

Dental Caries Status and Related Factors in 18-72 Month-old Children at Mahidol University Dental Clinic

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Abstract :

This study evaluates dental caries status and their related factors in a group of children at Mahidol University Pediatric Dental Clinic, Bangkok, Thailand. One hundred and four Thai children at Mahidol University Dental Clinic with the age six years and under (mean age = 47.62 ± 12.29 months) were sampled. Caries and plaque examination of children and their mothers were conducted. All parents completed the questionnaires regarding demographic data of children and parents, feeding and dietary habits, oral hygiene care, and child's dental visit. Twenty-nine percent of children were caries-free and the mean dmft of children was 7.00 ± 6.15 . Almost twenty six percent of children had dmft ranging from 6 to 10. Five statistically significantly protective factors for dental caries were found in the analysis. These were : fluoride supplementation, having water fed after bottle feeding, cleaning oral cavities for babies under one year of age, mother's level of education beyond high school and having milk as a snack. Children having sweets and desserts regularly, having the bottle held in the mouth while sleeping, and plaque accumulation, were three factors that found to be positively associated with dental caries. When using multivariate model for prediction of dental caries among studied children, having the bottle held in the mouth while sleeping was the only significant predictor in the studied model. The results suggest that children who have the bottle held in the mouth while sleeping is the only significant risk group in the studied children.

Key words : Bottle feeding; dental caries status; deciduous dentition; related factors; Thailand

Introduction

Caries status in young children is still a severe problem in Thailand. According to the fourth national survey of oral health status in Thailand in 1994, both dental caries prevalence of 3 and 6 year-old-children were 61.7% and 85.1% and the mean dmft per child were 3.4 and 5.7, respectively⁽¹⁾. Several reports over the past decades indicated that the prevalence of dental caries in many developed countries has shown a marked decline⁽²⁻⁴⁾. Contrary to those reports, the prevalence of dental caries in 6 year-old-children in Thailand was increasing from 71.6% in 1984, to 85.1% in 1994⁽¹⁾. These results indicated the importance of identifying risk factors of

dental caries in those with high caries to focus the preventive measures on them. Many studies reported the risk factors involved in dental caries in young children populations⁽⁵⁻¹⁷⁾. Some of those factors were low socioeconomic status^(5,6), low educational level of parents^(7,8), prolonged breast feeding^(9,10), bottle feeding⁽¹¹⁻¹³⁾, oral hygiene habit^(5,6,14-16), and consumption of sweet snacks^(7,14,17). Since Thai children population has high caries prevalence, the risk factors for dental caries in this group should be reassessed. The purpose of the study is to determine dental caries status and their related factors in the group of children at Mahidol University Pediatric Dental Clinic, Bangkok, Thailand.

Materials and Methods

This study was conducted in the pediatric dental clinic of Faculty of Dentistry, Mahidol University, Bangkok, Thailand. It included new patients six years of age and under between January 1998 to December 1998. Subjects consisted of 104 children who lived in Bangkok and its vicinity. Only children with deciduous dentition were selected. After obtaining informed consent from all parents, oral examinations of children were performed by two pediatric dentists at the dental units. A tooth surface or fissure was classified as decayed when it felt sticky to probing. Diagnosis of dental caries from bitewing radiograph was not included. Oral examinations of the mothers were also completed. The decayed, missing, filled teeth and plaque status of mothers and their children were recorded. Plaque accumulation was assessed by the plaque index developed by Greene and Vermillion⁽¹⁸⁾. For each individual, the plaque score of the preselected tooth surface (right and left upper and lower primary molars, right upper primary incisor and left lower primary incisor) were totaled and divided by the number of surface scored. The plaque index ranged from 0 to 3. The two examiners were calibrated with the inter-examiner reliability of 90%. All parents completed the self-administered questionnaires. The questionnaires comprised of the following categories : demographic data of children and parents, health history of the mothers and the children, feeding and dietary behaviors, oral hygiene care and child's dental visit.

Health history. Questions (yes/no) pertaining to health history of the child were asked (e.g. Does the child have any systemic disease?, Did the child receive any medicine at the first year of life?), as well as the mother's health history. (e.g. Did you have any health problem during pregnancy? Did you have proper food consumption during pregnancy?). History of fluoride supplement was also recorded.

