

The nutritional status of children of pre-school age in the Guatemalan community of Amatitlán

1. Comparison of family and child diets*

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Many reports of family food consumption and dietary habits in tropical and sub-tropical areas of the world are now available, but very few of them include an investigation of the distribution of food among the family members. The calculation of dietary adequacy assumes that the food is distributed in proportion to the age, sex, weight and activity of each person in the family. That this assumption is not necessarily valid for young children is shown by the discrepancy between the frequency of serious malnutrition in the 1-4 years age group in areas in which kwashiorkor is prevalent (Béhar, Ascoli & Scrimshaw, 1958) and the relative adequacy of the diets indicated by family dietary surveys (Flores & Reh, 1955 *a, b, c*; Flores, Meneses, Flores & de León, 1956; Flores, Flores & Meneses, 1957). The present study, which was carried out during 1955 in a small Guatemalan town, specifically determined the food given to the young child after weaning as well as the diet of the family as a whole.

METHODS

Description of the community

The community of Amatitlán is located on the shore of a small lake 28 km south-west of Guatemala City, and is listed in the 1950 official census as having a population of 11 667 including the rural areas adjoining. It is 1180 m above sea level and has a mean annual temperature of 20°. The yearly rainfall averages 52 in. The population is predominantly mestizo, representing a long-standing mixture of Mayan Indian and Spanish. Few Indian costumes or cultural traits are in evidence, but the economic level is low so that the contrasts with the Indian way of life in other villages are not sharp.

Most of the men are agricultural workers on large private farms near the town which raise maize, beans, groundnuts, chick-peas, sugar-cane and coffee. There are three small factories in which some of the men are employed and numerous small shops and stores. Many of the women contribute to the family income through the sale of locally made candy and other foods to persons who come from the city at weekends to use the municipal bathing beach or the many private lake cottages. The quantity of fish obtained from the lake is negligible. The town has a 350-bed hospital staffed by four

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physicians, and a health demonstration centre was being established by the Government at the time of the survey. The supply of water is inadequate and its purity undependable. The town has no central sewage system.

The dietary information was collected during a period of unusually dry weather and subsequently there was an acute scarcity of maize all over the country. The loss of land reclaimed by the former owners when an agrarian decree was revoked in the preceding year also depressed the economy of a segment of the population.

Selection of samples

A new census of the town was made at the beginning of our study. It included 1251 families which were grouped for family size, age of children, and family income. Since the study was concerned with families of low economic level, a cost-of-living study was made which established a monthly income of Q 10.00 (quetzales and U.S. dollars are at par) per person as the approximate lower limit of income consistent with minimum adequate nutritional and health standards. An arbitrary scale of income from Q 0.00 to Q 10.00, which divided this population group into five subgroups of approximately equal number of families, was devised. From each of these five subgroups, four children of each sex were randomly selected, covering the age range from birth to 5 years. These were studied during June 1955. Dietary, clinical and biochemical information was obtained on eight children from 6 to 12 months of age; twenty-seven from 1 to 4 years, and five who were 5 years old. The clinical and biochemical information is compared with that on the dietary intake of the children, by Béhar, Arroyave, Flores & Scrimshaw (1960). Five children were eliminated from the dietary survey because they were fed on breast milk exclusively.

Collection of information

Each field worker saw two families per day for several hours on each of 2 days to record food consumption. Visiting days were selected at random, and times of food preparation and eating were included. In this way some families were visited on 2 consecutive days, whereas others had an interval of one or several days between the two visits. To estimate the actual consumption by the child each food item was weighed before and after cooking. The portions given to the child as well as the left-overs were measured carefully. A record of the foods consumed by the whole family was taken during these visits.

RESULTS AND DISCUSSION

Food consumption of the children

Of three children aged from 6 to 12 months who were being breast-fed and were receiving also some supplementary food, one was given approximately 210 g daily of liquid cow's milk sweetened with white sugar. Another received a small amount of dried whole milk (5 g) and orange juice with sugar. The third was given a gruel of cassava or oats, bread, *tortilla* and small amounts of vegetables. These supplementary foods furnished daily 560, 180 and 304 kcal and 21, 4 and 0 g of animal protein respectively.

