal life? A longitudinal pilot study.** J Oral Health Oral Epidemiol 2016; 5(1): 40-5.

Severe early childhood caries (S-ECC) is defined as a condition in which the maxillary deciduous incisors become carious in children < 3 years of age, with different severity, ranging from decalcification of enamel to destruction of enamel and cavitation. Any sign of caries among children older 3-year-old until 6-year-old considered as ECC. In the majority of children, the condition begins as a

discoloration in the middle third and/or in the incisal third of the labial surface enamel of central incisors and lateral incisors.

Several studies have been carried out on the etiology of this condition, and several factors have been reported as affecting factors, including transfer of *Streptococcus mutans* (S. mutans) bacterial species from the mother's or the baby-career's oral cavity into the newborn's oral cavity and early

1- Professor, Kerman Oral and Dental Diseases Research Center AND Kerman Social Determinants on Oral Health Research Center AND Department of Pedodontics, School of Dentistry, Kerman University of Medical Sciences, Kerman, Iran

2- Assistant Professor, School of Medicine, Kerman University of Medical Sciences, Kerman, Iran

3- Assistant Professor, Department of Pedodontics, School of Dentistry, Kerman University of Medical Sciences, Kerman, Iran

4- Associate Professor, Research Center for Modeling in Health, Institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, Iran

5- Student of Dentistry, School of Dentistry, Mashhad University of Medical Sciences, Mashhad, Iran

Correspondence to: Hamidreza Poureslami, DDS, MSc

Email: hamid42pour@yahoo.com

colonization of these bacteria in the newborn's oral cavity, childbirth through the caesarean section, the habit of feeding the newborn with milk or sweetened liquids during sleep, inadequate or inefficient salivary flow in the newborn's oral cavity, iron deficiency anemia in the newborn, low birth weight, and poor quality of newborn's tooth enamel.^{1,2}

Despite the resulted data,^{1,2} there are children that have had some of the conditions above but have not been affected by S-ECC. Therefore, it appears other factors, too, may be effective in the occurrence of S-ECC that has not been identified yet. In other words, S-ECC in very young children is considered a multifactorial condition, similar to dental caries in adults and is affected by factors such as cariogenic bacteria and a diet rich in carbohydrates. However, although all the children under 3 years of age drink milk up to approximately 2 years of age and consume other sweetened drinks in addition to milk, and usually, there is vertical (mother to infant) and horizontal transfer (career, father and/or siblings to infant) of *S. mutans* into the oral cavities of all these children, only some of them are affected by S-ECC. For example, studies in Kerman, Iran, have shown that only approximately 40% of children < 3 years of age are affected by S-ECC and the others have sound teeth.² Therefore, it is believed that other factor(s) have a role in the initiation of S-ECC in children < 3 years of age.

Based on a pediatric medicine textbook, in a normal fetus, weight is almost 460 g at a gestational age of 20 weeks, and the weight increases to 900 g at week 25 which is the beginning of the third trimester of fetal life. The fetus weighs almost 1300 g at the 28th week of fetal life, i.e., there is a sharp increase in weight and size of the fetus during the 25th week, which continues up to 28th week and continues at a high rate thereafter.³ On the other hand, based on the pediatric dentistry textbook, the enamel of maxillary central and

lateral incisors begins to form during the 14 and 16th weeks of fetal life, respectively, with five sixth of the enamel of central incisors and two-third of the enamel of lateral incisors having formed at birth (42nd week). At 22-25 weeks of fetal life approximately half of the enamel of maxillary central incisors and the incisal edges up to one-third of the enamel of maxillary lateral incisors has already formed.^{3,4}

Since in the majority of cases of S-ECC in the first stage decalcification and discoloration of enamel is evident as a round band on the middle third of the labial surfaces of maxillary central incisors and the incisal thirds of the labial surface enamel of maxillary lateral incisors, it might be hypothesized that an increase in weight from week 21 to week 28 during the fetal life might have a relationship with the quantity and quality of the enamel formed during the same period (i.e., in the middle third and the incisal third of the crowns of central and lateral incisors). In other words, an adequate increase in the weight of the fetus during weeks 21-28 might affect the quality and quantity of the enamel formed during the same period and weaker enamel might exhibit less resistance against the destructive activity of *S. mutans* in the presence of milk and other sweetened drinks. Therefore, S-ECC might originate from weak enamel; in the other words, the weak enamel will act as a half-open gate for acid attack by bacteria. As a result, E-ECC might be observed in some young children with the habit of drinking milk during sleep and might not be observed with such a habit in some others.