Child feeding practices. Items within this section of questionnaires included the bottle used (e.g. Is the child using a bottle now? Do you add any sugary items in the milk feeding bottle? Do you give the child juices or sugary containing liquid in the feeding bottle?) as well as whether the child was taking a bottle to bed. (e.g. Does the child hold the bottle in the mouth while sleeping? Do you give the child the water after bottle feeding?) The length of time the bottle was kept in the mouth was also asked. Duration of bottle use was calculated by subtracting the age the bottle was started from the age it was stopped. The starting time when the child drinking from a cup and duration of breast feeding were also interviewed.

Dietary habits. Parents were asked to describe the snack they gave their children (e.g. Do you serve regular desserts as a snack? What kind of sweet snacks?), as well as listing the most common snack foods and drinks the children consumed.

Oral hygiene practices. Parents responded "yes" or

Table 1 Characteristics of data of studied population (children and parents)

| Factors | | N(%) |
|---------------------------------|--------------------------|----------|
| Child's gender | Male | 52(50) |
| | Female | 52(50) |
| Sibling rank | 1 st | 56(53.8) |
| | 2 nd | 41(39.4) |
| | 3 rd and more | 5(4.8) |
| Number of children in family | 1 | 38(36.5) |
| | 2 | 52(50) |
| | more than 2 | 13(12.5) |
| Parents interviewed | Mother | 92(88.5) |
| | Father | 11(10.6) |
| | Other | 1(1) |
| Parents' education | Degree | 43(41.3) |
| | Non-degree | 52(50) |
| Age at 1st dental visit (month) | 18-24 | 10(9.6) |
| | 25-48 | 49(47.1) |
| | 49-72 | 40(38.5) |

"no" to questions such as "Have you ever clean the child's oral cavities when the child was under 1 year of age?" "Is the child using a toothbrush now?" Parents were also asked whether they brushed their children's teeth and how often they did. Frequency of tooth brushing was scored on scale from 0 to 4. (less than once per week, 1 time per day, 2 times per day, more than twice per day)

Child's dental visit. Parents were asked when they brought their children for the first dental visit, the reason for seeking the treatment and how often they brought their children to see the dentists.

The data were analyzed by using SPSS (9.0) for Window. Descriptive statistics, chi-squares, correlation analyses, and logistic regression were used in the data analyses. All tests were performed two-tailed and at the 0.05 significant level.

Results

There were 104 children in the studies with 52 boys and 52 girls (Table 1). The majority of these children (53.8%) were the first child of the family. Most have two children in their families. Ninety-two of 104 parents interviewed were mothers. About 41 percent of parents had graduated with

degree education. Less than 10 percent of children had their first dental visit at the age between 18 to 24 months. Most of the children had their first dental visit at the age between 25 to 48 months (47%).

From Table 2, the overall mean age of children was 47.62 ± 12.29 with mean age of 47.88 ± 11.92 among boys, and mean age of 47.37 ± 12.76 among girls. Overall mean dmft of children was 7.00 ± 6.15 , and the overall mean plaque index (PI) was 1.46 ± 0.75 . Only mothers were examined for dental status. Among the mothers, the average mean age was 33.97 ± 7.06 , with the overall mean DMFT was 16.4 ± 12.02 .

The percentage of children with and without caries was shown in Figure 1. About 29 percent of children in the study were caries free. Almost twenty-six percent of children had dmft ranging from 6 to 10, while 20 percent had dmft from 11 to 15, and about 11 percent had dmft from 16 to 20.

In Table 3, caries status was defined as present or absent, simple logistic regression was performed to assess the association between dental caries status (yes/no) and potential risk factors for caries. Some protective factors for dental caries were statistically significantly ($p < 0.05$). These were : fluoride supplementation with the odds ratio was 0.36 (OR = 0.36, $p = 0.02$), having water fed after bottle feeding (OR = 0.09, $p = 0.006$), cleaning oral cavity for babies under

Table 2 Mean dmft, PI, and age of mothers and children

| Factors | Mean \pm SD | Overall Mean \pm SD |
|--------------------------|--------------------------|-----------------------|
| Age of children (months) | Male 47.88 \pm 11.92 | 47.62 \pm 2.29 |
| | Female 47.37 \pm 12.76 | |
| dmft of children | Male 6.69 \pm 6.24 | 7.00 \pm 6.15 |
| | Female 7.31 \pm 6.11 | |
| PI of children | Male 1.46 \pm 0.72 | 1.46 \pm 0.75 |
| | Female 1.46 \pm 0.78 | |
| Age of mothers (years) | 33.97 \pm 6.99 | |
| DMFT of mothers | 16.4 \pm 12.02 | |
| PI of mothers | 1.33 \pm 0.92 | |

