ORIGINAL RESEARCH

Evaluation of Early Childhood Caries and Its Association with Risk Factors among School Children—A Cross-sectional Study

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Abstract

Aim: The study aimed to assess early childhood caries and its correlation with risk variables among school children.

Materials and methods: 242 children under the age of 5 years were clinically assessed and to ascertain early childhood caries, a validated structured questionnaire was utilized. Demographic data (four questions) and oral health-related activities questions (two questions) were included. To verify visible signs of caries on the occlusal, buccal, and lingual surfaces, the community periodontal index (CPI) probe was used. Caries was diagnosed using the WHO criteria for carious lesions Children's saliva samples (3 mL) were taken, and a digital portable pH meter was used to determine the pH level. All data was gathered and statistically analyzed.

Results: The mean age with early childhood caries (ECC) was 4.6 $\pm$ 0.4 and 3.8 $\pm$ 0.8 without ECC. In both the groups, the highest education of mothers was Secondary and less [104 (59%) and 37 (56%), respectively]. In both with and without ECC, the maximum number of mothers Working was 111 (63%) and 41 (62%), respectively. The maximum number of children brushing their teeth once a day in both the groups were139 (79%) and 35 (53%), respectively, and 148 (84%) were using dentifrices to brush their teeth in the ECC group and 37 (56%) were using dentifrices to brush their teeth in without ECC group. The salivary pH is slightly less in with ECC (7.22 $\pm$ 0.34) group compared to without ECC group (7.48 $\pm$ 0.46). And there was a statistically significant difference found between the groups.

Conclusion: The current study demonstrated a significant association between the risk factors under investigation and early childhood caries among school children considered in the present study.

Clinical significance: Identifying children who are at risk might be aided by early screening for caries development. Both developed and developing nations continue to face a major public health issue with ECC. Despite the extensive knowledge that dental health professionals possess about the variables that lead to the development of ECC, it continues to be the most common and neglected oral healthcare requirement in children.

Keywords: Early childhood caries, Oral health-related practices, Risk factors, Salivary pH.

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Introduction

Dental caries is considered to be the most prevalent chronic illness in children that remains neglected. Early childhood caries (ECC) was defined in 2003 by the American Academy of Pediatric Dentistry as any primary tooth in a child up to 71 months of age that has one or more decaying (noncavitated or cavitated), missing (due to caries), or filled tooth surfaces. A diet heavy in fermentable carbohydrates, dental plaque, a high concentration of cariogenic bacteria like Lactobacillus and Streptococcus mutants, and most importantly time are the variables that cause ECC. Certain risk factors for this disorder include dental hygiene practices, frequent medication use, mother's employment position, dietary patterns, and socioeconomic status.[1,2]

Several health issues, including localized pain, infections, and abscesses that cause difficulty chewing, malnourishment, and trouble sleeping, have been associated with ECC. Additionally, children's emotional health, sleep habits, and capacity to learn or carry out daily tasks are all negatively impacted by the pain that comes with dental caries. If left untreated, preschoolers with ECC may endure tooth pain that causes them to avoid particular meals, which could negatively impact their nutritional status.[3]

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Children with neglected and untreated ECC are not only more likely to develop new carious lesions during adolescence, but they are also more likely to experience complications like low self-esteem, changed eating habits, dental pain, and missed school days. These outcomes negatively impact the children's quality of life considering their oral health and general well-being. It is recommended that in order to support the early prevention and management of ECC, the etiology and related variables of this significant public health issue impacting both developed and developing nations should be thoroughly investigated.[4]

In India, there is a low level of awareness regarding dental caries as a preventative illness, and it is commonly believed that primary teeth don't need much maintenance because permanent teeth would eventually replace them.[5] Studies examining the effects of different parenting styles on preschoolers' oral health are few and far between. So, we must assess and investigate the various risk factors and their prevalence in the Indian population, with a particular focus on the implementation of preventive measures in those groups or individuals at risk of developing ECC. A better understanding of the etiology of this condition will lead to better implementation of evidence-based oral health programs. The idea of risk assessment has become more and more important in ECC management methods over time. This is because caries prevention measures are thought to be costly, and the illness is not evenly distributed throughout any community.[6]

