

Proportion of Early Childhood Caries and Associated Risk Factors among Children Aged Less than 6 Years Attending Paediatric OPD in a Tertiary Care Centre, Kerala

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Abstract: ***Background:** Early childhood caries (ECC) affects the teeth of children under six years of age. According to the Global Burden of Disease Study in 2017, more than 530 million children globally have dental caries of primary teeth. The disease affects primary teeth and permanent teeth and influences general health and quality of life and is one of the most common chronic diseases of early childhood. **Objectives:** **Primary Objective:** To estimate the proportion of early childhood caries among children aged less than 6 years attending Paediatric OPD in a tertiary care centre, Kerala. **Secondary Objective:** To assess the risk factors associated with early childhood caries among children aged <6 years attending Paediatric OPD in a tertiary care centre, Kerala. **Methods:** This is a cross sectional study conducted in the Department of Paediatrics at Sree Gokulam Medical college among children below the age of 6 years attending the paediatrics OPD between March 2021 to June 2022. 704 children who presented to the paediatrics OPD were included in the study population. All the eligible cases who consented to the study, were enrolled using consecutive sampling. Clinical examination of oral cavity was done and dental caries measured using advanced International Caries Detection and Assessment System 4 (ICDAS II). The mothers of the children, chosen for the study were interviewed face-to-face using a structured proforma. **Results:** The prevalence of ECC among our study participants was observed to be 13%. The proportion was more common among boys, children belonging to lower socioeconomic status, belonging to urban origin, children who were bottle fed, brushes only once a day, not exclusively breastfed and who has the habit of consuming snacks, sweets and ice creams. (p value <0.05) With respect to the Sweet score, observed that the ECC was commonly seen among children who were in the watch out zone according to sweet score. **Conclusion:** ECC was observed to be a significant morbidity among children of less than 6 years, and the risk factors studied had significant association with dental caries*

Keywords: Early childhood caries, Prevalence, Paediatric children, Risk factors, Oral hygiene

1. Introduction

ECC has a significant influence on individuals, families and societies. The disease affects primary teeth and permanent teeth and influences general health and quality of life across the entire life course. ECC is one of the most common chronic diseases of early childhood. Which have been shown to be predictive of future dental problems, growth and development by interfering with comfort, nutrition, concentration, and school participation. (2)

The term “dental caries” is used to describe the results, signs, and symptoms of a localized chemical dissolution of the tooth surface caused by metabolic events taking place in the biofilms (dental plaque) that cover the affected area (3) Children in the age range of 12–30 months have a special caries pattern that differs from that in older children. Caries affects the maxillary primary incisors and first primary molars in a way that reflects the pattern of eruption. The longer the tooth has been present and exposed to the caries challenge, the more it is affected. The upper incisors are most vulnerable, while the mandibular incisors are protected by the tongue and by saliva from submandibular and sublingual glands. caries is one of the most common childhood diseases, and people continue (4) ECC is a multifactorial disease that results from the interaction of

factors that include cariogenic microorganisms, exposure to fermentable carbohydrates through inappropriate feeding practices, and a range of social variables. ECC is a severe health condition found among children living in socially disadvantaged communities in which malnutrition is a social and health disparity (5) Consequences of ECC include a higher risk of pain or discomfort, abscesses, carious lesions in both the primary and permanent dentitions, risk for delayed physical growth and development, increased days with restricted activity, and diminished oral health-related quality of life. (6) Thus, ECC is one of the preventable, non-communicable disease of medical, social and economic importance. However, despite this evidence, only a very few studies have attempted to study the prevalence of ECC in India, especially from a south Indian setting like Kerala. Thus, to bridge this gap, this study was aimed at estimating the proportion of early childhood caries and its associated risk factors among children aged less than 6 years attending Paediatric OPD in a tertiary care centre, in Kerala

2. Methods

We conducted a cross sectional study in the Department of Paediatrics at SreeGokulam Medical college, Trivandrum between March 2021 to June 2022.

As a part of this research proposal, we aimed to evaluate the burden and determinants of early childhood caries among children aged less than 6 years attending Paediatric OPD.

After institutional Ethics Committee approval and informed written consent, almost 704 children who presented to the pediatrics OPD were included in the study population.

