

ASSESSMENT OF EARLY CHILDHOOD CARIES (ECC) AND ITS ASSOCIATION WITH FEEDING PRACTICES AND SOCIOECONOMIC STATUS AMONG PRESCHOOL CHILDREN

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ABSTRACT

Background: Early childhood caries (ECC) involves a range of factors, such as diet, feeding, and socioeconomic influences, all of which have a role to play in the formation of ECC. Recognizing these factors is helpful when planning appropriate preventative measures.

Objective: To determine the prevalence of ECC and its association to feeding practices and socioeconomic status in preschool age children.

Methods: An analytical cross-sectional design was used on 125 children in preschool, aged 3 to 5 years. A sample was selected using systematic random sampling of preschools. Feeding practices were documented via the Feeding Practices Questionnaire, which was administered to the caregivers. Responses pertaining to the caregiver's feeding practice (breastfeeding, bottle feeding, nighttime feeding, feeding with sugary foods and drinks, and feeding just before sleep), as well as the caregiver's socioeconomic status, were documented using the Modified Kuppaswamy Socioeconomic Status Scale. Oral examinations were conducted using a mouth mirror and dental probes under good lighting, and the dental caries status was recorded, using WHO criteria, by the DMFT index. Data analysis was conducted using SPSS; a chi-square test was used to examine the associations between the variables. A p-value < 0.05 was significant.

Results: Out of 125 children, ECC was observed in 58 (46.4%) cases. It was more prevalent in children who had multiple nighttime feedings (61.8%), prolonged bottle feedings (58.6%), and frequent intake of sweetened snacks and drinks (60.9%). It was more prevalent in children from lower socioeconomic groups (60.0%), compared to children from upper (28.6%) and middle socioeconomic groups (46.0%). ECC was associated with frequent sweetened food or drink consumption, nighttime feedings, prolonged bottle feedings, and socioeconomic status ($p < 0.05$).

Conclusion: ECC was present in almost 46.4% of preschool children screened. Nighttime feeds, frequent prolonged bottle feeding, and frequent intake of sweetened foods were observed to have a significant association with ECC. It is warranted that preventative counseling of parents be done in the first year of a child's life, with an emphasis on the reduction of frequent exposure of sweetened foods, consumption of appropriate foods, and implementation of good oral health practices, within the early preschool years.

KEYWORDS: caries, feeding, socioeconomics, peads, diet

INTRODUCTION

Early Childhood Caries (ECC) is an important public health concern due to the negative effect on nutrition, growth and the wellbeing of young children. ECC is traditionally defined as the presence of decayed, missing, or filled primary teeth at or before the age of six years, when tooth decay is largely preventable (1). ECC is generally characterized by the presence of one or more decayed, missing, or filled primary tooth surfaces in children younger than six years. Although largely preventable, its occurrence remains high across many populations, particularly among socially disadvantaged children (2).

New data illustrate a tremendous burden of ECC in nearly every region of the world. The data demonstrate a tremendous burden of ECC in some regions of the world compared to others, and a great burden of ECC in certain

socio-economic strata. The data provide the rationale for the need to identify and address the modifiable risk factors for ECC in preschool children (3).

The early childhood period has a great opportunity to influence the development of dental caries through the establishment of healthy dietary and feeding habits. The repeated exposure of primary teeth to cariogenic substances becomes problematic when primary teeth are left in prolonged contact with such substances (4).

ECC has been linked with both bottle-feeding and other feeding activities performed at and around bedtime. Leaving primary teeth in prolonged contact with cariogenic substances becomes problematic with prolonged or inappropriate feeding (4). The association between breastfeeding and the development of ECC caries is unclear. However, it seems that a greater risk of caries is associated with prolonged night time breastfeeding (5).

Ultimately, the daily continuous consumption of sugary snacks and sugary drinks contributes significantly to the development of ECC as an imbalance in remineralization and demineralization processes is sustained (6). Differing socioeconomic conditions impact children's oral health in many ways, including diet, parental education levels, oral hygiene routines, use of health care, and access to preventative dental care. Consequently, economically disadvantaged children are at greater risk for ECC (7).

In similar research in the Middle East, low socioeconomic status, poor diet, parental education levels, and the availability of dental care were found to be contributing factors to ECC. This research shows that ECC is primarily an issue of individual behaviors and social inequities (8).

The research published on preschool-aged children has identified the feeding practices of children, and their socioeconomic status and ECC, reinforcing the need to investigate these factors as a group rather than in the context of dietary behavior (9).

