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Nutrition survey of Finnish rural children

V. Seasonal differences in food consumption and nutrient intakes

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Abstract. In connection with a survey of child nutrition in Finland the food consumption and nutrient intakes of the children in summer and in winter were compared. The material consisted of 158 children aged 5, 9 and 13 years living in Nurmijärvi. Food consumption was measured by the 24-hour recall method and the nutrient intakes were calculated on the basis of food composition tables. The interviews were made in June and the following January and February. The diet in winter included significantly more fruits and berries, inner organs and blood but less vegetables and milk products other than milk, sour milk or cheese. The differences were the same in all age groups. The intakes of energy and nutrients were notably similar in summer and in winter. Only the intakes of iron, vitamin A and ascorbic acid were higher in winter than in summer. This can be ascribed to the high consumption of inner organs and blood. The large consumption of fruits, citrus fruits in particular, raised the ascorbic acid intake to a quite high level in winter.

The differences in the present study between the diets of the children in summer and winter were not similar to those observed earlier among Finnish adults. The increased use of imported foodstuffs and the development of the domestic food industry have obviously levelled off the sharp seasonal fluctuations earlier seen in the Finnish diet.

Introduction

The composition of the Finnish diet is characterized by seasonal fluctuations due mainly to the effects of the climate on food production and consequently on the availability of various food supplies. However, import of foodstuffs has always increased the variety of food supplies available to the consumer, and is gradually becoming more important. In a number of dietary surveys the consumption of vegetables, berries and fruits has been found to be highest in autumn and lowest in late spring and early summer (VIRTANEN and TURPEINEN 1940, ROINE 1954, KONTTINEN and ROINE 1962, PEKKARINEN and ROINE 1964). According to the same surveys meat consumption was generally greater in autumn and winter than in other seasons of the year, while fish was

used most abundantly in spring and summer. These fluctuations in food consumption were reflected in the intakes of nutrients, most clearly in those of vitamin A and ascorbic acid, the intakes of which were highest in autumn and lowest in spring and early summer.

The survey of nutrition of Finnish children (RÄSÄNEN et al. 1975, RÄSÄNEN and AHLSTRÖM 1975) included a study aimed at clarifying whether there are significant differences in the food consumption and nutrient intakes of the children in summer and winter and if so, what such seasonal fluctuations are.

Material

The nutrition survey made in the rural commune of Nurmijärvi was attended by 208 children 5, 9 and 13 years of age. A 24-hour recall of food consumption was obtained from 198 of these children in summer 1971 (June 3—12). In two cases interviews were not obtained at all and eight interviews were discarded as incomplete or obviously unreliable.

In this first stage of the survey the children and their parents were asked if they were willing to attend a follow-up interview to be possibly made in the following winter. An absolute refusal was received from 11 subjects, who therefore were not contacted later. Three children did not attend because of change of residence, and 21 children did not respond to the written invitation.

A total of 163 children attended the survey made in winter 1972 (January 10 — February 10). In two cases interviews were not obtained and three interviews were discarded as incomplete or unreliable. The material of the present study therefore consists of 158 children from whom a 24-hour recall was obtained in both summer and winter. 55 of the children were 5 years, 59 9 years and 44 13 years old.

Methods

Food concumption was assessed by the 24-hour recall method, and from this information energy and nutrient intakes were calculated using the Finnish and foreign food composition tables as well as analytical data obtained from manufacturers (AHLSTRÖM et al. 1972, RÄSÄNEN and AHLSTRÖM 1975). The children were interviewed by the same persons in winter and in summer. On both occasions the children were randomly distributed between the interviewers. All the children in the present material were accompanied by the mother during both interviews.

The mean daily consumption of foods and the intakes of energy and nutrients were calculated. Significance of the differences between the means was tested by Student's t-test as described by STEEL and TORRIE (1960). In tables the statistical significance of the differences is expressed as follows:

$$\begin{aligned} 0.01 < p < 0.05 \quad & * \\ 0.001 < p < 0.01 \quad & ** \\ p < 0.001 \quad & *** \end{aligned}$$

Results

The mean daily consumption of foods in summer and in winter is presented in Table 1. Differences between the two seasons in the composition of the diet were most evident in the following food groups: milk products other than milk, sour milk or cheese; inner organs and blood; vegetables; fruits and berries; and beverages.

Table 1. Mean daily intake of foods in summer and in winter in grammes per 24 hours. Mean values and standard deviations of means (n = 158).

