



The effects of mode of delivery on Mutans Streptococci colonization and dental caries in a sample of Iraqi children aged 3-5 years from Baghdad city

Dr. Nebal Thabit Shaker, B.D.S., M.Sc.

Abstract

Aim: To investigate whether mode of delivery is associated with mutans streptococci (MS) colonization and dental caries in pre school children.

Methods: This study includes 64 pairs of mothers and their children aged 3- 5 years old (34 born vaginally and 30 born by Caesarean section).Data included a dental examination, a questionnaire survey of mode of delivery, maternal gestational age, as well as children's birth –weight, and laboratory assessment (by collecting non stimulated saliva for each woman and child and homogenizing them then Mutans Streptococci (MS) were counted ,isolated, purified and diagnosed according to morphological characteristic .

Results: Dental caries, salivary and plaque streptococcus mutans counts were significantly higher in children delivered by caesarean section mode than those delivered normally ($P<0.05$).There was a positive linear correlation between the mean value of DMFS, salivary and plaque streptococcus mutans count of children and their mothers, and this association statistically significant ($P<0.05$). Gender, gestational age and birth weight had no significant correlations with the dmfs of children ($P>0.05$).

Conclusion: The mode of delivery is significantly correlated with MS colonization and caries outcomes in pre-school children.

Keywords: Mode of delivery, Mutans Streptococci colonization, Dental caries, Preschool children.

Introduction

Dental caries is the most infectious and communicable dental disease of all age groups, which effects overall health of an individual. Childhood caries is a multifactorial dental disease and if left untreated it leads to discomfort, pain and lack of interest in routine activities and ultimately destroys tooth structure and early loss of tooth⁽¹⁾.

During and shortly after birth, the epithelial surfaces in the oral cavity of a bacterially native infants become colonized by various bacterial species⁽²⁾. In general, these early colonizers are members of the indigenous biota, and their presence plays an important role in host defense, not only in excluding potential exogenous pathogens, but also as stimuli for the development of the immune system in

infants⁽³⁾. As members of the indigenous biota, *Streptococcus oralis* (*S. oralis*), *S. mitis* and *S. salivarius* are the predominant pioneer streptococci that colonize the oral cavity of infants during the first few days of life^(4, 5). The colonization by two other members of the indigenous biota, *S. sanguinis* and *S. mutans*, comes later, approximately at 1 and 2 years of age, respectively, following the emergence of primary teeth^(6, 7).

S. mutans have been associated with dental caries based on well-defined cariogenicity^(8,9). Consistently, *S. mutans* and *S. sobrinus* have been commonly isolated from the saliva and dental plaque of caries-active individuals including children with early childhood caries. The natural history of *S. mutans* colonization has been previously studied^(10, 11), suggested that children acquire *S. mutans* primarily from their mothers^(3,10,12,13) and possibly other sources^(2, 14).

The main objectives of the present study were to determine the correlation between the mode of delivery (vaginal versus Caesarean section), MS colonization and development of caries in 3-5 years old Iraqi children.

Materials and Methods

A- Subjects: Sixty four pairs of mothers and their 3 to 5-year-old children (34 born vaginally and 30 born by Caesarean section) were participated in the study. Samples were taken from 64 mother and from their children aged 3-5 years old attending the hospital of Dentistry College of Al-Mustansiriya University for dental consultation selected by random sampling, then a questionnaire survey of mode of delivery, maternal gestational age, as well as children's birth -weight.

B- Dental examination: A clinical examination had been performed by using DMFS index 1989⁽¹⁵⁾. The examinations were carried out on dental chair by using of sterilized examination sets including dental mirrors, and explorers.

C-Bacterial sample collection and cultivation: Saliva and plaque samples were collected from each mother and child. Non stimulated saliva was collected in sterilized capped bottles and swab from plaque in oral cavity was collected and streaked directly onto mitis salivarius, bacitracin-sucrose agar (MSB) for direct cultivation of *S. mutans*. The salivary samples and the cotton swabs were collected under standard conditions according to Dansanyake et al 1995⁽¹⁶⁾.

