

Differences in Breakfast Consumption Among Schoolchildren from Four Geographical Regions in Croatia

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INTRODUCTION

Monitoring dietary intake patterns among children is important in order to prevent the onset of adult health problems, especially when factors other than health concerns (taste preferences, cultural norms, socioeconomic status, living region, food availability, etc.) influence dietary behaviour (Brady et al., 2002; Gharbi, 1998; Harnack et al., 1997; Norton et al., 2000; O'Dea and Caputi, 2001).

Consumption of any breakfast has traditionally been linked with a range of positive outcomes, most specifically related to cognitive performance and improved nutrient intake patterns (Mathews, 1996; Pollit et al., 1981; Smith, 1994). Breakfast consumption influences cognition via several mechanisms, including an increase in blood glucose and preferentially influences tasks requiring aspects of memory (Benton and Parker, 1998; Cueto, 2001). Omission of breakfast or consumption of an inadequate breakfast is a factor contributing to poor school performance and to dietary inadequacies that are rarely compensated for in other meals of the day (Nicklas et al., 1998b). Omitting breakfast interferes with cognition and learning, an effect that is more pronounced in nutritionally at-risk than in well-nourished children (Pollit and Mathews, 1998). It is possible that an inadequate breakfast contributes to the making of poor food choices over the rest of the day and in the long term to an increased risk of obesity (Ortega et al., 1998a; Ortega et al., 1998b).

Overall dietary intake and anthropometric status in Central and Eastern Europe, after the political, social and economic changes during the 1990s has varied considerably, especially in the regions with war (Parizkova, 2000).

The food intake data in Croatia, especially regarding breakfast consumption is insufficient. The aim of the study was to determine and compare the pattern of breakfast consumption among schoolchildren in four different regions of Croatia. Nutritional status was also evaluated by anthropometric parameters.

SUBJECTS AND METHODS

The research was carried out among 1246 schoolchildren from four different regions of Croatia: the south (Adriatic coast), the capital (Zagreb), central mountain region (Lika) and the eastern plane region (Slavonija). Both genders participated (51.0 % of subjects were boys and 49.0% girls). The average age was 10.3 ± 1.9 years ($x \pm SD$) (Table 1). Participants were recruited from the fourth grade of the six primary public schools in four regions that do not provide "all day care" or meals during school-time. Both schools and than children were chosen by random. Schools principals and parents approved the study. Participation was voluntarily and full name, surname and the date of birth were recorded. From 1283 children at the beginning 2.9 % were excluded from further analyses because the Food Frequency Questionnaire (FFQ) was improperly completed or was not returned.

The monitoring of food consumption was performed by specially designed Food Frequency Questionnaire (FFQ) (Macdonald, 1991). For the method has be found to be useful in measuring intakes for a variety of nutrients (Bodner et al., 1998; Cavadini et al., 1999; Pao and Cypel, 1990). The questionnaire contained a list of 22 different food items and enough space for adding food that was

Table 1: Subjects defined by age and living region

Parameters	Subjects				
	Children	South region	Zagreb	Central region	Eastern region
Age (years) ($x \pm SD$)	10.3 ± 1.87	10.2 ± 0.99	9.8 ± 2.16	11.9 ± 1.83	10.4 ± 0.57
Number (n)	1227	364	548	205	110
Boys (n)	623	176	295	103	49
Girls (n)	604	188	253	102	61

consumed but not listed. National and regional food items were also included. Consumption frequency of food was categorised into eight different categories: “never”, “once a week”, “two times per week”, etc. The portion sizes were either typical or natural portion (e.g. slice, piece, cup, glass, etc.).

The survey for children was obtained from parents or caregivers who were preliminary informed by professionals how to fill FFQ. With FFQ they received a booklet with written instructions and pictures as visual aid to explain portion size of eaten food. Parental reports of children's diet using FFQ methods seem accurate enough to be useful in nutrition screening (Byers et al., 1993). The children brought fulfilled FFQ's in closed envelopes in the schools and person in charge collected them.

