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Title: Risk Factors for Early Childhood Caries: A cross- sectional study in a Dental School

Running Head: Risk Factors for Early Childood Caries

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Risk Factors for Early Childhood Caries: A cross- sectional study in a Dental School

Abstract

Objective: This study aimed to investigate possible early childhood caries (ECC) risk indicators in preschoolers who applied for examination/ treatment in a Government University Pediatric Dentistry Clinic in Istanbul, Turkey.

Material and Methods: 36- 71 months old children and their mothers who applied for examination/ treatment and consented were enrolled in this cross sectional survey during a 3 month period. Mother- child pairs were examined intraorally and caries experience were recorded using (dmft/ DMFT) index. A structured questionnaire inquiring oral hygiene habits and diet history of the children was employed to interview mothers. Categorical data from children with no clinical caries (NC), ECC, Severe ECC (S- ECC) were compared using X^2 and correlation of caries experience in mother child pairs were tested with Spearman rho. Statistical significance was set $p< 0.05$.

Results: Two hundred sixty six children (4.41± 0.87 years old) were enrolled in the study. Forty (15.04 %) children were diagnosed with ECC, 209 children S-ECC and 17 had no clinical caries (NC). Breastfeeding was practiced by 255 (96.2%) mothers, and duration was not different among groups. There was no significant association between breastfeeding beyond 24 months and caries ($p= 0.743$). Children with S-ECC were snacking more frequently with sweets than ECC ($p= 0.012$). Number of mothers with visible dental plaque was higher in S-ECC than ECC ($p<0.01$). Maternal DMF-T scores correlated significantly with their children's dmf-t in the whole sample ($r= 0.547$, $p<0.01$).

Conclusion: Preventive measures should begin from the pregnancy and focus on oral health/ hygiene education to mothers to avoid devastating effects of ECC.

Keywords: Dental Caries, Breastfeeding, Bottle feeding, Oral health

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Erken Çocukluk Çağı Çürüğü Risk Faktörleri: Kesitsel Bir İnceleme

Özet

Amaç: İstanbul İlindeki bir Devlet Üniversitesi Pedodonti kliniğine başvuran çocuklarda erken çocukluk çağı çürüğü (ECC) risk faktörlerinin incelenmesidir.

Yöntem: Bu kesitsel çalışmaya 3 aylık süre içinde muayene/ tedavi edilen ve katılım için onam veren 36- 71 ay arası çocuklar ve anneleri dahil edildi. Anne ve çocukların ağız içi muayeneleri yapılıp çürük durumu (d/ D: çürük, m/ M: eksik, f/ F: dolgulu) dmf- t/ DMF- T indeksleri ile belirlendi. Çocukların beslenme, ve ağız hijyen alışkanlıkları anket ile görüşme şeklinde kaydedildi. Çürüksüz (NC), ECC ve Şiddetli ECC (S- ECC) olarak belirlenen çocuklar arası kategorik verilerin karşılaştırılması Ki- kare testi, anne- çocuk çiftlerinde çürük indeksleri arasındaki ilişki Spearman korelasyon testi ile değerlendirildi. İstatistiksel anlamlılık $p< 0.05$ olarak kabul edildi.

Bulgular: İki yüz altmış altı (4.41± 0.87 yaş) çocuk çalışmaya dahil edildi. Kırk çocuk ECC, 209 S- ECC, 17 çocuk çürüksüz olarak saptandı. 255 (96.2%) çocuğun anne tarafından emzirildiği görüldü ancak bu süre gruplar arasında fark göstermedi. 24 aydan daha uzun emzirmeyle diş çürüğü arasında ilişki saptanmadı ($p= 0.743$). Şekerli gıdalarla atıştırma sıklığı S- ECC grubunda ECC'den fazla bulundu ($p<0.01$). Görünür dental plak bulunan anne sayısı S- ECC'li çocularda ECC'den fazlaydı ($p<0.01$). Annenin DMF- T skoru çocuklarının dmf- t'leriyle anlamlı ilişki gösterdi ($r= 0.547$, $p<0.01$).

Sonuç: Okul öncesi çocukların oral hijyen ve diş sağlığı üzerinde anne etkindir. ECC'nin yıkıcı etkilerini engellemek için koruyucu hekimlik uygulamaları gebelikten başlayıp, ağız sağlığı/ hijyen eğitimine odaklanılmalıdır.