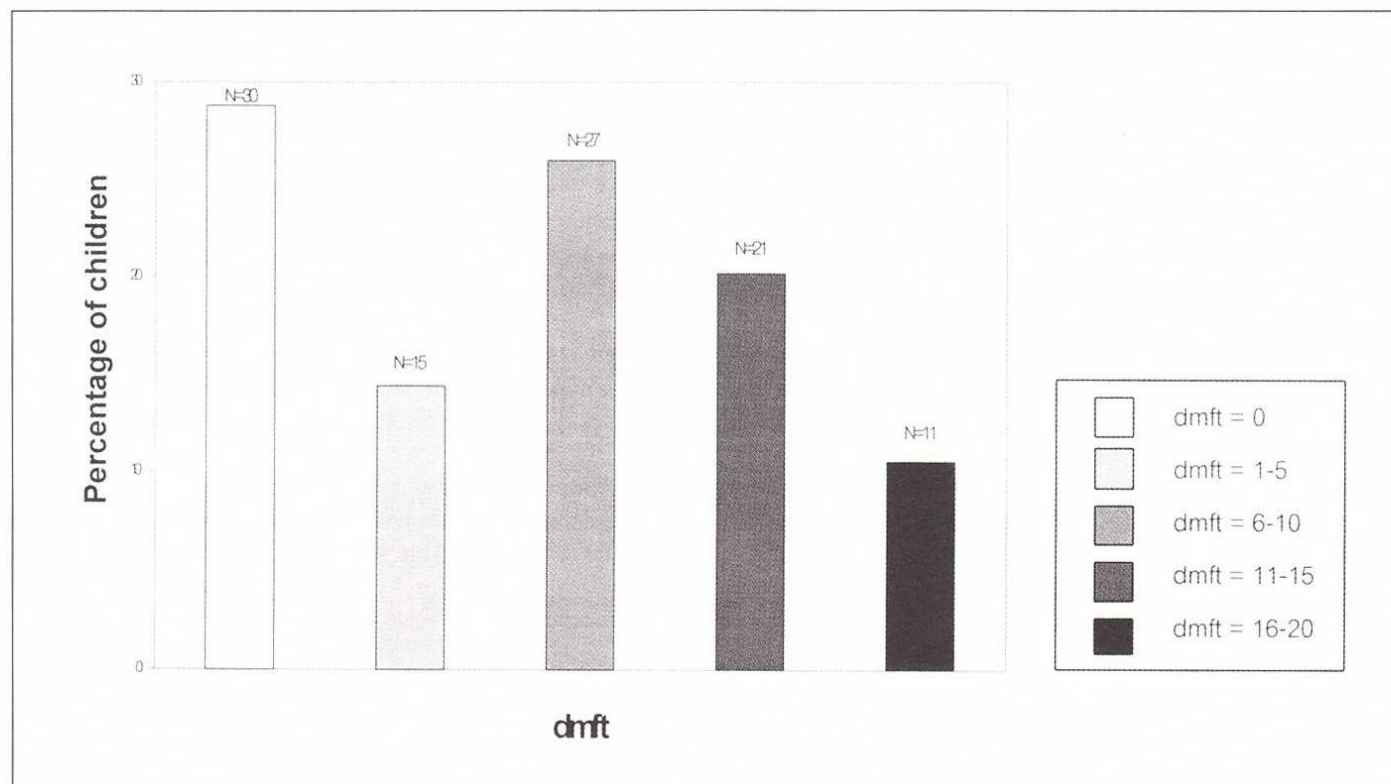


Fig. 1 Distribution of dmft

Table 3 Caries status and related factors by simple logistic regression analysis

| Factors related to caries status | | Caries Status | | OR(95%CI) | Chi-square | p-value |
|---|-----|---------------|----|------------------|------------|---------|
| | | Yes | No | | | |
| Fluoride supplementation | Yes | 22 | 17 | 0.36(0.15,0.87) | 5.38 | 0.02 |
| | No | 47 | 13 | | | |
| Sweet snacks | Yes | 42 | 10 | 2.49(1.02,6.09) | 4.14 | 0.04 |
| | No | 32 | 19 | | | |
| Water fed after bottle feeding | Yes | 54 | 29 | 0.09(0.01,0.73) | 7.44 | 0.006 |
| | No | 20 | 1 | | | |
| Milk for snacking | Yes | 20 | 17 | 0.27(0.11,0.67) | 8.47 | 0.004 |
| | No | 52 | 12 | | | |
| Cleaning babies' teeth | Yes | 59 | 29 | 0.14(0.02,1.08) | 4.70 | 0.03 |
| | No | 15 | 1 | | | |
| Mother's education (degree vs. non-degree) | Yes | 22 | 21 | 0.19(0.07,0.50) | 12.42 | 0.000 |
| | No | 44 | 8 | | | |
| Sleeping with nursing bottle | Yes | 42 | 7 | 4.55(1.72,12.04) | 10.10 | 0.001 |
| | No | 29 | 22 | | | |

