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Prevalence and risk-factors of early childhood caries among preschool children

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ABSTRACT

Purpose/Objectives: This research aims to better understand the risk factors for developing early childhood caries (ECC) in preschoolers.

Materials and Methods: Using a standardized questionnaire, a cross-sectional descriptive research was conducted to determine the prevalence of ECC and related risk factors among preschool-aged children.

Results: A total of 600 study participants of age 2–6 years are enrolled in this cross-sectional study. Mean age of the participants was 5.1 ± 0.33 years. Most of the study's participants were in the fifth year of life. When the sexes were broken down, females made up 62% of the population while boys made up 38%. Socioeconomic status, maternal education level at birth, length of bottle use, bottle use before bedtime, and bottle use while sleeping, as well as plaque scores, were all significantly associated with caries experience.

Conclusion: Five-year-olds had the highest prevalence of ECC compared to children of other ages, and there were significant correlations between ECC and socioeconomic status, mother's education level, developmental characteristics like enamel hypoplasia, feeding practices like prolonged and nocturnal bottle feeding, and clinical parameters like plaque scores.

Keywords: Bottle feeding, early childhood caries, enamel hypoplasia, gingivitis, plaque

INTRODUCTION

Caries in babies and toddlers, often known as early childhood caries (ECC), is a significant social and dental issue. [1],[2] Although the frequency of ECC varies from community to

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population, it has been observed that children from underprivileged subpopulations are more susceptible, regardless of race, ethnicity, or culture. [3] Prevalence estimates vary widely; in England they sit between 6.8% and 12%, whereas in the US they range from 11.0% to 53.1%. [4] The condition seems to be most common and severe in the Far East of Asia, where it has a frequency in 3-year-olds ranging from 36% to 85%. [5],[6],[7],[8] Caries has been recorded as a frequency of 44% in children aged 8-48 months in India. [6]

ECC is a multi-factorial disease.[6] Many cariogenic microbes, such as mutans streptococcus, lactobacillus, and time, are present in dental plaque when a susceptible host consumes a fermentable carbohydrate-rich diet. [9]

In 2003, Jose and King assessed the incidence of ECC and its relationship to dietary and dental hygiene behaviors among preschoolers in the Indian state of Kerala. [6] Children from poorer socioeconomic backgrounds, those who ate snacks often, or who were offered snacks as rewards, were shown to have a greater prevalence of caries. According to the published research, there is a robust relationship between enamel abnormalities, premature delivery, and low birth weight. [10]

Most of the kids who go to Anganwadis come from low-income families in rural and urban slums, meaning that they have less access to healthy food, less information about nutrition, and less money to spend on medical care. [11] This demographic certainly has a significant burden of ECC. Therefore, it is crucial to conduct a community-based research to expose the genuine picture of this issue in this group and to identify the connected variables for this problem. As a result, researchers in the Nellore area set out to survey the Anganwadis there to ascertain how common ECC is and what variables could put kids at risk.

MATERIALS AND METHODS

Source of data

Data collected were primary in nature.

Study design

The aim of this research was to use a cross-sectional descriptive approach to determine the prevalence of ECC and potential risk factors among preschool-aged children. Researchers gathered data for 30 days. Ethical approval was received from the institutional review board at prior to the commencement of the investigation.

Sampling

Children were recruited using multistage random sampling. At the first stage, 5 urban divisions were selected. At second stage in each division, 3 Anganwadi centers were selected using lottery method.

Pilot study

The questionnaire was standardized and checked for feasibility using a pilot study in two Anganwadi centers.

Collection of data

This procedure included a dental checkup and a predetermined set of questions. After providing a booklet to parents or guardians detailing the study's goals and why their kid was being asked to participate, we obtained written permission from them. A child's participation in the research was contingent on both the completion of a questionnaire and parental agreement.

