Factors Related to Dental Caries in Children (3–5 Years) at Grogol Utara, South Jakarta

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Abstract

Dental caries is the most prevalent oral disease in Indonesian children. For children aged 3–5 years, its occurrence is related to feeding patterns and behavior. We determined factors contributing most to dental caries occurrence in children 3–5 years old. A cross-sectional health screening study was carried out in the Grogol Utara area of South Jakarta. Two calibrated examiners collected oral health status with decayed, extracted and filled teeth (deft), and plaque indexes. Feeding pattern was collected using a structured questionnaire. Multivariate analysis was performed comparing dental caries, feeding pattern, oral health behavior, and sociodemographic characteristics. Of all 165 subjects, 82.4% had caries. On bivariate analysis, the contact time of breastmilk and teeth, formula milk frequency, and child's age showed significant relationships with dental caries. Predictive modeling showed that 30% of factors related to dental caries fit with available data. Therefore, oral hygiene and child's age are the most important factors.

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Introduction

Dental caries remains the most prevalent oral disease in Indonesia to date. The national Basic Health Survey (Riskesdas) in 2007 found that the prevalence was 90%.[1] Studies in Jakarta from as early as 2001–2013 showed a high prevalence of dental caries in 3–5-year-old children (81.2% and 76.3%, respectively).[2,3]

Dental caries in primary dentition (early childhood caries [ECC])[4] has many terminologies. "Nursing caries" indicates its relation to feeding pattern,[5–7] including breastfeeding and complimentary feeding. Oral hygiene remains a very important risk factor. Brushing teeth at least twice a day and before sleeping at night would lower the risk of caries.[8,9] Parents' behavior in caring for their children's oral health plays a significant role. As a multicausal disease, other related factors, such as sociodemographic factors, also must be considered.[10–12]

The breastfeeding program is part of national health promotion campaigned by the Indonesia Ministry of Health, and the Ministry also set a caries-free goal for all in 2030. Some people assumed that breastfeeding could cause caries, but studies remain scarce. Our results hopefully could support both programs of the Ministry of Health.

Methods

The cross-sectional study was performed as a health screening in the Grogol Utara area of South Jakarta, under the local Community Health Center administration. A total of 200 mother-and-child (36–71 months old) child pairs were at baseline, but only 165 pairs were analyzed. Two calibrated examiners collected oral health status with decayed, extracted, and filled teeth (deft) and plaque indexes.[13] Oral health behavior pattern data were collected using a structured questionnaire. The intra-

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observer reliability was 0.9 (excellent agreement), and the validity and reliability of the feeding pattern questionnaire from 15 mothers was considered valid (r > 0.514 for every question). The internal reliability test of questionnaires using Cronbach's α was 0.890. The intraclass correlation coefficient (ICC) for external reliability test using test–retest for the same respondents with an interval of 15 days was 0.623. Multivariate analysis was done comparing dental caries and factors of feeding pattern and oral health behavior. Covariates that were also to be considered are the child's sex and parents' sociodemographic characteristics.

Results

The prevalence of dental caries in this study was 82.4% (Table 1), with an average deft score of five teeth. Decay was the highest caries component (average, 6.09; range, 0–20). More than half of the children (53.3%) had fair oral hygiene based on plaque index score.

Variables	*n* (%)	Mean
Dental caries		
Free	29 (17.6)	5 (0–20)
Caries	136 (82.4)	
Oral hygiene		
Good	64 (38.8)	1 (0–2)
Fair	88 (53.3)	
Poor	13 (7.9)	

Table 1. Oral health Status

Questionnaires of feeding pattern included questions about colostrum, breastfeeding, formula milk, and complementary feeding since the first tooth erupts. Only contact time of breastmilk and teeth and formula milk frequency showed a significant relationship with dental caries. Breastfeeding frequency was included in the multivariate model because its P value was <0.25 (Table 2).

The characteristics of the 165 mother-child pairs are described in Table 3. Average age of the children and mothers was 60 (range, 34–80) months and 34 years, respectively. Educational level of the mothers was mostly senior high school graduates (48.5%) and 65.5% did not work. There were no significant differences between all demographic characteristics and dental caries, except for children's age and mother's educational level. Father's occupation and parents' income were submitted to multivariate modeling because their P values were <0.25.

