Prevalence of Early Childhood Caries (ECC) and the Related Factors among 3-5-Year-Old Children in Babol, Iran

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Abstract

Statement of the Problem: Regular dental attendance is critical for maintaining and improving children’s oral health and well-being.

Purpose: This study aimed to investigate the prevalence of early childhood caries (ECC) and its related factors in children 3-5 years old in Babol, Iran.

Materials and Method: This cross-sectional study was conducted on 280 children aged 3-5 years in the kindergartens of Babol. Children were examined for dental caries according to World Health Organization criteria. The variables such as age, gender, health and nutritional habits, parents’ educational level, parents’ job status, and dental care were recorded in the questionnaire. Data were analyzed using T-test, chi-square and Anova and p< 0.05 was considered significant.

Results: Average decayed-missing-filled teeth (dmft) was 4.03±3.6 and 73.2% of children had ECC, while 26.8% were caries-free. A significant association was found between age, snack consumption, father’s education, mother’s job, nocturnal drinking milk, tooth-brushing, and dental examination before two years old with ECC.

Conclusion: The results of this analysis showed a high prevalence of ECC in Babol. Therefore, educational and interventional programs in prevention and dental health care, especially for mothers, nurses and teachers of these age groups, should be considered.

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Introduction

Against the significant improvement of oral health in the past few decades, dental caries is among the most common chronic diseases of early childhood [1]. Different terms have been used to refer to the presence of dental caries among young children. Early childhood caries (ECC) is described as “the presence of one or more decayed tooth (non-cavitated or cavitated lesions), missing tooth (due to caries), or filled tooth surfaces in any primary tooth of a 72- month-old or a younger child. In children younger than three-year age, smooth-surface caries indicates severe early childhood caries (S-ECC). From ages 3 through 5, missing teeth (due to caries), one or more cavitated, or filled smooth surfaces in primary maxillary anterior teeth, or missing, decayed, or filled score of≥4 (age 3), ≥5 (age 4), or ≥6 (age 5) surfaces constitutes S-ECC [2].

ECC is an early, moderate, and slow dental decay that affects infants' and toddlers' primary teeth. It progresses on tooth surfaces, which are usually at low risk for caries. These include the labial surfaces of maxillary incisors or buccal and lingual surfaces of mandibular and maxillary molars. This kind of dental decay initially appears as dull white or brown spots on maxillary incisors along the gingival margin, which progresses to the crown destruction, leaving root stumps. In the moderate stage, caries starts to spread to maxillary molars. In the severe stage, the caries proceeding destroys maxillary teeth and reaches mandibular molars. S-ECC advert to children with ‘atypical,’ acute,’ ‘progressive,’ or ‘rampant’
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dental caries. A child with ECC may encounter considerable pain, which may cause difficulty in eating and talking. If the extent of the damage results in the extraction of the anterior teeth by age 2 or 3 years, the child may agonize further developmental delays involving speech articulation and patterns. The consequences are delays in physical development due to poor nutrition, and the pain and discomfort may compromise their desire to eat. Therefore, the pain and suffering associated with caries affect the child's quality of life [3].

ECC incidence in different countries and even between different groups in society varies according to several predisposing factors [3-7]. These factors include frequent consumption of foods containing high sugar and the presence of Streptococcus mutans [3]. However, factors such as parental caries experience, low social class, low family income, and single-parent families are still being discussed [8-9]. The parents' education and social living conditions indicate the family's social level and may be associated with knowledge and skills related to oral health [4, 7]. The impact of nutritional habits on oral health has been discussed in previous studies. Some surveys indicate that breastfeeding and bottle-feeding are related to ECC development [10-11], while others have shown no association between these factors and caries incidence [12-13]. Also, the influence of factors such as the age brushing started, brushing before bed, and brushing time on the prevalence of childhood caries is controversial [12, 14-18].

A prevalence of 51.2% dental caries in Iranian children was reported by Bagherian and Sadeghi [19] in 2013. The severity of the disease slightly increased along with its prevalence and arrived at 55% by 2014 [20] and in 2015, Hamissi [21] reported 68.1% with an overall mean decayed-missing-filled teeth (dmft) score of 3.167 (±3.003).

