

Association of Undernutrition and Early Childhood Dental Caries

CHANDRASHEKAR JANAKIRAM, BOBBY ANTONY AND JOE JOSEPH

From Department of Public Health Dentistry, Amrita School of Dentistry, Amrita Vishwa Vidyapeetham, Edapally, Kochi, India.

Correspondence to:

Prof Chandrashekar Janakiram,
Department of Public Health
Dentistry, Amrita School of Dentistry,
Amrita Vishwa Vidyapeetham,
Edapally, Kochi 682 041, India.
sekarandra@gmail.com

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Objectives: To determine the association between early childhood caries and nutritional status in preschool children. **Methods:** Cross-sectional study among preschool children ($N=550$, age 8-60 mo) were selected in tribal, rural and urban health care units of Kerala. An oral examination for early childhood caries status was done using Deft index. The anthropometric measurements were recorded. Multiple logistic regression with other covariates was used to determine the association between the early childhood caries and nutritional status. **Results:** The mean (SD) Deft scores were 0.93 (1.73), 2.22 (2.92) and 3.40 (3.23) for children with normal nutritional status, borderline undernutrition and undernutrition, respectively. Children with borderline undernutrition (adjusted OR 2.05, 95% CI 1.20, 3.49) or undernutrition (adjusted OR 3.46, 95% CI 1.93, 6.29) had higher odds of dental caries in comparison to those with normal nutritional status. **Conclusion:** Undernutrition is associated with early childhood caries among preschool children.

Keywords: Dental decay, Preschool children, Protein energy malnutrition.

Decay, or Early childhood caries (ECC), in the primary dentition is the best predictor for decay in the secondary dentition. Poor dental health affects speech articulation, growth, and dietary practices [1]. The prevalence of ECC ranges from 27% to 54% in Indian preschool children [2-5]. Children with dental caries (ECC) continue to grow at a slower pace [6-8] due to insufficient food consumption to meet the metabolic needs [9,10]. This study was designed to assess the relationship between undernutrition and caries in preschool children in the state of Kerala, India.

METHODS

This cross-sectional study was conducted in three different areas – one tribal (Amrita Kripa hospital at Kalpetta), one rural (Primary Health Centre at Angamaly) and one urban location (Amrita Institute of Medical Sciences, Cochin) in Kerala, India. These areas were chosen based on availability of health centers, and to account for different socioeconomic status. The ethical clearance was obtained from Institutional review board of Amrita Institute of Medical Sciences, Kochi, India. We enrolled children attending the health care center for vaccination or medical reasons in each of the three locations. Written informed consent was obtained from the parent(s) or guardian(s) of children involved in the study.

A structured close-ended questionnaire was used, which had information related to socioeconomic status of

parents, health status of the child, prenatal history and drug history of the mother, feeding practices, and milestones of development. Dental caries was assessed by use of a plain mouth mirror with a light source with the child seated on a chair or on lap of mother. Presence of any decayed, extracted or filled teeth were considered as evidence of ECC, and Deft index was recorded [11]. Weight was assessed using digital scale with 100 g increments. Nutritional status was assessed using the WHO growth curve for children up to five years of age. Children who had weight-for-age between 25th and 75th percentiles were considered normally nourished. Those children who did not have adequate weight for age were classified into two groups: (i) Borderline undernutrition (between 5th and 25th percentile) and (ii) undernutrition (below 5th percentile). To assess the association of ECC with nutritional status for adjusting the potential confounders, multivariate analysis was performed using SPSS version 17.