Given this hypothesis and in an attempt to help resolve the mystery of the occurrence and prevalence of S-ECC, the present longitudinal pilot study was undertaken to evaluate the association between the fetal weight from week 25 to week 28 of fetal life and the occurrence of S-ECC on the enamel surfaces of maxillary incisors at 1.5-2 years of age. Such a study was the first of its kind and

at present no such study is available.

Methods

The present longitudinal study was approved by the Ethics Committee, Deputy Dean of Research, Kerman University of Medical Sciences, with Ethical code K/92./340. A total of 100 healthy pregnant women with an age range of 18-45 years and with a gestational age of 21-28 weeks were included in the study; the subjects were selected from those referring to two obstetricians for periodic examinations. All of the women were employee in governmental offices in Kerman. They had received sufficient information and instructions about desirable nutrition as well as about physical and mental resting during pregnancy period from the obstetricians in their first visit.

They received an ultrasonic examination based on their own desire or a request by their physician. The sample size was determined based on a 40% prevalence rate of S-ECC in children < 3 years of age in Kerman,² using the formula specifically used to determine sample sizes. The subjects received sufficient explanation about the study procedures in the offices of the obstetricians and signed informed consent forms to be included in the study. The subjects referred to a radiology and ultrasound clinic with a written request issued by the obstetrician in charge for an ultrasound examination of the fetus in 2013 and underwent the ultrasound examination (General Electric, Logic 200, USA). The fetal weights determined by the ultrasonic examination were registered in the checklist of each subject. The checklist consisted of demographic data, including mother's age, address, phone number, cell phone number, as well as the weight of the fetus, gestational age (in weeks) and the health status of maxillary deciduous incisors at an age of 1.5-2 years based on International Caries Detection and Assessment System (ICDAS) index:⁵

Code 0

- Sound tooth surface
Code 1
- First visual change in enamel (after drying teeth for 5 seconds)
Code 2
- Distinct visual change in enamel
Code 3
- Localized enamel breakdown
Code 4
- Underlying dentinal shadow (not cavitated into dentine)
Code 5
- Distinct cavity with visible dentine
Code 6
- Extensive distinct cavity with visible dentine

The third author examined the babies' mouth. She was trained for examination according to ICDAS Index. After the ultrasonic examination, each subject (mother) received nutritional recommendations as well as oral hygiene instructions, for the babies after their birth, including: (1) Inhibition of extended and/or excessive frequency of feeding times (from the breast or bottle) especially at afternoon nap time and/or at night, (2) cleaning the gum pads and erupted teeth by the moisture pads or by the finger toothbrushes. Furthermore was asked of them to take the babies to the Department of Pediatric Dentistry, Kerman Faculty of Dentistry when the baby was 1.5-2 years of age for the examination of maxillary incisors and evaluation of absence or presence of S-ECC. After that the results of examination was recorded in the relevant checklist. Data were analyzed using t-test.

Results

Of 100 mothers included in the study, only 4 people were omitted for bring their 1.5-2-year-old children for dental examinations because they had low birth weight (< 2500 g). Therefore, finally the sample size decreased to 96.

A total of 22 children aged 1.5-2 years exhibited S-ECC signs in maxillary incisors (codes 1-5 of ICDAS Index) and 74 children

had no visible signs (code 0 of ICDAS Index). The evaluation of the checklists revealed that the mean fetal weight of 10 children with signs of S-ECC at 25-28 weeks of fetal life was 752.4 g. However, this mean was 898.05 g for 35 children who did not have any signs of S-ECC. The difference between the two groups was statistically significant (Tables 1 and 2).

Discussion

Based on the results of the present study, of 96 children which evaluated during their fetal life, approximately 23% (22 children) exhibited signs of S-ECC at 1.5-2 years of age. Previous cross-sectional studies in Iran have reported a prevalence rate of 13-44% for S-ECC and/or ECC in children.² In other countries, a prevalence rate of 8.4-72% has been reported.⁶ American Dental Association (ADA) has reported a 5-fold prevalence rate for S-ECC and ECC compared to that of asthma in children.⁷ The prevalence rate of S-ECC in the present study is consistent with the mean prevalence rate of this dental condition in Iran.

