



Comparison of Occurrence of Early Childhood Caries in Two Groups of Children Delivered by Cesarean Section and Normal Birth: A Longitudinal Study

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ABSTRACT

Background: Early Childhood Caries (ECC) is defined as a specific pattern of dental caries in infants and toddlers that may lead to diverse and serious oral consequences as well as an overall detriment to general health.

Objectives: The purpose of this study was to evaluate the association between the mode of mothers' delivery and ECC in their children.

Patients and Methods: The study was conducted as a longitudinal study using 120 mothers and their neonates up to two years of age in Kerman, Iran. Sample selection was according to a pilot study and a sample size formula. The women were examined at the ninth month of pregnancy and their babies were examined on the first day of life, and then every six months on a regular basis by only one examiner. The data was written on checklist and was analyzed by SPSS (version 18) and by Chi-square as well as Sign test.

Results: Analysis of the data demonstrated a statistically significant relationship between gender and occurrence of ECC, but no statistically significant relationship between mode of delivery and occurrence of ECC, as well as ABO blood groups and occurrence of ECC were seen.

Conclusions: There is not any significant association between mode of delivery and occurrence of ECC, despite the positive association between occurrence of ECC and gender.

Keywords: ABO Blood Group, Dental Caries, Gender, Kerman

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1. Background

Early acquisition of mutans streptococci is a major risk factor in the occurrence of Early Childhood Caries (ECC) (1). The mother-to-child transmission of mutans streptococci is called vertical transmission (2). It is said that neonatal factors are effective in the possibility of early acquisition of these bacteria through vertical transmission (3). A study showed that there is a significant relationship

between early acquisition of the aforementioned bacteria and mode of delivery, level of the bacteria in the mother's mouth, and also the oral hygiene of the mother, i.e., children delivered by caesarean section are afflicted with mutans streptococci a few months earlier than those delivered by normal vaginal delivery. The researchers of the study propose that caesarean section accelerates the acquisition of mutans streptococci, since in this type of

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►Implication for health policy/practice/research/medical education:

ECC can be prevented and managed if proper information and skills are implemented. Pediatricians can engage mothers in motivational interviewing and help them to prevent ECC.

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delivery, carried out in aseptic conditions, the infant is less exposed to maternal microbiota while in a normal vaginal delivery, the infant is exposed to more variety of the bacteria present in the mother's vaginal and anal regions (4).

2. Objectives

The present study conducted as a longitudinal study in order to evaluate the effect of the mode of delivery on the extent of occurrence of ECC in two groups of full-term and healthy infants delivered through caesarian section or normal vaginal birth. The effect of factors such as amount of mutans streptococci in the mother's mouth, and the status of mother's oral hygiene on the occurrence of the caries is studied as well. Furthermore, considering the lack of information concerning the effect of blood group types on the possibility of occurrence of ECC, and also reports highlighting the role of blood group types in affliction with some diseases such as certain cancers, Ischemic Heart Disease (IHD), and gastro-intestinal disorders (5-7), the present study deals with the above mentioned issue as well.

3. Patients and Methods

The study was conducted as a longitudinal study but at the end of study, data analysis was performed in the same manner as a cross-sectional study. This was done because there was no observed macroscopic sign of caries on erupted teeth surfaces at 6th, 12th and 18th month of life of the babies and the signs were observed only at their 2nd birthday.

3.1. Ethical Consideration

A written consent was obtained from every mother. This took the form of an explanatory information sheet and a consent form. The procedure was approved by Ethics Committee of Kerman University of Medical Science (with Ethical code K/86/20).

3.2. Sample Size

At the inception of this study, advice was sought from the statistician regarding sample size calculation. Based on the evidence from the previous studies and according to a pilot study among the children delivered by cesarean section and vaginal birth, every group was comprised of 25 mothers, which according to $\alpha = 0.05$ sample size, was determined to be 120 pregnant women. The women in their last month of pregnancy participated in the study gradually. The inclusion criteria:

(1)- Seeking pre-natal care at special clinics of Obstetrics & Gynecology of the Afzali and Kashani public hospitals in

Kerman, Iran, from Jan. 2007 till Oct.2007. Sampling method was census.

(2)- At least 18 years old of age.

(3)- Have more than 10 natural teeth.

A limitation to the study was the difficulty in finding mothers who fitted the inclusion criteria. The trial occurred at two hospitals, their child-birth divisions and their dental clinics. The subjects consisted of 120 infants (full-term and healthy without cleft lip and/or palate) and their respective mothers. From a few days before delivery, both of them were monitored for a period of two years.

