

Infant and child feeding practices: A preliminary investigation

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Abstract

The objective of this preliminary investigation was to examine the feeding practices of infants and pre-school children in Adelaide, and thereby contribute to the development of appropriate preventive dental strategies. A stratified random sample of 160 two year old and three year old pre-school children in the Adelaide Statistical District was obtained. Information about feeding practices and use of comforters or 'dummies' was obtained through a self-administered questionnaire completed by parents of the selected children. Information was collected for the age periods of 0-3 months, 4-6 months, 7-12 months, 13-24 months and 25-36 months. Most of the children (81.8 per cent) were breast-fed at some stage. However the percentage of children being breast-fed decreased markedly across age periods, particularly to 13-24 months, when only 15.9 per cent of children were being breast-fed. Over half of the children had been bottle-fed with infant formula at some stage. The highest percentage of children being bottle-fed with infant formula occurred in the 4-6 months (42.6 per cent) closely followed by the 7-12 months age period (37.4 per cent). Nearly two-thirds of children were bottle-fed with cow's milk at some stage. The highest percentage of children being bottle-fed with cow's milk occurred in the 13-24 months age period (49.6 per cent). A quarter (24.5 per cent) of the children were put to bed at some stage with a bottle containing cariogenic fluids. The majority of children used a 'dummy' at some stage during both day-time and night-time. Parents are in need of advice on appropriate feeding patterns for infants and young children.

Key words: Pre-school children: feeding patterns, dietary practices.

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Introduction

Feeding patterns are of prime importance in the aetiology of dental caries, especially nursing caries in pre-school children.¹⁻³ While dental caries has been declining in the Australian child population, there are still reports of early childhood caries in pre-school children.⁴⁻⁵ Some dietary practices such as prolonged and at-will breast feeding, prolonged and nocturnal bottle feeding, and the use of sweetened comforters have been associated with nursing caries.⁵⁻⁸

There is little information regarding the feeding practices of pre-school children in Australia.^{9,10} Hocking *et al.*⁹ studied the feeding patterns of children from a convenience sample, and Stacy and Wright¹⁰ studied two specific ethnic groups. These studies therefore may not characterize current feeding practices of a representative sample of Australian pre-school children. The objective of this preliminary investigation, completed in 1990, was to examine infant and child feeding practices through a questionnaire among two year old and three year old pre-school children in the Adelaide Statistical Division (ASD) and thereby contribute to the development of appropriate preventive strategies for infants and pre-school children. The results of this investigation would also provide base-line data for more comprehensive studies in future.

Materials and methods

The intention of the study was to obtain a stratified random sample of two year old and three year old pre-school children in the Adelaide Statistical District (ASD). The ASD was divided into post-codes. All the postcodes were stratified by socio-economic indicators from the 1986 Population Census available through the South Australian Health Commission. The socio-economic indicators used for the stratification of postcodes were the

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percentage of single parents, lower income families, and South East Asian migrants living in a particular postcode. The postcodes were divided into four strata, ranging from high to low aggregate exposure to these three indicators to weight the sample of the postcodes towards regions with high exposure to these indicators. A random sample of postcodes within each stratum was drawn using probabilities proportional to the size of each postcode. A total of ten postcodes were selected across the four strata.

Children aged two and three years whose parents had an address within these postcodes were then identified and selected by systematic random sampling from the South Australian Register of Births. The Principal Registrar of Births, Deaths and Marriages had agreed to the release of names and addresses for the selection of a sample. A random starting point was selected within each postcode's listing of births using random numbers followed by ten-day skip intervals; the first registered child in each interval was selected. This sampling strategy ensured that a random sample was selected that included a whole age range from two years to less than four years.

Parents of 472 selected children were sent an introductory letter outlining the aims of the study, and a consent form to be returned by pre-paid mail. All non-responding parents were sent two follow-up, pre-paid, more personalized and individually signed letters. Parents who consented for their child to participate in the study were requested to attend a Child, Adolescent and Family Health Service (CAFHS) centre nearest to their residence at one of a block of times agreed to by CAFHS staff. A maximum of three appointments at the CAFHS centres were attempted by mail after parents consented to participate in the study. Finally, where possible, parents who consented to participate in the study and who did not keep their appointments were telephoned.

