

# **Feeding and oral hygiene habits of preschool children in Hong Kong and their caregivers' dental knowledge and attitudes.**

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*Short Running Headline:* Preschool child's feeding and oral condition.

## **Abstract**

*Objectives:* This study was designed to gather data on infant feeding habits and oral hygiene practices of Hong Kong preschool children on the dental knowledge and attitudes of their caregivers and on the oral health status of the same group of children.

*Design:* Cross-sectional study

*Sample and methods:* Data was gathered for a total of 369 boys and 297 girls ( 207 one year olds, 269 two years old and 190 three year olds ) with a mean age of 20.19 ( $\pm$  0.38) months. Information related to children attending six randomly selected Maternity and Child Health Centres. by interviewing the attending caregivers and completing a questionnaire. The study was carried out and then completing an oral examination of the subjects using a torch, disposable mirror and wooden tongue spatula.

*Results:* Only 7% of the infants were exclusively breast-fed. More than 98% (656/666) of infants used a nursing bottle for at least some drinks. 62.8% (411/656) had used a nursing bottle to take fluids other than water and infant formula. At bedtime, 56% (361/656) were given a nursing bottle prior to sleep and 96% (340/361) of these bottles contained formula milk. Of these children, only 37% (131/361) finished the contents of the bottle before falling asleep. 73% (139/190) of the children continued to use a feeding bottle after 2 years of age. Non-nutritive sucking habits were practiced by 35.6% (237/666) of the children.

Visible plaque, on the labial surface of at least two maxillary incisors, was found in 19.5% (120/615) of the children. Oral cleansing habits were practiced for 66.2% (441/666) of the children. Toothbrushing habits were reported for 42.3% (260/615) of the dentate children, of whom 19% (49/260) had their teeth brushed twice daily. Toothpaste was used by 49.23% (128/260) of the children and 57.3% (149/260) brushed their own teeth.

Caries was seen in 7.6% of the infants (47/615). Of the caregivers 67.7% said they did not think carious primary teeth needed to be restored. Among the mothers, 12.6% (43/342) did not know the oral condition of their child. Reportedly 82% (417/510) and 87.5% (446/510) of the mothers had not received any oral health care information during the ante- or post-natal periods. Nearly all, 97% of all respondents said that they would like to receive more information on oral health care.

## **Introduction**

Limited information is available on the oral health status of children younger than 4 years of age living in Hong Kong. In 1986, Lo found that 6-8 years old children had a mean dmft index of 2.9 [1]. The Department of Health survey conducted in 1992 revealed mean dmft values of 1.1 and 1.9 for 3 and 6 years old children respectively [2]; while Wei and his co-workers in 1993, reported that 37% of 5 years old Hong Kong children were caries free [3]. A young child's dental environment is complex because their mothers' and/or caregiver's dental knowledge, attitudes, beliefs and practices affect the child's oral condition [4,5]. Feeding habits are said to be of prime importance in the aetiology of dental caries at any age, but more especially in young children of pre-school age [6,7,8,9]. As reported by Evans and Lo in 1992, the risk of acquiring dental caries appears, in the Hong Kong population, to be associated with events in the preschool period [10]. Because of the relationship, a better understanding of the knowledge, beliefs and practices of caregivers should contribute to formulation of more effective preventive strategies for the benefit of infants and children.

In Hong Kong, children under the age of 5 years attend Maternity and Child Health Centres (MCHC) which are operated by the Department of Health. More information about the centres and services is given in Appendix 1. These centres provide ante-natal therapy, vaccinations and developmental assessments at birth, 6 months, one year, two years and three years old. In 1999, 94.5% of local newborns took advantage of the service. Because levels of attendance are so high, these centres appear to be a valuable source for the gathering of data on the oral status of young children. It was therefore, decided to conduct an investigation of children under 4 years of age who attend the

MCHCs in order to first gather data on the feeding habits of infants and on the dental beliefs of their caregivers and second on the oral health status of the children attending.

## **Methods**

Six out of the 47 MCHCs which are scattered throughout Hong Kong were randomly selected, on behalf of the investigators, by the Department of Health administrative staff. For details of the sampling strategy, see Appendix 2. The survey lasted for four weeks. All children under the age of four years who attended these MCHCs were invited to participate in the study as part of their regular post-natal schedule.

