The snacking habits of white preschool children

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Summary

Three-day estimated dietary records were kept for 194 white 3- and 4-year-old children to determine and evaluate the extent, nature and quality of their snacking. All but 1 child ate between meals, with morning and afternoon snacking being favoured in terms of frequency and quantity. Soft drinks were consumed most frequently, followed by fresh fruits and fruit juices, sweets and chocolates, milk and sugar. Between-meal eating contributed more than one-third of the average day's energy and approximately one-quarter of most vitamins and minerals to the children's diets. Foods eaten between meals were, however, significantly less nutrient-dense than mealtime foods. Non-basic foods supplied more energy to the diet than any of the five basic food groups, but minimal quantities of micronutrients. Sugar consumption, mostly in the form of sugary foods and drinks, was high, but was not consumed exclusively between meals. Such children should be encouraged to make more use of basic commodities, particularly when snacking.

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The appetite of preschool children is frequently rated by mothers as poor, reaching its lowest point at between 3 years and 4,5 years.[1] Although this lack of interest in food and eating is partially due to decreased nutrient needs,[2] foods of high-nutrient density should receive priority in the diet.[3] In addition, young children prefer five small meals to three larger meals per day, so special attention needs to be given to foods eaten between meals to ensure that they are high in nutritive value rather than primarily refined carbohydrate.[3] Despite these recommendations, the subject of snacking has been more widely researched among adolescents than among younger children, and in South Africa no comprehensive reports have been published. Of particular concern are the snacking habits of white children, due to the wide variety of foods available to them, against the background of a non-prudent diet consumed by their adult counterparts.[4] A study was therefore undertaken to determine and evaluate the extent, nature and quality of white preschool children's snacking. In addition to investigating the foods consumed between meals, the study also focused on the use of non-basic foods, regardless of when they were eaten. From this it was envisaged that practical advice to improve the eating habits of this age group could be achieved.

Subjects and methods

All white children born between 1 September 1982 and 31 August 1984 in three rural white communities in the south-western Cape Province, and still residing in these areas, were invited to participate in this study. One hundred and ninety-four children (78%) out of a possible 250 responded and were included in the study. Three-day estimated dietary records were kept by the mothers after they had been trained in small group sessions. The records were quantified in terms of household measures and reflected all days of the week. Two dietitians, experienced in field-survey techniques, checked the food records in individual interviews with the mothers to ensure completeness and eliminate ambiguity. These dietary data

were then computer coded using the *NRIND Food Quantities Manual*,[5] and analysed using the *NRIND Food Composition Tables*.[6] These tables contain information on locally manufactured foodstuffs, including many of the commercially produced snack foods, e.g. chocolates, sweets and crisps. The average of the 3 recorded days for each child was used in analysis.

Daily food intake was divided into either mealtime or between-meal eating as follows: food eaten before 09h00, and meals eaten between 12h00 - 14h00 and after 17h00, were regarded as mealtime foods; breakfast, lunch and supper respectively. Any food consumed between these mealtimes or after the evening meal was classified as between-meal eating or snacking. The following information concerning between-meal eating was determined: the percentage of children eating between meals; the relative energy contributions of each snacking period; the foodstuffs consumed most frequently as snack foods; the percentage nutrient contributions to the total daily intake made by between-meal eating; and the relative nutrient densities per 420 kJ (100 kcal) of between-meal and mealtime foods. A comparison of the latter was made by paired *t*-test analysis, indicating significant differences at the 0,001 level.

Non-basic foods were defined as any food or drink not classifiable into one of the five basic food groups (milk group, meat and alternatives group, fruit and vegetable group, bread and cereal group, and fats and oils group). These non-basic foods included sugar, soft drinks, sweetened biscuits (cookies) and cakes, pies and pastries, crisps and other savoury snacks. The percentage contribution that non-basic foods made to the total daily nutrient intake were also calculated. In addition, certain non-basic foods were selected for detailed analysis, based on our observation of frequently used items while coding the food records. The percentage of days on which these foods were consumed, the percentage of children consuming these foods as well as their mean intakes were determined. The intake of all added sugar as well as sugar used as such in the diet was calculated, as was its distribution through the day.

Results

In this study, only 1 child did not snack between meals on any of the record days. Snacking was just as prevalent between breakfast and lunch as between lunch and supper (98% occurrence in both) but only 62% of children ate anything after supper. Morning and afternoon snacking each contributed 44,5% of the total energy from between-meal eating (together contributing 89%), while after-supper snacking supplied only 11%.