A self-administered questionnaire was completed by the parents at the time of their visit to a CAFHS centre. Assistance was provided in completion of the questionnaire, if requested by the parents. Interpreter services were provided by one of the authors (AHW), a research assistant and the CAFHS centre staff in cases where language difficulties were faced by the parents.

Dietary information collected in the questionnaire covered the following areas: breast feeding; use of infant formula; intake of cow's milk; other fluids (juices, soft drinks, cordials); and consumption of semi-solid and solid foods. Information was also obtained about the use of comforters or 'dummies'. Information was collected for the age periods of 0-3 months, 4-6 months, 7-12 months, 13-24 months and 25-36 months.

Table 1: Breast milk, infant formula and cow's milk feeding

Age period (months)	Feeding frequency per day (%)				
	0	1-3	4-6	7-9	10+
Breast feeding					
0-3	20.7	0.1	35.7	36.9	6.6
4-6	40.0	2.5	45.2	10.0	5.3
7-12	50.1	10.2	35.0	4.7	-
13-24	84.1	13.5	2.4	-	-
25-36	98.6	1.3	0.2	-	-
Infant formula bottle feeding					
0-3	77.0	1.6	17.8	3.5	-
4-6	57.4	3.9	37.4	1.3	-
7-12	62.6	14.4	23.0	-	-
13-24	87.3	9.2	3.5	-	-
25-36	94.4	5.5	0.1	-	-
Cow's milk bottle feeding					
0-3	98.6	0.1	1.3	-	-
4-6	97.5	0.1	2.4	-	-
7-12	68.6	19.4	11.0	1.0	-
13-24	50.4	36.2	12.3	1.0	-
25-36	75.2	20.1	4.7	-	-

Each questionnaire was examined immediately after the completion by the parents and, if appropriate, enquiries were made of the parents regarding the responses. Responses were coded and entered as a computer file on the University of Adelaide VAX/VMS Mainframe computer facility. The responses were weighted to take account of the stratified sampling procedures so that the results presented represent children in the ASD. Frequencies and cross-tabulations were generated using the Statistical Package for the Social Sciences-Extended.¹¹

Results

Out of 472 parents of the selected children who were sent the introductory letter, 206 (43.6 per cent) parents responded to the introductory letter. One hundred and ninety five (41.3 per cent) consented to the study and 11 (2.3 per cent) did not consent to participate. Out of 195 who consented, 160 (82.1 per cent) participated.

Table 1 presents the prevalence and frequency of breast feeding by age periods. Four in five children were breast-fed at some age period. The number of breast-fed children decreased across the higher age periods. The majority (72.6 per cent) of the children were breast-fed four to nine times per day during the age period 0-3 months, and the frequency then decreased across older age periods. A considerable percentage (15.9 per cent) of children were breast-fed between 13-14 months, reducing to 1.4 per cent at the age of 25-36 months.

Over half (54.3 per cent) of children were bottle-fed with infant formula at some stage. There was an increase in the number of children who were bottle-fed with formula from 0-3 months to 4-6 months age period and then a decrease across the older age

Table 2: Pattern of use of comforters at different age periods

Age period (months)	Not used	Use of comforters (%)		
		Day only	Night only	Day and night
0-12	43.1	2.4	11.3	43.2
13-24	56.7	3.5	14.1	25.7
25-36	82.0	1.0	9.7	7.3

periods (Table 1). Some children (5.6 per cent) were being bottle-fed with formula in the 25-36 months age period. The frequency of bottle feeding with formula per day was highest in the first year of life, and then declined in the older age periods.

Some 60.6 per cent of children were bottle-fed with cow's milk at some stage. The highest percentage were bottle-fed with cow's milk in the 13-24 months age period. At the age between 25-36 months 24.8 per cent of children were still being bottle-fed with cow's milk (Table 1).

Nearly two-thirds (64.1 per cent) of the mothers who bottle-fed their children with infant formula flavoured it before feeding it to their children. Less than one-fifth (17.7 per cent) of parents added flavouring to cow's milk in the bottle.