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Dental examination

Clinical evaluations were performed with the use of a tooth-drying apparatus, a flat mirror, and a WHO-Community Periodontal Index probe. When both an enamel and dentin lesion were found, caries was diagnosed. Plaque was evaluated using O'Leary et al.'s plaque control record index [12].Before the research began, [13] the examiner was given training and instructions. The examiner was calibrated for plaque and caries detection by examining 10 children younger than 6 years old. The reliability was assessed with kappa statistics (Cohen's kappa=0.86) which means that scores of the examiner are in almost perfect agreement.The questionnaire included the variables of a model which were selected from those reported to have an association with ECC in previous studies. Questionnaire was checked for validity and reliability. Validity was checked using face validity by giving questionnaire to 5 school teachers well versed in both English and Telugu languages to check whether translation for each question from English to Telugu is correctly done or not, their remarks were noted and subsequently modified in the final questionnaire. Reliability of questionnaire was assessed using test-retest design by distributing questionnaire to 5 school teachers to fill the form twice with 7 days apart and analyzed using Cronbach's alpha statistics which was 0.78 showing significant correlation.

Data analysis

Descriptive statistics were used to analyze the data, which was done in SPSS for Windows, version 21. Chi-square analysis was used to look for a correlation between ECC and demographic information. Risk factors for caries were investigated using logistic and linear regression analysis.

RESULTS

In this cross-sectional research, we have recruited 600 children between the ages of 2 and 6 years old. The individuals had a mean age of 5.1. The median age of the study's participants was 5. When the sexes were broken down, females made up 60% of the population while boys made up 40%.

Questionnaire was divided into 5 levels. Level 1 was based on socioeconomic and demographic variables of the participants and their parents/caregivers.

Study participants were also categorized based on socioeconomic status. Most of them were in upper middle class, followed by upper lower and lower class respectively based on Kuppuswamy scale[14]. This scale was originally developed in 1976. It is the summation of education, occupation and income. It is used for urban areas.

Mother's and father's age at childbirth was categorized among the subdivisions, 85% of mothers were in 18–23 years of age group. Sixty percent of fathers were in 19–24 years of age group categories. About 86% of the mother's occupation was described as unemployed and 76% of father's occupation as employees. Majority of the mothers and fathers were in below 10th class category.

Level 2 includes developmental characteristics of study participants at birth. By asking their parents and evaluating delivery records available with their parents, weight at birth was recorded. Weight of the child at birth was broadly divided into <2500 g and ≥2500 g. Gestational age at birth was divided into >37 weeks and ≤37 weeks.

When mothers were asked about the mode of delivery, majority of them reported that it was normal or vaginal delivery. By asking their parents regarding risk factors for enamel hypoplasia and any detection of structural damage of the toothbuds as they emerge in the oral cavity, 4% reported enamel hypoplasia in their children at the age of 2–3 years after birth.

Level 3 indicates general upbringing characteristics between 0 and 2 years of age group. 79 percent of children were breastfed for ≥1 year, 20%for <1 year and 1% were never breastfed.

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Similarly, duration of using bottle was also assessed, 10% reported usage for ≥2 years, 50% of them used for <2 years, and 40% never used bottle feeding. When mothers were asked about child's frequency of using bottle 20% of them reported that they used >3 times/day, 50% of them used ≤3 times/day, and 30% never used bottle for feeding.Most of the mothers reported that they used bottle for night feeding. Moreover, height of the children at 2 years was >2 feet.

Level 4 indicated oral health-related behaviors between 2 and 5 years of age. Majority of mothers gave food sometimes for their children before going to bed. Frequency of sweet consumption was divided into three subcategories ≥1 time/day, <1 time/day , and never. Soft drink consumption was also similarly divided constituting ≥1 time/day, <1 time/day, and never.Eighty-eight percent of the study participants reported that they were brushing ≥1 time/day and always used toothpaste for brushing and 99% of them had never visited dentist earlier for any type of treatment.

Clinical parameters were assessed using O'Leary plaque Index,[13] def, defs Index (1944),[15] and WHO Pro forma (1997).[16]

Logistic regression analysis had been done to assess the association between risk factors and dental caries experience. Age of 5 years of the study participants had higher odds of developing caries as compared to other age groups and mother's occupation as nonprofessional had higher odds for developing caries [Table 1].