Table 4 Simple logistic regression between caries and plaque index

| Predictors | B | Odds ratio | 95% CI (Odds Ratio) | p-value |
|--------------|-------|------------|------------------------|---------|
| Constant | -0.31 | | | 0.55 |
| Plaque index | 0.9 | 2.45 | (1.18,5.08) | 0.02 |

one year of age (OR = 0.14, $p = 0.03$), having mothers with education beyond high school level (OR = 0.19, $p = 0.0005$). Having milk as a snack, however, was also found to be protective of dental caries with OR = 0.27 and 95% confidence interval (CI) was between 0.11 and 0.67.

There were two factors that found to be positively associated with dental caries in the analysis. The children whose parents served regular desserts as a snack were 2.49 times at risk of developing dental caries as compared to those without desserts served ; 95% CI was between 1.02 and 6.09. As for having bottle held in the mouth, dental caries was found to be 4.55 times higher among children with bottle held in the mouth while sleeping as compared to those without, 95% CI was between 1.72 and 12.04.

Table 4, shows simple logistic regression between dental caries and plaque index. Plaque index was shown to

Table 5 Multivariate logistic regression model for prediction of dental caries among children

| Predictors | B | Odds ratio | 95% CI (Odds Ratio) | p-value |
|---------------------------------|-------|------------|------------------------|---------|
| Constant | -2.58 | | | 0.004 |
| Sleeping with nursing bottle | 1.74 | 5.67 | (1.51,21.32) | 0.01 |
| Fluoride supplementation | 1.30 | 3.68 | (0.93,14.54) | 0.06 |

be positively associated to dental caries ($p = 0.02$).

Prediction of dental caries by multivariate model

Table 5. Dental caries (yes/no) was used as the dependent variable in multiple logistic regression to predict the association between those significantly found as potential factors related to caries in the simple logistic regression analysis (water fed after bottle feeding, fluoride supplementation, milk for snacking, sleeping with bottle held in the mouth, babies' teeth and oral cavity cleaning, consumption of sweeten snacks, mother's education, and plaque index). It was found that having bottle held in the mouth while sleeping shown to be the only significant predictor in the model

(OR = 5.67, 95%CI = 1.51, 21.32). Fluoride supplementation was almost found to be statistically significantly associated dental caries in the model.

Discussion

The prevalence of dental caries in deciduous teeth in children of the age 18 to 72 months old (mean age = 47.62 ± 12.29 months) was 71.2% in this study, with a mean dmft of 7.00 ± 6.15 . The result was higher than the mean dmft of the six-year old children in Bangkok city reported in 1994 (dmft = 4.5). However, the percentage of caries free children in our study was higher than that study (29% vs. 16%). It must be noted that the samples of this study were clinic patients while the national survey samples were from the general population. The high prevalence of caries at Mahidol University Dental clinic may be partly explained by the fact that the majority of patients seen at this clinic are from low and middle income families. Those from middle-income families were mainly governmental officer families, which have full coverage of dental health care benefit provided by the government subsidy. This can be accounted for the higher percentage of caries-free children as compared to those in the national health statistics.

Comparing to children in other countries, the mean dmft in this study was higher than the Mexican-American children of the age between 16 to 72 months⁽¹⁹⁾. In that study, children at Harris County clinics were shown a mean dmft of 4.9 while 24% of them were caries free. Other studies that also examined dental caries status in children were Beijing⁽²⁰⁾ and Hong Kong studies⁽²¹⁾. It was found that 5-year-old children of Beijing study had a mean dmft of 5.0, with 17% were caries free, and the 5-year-old Hong Kong children had mean dmft of 3.2, with 37% were caries free. Of all the children in this study, 57% showed very high caries experience determined by $\text{dmft} > 5$.