	Summer	Winter	Signif. of diff.
Milk	573.5 ± 303.8	618.0 ± 270.7	—
Sour milk	111.8 ± 191.0	52.3 ± 120.7	**
Cheese	6.7 ± 17.6	6.3 ± 13.8	—
Other milk products	50.0 ± 67.0	18.0 ± 49.4	***
Butter, margarine, oils	41.4 ± 27.7	43.3 ± 22.7	—
Eggs	19.2 ± 26.6	25.4 ± 35.8	—
Beef	14.1 ± 35.4	7.4 ± 17.9	*
Pork	9.3 ± 38.3	16.0 ± 38.6	—
Other meats	12.7 ± 26.5	21.9 ± 37.6	*
Inner organs and blood	1.8 ± 8.5	12.3 ± 32.1	***
Sausages and other meat products	71.5 ± 94.4	65.9 ± 77.6	—
Fish	18.8 ± 45.8	8.9 ± 27.9	*
Rye	86.2 ± 84.5	71.7 ± 67.6	—
Wheat	77.2 ± 58.8	98.2 ± 72.2	**
Other cereal products	27.3 ± 40.2	16.3 ± 24.3	**
Potatoes	131.5 ± 114.2	142.8 ± 124.6	—
Roots	13.3 ± 30.1	16.0 ± 34.0	—
Legumes and nuts	4.9 ± 21.2	7.7 ± 25.4	—
Other vegetables	92.7 ± 98.9	35.7 ± 51.2	***
Fruits and berries	133.4 ± 164.5	230.2 ± 207.3	***
Sugar and candy	41.4 ± 32.3	51.4 ± 48.4	*
Beverages	236.4 ± 216.2	137.4 ± 198.4	***
Other foods	3.2 ± 5.0	3.0 ± 4.4	—

The differences in the consumption of the various food groups in winter and summer had the same trend in the three age groups. The difference in »other milk products» was due mainly to the greater consumption of ice cream in summer than in winter. The diets of the 9- and 13-year-olds included significantly more blood and liver dishes in winter than in summer. In the 5-year-old group the difference was not statistically significant. In all the age groups more vegetables were used in summer, the difference being mainly due to higher consumption of cucumbers, tomatoes and rhubarb. In winter the children ate nearly twice as much fruits and berries as in summer, particularly the consumption of citrus fruits, citrus juices and apples was high in winter. The seasonal difference in the mean daily consumption of beverages was due to the greater consumption of soft drinks by children in summer.

In all age groups the mean intakes of energy and most nutrients were notably similar in summer and winter (Table 2). The mean intake of iron in the whole material was significantly higher in winter than in summer. This difference was seen in all age groups, but it was statistically significant only in the 9-year-old group. The mean iron content of the children's diet was 5.0 mg/1000 kcal in summer and 5.8 mg/1000 kcal in winter. Likewise the intake of vitamin A was higher in winter. A very clear seasonal difference between the diets was seen in ascorbic acid, the intake of this being greater in winter. In both summer and winter about 12.5 % of the total intake of energy was obtained from protein. Fat accounted for 40.6 % of the total energy intake in summer and for 40.3 % in winter, and carbohydrate for 46.9 % and 47.2 %, respectively.

The supply of energy and nutrients by the different food groups is presented in Table 3. The role of milk and milk products as source of energy and nutrients was somewhat greater in summer than in winter. The rather general use of low-fat milk products in winter, especially that of milk with fat content of 2.5 % instead of standard milk (fat content 3.9 %), reduced the proportion on fat intake from milk and milk products in this season below the summer level. Only slight seasonal differences were found in the total amount of eggs, meat and fish consumed. This food category, however, contained in winter considerably more inner organs and blood, which raised its importance as a source of nutrients to a clearly higher level than in summer. The seasonal variations were notably great in iron, vitamin A and riboflavin. Conversely, the proportionate share of cereal and cereal products in supplying nutrients was smaller in winter than in summer. The vegetable group and the fruit and berry group changed positions as ascorbic acid sources in summer and winter. The persentage share of fruits and berries was greatly increased in winter, yielding over a half of the total ascorbic acid intake, whereas vegetables were of minor importance in this season.

Table 2. Mean values and standard deviations of intake of energy and some nutrients in summer and in winter (n = 158).