Factors	**P**	**OR**	**95.0% C.I. for OR**	
			Lower	**Upper**
Age groups				
2 Years		1.00		
3 Years	0.01	0.41	0.21	0.65
4 Years	0.01	0.45	0.45	0.45
5 Years	0.41	0.76	0.56	1.23
6 years	0.43	0.67	0.34	1.23
Mother's occupation at Child's birth				
Unemployed		1.00		
Professional	0.73	0.91	0.22	2.34
Non-professional	0.01	2.34	1.34	4.11

To analyze the relationship between potential risk variables and dental caries, a linear regression model was developed. There was a strong correlation between caries experience and socioeconomic status, maternal education level, time spent using a bottle, time spent using a bottle while sleeping, and plaque scores.

DISCUSSION

Dental caries is an infectious microbiological disease with multifactorial etiology. Paternal and maternal variables are included as model 1. Among the maternal variables age group of 24–29 years and nonprofessional occupation had higher odds for developing caries which reinforces the stronger mother-child correlation. A strong association between mother's education and presence of caries in their children was also observed in studies reported by Zhou et al.,[17] Jose and King,[6] Hallett and O'Rourke,[18] Livny and Sgan-Cohen.[19]

The link between ECC and the child's age was statistically significant. Caries was more common in children under the age of five than in any other age group. Caries development increases with age, according to a study by Hallett and O'Rourke[18], since primary teeth are left in the mouth for longer. The risk of developing dental caries also rises with age because of changes in the nutrition and oral hygiene routines of children. On the other hand, Gaidhane

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et al.[11] found no statistically significant correlation between a child's age and the development of ECC.
Low socioeconomic status showed statistically significant correlation with caries prevalence. According to Jose and King, people from lower socioeconomic backgrounds are more susceptible to oral and other diseases because they face greater barriers in taking care of themselves, accessing professional oral health-care services, and maintaining a healthy environment. [6]
Model 2 describes child developmental characteristics at 2 years of age. Enamel hypoplasia showed significant association with ECC development.[20] Rythén et al.[21] the evidence supporting the function of enamel abnormalities in the development of ECC was strengthened by the finding that infants born preterm had suffered impaired mineralization of the teeth and worse oral health.
In Model 3, children with prolonged and nocturnal bottle feeding practices had a significant correlation with ECC. al Ghanim et al.,[22] Creedon and O'Mullane,[23] and Hallet and O'Rourke[18] said that this can happen because of how long the alcoholic beverage sits in the mouth.
Model 5 describes that Plaque scores showed significant correlation with ECC. Plaque acts as a reservoir for supply of nutrients to bacteria and prevents buffering of acids by regulating the flow of ions across the membrane, hence leading to increase in progression of caries Mohebbi et al.[24]
Lack of filled component among children in this research is indicative of significant unmet restorative requirements. Naidu et al.[25] described that accessibility and symptom-based attendance for dental care are the major barriers which hinder prevention of ECC at earlier stage.

CONCLUSION

Five-year-olds had the highest prevalence of ECC compared to children of other ages, and there were significant correlations between ECC and socioeconomic status, mother's education level, developmental characteristics like enamel hypoplasia, feeding practices like prolonged and nocturnal bottle feeding, and clinical parameters like plaque scores. As a result, it's crucial to educate parents, educators, and other caretakers on how to spot dental caries early and how to prevent children from developing them. The requirements of the next generation will necessitate the expansion of dental care to outlying places.

REFERENCES

1. Tsubouchi J, Tsubouchi M, Maynard RJ, Domoto PK, Weinstein P. A study of dental caries and risk factors among native American infants. ASDC J Dent Child 1995;62:283-7.
2. Douglass JM. Response to tinanoff and palmer. Dietary determinants of dental caries and dietary recommendation preschool children. J Public Health Dent 2000;60:207-9.
3. Livny A, Sgan-Cohen HD. A review of a community program aimed at preventing early childhood caries among Jerusalem infants – A brief communication. J Public Health Dent 2007;67:78-82.
4. Tyagi R. The prevalence of nursing caries in Davangere preschool children and its relationship with feeding practices and socioeconomic status of the family. J Indian Soc Pedod Prev Dent 2008;26:153-7.
5. Mahejabeen R, Sudha P, Kulkarni SS, Anegundi R. Dental caries prevalence among preschool children of Hubli: Dharwad city. J Indian Soc Pedod Prev Dent 2006;24:19-22.
6. Jose B, King NM. Early childhood caries lesions in preschool children in Kerala, India. Pediatr Dent 2003;25:594-600.