A study has shown that hypoplastic or hypocalcified enamel (with different severities) can be a predisposing factor for S-ECC;⁸ however, no longitudinal researches until this time have studied the possible relationship between hypoplastic or hypocalcified enamel with fetal weight at a

time when enamel is developing during the fetal life. The current study is the first such study. Some researchers have studied the relationship between low birth weight (< 2500 g) and occurrence S-ECC, but could not find any statistically significant relation between of them. Low birth weight babies have had equal or less experience of dental caries in comparison to normal birth weight babies.⁹⁻¹¹ Those researches stated the results are based on a very limited evidence and further studies, particularly prospective studies, are needed to confirm that there is indeed no association between birth conditions and dental caries in children.⁹⁻¹¹

A researcher has stated high dose of antibiotics which have described by pediatricians for low birth weight infants suppress early colonization of *S. mutans* and resulted low occurrence S-ECC.¹² Numerous of fetuses who do not experience sharp increase in weight during the 25th week, in later weeks in the three trimester compensate the weight deficit and will have normal weight at birth time but after eruption deciduous teeth will experience dental caries because enamel of their teeth is weak. The current study showed this issue. However, this study had some limitations and should be considered a pilot study. These limitations include the sample size and

Table 1. Frequency distributions of children with and without early childhood caries (ECC) in terms of the time their mothers underwent ultrasound examinations

Children	Mothers referring for ultrasound examination from week 21 to week 24 of pregnancy [n (%)]	Mothers referring for ultrasound examination from week 25 to week 28 of pregnancy [n (%)]	Total [n (%)]
Without caries	39 (40.62)	35 (36.46)	74 (77.08)
With caries	12 (12.50)	10 (10.42)	22 (22.92)
Total	51 (53.12)	45 (46.88)	96 (100)

Table 2. Comparison of fetal weights in mothers undergoing ultrasound examinations at weeks 25-28 of gestational age and whether the children were affected by early childhood caries (ECC) or not

Children	Mothers referring for ultrasound examination from week 25 to week 28 of pregnancy (%)	The mean weight of the fetuses (g)	SD	P
Without caries	35	898.05	138.5089	0.014
With caries	10	752.40	218.1122	
Total	45	865.68	168.2429	

SD: Standard deviation

the time the mothers underwent ultrasound examinations. In other words, approximately 100 mothers (finally 96 mothers) voluntarily participated in this study and due to ethical considerations they underwent ultrasound examination only once based on their own request or based on a request by the physician in charge for specific considerations. Therefore, the mothers did not undergo ultrasound examinations solely for the purpose of this study.

From a scientific point of view, ultrasound examinations should be carried out 3 times during the whole pregnancy period. The first examination is carried out from week 6 to week 13 of gestational age to confirm pregnancy and determine the thickness of the fetal neck. The second examination is carried out from week 18 to week 22 to evaluate fetal anomalies, and the third is carried out during the third semester to evaluate proper growth and development and the amniotic fluid.¹³ In the present study, almost half of the mothers (51 mothers) had referred for an ultrasound examination from week 21 to week 24. If these 51 mothers had referred at week 25-28 or if they had undergone second ultrasound examination from week 25 to week 28, the fetus of 12 persons of them, which later

affected by ECC, showed a weight that could possibly reveal a stronger association between fetal weight at 25 and 28 weeks and the occurrence of ECC. Therefore, it is suggested that studies be carried out with larger sample sizes with ultrasound examinations at 25-28 weeks of gestational age.

Conclusion

Based on the results, it seems there is an association between the rate of changes in fetal weight at 25-28 weeks of gestational age and occurrence S-ECC. Due to the fetal weight can be effective on thickness as and hardness of enamel developed on deciduous maxillary incisors, therefore, the fetal weight can be associate to the occurrence of S-ECC in these teeth after birth.

Conflict of Interests

Authors have no conflict of interest.

Acknowledgments

The authors would like to express their gratitude to Dr. Zohreh Salari and Dr. Zahra Bidarian, as well as the mothers who collaborated in the study. This study was supported by a grant from the Kerman University of Medical Sciences.

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