Mutans streptococci were diagnosed according to their morphological characteristics on MSB plate using microscopical examination by gram stain and biochemical test. According to (Al-Mizraqchi, 1998)⁽¹⁷⁾.

D- Statistical analysis: Data were analyzed using the two sided independent t-test. Correlation between different variables was done by Pearson correlation (bivariate correlation) to assess the strength and direction of association.

Results

The results of the study show that the mean value of dmfs index, salivary mutans streptococci and plaque mutans streptococci were higher in children delivered by caesarean section mode than those delivered normally and statistical significant difference was noted between the mean value (p value= 0.02, 0.03, 0.01) respectively (Table 1),(Figure 1).

The result revealed a positive linear correlation between the mean value of

salivary and plaque MS count of children and their mothers, the results demonstrated that the value of salivary MS count of children increased when the count of salivary MS of mothers increased ($r=0.9$), this association statistically significant ($p=0.03$) (Table 2).

Table (3) showed that the value of MS count in plaque of children increased when the count of MS in plaque of mothers increased ($r=0.6$) and this association statistically significant ($p=0.04$), and there was a positive linear correlation ($r=0.4$) between the value of dmfs index of children and their mothers, where the results showed that the value of dmfs index of children increased when the DMFS index of mothers increased, this association statistically significant ($p=0.03$) (Table 4).

While there were no statistically significant correlations between the dmfs of child with, gender, gestational age and birth weight. The mean value of dmfs index for male children was higher than of female ($p=0.2$) (Table 5), and the mean value of dmfs index for full-term children was higher than those of pre-term one but no statistical significant difference was reported ($p=0.3$) (Table 6). But there was a weak negative correlation ($r=-0.06$) between the dmfs index of children and their body birth weight, where the results of analyses revealed that the dmfs index decreased when the body birth weight increased and this association statistically insignificant ($p=0.7$) (Table 7).

Discussion

In this present study, there is a significant association between the mode of delivery and dental caries in preschool children.

The first exposure to micro-organisms in vaginally delivered

infants occurs during passage through the birth canal, whereas the first exposure to bacteria in infants born by Caesarian section (C-section) is from the skin of parents and health providers, and medical equipment⁽¹⁸⁾. Different modes of delivery lead to differences in the intestinal microbiota in infants^(19, 20). In the oral cavity, mutans streptococci were detected more frequently and at a younger age in children delivered by C-section than in those delivered vaginally⁽¹¹⁾. C-section, compared with vaginal birth, the lower exposure to commensal, protective bacteria from the mother during birth, reducing the natural barrier to colonization by oral pathogens. The initial pioneer microbes entering the oral cavity influence the pattern of microbial succession, and that the succession is associated with the availability of colonization sites⁽²¹⁾. Bacteria that subsequently attempt to colonize must compete with other micro-organisms for colonization sites and essential nutrients. Additionally they must survive in the presence of adverse metabolic end-products and antimicrobial products that may be produced by other members of the indigenous oral biota. Once established, early-colonizing species tend to persist in the mouth^(22, 23). Because the Caesarean-born infants may have experienced less exposure to maternal and environmental microbial challenges at birth, any atypical microbial environment may prevail, providing more potential biological binding niches for "latecomers" such as *S. mutans*⁽²⁴⁾.

The mothers' oral health perception and social behaviors significantly affect the oral health-related quality of life of their children⁽²⁵⁾. Our study demonstrated significant connections between maternal influences on children's cariogenic bacterial

colonization and caries status. The reduction MS in the mother during the tooth emergence period of young children could have long-term influence on colonization by these bacteria in children and a reduction in childhood caries experience⁽²⁶⁾, evidence from this study further supports the notion that early interventions to control MS levels improve the oral health of mothers transform maternal attitude toward good oral health, and, promote healthy behaviors and practices, is essential to reduce the risk of MS infection and early dental caries in young children.