The mean daily consumption of individual foods by age groups is shown in Table 1.

Table 1. *Kinds and amounts (g/child/day) of foods consumed by pre-school children in Amatitlán in 1955*

Food	Age group (years)		
	1 to < 2* (13)	2 to < 3 (10)	3-5 (9)
Milk and milk products			
Reconstituted milk	—	7	—
Fresh cow's milk	68	78	178
Cream	—	1	1
Cheese	1	2	2
Eggs	—	13	3
Meat			
Beef broth	9	—	—
Beef	1	4	6
Fish	—	2	15
Pork	—	8	4
Snails	—	—	2
Pork-skin	—	—	1
Pulses			
Black beans	11	25	45
Bean broth	99	31	3
Chocolate	—	2	2
Fresh vegetables			
Green vegetables	4	1	—
Tomato	7	8	4
Onion	1	1	1
Green beans	—	10	5
Squash	—	—	4
Fruits			
Pineapple	4	2	—
Peaches	—	—	19
Papaya and others	—	75	58
Starchy roots (potatoes)	6	1	1
Cereals			
Oats	—	2	1
<i>Tortilla</i>	50	98	129
Cereal flour	2	1	—
Sweet roll	27	43	33
French roll	20	56	38
Maize gruel	—	21	10
Rice	—	12	6
Wheat flour	—	—	1
Spaghetti	12	8	—
Sugar			
White	12	40	7
Honey	—	3	3
Raw	—	10	23
Fat (lard)	3	3	5
Miscellaneous (ice-cream)	1	18	—

Figures in parentheses are the numbers studied.

* One child received some breast milk in addition.

Of the thirteen children between the ages of 1 and 2 years, one child was still receiving some breast milk. Only three were fed with cow's milk; two received from 336 to 420 ml daily, and the third only 42 ml. *Tortilla* and thin black-bean soup were the two foods that were introduced first in the diet and given to all but two children of this age group. Wheat bread, mainly of a sweet type, was given to all of the children in appreciable amounts. Other foods which appeared frequently in their diets were rice and noodle soups, tomatoes, black beans and small amounts of potatoes.

The diets of the ten children in the group aged 2-3 years showed a greater variety of foods introduced gradually after the 1st year of age. The amounts of fresh cow's milk given to three children of this group fluctuated between 120 and 480 ml daily per child. From 45 to 90 g dried whole milk were given to two other children. Several of these children received other animal foods such as eggs, beef, pork, chicken or fish in small amounts; others consumed only food of vegetable origin. Black beans, *tortilla*, bread and banana were given to all the children of this age. Other foods frequently served to the children and to all members of the family were rice or spaghetti with tomatoes and onions. Refined sugar was included in the children's diet for sweetening the lemonades frequently given to them, and in their coffee.

The nine children from 3 to 5 years studied had diets similar to those of the adults. Three received liquid milk in liberal amounts, and others cheese in small quantities. The child who received the most milk also consumed some beef and fish. Two children did not eat any animal food. Although the rest ate small amounts of beef, beans and *tortilla* or wheat bread constituted their basic food. Other common foods were bananas, tomatoes and onions. Refined and crude sugar were consumed in greater amounts than in the younger groups. Only negligible amounts of other fruits, vegetables and cereals were eaten.

Feeding practices

Although 60% of the mothers stated that they followed a fixed schedule for breast-feeding, it was clear from observation that the children were fed at irregular intervals. The mothers reported that weaning took place at 9-18 months. The principal reasons given for weaning were pregnancy or maternal illness.

When mothers were asked which food was first given to the child, the reply was always milk. Nevertheless, very few children were consuming milk during the period of the study. Mothers asked to explain why they did not offer fruits or vegetables to the small child replied that the child might get sick if given such solid foods. No changes in the maternal diets during pregnancy or lactation were reported except for the infrequent addition of some milk, cereal gruels and chocolate, which were thought to increase the milk production. Of the children included in the study, 16% were under the care of grandparents because the mother was working.