Nevertheless, there hasn't been much of a practical tool for evaluating caries risk in infants and very young children, and the lack of well-designed studies and the availability of scant data make it difficult to develop a predictive model for risk assessment for preschoolers in India. Hence the present study was conducted to assess ECC and its correlation with risk variables among school children.

Materials and Methods

The present cross-sectional research was conducted at JSS Dental College and Hospital, Mysore, India in 2013; 242 children under the age of 5 years, attending Anganwadi centers (10 centers) were included. All children were included in the study after obtaining informed consent from the parents.

Pilot Study

The purpose of the pilot study was to determine the viability and applicability of proforma, to get an estimate of how long it would take to examine each patient and to plan the study appropriately. A preliminary study was conducted 15 days prior to the commencement of the survey on 20 children (10–15 minutes for each child) of 3- to 5-year-old preschoolers by using simple random sampling, and intra-examiner reliability was assessed. The excellent degree of conformity in observations was revealed by the Kappa coefficient value of 0.8 for intra-examiner reliability with respect to caries detection. Children below 5 years of age and those children willing to participate were included in the study. Children with developmental enamel defects and systemic diseases were excluded from the study.

Collection of Data

To detect the presence of ECC, a clinical examination was conducted apart from using a validated, close-ended, structured questionnaire (total of six questions) in the Kannada language. The questionnaire consisted of the mother's employment situation, her level of education, and the child's demographics (four questions). Questions about dental hygiene habits (two questions) included how often teeth were brushed and how often dentifrice was used. The parents completed the questionnaire and those who were not able to read were assisted by the investigator. Ten minutes were allotted to fill out the questionnaire form. Those with missing data sets or multiple answers were excluded from the present study.

Source of support: Nil
Conflict of interest: None

Clinical Examination

A single investigator used torch light and mouth mirrors to complete the clinical assessment, providing indirect visibility of the tooth's lingual portions. To verify visible signs of caries on the occlusal, buccal, and lingual surfaces, the Community Periodontal Index (CPI) probe was employed. The children were positioned in chairs for the examination, and the infants were evaluated using the "knee-to-knee" method while their mothers assisted. The surfaces of the teeth were cleaned and dried with gauze pads before being inspected. Each day 30–40 children were examined on average, according to a prearranged plan for data gathering. For practical purposes, no radiographs were taken. A caries diagnosis was made using the WHO criteria for carious lesions (1997).[7]

Salivary Sample Collection

In order to standardize the time of collection, saliva samples were taken from children in the morning between 9 and 11 a.m. In order to clear any remaining saliva, the children were instructed to swallow the saliva that had formed already. The children's heads were tilted slightly forward during the collection of unstimulated whole saliva. Three milliliters of saliva were collected for biochemical analysis by allowing it to drip from the lower lip into a graduated test tube. Sterile plastic centrifuging tubes were used to hold the collected saliva. Using a digital portable pH meter, the initial pH was determined.

Statistical Analysis

SPSS Version 20.0 was used to statistically analyze the collected data. For every category, descriptive statistics were computed, which included mean, standard deviation, and percentages. ANOVA and the student *t*-test were employed to identify significant group differences. The Chi-square test was used to examine the differences between groups in the categorical data. Every statistical test established significance at a probability value of 0.05 or less.