The predictive modeling of factors most related to dental caries in 3–5-year-old children were in oral hygiene and child's age (Table 4). No sociodemographic characteristics were determined to be confounders or effect modifiers, and feeding pattern factors significant on bivariate analysis were dropped because they became insignificant and did not affect the change in association by >10%. The R^2 of this predictive model was 30.4% and very significant, meaning both factors in the predictive model can explain the occurrence of dental caries based on the data. Oral hygiene was the most important because the variable had the highest association value (prevalence odds ratio [POR]).

Discussion

The prevalence of dental caries in this study was 82.4%, which was slightly higher than that of the 2013 study conducted in Jakarta.[3] Caries trend tends to increase with age, which is logical because dental caries is nonreversible disease regarding its destructive process of enamel demineralization.[14] The highest dental caries prevalence was in 5-year-old children (44.5%) with a mean of seven teeth. In this study, sex had no significant difference with regard to caries. This finding contradicts with that of Gopal et al.,[8] who reported that ECC prevalence was higher in girls and the association was significant.[8] A study in India also showed that boys have higher caries risk because of differences in food preference.[15]

Variable	Dental Caries			*P* value
	Low *n* (%)	High *n* (%)	Total *N* (%)	
Oral hygiene				0.004
Good	45 (61.6)	19 (20.7)	64 (38.8)	
Fair	26 (35.6)	62 (67.4)	88 (53.3)	
Poor	2 (2.7)	11 (12.0)	13 (7.9)	
Breastfeeding frequency				0.23
≥7 times	37 (50.7)	38 (41.3)	75 (45.5)	
<7 times	36 (49.3)	54 (58.7)	90 (54.5)	
Length contact time of breastmilk and teeth				0.03
≥6 months	69 (94.5)	77 (83.7)	146 (88.5)	
<6 months	4 (5.5)	15 (16.3)	19 (11.5)	
Formula milk frequency				0.02
< 3 times	26 (35.6)	18 (19.6)	44 (26.7)	
≥3 times	47 (64.4)	74 (80.4)	121 (73.3)	

Table 2. Dental caries distribution based on feeding pattern and oral hygiene.

Variable	Dental Caries			*P* value
	Low *n*(%)	High *n* (%)	Total *N* (%)	
Child age				
3-4 yr	48 (65.8)	33 (35.9)	81 (49.1)	0.001
5 yr and above	25 (34.2)	59 (64.)	84 (50.9)	
Child sex				
Female	37 (50.7)	43 (46.7)	80 (48.5)	NS
Male	36 (49.3)	49 (53.3)	85 (51.5)	
Mother's educational level				
High	35 (47.9)	31 (33.7)	66 (40)	0.045
Low	30 (52.1)	61 (66.3)	99 (60)	
Mother's occupation				
Working	26 (35.6)	31 (33.7)	57 (34.5)	NS
Not working	47 (64.4)	61 (66.3)	108 (65.5)	
Father's occupation				
Working	71 (97.3)	84 (91.3)	155 (93.9)	0.19
Not working	2 (2.7)	8 (8.7)	10 (6.1)	
Parent's income				
Above regional minimum wage	58 (79.5)	61 (66.3)	119 (72.1)	0.08
Below regional minimum wage	15 (20.5)	31 (33.7)	46 (27.9)	

Table 3. Dental caries distribution based on Socio-Demographic Characteristics

Variable	β	POR	95% CI	*P* value
Age	1.217	3.377	1.661–6.865	0.001
Oral hygiene				
Good		1		
Fair	1.698	5.460	2.617–11.395	0.001
Poor	2.623	13.783	2.660–71.430	0.002

Table 4. Factors most related to dental caries. CI = confidence interval.

Socioeconomic factors included in this study were mother's education, parents' occupation, and income. Only mother's education level had a significant difference with dental caries. This contradicts with many studies. A study in Turkey showed that caries prevalence was higher in 2–5-year-old children of lower socioeconomic status. Families with lower socioeconomic status tended to prioritize their children's oral health less than food, so the decay was left untreated.[16] Other related conditions were having a low knowledge of oral health, the ability to provide good nutritious food to their children, or having no access to health services. Since many studies confirmed that these factors are related to caries,[17–21] the factors with $P < 0.25$ were included in the multivariate analysis.