More than half (53.4 per cent) of children were bottle-fed with fluids other than infant formula and cow's milk. The other fluids given in the bottle were fruit juices (34.4 per cent), water (10.2 per cent), cordials (5.0 per cent), others (2.8 per cent) and carbonated beverages (1.0 per cent).

Nearly a quarter (24.5 per cent) of children were put to bed with a bottle still in the mouth at some age period. The percentage of children put to bed with a bottle was 2.6 per cent in the 0-3 month age period. It increased slightly (to 2.8 per cent) in 4-6 months age period. There was a marked increase (to 12.8 per cent) in 7-12 months age period reaching a peak of 21.6 per cent in 13-24 months age period before dropping down to 8.0 per cent in 25-36 months age period.

Over three-quarters (78.6 per cent) of parents stated that they were giving fluids in a cup to their children by the age of 12 months. In addition, 16.6 per cent of parents started giving fluids in a cup between the age of 13-24 months and the remaining parents from 25-36 months of age. Fruit juices (90.8 per cent), water (85.1 per cent), cow's milk (77.2 per cent), cordials (50.1 per cent), vitamin C enriched drinks (24.4 per cent) and soft drinks (19.9 per cent) were used by parents as the fluids given in a cup. Most (82.2 per cent) parents added flavouring to the contents of the cup.

Some 60.7 per cent of children used a comforter. The pattern of the use of a comforter is given in Table 2. In the first year over half of the children used a comforter and the majority of these children used the comforter both in the daytime and night-

Table 3: Use of commercial and home-made baby food in the children

Type of food	Age period (months)	Number of times per day (%)				
		0	1	2	3	4+
Commercial baby food	0-3	93.8	3.8	2.4	-	-
	4-6	65.3	17.8	10.9	4.7	1.4
	7-12	55.3	21.7	14.4	5.0	3.5
	13-24	80.6	11.2	5.7	2.4	0.1
	25-36	96.2	1.2	1.4	1.3	-
Home-made baby food	0-3	92.9	3.4	2.4	0.2	1.0
	4-6	51.5	15.9	21.3	7.8	3.4
	7-12	18.5	7.7	35.7	34.5	3.6
	13-24	18.7	8.5	12.4	55.6	4.8
	25-36	24.4	6.4	4.7	59.7	4.8

time. The percentage of children using comforters decreased across older age periods. Only 5.4 per cent of parents coated the comforter with sweeteners with most of these (98.1 per cent) coating the comforter with honey.

Commercial baby food was given to over half (59.4 per cent) of the children, while home-made food was given to more than three-quarters (81.5 per cent) of the children. The percentage of children who were given commercial baby food was highest in the 7-12 months age period and decreased sharply across older age periods (Table 3). Only 3.8 per cent of children were given commercial baby food in the age period between 25-36 months. There was an increase in the number of children who were given home-made food from the 4-6 months age period (48.5 per cent) to 7-12 months age period (81.5 per cent). The percentage of children who were given home-made food remained about the same across the 13-24 months and 25-36 months age period.

Discussion

The prevalence of children who were breast-fed in this study was similar to the study carried out by Hocking *et al.*⁹ in Victoria in which they reported that 76.6 per cent of children were breast fed. Breast feeding gradually declined from the age period of 7-12 months onwards, which conforms with the usual weaning time.¹² However, about one in six children was breast-fed between 13-24 months and a few at the age of 25-36 months. The cariogenic effects of prolonged breast feeding on dental health have been reported by many researchers.^{8,13-17}

More than half (54.3 per cent) of the children were bottle-fed with infant formula. A small number of children were being given formula in the bottle after the age of 25 months. Similarly, a considerable number of the children were still being bottle-fed with cow's milk at age period 25-36 months. The prolonged bottle feeding has similar cariogenic effects to prolonged breast feeding.^{8,15,16,18} The decrease in the number of bottle-fed children across

the age groups was in accordance with the nutritionists' advice of introduction of semi-solids in the age period 4-6 months and a gradual decrease in the breast and bottle feeding.^{12,19} Nearly two-thirds of parents who bottle-fed their children with infant formula added flavourings which contained sugar. The addition of sugar or sugar containing flavourings render infant formula cariogenic.^{18,19} One in six parents added flavourings to cow's milk. Prolonged bottle feeding with flavouring added to cow's milk can be cariogenic.^{1,8,15,17,18,20}