Results

A total of 242 children below 5 years were included in the present study. An average of 24 children were considered from each Anganwadi center. Out of 242, 176 children were with ECC and 66 were without ECC. Table 1 shows the association of sociodemographic factors in children with and without ECC. The mean age with ECC was 4.6 ± 0.4 and 3.8 ± 0.8 without ECC. Male participants were more in both with [92 (52.2%)] and without [45 (68.1%)] ECC groups. With and without ECC, the maximum mother's education was secondary and less was 104 (59%) and 37 (56%), respectively. In both with and without ECC, maximum number of mothers working was 111 (63%) and 41 (62%), respectively. There was a statistically significant difference between the groups.

Table 1: Association of sociodemographic factors in children with and without early childhood caries

Sociodemographic factors	*With early childhood caries*	*Without early childhood caries*	*p-value*
Age (Mean ± SD)	4.6 ± 0.4	3.8 ± 0.8	0.071
Gender			
Male	92 (52.2%)	45 (68.1%)	0.001
Female	84 (47.8%)	21(31.9%)	
Mother's education			
Illiterate	27 (15.3%)	13 (19.7%)	0.001
Secondary or less	104 (59%)	37 (56%)	
College completed	45 (25.7%)	16 (24.3%)	
Working status of mother			
Working	111 (63%)	41 (62%)	0.001
Nonworking	65 (37%)	25 (38%)	

Table 2: Association of oral health-related practices in children with and without early childhood caries

Oral health-related practices	*With early childhood caries*	*Without early childhood caries*	*p-value*
Frequency of tooth brushing			
Once	139 (79%)	35 (53%)	0.001
Twice	26 (14.7%)	15 (22.7%)	
Don't use	11 (6.3%)	16 (24.3%)	
Dentifrice used			
Yes	148 (84%)	37 (56%)	0.001
No	28 (16%)	29 (44%)	

Table 3: Association of salivary pH in children with and without early childhood caries

Salivary factor	*With early childhood caries*	*Without early childhood caries*	*p-value*
Salivary pH level	7.22 ± 0.34	7.48 ± 0.46	0.001

Table 2 reveals the association of oral health-related practices in children with and without ECC. The maximum number of children brushing their teeth once a day in both the groups was 139 (79%) and 35 (53%), respectively, and 148 (84%) were using dentifrices to brush their teeth in the ECC group and 37 (56%) were using dentifrices to brush their teeth in without ECC group. There was a statistically significant difference between the groups.

Table 3 shows the association of salivary pH in children with and without ECC. The salivary pH is slightly less in with ECC (7.22 ± 0.34) group compared to without ECC (7.48 ± 0.46). And there was a statistically significant difference between the groups.

The present study indicated that there was a strong association between the risk factors studied and ECC among school children considered in the present study.

Discussion

Dental caries is a complex disease, the cause of which has received major attention during the 19th and most of the 20th century. According to the Centers for Disease Control & Prevention, dental caries may be the most common infectious disease affecting children in our country. When children go to kindergarten, more than 40% of them have dental cavities. Early-life caries develop on smooth surfaces and can be an especially virulent type that starts soon after tooth eruption, advances quickly, and negatively affects dentition over time.[8]

In the present study, it was found that the prevalence of ECC was high with an increase in age. Similar results were reported among Kerala children by Jose and King,[9] Ibrahim et al.[10] and Simratvir et al.[11] on Ludhiana children have documented age-related changes, which may be connected to dental caries' cumulative nature. This could be explained by the way children's diets were changed, by unsupervised oral hygiene routines, and by the way more teeth gradually become implicated over time in the absence of treatment.

The present study observed that males had a higher prevalence of ECC than females. Contrarily, Lukacs and Largaespada[12] observed among Guanches children that females have much higher dental caries than males. However, because female teeth erupt earlier than male teeth, they are exposed to the oral cavity for a longer period of time. However, studies conducted by Adekoya-Sofowora et al.[13] among Nigeria children and De Carvalho et al.[14] among Bauru children also showed no significant difference in ECC prevalence between males and females.