Identifying potential risk factors in the preschool period presents an opportunity to intervene early to stop the development of ECC. The risk of ECC can be decreased and its progression halted by improvements in diet, appropriate feeding, stepwise oral hygiene, exposure to fluoride, and timely assessment by dental professionals (10). Because ECC is multifactorial, analyzing the roles of distinct feeding behaviors and socioeconomic circumstances is necessary for the construction of targeted preventive measures. Local data can assist health practitioners and decision makers construct the most appropriate interventions for the most significant risk factors among preschool children.

METHODOLOGY

An analytical cross-sectional study was conducted with preschool children (3-5 years) to assess the prevalence of early childhood caries (ECC) and the possible role of feeding practices and socioeconomic status. The study included 125 children from selected preschools through systematic random sampling and their parents or caregivers who provided their informed consent. Children were excluded with systemic or oral conditions that could possibly impact the development of caries, children who were in the process of active dental treatment, or subjects whose parents or caregivers were unable to give structured feeding history data.

Data collection tools included a 15-item in Feeding Practices Questionnaire, a clinical dental examination form based on the World Health Organization (WHO) Oral Health Surveys: Basic Methods 5th edition, and the Modified Kuppuswamy Socioeconomic Status Scale. Based on feeding practices related to ECC and literature gaps, the 15-item Feeding Practices Questionnaire was developed specifically for this study. Participants were asked to complete questions about the duration of breastfeeding and bottle-feeding, the length of time bottles were used, the type of liquid used in bottles (milk vs sweetened liquids), bedtime feedings, the frequency of bedtime feedings, time feedings and bottle use when bed feedings occurred, the age at which complementary food was introduced, how many times they fed sweet foods to their kids, how many times their kids drank sweet liquids, the consumption of 'sticky' or cariogenic foods, the frequency of between-meal snacking, parents giving sweet foods as treats, and oral hygiene practice. These items were asked to be completed using a given set of response options so that each response would be amenable to statistical analysis. Because it was a study-specific questionnaire, it was reviewed for clarity and relevance prior to its administration.

To diagnose dental caries, a clinical oral examination was performed following the criteria outlined in the WHO Oral Health Surveys: Basic Methods, 5th edition (2013). The examination was done with the use of a dental mirror and probe in sufficient light, and the index for primary teeth was registered as decayed, missing, and filled teeth (DMFT). For the recording of dental caries, the WHO methodology was used to ensure consistency in clinical assessment. Socio-economic status was evaluated with the help of the Modified Kuppuswamy Socioeconomic Status Scale, constructed by B.Kuppuswamy in 1976. The scale establishes the socio-economic status of the family through the educational level and employment of the family head along with the income of the family, with the income level adjusted as per the corresponding consumer price index.

After obtaining permission from the selected preschools and informed consent from parents or guardians, data collection began. For the collection of data, parents or guardians were interviewed using a 15-item Feeding Practices Questionnaire. Information about the participants' feeding history and dietary practices was collected. For the

interview, additional information such as the age, gender, preschool type, and residence were collected. Parents or the household head were interviewed to collect information for the classification of the socioeconomic status using the Modified Kuppaswamy scale. Once that was completed, the child was taken for an oral examination in a well-lit area. The status of dental caries was recorded on the WHO clinical examination form, and the dmft score was calculated for all participants. The completeness of the questionnaires and oral examination records were checked, and the participants' information was kept confidential.

The collected data were entered and analyzed using IBM SPSS Statistics. Frequencies and percentages were used to summarize the categorical variables, and the prevalence of ECC and the distribution of dmft were analyzed for the study population. The chi-square test was used to study the ECC status and the feeding-practice, and socioeconomic variables. The level of significance was set at p-value <0.05.

RESULTS

A total of 125 preschool children (3–5 years old) participated in the study. The demographic data, the distribution of ECC, the feeding practices, the socioeconomic data, and the associations of ECC were analyzed. SPSS was used for the data analysis.

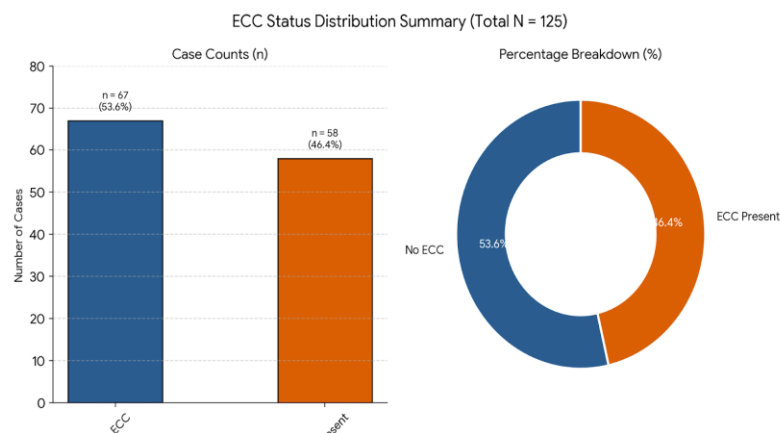
Table 1. Demographic Characteristics of Preschool Children (N=125)

Variable	Category	n	%
Age (years)	3	38	30.4
	4	43	34.4
	5	44	35.2
Sex	Male	65	52.0
	Female	60	48.0
Preschool type	Public	57	45.6
	Private	68	54.4
Residence	Urban	78	62.4
	Rural	47	37.6

Most participants were between the ages of 4-5 years old and over represented males. Most participants described attending private preschool and living in the city.