Because of the controversial results of previous studies regarding the factors associated with ECC and the absence of a newly-published article about the prevalence of this disease in the north of Iran, this study helped to investigate the prevalence of ECC and its related factors in children 3-5 years old in Babol, Iran.

Materials and Method

Sampling and sample size

Stratified cluster random sampling served to examine 280 children 3-5 years old from nine kindergartens in Babol, Iran. Kindergartens were classified based on welfare rating (1 to 3 stars) and samples were randomly selected based on gender quotas and the population in these kindergartens. On the basis of the distribution of kindergartens in the city, 40, 50 and 10 percent of children were selected from 1, 2 and 3 stars' kindergartens. The distribution of boys and girls was equal in each group.

Calibration of the Examiners

The principal researcher examined all studied samples. First, the examiner practiced examinations under a pediatric dentist (master) on a group of 10 children. Then, the examiner and the master examined the group of 20 children alone. This procedure was repeated, and findings were compared until an 85-95% agreement was obtained between the examiner and his master. This examination was repeated in the same group of 20 children a week later for reliability assessment. Results showed an 85 % agreement.

Oral Examination

This cross-sectional study was carried out in the kindergartens of Babol for two months. All clinical examinations were done by a senior dental student using a disposable mirror in natural light. Before the test, the tooth surfaces were cleaned with sterile gauze. Senior dental student examined very young recruited children in the adjoining room in the knee-to-knee position. Intraoral examination to assess dental caries was done according to the World Health Organization criteria [22]. To determine dmft, all filled, decayed, or extracted teeth due to decay were marked in a dental chart.

The examiner asked each child's mother to complete a questionnaire anonymously, including background information: child's age, birth weight, the child's eating habits, child's dental health behavior, parents' education, and parents’ job status.

Measures

Alternative responses for the frequency of tooth brushing were "once daily," "twice or more daily," "sometimes," and "never," but for analysis, were dichotomized as "once and more daily" and “less than once daily” based on optimal tooth brushing [23]. We considered three categories, “Zero time/night,” “1-2 times/night,” and “> two times/night” for drinking milk during the night in the questionnaire. For analysis, we dichotomiz-
Parents’ education was categorized and scored into three levels: first level (both parents had a diploma, score 3), second level (one of them had a diploma, score 2), third level (both parents had less than a diploma, score 1). Also, parents’ job was categorized and scored into three levels: first level (both parents were employed, score 3), the second level (one of them were employed, score 2), third level (both parents were unemployed, score 1). For analysis, we accumulated job and education scores and dichotomized these measures into high (summation of 5 and 6 scores) and low (summation of 2, 3 and 4) as families’ socioeconomic status [24].

Statistical Analysis
We double-checked all data by considering the original survey and examination forms to omit the data entry errors. Descriptive statistics, including frequencies, mean, median, and standard deviation, were carried out to obtain samples’ overall characteristics and prevalence. We use T-test, chi-square and ANOVA for analytical statistics. Significance was set at $p < 0.05$. We analyzed all data by using SPSS software for Windows (version 22).

This study was accredited by the ethical committee of the Babol University of Medical Sciences. The examination date has been notified to the kindergartens’ managers, and mothers were asked to be present on the examination date. Before the test, the study’s goal was described for mothers, and their consent was obtained. Participation in this investigation was entirely voluntary.

Limitations
We utilized a self-administered questionnaire to record all potential associated factors. In this way, many families preferred not to give detailed information, especially about their job status, for personal considerations. Besides, due to the limited sample size, the classification of university education was difficult and unreliable. As with any study carried out on a self-administered questionnaire, the information resulting from parents’ memory may not be completely accurate, mainly due to the long time frame applied in the survey, leading to recall bias.