Anahtar Kelime: Diş çürükleri, Emzirme, Biberon beslenmesi, Ağız sağlığı

Introduction

Early Childhood Caries (ECC) is a common public health problem of global proportions, especially for those living in the developing world. Although dental caries has shown an overall decline worldwide, it remains a problem for a large number of preschoolers (1, 2).

Starting with smooth-surface carious lesions on primary maxillary incisors, it spreads quickly to the remaining teeth, causing severe impairment of the dentition. Pain, infection, eating difficulties and challenges of treating the affected young children makes ECC a complex dental problem (3).

ECC prevalence in literature from developed countries are at 1- 12%, while up to 70% prevalence have been reported from developing countries (4, 5). Although different studies reveal different percentages, socioeconomically disadvantaged children are the most severely affected (6). Countrywide and local studies showed similar high-level prevalence in Turkey. Study by Namal et al. reported 74% caries prevalence in 3-6 year olds (7).

ECC is a chronic, transmissible, infectious disease with a multifactorial etiology (8). Dietary factors significantly associated to ECC are: frequency, timing and amount of sugar consumption (9). Specific dietary factors include daily sucrose intake, nighttime feeding, frequent consumption of sugary drinks (particularly juice)- carbonated drinks, amount and frequency of sweet intake, frequent feeding during the day (10-12). Complex interactions between the use of sweetened pacifiers, breastfeeding on demand, neglected oral hygiene, Streptococcus mutans (MS), maternal education and dental health awareness, family structure and social status make its etiology complex (9).

Other factors associated with ECC include: genetic predisposition; parental education; nutritional, environmental, socioeconomic, and parental style factors (13). Education level is considered as an important socioeconomic indicator, and maternal education level is related to the prevalence of dental caries (9, 12).

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Most likely suspected causitive agent for ECC is Streptococcus mutans (MS). Establishment and expression of its infection depends on diet and transmission. MS may be transmitted from a vertical or a horizontal source. Maternal saliva is the primary source for vertical MS transmission for children (4). Factors related to infant feeding practices such as frequent exposure to sugar, frequent snacking, feeding sweetened drinks in bed, sharing foods with adults, as well as maternal caries status, oral hygiene and dietary habits predispose to early MS colonization and establishment of high MS counts. Vertical transmission is the main route for MS colonization. Evidence for horizontal transmission may be also important due to socioeconomic changes in Western culture ie. use of day care facilities when both parents are employed (4, 14).

Our study aimed to investigate possible risk indicators, feeding habits of preschoolers and maternal oral health in Istanbul, Turkey.

Materials and Methods

Sample Size Calculation

Sample size calculation was based on a previous study conducted in our department. Eighty percent caries prevalence with 5% error and 95% confidence interval resulting in a minimum sample size of 243 subjects.

Study Population

This study was carried out in Marmara University Department of Pediatric Dentistry during a period of 3 months (between September- December 2014) in children aged 36- 71 months fulfilling eligibility criteria and whose parents agreed with a written consent to participate after its purpose was explained. Socioeconomically disadvantaged children makes up the majority of the patient profile.

Systemically healthy children who have completed their primary teeth eruption and mothers of the children who were diagnosed with ECC were included in the study. Two hundred sixty six children were enrolled. Children and ECC mothers were clinically examined and a structured questionnaire was filled. Ethical approval was taken fom Marmara University Ethical Committee (Protocol Number:129).

Eligibility Criteria

Age 36- 71 months

Mother present in the examination

Child willing to participate- cooperative for examination

Completed primary dentition

No history of systemic illness

Survey and Clinical Examination

Two dentists filled out a questionnaire (Table 1) by interviewing mothers at the visit. Two calibrated examiners conducted clinical exams and kappa value was 0.8 tested on 25 children out of the sample. (MS, KS). In order to avoid potential bias, the same interviewer did not perform oral examinations. The child/mother was seated on dental chair and dental examination was performed on dry surfaces; cavitated and visible carious teeth were noted according to World Health Organization criteria (15), on the examination form; DMFT and dmft scores were recorded. Each child was classified;

1. No clinical caries (NC)
2. With Caries
    a) Early Childhood Caries (ECC): Presence of 1 or more decayed, missing, or filled tooth surfaces in any primary tooth in a child under 6 yrs of age.

b) Severe ECC (S-ECC): Decayed, missing, or filled scores of ≥ 4 (ages 3 to < 4), ≥ 5 (ages 4 to < 5), or ≥ 6 (ages 5 to < 6) (8).

