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ORIGINAL CONTRIBUTION

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Comparison of dietary habits in the urban and rural Croatian schoolchildren

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Summary *Background* Post-war socio-economic changes in Croatia probably affected dietary habits, and dietary data about schoolchildren after the war are missing. *Aim of the study* The aim of the study was to compare current nutrient intakes and dietary behavior between urban and rural schoolchildren in Croatia. *Methods* A completely quantified Food Frequency Questionnaire was used. Subjects were 315 urban and 163 rural schoolchildren. Mean age was 12.5 and 12.6 years in the urban and rural area, respectively. *Results* Consumption of fast food, soft drinks and alcohol was more prevalent and more linked with dietary behavior in the urban than in the rural area. In both living areas protein intake was excessive (in the urban area 38.1 % of subjects and in the rural 36.2 % of subjects had protein intake higher than 200 % RDA). Under 75 % RDA/DRI in both living areas was observed for vitamin D, folate, calcium and selenium. Micronutrient intakes negatively correlated with age in both living areas, but were more pronounced in the urban area. *Conclusion* The urban sample had more adequate energy and nutrient intakes which is consistent with prewar findings.

Key words urban – rural – children – adolescents – diet

Introduction

Monitoring dietary intake patterns among schoolchildren 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, food availability, etc.) influence dietary behavior [1, 2].

Differences among the rural and urban food cognition, and dietary and physical activity patterns are due to different lifestyles [3].

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 war torn areas [4]. The liberation of occupied Croatian territories ended the war in the country in 1995. The ratio of urban-rural population in Croatia has changed after the war. The rural areas were more affected by the war and hence the urban population increased by migrations toward the urban areas. Since Croatian urban areas provide more employment opportunities than rural (which is dominant in the relative distribution of urban and rural population growth) beside migrations that were a consequence of the war, the majority (61.8 %) of the Croatian population is urban [5, 6].

The aim of this study was to compare nutrient intakes and dietary behavior between the urban and the rural schoolchildren in Croatia after post-war socio-economic changes. The study in Croatia from the late 1980s had shown much better overall nutrient intakes and anthropometric status in the urban children, aged 1–14 years, compared to the rural children [7].

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Subjects and methods

Subjects were 315 urban and 163 rural schoolchildren. Urban subjects were from the Croatian capital (Zagreb), and rural subjects from both continental and Adriatic rural areas (Gospić and Pazin). Mean age ($\bar{x} \pm SD$) was 12.5 ± 3.43 and 12.6 ± 3.74 years in the urban and the rural area, respectively. Initial sample size was 503, but 25 subjects were excluded from analyses as a result of chronic disease or because of unreliable food intake data. Children and adolescents were recruited by random sampling from 3rd grades of public primary schools and 3rd grades of secondary schools that do not provide 'all day-care' or meals during school-time. Number of Croatian schools that are private or provide 'all day-care' can be neglected. Parents were informed about the survey from the school principals and their consent was obtained. Data were collected from 1998–2000, during the autumns at the same time in both living areas.

Food consumption was monitored with a specially designed completely quantified Food Frequency Questionnaire (FFQ); this method was found to be useful in measuring intakes for a variety of nutrients [8]. The questionnaire contained a list of 83 different items and enough space for adding foods that are consumed but were not listed. National foods were included. Available frequencies of food consumption were: 'Never', 'At least once a month', '2–3 times a month', '1–2 times a week', '3–4 times a week', '5–6 times a week', 'Once a day' and 'More than once a day'. Quantities were described as units of serving (piece, plate, cup, spoon, etc.). To determine the weight of portion sizes, predefined measures were used [9]. Records were converted to quantities by using food composition tables and product declarations [10]. Portion sizes were demonstrated with dish models and serving utensils. Each questionnaire required approximately 80 minutes to complete.

The survey for children was obtained from parents who received the FFQ and were informed how to complete it and also received written instructions and pictures explaining portion sizes. Parental reports of children's diet using FFQ methods seem accurate enough to be useful in nutrition screening [11]. Information from adolescents was obtained in a form of a personal interview with trained interviewers. Subjects were explained the importance of honesty and correct reporting of food intake. Such information seems to affect accuracy of food intake reporting [12].

Energy and nutrient intakes were evaluated with regard to Recommended Dietary Allowances (RDA), which have been valid in Croatia since 1994 and Dietary Reference Intake (DRI) which are currently revised RDA's for some nutrients [13–15]. Thus, some micronutrient intakes are shown as % RDA and some as % DRI. Both the urban and the rural population examined consisted of subjects of both genders and subjects' age range was wide (8–16 years). Therefore, percentages (% RDA and % DRI) were used instead of showing micronutrient intakes in quantum because both RDAs and DRIs are gender and age dependent.

