

## Feeding practices and behavior of Saudi children with early childhood caries and dental knowledge of mothers

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الغرض من الدراسة هو تقييم اساليب الرضاعة، مدى الإدراك، والعادات القموية والغذائية للأطفال المصابين بنخر الأسنان المبكر ومقارنتها بالأطفال الخالين تماما من النخر في الرياض، المملكة العربية السعودية. تم الكشف على ١٢٥ طفل تتراوح أعمارهم بين ١-٥ سنوات كما تمت مقابلة أمهاتهم للإجابة على استبيان خاص. أظهرت نتائج الدراسة أن ٦٧% (٥٤%) طفل كانوا خالين تماما من النخر و ٥٨% (٤٦%) كان لديهم نخر مبكر. كما أظهرت أيضا أن نسبة عالية (٣٩,٧%) من أمهات الأطفال المصابين بالنخر المبكر اقل تعليما من أمهات الأطفال الخالين تماما من النخر المبكر كذلك فان معدل الرضاعة في اليوم الواحد، الرضاعة أثناء الليل، و النوم كانت أعلى كثيرا بين الأطفال المصابين بالنخر المبكر مقارنة بالأطفال الخالين من النخر. كما أن أمهات الأطفال الخالين تماما من النخر لديهن عادات سلوكية صحية أكثر ودراسة بمخاطر وأسباب النخر المبكر مقسارنة بأمهات الأطفال المصابين بالنخر. أظهرت الدراسة كذلك وجود اختلافات كثيرة بين الأطفال المصابين والخالين تماما من النخر في العادات القموية والغذائية.

The objective of this study was to investigate the feeding practices, dental and nutritional behaviors of pre-school children with early childhood caries and to compare these, to caries free children in Riyadh, Saudi Arabia. The knowledge and dental practices of the mothers of both groups were also assessed. Mothers of pre-school children were interviewed and their children, aged 1 to 5 years, received dental examination. Of the 125 children examined, 67 (54%) were caries free, and 58 (46%) had early childhood caries. A higher percentage (39.7%) of mothers of early childhood caries children had lower educational levels compared to mothers of caries free children. The average number of feeding times in a 24-hour period for the early childhood caries children was significantly ( $p < 0.0001$ ) higher than in caries free children. Early childhood caries children were fed mostly at night and they fell asleep with the nipple in the mouth compared to caries free children ( $p < 0.0001$ ). Mothers of caries free children had more knowledge regarding the harmful effect of the nursing habit and started brushing their children's teeth earlier than the mothers of early childhood caries children ( $p < 0.0001$ ). Significant differences appeared to be present between the early childhood caries children and caries free children with regards to nutritional and dental behaviors.

### Introduction

Early childhood caries is a unique form of rampant decay of the primary teeth, which may appear as early as nine months of age.<sup>1</sup> It has been called by a number of names such as: nursing bottle caries, bottle caries, nursing bottle mouth and nursing bottle syndrome.<sup>2-6</sup> The term early childhood caries was recommended at the 1994 workshop sponsored by the Centers for Disease Control and Prevention.<sup>7</sup>

The pattern of decay in early childhood caries is distinctive, and is closely related to the eruption sequence, with the exception of the primary mandibular incisors.<sup>2,4</sup> The four maxillary incisors are most affected, while the four mandibular incisors usually exhibit no involvement. The canines and molars may exhibit some involvement depending upon how long the carious process remains active.<sup>5,8</sup> The etiology of nursing caries appears to be multifactorial.<sup>9,10</sup> Many studies have been conducted to investigate the association of early childhood caries with different variables. Finding these variables might help in understanding, minimizing or solving this problem.

Improper use of the nursing bottle was

associated with early childhood caries especially with the habit of sleeping with the bottle in the mouth.<sup>1,9-14</sup> Nursing bottles which contained formula milk, bovine milk, fruit juices or carbonated beverages were found to be related to early childhood caries.<sup>3,15,16</sup> McIntosh and her team,<sup>17</sup> found that dentists identified fruit juice as the most common agent causing early childhood caries, followed by milk.

