Sociodemographic and Behavioral Factors Associated with Early Childhood Caries among Preschool Children of Western Maharashtra

Abstract

Introduction: Early childhood caries is a preventable disease of multifactorial etiology and is a public health problem affecting majority of the preschool-age children of the country. If left untreated, it has many social, economic, and nutritional implications and affects the quality of life of the affected child. Methods: This cross-sectional study was conducted among 200 preschool children of Karad city, western Maharashtra, to assess the prevalence of dental caries among the preschool children and to assess the factors affecting the development of dental caries. Various child-level, parent-level, attitudinal- and family-level factors, and clinical variables were evaluated. Results: High prevalence of caries of 87.5% was observed in the study sample. Bivariate analysis showed a significant association of age of child (P < 0.001), age of mother at birth (P = 0.041), feeding during 1st year (P = 0.034), snacking habits (P = 0.001), and brushing frequency (P = 0.03) with dental caries. On multivariate analysis, the factors of snacking habits (P = 0.003) and age of child (P = 0.002) remained significantly correlated with dental caries. Conclusion: There was a strong and consistent relation of the snacking habits with the prevalence of dental caries among the preschool children of Karad city. There is a need to sensitize the caregivers regarding the role of frequent snacking in dental caries.

Keywords: Early childhood caries, preschool children, secondary caregivers

Introduction

Early childhood caries (ECC) is a serious sociobehavioral and dental public health problem that continues to affect babies and preschool children worldwide. The American Academy of Pediatric Dentistry guidelines defined ECC as the presence of one or more decayed (noncavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in any primary tooth in a child 71 months of age or younger.[1]

A comprehensive review of the epidemiology of ECC showed that its prevalence varies from population to population. Studies from Europe, Africa, Asia, the Middle East and North America, and Canada revealed that the prevalence of ECC in socially disadvantaged groups globally could be as high as 80%.[2–6] The National Oral Health Survey was the first ever national level epidemiological survey in the country on the oral health problems. The study, which took three years (2001-2004) to complete, was based on the prevalence patterns of oral disease in the various states and union territories of India. Published by the Dental Council of India in 2004, the study covered 19 states/union territories. Reports were published for each of these 19 states/UTs. A national report, based on the data from these states/UTs was published to provide the national picture.[7] A study conducted by Mahejabeen et al., in Hubli and Dharwad city, India, reported the disease prevalence in children of 3, 4, and 5 years as 42.6%, 50.7%, and 60.9%, respectively.[8] Similarly, a study by Simratvir et al., in Ludhiana city, reported a dental caries prevalence of nearly 51% among the 3- to 5-year-old children.[9]

If left untreated, ECC impacts the quality of life to an extent similar to other systemic diseases and might lead to dental pain and avoidance of certain types of foods and might interfere adversely with anthropometric and nutritional status, socializing, self-esteem, and learning abilities.[10,11] ECC has also been described as a social, political, behavioral, medical, psychological, economical, and dental problem of multifactorial etiology.[5]

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Access this article online

Website: www.jdr.in

DOI: 10.4103/ijdr.IJDR_158_17

Quick Response Code:

How to cite this article: Jain R, Patil S, Shivakumar KM, Srinivasan SR. Sociodemographic and behavioral factors associated with early childhood caries among preschool children of Western Maharashtra, Indian J Dent Res 2018;29:568-74.
ECC has been associated with demographic characteristics, oral hygiene practices, parental attitudes and awareness, household income, educational status of mother, socioeconomic status (SES), temperament of the child, siblings, pacifiers dipped in honey, children with chronic illness or special health-care needs and other feeding habits, maternal nutrition, psychosocial issues, and parenting practices such as breastfeeding, frequency of fermentable carbohydrates consumption, and dietary habits assessed using pediatric cariogenicity index.[12]

This study is aimed at assessing the association of these multiple factors with the ECC among the preschool children. This study especially focuses on the influence of secondary caregivers such as grandparents or other family members on the dietary habits of the child considering the family structure of the developing countries. Similarly, the influence of the parental sense of coherence, parental stress, and self-efficacy on the child’s oral health will be evaluated.

Detailed information regarding the prevalence and influencing factors of ECC provides a valuable tool in the planning, implementation, and evaluation of oral health promotion programs. Hence, this study was conducted with the aim to investigate the relationship between sociodemographic and behavioral factors associated with ECC in preschool children of western Maharashtra.