To determine the weight of consumed food, predefined measures for all foods and portion sizes were provided (Colić, 1987). Professionals using food composition tables and product declarations converted records to quantities (Kulier, 1990). Descriptive analyses (e.g., mean, SD) of demographic characteristics (percentage of calories obtained from macronutrients as well as from food groups, and energy and nutrient intakes in absolute quantity and in relation to energy intake and Recommended Dietary Allowances (RDA) and Dietary Reference Intake (DRI) were calculated with regard to gender and living region (The National Academy of Science, 1989;). DRI's are currently revised RDA's (Food and

Nutrition Board, 1997). RDA's are in use in Croatia since 1994 (The Ministry of Health, 1994).

Anthropometric assessment included measures of weight and height and was performed in the morning hours. The height was measured without shoes, on a portable stadiometer. The body weight was measured on the mechanic scale (Seca, Typ 710-220, Vogel & Halke GmbH & Co., Germany). The body mass index (BMI) was calculated as weight (kg) divided by square of height (m²). Cut-off percentiles of the BMI (25th and 85th) of examined subjects with regard to age and gender were used to determine nutritional status since exist no Croatian reference values.

Statistical analyses were performed by MS Excel 97 and included F-test and calculation of Pearson's correlation coefficient.

RESULTS AND DISCUSSION

From 1246 children 1.5 % did not have breakfast at all, and they were excluded from further analyses. In this study was observed higher number of children who did not skip the breakfast what is opposite to some, but also in correlation to others similar studies (Bellisle and Rolland-Cachera, 2000; Brugman et al., 1998; Lytle et al., 2000; Nicklas et al., 1993). Regular breakfast as a healthy dietary habit should be established in the early childhood, since eating patterns seem to track from childhood until the late adolescence (Kelder et al., 1994).

Table 2: Average food, energy, macronutrient, cholesterol and dietary fiber intake by breakfast ($\bar{x} \pm \text{SD}$)

Parameters	Subjects				F-test					
	South region (S)	Zagreb (Z)	Central region (C)	Eastern region (E)	S/Z	S/C	S/E	Z/C	Z/E	C/E
Food intake (g)	529.2 $\pm$ 266.35	428.7 $\pm$ 191.88	595.8 $\pm$ 276.19	316.1 $\pm$ 201.43	*	/	*	*	/	*
Energy intake (kJ)	2606.2 $\pm$ 1467.79	2033.8 $\pm$ 930.33	2609.1 $\pm$ 1183.52	1256.48 $\pm$ 628.33	*	*	*	*	*	*
Energy intake (% RDA)	28.6 $\pm$ 15.82	26.2 $\pm$ 25.20	30.7 $\pm$ 22.62	14.1 $\pm$ 7.34	*	*	*	/	*	*
Protein (g)	23.7 $\pm$ 12.31	21.9 $\pm$ 11.11	29.1 $\pm$ 13.58	15.4 $\pm$ 8.58	/	/	*	*	*	*
Protein (% RDA)	66.9 $\pm$ 35.15	67.6 $\pm$ 33.18	73.4 $\pm$ 39.58	46.1 $\pm$ 30.95	/	/	/	/	/	/
Protein (% kJ)	16.5 $\pm$ 4.40	18.1 $\pm$ 3.92	18.6 $\pm$ 2.74	20.5 $\pm$ 5.39	/	*	/	*	*	*
Fat (g)	16.9 $\pm$ 11.12	15.5 $\pm$ 8.80	17.2 $\pm$ 8.31	8.7 $\pm$ 5.61	*	*	*	/	*	*
Fat (% kJ)	24.4 $\pm$ 6.63	27.7 $\pm$ 7.86	24.6 $\pm$ 4.53	25.8 $\pm$ 8.59	*	*	*	*	/	*
Cholesterol (mg)	68.3 $\pm$ 67.26	46.2 $\pm$ 39.51	39.0 $\pm$ 21.03	17.0 $\pm$ 15.54	*	*	*	*	*	*
Carbohydrates (g)	93.8 $\pm$ 58.46	64.6 $\pm$ 29.17	88.1 $\pm$ 41.09	39.9 $\pm$ 21.57	*	*	*	*	*	*
Carbohydrates (% kJ)	59.1 $\pm$ 9.43	54.2 $\pm$ 9.16	56.8 $\pm$ 6.75	53.7 $\pm$ 12.46	/	*	*	*	*	*
Dietary fiber (g)	4.0 $\pm$ 2.92	3.4 $\pm$ 1.8	5.2 $\pm$ 2.38	1.7 $\pm$ 1.42	*	*	*	*	/	*
Dietary fiber (% of the “age + 5” rule)	25.9 $\pm$ 18.44	22.8 $\pm$ 12.27	31.4 $\pm$ 14.62	10.9 $\pm$ 9.14	*	*	*	*	*	*