Several weeks in advance of the scheduled start of the investigation it was publicized by notices displayed in the waiting areas of each MCHC. After explaining the nature of the investigation, a nurse verbally invited the parents or caregivers of the children who were in the specific age group if they wished to join the investigation. Written consent to participate in the investigation was subsequently obtained from the parents.

The parents, or caregivers were interviewed in order to complete a questionnaire which was designed to collect data on the feeding habits, snack and confectionery consumption (the day prior to interview) and oral hygiene habits of the infants as well as the oral hygiene practices, dental attendance pattern, attitude towards oral health care and knowledge of the parents, or caregivers. All of the interviews were conducted by a trained dental nurse or an undergraduate dental student in a private and relaxed atmosphere so as to avoid biasing other potential participants. The questionnaire was

pre-coded and all of the interviewers were trained to ensure a standardized interpretation of the questions.

The interview was followed by an oral examination for the child which was performed by one of two trained and calibrated dentists using a torch, disposable mirror and wooden tongue spatula. Caries was diagnosed, according to WHO criteria for caries, that is, only lesions showing unmistakable cavitation were recorded. No radiographs were taken. Presence of visible plaque on the labial surfaces of more than two maxillary incisors were recorded.

Inter-examiner calibration was carried out before the field work. Duplicate examinations were also conducted on one out of every ten subjects to test the reliability of the examination. Inter-examiner reliability as measured by Kappa was 0.95 and intra-examiner values were 0.99. The statistical software, package SAS System for Windows Release 6.11 was used. Chi-square test, Unpaired t-test and Fisher's Exact test were used in statistical analysis of the data.

## **Results**

### ***Sample size***

The sample comprised of 666 infants, 369 boys and 297 girls with a mean age of 20.19 ( $\pm 10.38$ ) months, of these 615 were dentate.

### ***Dental condition***

Caries was found in 7.6% of the dentate children (47/615) and visible plaque, on the labial surface of at least two maxillary incisors, was seen in 19.5% (120/615). Maxillary teeth were most frequently affected by caries (Figure1). Caries was found to be significantly associated with the presence of plaque ( $p=0.0002$ ), late weaning age ( $p=0.0012$ ), eating candies ( $p=0.0003$ ), use of toothpaste ( $p=0.0057$ ), low education level of father and mother ( $p=0.0214$  and  $0.0133$ ) and household income ( $p=0.0142$ ) but not with type of caregiver.

### ***Feeding habits***

Breast-feeding had been practiced for 44% (294/666) of the children (Table 1); of these children, only 47 had been exclusively breast-fed. By the age of six months, 67% (197/294) of the infants had ceased breast-feeding. Feeding by the clock was practiced in 53% (355/666) of the children with the remainder being fed on demand..

Among the 656 bottle-fed children, 33.7% (221/656) were given a bottle at naptime, and, 56% (361/656) were given a bottle prior to sleep at bedtime; for 96% (340/361) of children the feeding bottles contained infant formula milk. Of those given a bottle infants, 63.7% (230/361) reportedly often fell asleep with a bottle. Seventy three percent (139/190) of the children were still using a nursing bottle even after two years of age.

Of all the infants and children indicated 62.8% (411/656) used a nursing bottle to take fluids other than water and infant formula. Fruit juices were being given to 60%, soup to 17.8%, while products with a recognizable sugar content were consumed by 26.2%

of the children. Of those children who took non-dairy products, 27.5% (113/411) consumed them more than six times per day.

### ***Dummy sucking habits***

Non-nutritive sucking habits were practiced by 35.6% (237/666) of the children with only 3% of them using a sweeten dummy. At the time of interview, 60% (140/237) of the children were still using dummies; 8.5% (12/140) of whom were over the age of two years.

### ***Weaning***

Among the 666 infants, only 90 had been weaned. Four of these were weaned directly from human breast milk. The mean age of weaning in the caries free group was  $12.34 \pm 7.23$  months while the mean age of weaning in the group with caries was  $19.92 \pm 6.58$  months. Children in the group with some caries experience were significantly older at the time of weaning ( $p=0.0012$ ).