The results were reviewed from both disease perspective as caries/ NC and according to AAPD ECC criteria in order to study specific clinical features of this diagnosis approach (NC/ ECC/ S-ECC).

Descriptive statistics were used for continuous variables (mean, median, standard deviation, maximum, minimum). Independent and nonnormally distributed data were analyzed using Kruskal Wallis, post hoc Mann Whitney U tests with Bonferroni corrections for three groups and Mann Whitney U for two group comparisons. Categorical variables were compared for statistical differences across groups using X^2 tests and Fisher's exact tests. Spearman's rho was used for correlations. Statistical significance was set $p< 0.05$. Statistical analyses was performed using MedCalc Statistical Software version 12.7.7 (MedCalc Software bvba, Ostend, Belgium; http://www.medcalc.org; 2013).

Results

Demographic Data

Two hundred sixty six children (mean age± standard deviation) (4.41± 0.87) were enrolled in the study (Figure 1), 104 girls and 162 boys. Forty (15.04 %) children (17 girls and 23 boys) were diagnosed with ECC, 209 children (78.57 %, 77 girls, 132 boys) were diagnosed with S-ECC and 17 (6.39 %) children (10 girls and 7 boys) had no clinical caries (NC). Gender distribution was not different across groups (p=0.181). Median dmft (min- max) for ECC group was 3 (1- 5) and 10 (4- 20)

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for S-ECC group (3). Age was not different between groups (p= 0.36) but dmft of children was significantly different between groups (p< 0.01). Majority of the mothers (57.7 %) and fathers (50.6 %) were primary school graduates. Parental education level was not different between NC, ECC and S-ECC diagnoses (Fisher's exact, p= 0.888, p= 0.104).

Child Feeding/ Dietary Practices

Two hundred and fifty- five (96.2%) mothers in the whole sample practiced breastfeeding. Duration of breastfeeding was not statistically different among groups. (Table 2) There was no significant association between breastfeeding beyond 24 months and caries (Fisher's exact test, p= 0.743).

Overall 178 (66.91 %) of the children was bottle-fed. 28 (10.52 %) children with ECC, 140 (52.63 %) S-ECC and 11 (4.14 %) NC was bottle-fed. Timing of bottle-feeding (daytime/ nighttime/ both) was not different among study groups (Fisher's exact = 0.873). Number of children bottle-fed with water, milk, fruit juice and formula was higher in S-ECC group than ECC group during daytime. Nighttime fruit juice and formula was not different between S-ECC and ECC but milk was more common in S-ECC group (p= 0.002) (Table 3).

Majority (94.7%) of children were snacking between meals in the whole sample. Times of snacking between meals was not different among three groups (p= 0.258). Children diagnosed with S-ECC were snacking more frequently with sweets more than ECC children during the day (p= 0.012).

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Dental Health Behaviors

Median age of children at first dental visit was statistically different between groups (p= 0.002). First dental visit in S-ECC kids were significantly earlier than ECC, and NC (p< 0.05). Time for beginning tooth brushing (started eruption/ age 1/ age 2/ age 3) was not different between all groups (p= 0.889). Frequency of tooth brushing was no different among three groups (p= 0.44) and 82% of the children were using toothpaste for brushing but this was not different between groups (p= 0.155).

Hundred and thirty-two children had at least one sibling; half of the families (49.6 %) had two children. Frequency of single kids versus kids with at least one sibling was not significantly different between three groups (p=0.548). Median (min- max) DMF-T scores for ECC group mothers 0 (0-18) was significantly higher than S-ECC mothers was 8 (0-21) (p< 0.001). Number of mothers with visible dental plaque (Fisher's exact, p<0.01) and median DMFT scores (p< 0.001) was higher in S-ECC than ECC. Maternal DMF-T scores correlated significantly with their children's dmf-t in the whole sample (r= 0.547, p<0.01). Although majority of the mothers 233 (90%) do not put their infant's pacifier or feeding bottle in their mouth, nearly half of the mothers admitted (44.2%) they do not refrain from tasting their kids meal with his/her spoon which is significantly higher in S-ECC group than ECC group (p< 0.01).