Study participants: Children below the age of 6 years attending the pediatrics OPD

Exclusion criteria:

Children with congenital anomalies of the orofacial region.
Children whose mothers are not willing to give consent.

Sample size:

Taking 12% as the prevalence of early childhood caries in the previous study titled 'Early childhood caries lesions in preschool children in Kerala, India' by Jose et al, and relative precision taken 20% of p, the required sample size is calculated using the formula:

Exclusion criteria:

$n = Z\alpha \uparrow 2 * P * q / d \uparrow 2$
 $Z\alpha = 1.96$ $p = 12$, $q = 88$, $d = 2.4$
 $Z\alpha = 1.96 \uparrow 2 * 12 * 88 / 2.4 \uparrow 2$ $n = 704$
 Minimum sample size required = 704

Sampling Method: All the eligible cases who consented to the study, were enrolled using consecutive sampling.

Study Variables

Exposure Variables:

- Age
- Gender
- socio- economic status (SES)
- Infant Feeding Practices
- Oral hygiene practices
- Sweet score (7)

Outcome Variables:

- Prevalence of ECC
- Association between exposure variables and ECC

Operational Definition:

Early childhood caries

Caries are characterized by the presence of one or more teeth affected by carious lesions or with white spot lesions in primary teeth, loss of teeth due to caries, or filled tooth surfaces in affected teeth of a child aged under six years. (1)

Data Collection Technique:

After getting approval from the ethical committee and obtaining informed written assent from each parent of the selected children, children satisfying all the inclusion criteria were enrolled. The mothers of the children, chosen for the study were interviewed face- to-face using a structured proforma. The proforma consisted of four domains; socio-demographic and socio-economic factors, feeding practices, dietary habits and oral hygiene measures Clinical

examination of oral cavity was done and dental caries measured using advanced International Caries Detection and Assessment System4 (ICDAS II). (8)

Statistical Methods:

Microsoft Excel Spreadsheet was used to create the graphs after the data were entered in Excel and analyzed using SPSS 21.0. In order to summarize continuous variables, they were given a mean, standard deviation, or median along with an interquartile range. The proportion of children having ECC were expressed in frequency and percentages. The association between the ECC and independent variables were done using the chi-square test. Statistical significance was determined by a p-value of less than 0.05.

3. Results

Table 1: Sociodemographic distribution of the study participants (N=704)

Characteristics	Frequency (%)
Age group	
<3 years	321 (45.6)
3-6 years	383 (54.4)
Sex	
Male	404 (57.4)
Female	300 (42.6)
Socio economic status	
Lower	389 (52.2)
Middle	254 (36.1)
Upper	61 (8.6)
Residence	
Rural	514 (73.1)
Urban	190 (26.9)

We could reach around 704 participants who fitted the inclusion criteria. Everyone agreed to participate in the study thus accounting for a response rate of 100%. Table 1 depicts the age and gender distribution of the study participants. We could see that there was almost equal representation of the age groups and sex, with a mean age of 4.7 (1.4) years. Males were more common (57%) among the study participants. Almost half of them belonged to the lower socioeconomic status (52%) and 3/4th hailed from a rural background

Infant Feeding Practices	
Bottle Feeding Present	271 (38.5)
Bottle Feeding Absent	433 (61.5)
Oral Hygiene practices	
Brushes daily once	589 (83.6)
Brushes daily twice	115 (16.4)
Sweet Score	
Excellent	89 (12.6)
Good	405 (57.5)
Watch out Zone	211 (29.9)
Breast feeding practices	
Exclusively Breast fed	430 (61.1)
Non EBF	274 (38.9)
Consumption of snacks, sweets and ice creams	
Yes	267 (37.9)
No	437 (62.1)