Nutritive value of the children's diets

The nutrient content of all foods consumed by the children during the investigation period was calculated, by means of the INCAP Food Composition Table (Instituto de Nutrición de Centro América y Panamá, 1953*b*). For some foods, samples collected

from the families were analysed to obtain the necessary data. The amounts of each nutrient consumed per child were averaged by age groups. Recommended allowances for individual nutrients were taken from an earlier INCAP Table (Instituto de Nutrición de Centro América y Panamá, 1953*a*) which adapted the (U.S.A.) National Research Council: Food and Nutrition Board (1948) allowances to temperatures and body sizes appropriate for Central America and Panama.

Table 2. Mean values with standard deviations for intake|child/day of calories and nutrients by pre-school children in Amatitlán in 1955, and comparison with recommended allowances (see above)

Nutrient	Age group (years)					
	1 to < 2 (13*)		2 to < 3 (10)		3-5 (9)	
	A	B	A	B	A	B
Calories (kcal)	649 ± 250	57	1173 ± 348	103	1157 ± 373	78
Total protein (g)	16 ± 8	41	32 ± 12	71	36 ± 13	74
Animal protein (g)	2.8 ± 5.2	—	9.1 ± 6.2	—	11.7 ± 13.0	—
Calcium (g)	0.3 ± 0.3	26	0.5 ± 0.3	47	0.7 ± 0.5	66
Iron (mg)	5 ± 2	67	8 ± 4	122	11 ± 4	140
Vitamin A activity (i.u.)†	357 ± 518.	18	986 ± 847	49	656 ± 877	27
Thiamine (mg)	0.4 ± 0.1	60	0.6 ± 0.2	97	0.6 ± 0.2	80
Riboflavin (mg)	0.3 ± 0.4	31	0.6 ± 0.4	61	0.7 ± 0.6	56
Nicotinic acid (mg)	2.7 ± 1.0	48	4.6 ± 1.7	80	4.6 ± 2.0	63
Ascorbic acid (mg)	13 ± 14	37	35 ± 31	100	23 ± 17	47

A, amount; B, as percentage of recommended allowance.

Figures in parentheses are the numbers studied.

* One child still received some breast milk.

† Calculated on the basis: 0.6 µg carotene = 1 i.u. and 0.3 µg vitamin A = 1 i.u.

As seen in Table 2, mean intakes increased with age up to about 3 years, especially of total protein, calcium and iron, although the variation was very great, particularly for vitamin A. The mean nutritive values of diets taken by children aged 2-3 years and by those aged 3-5 years were broadly similar.

The age group 1-2 years consumed about one-third of the recommended allowances of protein, calcium, riboflavin and ascorbic acid. Their mean intake of calories, iron, thiamine and nicotinic acid, was only half the recommended allowance and of vitamin A only one-sixth. The mean intakes of nutrients by children from 2 to 3 years were nearer the recommended allowances, except for calcium, vitamin A and riboflavin which were consumed in approximately half of the recommended amounts.

The diets of the 3- to 5-year-old children supplied about 75% of the recommended allowances for calories, protein and thiamine; about 50% for calcium, riboflavin, nicotinic acid and ascorbic acid; but only 27% for vitamin A.

In general, the diets of almost all the children appeared seriously deficient when intake was compared with the recommended allowance; intakes of vitamin A and riboflavin were particularly inadequate. The differences between the calorie and nutrient intakes of children from 1 to 2 years and those of children from 2 to 3 years old are of practical importance. After 3 years of age the nutrient intake of the child follows the

same pattern as that of his family, even though the child's intake is relatively more deficient than that of the rest of the family.

Nutritive value of the family diets

In several instances during the study the total quantity of food consumed by the whole family was determined by direct weighing. The daily intakes of foodstuffs by thirty-two of the families were calculated in the same way as for the children. The results, given in Table 3, show that maize and beans were the main constituents of the diet, and the consumption of animal products as well as of vegetables and fruits was very low.