The foods selected for between-meal consumption, in decreasing order of frequency, were: soft drinks (dilute base and carbonated soft drinks); fresh fruit and unsweetened fruit juices; sweets and chocolates; milk (consumed as such or in beverages); sugar (mainly used in beverages); tea and coffee; and baked products (rusks, biscuits and cake).

Other frequently used foods were sweetened fruit juices, crisps and corn-based snacks. Table I shows the percentage energy and nutrient contributions of between-meal eating to total intake. Because of the wide range in consumption, the median as well as the mean values are reported. It can be seen that between-meal eating supplied slightly more than one-third of the day's energy, almost half of the total carbohydrate and nearly two-thirds of the added sugar. Roughly one-quarter of most minerals and vitamins was supplied by between-meal eating.

The percentage energy and nutrient contributions of non-basic foods to total intake is shown in Table II. These foods contributed over one-quarter of the energy for the day and were very high in sugar, but their micronutrient contribution to the total daily intake was minimal. Differences between the nutrient density of between-meal and mealtime foods are indicated in Table III. Meals were characterised by a significantly greater nutrient density for 15 of the 19 nutrients listed, while between-meal eating supplied significantly more total carbohydrate, added sugar and vitamin C per 420 kJ (100 kcal) consumed. Fibre was supplied in approximately equal concentrations by between-meal foods and meals.

TABLE I. PERCENTAGE ENERGY AND NUTRIENT CONTRIBUTIONS OF BETWEEN-MEAL EATING TO TOTAL INTAKE IN 3- AND 4-YEAR-OLD CHILDREN ($N = 194$)

	Contribution to total intake	
	Mean ± SD	Median
Energy	36,4 ± 12,3	36,9
Protein	21,5 ± 12,1	19,6
Fat	28,1 ± 13,2	28,1
Cholesterol	16,2 ± 15,9	11,5
Total carbohydrate	46,3 ± 13,2	46,1
Fibre	36,7 ± 19,5	35,9
Added sugar	59,5 ± 17,2	61,6
Calcium	29,4 ± 16,9	27,6
Iron	25,2 ± 13,6	23,1
Magnesium	30,1 ± 13,9	29,3
Potassium	32,8 ± 14,6	31,5
Zinc	20,5 ± 12,3	18,9
Copper	33,4 ± 14,7	32,9
Vitamin A	23,4 ± 19,0	17,3
Thiamin	28,3 ± 14,3	26,5
Riboflavin	27,3 ± 15,3	25,1
Niacin	23,0 ± 13,1	21,6
Vitamin B6	28,2 ± 15,9	26,3
Vitamin B12	17,8 ± 15,4	14,6
Vitamin C	47,9 ± 27,3	52,8

TABLE II. PERCENTAGE ENERGY AND NUTRIENT CONTRIBUTIONS OF NON-BASIC FOODS TO TOTAL INTAKE IN 3- AND 4-YEAR-OLD CHILDREN ($N = 194$)

	Contribution to total intake	
	Mean ± SD	Median
Energy	28,3 ± 10,7	27,8
Protein	7,4 ± 5,8	6,2
Fat	20,1 ± 12,2	18,4
Cholesterol	8,9 ± 12,1	3,9
Total carbohydrate	40,5 ± 13,2	38,7
Fibre	5,7 ± 7,5	3,1
Added sugar	84,5 ± 13,7	87,4
Calcium	9,5 ± 8,7	6,7
Iron	10,6 ± 7,5	9,1
Magnesium	7,8 ± 6,4	6,4
Potassium	9,6 ± 7,2	8,8
Zinc	5,7 ± 5,9	4,2
Copper	13,8 ± 9,3	12,2
Vitamin A	5,0 ± 7,7	2,0
Thiamin	5,4 ± 4,8	4,0
Riboflavin	6,8 ± 7,0	4,4
Niacin	3,6 ± 4,4	2,1
Vitamin B6	5,4 ± 5,5	3,5
Vitamin B12	3,8 ± 8,2	0,0
Vitamin C	3,5 ± 7,6	0,0

TABLE III. NUTRIENT INTAKE (MEAN ± SD) PER 420 kJ (100 kcal) OF BETWEEN-MEAL AND MEALTIME FOODS IN 3- AND 4-YEAR-OLD CHILDREN (*N* = 194) (NUTRIENT DENSITY)