This study was conducted with the dual objective of assessing the prevalence of ECC among the preschool children and to find the association between sociobehavioral factors and ECC among the preschool children of Karad city, western Maharashtra.

**Methods**

A cross-sectional, analytical study was conducted among preschool children of Karad city, western Maharashtra. List of preschools and Anganwadis in the area was obtained. From this list, ten preschools and Anganwadis were selected using systematic random sampling technique and from these schools, children were selected randomly using fishbowl method.

Permission to conduct the study was obtained from randomly selected schools. Written informed consent was obtained from the parents/caretakers and they were given the opportunity to decline the participation and were assured that their participation or no participation will not affect the future treatment of their child. Ethical approval was obtained from Institutional Ethics Committee of Krishna Institute of Medical Sciences, Karad, before the initiation of the study. This study was conducted in full accordance with the World Medical Association, Declaration of Helsinki.[13]

A pilot study was conducted to assess the feasibility of the study and to calculate the sample size based on the prevalence of caries among the study population. The sample size was calculated to be 196 based on the prevalence of 87% and error of 5% and 90% precision.

**Selection criteria**

1. Children in the age group of 2–6 years were “included” as complete primary dentition is present in this age group
2. No previous invasive dental procedures such as restorative care or extractions were recorded
3. Noncontributory medical history
4. Patients with positive parental consent.

The following variables were assessed in the questionnaire:

**Sociodemographic variables** – mother’s and father’s education were assessed as primary schooling, secondary schooling/high schooling, graduate, or above. For the purpose of analysis, they were divided into groups as completed “primary education” and “completed secondary education and above.” The study location was chosen as Karad which is a town located in western Maharashtra. For assessing the SES, information on annual household income and family size were obtained. Prasad SES scale was used to calculate the SES of the sample as Class I, II, III, IV, and V based on the per capita income.[14]

**Family-level variables** – information on size of the family as “nuclear family” (parents and children) or “three generational” (grandparents, parents, and children) “joint family” systems (grandparents, parents their siblings, and the children) was obtained. The number of siblings was questioned, and for the purpose of analysis, it was divided as “no siblings” and “one or more” siblings.

Secondary caregivers were considered as the family members who occasionally fed the children with various types of snacks. Whether the secondary caregivers had access to the child’s diet was classified as “yes” and “no.” The items being fed were also recorded as open-ended question.

**Parental-level variables** – prenatal dental advice was recorded as dichotomized response. In pretested standardized parental stress index,[15] 18 items recorded the positive (e.g., emotional benefits, personal development) and negative (demands on resources, restrictions) themes of parenthood on a 5-point Likert scale, general self-efficacy (ten-item scale with response on 4-point scale ranging from “not at all true” to “exactly true”), sense of coherence (13 items with responses ranging from 1 to 7), oral health knowledge (score 1 was given for a correct answer and score 0 for a wrong answer, scores ranging from 0 to 8), and age of mother at birth were recorded and were classified as “<=20 years,” “21–30 years,” and “more than 31 years.”
Child-level factors

Child’s oral health rating (excellent, very good, good, and poor), cariogenicity scores of the diet (liquid and solid scores),[12] feeding habits (breastfeeding only, breast- and bottle-feeding, and bottle-feeding only), sleeping with bottle (yes/no), snacking frequency (never, once a day, 2 times, or more), age of initiation of brushing habits, brushing frequency (never, once a day, 2 times, or more), brushing assistance, and visit to dentist were observed.

A pilot study was conducted on twenty children–caregivers’ dyads, to assess face validity, content validity, and reliability of the questionnaire. The reliability was assessed by measuring Cronbach’s alpha and interitem correlations. Test–retest reliability was calculated using intraclass correlation coefficient (ICC). The validity was assessed by correlating all scales with each other. The internal consistency reliability coefficient (Cronbach’s alpha) for the questionnaire was 0.789. The coefficient of test–retest reliability measured by ICC was 0.78.

Clinical examination

Children and caregivers were subjected to type 2 oral examination (ADA).[17] Dental caries levels were recorded with deft index[18] and decayed/missing/filled teeth (DMFT)[19] – d/D decayed, m/M missing, and f/F filled teeth. For the clinical examination, portable dental chair was used. Examiners were trained and calibrated for performing oral health examination under expert guidance in Department of Public Health Dentistry, School of Dental Sciences, Karad. Provisions of examination and interview of few children every day were made, and the corresponding number of sets of sterilized instruments was procured and used for the study.