RESULTS

We enrolled 550 (186 tribal, 184 rural and 180 urban) children (age 8-60 mo) in the study. **Table I** shows the association of the various covariates with ECC. The frequency of the ECC increased with lower categories of nutritional status. The children classified as having normal nutritional status had the lowest (22.3%) (Mean (SD) deft score and undernutrition 0.93 (1.73) prevalence of ECC compared to those with borderline undernutrition [33.2% (mean (SD) deft score 2.22 (2.92) and 44.5%

TABLE I ASSOCIATION OF EARLY CHILDHOOD CARIES WITH VARIOUS RISK FACTORS

Variables	No ECC	ECC present	P value
<i>Location of the participants</i>			
Tribal	47 (25.3)	139 (74.7)	0.001
Rural	117 (63.5)	67 (36.5)	
Urban	85 (52.8)	95 (47.2)	
<i>Age of the child</i>			
Up to 3 years	137 (56.6)	105 (43.4)	0.001
Above 3 years	112 (36.6)	196 (63.4)	
<i>Sex</i>			
Male	131 (45.5)	157 (55.5)	0.916
Female	118 (48.3)	144 (41.7)	
<i>Education of Mother</i>			
Upto middle school	27 (18.6)	118 (81.4)	0.001
Completed 10 th grade	69 (40.3)	102 (59.7)	
Graduate	153 (65.4)	81 (34.6)	
<i>Nutritional status</i>			
Normal	117 (63.5)	67 (36.4)	0.001
Borderline	81 (44.7)	100 (55.3)	
Undernutrition	51 (27.6)	134 (72.4)	
<i>Socio Economic Status</i>			
Upper class	152 (63.5)	87 (36.5)	0.001
Middle class	66 (41.6)	76 (57.4)	
Lower class	31 (14.4)	138 (85.6)	

ECC: early childhood caries; Values in No. (%).

(mean (SD) Deft score 3.4 (3.23)], respectively. In multivariate analysis model, the association of ECC with nutritional status persisted after adjustment for potential confounders (**Table II**).

DISCUSSION

In this study, we found that undernutrition of the preschool child was associated with ECC. The children who had borderline undernutrition had twice the odds of having ECC whereas children having undernutrition had thrice the odds of having ECC, when compared to children with normal nutritional status. These findings were consistent with other studies [5-7].

As the study was hospital-based, it may have selection bias. Temporality of the causal relationship of ECC and undernutrition, which has complex interaction with other covariates, is difficult to establish in cross-

TABLE II MULTIVARIATE LOGISTIC REGRESSION OF FACTORS ASSOCIATED WITH EARLY CHILDHOOD CARIES

Variables	Adjusted OR (95% CI)
Borderline nutrition	2.05 (1.21-3.49)
Undernourished	3.46 (1.93-6.29)
Age >3 years	5.33 (3.34-8.49)
Female gender	0.75 (0.49-1.14)
Middle socioeconomic class	1.55 (0.68-3.53)
Lower class	6.43 (2.15-17.49)
<i>Mother's education</i>	
Upto middle school	4.75 (1.89-11.91)
Upto intermediate	2.25 (1.34-3.78)

sectional methodology. Use of non-standard definitions of undernutrition is another limitation of this study. The preschool children were selected from three different geographical areas covering various socioeconomic conditions to strengthen the external validity of the study.

The study findings of higher dental caries scores in undernourished children are comparable with other studies [9,10]. There are various plausible mechanisms for association of dental caries with underweight and poor growth in young children [8]. First, untreated caries and associated infection can cause pain and discomfort and reduce intake of foods because eating becomes painful [8]. Second, dental caries can cause disorders of appetite and sleep, which affects the overall growth of the child [8]. Disturbed sleep may affect glucocorticoid production and growth. Chronic inflammation from pulpitis and dental abscesses affects metabolic pathways involving cytokines [12]. It has been shown that child tends to catch-up the growth within six months following rehabilitation of ECC, and shift to higher growth percentiles categories [10].

Early childhood caries is a morbid condition that is difficult to treat in infants and very young children. ECC has received little attention from the health professionals other than dentists. Physicians treating young children should consider that ECC is a risk marker for undernutrition. For physicians, nutritional deficiencies should alert them to the possibility that ECC is present and is a possible explanation for the deficiencies in their patients. For dentists, children presenting with ECC should be considered at-risk for nutritional deficiencies that may affect long-term health and well-being.

<p>WHAT THIS STUDY ADDS?</p> <ul style="list-style-type: none"> • Undernutrition is associated with early childhood caries in preschool children.

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