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Discussion

Epidemiological studies show that its ECC prevalence varies from population to population; however, disadvantaged children, regardless of race, ethnicity or culture, are most vulnerable (16). Our study was carried out in a government funded University Clinic in Istanbul, the most densely populated city in the country. Majority of the patients are referred form all over the city for their extensive dental treatment needs. Participants to our study are routine incoming patients seeking advanced dental treatment covered by government insurence for children below 18 years of age. This level of caries prevelance is significantly higher than 69,8% caries prevalenceof five year olds reported by Gokalp et al. (17) and 70.5 % reported in 9- 57 months old children by Olmez et al. (18).

Breast-feeding presents immunological, nutritional and psychological advantages. Although breast milk is non - cariogenic, it does contain lactose which can be used by cariogenic bacteria to produce acids (19, 20). Ad libitum breastfeeding or breastfeeding for longer duration decreases the plaque pH, and thereby increases the risk of ECC (21). A regression analysis by Nunes et al.(11) reported that prolonged breastfeeding per se was not a risk factor for early childhood caries. Duration of breastfeeding was not different between groups in our study similar to Paglia et al (2). The association between caries and a child ever breastfed should be interpreted with accompanying dietary habits.

Caries depends on multiple factors but diet, oral hygiene are two of the highest ranked. Due to the historical evolution of ECC concept, baby bottle use has been inquired in many studies, and recommended by the AAPD to be used without sugar containing liquids (8, 10-12, 18). Bottle-feeding was practiced by 66.91% in the whole sample and, duration or its timing was not different between groups. Bottle use, especially with sweetened liquids has been associated to ECC in the literature (12, 22). But it is reported not to be an implenting factor in all cases (23).

Frequent snacking increases the acidogenic/aciduric bacteria colonization and subsequently leads to dominance of the MS, with progression of caries lesions (9). Increased amount of sugar- snacks and

it's between meals consumption, are significant caries risk factors (24). Snacking frequency between meals was not different in our study but higher in S-ECC than ECC. According to Rosenblatt et al. (10) prevalence of caries and the number of sugary snacks between meals and a cariogenic diet were strongly related to ECC.

Questionnaire method is a common methodology used in ECC studies and is a shortcoming in our study (12, 25). This method of history taking depends on mother's recollection of the past and motives of social desirability may cause information bias. The other shortcoming of our study is lack of microbiological evidence to support MS transmission from mother similarly by Agarwal et al. (9). Influence of the parents on their children's oral hygiene and eating preferences has been reported repeatedly but the motives behind those actions are unknown to the dental community (5). Examining parental rearing styles concerning child's oral health beyond socioeconomic status, emphasis on the child-parent interaction mayshed more light on this issue.

According to King et al. (26) most children receive the benefit of oral hygiene practice by their first year. There was only a marginal increase in the caries prevalence of those children in whom initiation of tooth brushing/cleaning was delayed (26, 27). Majority of the children started toothbrushing after 3 years of age, and intitiation time was not different between study groups in our study.
Being the primary caretaker of the child makes mother influential on the eating, oral hygiene practices of the child (28). Besides her influence on eating and oral hygiene, mothers are also a potential source for MS transmission if they engage in practices such as tasting the infant's food and sharing eating utensils (29). Higher maternal DMFT scores were reported in ECC compared with children without caries previously (2) and this result was reaffirmed between ECC and S-ECC mothers in our study. Salivary transmission link has been established more than three decades ago, unfortunately a significant portion of the mothers in our study share utensils for tasting their childs meal and this behavior is significantly higher in S-ECC group than ECC.

Mother- child oral hygiene levels correlated in our study smiliar to Mohebbi et al (25). Mother's caries experience was moderately correlated to their children's caries level in agreement with Zanata et al.(30) and Agarwal (9). Caries experience correlation in mother- child pairs may be the result of both salivary transmission and maternal neglect towards their child's oral hygiene. Preschool

children's hand dexterity is generally accepted as insufficient to effectively perform toothbrushing thus needing parental assistance is necessary (20, 31). Although we failed to measure parental supervision during toothbrushing, imbalance between reported child toothbrushing frequency by parents and caries experience of the sample might be due to this.