Table 2: Distribution of feeding and dietary practices

Sex	ECC, frequency (%)	No ECC, frequency (%)	OR (95% CI)	P value
Male	61 (15.1)	343 (84.9)	1.60 (1.15 – 1.92)	0.007
Female	30 (10.0)	270 (90.0)	Ref	
Socioeconomic status	ECC, frequency (%)	No ECC, frequency (%)	OR (95% CI)	P value
Lower	59 (15.1)	330 (84.9)	1.71 (1.21 – 1.99)	<0.001
Middle	28 (11.1)	226 (88.9)	226 (88.9)	
Upper	4 (6.5)	57 (93.5)	Ref	
Residence	ECC, frequency (%)	No ECC, frequency (%)	OR (95% CI)	P value
Rural	57 (11.1)	457 (88.9)	Ref	0.01
Urban	34 (17.9)	156 (82.1)	1.37 (1.08 – 1.61)	
Bottle feeding present	51 (18.8)	220 (81.2)	1.63 (1.21 – 1.89)	<0.001
Bottle feeding absent	40 (9.2)	393 (90.8)	Ref	
Bottle Feeding Practices	ECC, frequency (%)	No ECC, frequency (%)	OR (95% CI)	P value

The above tables show the distribution of feeding and dietary practices among the study participants. We observed that around 38% used to feed their children with bottles during infancy, only 17% has the habit of brushing twice daily, 61% had exclusively breastfed the children for 6 months, and around 28% admitted of consumption of snacks, sweets and ice creams by the child. With respect to the sweet score, we observed that almost 1/3rd was in the watch-out zone.

Table 3: Prevalence of ECC

Proportion of ECC	
Yes	91 (12.9)
No	613 (87.1)

Age	ECC, frequency (%)	NECC, frequency (%)	OR (95% CI)	P value
<3 years	41 (12.7)	280 (87.3)	1.25 (0.95 – 1.34)	0.09
3-6 years	40 (10.4)	343 (89.6)	Ref	

We observed that among our study participants around 13% had early childhood caries.

Table 4: Association between sociodemographic, feeding and dietary practices with ECC, n=704

Night bottle feeding present	40 (22.2)	140 (77.8)	1.57 (1.15 – 1.66)	<0.001
Night bottle feeding absent	11 (12.1)	80 (87.9)	Ref	
Oral hygiene practices	ECC, frequency (%)	No ECC, frequency (%)	OR (95% CI)	P value
Brushes daily once	86 (14.6)	503 (85.4)	1.78 (1.31 – 2.13)	<0.001
Brushes daily twice	5 (4.3)	110 (95.7)	Ref	
Sweet score	ECC, frequency (%)	No ECC, frequency (%)	OR (95% CI)	P value
Excellent	8 (8.9)	81 (91.1)	1.15 (0.84 – 1.43)	<0.001
Good	22 (5.5)	383 (94.5)	Ref	
Watch out zone	61 (28.9)	150 (71.1)	1.59 (1.31 – 2.14)	
Breast feeding practices	ECC, frequency (%)	No ECC, frequency (%)	OR (95% CI)	P value
Exclusively breast fed	32 (7.4)	398 (92.6)	Ref	<0.001
Non EBF	59 (21.5)	215 (78.5)	1.81 (1.51 – 2.59)	

The above table describes the association between sociodemographic, feeding and dietary practices with ECC. We observed that there was a significant association observed all the included variables except for age. We observed that the proportion of ECC was more common among boys, children belonging to lower socioeconomic status, belonging to urban origin, children who were bottle fed specifically children who were fed at night, brushes only once a day, not exclusively breast fed and who has the habit of consuming snacks, sweets and ice creams. With respect to the Sweet score, we observed that the ECC was commonly seen among children who were in the watch out zone according to sweet score.

4. Discussion

We basically did a cross sectional study in the Department of Pediatrics in a tertiary care setting to estimate the proportion of early childhood caries among children aged less than 6 years attending Paediatric OPD in a tertiary care centre, Kerala during the study period of 1 and a half year. In addition to determining the prevalence and burden of

dental carries, we also tried to estimate and assess the risk factors associated with early childhood caries among children aged <6 years attending our OPD. The aetiology of ECC is complex, and there are still a number of unknown interactions between variables such as Staph mutansinfection, mothers' educational status, dental knowledge, stress, self-esteem, social position, family structure, and the usage of infant bottles or breastfeeding on demand. Caries lesions are a complex disease with a high frequency. These elements include a host and tooth that are vulnerable, dietary fermentable carbohydrates, cariogenic bacteria, and time. Compared to kids who don't have any caries lesions in their primary teeth, kids who do have caries lesions in their primary teeth have a higher risk of having them in their permanent teeth. (83)Early primary incisor caries lesions are a risk factor for developing later dental caries lesions. Therefore, for preschoolers who are identified as being at risk, preventive actions against caries lesion can be organised and put into action. (84)Existent research on this area is mainly focused in western, and there is a lack of literature from India, specifically from south Indian settings, where the existing literature mainly deals with a