	Summer	Winter	Signif. of diff.
Energy, kcal	2 221 ± 823	2 256 ± 686	—
MJ	9.3 ± 3.4	9.4 ± 2.9	—
Protein, g	71.1 ± 25.8	72.1 ± 22.3	—
Fat, g	102.5 ± 47.9	103.5 ± 38.6	—
Carbohydrate, g	267.0 ± 103.0	272.5 ± 89.9	—
Calcium, mg	1 095 ± 430	1 080 ± 406	—
Iron, mg	11.2 ± 4.8	13.0 ± 6.8	**
Vitamin A, ret. eq., µg	1 004 ± 901	1 431 ± 2 034	*
Thiamin, mg	1.3 ± 0.6	1.4 ± 0.5	—
Riboflavin, mg	2.4 ± 0.9	2.6 ± 1.1	—
Niacin, mg	11.7 ± 6.1	12.0 ± 5.7	—
Niacin eq., mg	26.8 ± 10.7	27.1 ± 9.4	—
Ascorbic acid, mg	81.1 ± 54.7	104.4 ± 70.9	***

Table 3. Percentage distribution of energy and some nutrients among the different food groups.

Food group	Energy	Protein	Fat	Carbo-hydrate	Calcium	Iron	Vit. A Ret .eq.	Thiamin	Riboflavin	Niacin	Niacin eq.	Ascorbic acid
Milk and milk products	26,22[1])	38,35	34,28	16,13	85,82	4,3	28,17	22,20	62,54	6,6	26,24	15,10
Butter, margarine and oils	14,14	0,0	33,34	0,0	0,0	0,0	26,19	0,0	0,0	0,0	0,0	0,0
Eggs, meat and fish	16,18	28,30	29,32	1,1	2,2	25,35	24,51	17,22	15,25	40,48	35,40	0,3
Cereals and cereal products	24,24	25,25	3,3	43,43	5,6	44,35	0,0	37,30	14,10	27,21	23,20	0,0
Potatoes and roots	5,5	4,4	0,0	9,10	2,2	10,10	12,8	13,13	2,3	14,15	8,9	27,23
Vegetables	1,1	3,3	0,0	2,2	2,2	8,5	9,3	6,5	3,2	5,3	3,2	22,10
Fruits and berries	4,6	1,2	0,0	9,11	2,4	5,7	1,2	4,9	2,3	3,4	2,3	36,54
Sugar, candy, beverages and others	10,10	1,2	1,3	20,20	2,2	4,5	0,0	0,1	2,3	5,3	3,2	0,0

[1]) The figures refer to summer and winter, respectively.

Discussion

The diet of the children in Nurmijärvi in summer did not differ with respect to any nutrient from the mean for the whole country in this season (RÄSÄNEN and AHLSTRÖM 1975). The data collected from the same children in winter may thus be regarded as representative of the whole country.

Only a few of the numerous nutrition surveys made in Finland have studied the food consumption in different seasons in the same population using the same methods (TIGERSTEDT 1916, KANSANRAVITSEMUSKOMITEA 1940, VIRTANEN and TURPEINEN 1940, ROINE 1954, KONTTINEN and ROINE 1962, PEKKARINEN and ROINE 1964). Very little information is available for Finland on seasonal differences in food consumption and nutrient intakes during the past decade.

The differences in the present study between the diets in summer and in winter were in some respects dissimilar from the earlier observations on the seasonal diets of Finnish adults. In the earlier studies the use of vegetables was lowest in late spring and early summer (VIRTANEN and TURPEINEN 1940, ROINE 1954, PEKKARINEN and ROINE 1964), whereas in the present study a relatively large amount of vegetables was used in early summer. This was, however, due to an abundant consumption of only a few kinds of vegetables. The consumption of fruits and berries has usually been highest in early autumn months and has then declined sharply towards spring (VIRTANEN and TURPEINEN 1940, ROINE 1954, PEKKARINEN and ROINE 1964). In the present study the diet of the children was found to contain a large amount of fruits, particularly citrus fruits, even in mid-winter. This change can be ascribed most probably to the availability of imported fruits at reasonable prices throughout the year.

A seasonal difference was also observed in the amount of fish consumed. The difference was, however, smaller than in the earlier surveys (VIRTANEN and TURPEINEN 1940, ROINE 1954, PEKKARINEN and ROINE 1964), this being possibly due to the availability of frozen fish throughout the year.