7. Drury TF, Horowitz AM, Ismail AI, Maertens MP, Rozier RG, Selwitz RH, et al. Diagnosing and reporting early childhood caries for research purposes. A report of a workshop sponsored by the National Institute of Dental and Craniofacial Research, the Health Resources and Services Administration, and the Health Care Financing Administration. J Public Health Dent 1999;59:192-7.
8. Bali RK, Hiremath SS, Manjunath P. National Oral Health Survey and Fluoride Mapping 2002-2003. Karnataka: By Dental Council of India, New Delhi; 2004.
9. Ripa LW. Nursing caries: A comprehensive review. Pediatr Dent 1988;10:268-82.
10. Fearne JM, Bryan EM, Elliman AM, Brook AH, Williams DM. Enamel defects in the primary dentition of children born weighing less than 2000 g. Br Dent J 1990;168:433-7.
11. Gaidhane AM, Patil M, Khatib N, Zodpey S, Zahiruddin QS. Prevalence and determinant of early childhood caries among the children attending the anganwadis of Wardha district, India. Indian J Dent Res 2013;24:199-205.
12. Pitts NB, Fyffe HE. The effect of varying diagnostic thresholds upon clinical caries data for a low prevalence group. J Dent Res 1988;67:592-6
13. O'Leary TJ, Drake RB, Naylor JE. The plaque control record. J Periodontol 1972;43:38.
14. Kuppuswamy B. Manual of Socioeconomic Status (Urban). 1st ed. New Delhi: Manasayan; 1981. p. 66-72.
15. Gruebbel AO. Measurement of dental caries prevalence and treatment service for deciduous teeth. J Dent Res 1944;23:163-8.
16. World Health Organization. Oral Health Survey: Basic Methods. 4th ed. Geneva: World Health Organization; 1997.
17. Zhou Y, Lin HC, Lo EC, Wong MC. Risk indicators for early childhood caries in 2-year-old children in Southern China. Aust Dent J 2011;56:33-9.
18. Hallett KB, O'Rourke PK. Pattern and severity of early childhood caries. Community Dent Oral Epidemiol 2006;34:25-35.
19. Livny A, Assali R, Sgan-Cohen HD. Early childhood caries among a Bedouin community residing in the Eastern outskirts of Jerusalem. BMC Public Health 2007;7:167.
20. Caufield PW, Li Y, Bromage TG. Hypoplasia-associated severe early childhood caries – A proposed definition. J Dent Res 2012;91:544-50.
21. Rythén M, Sabel N, Dietz W, Robertson A, Norén JG. Chemical aspects on dental hard tissues in primary teeth from preterm infants. Eur J Oral Sci 2010;118:389-95.
22. al Ghanim NA, Adenubi JO, Wyne AA, Khan NB. Caries prediction model in pre-school children in Riyadh, Saudi Arabia. Int J Paediatr Dent 1998;8:115-22
23. Creedon MI, O'Mullane DM. Factors affecting caries levels amongst 5-year-old children in county Kerry, Ireland. Community Dent Health 2001;18:72-8.
24. Mohebbi SZ, Virtanen JI, Vahid-Golpayegani M, Vehkalahti MM. Early childhood caries and dental plaque among 1-3-year-olds in Tehran, Iran. J Indian Soc Pedod Prev Dent 2006;24:177-81.
25. Naidu R, Nunn J, Kelly A. Socio-behavioural factors and early childhood caries: A cross-sectional study of preschool children in central Trinidad. BMC Oral Health 2013;13:30.