*p<0.001 according to the living region

Children from the south and the central region had significantly larger breakfast then ones from Zagreb and the eastern region (529.2 g and 595.8 g vs. 428.7 g and 316.1 g) ($p < 0.001$) (Table 2).

Energy intake (kJ) by breakfast differed significantly according to living region (Table 2). When expressed as % RDA all children except from the eastern region, had energy intake more than recommended 20 - 25 % RDA (Table 2). Energy intake by breakfast in all regions except eastern, correlate to similar study in Croatia (Colić Barić et al., 2001). Lower energy intake by breakfast is detected among Croatian adolescents (Colić Barić et al., 2000a). Wyon et al. (1997) found that the voluntary physical endurance and the performance of a creativity test were much better after a breakfast from which children derived over 20 % of their recommended daily energy intake than after a breakfast from which they obtained less than 10 % of recommended values. In the eastern region 82.7 % of the children had energy intake less than 20 % RDA (Table 3). Martin et al. do not support the current advice to consume more energy at breakfast (Martin et al., 2000).

In average protein intake was up to 45 % RDA in all regions and did not differ according to the living region (Table 2). High protein intake as observed in this study is often reported (Colić Barić and Šatalić, 2002; Parizkova, 2000). High protein intake can have some adverse affects: increase in renal excretion of

The intake of proteins, fats and carbohydrates as energy providing macronutrients generally was well balanced (Table 2). Still, the protein intake should be decreased and the carbohydrate intake should be increased.

The role of a dietary fiber in human health is well known. The recommendation for the children more than 2 years old is to achieve an amount of dietary fiber intake equal or greater than their age plus 5 g per day (Williams, 1995). A dietary fiber intake, presented as a percentage of the "age + 5" rule, was significantly different according to the living region and showed that children in the central region had the highest and the children on the east of Croatia the lowest intake (Table 2).

Intake of cholesterol also was significantly different ($p < 0.001$) according to the living region but in correlation to dietetic recommendation. In average the highest amount of cholesterol was present in the south region, mostly from eggs and meat products (Table 2).

Intakes of vitamins (D, E, C, B₆, thiamine, riboflavin, niacin and folate) and minerals (calcium, phosphorus, magnesium, iron and zinc) were examined and expressed as % RDA and % DRI (Table 4). Intakes of all micronutrients differed significantly ($p < 0.001$) according to the living region but intake of riboflavin, phosphorus and calcium could be considered as similar in all four regions (Table 4). It is very difficult to meet children's calcium needs without a source of milk in a diet and 60 % of RDA for calcium should be derived from milk and dairy products (Infante and Tormo, 2000). In this study riboflavin, phosphorus and calcium were present in the breakfast in higher amount than others micronutrients, because dairy foods are good sources of these nutrients and they represented the largest part of breakfast in children of all regions (Table 4-5). Similar studies indicate different intake of calcium derived from milk and dairy in Croatian children (Colić Barić et al., 2000b; Kaić-Rak et al., 1995).

The intake of iron and zinc was statistically lower within children in the eastern region than in those in the other living regions (Table 4). Nicklas et al. (1998a) reported that higher number of young adults who skip breakfast do not meet two thirds of RDA for most micronutrients, unlike those who consume breakfast. In this study, intake of all the examined micronutrients could be considered as adequate except for the vitamins D, E and niacin (Table 4).

