

**Original Article**

## **Longitudinal Study on Influence of Prolonged Non-nutritive Sucking Habits on Dental Caries in Japanese Children from 1.5 to 3 Years of Age**

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### **Abstract**

The purpose of the present study was to investigate the relationship between infant sucking habits and the prevalence of caries in Japanese preschool children.

The study was designed as a prospective, longitudinal study starting with 592 children aged 18 months. Information on sucking habits and patterns of feeding was collected from parents in the form of a questionnaire. Children who continued breast- or bottle-feeding at 18 months of age were eliminated prior to the evaluations. The children were divided into 3 groups according to their sucking habits at 18 months of age: Group 1: children with a finger-sucking habit ( $n = 151$ ); Group 2: children who used a pacifier ( $n = 45$ ) and Group 3: children with no oral habit ( $n = 205$ ). Clinical examinations were carried out by one of the authors.

Mean dft and prevalence of caries were not statistically significant among the 3 groups at 18 months of age. However, only 10.6% of the children in Group 1 exhibited caries at 36 months of age, compared with 17.1% in Group 3 and 24.4% in Group 2. Group 1 children showed the smallest mean dft at 0.30 among the 3 groups at 36 months of age, and those in Group 2 showed 1.18; the difference was statistically significant ( $p < 0.01$ ).

The results suggest that children with a finger-sucking habit are more likely to be free of caries by the age of 3. However, use of pacifier at 18 months of age is a potential risk factor for the development of dental caries in children.

**Key words:** Dental caries—Finger-sucking—Pacifier—Japanese infant—  
Longitudinal study

### **Introduction**

In an earlier study<sup>9)</sup>, we showed that the mean dft at 3 years of age in children developing caries before 2 years of age was significantly greater than that in children caries-free

at 2 years of age. This indicates that children who develop caries before 2 years of age are at greater risk for dental caries later. Identifying these children before the disease is established requires gathering information on all potential caries-related factors during these

years.

We reported that children who were breast-fed at 18 months of age were more likely to have dental caries than children who had been bottle-fed over a prolonged period of time or children who had been weaned before 18 months of age<sup>10</sup>. Therefore, breast-fed children need to be monitored more closely, and aggressive methods of preventive care need to be instituted.

On the other hand, an association between pacifier-sucking and caries in children has also been demonstrated in some studies<sup>2,4</sup>, whereas the connection between finger-sucking and caries development has been studied less frequently. The purpose of this investigation was to study the prevalence of dental caries and its relationship with non-nutritive sucking habits in Japanese preschool children.

### Materials and Methods

All infants in this study took part in preventive dental care programs at public health centers in accordance with the recommendations of the Japanese National Board of Health and Welfare.

This study was designed as a prospective study starting with children at 18 months of age. Cohort children were born in 1997–99 and visited a public health center in “K” city, Tokyo for regular dental examinations. We examined 922 children at 18 months, 742 children at 24 months and 910 children at 36 months of age. Of the 1,120 children examined, 592 (52.9%) were followed longitudinally. All children were Japanese, in good general health, and had age-appropriate cognitive development.

Parents were asked to give consent to the study and fill out questionnaires at every dental examination. The questionnaire included questions on non-nutritive sucking habits and the child’s past and present breast- or bottle-feeding habits.

Dental examinations were carried out using a mirror, an explorer, and an ordinary examination light. In each case, the examiner was

blind to the child’s questionnaire data. The presence or absence of dental caries, including initial carious lesions, was recorded for all erupted tooth surfaces. Caries on smooth surfaces was recorded when there was definite cavitation and/or creamy shadowing with roughness on probing. Caries on pits and fissures was registered when there was definite cavitation and/or detection by probing under light pressure. The above diagnostic criteria for caries were based upon recent Swedish caries research in children<sup>8</sup>.

Children who continued breast- or bottle-feeding at 18 months of age were eliminated prior to evaluating the association between non-nutritive sucking habits and dental caries. In other words, the analysis focused on the influence of non-nutritive sucking, eliminating confounding variables such as prolonged breast- or bottle-feeding.

The children were divided into 3 groups according to their sucking habits at 18 months of age:

Group 1: children with a finger-sucking habit (n = 151)

Group 2: children who used a pacifier (n = 45)

Group 3: children with no oral habit (n = 205)

The chi-square test or Fisher’s exact test for categorical variables was used for comparisons of proportions. The significance of differences between multiple groups was assessed by an analysis of variance according to the Tukey-Kramer test.

### Results

The results in Table 1 show that 151 of the 592 children (25.5%) had a finger-sucking habit, 45 children (7.6%) used a pacifier, and 205 children (34.6%) had no oral habits and were not being breast- or bottle-fed at 18 months of age.