	Between-meal foods	Mealtime foods
Protein (g)	1,70 ± 0,70	3,86 ± 0,65*
Fat (g)	2,91 ± 1,00	4,42 ± 0,67*
Total carbohydrate (g)	16,89 ± 2,65	10,89 ± 1,81*
Fibre (g)	0,81 ± 0,53	0,75 ± 0,34
Total sugar (g)	8,56 ± 3,63	3,16 ± 1,48*
Calcium (mg)	33,61 ± 22,38	46,46 ± 16,80
Iron (mg)	0,30 ± 0,12	0,55 ± 0,17*
Magnesium (mg)	9,86 ± 3,54	13,20 ± 2,97*
Phosphorus (mg)	38,84 ± 17,86	64,30 ± 13,30*
Zinc (mg)	0,23 ± 0,11	0,55 ± 0,13*
Copper (mg)	0,05 ± 0,02	0,07 ± 0,05
Vitamin A (IU)	186,80 ± 210,05	460,57 ± 590,93*
Thiamin (mg)	0,05 ± 0,02	0,07 ± 0,02*
Riboflavin (mg)	0,06 ± 0,03	0,10 ± 0,04*
Niacin (mg)	0,45 ± 0,23	0,89 ± 0,26*
Folate (μg)	5,82 ± 5,76	8,87 ± 3,86*
Vitamin B6 (mg)	0,05 ± 0,04	0,07 ± 0,02*
Vitamin B12 (μg)	0,09 ± 0,08	0,33 ± 0,54*
Vitamin C (mg)	9,08 ± 11,32	3,85 ± 4,30*

*$P < 0{,}001$; this represents a significant difference in nutrient density for between-meal foods and mealtime foods.

Data on selected non-basic food consumption are reflected in Table IV. Dilute-base soft drinks, which are usually artificially flavoured, coloured and preserved, and are high in sugar, were used most often, averaging 285 ml on the days that they were consumed. Carbonated soft drinks were not as widely used or used in such great quantities. Sweetened fruit juices (not shown in Table IV, since they were classified in the fruit and vegetable group) were only used by 43% of the children on 25% of the days, but the average intake on days consumed was high (257 ml). Sweets were used more often than chocolates, but the average portion size of the sweets was smaller than that of chocolates (16 g and 23 g, respectively). The preferred sweets were small toffees and chewy bars as well as suckers (lollipops), marshmallows and boiled sweets. Potato crisps, popcorn and corn-based snacks were analysed together, and the results showed that these young children ate this kind of snack approximately twice a week (23 g was the average portion size).

The mean daily sugar consumption was 63,9 g (range 9,9 - 196,1 g), representing 20,5% of the average energy intake of which 24,9 g was consumed at or with meals and 39,0 g between meals. Less than one-quarter of this sugar (14,4 g/d) was used as table sugar.

TABLE IV. NON-BASIC FOOD CONSUMPTION IN 3- AND 4-YEAR-OLD CHILDREN (*N* = 194)

Commodity	% of days consumed	% consumers on any day	Mean weekly intake for all children
Dilute-base soft drink (ml)	62	85	1 238
Sweets (g)	34	61	55
Crisps and snacks (g)	27	60	48
Carbonated soft drink (ml)	27	49	380
Ice cream (ml)	23	46	126
Chocolate/s (g)	22	45	43

Discussion

The prevalence of snacking in this group of preschool children is similar to that reported by other researchers. Leung *et al.*[7] found that all of the 3,5 - 4-year-old Canadian children in their study ate at least one between-meal snack. In the USA 59 - 70% of children and teenagers reported having at least one snack during the day in the 1977-1978 Nationwide Food Consumption Survey.[8] Between-meal eating can therefore be regarded as an important component of the eating pattern of preschool, and possibly older, children. In our study group, morning and afternoon snacking was favoured in terms of frequency and quantity consumed, as opposed to elementary schoolchildren who reported more frequent snacking in afternoon and evening periods.[9] Cala *et al.*[10] also found that among older children (5 - 12 years) afternoon and evening snacking was more frequent and more substantial than morning snacking. This might be because, as children grow older, they stay up later in the evenings and consequently snack more after upper. However, in preschool years, it is daytime snacking that deserves attention.

Soft drinks, fruit, sweets and chocolates, milk and baked products feature prominently on most frequency counts of between-meal eating among children. In our study, soft drinks were by far the most frequently consumed commodity, as was the case in the study by Cala *et al.*[10] This is of concern, since the amount and frequency of soft-drink consumption between meals has been found to be significantly associated with higher dental caries probability scores.[11] However, the fact that our survey was conducted in mid-summer may have exaggerated the soft-drink consumption.