Children with early childhood caries were found to maintain the nursing habit beyond the normal weaning period and fed more on demand.<sup>9,14,18-21</sup> The frequency and the duration of exposure to the offending liquid was also an important factor in the development of early childhood caries. Another factor that might be associated with early childhood caries is breastfeeding. Some researchers have found that breast fed children had low caries prevalence.<sup>9,20,22</sup> Other studies, however, found that children with prolonged breast feeding, or who were breast fed on demand developed early childhood caries.<sup>1-3,6</sup> The use of a pacifier (dummy) which has been dipped in vitamin syrups, honey or other sweeteners was found to be associated with early childhood caries.<sup>5,10,15,18</sup>

With regard to demographic parameters, early childhood caries was found to be equally distributed in males and females.<sup>3,23</sup> The only

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child in the family, the first and second siblings were all found to have the same probability of developing early childhood caries.<sup>3,13,20</sup> Johnson,<sup>24</sup> however, found no significant relationship between early childhood caries and the sibling rank. Early childhood caries was also found to be associated with lower socio-economic status and lower education level of the parents.<sup>3,6,9,10,18</sup> McIntosh and her group,<sup>17</sup> on the other hand, found that early childhood caries was not limited to specific income levels and Weinstein and his team<sup>19</sup> found that children with early childhood caries had mothers with more education than caries free children. Lack of health education by the parents and delayed or neglected dental care were also found to be related to early childhood caries.<sup>3,23</sup> Children with early childhood caries were found to receive more carbohydrates and sugary snacks than caries free children.<sup>9,11</sup>

The purpose of the present study was to compare feeding practices, dental and nutritional behavior of 1-5 year old children with early childhood caries to those of children who were caries free. The knowledge and dental practices of the mothers of both groups were also assessed in this study.

### Materials and Methods

The subjects for the study were selected from children who presented themselves for treatment in the College of Dentistry King Saud University (in the undergraduate pedodontic clinic and faculty clinic). All the children were between the age of one and five years.

A clinical examination for caries was performed in the dental clinic setting. The tooth surfaces were visually examined with the aid of a No. 5 plane mouth mirror. A probe (no. 6) was only used to remove plaque or to confirm or reject the visual diagnosis of doubtful lesions. No radiographs were taken. The criteria used in the diagnosis of early childhood caries was the presence of a minimum of two maxillary incisors with labial or palatal carious lesions and absence of caries in the mandibular incisors. All the dental examinations were carried out by the same examiner.

Any healthy child who exhibited a decay pattern similar to that described for nursing caries was included as having early childhood caries. Any child who presented no caries was included as a caries free child.

A questionnaire consisting of five sections was constructed. The construction of most items was based primarily on the dental theories concerning

early childhood caries.<sup>9,11,20</sup> The following sections were covered in the questionnaire:

- \* Demographic characteristics such as the child's age, sex, sibling rank, number of children in the family and mothers' level of education.
- \* The child's feeding practices (how, when, what, why and the use of a pacifier) and weaning time.
- The child's snacking habits and type of drinking water.
- \* The child's oral hygiene habits and dental visits.
- \* The mothers' dental health knowledge and dental habits.

One of the investigators interviewed the mothers of the children who were diagnosed as having early childhood caries, and also those who were caries free. Only children with early childhood caries and caries free were included.

Two-way frequencies were generated for descriptive statistics. Chi-square and Fisher-exact test were utilized to compare the children with and without early childhood caries.

### Results

#### Demographic characteristics

Parents of 125 children completed the questionnaire. Fifty-eight mothers had early childhood caries children (ECHCC), of whom 32 were males and 26 were females, and 67 mothers had caries free children (CFC) of whom 43 were males and 24 were females. The mean age of the children was 24.6 months.

For the ECHCC, the mean number of children per family was 4.69(±2.04). Seventeen (29.3%) children were the first or second born, while 22 (37.9%) children were third or fourth and 19 (32.8%) children were fifth and above. For the CFC, the mean number of children per family was 3.66(±1.58). Twenty-five (37.3%) children were the first or second born, while 26 (38.8%) children were the third or fourth and 16 (23.9%) were the fifth and above.

The percentage of ECHCC with mothers of low or no education was higher (39.7%) than the CFC (7.5%). A higher percentage (67.2%) of mothers of CFC had a college or a higher degree as compared to only 32.8% of mothers of ECHCC and these differences were statistically significant ( $p < 0.0001$ ).

#### Child's feeding practices and weaning time

A higher percentage (45.2%) of CFC had low feeding frequency of (3-5 times/day) as compared

to only 14.3% of the ECHCC and about 41% of ECHCC had high feeding frequency (10 days/day) compared to only 9.7% of CFC. These differences were statistically significant ( $p < 0.0001$ ). However, no differences were found between the two groups regarding the type of feeding (breast or bottle).