One (0.7%) of the Group 1 children and 1 (2.2%) of the Group 2 children had caries, compared to 4 (2.0%) of the Group 3 children at 18 months of age. There were no statisti-

Table 1 Number and proportions of children with caries at 18 months, 24 months and 36 months of age according to sucking habit at 18 months of age

	n	Number of children with caries (%)		
		18 months	24 months	36 months
Group 1 (Finger sucking)	151	1 (0.7)	2 (1.3)	16 (10.6)
Group 2 (Pacifier sucking)	45	1 (2.2)	6 (13.3)	11 (24.4)
Group 3 (Control)	205	4 (2.0)	11 (5.4)	35 (17.1)

\*\*: p&lt;0.01, \*: p&lt;0.05

Table 2 Mean scores of dft distributed according to sucking habit at 18 months of age

	n	Mean dft (S.D.)		
		18 months	24 months	36 months
Group 1 (Finger sucking)	151	0.01 (0.08)	0.03 (0.17)	0.30 (0.63)
Group 2 (Pacifier sucking)	45	0.09 (2.05)	0.38 (1.79)	1.18 (2.74)
Group 3 (Control)	205	0.06 (0.47)	0.11 (0.51)	0.54 (1.77)

\*\*: p&lt;0.01, \*: p&lt;0.05

cally significant differences between groups.

Table 1 also shows the prevalence of dental caries at 24 months age. Two (1.3%) of the Group 1 children had caries, compared to 6 (13.3%) of the Group 2 children: the difference was statistically significant (p<0.01). On the other hand, 11 (5.4%) of the Group 3 children had caries, although the difference failed to reach statistical significance in comparison with the other groups.

Sixteen (10.6%) of the Group 1 children had caries, compared to 11 (24.4%) of the Group 2 children at 36 months of age: the difference was statistically significant (p<0.05). In Group 3, 35 (17.1%) children had caries, although the difference was not significant in comparison with the other groups.

Table 2 shows the mean dft of the children in the 3 groups at 18 months, 24 months and 36 months of age. The mean dft of the Group 1 children was 0.03 at 24 months of age and 0.30 at 36 months of age. These dft data were statistically significant between Group 2 children (p<0.01), but not statistically significant between Group 3 children. The mean dft of Group 2 children at 24 months of age was 0.38 and 1.18 at 36 months of age. These differences were statistically significant in

comparison with Group 3 children (p<0.01 at 24 months of age, p<0.05 at 36 months of age).

## Discussion

We found that children with a finger-sucking habit at 18 months of age were more likely to be free of caries by the age of 3.

Warren *et al.*<sup>6)</sup> reported that the absence of interdental spaces was weakly associated with greater decay experience in primary dentition. Ben-Basset *et al.*<sup>1)</sup> also studied the relationship between interdental spacing and caries. In their study, caries-free children had a significantly higher proportion of surfaces with at least 0.5 mm of space adjacent to them, compared to the caries-affected group. A study of primary dentition in 436 Japanese children also suggested a relationship between caries and lack of spacing in the maxillary incisors<sup>3)</sup>. In an earlier study<sup>11)</sup>, we found that finger habits were associated with excessive overjet in Japanese preschool children. Therefore, we hypothesized that excessive overjet might create spacing in the maxillary incisors, thus decreasing the risk factor for the development

of dental caries in these children.

On the other hand, we found that use of a pacifier at 18 months of age was a possible risk factor for the development of dental caries in children. This finding is in accordance with the results of those of a study by Ollila *et al.*<sup>4)</sup> They reported that prolonged pacifier-sucking was a significant risk factor for caries development in children.

In an earlier study<sup>11)</sup>, we reported that pacifier habits were more strongly associated with the development of openbite and posterior crossbite in Japanese preschool children. Warren *et al.*<sup>7)</sup> also reported that pacifier habits were strongly associated with the development of posterior crossbite, increased mandibular arch width and shallower palatal depth, while finger habits were associated with increased overjet, narrowed maxillary arch width and elongated maxillary arch depth. This indicates the importance of clarifying the similarities and differences in the effects of pacifier and finger habits on dental arch and occlusal characteristics.

However, the results of this study do clarify why a pacifier-sucking habit was correlated with more dental caries among these children. In addition, there may be other risk factors behind the use of a pacifier that were not investigated in this study, such as unfavorable dietary habits, infant's behavior and faulty oral hygiene.

Ollila *et al.*<sup>5)</sup> reported that pacifier-sucking and the use of nursing bottle at night led to increased caries activity in the early primary dentition, as indicated by increased levels of salivary caries-associated microorganisms. They suggested that change in local environmental conditions in the mouth was one reason for this effect. Accordingly, further study is necessary to determine the relationship between levels of salivary caries-related microorganisms and caries and occlusal characteristics such as openbite.

In conclusion, our results show that pacifier-sucking children may develop caries at an early age, even before the primary dentition has fully erupted. It is, therefore, important to try and identify the factors of dental caries

among pacifier-sucking children as soon as possible and seek effective preventive programs. Many dentists recommend introducing pacifiers for children who have a tendency to start finger-sucking, as digit-sucking has a more detrimental effect on occlusion. However, it is important to remember that caries development should be evaluated on a routine basis in persistent pacifier-suckers, and caries-preventive treatment rendered when indicated.

On the other hand, the results of this study suggest that children with a finger-sucking habit are more likely to be free of caries by the age of 3. However, we must always consider the potential for increased incidence of malocclusion in individuals with persistent finger-sucking habits.

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