The results of the present study also revealed that males experienced insignificantly more dental caries in term of mean dmfs scores than the females. Other studies have reported similar results in various preschool children population^(27, 28, 29). The differences in eruption and exfoliation of the deciduous teeth, feeding practice, or eating habits may be associated with gender differences⁽³⁰⁾. In a *S.mutans* mother-to-infant transmission study, it was suggested that male children were 13 times more likely to experience caries than female children if they acquired *S.mutans* strains from their biological mother⁽¹²⁾.

In conclusion, the mode of delivery may be an appropriate question to be included in past medical history for further determination of why some children are at greater risk for caries than others.

References

- 1- Javed A, Chaudhry S, Butt S, Ijaz S, Asad R, Awais F, Khan A. Transmission Of Streptococcus Mutans From Mother To Child. Pakistan Oral & Dental Journal; Dec 2012, Vol. 32 Issue 3, P4931.
- 2- Alves AC, Nogueira RD, Stipp RN, Pampolini F, Moraes AB, Goncalves RB. Prospective study of potential sources of Streptococcus mutans transmission in nursery school children. J Med Microbiol. 2009;58:476–81.
- 3- Berkowitz RJ, Jones P. Mouth-to-mouth transmission of the bacterium Streptococcus mutans between mother and child. Arch Oral Biol. 1985;30:377–9.
- 4- Hanvoravongchai P. Implications of private practice in public hospitals on the cesarean section rate in Thailand. Hum Resour Health Dev J (WHO) 2000;4:2–12.
- 5- Biasucci G, Benenati B, Morelli L, Bessi E, Boehm G. Cesarean delivery may affect the early biodiversity of intestinal bacteria. J Nutr. 2008;138:1796S–800S.
- 6- Abanto J, Carvalho TS, Mendes FM, Wanderley MT, Bonecker M, Raggio DP. Impact of oral diseases and disorders on oral health-related quality of life of preschool children. Community Dent Oral Epidemiol. 2011;39:105–14.
- 7- Cunnion DT, Spiro A, Jones JA, Rich SE, Papageorgiou CP, Tate A. Pediatric oral health-related quality of life improvement after treatment of early childhood caries: a prospective multisite study. J Dent Child. 2010;77:4–11.
- 8- Bratthall D. Mutans streptococci -dental, oral and global aspects. J Indian Soc Pedod Prev Dent. 1991; 9:4–12.
- 9- Tanzer JM, Livingston J, Thompson AM. The microbiology of primary dental caries in humans. J Dent Educ. 2001;65:1028–37.
- 10- Kohler B, Lundberg AB, Birkhed D, Papapanou PN. Longitudinal study of intrafamilial mutans streptococci ribotypes. Eur J Oral Sci. 2003; 111:383–9.
- 11- Li Y, Caufield PW, Dasanayake AP, Wiener HW, Vermund SH. Mode of delivery and other maternal factors influence the acquisition of Streptococcus mutans in infants. J Dent Res. 2005; 84: 806–11.
- 12- Li Y, Caufield PW. The fidelity of initial acquisition of mutans streptococci by infants from their mothers. J Dent Res. 1995; 74: 681–5.
- 13- Beighton D. The complex oral microflora of high-risk individuals and groups and its role in the caries process. Community Dent Oral Epidemiol. 2005;33:248–55.
- 14- Douglass JM, Li Y, Tinanoff N. Association of mutans streptococci between caregivers and their children. Pediatr Dent. 2008;30:375–87.
- 15- WHO (1987): oralhealth surveys, Survey forms, Geneva.
- 16- Dasanayake AP, Caufield PW, Cutter GR, Roseman JM, and Kohler B.