Plaque examination was performed to confirm oral hygiene behavior, because subjects with better oral hygiene behavior had lower plaque scores.[22] More than half of the subjects (53.3%) had fair oral hygiene based on the plaque index score, and it was significantly related to dental caries. A child's oral hygiene behavior could not be an indicator for the occurrence of ECC, but the presence of plaque could be an adequate indicator. Studies showed that caries prevalence is higher in children with more plaque.[23,24]

A structured questionnaire on the patterns of breastfeeding and complimentary feeding was asked to the children's mothers. For breastfeeding, only contact time of breastmilk and teeth showed a significant relationship with dental caries. Contact time of breast milk and teeth was counted from the first tooth eruption until breastfeeding stopped. In this study, dental caries prevalence was higher in children with a contact time between breast milk and teeth of <7 months, while a study in Jakarta Indonesia showed that caries severity was higher in children whose contact time was <8 months.[25] Breast milk is not cariogenic, unless combined with other carbohydrate sources. This means that a child would have a higher risk of caries if given complimentary feeding too early.[26]

Other factors included in the questionnaire on breastfeeding pattern were colostrum, exclusive breastfeeding, and frequency, length, and duration of breastfeeding. They showed no significant relationship to dental caries in this study. These results were not in line with those of many other studies. Colostrum might prevent dental caries, because it contains specific antibodies for *Streptococcus* species and immunological components, such as secretory IgA (sIgA), lactoferrin, and leukocytes.[27,28] Breast milk components of casein and IgA act as an inhibitor of *S. mutans* adhesion on saliva-coated hydroxyapatite (s-HA).[29] Exclusive breastfeeding for 3–6 months was related to lower caries incidence in children.[30]

Meanwhile, for complimentary feeding, only the frequency of formula milk had a significant relationship with dental caries, just like one complimentary feeding factor reported by Ribeiro.[31] The sucrose content in the formula milk and longer contact with teeth also were reported. Formula milk can be cariogenic even without added sucrose,[32] and consistency would affect contact time with teeth.[33] Although formula milk consistency is liquid and less cariogenic than complimentary food, it was proven to be significantly related to dental caries in our study because it was given frequently. The prevalence of dental caries was higher in children who were given formula milk three times or more per day.

The complimentary feeding pattern in the questionnaire that did not show significant results in this study were child's starting age at introduction to complimentary feeding, additional sugar, feeding time. Giving complementary food before age 6 months and giving formula milk at night before bedtime increase the risk of caries.[34–36]

To determine which factor contributed the most to dental caries in this study, factors that were significantly related to dental caries and had P values of < 25 were included in the multivariate analysis. Oral hygiene (plaque index), contact time between breastmilk and teeth, use of formula milk, and breastfeeding frequency were included. Socioeconomic factors included child's age, mothers' education level, fathers' occupation, and parents' income.

The final model (Table 4) showed that oral hygiene and child's age were factors most contributing to dental caries, and oral hygiene

was the most important factor. The predictive model had an R^2 of 30.4% and showed significance with the goodness-of-fit test. This means both factors can explain the occurrence of dental caries based on the data. Children with fair and poor plaque indexes have 5.5 (95% CI, 2.617–11.395) and 13.8 (95% CI, 2.660–71.430) times higher risks of dental caries than children with a good plaque index, respectively, after adjustment for age. As age has linear correlation with dental caries experience, as the children became older, they had 3.4 (95% CI, 1.661–6.865) time greater risk of caries after adjustment for the oral hygiene factor.

Conclusions

The prevalence of dental caries in this study was 82.4%. Although some feeding pattern factors showed a significant relationship to dental caries, the factors had to be dropped out on multivariate analysis. Predictive modeling with an R^2 of 30% showed that oral hygiene and child's age are the most important factors. Children who had fair or poor oral hygiene would have a 5.5 or 13.8 time greater risk of caries compared to those with good oral hygiene, respectively. The children would have 3.4 times greater risk of caries as they became older, meaning that the risk factors still exist and they need preventive measures immediately.

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Declaration of Interest

The authors declare that there are no conflicts of interest.

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