Nursing mostly at night was found to be higher among ECHCC (69.6%) compared to CFC (23.1%), and the difference was statistically significant ( $p < 0.0001$ ). About three-quarters (75.9%) of the ECHCC fell asleep with the nipple in the mouth compared to only 28.4% of the CFC, and the difference was found to be statistically significant ( $p < 0.0001$ ). Feeding on demand was practiced more among ECHCC (84.2%) as compared to 66.7% of the CFC ( $p < 0.05$ ).

Statistically significant differences were found between the two groups in the use of plain water, sweetened water, natural fruit juice and herbal tea besides milk (Table 1). CFC were found to consume less canned juice than ECHCC, and none of them were found to consume carbonated beverages compared to 3.4% of the ECHCC. Very few children in both groups used a pacifier (13.8% of ECHC and 16.4% of CFC) and none of them used pacifiers dipped in sweeteners.

About 85% of the CFC stopped the nursing habit before or at the age of 24 months compared to 62.5% of the ECHCC ( $p < 0.005$ ). Only 3.4% of the CFC were weaned at the age of 31 months or more compared to 23.2% of the ECHCC. No statistically significant differences were found between the two groups regarding the reasons given for the prolonged nursing habit which included one or more of the following: difficulty falling asleep, frequent sickness, insistence of the child and the child not eating enough food during the day.

**Table 1.** Type of drinks used besides milk during the first year of life by both groups of children.

| Type of drink        | ECHCC*     | CFC**      | $\chi^2$ | p       |
|----------------------|------------|------------|----------|---------|
| Plain water          | 26 (44.8%) | 44 (65.7%) | 5.48     | 0.015   |
| Sweetened water      | 5 (8.6%)   | 14 (20.9%) | 3.63     | 0.047   |
| Natural fruit juice  | 31 (53.4%) | 54 (80.6%) | 10.53    | < 0.001 |
| Canned fruit juice   | 12 (20.7%) | 6 (9.0%)   | 3.47     | 0.054   |
| Herbal tea           | 13 (22.4%) | 26 (38.8%) | 3.89     | 0.037   |
| Carbonated beverages | 2 (3.4%)   | 0          | 2.34     | 0.213   |

\* ECHCC (Early childhood caries children)

\*\* CFC (Caries-free children)

#### Child's snacking habits and type of drinking water

Nearly half (45%) of the ECHCC had three or more snacks a day compared to only 21.5% of the CFC ( $p < 0.0001$ ). For the type of snacks used, no statistically significant differences were found between the two groups in the consumption of snacks such as yogurt, cheese, eggs, vegetable soup, laban and milk using a cup. However, with regard to the consumption of fruits, about two thirds (68.2%) of the CFC ate fruits once or twice a day compared to less than half (45.6%) of the ECHCC ( $p < 0.06$ ).

Table 2 presents the pattern of consumption of cariogenic snacks in the two groups. Although ECHCC consumed more sweet biscuits, jam or honey, chocolate, canned fruit juices and dates than CFC, the difference between the two groups was not statistically significant. Statistically significant differences, however, were found between both groups in the consumption of pastries, soft drinks and ice cream, as ECHCC were found to consume these snacks more than CFC. About two thirds (62.7%) of the CFC used bottled water in comparison to only 43.1% of the ECHCC ( $p < 0.05$ ).

#### Child's oral hygiene habits and dental visits

Twenty one percent of the CFC started tooth brushing at the age of 10 months or younger compared to only 1.8% of the ECHCC (Table 3). Of the ECHCC 17.5% never brushed their teeth compared to 6% of the CFC ( $p < 0.0001$ ). For those who brushed their teeth, 90.5% of the CFC brushed once or twice a day while only 72.3% of the ECHCC brushed their teeth as frequently (Table 4). More than half (53.4%) of the ECHCC who brushed their teeth and did so, with the assistance of the mother compared to 73.1% of the CFC ( $p < 0.015$ ).

Very few (9%) of the CFC made their first visit to the dentist at or before the age of 12 months, whereas, none of the ECHCC went to the dentist at the same age. About 87% of the ECHCC visited the dentist because there was a problem such as pain or swelling and only 13% went for routine check-up. In contrast 100% of the CFC made their first dental visit for routine check-up ( $p < 0.0001$ ).