The average time for the first dental visit was 35.55 ± 22.91 months and none of them visited the dental clinics until the age of 18 months or older, which considered to be very late compared to oral health policies established by The American Academy of Pediatric Dentistry⁽²²⁾. The policies recommended that the child should have an oral consultation visit within six months of eruption of the first tooth because dental caries in children can occur as early as 12 months old and it can be increased dramatically within the next 12 months period⁽²³⁾. Moreover, it was found that 30% of 6-12 month-old Puerto Rican children in the rural area had frank or decalcification tooth lesions⁽²⁴⁾. This could be one of the reasons why children in this study had very high caries prevalence. Education concerning an early caries investigation and early intervention should be emphasized to parents, since the untreated dental caries did not only cause pain & swelling, or sleepless night, but they may also affect child's body weight⁽²⁵⁾.

The educational level of the mother was found to be significantly related to dental caries experience among the children. The mother with bachelor's degree was found to be a protective factor for development of her child's dental caries (OR = 0.19, $p < 0.0001$). This implied that 81 percent of caries prevalence could have been prevented, had the mothers had education with degree level. This result was in accordance with Dilly et al⁽¹¹⁾ who reported that 86% of parents whose children exhibited nursing caries were the high-school graduates or lower. Moreover, Grytten et al⁽⁷⁾ found a relationship between children caries experience and mother's level of education.

The majority of children (87%) were bottle-fed over the period of 24 months. However, the prolonged bottle feeding was not related to dental caries. In this study, the habit of falling asleep with a bottle in the mouth was found to be significantly related to dental caries which is comparable to previous studies^(26,27). Children with bottle held in the mouth in this study were found to be 4.5 times at risk of developing dental caries as compared to those without. This confirmed that acid production from carbohydrate fermentable during the decreasing salivation causes enamel demineralization. Del Valle⁽²⁴⁾ reported that mothers who held, rocked, talked or distracted their child after nursing, had less dental disease than those who left their babies sleeping with bottle held in the mouth.

It was interesting to find that water was an efficient mean in helping caries reduction by clearing those fermentable substrate from oral cavity. About 91 percent of caries risk could have been prevented if parents had fed their children with water after bottle-feeding. This habit of feeding water following bottle nursing is beneficial for those prolonged bottle-feeding. It is the first study to demonstrate the role of water as an important mean in preventing dental caries as an oral clearance after bottle feeding.

When interviewing parents about the oral hygiene care, it was found that 15 out of 16 children whose parents did not clean oral cavities for their children under the age of 12 months appeared to have dental caries. Oral hygiene care should be implemented at the time of the first primary tooth eruption⁽²²⁾. It was demonstrated that oral hygiene habit established during infancy were maintained throughout early childhood period⁽²⁸⁾. However, our study failed to show the significant association between dental caries and frequency of tooth brushing. Plaque formation was also found to be a strong predictor of dental caries, which confirmed with the previous studies that the visible plaque and lack of good oral hygiene habits at 2 years of age were the two factors most strongly associated with the presence of carious lesion^(27,28).

The types of food intake and dietary behavior were also evaluated as the potential predictors for dental caries. The children whose parents served regular desserts as a snack were 2.5 times at risk of developing dental caries than

those whose parents did not. The result was comparable to the previous studies^(23,29) which had shown that misuse of sugar was one of the strongest determinants of dental caries. Milk, in this study, was found to be protective of dental caries. This agreed with earlier studies^(30,31). The result showed that about 73% of children would not develop caries if parents served milk instead of other kinds of snack. Milk has been suggested to be an anticaries food⁽³²⁾. Some of the milk ingredients, such as, calcium, protein, and phosphorus were attributed to a protective role against decay⁽³¹⁾. Dietary patterns seemed to be established early in life⁽³³⁾, therefore the snacks and food provided by the parents should be of primary concern to their children. Furthermore, it was also found that frequent use of a sweetened feeding bottle, soft drink and sweets early in life contributed to a higher consumption of sugary items later in life⁽³⁴⁾.

Only 39% of children were given fluoride supplement, which was found to be an effective mean in prevention of dental caries. This result was similar to Holbrook⁽²⁹⁾, who demonstrated that regular use of fluoride tablet was a good protective factor of dental caries.