Table 2. Distribution of Early Childhood Caries among Participants (N=125)

ECC Status	n	%
No ECC	67	53.6
ECC present	58	46.4
Total	125	100.0



DMFT Category

DMFT Category	n	%
0	67	53.6
1–2	25	20.0
3–4	18	14.4

DMFT Category	n	%
≥5	15	12.0
Total	125	100.0

58 (46.4%) children had ECC. The other 53.6% of children were caries free. The proportion of children with caries that showed higher values of dmft was smaller.

Table 3. Distribution of Feeding Practices among Preschool Children (N=125)

Feeding Practice	Category	n	%
Breastfeeding duration	≤12 months	48	38.4
	>12 months	77	61.6
Bottle feeding	No	54	43.2
	Yes	71	56.8
Nighttime feeding	No	59	47.2
	Yes	66	52.8
Feeding before bedtime	No	63	50.4
	Yes	62	49.6
Sugary snacks/drinks	<2 times/day	70	56.0
	≥2 times/day	55	44.0

More than half of surveyed children had a history of bottle feeding and nighttime feeding. 44.0% consumed sugary snacks or drinks two or more times each day.

Table 4. Association Between Feeding Practices and ECC (N=125)

Feeding Practice	Category	ECC n (%)	No ECC n (%)	χ^2	p-value
Bottle feeding	No	17 (31.5)	37 (68.5)	8.02	0.005
	Yes	41 (57.7)	30 (42.3)		
Nighttime feeding	No	20 (33.9)	39 (66.1)	9.41	0.002
	Yes	38 (57.6)	28 (42.4)		
Feeding before bedtime	No	23 (36.5)	40 (63.5)	5.12	0.024
	Yes	35 (56.5)	27 (43.5)		
Sugary snacks/drinks	<2 times/day	25 (35.7)	45 (64.3)	10.76	0.001
	≥2 times/day	33 (60.0)	22 (40.0)		

Bottle feeding with nighttime, bedtime feeds, and intake of sugary foods or drinks were found to be associated with a greater prevalence of ECC in the study group ($p < 0.05$).

Table 5. Association Between Socioeconomic Status and ECC (N=125)

Socioeconomic Status	ECC n (%)	No ECC n (%)	Total	χ^2	p-value
Upper	4 (28.6)	10 (71.4)	14	7.86	0.020
Middle	23 (46.0)	27 (54.0)	50		
Lower	31 (60.0)	20 (40.0)	51		
Total	58 (46.4)	67 (53.6)	125		

There was a positive association between decreasing socioeconomic status and increasing prevalence of ECC ($p = 0.020$). The highest prevalence of ECC was observed in the low socioeconomic group.

Table 6. Overall Association of Selected Risk Factors with ECC (N=125)

Variable	Category Associated With Higher ECC	ECC n (%)	χ^2	p-value
Bottle feeding	Yes	41 (57.7)	8.02	0.005
Nighttime feeding	Yes	38 (57.6)	9.41	0.002
Bedtime feeding	Yes	35 (56.5)	5.12	0.024
Sugary snacks/drinks	≥2 times/day	33 (60.0)	10.76	0.001
Socioeconomic status	Lower	31 (60.0)	7.86	0.020

Analysis revealed associations with ECC (early childhood caries) that were statistically significant for certain feeding habits and socioeconomic status. There were some sugar snacks and drinks eating and drinking habits at nighttime feeding that occurred and they were statistically significant at p of 0.001 and 0.002 respectively.

Note. ECC = early childhood caries; DMFT= decayed, missing, and filled primary teeth.

DISCUSSION

Early childhood caries (ECC) was present in 46.4% of the 125 preschool children studied. Based on this data, ECC can be classified as a significant oral-health problem for preschool children in the study population. The data collected accredit a combination of feeding patterns, diet, and economic factors. The complexity of ECC causes a range of factors which cannot be identified to cause the problem. It is reasonable to assume that the combination of various factors is at least partially responsible for the observed prevalence of ECC.