### ***Confectionery consumption***

In the dentate children, 77.4% (476/615) had already developed snacking habits which for 57% (270/476) of the children involved the eating of candies. Taking candies frequently was found to be associated with dental caries ( $p=0.0003$ ).

### ***Oral cleansing methods***

Oral cleansing habits were reported to be practiced on, or by, 66.2% (441/666) of the children while 21% (140/666) rinsed their mouths with water. Of those, caregivers of 44.2% (195/441) stated that the practice had started immediately after birth. Cleaning



was carried out for 61% (269/441) of the children by using either a piece of cotton gauze or a handkerchief, a cotton bud or cotton tipped applicator.

### ***Toothbrushing habits***

Among the group of 615 dentate children, toothbrushing was reported to be practiced by 42.3% (260/615). Fifty six percent (149/260) of these children brushed their teeth without any adult supervision. The toothbrushing habit had already started in 86% (219/260) of the children by the age of two years (Table 2). Significantly, more caries free children started toothbrushing early ( $p < 0.001$ ). Among those children brushing their teeth, 34% (89/260) brushed irregularly, 44% (115/260) brushed once a day and 19% (49/260) brush twice daily (Table 3). Toothpaste was used by 49.2% (128/260) of the children. Among these, 54% (69/128) used children's toothpaste.

### ***Attitudes, knowledge and beliefs of parents / caregivers***

When the mothers/caregivers were asked when their child's first tooth erupted, 15.3% (94/615) were unable to provide the answer. The aetiological factors for dental caries were not known by only 7.5% (50/666) and 4.9% (33/666) could not answer the questions on the ways that dental caries can be prevented.

It was suggested by 44% (294/666) of the mothers/caregivers that the oral cavity of an infant should be cleansed from birth. Primary teeth had no particular function according to 17.3% (115/666). This indifference towards the primary dentition was further shown in the finding that 67.7% (451/666) of the caregivers suggested that when carious, these teeth need not be restored.. The preferred age for the child's first dental visit varied; with 37% (248/666) of parents/caregivers saying that it should be

around one year of age and, 20.7% (138/666) before 3 years, while 26.4% (174/666) would not take their child to visit a dentist until after the age of six years, or would take them only when a problem arose (Table 4).

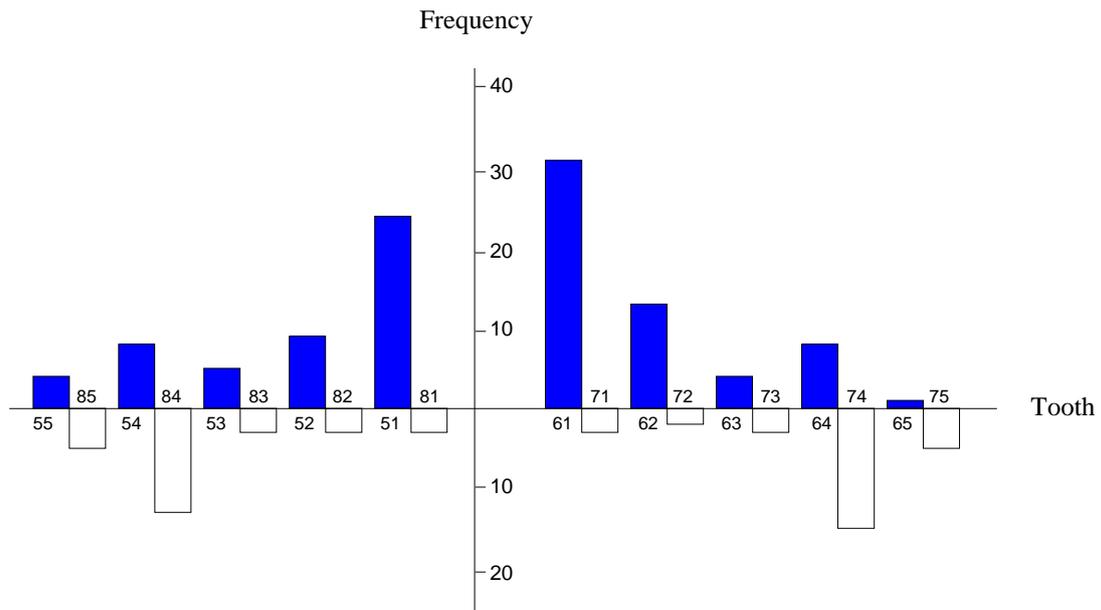
It was reported by 8.3% (55/666) of the mothers/caregivers, (40% (22/55) of whom were the mothers ), that they did not know the dental condition of their children. Of those with caries, only 33% (16/48) of their caregivers had perceived any oral problem (Table 4). Significantly, more caregivers of children in the group with caries did not realize the oral condition of the children compared with those of children who were caries free ( $p=0.0298$ ). Regular dental visits were made by 24.6% (164/666) of the mothers/caregivers (Table 5).