- Differences in the detection and enumeration of mutans streptococci due to differences in methods. *Arch Oral Biol* 1995;40: 345-51.
- 17- AL-Mizraqchi. A microbiology and biochemical studies on adherence of mutans streptococci on tooth surfaces. Ph.D thesis. Col Sci. Uni Al-Mustansiriya, 1998.
- 18- Lif Holgerson P, Harnevik L, Hernell O, Tanner ACR, Johansson I. Mode of Birth Delivery Affects Oral Microbiota in Infants. *J Dent Res*. 2011 Oct; 90(10): 1183–1188.
- 19- Penders J, Thijs C, Vink C, Stelma FF, Snijders B, Kummeling I. Factors influencing the composition of the intestinal microbiota in early infancy. *Pediatrics* (2006) 118:511-521.
- 20- Dominguez-Bello MG, Costello EK, Contreras M, Magris M, Hidalgo G, Fierer N. Delivery mode shapes the acquisition and structure of the initial microbiota across multiple body habitats in newborns. *Proc Natl Acad Sci USA* (2010).107:11971-11975.
- 21- Gibbons RJ. Bacterial adhesion to oral tissues: a model for infectious diseases. *Den Res*.1989, 68: 750-760.
- 22- Cole MF, Bryan S, Evans MK, Pearce CL, Sheridan MJ, Sura PA. Humoral immunity to commensal oral bacteria in human infants: salivary antibodies reactive with *Actinomyces naeslundii* genospecies 1 and 2 during colonization. *Infect Immun* 1998, 66: 4283-4289.
- 23- Könönen E, Kanervo A, Takala A, Asikainen S, Jousimies-Somer H. Establishment of oral anaerobes during the first year of life. *J Dent Res* 1999, 78: 1634-1639.
- 24- Nelun Barfod M, Magnusson K, Lexner MO, Blomqvist S, Dahlén G, Twetman S. Oral microflora in infants delivered vaginally and by caesarean section¹. *Int J Paediatr Dent*. 2011 Nov; 21(6):401-6.
- 25- Paula JS, Leite IC, Almeida AB, Ambrosano GM, Pereira AC, Mialhe FL. The influence of oral health conditions, socioeconomic status and home environment factors on schoolchildren's self-perception of quality of life. *Health Qual Life Outcomes*. 2012; 10:6.
- 26- Kohler B, Andreen I. Influence of caries-preventive measures in mothers on cariogenic bacteria and caries experience in their children. *Arch Oral Biol*. 1994;39:907–11.
- 27- Schroth RJ, Cheba V. Determining the prevalence and risk factors for early childhood caries in a community dental health clinic. *Pediatr Dent*. 2007;29:387–96.
- 28- Thitasomakul S, Piwat S, Thearmontree A, Chankanka O, Pithpornchaiyakul W, Madyusoh S. Risks for early childhood caries analyzed by negative binomial models. *J Dent Res*. 2009;88:137–41.
- 29- Pattanaporn K, Saraithong P, Khongkhunthian S, Aleksejuniene J, Laohapensang P, Chhun N, Chen Z, Li Y. Mode of delivery, mutans streptococci colonization, and early childhood caries in three- to five-year-old Thai children. *Community Dent Oral Epidemiol*. 2013 Jun; 41(3): 212–223.
- 30- Barfod MN, Christensen LB, Twetman S, Lexner MO. Caries prevalence in Danish pre-school children delivered vaginally and by caesarean section. *Acta Odontol Scand*. 2012 May; 70(3):190-3.

Table (1): Comparison the mean value of dmfs index, salivary MS and plaque MS of children according to the mode of delivery.

	Mode of delivery								P value
	Normal				Caesarean				
	Mean	Min.	Max.	St.d	Mean	Min.	Max.	St.d	
dmfs(children)	13	0	43	13	20	0	43	16	0.02
Salivary MS (children)	13	1	44	12	25	5	59	18	0.03
Plaque MS (children)	16	0	48	13	30	11	64	16	0.01