About half of the children were given fluids other than infant formula and cow's milk in a bottle. Fruit juices, soft drinks and cordials were the popular choices. Sufficient fluid intake is important for breast-fed and bottle-fed children. Boiled water and diluted fruit juices are appropriate fluids to be fed in addition to milk.^{18,19,21} Cordials, pure fruit juices, and soft drinks are not desirable because of their higher sugar content and a low pH.²⁰⁻²² Both of these factors render these fluids cariogenic and can lead to extensive caries development.²¹

A major risk factor for nursing caries is putting the child to bed with a bottle containing cariogenic fluids.^{1,8,18,23} This was practised by about one-quarter of the parents in the present study. The number was higher than that (22.0 per cent) reported by Hocking *et al.* in their study.⁹ This clearly points towards the need for increased effort in preventive dental education of the parents of infants and young children. The practice of putting the child to bed with a bottle was most common during the age period 13-24 months. Information about the practical ways to control bedtime behaviour of the child in this age group should be provided to parents.²⁴

Cordials, fruit juices and drinks were given in a cup by a large number of mothers. Many of these drinks are high in sugar content and have very low pH. Used too frequently and in an undiluted form these fluids are cariogenic.^{21,22} Fruit juices should be diluted to reduce the acidity and sugar concentration before being given to children.^{21,22} Water and diluted fruit juices provide the required body fluid. There is no need to add sugar or sugar containing flavourings.^{1,12}

In the present study, 39.3 per cent of children were not given a 'dummy' or comforter. This is similar to the level reported by Hocking *et al.* in Melbourne children.⁹ Of the children who were given a comforter, the majority used it both in the daytime and night-time in all the age groups. A very few parents coated the comforters with a sweetening agent. The low prevalence of sweetening the comforter was a positive finding, because the use of a sweetened comforter is an established factor in the aetiology of nursing caries.^{17,22,25,26}

Commercial baby foods which were given to nearly two-thirds of the children are convenience foods and should not be used as the only source of nutrition and energy.¹⁹ Frequent use of commercial baby foods makes it difficult for the child to learn to chew and deal with lumps in food.¹⁹ In the present study, the percentage of children using commercial baby food was highest in the 7-12 months age period, and there was a sudden drop across the older age periods to the age period 25-36 months, where only few parents used commercial baby foods. Home-made food was given to children by a large majority of parents. Parents mostly used tap water in the preparation of the food. Tap water is fluoridated in the Adelaide Statistical District. A minority of parents added flavourings to the home-made foods. Children do not need additional salt and sugar other than that naturally present in the food.¹⁹

Recall of parents regarding feeding patterns and use of comforters could be adversely affected by the passage of time. An effort was made to minimize this difficulty by selecting two and three year olds for the present study, thus reducing the interval between actual practice and questioning. Although it was expected that parents of children of this age group would mostly be interested in such a topic, the response rate was not high. The sample could be biased towards parents with an active interest in feeding or an interest in the prevention of dental disease. It was possible that non-responding parents did not consider the topic very important, had no history of dental disease, were not interested in prevention, or were simply too busy.

Parents are in need of advice about feeding patterns of infants and young children. This advice may come from health professionals such as nutritionists, paediatric dentists, general dentists, general medical practitioners, and nursing staff of local mother and child health care centres. In this respect, the first logical step would be to inform all relevant health care providers of appropriate feeding practices and problems associated with prolonged use of nursing bottles or the use of sweetened fluids in nursing bottles and drinking cups. In this way prospective and new parents should learn about the harmful effects of cariogenic feeding patterns for their children. Parents should be provided with practical advice regarding healthy feeding practices and various strategies for timely and successful weaning.

Conclusion

Many parents of infants and young children are in need of advice about feeding their infants and young children. Advice is required on avoidance of nocturnal bottle feedings, in particular with sweetened fluids, and prolonged bottle feeding. Further research is required to identify high risk parents and target these parents for efficient oral health promotion.

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