Of the 510 mothers who were interviewed, 82% (417/510) and 87.5% (446/510) reported that they had not received any oral health messages during the ante-natal and post-natal periods respectively. Nearly all, 97% of the respondents, said that they would like to receive more information about oral health.

### ***Household income and education level of parents***

Information summarized in Tables 6, 7 and 8 shows that significantly more children with caries came from families with lower household incomes and had parents with a lower education level.

Figure 1. Frequency of dental caries attacks according to type of primary tooth in 666 preschool Hong Kong children.



**Table 1.** Type of milk fed to the 666 dentate preschool Hong Kong children.

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| Type of milk                            | Number | Percentage |
|---|--------|------------|
| Formula milk                            | 372    | 56         |
| Breast milk                             | 10     | 1.5        |
| Breast milk and formula milk            | 247    | 37         |
| Expressed breast milk in nursing bottle | 37     | 5.5        |

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**Table 2.** The age of 260 preschool Hong Kong children at the time that toothbrushing commenced.

| Age (years) | Toothbrushing in caries group | Toothbrushing in caries free group |
|-------------|-------------------------------|------------------------------------|
| <2          | 7                             | 212                                |
| >2          | 30                            | 3                                  |
| no answer   | 0                             | 8                                  |

Fisher's Exact test with  $p < 0.0001$

**Table 3.** Daily frequency of toothbrushing amongst 260 preschool Hong Kong children.

| Daily frequency | Number | Percentage |
|-----------------|--------|------------|
| Once            | 115    | 44         |
| Twice           | 49     | 19         |
| Irregular       | 89     | 34         |
| More than twice | 7      | 3          |

**Table 4.** The oral condition of 560 preschool Hong Kong children as perceived by their caregiver.

| Oral condition     | Caries | Caries free |
|--------------------|--------|-------------|
| No problem         | 31     | 487         |
| Not good           | 16     | 26          |
| No idea / not sure | 1      | 54          |

Fisher's Exact test with  $p=0.0295$

**Table 5.** The distribution of major caregivers of 615 dentate preschool Hong Kong children.

| Major caregiver | Caries | Caries free |
|-----------------|--------|-------------|
| Mother          | 33     | 347         |
| Grandparents    | 7      | 100         |
| Maid            | 3      | 110         |
| Others          | 4      | 11          |

Fisher's Exact test found not significant (  $p=0.0612$  )



**Table 6.** The distribution of household income.

| Household income (HK\$) | Caries | Caries free | Total |
|-------------------------|--------|-------------|-------|
| Below 20000             | 35     | 317         | 352   |
| Above 20000             | 13     | 250         | 263   |

Chi-square test with  $p=0.0142$

(significant association between caries and lower household income)

**Table 7.** The education level of the fathers of 666 preschool Hong Kong children.

| Educational (father) | Caries | Caries free | Total |
|----------------------|--------|-------------|-------|
| None / primary       | 16     | 107         | 123   |
| Secondary            | 26     | 383         | 409   |
| Tertiary / above     | 6      | 128         | 134   |

Chi-square test with  $p=0.0214$

(significant association between caries and lower educational level of father)

**Table 8.** The education level of the mothers of 666 preschool Hong Kong children.

| Educational (mother) | Caries | Caries free | Total |
|----------------------|--------|-------------|-------|
| No / primary         | 16     | 103         | 119   |
| Secondary            | 28     | 426         | 454   |
| Tertiary / above     | 4      | 89          | 93    |

Chi-square test with  $p=0.0133$

(significant association between caries and lower educational level of mother)

## **Discussion**

### ***Dental caries***

Although dental caries prevalence amongst children in this study is not high, poor oral hygiene, manifested by the presence of visible plaque on labial surface of at least two maxillary incisors was found to be associated with dental caries ( $p=0.0002$ ). Maxillary incisors were the teeth most frequently affected by the disease. This is in accordance with findings of other studies of Chinese preschool children [11,12].