Results
Two hundred eighty children aged 3 to 5 years (140 boys and 140 girls) have been examined in this study. The mean (±SD) age was 4.45 (±0.71). We selected 28, 140 and 112 children from kindergartens with 3, 2 and 1 star, respectively. The descriptive characteristics of the analysis sample are shown in Table 1. At all, 205 (73.2%) children had ECC, while 75 (26.8%) were caries-free. According to the families’ educational level and occupation status, higher ECC was associated with lower educated fathers ($p < 0.05$) and unemployed mothers ($p < 0.001$), however regarding both parents’ educational level and job status, the higher prevalence was found among children whose parents were in lower education and job level ($p = 0.05$) (Table 2).

Mean (±SD) dmft was 4.03 (±3.6) and mean (±SD) of each part as $d$ (decay), $m$ (missing) and $f$ (filling) were 3.1 (±0.32), 0.2 (±0.82) and 0.72 (±1.48), respectively. The systemic disease was evident among 34 (12.1%) children, which the most popular one was Enz-

### Table 1: Descriptive characteristics of the study sample (n=280)

| Characteristics                      | Frequency | Valid percent |
|--------------------------------------|-----------|---------------|
| Parents’ education and job           |           |               |
| Low                                  | 102       | 36.4%         |
| High                                 | 178       | 63.8%         |
| Nocturnal milk-drinking              |           |               |
| Zero time/night                      | 11        | 3.9%          |
| 1-2 times/night                      | 105       | 37.5%         |
| >2 times/night                       | 164       | 58.6%         |
| Tooth-Brushing                       |           |               |
| ≥1/day                               | 146       | 52.1%         |
| <1/day                               | 134       | 47.9%         |
| Responsible for Brushing             |           |               |
| Child                                | 51        | 18.2%         |
| Parents                              | 47        | 16.8%         |
| Child under the supervision of parents | 182     | 65%           |
| Examination before two years old     |           |               |
| Yes                                  | 17        | 6.1%          |
| No                                   | 263       | 93.9%         |
| Reason of attendance to the dentist  |           |               |
| Examination                          | 47        | 28.7%         |
| Pain                                 | 54        | 32.9%         |
| Filling                              | 49        | 29.9%         |
| Extraction                           | 14        | 8.5%          |
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Table 2: Prevalence of ECC and mean dmft by age, sex, parents’ education-job and kindergarten star (n=280)

| ECC | Age | Sex | Yes | No | p Value | Mean(SD) | p Value |
|-----|-----|-----|-----|----|---------|----------|---------|
|     | 3   |     | 17(45/9%) | 20(54/1%) | 1/68(±2/23) | <0.0017 |
|     | 4   |     | 55(69/6%) | 24(30/4%) | 3/28(±3/2) | 0.2      |
| Gender | 5   |     | 133(81/1%) | 31(18/9%) | <0.001 | 4/93(±7/4) |
| Boy | 99(70/7%) | 41(29/3%) | 3/96(±3/6) | 0.8     |
| Girl | 106(75/7%) | 34(24/3%) | 4/1(±3/5) | 0.2      |
| parents’ education and job | Low | 124(69/7%) | 54(30/3%) | 0.05 | 3/75(±3/5) |
| High | 81(79/4%) | 21(20/6%) | 4/53(±3/6) | 0.6     |
| Kindergarten star | 1 | 78(69/6%) | 34(30/4%) | 4/4(±4/1) | 0.3     |
| 2 | 107(76/4%) | 33(23/6%) | 3/8(±3/1) | 0.05 |
| 3 | 20(71/4%) | 8(28/6%) | 3/51(±3/8) | 0.4     |

Table 3: ECC and dmft by dentistry experience of children (n=280)

| ECC | Examination before Two years old | Yes | No | p Value | Mean(SD) | p Value |
|-----|---------------------------------|-----|----|---------|----------|---------|
|     | 9(52/9%) | 8(47/1%) | 3/36(±3/5) | 0.3     |
|     | 196(74/5%) | 67(25/5%) | 0.05 | 4/76(±7/6) | 0.3     |
| Reason of attendance to the dentist | Examination | 54(100%) | 0(0/0%) | 1/66(±2/6) | <0.001 |
| Pain | 49(100%) | 0(0/0%) | 5/3(±2/4) | 0.001 |
| Filling | 21(44/7%) | 26(55/3%) | 6/43(±3/2) | 0.001 |
| Extraction | 10(71/4%) | 4(28/6%) | 8/14(±5/9) | 0.001 |

Discussion

This survey was performed to evaluate early caries prevalence and severity in 280 children in a city in northern Iran and identify the factors related to this condition. The prevalence in this study was 73.2%. Previous surveys conducted in different parts of Iran have reported various prevalence degrees, as 55% in Shiraz [20], 51.2% in Rafsanjan [19], 63.4%. In Shemiranat [25] and 68.1% in Qazvin [21].