At the first visit in the last month of pregnancy, volunteer mothers were asked about their preferred method of delivery. The results were recorded; they were divided into two groups: normal delivery (60 mothers) and caesarean section (60 mothers). The samples were gathered before delivery, and bacteriologic assessment (salivary level of Strep. Mutans) was done by MUTAN Rapid Detection Kit, (GC Co, Japan), and oral hygiene was assessed by Simplified Oral Hygiene Index (Green & Vermilion) for every mother: four posterior and two anterior teeth were examined by a No. 5 explorer. In the posterior portion of dentition, the first molar (in some cases, the second molar) was examined on each side of the oral arch. Buccal surfaces of selected maxillary molars and lingual surfaces of selected mandibulars were inspected. In anterior portion of the mouth, labial surface of the right maxillary central incisor and lingual surface of the left mandibular central incisor were scored. The following criteria were applied to determine the scores of each surface examined (8):

0. No debris present.

1. Soft debris covering not more than one-third of the tooth surface.

2. Soft debris covering more than one-third but not more than two-thirds.

3. Soft debris covering more than two-thirds of the tooth surface.

The salivary levels of streptococci mutans were assessed according to a clear line on the kit. The following criterion was applied to determine the score for each mother:

0. Low mutans count, the red line on the C window.

1. Moderate mutans count, the light red line on the T window.

2. High mutans count, the dark red line on the T window.

On the first day of life, each baby's data such as sex, weight and blood group were recorded according to the hospital documentation, duration of pregnancy and method of delivery. According to these records, method of delivery in the normal delivery group was changed to caesarean section so a number of the mothers in the groups changed to 59 (normal delivery) and 61 (caesarean section). The mothers were asked to breastfeed their children on demand at any time of the day. After six months, the status of eruption and health of maxillary incisors were evaluated. The status of health in the teeth was recorded according to Garcia-Godoy's criteria (9). The babies' examinations lasted for two

years, performed on a six month basis. The mother's oral hygiene was assessed after two years as well. During the current study, three mothers discontinued their cooperation; one newborn in the normal delivery group and two in the caesarian section group; all female. The gathered data were analyzed by SPSS version 18, Chi-square and Sign test. $P < 0.05$ was considered statistically significant.

4. Results

There was no observed macroscopic sign of caries on erupted teeth surfaces at 6th, 12th and 18th month of life of the babies and the signs were observed only at their 2nd birthday. Therefore, analysis and statistical method was used similar to a cross-sectional study.

- The occurrence of ECC and the children's gender relationship:

It was observed that there is a statistically significant relationship between these variables. ($P < 0.05$), 28.2% of the children had caries of their primary maxillary incisors by 24 months of age (Table 1).

- The occurrence of ECC and the mode of delivery relationship:

There was no significant relationship between the occurrence of ECC and the mode of delivery ($P > 0.05$), (Table 1)

- Status of oral hygiene of mothers, the amount of mutans streptococci, and the extent of children's caries relationship:

The instances of ECC in children of mothers who had poor oral hygiene and higher amount of mutans streptococci were higher (Table 2). There were 24 mothers scored as 0 and 4% of their children had caries; 65 mothers were scored as group 1 and 7.7% of their children had caries; 28 mothers were scored as group 2 and 96.4% of children had caries.

- The occurrence of ECC and the birth weight relationship:

There was a statistically significant relationship between the occurrence of ECC and the birth weight of the children ($P < 0.05$), (Table 3).

Table 1. Distribution of the 2-year-old Children with or without Carious Max. Incisors in Relation to their Gender and in Relation to Mode of Birth

	Children With Carious Teeth, No. (%)	Children With Healthy Teeth, No. (%)	Total, No. (%)
Female	9 (13.20)	59 (86.80)	68 (100.00)
Male	24 (49.00)	25 (51.00)	49 (100.00)
Total	33 (28.20)	84 (71.80)	117 (100.00)
Caesarean	19 (32.20)	40 (67.80)	59 (100.00)
Normal	14 (24.10)	44 (75.90)	58 (100.00)
Total	33 (28.20)	84 (71.80)	117 (100.00)

Table 2. Distribution of the 2-year-old Children with or without Carious Max. Incisors in Relation to Salivary Level of Strep. Mutans (SM) in their Mothers and in Relation Mother's Oral Hygiene (S-OHI)

	Children with Carious Teeth, No. (%)	Children with Healthy Teeth, No. (%)	Total, No. (%)
Score0^a	1 (3.00)	23 (27.40)	24 (20.50)
Score1^a	5 (15.20)	60 (71.40)	65 (55.60)
Score2^a	27 (81.80)	1 (1.20)	28 (23.90)
Total^a	33 (100.00)	84 (100.00)	117 (100.00)
Score0^b	0 (0.00)	0 (0.00)	0 (0.00)
Score1^b	0 (0.00)	42 (50.00)	42 (35.90)
Score2^b	2 (6.10)	40 (47.60)	42 (35.90)
Score3^b	31 (93.90)	2 (2.40)	33 (28.20)
Total^b	33 (100.00)	84 (100.00)	117 (100.00)

^a Level of the S.M

^b S-OHI

Table 3. Distribution of the 2-year-old Children with or without Carious Max. Incisors in Relation to Their Weight at Time of Birth (g).