In the present study, the mother's education status showed that 15.3% were Illiterate and 59% of mothers were secondary or less educated. The results of this study are similar to Livny et al.[15] study of Jerusalem children and Jin et al.[16] study of Seoul children studies, which demonstrate a significant correlation between a mother's level of education and her children's caries prevalence. This could be explained by the absence of knowledge and instruction regarding dental health care for kids raised by illiterate mothers. A recent study by Schroth et al.[17] of Mannitoba communities revealed no correlation at all between the mother's educational attainment and ECC.

The mean level of salivary pH is slightly reduced in children with ECC compared to children without ECC. Statistics show that there is a statistically significant difference in salivary pH. As the caries scores rise in the caries active group, the salivary pH levels decrease. Lamberts et al.[18] studied salivary pH rise activity in naval recruits without dental caries and those with dental caries. The researchers found a strong association between the samples' minimum pH values and bicarbonate content, but no significant correlation between caries history and salivary pH rise activity. Similarly, Bagherian and Asadikaram[19] stated that the mean resting salivary pH was significantly higher among children without ECC. In contrast to the present study results, Jayaraj and Ganesan[20] study of Puducherry children showed no significant difference between the groups and all salivary parameters assessed. And salivary pH may not serve as reliable markers for risk prediction of ECC.

The information gathered in the present study could be used as a starting point for assessing community development and dental health promotion initiatives. While upcoming community initiatives may raise awareness of ECC, maintaining long-term behavioral change among parents will be the biggest issue. This population's high rate of tooth decay highlights the need for efficient preventive measures. As a result, medical professionals as well as individuals who work with expectant mothers and the very young must be crucial in the prevention and early identification of ECC. As the first line of defense, pediatricians, family doctors, and other healthcare professionals who work with expectant mothers and young children

should be aware of ECC and its implications. Finally, it is important to investigate community-based options, which can be reinforced when combined with both established and cutting-edge tactics to support early children oral health and prevent dental decay.[21,22]

The study had limitations. Some limitations included gathering extensive and reliable information from parents on eating and oral hygiene practices. Additionally, a national assessment on the prevalence of ECC is required to support an oral health promotion program. The present study concentrated on a specific population, that is, Anganwadi children, therefore, the result of the current study cannot be generalized to the whole population of the geography.

Conclusion

The current study demonstrated a significant correlation between the risk factors under investigation and early childhood caries among school children considered in the present study. In this demographic, ECC is a significant public health concern, hence efforts to raise awareness should be made. Mothers and those who work in daycare facilities should be the primary target population for initiatives that promote dental health.