Inconsistent with previous surveys [26-27], we found a significant association between the child’s higher age and the higher ECC prevalence. With the increase in age, the duration of exposure of teeth to cariogenic factors increases. Therefore, it is reasonable that a higher prevalence is seen in older children.

We found a higher incidence of ECC among girls. Conversely, in the study performed by Koya et al. [28], the prevalence was higher in boys. However, Amanlou et al. [29] and Toutouni et al. [30] in Iran found no significant relationship between sex and this disease.

In the current study, the prevalence of early caries in children of higher social class families was significantly higher than that of lower social class ones. Similar findings were reported by Casanova-Rosado et al. [23] and Amanlou et al. [29]. An investigation carried out by Popoola et al. [31] showed that the average number of dental caries in children with higher socioeconomic status seems to be more. In our study, the employment status of parents was considered as a socioeconomic determinant. Higher income can be related to more acc-
Based on the American Academy of Pediatric Dentistry guidelines, a child’s first dental visit should occur before 1-year-old [32]. Our findings showed that children who have a dental examination before two years of age have a lower average dmft. Parents taking their children for regular dental visits are better informed of oral hygiene instructions. If early carious lesions are diagnosed and treated by the dentist in these sessions, the oral environment can be less susceptible to dental caries.

Similar to previous findings [33-35], the higher incidence of early caries was evident among those children who drink or eat sweets after dinner every day, and the intake of candy, soda, or isotonic drinks was more than four days a week.

ECC was related to bottle-feeding and sleeping with a bottle [27,33,36]. We also observed that breastfeeding and frequency of nocturnal milk-drinking increase the number of children with early caries and the mean dmft. Some case report studies suggested that prolonged and excessive breastfeeding is associated with rampant tooth decay in infants [37-38]. There appears to be a clinical consensus between dental practitioners that prolonged and nocturnal breastfeeding is affiliated with an increased ECC risk, especially after 12 months. The controversial issue of the cariogenecity of human milk is still unresolved [39].

Adequate oral hygiene is one of the necessities for avoiding childhood caries. However, in the present study, the vast majority of the children who exhibited poor oral hygiene were characterized by the presence of clinically visible plaque. Higher dental caries was associated with lower supervision during tooth-brushing, revealing insufficient preschoolers’ manual skills to maintain adequate oral hygiene [14,27]. Similarly, our results showed that early caries decreased when parents were responsible for children’s tooth brushing, and they were doing this duty at least one time a day.

### Conflict of Interest
The authors declare that they have no conflict of interest.

### References

[1] Nobile CGA, Fortunato L, Bianco A, Pileggi C, Pavia M. Pattern and severity of early childhood caries in southern Italy: a preschool-based cross-sectional study. BMC Public Health. 2014; 14: 206.

[2] Çolak H, Dülgergil ÇT, Dalili M, Hamidi MM. Early childhood caries updates: A review of causes, diagnoses, and treatments. Journal of natural science, biology, and medicine. 2013; 4: 29-38.

[3] Anil S, Anand PS. Early childhood caries: prevalence, ri-
Prevalence of Early Childhood Caries (ECC) and the Related Factors

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Prevalence of early childhood caries and prevention. Frontiers in pediatrics. 2017; 5: 157.

[4] Singh S, Vijayakumar N, Priyadarshini HR, Shobha M. Prevalence of early childhood caries among 3-5-year-old preschoolers in schools of Morathamahal, Bangalore. Dent Res J. 2012; 9: 710-714.