In average children in the central region consumed more milk then those in other regions

Table 3. Energy intake by breakfast with regard to RDA

Parameters	% subjects			
	South region	Zagreb	Central region	Eastern region
< 20 % RDA	35.7	41.6	28.3	82.7
20-30 % RDA	22.8	33.4	23.9	11.8
> 30 % RDA	41.5	25.0	47.8	5.5

calcium and the age of adiposity rebound for the children consuming a high protein diet is found to be significantly lower (Allen et al., 1979; Ziegler et al., 2000).

Children from all four regions obtained the most energy from carbohydrates (Table 2). Bread was present in almost all breakfasts and confectionery was in average very frequently consumed (Table 5). In similar study was observed that confectionery is mostly present in children's than in adolescents diet in Croatia (Colić Barić et al., 2001).

Table 4: Micronutrient intake by breakfast (% RDA, % DRI) ($\bar{x} \pm SD$)

Parameters	Subjects				F-test					
	South region (S)	Zagreb (Z)	Central region (C)	Eastern region (E)	S/Z	S/C	S/E	Z/C	Z/E	C/E
Vitamin D (% RDA)	1.1 $\pm$ 1.50	0.6 $\pm$ 0.58	0.5 $\pm$ 0.39	0.2 $\pm$ 0.29	*	*	*	*	*	/
Vitamin E (% RDA)	4.33 $\pm$ 3.83	3.7 $\pm$ 2.52	4.3 $\pm$ 2.47	1.6 $\pm$ 1.89	*	*	*	/	*	/
Vitamin C (% RDA)	52.54 $\pm$ 68.81	27.3 $\pm$ 21.44	47.9 $\pm$ 21.73	17.5 $\pm$ 32.98	*	*	*	/	*	*
Thiamin (% DRI)	29.0 $\pm$ 16.68	23.4 $\pm$ 11.86	29.1 $\pm$ 14.92	14.5 $\pm$ 9.41	*	/	*	*	/	*
Riboflavin (% DRI)	86.6 $\pm$ 49.96	77.6 $\pm$ 44.61	88.7 $\pm$ 51.9	49.8 $\pm$ 39.51	/	/	/	/	/	*
Niacin (% DRI)	12.1 $\pm$ 7.24	11.3 $\pm$ 5.81	14.2 $\pm$ 7.22	5.5 $\pm$ 3.04	*	/	*	*	*	*
Vitamin B6 (% RDA)	24.0 $\pm$ 18.36	18.0 $\pm$ 8.33	26.6 $\pm$ 11.53	10.4 $\pm$ 7.15	*	*	*	*	/	*
Folate (% RDA)	34.8 $\pm$ 21.34	34.1 $\pm$ 16.17	45.0 $\pm$ 20.59	19.3 $\pm$ 10.92	*	/	*	*	*	*
Calcium (% DRI)	43.8 $\pm$ 22.82	40.6 $\pm$ 24.13	46.4 $\pm$ 26.13	25.7 $\pm$ 19.96	/	/	/	/	/	*
Phosphorus (% RDA)	60.6 $\pm$ 34.88	47.9 $\pm$ 22.92	52.0 $\pm$ 27.31	32.8 $\pm$ 24.93	*	*	*	*	/	/
Magnesium (% RDA)	28.2 $\pm$ 16.64	23.3 $\pm$ 12.17	26.3 $\pm$ 15.24	17.3 $\pm$ 16.78	*	/	/	*	*	/
Iron (% RDA)	16.4 $\pm$ 9.93	13.5 $\pm$ 6.58	15.6 $\pm$ 7.94	6.8 $\pm$ 3.82	*	*	*	/	*	*
Zinc (% RDA)	15.6 $\pm$ 8.09	13.7 $\pm$ 7.67	16.5 $\pm$ 10.20	11.1 $\pm$ 10.75	/	*	*	*	*	/

*p<0.001 according to the living region

(Table 5). In that region consumption frequency of milk during the week also was the highest as well as the number of subjects who consumed milk and dairy products in general (98.1 %) and on daily bases (51.2 %) (Table 5-7).