Statistical analysis

All the data were analyzed using SPSS Inc. Released 2008. SPSS Statistics for Windows, Version 17.0. (Chicago: SPSS Inc.) and P < 0.05 was considered as statistically significant. Presence or absence of caries was the main outcome variable. Mean and standard deviations were calculated for the variables. Chi-square and t-test were used for bivariate analysis to compare the study variables with outcome variable. The variable significantly associated with the outcome variable was subjected to multivariate analysis. Kappa was calculated to assess the reproducibility of the findings by examiners.

Results

The study consisted of a total sample of 200 children and caregivers. Table 1 shows the distribution of the participants according to sociodemographic, behavioral, and clinical variables. The study sample showed 53% males, majority of the sample belonged to age group 4–6 years, and more than half of the parents had secondary education or above. The sample was equally distributed between the SES

| Variables | n (%) | N=Total sample size |
|-----------|-------|---------------------|
| Sex       |       |                     |
| Male      | 106 (53) | 200               |
| Female    | 94 (47)  | 200               |
| Age (years) |     |                   |
| 2         | 10 (5)  | 200               |
| 3         | 35 (17.5) | 200             |
| 4         | 49 (24.5) | 200             |
| 5         | 60 (30)  | 200               |
| 6         | 46 (23)  | 200               |
| Father’s education | |         |
| Primary education | 67 (33.5) | 200             |
| Secondary or above | 133 (66.5) | 200             |
| Mother’s education   |       |                   |
| Primary education | 67 (33.5) | 200             |
| Secondary or above | 133 (66.5) | 200             |
| SES        |       |                     |
| Class 1   | 53 (26.5) | 200             |
| Class 2   | 44 (22)  | 200               |
| Class 3   | 17 (8.5)  | 200               |
| Class 4   | 46 (23)  | 200               |
| Class 5   | 40 (20)  | 200               |
| Feeding during first year of life | |               |
| Breast only | 152 (76)  | 200             |
| Breast and bottle | 47 (23.5)  | 200             |
| Bottle only | 1 (0.5)   | 200               |
| Does your child sleep with a bottle | |               |
| Yes       | 13 (6.5)  | 200               |
| No        | 187 (93.5) | 200            |
| Snacking frequency | |               |
| Never     | 65 (32.5) | 200             |
| Once a day | 94 (47)   | 200             |
| Two times or more | 41 (20.5) | 200           |
| Initiation of brushing habit | |               |
| Before 12 months | 34 (17)   | 200             |
| 1-2 years | 111 (55.5) | 200           |
| More than 2 years | 55 (27.5) | 200           |
| Brushing frequency | |               |
| Once      | 132 (66)  | 200             |
| Twice     | 57 (28.5)  | 200             |
| Thrice    | 11 (5.5)   | 200             |
| Brushing assistance | |               |
| Yes       | 86 (43)   | 200             |
| No        | 114 (57)  | 200             |
| Visit to dentist | |               |
| Yes       | 92 (46)   | 200             |
| No        | 108 (54)  | 200             |
| Prenatal advice for oral health | |               |
| Yes       | 15 (7.5)  | 200             |
| No        | 185 (92.5) | 200         |

Contd...
categories, majority of the children were breastfed and did not sleep with bottle at night and had snacking frequency at least “once” or “more.” Majority of the preschool children started brushing after the age of 12 months, once a day and they did not take any assistance from their parents or caregiver. Similarly, majority did not visit dentist and the mother did not have prenatal dental advice, had good knowledge scores, rated child’s oral health as good, belonged to joint family system, belonged to age group of 21–30 during child’s birth, had one or more siblings, had liquid and solid pediatric cariogenicity scores between 0 and 4, and had deft and DMFT scores more than 0. Nearly one-third of the sample reported the access of secondary caregiver to the diet of the child.

Tables 2 and 3 show the results of association between various sociodemographic, behavioral, and clinical variables and deft levels of the children. There was a statistically significant association between the age of the child \((P < 0.001)\), age of mother at birth \((P = 0.041)\), feeding during 1st year \((P < 0.034)\), snacking habits \((P < 0.0001)\), brushing frequency \((P < 0.039)\), and dental caries levels in the study sample.

Table 4 shows the results of regression analysis in which the variables of snacking habits and age emerged as significant variables after the adjustment of the variables. Kappa values for the DMFT and deft indices were in the range of 0.8–0.86 for both indices, which reflected a high degree of conformity in the observations.