However, when controlling for important confounding factors (fluoride supplementation, having sweets and desserts regularly, water fed after bottle feeding, having milk as a snack, cleaning babies' teeth, mother's level of education, having bottle held in the mouth while sleeping, and plaque accumulation) in multivariate logistic regression analysis, only the habit of having bottle held in the mouth while sleeping was found to be statistically significantly associated with dental caries. The results of this study confirmed that the cause of dental caries is multifactorial, and can be confounded by various factors as found in our multivariate analysis.

To accomplish one's goal in reducing prevalence of dental caries, the guidelines of oral health care, food intake, dietary and feeding habit, and the child's dental visits should be recommended to parents as early as possible. Oral hygiene education, as an important strategy, should also be reemphasized at the high-school level.

Conclusions

1. The prevalence of dental caries in one hundred and four Thai children with the mean age 47.62±12.29 months (range from 18 to 72 months) were 71% with the mean decayed, missing and filling per child (dmft) of 7.00±6.15.

2. Five protective factors for dental caries from bivariate logistic regression were statistically significantly found in the analysis. These were : fluoride supplementation, having water fed after bottle feeding, cleaning oral cavities for babies under one year of age, mother's level of education beyond high school, and having milk as a snack. Children having sweets and desserts regularly served, having bottle

held in the mouth while sleeping, and plaque accumulation were found to be significantly positively associated with dental caries.

3. Having bottle held in the mouth while sleeping was the only significant predictor in multivariate analysis.

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บทวิทยากร

สถานภาพของโรคฟันผุและปัจจัยที่เกี่ยวข้องของเด็กวัย ๑๘-๗๒ เดือน ที่เข้ารับการรักษาในมหาวิทยาลัยมหิดล

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บทคัดย่อ

การวิจัยนี้มีจุดมุ่งหมายเพื่อประเมินสถานภาพของโรคฟันผุและปัจจัยที่เกี่ยวข้องในกลุ่มเด็กที่เข้ารับการรักษาในคลินิกทันตกรรมเด็ก มหาวิทยาลัยมหิดล โดยทำการตรวจฟันผุและแผ่นคราบจุลินทรีย์ในผู้ป่วยเด็กใหม่อายุไม่เกิน ๖ ปี (อายุเฉลี่ย 47.62 ± 12.24 เดือน) จำนวน ๑๐๔ คน ตรวจฟันผุและแผ่นคราบจุลินทรีย์ในมารดาของผู้ป่วยเด็ก ศึกษาปัจจัยที่เกี่ยวข้องกับโรคฟันผุจากแบบสอบถามที่ผู้ปกครองกรอกในเรื่องของ ประวัติทั่วไป พฤติกรรมการเลี้ยงดูและการรับประทานอาหารว่างของเด็ก การดูแลรักษาสุขภาพช่องปากของเด็ก และการพาเด็กไปพบทันตแพทย์ จากการศึกษาพบว่าเด็กกลุ่มที่ศึกษามีค่าเฉลี่ยฟันน้ำนมผุ ถอน อุด 7.00 ± 6.15 ซึ่งต่อคนในจำนวนนี้เด็ก ๒๙% ไม่มีฟันผุ เด็กจำนวน ๒๖% มีค่าเฉลี่ยฟันผุ ถอน อุดประมาณ ๖-๑๐ ซึ่งต่อคน ปัจจัยที่ป้องกันฟันผุอย่างมีนัยสำคัญ ($p < 0.05$) มี ๕ ปัจจัย ได้แก่ ฟลูออไรด์เสริม การดื่มน้ำตามหลังจากดูดนมขวด การทำความสะอาดช่องปากในทารกอายุน้อยกว่าหนึ่งปี มารดามีการศึกษาสูงกว่ามัธยมปลาย และการดื่มนมเป็นอาหารว่าง ส่วนปัจจัยที่ส่งเสริมให้เกิดฟันผุอย่างมีนัยสำคัญ ($p < 0.05$) มี ๓ ปัจจัย คือ การรับประทานอาหารหวานหรือขนมเป็นประจำ การดูดขวดนมคาปากขณะหลับ และปริมาณแผ่นคราบจุลินทรีย์ จากการวิเคราะห์โดยวิธีมีัลติวาริเอตโลจิสติก รีเกรสชั่น (multivariate logistic regression) พบว่าการดูดขวดนมคาปากขณะหลับเป็นปัจจัยที่สำคัญที่สุดที่ทำให้เกิดฟันผุ จากผลการศึกษาสามารถทำนายได้ว่ากลุ่มเด็กที่ดูดนมคาปากขณะหลับเป็นปัจจัยที่เกี่ยวข้องกับการเกิดฟันผุ