First dental visit is recommended before 12 months of age but still data indicate that approximately 9% in USA and 40% of 3-4 year olds in Australia are taken to a dental Professional (1). In our study, median age of the children with ECC at the first dental visit was 4 years and age of first visit was not different between study groups. This represents the direct result of mentality; to seek dental care when and if you perceive dental pain in the country (32, 33). But the situation is also a paradox considering the frequent check up's at young ages performed by pediatricians.

In Turkey government has taken a step in 2008 to provide access to primary healthcare for all citizens. In these clinics medical doctors provide basic exams, vaccinations and referral to advanced facilities if necessary. In order to change this caries trend in the country in the years to come integration of dental exams to children's regular medical visits and reaching out non- dental medical professionals to create awareness can be considered.

Early childhood caries has been reported by numerous researchers in varying degrees in Turkey (7, 18, 34). Caries' affect the child's physical, emotional well- being destructively and economically burden the healthcare system. Parental influence on their children's caries experience is certain but the motives behind those actions are unknown to the dental community. Parental rearing styles concerning child's oral health needs to be examined beyond socioeconomic status with the inclusion of child- parent interaction. Evidence from this current study can be used to help caries prevention in the future and risk minimization activities in preschool children.

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Conclusion

Mother's influence on oral hygiene and health was apparent in preschoolers with caries. Preventive measures should begin from the pregnancy and focus on oral health/ hygiene education to mothers to avoid it'sdevastating effects.

Acknowledgement

None

Conflict of Interest

None

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References

1. Arora A, Schwarz E, Blinkhorn AS. Risk factors for early childhood caries in disadvantaged populations. J Investig Clin Dent 2011; 2:223-8. PubMed PMID: 25426892.
2. Paglia L, Scaglioni S, Torchia V, De Cosmi V, Moretti M, Marzo G, et al. Familial and dietary risk factors in Early Childhood Caries. Eur J Paediatr Dent 2016;17:93-9. PubMed PMID: 27377105.
3. American Academy of Pediatric Dentistry. Policy on Early Childhood Caries (ECC): Unique Challenges and Treatment Options. Pediatr Dent 2003;25:328-33.
4. Fung MHT, Wong MCM, Lo ECM, Chu CH. Early Childhood Caries: A Literature Review. Oral Hyg Health 2013;1:1-7.
5. Hooley M, Skouteris H, Boganin C, Satur J, Kilpatrick N. Parental influence and the development of dental caries in children aged 0-6 years: a systematic review of the literature. J Dent 2012;40:873-85. PubMed PMID: 22842202.
6. Berkowitz RJ. Causes, treatment and prevention of early childhood caries: a microbiologic perspective. J Can Dent Assoc 2003;69:304-7. PubMed PMID: 12734024.
7. Namal N, Vehit HE, Can G. Risk factors for dental caries in Turkish preschool children. J Indian Soc Pedod Prev Dent 2005;23:115-8. PubMed PMID: 16224128.
8. American Academy of Pediatric Dentistry. Policy on Early Childhood Caries (ECC): Classifications, Consequences, and Preventive Strategies. Pediatr Dent 2016;37:50- 2.
9. Agarwal V, Nagarajappa R, Keshavappa SB, Lingesha RT. Association of maternal risk factors with early childhood caries in schoolchildren of Moradabad, India. Int J Paediatr Dent 2011; 21: 382-8. PubMed PMID: 21668809.
10. Rosenblatt A, Zarzar P. Breast-feeding and early childhood caries: an assessment among Brazilian infants. Int J Paediatr Dent 2004;14:439-45. PubMed PMID: 15525313.
12. Nunes AM, Alves CM, Borba de Araujo F, Ortiz TM, Ribeiro MR, Silva AA, et al. Association between prolonged breast-feeding and early childhood caries: a hierarchical approach. Community Dent Oral Epidemiol 2012;40:542-9. PubMed PMID: 22725605.
13. Hallett KB, O'Rourke PK. Social and behavioural determinants of early childhood caries. Aust Dent J 2003;48:27-33. PubMed PMID: 14640154.
14. Qin M, Li J, Zhang S, Ma W. Risk factors for severe early childhood caries in children younger than 4 years old in Beijing, China. Pediatr Dent 2008;30:122-8. PubMed PMID: 18481576.
15. Vadiakas G. Case definition, aetiology and risk assessment of early childhood caries (ECC): a revisited review. Eur Arch Paediatr Dent 2008;9:114-25. PubMed PMID: 18793593.
15. WHO. Oral Health Surveys. Basic Methods. 4th ed. Geneva: World Health Organization; 1997.
16. Caufield PW, Li Y, Bromage TG. Hypoplasia-associated severe early childhood caries--a proposed definition. J Dent Res 2012; 91: 544-50. PubMed PMID: 22529242.
17. Gokalp S, Dogan G, Tekcicek M, Berberoğlu A, Unluer S. The Oral Health Profile of 5,12 and 15 Year Olds, Turkey-2004. Hacettepe Dis Hekimligi Fakultesi Dergisi 2007; 31: 3-10.
18. Olmez S, Uzamis M, Erdem G. Association between early childhood caries and clinical, microbiological, oral hygiene and dietary variables in rural Turkish children. Turk J Pediatr 2003; 45: 231-6. PubMed PMID: 14696801.
19. Aimutis WR. Lactose cariogenicity with an emphasis on childhood dental caries. International Dairy Journal 2012; 22: 152-8.