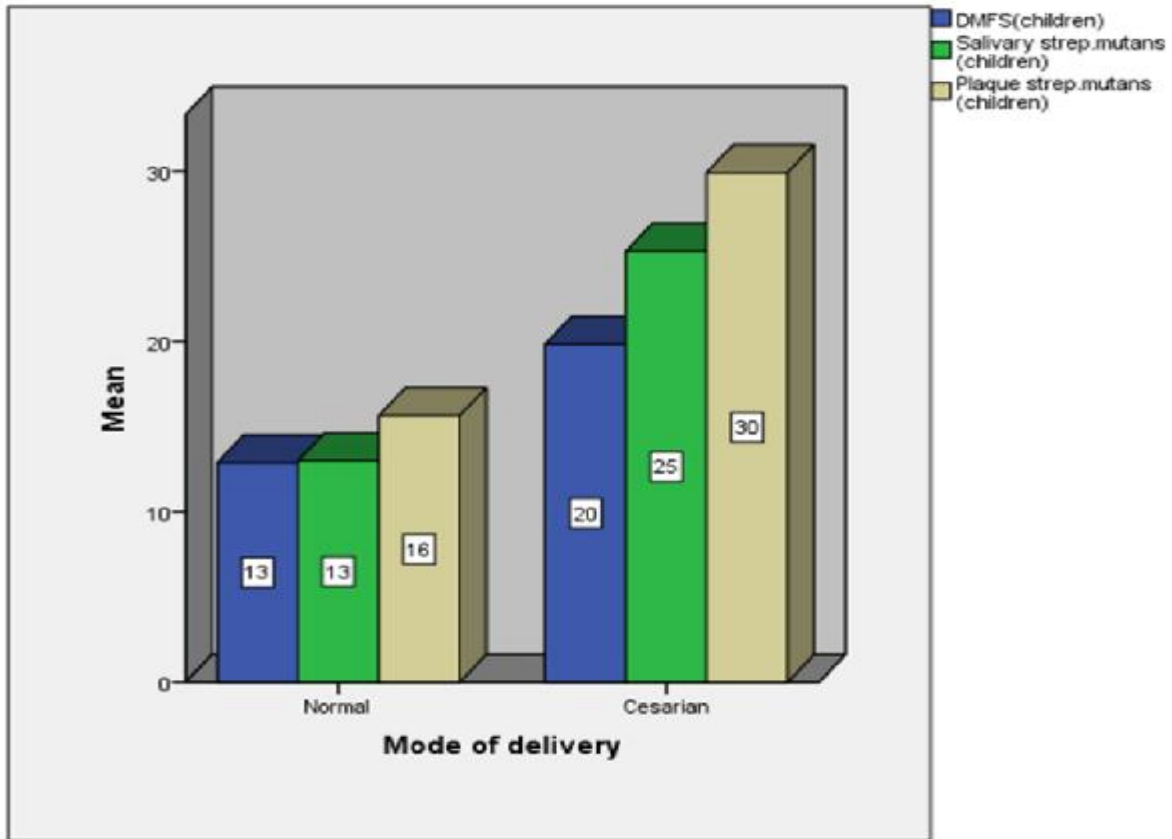


Figure 1: comparison the mean value of dmfs index, salivary MS and plaque MS of children according to the mode of delivery.

Table (2): Correlation between the mean value of salivary MScount of children and mothers

	Mean	Std. Deviation	N	R	p
Salivary MS(mother)	24.4	14.0	64	0.9	0.03
Salivary MS(children)	17.8	15.3	64		

Table (3): Correlation between the colony count of plaque MS of children and their mothers.

0	Mean	Std. Deviation	N	R	P
Plaque MS (mother)	28.0	14.1	64	0.6	0.04
Plaque MS (children)	21.2	15.6	64		

Table (4): Correlation between dmfs index of mothers and children.

	Mean	Std. Deviation	N	R	p
DMFS(mother)	21.6	12.8	64	0.4	0.03
dmfs (children)	15.6	14.4	64		

Table (5): Comparison the mean value of dmfs index between the female and male children.

	Gender	N	Mean	Std. Deviation	T- test	P
dmfs(children)	F	31	12.5	13.9	-1.1	0.2
	M	33	18.5	14.7		

Table(6): Comparison the mean value of dmfs index between the preterm and full-term children.

	Gestational age	N	Mean	Std. Deviation	T- test	p
dmfs index (children)	Preterm	23	12.6	14.5	-0.9	0.3
	Full-term	41	17.5	14.4		

Table (7): Correlation between the dmfs index of children and their body birth weight (kg)

	Mean	Std. Deviation	N	R	p
dmfs(children)	15.6	14.4	64	-0.06	0.7
Body weight(kg)	3.0	0.585	64		