	Children with Carious Teeth, No. (%)	Children with Healthy Teeth, No. (%)	Total, No. (%)
< 2700	11 (33.30)	0 (0.00)	11 (9.40)
2700 < 3000	4 (12.10)	16 (19.00)	20 (17.10)
3000 <	8 (24.20)	36 (42.90)	44 (37.60)
Non registered	10 (30.30)	32 (38.10)	42 (35.90)
Total	33 (100.00)	84 (100.00)	117 (100.00)

- The occurrence of ECC and the blood groups relationship:

There was no statistically significant relationship between the occurrence of ECC among the children and specific blood groups (Table 4).

Table 4. Distribution of the 2-year-old Children with or without Carious Max. Incisors in Relation to Type of Blood Group.

	Children with Carious Teeth, No. (%)	Children with Healthy Teeth, No. (%)	Total, No. (%)
A	11 (33.30)	8 (9.50)	19 (16.20)
B	7 (21.20)	8 (9.50)	15 (12.80)
AB	3 (9.10)	4 (4.80)	7 (6.00)
O	2 (6.10)	7 (8.30)	9 (7.70)
Non registered	10 (30.30)	57 (67.90)	67 (57.30)
Total	33 (100.00)	84 (100.00)	117 (100.00)

4. Discussion

There have been a limited number of studies to explore the possibility of a relationship between gender and occurrence of Early Childhood Caries (ECC). In a pilot study done in Canada, it was observed that the instances of ECC in boys were higher than in girls; however, the difference was not significant (10). A similar study in Kerman, Iran among 500 children, reported that the instances of ECC in boys under the age of 3 were significantly higher than that of girls of the same age (11). In the present study, there was a significant difference; a high incidence of dental caries among male in comparison to the female group. This difference may be related to Follicle Stimulating Hormone (FSH) which is higher in female. This hormone is secreted by the anterior portion of pituitary gland and has an important role in the development, body growth, puberty and reproductive processes (12). So, it may work as a probable factor for increasing Secretory IgA (S-IgA) in female babies given the low prevalence of dental caries among them. A study showed that the mean saliva concentration of S-IgA in female toddlers with ECC was higher than that in female toddlers without ECC ($P < 0.05$) (13).

The present study showed that there is no statistically significant agreement between types of delivery and the occurrence of caries in the newly-erupted teeth of the child while Li et al. maintained that there was a significant relationship between caesarean deliveries and the early acquisition of mutans streptococci (4). Furthermore, Li et al. as well as Lai et al. had previously showed that there is a significant relationship between early colonization of mutans streptococci and higher and more severe incidences of caries in children (14, 15). Also, Li and colleagues concluded that caesarean section causes a higher incidence of risk of ECC in children (4). However, the present study showed the opposite (Table 1). The amount of streptococci in the mouths of children in the two groups was not investigated in this study. There is a possibility that the acquisition of the bacteria occurs sooner in children born by caesarean section but the occurrence of caries did not show a significant difference between the two groups. This may be due to the numerous factors in the complicated process of occurrence and development of caries.

The present study showed that those mothers who had higher amounts of streptococci in their mouths and lower oral hygiene had children with higher chance of ECC (Table 2). This is indicative of the fact that the aforementioned mothers probably transmitted more bacteria to their children, which is similar to the findings of Berkowitz's studies (1, 2).

In this study, a significant relationship between child's birth weight and occurrence of ECC was also found (Table 3). There was a higher occurrence of ECC observed in infants with lower birth weights. It seems that infants with lower birth weights are more likely to progress teeth with hypocalcified and hypoplastic enamels which pro-

vide better environments for accumulation of mutans streptococci. Furthermore, the low resistance of developmentally disordered enamel against destructive acids may lead to accelerated caries. These instances were also mentioned in studies carried out by Milgram, Wan and Law (3, 16, 17).

Through the analysis of blood group types of children, the hypothesis that certain genetic factors may be effective in the occurrence of ECC was proposed and investigated. The results showed that although children with blood group of 'A' had a higher occurrence of caries compared to other blood group types, the difference was not significant (Table 4). No study on the relationship of incidence of ECC and blood group types has been conducted yet. However, numerous studies showed that among patients suffering from Ischemic Heart Disease, most of the patients without risk factors had the blood group of 'A'. (6, 18, 19). A study showed that the blood group of Louis is effective in breast cancer (5) and the effect of blood group of 'O' in the occurrence of peptic ulcer is clear (7). Nevertheless the identification of mechanisms under which blood group types affect diseases needs further analytical and case-control studies. A limitation of the study was lack of patients' cooperation. In this two-year follow-up study, we didn't observe any significant association between method of delivery and occurrence of ECC, despite the positive correlation between occurrence of ECC and gender.

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