20. Gopal S, Chandrappa V, Kadidal U, Rayala C, Vegesna M. Prevalence and Predictors of Early Childhood Caries in 3- to 6-year-old South Indian Children--A Cross-sectional Descriptive Study. Oral Health Prev Dent 2016; 14: 267-73. PubMed PMID: 26870850.
21. Subramaniam P, Prashanth P. Prevalence of early childhood caries in 8 - 48 month old preschool children of Bangalore city, South India. Contemp Clin Dent 2012; 3: 15-21. PubMed PMID: 22557891.
22. Ozer S, Sen Tunc E, Bayrak S, Egilmez T. Evaluation of certain risk factors for early childhood caries in Samsun, Turkey. Eur J Paediatr Dent 2011; 12: 103-6. PubMed PMID: 21668281.
23. Reisine S, Douglass JM. Psychosocial and behavioral issues in early childhood caries. Community Dent Oral Epidemiol 1998; 26: 32-44. PubMed PMID: 9671198.
24. Ozen B, Van Strijp AJ, Ozer L, Olmus H, Genc A, Cehreli SB. Evaluation of Possible Associated Factors for Early Childhood Caries and Severe Early Childhood Caries: A Multicenter Cross-Sectional Survey. J Clin Pediatr Dent 2016; 40: 118-23. PubMed PMID: 26950812.
25. Mohebbi SZ, Virtanen JI, Murtomaa H, Vahid-Golpayegani M, Vehkalahti MM. Mothers as facilitators of oral hygiene in early childhood. Int J Paediatr Dent 2008; 18: 48-55. PubMed PMID: 18086026.
26. King NM, Wu, II, Tsai JS. Caries prevalence and distribution, and oral health habits of zero- to four-year-old children in Macau, China. J Dent Child (Chic) 2003; 70: 243-9. PubMed PMID: 14998209.
27. Ayhan H. Influencing factors of nursing caries. J Clin Pediatr Dent 1996; 20: 313-6. PubMed PMID: 9151624.
28. Mattila ML, Rautava P, Sillanpaa M, Paunio P. Caries in five-year-old children and associations with family-related factors. J Dent Res 2000; 79: 875-81. PubMed PMID: 10765963.
29. Litt MD, Reisine S, Tinanoff N. Multidimensional causal model of dental caries development in low-income preschool children. Public Health Rep 1995; 110: 607-17. PubMed PMID: 7480616.
30. Zanata RL, Navarro MF, Pereira JC, Franco EB, Lauris JR, Barbosa SH. Effect of caries preventive measures directed to expectant mothers on caries experience in their children. Braz Dent J 2003; 14: 75-81. PubMed PMID: 12964648.
31. Sheehy E, Hirayama K, Tsamtsouris A. A survey of parents whose children had full-mouth rehabilitation under general anesthesia regarding subsequent preventive dental care. Pediatr Dent 1994; 16: 362-4. PubMed PMID: 7831142.
32. Mumcu G, Sur H, Yildirim C, Soylemez D, Atli H, Hayran O. Utilisation of dental services in Turkey: a cross-sectional survey. Int Dent J 2004; 54: 90-6. PubMed PMID: 15119799.
33. Topaloglu-Ak A, Eden E, Frencken JE. Managing dental caries in children in Turkey--a discussion paper. BMC Oral Health 2009; 9: 32. PubMed PMID: 19939240.
34. Dogan D, Dulgergil CT, Mutluay AT, Yildirim I, Hamidi MM, Colak H. Prevalence of caries among preschool-aged children in a central Anatolian population. J Nat Sci Biol Med 2013; 4: 325-9. PubMed PMID: 24082726.