References

1. Curzon ME, Preston AJ. Risk groups: Nursing bottle caries/caries in the elderly. Caries Res 2004;38 Suppl 1:24–33. DOI: 10.1159/000074359.
2. Quinonez R, Santos RG, Wilson S, et al. The relationship between child temperament and early childhood caries. Pediatr Dent 2001;23:5–10. PMID: 11242732.
3. Dimaisip-Nabuab J, Duijster D, Benzian H, et al. Nutritional status, dental caries and tooth eruption in children: A longitudinal study in Cambodia, Indonesia and Lao PDR. BMC Pediatr 2018;5(538):1–10. DOI: 10.1186/s12887-018-1277-6.
4. Li MY, Zhi QH, Zhou Y, et al. Impact of early childhood caries on oral health-related quality of life of preschool children. Eur J Paediatr Dent 2015;16:65–72. PMID: 25793957.
5. Wadhwa P, Goyal A, Gauba K, et al. Risk factors in development of early childhood caries in 12–18-month-old Indian children: A prospective study. J Postgrad Med Edu Res 2022;56(1):7–12. Available from: https://www.jpmer.com/abstractArticleContentBrowse/JPMER/26844/JPJ/fullText.
6. Carino KMG, Shinada K, Kawaguchi Y. Early childhood caries in northern Philippines. Community Dent Oral Epidemiol 2003;31(02):81–89. DOI: 10.1034/j.1600-0528.2003.00010.x.
7. World Health Organization. Oral Health Surveys – basic methods. 4th ed. WHO: Geneva;1997.
8. Sofowora AC, Nasir WO, Taiwo M, et al. Caries experience in the primary dentition of nursery school children in Ile-Ife, Nigeria. African Journal of Oral Health 2006;2:19–25. Available from: https://www.ajol.info/index.php/ajoh/article/view/57020.
9. Jose B, King NM. Early childhood caries lesions in preschool children in Kerala, India. Pediatr Dent 2003;25(6):594–600. PMID: 14733478.
10. Ibrahim S, Nishimura M, Matsumura S, et al. A longitudinal study of early childhood caries risk, dental caries and lifestyle. Pediatr Dent J 2009;19(2):174–180. Available from: https://www.sciencedirect.com/science/article/abs/pii/S0917239409701715.
11. Simratvir M, Moghe GA, Thomas AM, et al. Evaluation of caries experience in 3-6-year-old children, and dental attitudes amongst the caregivers in the Ludhiana city. J Indian Soc Pedo Prev Dent 2009;27(3):164–169. DOI: 10.4103/0970-4388.57097.
12. Lukacs JR, Largaespada LL. Explaining sex differences in dental caries prevalence: Saliva, hormones, and "life-history" etiologies. Am J Hum Biol 2006;18(4):540–555. DOI: 10.1002/ajhb.20530.
13. Adekoya-Sofowora C, Nasir WO, Taiwo M, et al. Caries experience in the primary dentition of nursery school children in Ile-Ife, Nigeria. Afr J Oral Health 2006;3(1-2):19–25. Available from: https://www.ajol.info/index.php/ajoh/article/view/57020.
14. De Carvalho FS, de Carvalho CA, Bastos RS, et al. Dental caries experience in preschool children of Bauru, SP, Brazil. Braz J Oral Sci 2009;8(2):97–100. Available from: https://tspace.library.utoronto.ca/bitstream/1807/58154/1/os09020.pdf.
15. Livny A, Assali R, Sgan-Cohen HD. Early childhood caries among a Bedouin community residing in eastern outskirts of Jerusalem. BMC Public Health 2007;7:167. DOI: 10.1186/1471-2458-7-167.
16. Jin B, Ma D, Moon H, et al. Early Childhood Caries: Prevalence and risk factors in Seoul, Korea. J Pub Health Dent 2003;63:183–188. DOI: 10.1111/j.1752-7325.2003.tb03497.x.
17. Schroth RJ, Moore P, Brothwell DJ. Prevalence of early childhood caries in four Mannitoba communities. J Can Dent Assoc 2005:71;567. PMID: 16202195.
18. Lamberts BL, Pederson ED, Shklair IL. Salivary pH-rise activities in caries-free and caries-active naval recruits. Arch Oral Biol 1983;28(7):605–608. DOI: 10.1016/0003-9969(83)90008-0.
19. Bagherian A, Asadikaram G. Comparison of some salivary characteristics between children with and without early childhood caries. Indian J Dent Res 2012;23(5):628–632. DOI: 10.4103/0970-9290.107380.
20. Jayaraj D, Ganesan S. Salivary pH and Buffering capacity as risk markers for early childhood caries: A clinical study. Int J Clin Pediatr Dent 2015;8(3):167–171. DOI: 10.5005/jp-journals-10005-1307.
21. Kagihara LE, Niederhauser VP, Stark M. Assessment, management and prevention of early childhood caries. J Am Acad Nurse Pract 2009;21:1–10. DOI: 10.1111/j.1745-7599.2008.00367.x.
22. Mani SA, Aziz AA, John J, et al. Knowledge, attitude and practice of oral health promoting factors among caretakers of children attending day-care centers in Kubang Kerian, Malaysia: A preliminary study. J Indian Soc Pedod Prevent Dent 2010;28:78–83. Available from: https://pubmed.ncbi.nlm.nih.gov/20660972/.