### ***Infant feeding***

In Western countries, breast-feeding is the commonly accepted practice [13] but this study shows that most of the mothers in Hong Kong had used a nursing bottle to feed their infants formula milk, only a small proportion used expressed breast milk. Of those mothers who did not breast feed their babies, 72% indicated that it was not convenient to do so. In Hong Kong it is common for mothers to leave their child with a maid, grandparent or professional caregiver; this is supported by the fact that questionnaire results show that mothers were the major caregiver for only 51.4% of the children in this study.

Of the 56% of the children reported to use a nursing bottle at night-time, only 36.3% finished the contents before falling asleep. These nocturnal feeding habits are well known to contribute to caries development in young children [14]. The use of a nursing bottle at night may be a form of comforter and so a habit, that is subsequently difficult to break, is unfortunately created. The prolonged use of a nursing bottle after the age of two years was also common (73.2%) in these children.

Information on practical ways to control bedtime feeding practices of young children needs to be made available. The importance of feeding need to be emphasized [15] prior to the establishment of such a deleterious habit. In this study, all but ten of the children had infant feeding bottles for milk feeds. Of these, 61.7% (411/656) also took non-milk and non-plain water products from the bottle. Fruit juices were the commonest alternative drink, and were reportedly given to 60% (394/656) of the respondents. The majority of the children had used a nursing bottle to drink these fluids in preference to using a cup.

Snacking habits were common amongst the dentate children (77.4%) and the preferred foods were candies or sugary snack type foods (57%). This probably was probably because they are readily available, easy to store and are well accepted by the children. They may well have been used as a reward by caregivers who were looking after the children in place of the parents. Unfortunately, the introduction of sugary drinks and confectionery at an early age is known to lead to the establishment of a habit that persists even after a child gets older [16,17]. In this study, eating candies was also found to be significantly associated with caries development ( $p= 0.0003$  ).

Although they may have been given sweet drinks and snacks, the use of a sweetened comforter, which has been reported to be associated with childhood caries [18,19], was not a commonly practiced habit in Hong Kong.

The ability of the parents to recall the nature of feeding habits is likely to get less reliable with the passage of time, so the parents of the younger children probably

provided the more accurate data because of the shorter time interval between the practicing of the habit and the answering of the questionnaire.

### ***Oral hygiene***

It was encouraging to find that the majority of mothers/caregivers cleansed their children's mouths and that about half of them had started the practice soon after birth. The figure of 86% (168/260), which indicated those children who started to brush their teeth before the age of two years, was much higher than the 59% found in a previous study in Hong Kong [20]. In the present study, nearly half of the children managed to brush their teeth at least once a day. However, the majority (56%) of the children were left to clean their teeth by themselves. This finding confirmed that of Lee [21] who reported that only 45% of parents helped their children to brush their teeth. Although a child's effort may be largely ineffective they should not be discouraged from attempting to brush their own teeth as well having help. However, it is worth noting that children who brush their own teeth without help have been shown to be more likely to develop dental caries than those who sometimes, or always have their teeth brushed by an adult [24].

Of those children who had a toothbrushing habit, 49% reportedly used toothpaste. Use of toothpaste was found to be associated with caries free status ( $p=0.0057$ ). As shown by the brand name in the reply, all toothpastes being used by the children were of the fluoridated type. However, 46% of these children used brands intended for adults, so they would not have had a low fluoride content. This could have been because it was more convenient to use the same tube of toothpaste as the rest of the family members;

or more likely it was because in Hong Kong toothpastes with a low fluoride content are not yet widely advertised or available.

### ***Knowledge, attitudes and beliefs of mothers/caregivers***

It was previously reported by Lee that 51% of the nurses in the MCHCs had indicated that parents were not interested in the oral health care of their children [20]; so it was encouraging that in this study 99.7% of the mothers, or caregivers whose children were in the target group and were invited to participate in the study did so. Two children were excluded from the study because their grandmothers were not the main caregiver but had happened to bring the child to the clinic on the day of the study. Nearly all of the mothers indicated that they would like to receive more information about infant oral health care.