#### Mothers' dental health knowledge and dental habits

Around 90% of the mothers of CFC reported knowing about the harmful effect of keeping the bottle in the child's mouth during sleep compared to only 60.3% of the mothers of ECHCC ( $p < 0.0001$ ). When the mothers were asked about the source of the information, and were allowed to

**Table 2.** Frequency of consumption of cariogenic snack by both groups of children.

|          | Group | Several times a day | Twice a day | Once a day | Once or twice a week | Rarely | Never | p        |
|----------|-------|---------------------|-------------|------------|----------------------|--------|-------|----------|
| Biscuits | ECHCC | 14.5%               | 18.2%       | 34.5%      | 16.4%                | 14.6%  | 1.8%  | 0.124    |
|          | CFC   | 6.2%                | 9.2%        | 32.3%      | 32.3%                | 20.0%  | --    |          |
|          | ECHCC | 14.5%               | 12.7%       | 16.4%      | 43.6%                | 10.9%  | 1.8%  | 0.042*   |
|          | CFC   | 4.5%                | 3.0%        | 25.4%      | 46.3%                | 20.9%  | --    |          |
|          | ECHCC | 3.6%                | 7.3%        | 16.4%      | 27.3%                | 29.1%  | 16.4% | 0.707    |
|          | CFC   | 3.1%                | 3.1%        | 23.4%      | 31.3%                | 20.3%  | 18.8% |          |
|          | ECHCC | 12.3%               | 15.8%       | 24.6%      | 29.8%                | 14.0%  | 3.5%  | 0.080    |
|          | CFC   | 3.1%                | 4.6%        | 29.2%      | 41.5%                | 20.0%  | 1.5%  |          |
|          | ECHCC | 7.0%                | 14%         | 21.1%      | 22.8%                | 33.3%  | 1.8%  | <0.0001* |
|          | CFC   | 1.5%                | --          | 4.5%       | 29.9%                | 43.3%  | 2.9%  |          |
|          | ECHCC | 10.7%               | 14.3%       | 46.4%      | 17.9%                | 8.9%   | 1.8%  | 0.219    |
|          | CFC   | 7.5%                | 13.4%       | 35.8%      | 13.4%                | 22.4%  | 7.5%  |          |
|          | ECHCC | 5.3%                | 3.5%        | 8.8%       | 33.3%                | 36.8%  | 12.3% | 0.012*   |
|          | CFC   | --                  | --          | 4.5%       | 16.4%                | 61.2%  | 17.9% |          |
|          | ECHCC | 5.4%                | 7.1%        | 26.8%      | 23.2%                | 26.8%  | 10.7% | 0.890    |
|          | CFC   | 4.5%                | 4.5%        | 20.9%      |                      | 31.3%  | 9.0%  |          |

\*Statistically significant

**Table 3.** Ages at the commencement of tooth brushing.

| Age of child  | ECHCC      | CFC        |
|---------------|------------|------------|
| 11 months     | 1 (1.8%)   | 14 (20.9%) |
| One year      | 10 (17.5%) | 17 (25.4%) |
| Two years     | 13 (22.8%) | 21 (31.3%) |
| Three years   | 12 (21.1%) | 10 (14.9%) |
| Over 3 years  | 11 (19.3%) | 1 (1.5%)   |
| Never brushed | 10 (17.5%) | 4 (6%)     |

$\chi^2 = 25.5$  df = 5 p < 0.0001

select more than one answer, 26.9% of the CFC mothers and 10.3% of the ECHCC mothers reported that they received their information from the dentist (p < 0.05). About the same percentage (20.8%) of both groups got their information from relatives and friends. Nearly 60% of the CFC mothers and 29.3% of the ECHCC mothers got the information from personal readings (p < 0.0001).

**Table 4.** Brushing frequency.

| Brushing Frequency | ECHCC      | CFC        |
|--------------------|------------|------------|
| Less than once/day | 13 (27.7%) | 2 (3.2%)   |
| Once/day           | 18 (38.3%) | 26 (41.3%) |
| Twice/day          | 16 (34.0%) | 31 (49.2%) |
| 3 times/day        | 0          | 11 (6.3%)  |

$\chi^2 = 25.35$  df = 3 p < 0.0001

Nearly 12% of the ECHCC mothers and 7.5% of the CFC mothers got their information from other sources such as television and radio programs.

When asked about the prevention of dental caries, over two-thirds of mothers of both groups thought it could be prevented by brushing the teeth, eating less sweets and visiting the dentist regularly. About 62% of the mothers of both groups thought that caries in the primary teeth could affect the permanent teeth.

Mothers of both groups reported brushing their

teeth. In addition to tooth brushing, 77.8% of mothers of ECHCC and 70% of mothers of CFC reported their use of Miswak. Only 3.4% of ECHCC mothers used other devices to clean their teeth compared to 11.9% of the CFC mothers such as Derum (*Juglandaceae*). Regarding the frequency of tooth brushing, 83.3% of mothers of CFC brushed their teeth 2-3 times a day while only 60.7% of the ECHCC mothers brushed as frequent ( $p < 0.05$ )

### Discussion

This study compared children with and without early childhood caries with regard to demographic, feeding practices, nutritional and dental behaviors and mothers dental knowledge and dental care practices.