Table 3. *Kinds and amounts (g/person/day) of food consumed by thirty-two families with pre-school children in Amatitlán in 1955*

Milk and milk products		Fruits	
Liquid milk	18	Avocado	2
Whole dried milk	1	Mango	3
Dry cheese	2	Papaya	3
Cream	1	Citrus fruits	2
Total (in liquid milk equivalent)	42	Others	1
		Total	11
Eggs	3	Musaceae	
Meat		Banana	6
Beef	16	Plantain	5
Pork	12	Total	11
Chicken	5	Starchy roots (potatoes)	5
Fish	8	Cereals and cereal products	
Blood-sausage	1	<i>Tortilla</i>	328
Total	42	<i>Tamal</i> (maize pie)	6
Pulses (black beans)	73	Wheat bread	41
Vegetables		Rice	13
Tomato	12	Spaghetti	5
<i>Guisquil</i> (<i>Sechium edule</i>)	9	Oats	1
Onion	3	Flour	1
Green maize	2	Total (in grain equivalent)	257
Yellow vegetables	2	Sugar	
Green leaves	2	White	21
Cabbage	2	Brown	18
Others	2	Honey	1
Total	34	Sweets	1
Fat (lard)	7	Total	41

In order to estimate the adequacy of the diets, the calorie needs and nutrient allowances for the members of each family were estimated from tables (Instituto de Nutrición de Centro América y Panamá, 1953*a*), and the mean intake/person/day was compared with the mean recommended allowances. Table 4 shows that the diet of 84% of the families studied met at least two-thirds of the recommended allowances for calories and total protein, and half of that for calcium. Iron consumption was far beyond the recommended amounts, but vitamin A intake was extremely limited in most of the families.

The mean intake for the entire group reached or approached the recommended level only for iron, thiamine, nicotinic acid, protein and calories. Allowances were based on the recommendations of the (U.S.A.) National Research Council: Food and Nutrition Board (1948) which are probably too high for calcium (Hegsted, Moscoso & Collazos, 1952), so that the intake of calcium was probably adequate for most families. The ascorbic-acid intake may be similarly interpreted. Accordingly, only the intakes of riboflavin and vitamin A would be very deficient in this group. However, the mean figure of 99% for protein is misleading since most of this protein was of poor biological value.

Table 4. *Distribution of consumption levels expressed as percentages of recommended allowance among thirty-two families in Amatitlán in 1955*

Calories	Protein	Calcium	Iron	Vitamin A	Thiamine	Ribo- flavin	Nicotinic acid	Ascorbic acid
45	45	20	79	3	57	19	37	7
63	56	36	110	3	60	21	52	7
64	66	38	110	4	67	23	59	8
66	69	40	118	4	67	25	59	8
67	70	40	118	6	70	25	59	9
69	71	42	125	6	75	25	59	10
71	76	44	127	6	75	27	65	11
73	77	44	130	6	80	29	66	13
77	77	50	130	7	82	29	75	13
78	78	56	140	7	89	33	75	14
79	88	56	144	7	90	33	77	16
81	90	58	144	7	91	36	79	21
82	90	58	145	8	91	38	86	21
83	93	60	156	10	100	38	86	22
84	98	60	170	10	100	38	87	23
88	98	62	170	11	100	38	91	24
89	106	62	173	11	110	38	96	26
90	106	67	178	11	117	39	98	30
91	110	70	189	12	118	42	105	30
95	111	70	191	13	120	43	108	30
96	111	80	192	14	122	43	109	31
96	112	83	200	17	122	43	109	38
97	112	88	200	19	130	43	110	38
102	115	88	210	20	133	46	111	43
106	122	88	210	20	140	46	111	54
107	128	89	220	22	143	46	112	56
113	131	89	222	34	144	50	114	56
121	135	100	240	34	160	50	123	65
125	141	109	245	35	160	53	128	69
133	142	110	245	36	160	54	139	123
134	143	131	270	46	172	77	142	205
141	145	160	290	98	233	93	190	207
Mean								
89	99	74	171	17	112	39	93	42