Many fresh fruits were in season in these summer months, making them a popular snacking choice. Fruit was also the second most frequently used snack in the Cala *et al.*[10] study and in one by Beals *et al.*,[12] both studies being on school-going children. Another source of concern is that sweets and chocolates featured more prominently, and milk less so, in our sample than in other studies conducted on similar age groups. Dierks and Morse[2] and Pao[13] both reported milk to be the second most frequently used snack, while sweets and chocolates (candy) appeared 4th and 6th respectively. The mean quantity of milk consumed each time a child drank milk was 110 ml, less than the 161 ml for soft drinks in our study. These observations support the finding that the calcium intakes of these children fell well below recommended daily allowances (Langenhoven *et al.*, article in preparation). Baked products were used less often in this study than in any of the four other studies mentioned above.

The nutritional value of between-meal eating can be ascertained from its contribution to the total daily intake (Table I) and the nutrient density of foods consumed (Table III). The 36% of the total daily energy intake (%E) derived from between-meal eating in this study is higher than that found in other preschool children. Beyer and Morris[9] reported that snacking supplied 22%E, Morgan[8] 20%E and Leung *et al.*[7] 26%E. The reason for this disparity is unclear, but could possibly be due to the method whereby food was classified into periods. However, it can be concluded that without the nutrients contributed by between-meal eating, the diets of these children would have fallen seriously below their needs, as their current intakes were low for several micronutrients (Langenhoven *et al.*, article in preparation). The foods selected for between-meal eating were high in added sugar and total carbohydrate, but the fruits and fruit juices were responsible for a valuable supply of vitamin C and fibre. Apart from these

nutrients, between-meal eating was not as nutrient-dense as foods consumed during mealtimes, but the contributions made were still valuable. Snacking did not supply excessive amounts of fat or cholesterol, which can be regarded as being beneficial in the ischaemic heart disease-prone population from which these children come.[14] Between-meal snacks are an important component in the diets of children.[15] Leung *et al.*[7] stated that a wise choice of snack foods can enhance the nutritional value of the preschool diet. Our study supports these conclusions but there does seem to be room for an improved food choice.

It is quite probable that foods selected as snacks reflected what children chose to eat, while meals consisted predominantly of what parents wanted children to eat. Foods of lower nutrient density therefore seem to have more appeal to young children. The authors feel that a regulated quantity of such 'non-basic' foods is inevitable and acceptable. However, these non-basic foods should never replace basic foods in the diet. It is therefore suggested that those concerned with the feeding of young children try to increase the appeal of the more nutrient-dense foods. 'Healthy' foods do not have to be dull or unappetising.

The young children in this study derived more energy (28,3%E) from non-basic foods than they did from any of the five basic food groups (Langenhoven *et al.*, article in preparation). The comparative figure for Dutch toddlers aged 28 months is 20,9%E.[16] Leung *et al.*[7] reported that 21,7%E in the diets of Canadian children was derived from non-basic foods, but this figure also included the energy derived from fats and oils. The consumption of non-basic foods in this study therefore seems high. This could negatively affect the nutritional value of the total diet, since non-basic foods are generally micronutrient-depleted (Table II), and could be one of the reasons why the intake of the children was found to be adequate in terms of energy, but of marginal adequacy in terms of several micronutrients (Langenhoven *et al.*, article in preparation). In the 3 days of food record, many children used the listed non-basic foods (Table IV) in not inconsiderable quantities. Mean added sugar consumption was lower than the 75 g reported for 4-5-year-old South Africa urban whites by Richardson and Cleaton-Jones.[17] The reason for this could be that our study was conducted in a rural area. However, the sugar intake was still higher than the 50 g suggested by Screenby[18] as possibly being a safe or acceptable daily amount. Sugary foods and drinks were more responsible for the high sugar intake than the use of table sugar as such. These foods and drinks were not used exclusively between meals, although this use was more frequent.

Conclusion

Between-meal food consumption in preschool children can be regarded as an important component of daily eating. However, it was evident from the food frequency and non-basic food consumption data that some undesirable food habits were already prevalent in these young children. The intake of sugar-rich but largely nutrient-depleted food and drink was high but was not necessarily confined to between-meal use. Mothers should be encouraged to limit the supply of these foods and instead to provide their young children with more nutrient-dense commodities. Unsweetened fruit juices, milk, breads and baked products made from whole grain meal and continued use of fresh fruits would be wiser foods to snack on. This type of education should be aimed at young families, since it is easier to develop good food habits in young children than it is to correct poor habits later on in life.

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