The use of inner organs and blood in summer was notably different from that in winter. The effect of the school lunch on the total food intake of the children was not investigated in the present survey. According to the instructions of the NATIONAL BOARD OF GENERAL EDUCATION (1973) the school menu must include a dish prepared from inner organs or blood at least once a week. The prescribed iron content of school food, 5.7—7.7 mg/1000 kcal according to the sex and age of children, is definitely higher than the observed mean in the children's diet, 5.0 mg/1000 kcal (RÄSÄNEN and AHLSTRÖM 1975), or in the adult diet 5.7—5.9 mg/1000 kcal (SEPPÄNEN et al. 1973, KOSKINEN 1975). Similarly the fact that the seasonal fluctuations were most evident in the diets of the 9- and 13-year-old children seems to indicate that the school feeding programme definitely raises the proportion of inner organs and blood in the children's diet and consequently their iron intake is increased. The relatively high consumption of inner organs and blood in winter increased also the intake of vitamin A.

In the earlier studies the ascorbic acid intake was generally found to be low in Finland in the winter season (VIRTANEN and TURPEINEN 1940, ROINE 1954, PEKKARINEN and ROINE 1964). In the present study the large consumption of fruits by children has raised the ascorbic acid intake to a relatively high level also in winter. It is our impression that due to developments in both food import trade and domestic food industry the seasonal fluctuations in the available selection of foodstuffs are undergoing progressive reduction and this in turn levels off the fluctuations observed earlier in the intakes of various nutrients.

In the earlier part of this survey it was observed that with the exception of iron the nutrient intake of Finnish children is on the average adequate. The intake of iron was regarded as scanty (RÄSÄNEN and AHLSTRÖM 1975). The results of the present follow-up study seem to indicate that on a year-round basis the situation in this respect is better. The mean intake of iron is clearly greater in winter. A study on the effect of school lunches on the food consumption of the children would further clarify this matter.

The seasons selected for the dietary interviews in this study were early summer and mid-winter since they were considered to be the periods when the intakes of nutrients were lowest. However, to obtain an accurate idea of the seasonal fluctuations in the composition of the diet and in the intakes of nutrients of Finnish children it would be necessary to carry out cross-sectional studies during several seasons of the year.

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SELOSTUS

Tutkimus suomalaisten maalaislasten ravitsemuksesta

V. Vuodenaikaiserot ruoankäytössä ja ravinnon saannissa

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Suomalaisten maalaislasten ravitsemusta koskevan tutkimussarjan yhteydessä verrattiin toisiinsa kesäistä ja talvista ruoankäyttöä ja ravinnonsaantia. Tutkimusaineiston muodosti 158 Nurmijärvellä asuvaa lasta, joista 55 oli 5-vuotiaita, 59 9-vuotiaita ja 44 13-vuotiaita. Ravinnonkäyttö selvitettiin tutkimusta edeltäneeseen vuorokauteen kohdistuvaa haastattelumenetelmää (24-hour recall method) käyttäen. Ensimmäiset haastattelut suoritettiin kesäkuussa 1971 ja toiset tammi–helmikuussa 1972.

Lasten talviseen ruokavalioon sisältyi erittäin merkitsevästi enemmän hedelmiä ja marjoja ja sisäelimiä ja verta sekä vähemmän kasviksia ja ns. muita maitotuotteita, lähinnä jäätelöä,

kuin kesäiseen ruokavalioon. Erot olivat kaikissa ikäryhmissä samansuuntaiset. Energian ja ravintoaineiden saantimäärät olivat huomattavan samankaltaiset kesällä ja talvella. Tilastollisesti merkitsevä ero kesän ja talven välillä oli ainoastaan raudan, A-vitamiinin ja askorbiinihapon keskimääräisissä saantimäärissä, jotka kaikki olivat talvella suuremmat kuin kesällä. Raudan ja A-vitamiinin suurempi saanti talvella johtui nimenomaan sisäelinten ja veren suhteellisen runsaasta kulutuksesta. Lasten runsas hedelmien, lähinnä sitrushedelmien, käyttö johti siihen, että myös askorbiinihapon saanti oli talvella erittäin runsasta.

Lasten ruoankäytössä ja ravintoaineiden saannissa todetut kesän ja talven väliset erot poikkesivat suomalaisen ruokavalion koostumuksesta varhaisemmissa tutkimuksissa tehdyistä havainnoista. Tuontielintarvikkeiden lisääntynyt käyttö ja elintarvikkeiden entistä paremmat säilytysmahdollisuudet ovat ilmeisesti tasoittaneet aiemmin suomalaisväestön ravinnonsaannissa eri vuodenaikojen välillä havaittuja jyrkkiäkin eroja.