[5] Priyadarshini HR, Hiremath SS, Puranik M, Rudresh SM, Nagaratnamma T. Prevalence of early childhood caries among preschool children of low socioeconomic status in Bangalore city, India. Journal of International Society of Preventive & Community Dentistry. 2011; 1: 27-30.

[6] Folayan MO, Kolawole KA, Oziegbe EO, Oyedele T, Oshomoji OV, Chukwumah NM, et al. Prevalence and early childhood caries risk indicators in preschool children in suburban Nigeria. BMC Oral Health. 2015; 15: 72.

[7] Prakash P, Subramaniam P, Dorgesh BH, Konde S. Prevalence of early childhood & caries and associated risk factors in preschool children of urban Bangalore, Indian: A cross-sectional study. Eur J Dent. 2012; 6: 141-152.

[8] Wigen TI, Espelid I, Skoar AB, Wang N3. Family characteristics and caries experience in preschool children. A longitudinal study from pregnancy to 5 years of age. Community Dent Oral Epidemiol 2011; 39:31-317.

[9] Dye BA, Vargas CM, Lee JJ, Magder L, Tianoff N. Assessing the relationship between children’s oral health status and that of their mothers. J Am Dent Assoc. 2011; 142: 173-183.

[10] Quadri G, Nourallah A, Spleith CH. Early childhood caries and feeding practices in kindergarten children. Quint Int. 2012; 43: 503-510.

[11] Correa-Faria P, Martins-Junior PA, Vieira-Andrade RG, Marques LS, Ramos-Jorge ML. Factors associated with the development of early childhood caries among Brazilian preschoolers. Brazilian Oral Res. 2013; 27: 356-362.

[12] AL- Jewair TS, Leake JL. The prevalence and risk factors of early childhood caries (ECC) in Toronto, Canada. J Contemp Dent Pract. 2010; 11: 1-8.

[13] Nunes AMM, Alves CMC, Aravjo FB, Ortiz TML, Ribeiro MRC, Silva AAM et al. association between prolonged breastfeeding and early childhood caries: a hierarchical approach. Community Dent Oral Epidemiol. 2012; 40: 542-549.

[14] Jain M, Namdev R, Bodh M, Dutta S, Singhal P, Kumar A. Social and behavioral determinants for early childhood caries among preschool children in India. J Dent Res Dent Clin Dent Pros. 2015; 9: 115-120.

[15] Bissar A, Schiller P, Wolff A, Niekusch U, Schulte AG. Factors contributing to severe early childhood caries in south-west Germany. Clin Oral Invest. 2014; 18: 1411-1418.

[16] Slabinskiene E, Milciusiene S, Narbutaitis J, Vasilieuskienė I, Andruškevičienė V, Bendoraitienė EA, et al. Severe early childhood caries and behavioral risk factors among 3-year-old children in Lithuania. Medicine. 2010; 46: 135-141.

[17] Kowash MB, Alkhabuli JO, Dafaalla SA, Shah A, Khams AH. Early childhood caries and associated risk factors among preschool children in Ras Al-Khaimah, United Arab Emirates. European Archives of Paediatric Dentistry. 2017; 18: 97-103.

[18] Ngoc VT, Chu DT, Le DH. Prevalence of early childhood caries and its related risk factors in preschoolers: Result from a cross-sectional study in Vietnam. PedDent J. 2017; 27: 79-84.

[19] Bagherian A, Sadeghi M. Association between dental caries and age-specific body mass index in preschool children of an Iranian population. J Dent Res. 2013; 24: 66-70.

[20] Edalat A, Abbaszadeh M, Eesvandi M, Heidari K. The relationship of severe early childhood caries and body mass index in a group of 3-to 6-year-old children in Shiraz. J dent. 2014; 15: 68-73.

[21] Hamissi JH. Prevalence of Dental Caries among Preschool Children in Qazvin, Iran: School Screening Programs. J Int Oral Health. 2015; 7: 5-9.