In the present study, bottle feeding habits had a clear correlation with the presence of ECC. The presence of ECC was recorded for 57.7% of the children who had a history of bottle feeding. For children who were not bottle fed, ECC was recorded for 31.5% and this difference was significant ($p = .005$). Bottle feeding during daytime hours may pose a risk of exposure of primary teeth to cariogenic factors, however feeding prior to bedtime may increase this risk, especially if feedings are performed frequently or repeated throughout the night. The recent systematic review and meta-analysis confirmed that feeding habits and practices are critical nutritional factors associated with ECC. This corroborates the findings of the present study (11).

Nighttime feeding also had a clear correlation with ECC. The presence of ECC was recorded for 57.6% of the children who had nighttime feeds. For children who were not nighttime fed, the presence of ECC was recorded for 33.9% of the subjects ($p = .002$). Adult supervised nocturnal nursing increases the risk of ECC (12).

Feeding before bedtime was found to be associated with ECC in the present study. Children who received bedtime feeding had ECC with a prevalence of 56.5%, compared to 36.5% of children not receiving bedtime feeding. This result was found to be statistically significant ($p = .024$). There is the potential for feeding at bedtime to prolong the exposure of erupted primary teeth to dietary substrates, especially if teeth are not cleaned after the last feeding. Recent research supports the importance of assessing the relationship between ECC and frequent feeding and nighttime feeding, although these feeding patterns need to be examined in conjunction with other dietary and oral health behaviors (13).

Among the findings in the present study, the strongest association with ECC was found with the frequent consumption of sugary snacks and drinks. Among children who reported consuming sugary snacks or drinks at least twice daily, ECC was present in 60.0% of those children compared to 35.7% of children with less frequent consumption of sugary snacks and drinks ($p = .001$). This is consistent with other research which focuses on the relationship of sugar consumption with ECC. A systematic review and meta-analysis reported that each increment in the frequency of sugary food consumption was associated with an increased risk of ECC, with a pooled odds ratio of 1.59 (14).

There was a clear association for socioeconomic status on ECC in this study. ECC prevalence was 28.6% in the higher socioeconomic status group, 46.0% in the middle group and 60% in the lower socioeconomic status group ($p = .020$). In this order, it may be that more disadvantaged groups experience more ECC. Some studies show that social disadvantage is an early risk factor for ECC and that social disadvantage highlights the need for early preventive services for socially disadvantaged children (15).

Socioeconomic status as a risk indicator for ECC may be framed within other social inequalities. There is a social gradient to health and income disparities and are seen in the oral health of children. Children from socioeconomically disadvantaged groups may have a variety of social and health inequities seen in access to health protective services, and dental services in particular. A recent scoping review highlighted social inequality and ECC, including the need for more research in lower and lower-middle income countries. (16).

It appears that many of the observed socioeconomic factors may be addressed and may influence ECC. There were significant associations for frequent consumption of sugary drinks and snacks and nighttime feeding. It may be that in this setting, prevention may include more counseling of parents on feeding practices, less frequent sugary snacks and drinks, avoidance of nighttime feeding post-eruption, and more preventive dental services. It may be particularly important to provide early preventive services for socioeconomically disadvantaged children.

CONCLUSION

Prevalence of early childhood caries (ECC) was high in the preschool children studied at 46.4%. ECC was associated with bottle feeding, nighttime feeding, feeding before bedtime, high frequency of sugar intake, feeding practices, and socioeconomic status. ECC may be caused by a combination of feeding habits, dietary practices, and social factors. As a result of the above findings, early interventions for preschool children include education of parents to approve proper feeding practices, ensure a diet with low sugar, and frequent preventive dental care to control ECC.

Limitations of Study

There are limitations when drawing conclusions from the current research. Among those are, first, the inability to draw a cause-effect relationship between feeding practices, socioeconomic status, and ECC, due to the nature of the cross-sectional design of the research. Second, there is the issue of bias caused by recall and the reporting of parents or caregivers in this study, when asked to provide information on feeding and dietary practices. Third, there is the issue of low sample size, considering that the research reached 125 preschool children at selected preschool institutions, and therefore, the extent to which the findings can be extrapolated to preschool children in general is limited. Finally, many factors of importance such as oral hygiene and level of exposure to fluoride, were not investigated.

Future Suggestions

More generalizable research will come with more diverse and larger samples from varying geographical and socioeconomic regions. Due to the nature of longitudinal studies, it is recommended that these studies add feeding practices as a variable in order to show the developmental relationship with early child caries. Research should also dig into the areas of oral-hygiene practices, exposure to fluoride, caregiver knowledge of oral health, and all the individual detail of the diet. Interventions of counseling and educating parents on diet and providing preventive dental programs for preschool children will provide research data to help end child caries in socioeconomically disadvantaged preschool children.

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