**Discussion**

This study was conducted to assess the prevalence of dental caries and the risk factors for dental caries among the preschool children of Karad city. In the present study, the prevalence of dental caries was found to be 87.5% among the preschool children. These findings are comparable to those of studies conducted in northern Philippines[20] which reported the prevalence of caries to be 59%–92%, and a review of studies among disadvantaged population groups in countries like Europe, Africa, Asia, and Middle East and North America reported the prevalence of caries as high as 70%.[21] These findings can be attributed to the synergistic effect of high snacking frequency, late initiation of toothbrushing among the children, lack of prenatal dental advice, and more number of siblings among others.
In our study, feeding during 1st year of life was found to be significantly associated with dental caries in the study population. These findings are similar to those of reported by Azevedo et al. (2003),[21] Vazquez et al. 2008,[22] and Sankeshwari et al. 2013.[23] Such an association has been attributed to in-between caregiving by Azevedo et al. (2003). In this study, the breastfeeding reported by majority of the sample was “once a day,” and majority of them were not been given any brushing assistance by the caregivers. Bivariate analysis had shown significant association of the brushing frequency and prevalence of dental caries. Brushing habits are indicative of the oral hygiene maintenance of the children, and good oral hygiene is one of the prerequisites of preventing ECC. These findings are similar to the study conducted by Hsieh et al. in Taiwan[27] and Jain et al. in India.[28]

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This study aimed at understanding the influence of secondary caregivers on the child’s diet. Among one-third of the children in whom the secondary caregivers played a role in diet, majority of times, they contributed to food items high on added sugars such as chocolates, sweets, and candies. The multivariate analysis showed a strong correlation of snacking habits.
with dental caries, making it a vital contributing factor in understanding the high prevalence of caries in the study population. Considering the family structure of the present generation, which is a combination of nuclear families and joint families and that both the parents are usually working full time, the role of secondary caregivers needs to be considered and assessed in depth in studies with larger sample sizes.

Most of the child-level, parental-level, family-level, and attitudinal-level factors may not have been significant in this study due to the uneven distribution between the groups and small sample size. Future studies need to be conducted with large sample sizes to assess the confirmatory relation of these factors in the prevalence of dental caries among the preschool children.

**Conclusion**

There was a strong and consistent relation of the snacking habits with the prevalence of dental caries among the preschool children of Karad city. There is a need to sensitize the caregivers regarding the role of frequent snacking in initiation and progression of dental caries. Similarly, considering the commonly seen family structure in the country, the role of secondary caregivers in influencing the snacking habits of the child cannot be undermined. Hence, we as oral health researchers and practitioners need to rally the efforts in educating the primary and secondary caregivers regarding the role of diet in dental caries and its potential to control the caries levels in the children.

**Acknowledgment**

We are grateful to all the parents, caregivers, and children for their kind cooperation during the study duration.

**Financial support and sponsorship**

The ICMR funded the project under the auspices of short-term fellowship program 2015.

**Conflicts of interest**

There are no conflicts of interest.