The mean number of children per family for both groups was 4.18 which is considered high compared to the western countries although it is considered average in the local area.<sup>25</sup> No differences were found between the ECHCC and CFC in relation to the sibling rank which is in agreement with the findings of Johnsen.<sup>24</sup> The highest percentage of children (37.9%) with early childhood caries were the third or fourth born. This was interesting, because studies undertaken in the same area and other countries have found that the first and second siblings were more prone to develop early childhood caries, which was attributed to the lack of knowledge and experience of the parents in child rearing.<sup>3,13,20</sup> ECHCC had less educated mothers than the mothers of CFC, which agrees with the results of several investigators who found a negative association between parents education level and early childhood caries.<sup>3,9,10</sup>

In this study the improper nursing habit was apparent. CFC were found to have lower feeding frequencies than the ECHCC. These results agree with the findings of other studies who reported that increased exposure to the nursing habit should influence both the initiation and progression of lesions.<sup>9,10</sup>

The percentage of ECHCC who used the bottle mostly at night and who fell asleep with the bottle in their mouth was higher than CFC. This finding is in agreement with several studies and could be explained by the decrease in the salivary flow and the reduction of swallowing reflex as the child gets drowsier, allowing the carbohydrates to remain in the mouth and pool around the teeth while the child is asleep.<sup>1-14</sup> Other studies found differences in the practice of feeding on demand between

ECHCC and CFC.<sup>21</sup> In this study more ECHCC were fed upon demand than CFC.

Controversy still exists regarding the cariogenicity of breast milk. Some studies found that breast fed children had low caries prevalence.<sup>9,20,22</sup> The results of this study found no differences between the ECHCC and CFC with regard to the type of feeding indicating that both types of milk could cause nursing caries.

Fruit juices and carbonated beverages were frequently reported to be associated with nursing caries which could be related to the cariogenicity of fructose and the pH of the juice.<sup>3,16,17</sup> The results of this study showed that CFC consumed more natural fruit juices, less canned fruit juices and no carbonated beverages compared to the ECHCC, which might indicate that the naturally contained sugar and intrinsic acidity of the natural fruit juice may be less harmful than the other two drinks.

Several reports have stressed the relationship between early childhood caries and the duration of the nursing habits.<sup>14,18</sup> In our study, the percentage of ECHCC who maintained the nursing habit for a longer period was higher than the CFC.

The use of pacifier in both groups was generally low which could be attributed to the late weaning of the children. None of the parents of both groups dipped the pacifier in any sweeteners.

The carbohydrate component of the diet is associated with the development of dental caries.<sup>5</sup> A higher percentage of ECHCC received more cariogenic snacks than the CFC which is in agreement with the results of earlier studies.<sup>9,11</sup>

A higher percentage of CFC used bottled water compared to the ECHCC. The fluoride content of the bottled water could have a role as a protective factor from early childhood caries.

A large percentage of both groups received the benefits of oral hygiene, however, only 19.3% of the ECHCC started brushing their teeth before or at 1 year compared to 46.3% of the CFC. About half of the ECHCC brushed their teeth without assistance compared to only one quarter of the CFC. Both factors might have played a role in the development of nursing caries in ECHCC.

According to the American Academy of Pediatric Dentistry guidelines, the recommended age for the first dental visit ranges from the time of eruption of the first tooth to 1 year of age.<sup>26</sup> In this study, none of the ECHCC visited the dentist before the age of 1 year compared to 9% of the CFC.

Hattab and his team<sup>23</sup> found that lack of education and information regarding early

childhood caries appeared to be a very important etiologic factor. In this study, although mothers of CFC had more dental health knowledge, a large percentage (60%) of the mothers of ECHCC also had this knowledge. However, knowing and acting based on the awareness appear to be two different things. A greater number of CFC mothers obtained their information from the dentist and from personal reading. The mothers of both groups used oral hygiene methods to keep their teeth clean.

### Conclusions

1. A higher number of feeding times in a 24-hour period, feeding mostly at night and falling asleep with the nipple in the mouth appeared to be very important etiological factors in the development of early childhood caries.
2. There were no significant differences between the early childhood caries and caries free children in relation to the child's sibling rank.
3. No differences were found between the ECHC and CFC with regard to the type of feeding practice (breast or bottle).
4. Mothers of children who suffered from early childhood caries differed from mothers of children who are caries free in both the level of education and dental health knowledge.

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