According to the protocol of the MCHCs, information and messages on oral health are provided ante-natally. However, it has been said that the messages have, in the past, been given by only 45% of nurses in accordance with the guidelines of their nursing manuals [20,21]. More than 80% of the mothers in this study could not remember receiving any messages or handouts on infant oral health during either the ante-natal or post-natal periods. However, the poor response may be partly due to the retrospective nature of data information.

Social class was found, as in other studies [23,24], to be an important consideration. Socioeconomic status may be evaluated by income and education [25]. It has been shown, for example, that the higher the mother's educational level, the lower their

child's caries experience [26]. This is supported in this study in which the father's education level was also found to be important but to a lesser extent.

Although 37% of the caregivers suggesting that the first dental visit should be around the age of one year, no children of this age had visited the dentist. Three children in the study had previously seen a dentist. Two of the 27 children, who were eligible for free dental treatment at Government dental clinics, had attended for check-ups and a third child, who had attended a private practitioner for treatment had 10 carious teeth, only five of which had been restored. This pattern of behavior may indicate barriers to dental services and utilization which need to be explored in future studies. Previously, the utilization of dental services in Hong Kong by pre-school children was found to be low [2,3]. The reason given in a further previous study was that the parents did not perceive that a dental problem existed in their own child [2]. In this study, of the children who had caries, only 34% (16/48) were perceived by their mothers or caregivers to have a problem. Not many of the mothers could recall the time when their child's first tooth erupted into the mouth. This was in spite of it probably being a momentous event at the time. These findings to a certain extent, reflect the low awareness of oral condition of the children by their mothers or caregivers. In this respect, many (67.7%) of the caregivers indicated that there was no need to restore carious primary teeth.

Personal, communal, cultural as well as economic factors which influence dental health behaviors and nutritional habits are powerful determinants of when families seek dental care [26]. Conditions established in the pre-school years provide a foundation for oral health conditions and patterns for the use of dental services later and in adulthood [26].



Parents need to be helped to realize that they are role models for their children and to be encouraged to improve the children's dental health habits [27].

## **Conclusions**

Health professionals, who are the first to come into contact with new mothers, need to disseminate appropriate and accurate information about oral health care for infants and caregivers, especially the use of a nursing bottle at night-time and the taking of non-dairy products from the bottle. The value of toothbrushing with a child's type of toothpaste should also be emphasized to parents. It is necessary to promote dental awareness amongst the major caregivers in order to facilitate early dental checkups for young children.

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## Appendix 1

The Family Health Service consists of maternal and child health services which operate the (MCHC) which are distributed throughout Hong Kong. By late 2001, a total of 50 centers were in operation. Children under the age of five years and women of child bearing age are eligible to attend these centers. The services provided consist of child health, maternal health and family planning services. For child health services, a comprehensive immunization programme is provided for infants and children against nine childhood infectious disease, namely tuberculosis, hepatitis B, diphtheria, tetanus, whooping cough, polio, measles, rubella and mumps. Developmental assessment tests are also carried out at appropriate times to assess developmental progress. Children with suspected abnormalities are then referred to specialist centers for further management. Though it is not compulsory for children to attend the centres, data for 1999 indicated that 94.5% local born infants did so.

## Appendix 2

Hong Kong is divided into three zones. Hong Kong Island, Kowloon and New Territories. The ratio of population size is 1:1.5:2.3 respectively with the New Territories also being the largest in area. Maternity and Child Care centers are located in all major residential zones and are easily accessed by public transport. New estates have developed rapidly and many younger families have moved into the residential zones in the New Territories. Of the 47 centers in operation in Hong Kong in 1998, a sample size of six centers was calculated sufficiently to be sufficiently representative. Taking into account the number of centers in each zone and size of the population served by each centre, one was selected in Hong Kong Island, two in Kowloon and three in the New Territories. Centres were randomly selected by the Department of Health from those in each zone.

Compared to the population as a whole (43.7%), slightly more respondents came from families with lower total household income (52.8%) in this study.