bacteriological profile of dental carries cases and especially among the adult population, and only very few attempts have been made to study the risk factor and burden of dental carries among children (85) Thus considering the huge variations in the burden and determinants of dental carries among children into consideration, we decided to estimate the burden and determinants of early childhood caries among children aged less than 6 years attending Paediatric OPD at Shree Gokulam Medical college, Trivandrum In our study where we included 704 cases who attended the pediatrics OPD during the study period. We observed that there was almost equal representation of the age groups and sex, with a mean age of 4.7 (1.4) years. This finding was observed to be in line with the findings noted from other studies done in various other study settings. (85) We noted that Males were more common (57%) among the study participants, which was also observed to be similar to findings from other studies, which have documented that males are more commonly affected with dental carries. (86) Almost half of them belonged to the lower socioeconomic status (52%) and 3/4th hailed from a rural background. This finding also proves the finding that dental carries are more commonly seen among the lower socio-economic status groups, which may be owing to poor dental hygiene maintained by them. This finding is also previously documented by other studies. (80) With respect to the feeding and dietary practices followed among children, we observed that around 38% used to feed their children with bottles during infancy, and only 17% has the habit of brushing twice daily. This was observed to be similar to studies done by Ganesh et al, who also showed that the prevalence of brushing daily is only seen among 17% of children in their study. (86) We also noted that 61% had exclusively breastfed the children for 6 months, and around 28% admitted of consuming snacks, sweets and ice creams by the child. This finding again shows that only 2/3rd of the children who were studied were exclusively breastfed. With respect to the sweet score, we observed that almost 1/3rd was in the watch-out zone, which again suggests, that one-third of children are at a high risk of developing dental caries in future and thus need to be monitored routinely for prevention of ECC.

With respect to our outcome parameter of estimating the prevalence of ECC, we observed that among our study participants around 13% had early childhood caries. This finding was observed to be comparable to findings put forth by Jose et al, who estimated a prevalence of 12%. Our findings were also observed to be lower than findings put forth by Gathecha et al, who has shown a prevalence of 37.5%, this low prevalence could be due to the fact of differences in study settings, study characteristics or differences in health-seeking behaviour across the study settings. (87)

With respect to the association between sociodemographic, feeding and dietary practices with ECC. We observed that there was a significant association observed all the included variables except for age. (p value <0.05) We observed that the proportion of ECC was more common among boys (OR 1.60 (1.15 – 1.92)), children belonging to lower socioeconomic status (OR 1.71 (1.21 – 1.99)), belonging to urban origin (OR 1.37 (1.08 – 1.61)), children who were

bottle fed (OR 1.63 (1.21 – 1.89)), brushes only once a day (OR 1.78 (1.31 – 2.13)), not exclusively breastfed (OR 1.81 (1.51 – 2.59)) and who has the habit of consuming snacks, sweets and ice creams (OR 1.98 (1.61 – 2.73)). These findings were also observed to be similar to the findings established by Kirthiga et al, who have also shown that factors such as high social income, poor oral hygiene, and consumption of sweetened foods were observed to be significant determinants of early childhood carries. (88)

With respect to the Sweet score, we observed that the ECC was commonly seen among children who were in the watch-out zone according to the sweet score (OR 1.59 (1.31 – 2.14)), this finding again strengthens the fact that sweet score maybe used as a significant determinant of ECC, and can be used as a useful tool for screening children for ECC, at an early stage.

5. Conclusion

From this study, it is concluded that the prevalence of ECC among our study participants was observed to be 13%. We observed that the proportion of ECC was more common among boys, children belonging to lower socioeconomic status, belonging to urban origin, children who were bottle fed, brushes only once a day, not exclusively breastfed and who has the habit of consuming snacks, sweets and ice creams. With respect to the Sweet score, we observed that the ECC was commonly seen among children who were in the watch out zone according to sweet score.

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