More than 97 % of children consumed milk and dairy products in all regions with exception of the eastern region where 19.1 % of children did not consumed those kinds of products at all, what according to Teegarden et al. (1999) can have negative influence on a milk intake later in life.

Milk, dairy and cereal products were the most present food groups in children's breakfast in all four regions (Table 5). Between 88 and 99.5 % of the children respectively had cereal products for breakfast (Table 6). Cereal products were major energy contributors in children's breakfast, except for the children from the eastern region where the main source of energy in breakfast were milk and dairy products (Table 5). Still, corn-flakes with milk was not common breakfast food, and the highest percentage of subjects who consume corn-flakes was observed for Zagreb (Table 7).

The highest consumption frequency of meat products (frankfurters and salami) was observed in the central mountain region as was expected (Table 5-6). Margarine, butter and mayonnaise as fat products were consumed also in low amount with frequency similar to that of meat products (Table 5-6).

Eggs were the least present food in children's breakfasts (Table 5). Children from the central and the eastern region did not consume eggs at all (Table 5-6). Considering results of one study eggs improve daily nutrient intake what can be beneficial for children in the eastern region (Song and Kerver, 2000).

Fruit and fruit juice were most frequent and in the highest amount present in breakfast of the children in the central region (Table 5). The lowest consumption was observed in the eastern region where 88.2 % of the children did not consume fruit or fruit juice for breakfast at all (Table 5-7). The lowest energy, macro- and micronutrient intakes as well as the highest percentage of children who never had milk or other food which is highly recommended for breakfast was observed among children on the east of Croatia. That region was mostly affected by the war what had great influence on economy during and after the war. It is well known that low income is associated with poor nutrition at all stages of life (Nelson, 2000).

Since there are no Croatian standards, the 85th percentile for the body mass index (BMI, kg/m²) of investigated population, regarding age and gender, was taken as a marginal value for obesity. The same criterion was used by Perl et al. (1998) to determine obesity in Croatian adolescents. Most of the children from all four regions were normal nourished but high percentage of children were undernourished (Table

Table 5: Consumption frequency and an average intake of different foods by breakfast ($\bar{x} \pm SD$)