Sources of calories and nutrients

Table 5 shows the contribution of food groups to the nutritive value of the diets of both the children and their families. The percentages of calories and nutrients derived from each food group in the child's diet were often quite different from those for the family. The greatest differences were found in milk and milk products, vegetables and

fruits. In the children's diet more than 50% of the calcium and riboflavin was derived from milk, whereas in the family diets the greater proportion of these nutrients was provided by cereals, especially *tortilla* made from lime-treated maize. Vegetables provided 50% of the total intake of vitamins A and C for the families and only 25% for children. For fruits the picture was reversed, as these provided 50% of the children's intake of vitamins A and C and only 25% of the family's.

Maize in the form of *tortilla* contributed the largest amount of nutrients to the family diet as well as to the diet of the child. The main sources of protein were, in the children's diets, maize and beans, and in the family diets, maize, meat and beans. Meat was only occasionally given to children.

Table 5. *Percentage contribution of food groups to dietary nutrients of families with pre-school children in Amatitlán in 1955*

Food group	Calories	Protein	Fat	Carbo- hydrates	Calcium	Iron	Vitamin A	Thia- mine	Ribo- flavin	Nicotinic acid	Ascorbic acid
Children (35)											
Milk and milk products	10	18	26	4	54	7	36	11	58	2	10
Eggs	1	2	3	—	1	2	8	1	4	—	—
Meat	2	10	6	—	3	10	—	7	4	12	—
Pulses	10	20	4	10	8	21	1	34	9	19	3
Fresh vegetables	1	1	—	1	1	2	24	3	2	3	25
Fruits	5	2	2	7	1	5	25	4	4	10	57
Starchy roots	—	—	—	—	—	—	—	—	—	1	3
Cereals	52	45	38	56	30	46	4	38	15	50	—
Sugar	14	—	1	20	2	6	—	1	2	1	1
Fat	3	—	18	—	—	—	—	—	—	—	—
Miscellaneous	1	—	1	1	—	—	1	1	1	1	—
Families (32)											
Milk and milk products	1	3	5	—	9	1	8	1	14	—	2
Eggs	—	1	1	—	—	—	4	—	2	—	—
Meat	4	15	16	—	2	21	1	12	14	23	1
Pulses	16	30	6	16	16	27	2	37	22	17	8
Fresh vegetables	1	1	1	1	2	2	60	3	6	3	54
Fruits	1	—	1	1	—	1	12	1	2	1	27
Starchy roots	—	—	—	—	—	—	—	—	—	1	5
Cereals	62	50	42	68	68	42	13	44	36	53	—
Sugar	9	—	—	13	2	4	—	1	3	1	1
Fat	4	—	27	—	—	—	—	—	—	—	—
Miscellaneous	—	—	2	—	—	—	—	—	—	—	—

Figures in parentheses are the numbers studied. The dashes stand for values below 0.5%.

Cost of the diets

The mean amount spent daily on the family diet was 22 cents/individual, which contrasts strikingly with the much lower cost, 11 cents, of the child's diet. In general, the amount of money spent on food was too low to provide an adequate diet, especially for the children. Cereal and animal products each accounted for about one-third of the total expenditure.

SUMMARY

1. Our study provides quantitative information on the calorie and nutrient intake of thirty-five pre-school children and their families living in a semi-rural area of Guatemala.

2. The dietary intake of most of the children was inadequate especially of vitamin A, riboflavin, and protein of good quality.
3. When the nutritive value of the children's diets was compared with recommended allowances, the most marked dietary deficiencies occurred between 1 and 2 years of age. The diet of the family as a whole was generally better.
4. The mean intakes of calories, protein, thiamine and nicotinic acid by families were 89, 99, 112 and 93%, respectively, of the recommended allowances. Vitamin A and riboflavin intakes met only 17 and 39% of the allowances, respectively.
5. The money spent on food was insufficient to purchase an adequate family diet, and that spent on feeding the young child was particularly unsatisfactory.

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