[22] World Health Organization. Oral health surveys: basic methods. World Health Organization; 2013. Available at: https://apps.who.int/iris/handle/10665/97035

[23] Casanova-Rosado AJ, Medina-Solis CE, Casanova-Rosado JF, Vallejos-Sánchez AA, Minaya-Sánchez M, Mendoza-Rodriguez M, et al. Tooth brushing frequency in Mexican schoolchildren and associated sociodemographic, socioeconomic, and dental variables. Medical science monitor: international medical journal of experimental and clinical research. 2014; 20: 938-944.

[24] Holyachi S, Santosh A. Socioeconomic status scales-An update. Annals of community health. 2013; 1: 24-27.

[25] Kalantarib, Rahmannia J, Hatami H, Karkhaneh S, Farsar A, Sharifpoor A, et al. The prevalence of dental caries in primary molars and its related factors in 6 and 7 years old children in Shemiranat health center. J Health Field. 2014; 1: 7-13.
[26] Stephen A, Krishnan R, Ramesh M, Kumar VS. Prevalence of early childhood caries and its risk factors in 18–72-month-old children in Salem, Tamil Nadu. Journal of International Society of Preventive & Community Dentistry. 2015; 5: 95-102.

[27] Olatosi OO, Inem V, Sofola OO, Prakash P, Sote EO. The prevalence of early childhood caries and its associated risk factors among preschool children referred to a tertiary care institution. Nigerian Journal of Clinical Practice. 2015; 18: 493-501.

[28] Koya S, Ravichandra KS, Arunkumar VA, Sahana S, Pushpalatha HM. Prevalence of early childhood caries in children of West Godavari District, Andhra Pradesh, South India: an epidemiological study. Int J Clin Ped Dent. 2016; 9: 251-255.

[29] Amanlou M, Jafari S, Afzalianmand N, Bahrampour Omrany Z, Farsam H, et al. Association of Saliva Fluoride level and socioeconomic factors with dental caries in 3-6 years old children in Tehran-Iran. Iran J Pharm Res. 2011; 10: 159-166.

[30] Toutouni H, Nokhostin MR, Amaechi BT, Zafarmand AH. The prevalence of early childhood caries among 24 to 36 months old children of Iran: Using the novel ICDAS-II method. J Dent. 2015; 16: 362-370.

[31] Popoola BO, Denloye OO, Iyun OL. Influence of parental socioeconomic status on caries prevalence among children seen at the university college hospital, Ibadan. Annals of Ibadan postgraduate medicine. 2013; 11: 81-86.

[32] Committee CA, Subcommittee IO, American Academy of Pediatric Dentistry. Guideline on infant oral health care. Ped Dent. 2012; 34: e148-e152.

[33] Makhdoom S, Khan MA, Qureshi ZU. Assessment of early childhood caries (ECC) and its relationship with feeding practices- a study. Pakistan Oral Dent J. 2015; 35: 254-257.

[34] Nakayama Y, Mori M. Association between nocturnal breastfeeding and snacking habits and the risk of early childhood caries in 18-to 23-month-old Japanese children. J Epidemiol. 2015; 25: 142-147.

[35] Kuriakose S, Prasannan M, Remya KC, Kurian J, Sreejith KR. Prevalence of early childhood caries among preschool children in Trivandrum and its association with various risk factors. Contemp Clin Dent. 2015; 6: 69-73.

[36] Ozer S, Sen Tunc E, Bayrak S, Egilmez T. Evaluation of certain risk factors for early childhood caries in Samsun, Turkey. European Journal of Paediatric Dentistry. 2011; 12: 103-106.

[37] Peres KG, Nascimento GG, Peres MA, Mittinty MN, Demarco FF, Santos IS, et al. Impact of prolonged breastfeeding on dental caries: a population-based birth cohort study. Pediatrics. 2017; 140: e20162943.

[38] Folayan M, Sowole C, Owotade F, Sote E. Impact of infant feeding practices on caries experience of preschool children. J Clinic Ped Dent. 2010; 34: 297-301.

[39] Aarthi J, Muthu MS, Sujatha S. Cariogenic potential of milk and infant formulas: a systematic review. European Archives of Paediatric Dentistry. 2013; 14: 289-300.