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Figure 1. Flowchart of participating children in the study

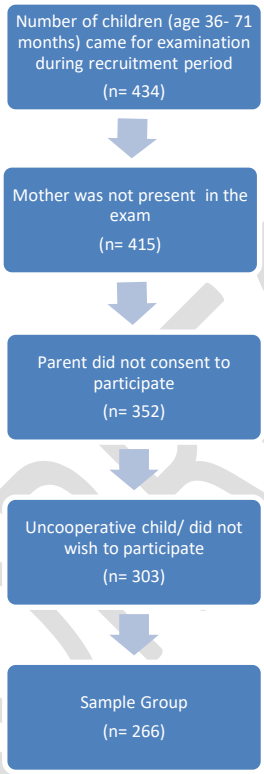

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Table 1. Contents of the questionnaire

Demographic Data
Age Gender Mother's education level (None/ Elementary/ High school/ University) Number of siblings
Child Feeding Practices
History, timing and duration of breast feeding (Yes/ No, Day/ Night/Day and Night, 0-6 months/ 1 year of age/ 2 years of age/ 3 years of age/ 3+ years of age) History, timing and duration of bottle feeding (Yes/ No, Day/ Night/Day and Night, 0-6 months/ 1 year of age/ 2 years of age/ 3 years of age/ 3+ years of age) Contents of bottle feeding (Daytime; Water/ Milk/ Juice/ Formula, Nighttime; Water/ Milk/ Juice/ Formula) Frequency of snacking with processed sweets, confectionary/ day (Yes/ No, 1-3 times a day/ 3+ times a day)
Dental Health Behaviours
Age of first dental examination Age of commencement of toothbrushing (Not Brushing/ Upon tooth eruption/ 1 year of age/ 2 years of age/ 3- 4 years of age) Toothpaste use Frequency of toothbrushing (Not brushing/ Once a day/ Twice a day) Mother's DMFT value Visible dental plaque presence/ absence in mother

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Table 2. Breastfeeding Duration

	None	0-6 months	Age 1	Age 2	Age 3	Age 3+	Total	p
NC	2(11,8)	4(23,5)	4(23,5)	5(29,4)	1(5,9)	1(5,9)	17(100)	0.235
ECC	3(7,5)	11(27,5)	6(15)	12(30)	7(17,5)	1(2,5)	40 (100)	
SECC	5(2,4)	37(17,7)	39(18,7)	89(42,6)	32(15,3)	7(3,3)	209(100)	
Total	10(3,8)	52(19,5)	49(18,4)	106(39,8)	40(15)	9(3,4)	266(100)	

Fisher's Exact

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Table 3. Daytime/ Nighttime bottle content

	Daytime						Nighttime					
	Milk		Juice		Formula		Milk		Juice		Formula	
	No	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**
ECC	39 (97,5)	2 (2,5)	40 (100)	0	39 (97,5)	1 (2,5)	39 (97,5)	1 (2,5)	40 (100)	0	39 (97,5)	1 (2,5)
S- ECC	123 (58,9)	86 (41,1)	166 (79,4)	43 (20,6)	154 (73,7)	55 (26,3)	160 (76,6)	49 (23,4)	202 (96,7)	7 (3,3)	188 (90)	21 (10)
p	<0.01		<0.01		<0.01		<0.05		>0.05		>0.05	

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