Parameters	Subjects				F-test					
	South region (S)	Zagreb (Z)	Central region (C)	Eastern region (E)	S/Z	S/C	S/E	Z/C	Z/E	C/E
Milk and dairy products (n times per week)	6.3 $\pm$ 1.62	6.2 $\pm$ 1.74	6.2 $\pm$ 1.75	5.0 $\pm$ 2.88	/	/	*	/	*	*
Milk (n times per week)	4.5 $\pm$ 2.70	3.7 $\pm$ 2.83	5.1 $\pm$ 2.44	3.7 $\pm$ 3.17	/	/	/	/	/	*
Yoghurt (n times per week)	1.9 $\pm$ 2.08	1.6 $\pm$ 2.06	2.7 $\pm$ 2.38	0.8 $\pm$ 1.99	/	/	/	/	/	/
Corn flakes with milk (n times per week)	0.7 $\pm$ 1.39	1.0 $\pm$ 1.59	0.9 $\pm$ 1.67	0.8 $\pm$ 2.03	/	/	*	/	*	/
Cereal products (n times per week)	6.1 $\pm$ 1.90	6.5 $\pm$ 1.48	6.5 $\pm$ 1.23	5.5 $\pm$ 2.44	*	*	*	*	*	*
Meat products (n times per week)	2.7 $\pm$ 2.62	2.9 $\pm$ 2.93	4.2 $\pm$ 2.60	1.1 $\pm$ 2.39	/	/	/	/	/	/
Fats and products (n times per week)	1.4 $\pm$ 2.06	2.1 $\pm$ 2.50	2.7 $\pm$ 2.46	1.2 $\pm$ 2.41	*	/	/	/	/	/
Eggs (n times per week)	0.4 $\pm$ 0.97	0.3 $\pm$ 0.79	0 $\pm$ 0	0 $\pm$ 0	*	/	*	*	*	/
Fruit or fruit juice (n times per week)	2.5 $\pm$ 3.22	2.4 $\pm$ 2.83	5.0 $\pm$ 2.12	0.6 $\pm$ 1.78	/	*	*	*	*	/
Confectionery (n times per week)	4.4 $\pm$ 2.49	3.2 $\pm$ 2.72	4.1 $\pm$ 2.70	1.7 $\pm$ 2.80	/	/	/	/	/	/
Milk and dairy products (g)	47.8 $\pm$ 90.21	48.9 $\pm$ 94.26	76.4 $\pm$ 124.65	47.3 $\pm$ 114.41	/	*	*	*	*	/
Milk (mL)	171.0 $\pm$ 139.04	157.1 $\pm$ 159.38	240.0 $\pm$ 170.55	176.1 $\pm$ 187.59	/	*	*	/	/	/
Cereal products (g)	20.7 $\pm$ 37.62	19.4 $\pm$ 31.52	29.5 $\pm$ 50.14	12.4 $\pm$ 26.52	*	*	*	*	*	*
Meat products (g)	6.4 $\pm$ 12.24	8.2 $\pm$ 12.24	8.9 $\pm$ 12.10	10.8 $\pm$ 17.54	/	/	*	/	*	*
Fats and products (g)	1.2 $\pm$ 1.98	1.9 $\pm$ 2.72	2.2 $\pm$ 2.41	1.3 $\pm$ 2.97	*	*	*	/	/	/
Eggs (g)	4.3 $\pm$ 9.67	1.8 $\pm$ 5.66	0 $\pm$ 0	0 $\pm$ 0	*	*	*	*	*	/
Fruit fruit juice (g)	34.1 $\pm$ 53.59	34.8 $\pm$ 40.48	72.1 $\pm$ 30.23	8.1 $\pm$ 34.27	*	*	*	*	/	/
Confectionery (g)	9.2 $\pm$ 19.84	5.7 $\pm$ 9.83	3.8 $\pm$ 3.23	1.7 $\pm$ 3.12	*	*	*	*	*	/
Milk and dairy products (% kJ)	32.7 $\pm$ 19.28	38.4 $\pm$ 15.61	38.1 $\pm$ 15.87	45.6 $\pm$ 29.07	*	/	*	/	*	*
Cereal products (% kJ)	35.9 $\pm$ 17.94	40.3 $\pm$ 14.17	45.4 $\pm$ 12.64	42.0 $\pm$ 23.21	*	*	*	/	*	*
Meat products (% kJ)	4.9 $\pm$ 5.60	5.5 $\pm$ 5.09	4.6 $\pm$ 3.41	4.6 $\pm$ 7.07	/	*	*	*	*	*
Fats and products (% kJ)	1.5 $\pm$ 2.57	2.6 $\pm$ 3.64	2.6 $\pm$ 2.83	3.2 $\pm$ 6.90	*	/	*	*	*	*
Eggs (% kJ)	0.7 $\pm$ 1.65	1.2 $\pm$ 3.70	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0	*	*	*	*	*	/
Fruit or fruit juice (% kJ)	6.2 $\pm$ 9.46	5.8 $\pm$ 11.18	7.8 $\pm$ 6.84	2.9 $\pm$ 9.55	*	*	/	*	/	*
Confectionery (% kJ)	18.1 $\pm$ 17.51	6.1 $\pm$ 9.16	1.6 $\pm$ 1.16	1.6 $\pm$ 2.98	*	*	*	*	*	*

*p<0.001 according to the living region

Table 6: Consumption of different foods by breakfast

Parameters	% subjects (consumers)			
	South region	Zagreb region	Central region	Eastern region
Milk and dairy products	97.7	96.9	98.1	80.9
Cereal products	94.5	96.9	99.5	88.2
Meat products	61.0	60.0	89.8	19.1
Fats and products	42.9	59.1	72.2	24.5
Eggs	20.9	12.8	0.0	0.0
Fruit or fruit juice	39.6	49.3	96.6	11.8
Confectionery	89.0	71.5	87.3	30.9

8). No significant correlation was found between the BMI and assessed dietetics parameters.