**References**

1. American Academy of Pediatric Dentistry. Definition of early childhood caries (ECC). Pediatr Dent 2006;28:13.
2. Milnes AR. Description and epidemiology of nursing caries. J Public Health Dent 1996;56:38-50.
3. Reisine S, Douglass JM. Psychosocial and behavioral issues in early childhood caries. Community Dent Oral Epidemiol 1998;26:32-44.
4. Shaw L, Clark DC, Edger NP. The oral health status of Cree children living in Chisasibi, Quebec. J Can Dent Assoc 1987;53:201-5.
5. Hallett KB, O'Rourke PK. Social and behavioural determinants of early childhood caries. Aust Dent J 2003;48:27-33.
6. Johnsen DC, Horowitz HS. Research issues in early childhood caries. Community Dent Oral Epidemiol 1998;26:67-81.
7. Bali RK, Mathur VB, Talwar PP, Chanana HB. National Oral Health Survey and Fluoride Mapping. New Delhi: Dental Council of India; 2004.
8. Mahejabeen R, Sudha P, Kulkarni SS, Anegundi R. Dental caries prevalence among preschool children of Hubli: Dhawad city. J Indian Soc Pedod Prev Dent 2006;24:19-22.
9. Simratvir M, Moghe GA, Thomas AM, Singh N, Chopra S. Evaluation of caries experience in 3-6-year-old children, and dental attitudes amongst the caregivers in the Ludhiana city. J Indian Soc Pedod Prev Dent 2009;27:164-9.
10. Ayhan H, Suskan E, Yildirim S. The effect of nursing or rampant caries on height, body weight and head circumference. J Clin Pediatr Dent 1996;20:209-12.
11. Fettoza S, Colares V, Pinkham J. The psychosocial effects of severe caries in 4-year-old children in Recife, Pernambuco, Brazil. Cad Saude Publica 2005;21:1550-6.
12. Pancholi S, Patil S, Shivakumar KM, Malik N, Pawar R, Suresh KV, et al. Utility of pediatric cariogenicity index among children of Western Maharashtra. J Indian Assoc Public Health Dent 2015;13:1.
13. World Medical Association. World medical association declaration of Helsinki: Ethical principles for medical research involving human subjects. JAMA 2013;310:2191-4.
14. Duda la SR, Reddy KA, Prabhu GR. Prasad’s socio-economic status classification – An update for 2014. Int J Res Health Sci 2014;31:875-8.
15. Abidin R. Parenting Stress Index. Charlottesville, VA: Pediaic Psychology; 1990.
16. Qiu RM, Wong MC, Lo EC, Lin HC. Relationship between children’s oral health-related behaviors and their caregiver’s sense of coherence. BMC Public Health 2013;13:239.
17. American Dental Association. A Dental Health Program for Schools. Chicago (IL): The American Dental Association; 1954. p. 16.
18. Grueb ebl AO. A measurement of dental caries prevalence and treatment service for deciduous teeth. J Dent Res 1944;23:163-8.
19. Klein H, Palmer CE, Knutson JW. Studies on dental caries: I. Dental status and dental needs of elementary school children. Public Health Rep 1938;53:761-5.
20. Figueiredo MJ, de Amorim RG, Leal SC, Mulder J, Frencken JE. Prevalence and severity of clinical consequences of untreated dentine carious lesions in children from a deprived area of Brazil. Caries Res 2011;45:435-42.
21. Azevedo TD, Bezerra AC, de Toledo OA. Feeding habits and severe early childhood caries in Brazilian preschool children. Pediatr Dent 2005;27:28-33.
22. Erickson PR, Mazhari E. Investigation of the role of human breast milk in caries development. Pediatr Dent 1999;21:86-90.
23. Leroy R, Hoppenbrouwers K, Jara A, Declerck D. Parental smoking behavior and caries experience in preschool children. Community Dent Oral Epidemiol 2008;36:249-57.
24. Vázquez-Nava F, Vázquez RE, Saltivar GA, Beltrán GF, Almeida AV, Vázquez RC, et al. Allergic rhinitis, feeding and oral habits, toothbrushing and socioeconomic status. Effects on development of dental caries in primary dentition. Caries Res 2008;42:141-7.
25. Sankeshwari RM, Ankola AV, Tangade PS, Hebbal MI. Association of socio-economic status and dietary habits with early childhood caries among 3- to 5-year-old children of Belgaum city. Eur Arch Pediatr Dent 2013;14:147-53.
26. Hawkes C. Uneven dietary development: Linking the policies and processes of globalization with the nutrition transition, obesity and diet-related chronic diseases. Global Health 2006;2:4.
27. Hsieh HJ, Huang ST, Tsai CC, Hsiao SY. Toothbrushing habits...
and risk indicators of severe early childhood caries among aboriginal Taiwanese. Asia Pac J Public Health 2014;26:238-47.
28. Jain M, Namdev R, Bodh M, Dutta S, Singhal P, Kumar A, et al. Social and behavioral determinants for early childhood caries among preschool children in India. J Dent Res Dent Clin Dent Prospects 2015;9:115-20.
29. Sujlana A, Pannu PK. Family related factors associated with caries prevalence in the primary dentition of five-year-old children. J Indian Soc Pedod Prev Dent 2015;33:33-7.
30. Wulaerhan J, Abudureyimu A, Bao XL, Zhao J. Risk determinants associated with early childhood caries in Uygur children: A preschool-based cross-sectional study. BMC Oral Health 2014;14:136.
31. Biswal I, Nagarajappa R, Srivastava BK. Association between parenting stress and early childhood caries in 4-5 years preschool children of Moradabad, India. Int J Public Health Dent 2010;1:1-4.