CONCLUSIONS

In this study we observed some differences in consumption of breakfast according to the living region. The differences were expected since the environment, gender, ethnicity and educational level have a significant influence on dietary habits. The intake of energy, macro and micronutrients by breakfast of children from the south, the central part

Table 7: Consumption frequency of some foods by breakfast

Parameters	South region					Zagreb					% subjects (consumers) Central region					Eastern region				
	1-3 times per week		4-6 times per week		Every day	1-3 times per week		4-6 times per week		Every day	Never		1-3 times per week		4-6 times per week	Never		1-3 times per week		4-6 times per week
	Never	1-3 times per week	4-6 times per week	20.1	44.0	25.7	23.4	18.6	32.2	9.3	23.4	42.0	14.6	24.9	51.2	34.5	14.5	6.4	44.5	6.4
Milk	16.5	19.5	20.1	44.0	44.0	25.7	23.4	18.6	32.2	9.3	23.4	42.0	14.6	24.9	51.2	34.5	14.5	6.4	44.5	6.4
Yoghurt	37.6	41.2	14.8	6.3	6.3	25.0	27.4	9.9	4.2	23.4	69.8	20.5	6.8	21.0	13.6	82.7	4.5	6.4	6.4	6.4
Corn flakes with milk	70.1	24.7	3.3	1.9	1.9	57.3	32.3	8.6	1.8	69.8	20.5	6.8	21.0	13.6	13.6	82.7	4.5	6.4	6.4	6.4
Fruit or fruit juice	70.1	60.4	3.6	5.8	5.8	50.7	14.1	17.3	17.9	3.4	23.4	29.3	43.9	88.2	0.9	6.4	4.5	4.5	4.5	4.5

Table 8: Nutritive status of subjects according to cut-off percentiles for BMI

Parameters	% subjects			
	South region	Zagreb	Central region	Eastern region
< 25 th percentile	25.3	25.0	25.4	24.5
25 - 85 th percentile	59.3	60.0	59.0	59.1
> 85 th percentile	15.4	15.0	15.6	16.4

and Zagreb was acceptable, although there was a difference according to the living region. Children in the eastern region made the greatest exception from the average. This can be interpreted as a consequence of the war, since that region was the most affected. The war caused great migrations and socio-economic changes that probably made an influence on nutritional quality of breakfast. Most of the children from all four regions were being fed properly but significant percentage of children was undernourished. The provision of breakfast and education program about adequate nutrition and human health at schools could improve daily nutrient intake and could improve nutritional status of children in Croatia.

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KEYWORDS Food. Frequency. Questionnaire. Nutritive Value. RDA

ABSTRACT The aim of the study was to determine and compare breakfast consumption among schoolchildren (n=1246) in four different regions of Croatia: the south (Adriatic coast), the capital (Zagreb), the central mountain region (Lika) and the eastern plane region (Slavonija). A Food Frequency Questionnaire was used. One point five percent of the children skip breakfast. Energy intake by breakfast was 26 - 31 % RDA except in the eastern region (14 % RDA). In the central region the highest percentage of subjects had energy intake by breakfast higher than 30 % RDA. Children from all four regions obtained more energy from carbohydrates than from other macronutrients ($p < 0.001$). Energy fraction of fat and protein was 24.4 - 27.7 % kJ and 16.5 - 20.5 % kJ respectively. Cholesterol and dietary fiber intake differed significantly according to living region ($p < 0.001$). The intakes of almost all examined micronutrients (% RDA, % DRI) were also different ($p < 0.001$) according to living region. Milk and dairy products as well as cereal products were major energy contributors in children's breakfasts in all four regions (32.7 - 45.6 % kJ from milk and dairy products and 35.9 - 45.4 % kJ from cereal products). Differences in nutritional quality with regard to region were established and children from the eastern region made the greatest exception from the average what can be explained as a consequence of the war, since that region was the most war affected.

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