Anthropometric assessment included height and weight measures, and was performed in the morning hours. Height was measured with a portable stadiometer to the nearest 0.5 cm with subjects standing without shoes, heels together and head in horizontal Frankfurter plane. Body weight was measured on an electronic scale to the nearest 0.5 kg with subjects dressed in indoor clothes only (Tanita Corp., Tokyo, Japan). Body mass index (BMI) was calculated using the formula: body weight in kilograms divided by squared body height in meters.

Since no appropriate Croatian cutoff points for identifying underweight, overweight and obesity in children and adolescents exist, we used cutoff points from Prebeg et al. who following WHO experts recommendations determined 5th, 85th and 95th percentile of BMI, for screening underweight, overweight and obesity in population of 7–19 year old Zagreb schoolchildren (Croatian capital) [16, 17].

Statistical analyses included the F-test and calculation of Pearson's correlation coefficient.

Results

Energy intake was higher in the urban than in the rural area (Table 1). Under 75 % RDA for energy was observed in 19.7 and 42.9 % of the urban and the rural subjects,

Table 1 Daily energy, food, macronutrient, cholesterol and dietary fiber intake ($\bar{x} \pm SD$)

Parameters	Urban area	Rural area	p
Food (g)	1785.6±546.38	1676.4±424.50	***
Energy density (kJ/100 g of food)	511.5±79.03	458.7±65.95	**
Energy (% RDA)	94.8±24.96	81.5±24.98	/
Protein (% RDA)	193.2±66.94	174.2±75.59	*
Animal: vegetative protein (g)	1.7±0.62	1.8±0.50	**
Protein (% kJ)	13.5±1.56	13.8±1.59	/
Fat (% kJ)	34.2±4.13	33.8±3.44	**
Carbohydrate (% kJ)	52.3±4.71	52.5±3.91	**
SFA (% kJ)	13.7±2.30	12.8±1.99	*
MUFA (% kJ)	11.5±1.64	11.5±1.53	/
PUFA (% kJ)	4.9±1.00	5.8±1.15	*
Cholesterol (mg)	248.5±105.54	245.3±119.10	*
Cholesterol (mg/4187 kJ)	117.5±41.96	132.7±51.43	**
Dietary fiber (g)	14.9±5.19	11.4±2.98	***
Dietary fiber (% 'age + 5' rule)	85.3±25.73	67.4±22.46	*

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

respectively. Energy intake (% RDA) negatively correlated with BMI in the rural (r = – 0.39; p < 0.001), but not in the urban area.

Fat and carbohydrate intake (% kJ) were statistically significantly different, which was not observed for protein intake (Table 1). Protein intake under 15 % kJ, fat intake of 20–30 % kJ and carbohydrate intake above 55 % kJ was observed in 15.2 and 11 % of the urban and the rural subjects, respectively. In the urban area 38.1 % of the subjects and in the rural 36.2 % of subjects had protein intake higher than 200 % RDA.

Cholesterol intake when expressed per energy units was significantly higher in the rural area (Table 1). Dietary fiber intake was significantly higher in the urban than in the rural area, and urban subjects achieved a higher percent of amount recommended by the 'age plus 5' rule (Table 1) (the recommendation for children older than 2 years is to achieve an amount of dietary fibre intake equal or greater than their age plus 5 g per day) [18].

Significant difference in micronutrient intake between the urban and the rural area was observed for all micronutrients calculated with the exception of vitamins A, C, D and zinc (Table 2). Intake under 75 % RDA or DRI in both living areas was observed for vitamin D, folate, calcium and selenium (Table 2). When set as criteria all micronutrient intake at least 75 % RDA or DRI, with the exception of those above mentioned, criteria satisfied 53.0 and 41.1 % of the urban and the rural subjects respectively. In the rural area age correlated significantly negative with intake of all micronutrients (% RDA, % DRI) with the exception of vitamin D (r = – 0.30 to – 0.66). In the urban area this was observed for vitamin A (r = –0.25), B_6 (r = –0.27), folate (r = –0.29), B_{12} (r = –0.30), magnesium (r = –0.45) and selenium (r = –0.52).

A significant difference of energy intake (% kJ) by different food groups was observed among areas (Table 3). Consumption of confectionery (doughnuts, pancakes, chocolate, etc.) (% kJ) negatively correlated with BMI in both living areas (r = – 0.39 and – 0.33 in the urban and the rural area, respectively; p < 0.001). Fruit, but also fast food and soft drinks were present significantly more in diets of the urban than the rural population. In the urban, but not in the rural area, correlated consumption of fast food and soft drinks (r = 0.43; p < 0.001). Energy intake and soft drinks consumption correlated in the urban (r = 0.33; p < 0.001), but not in the rural area (r = 0.17). In the urban, but not in the rural area, non-consumers had significantly higher milk intake (265.6 vs 256.0 mL; p < 0.05) and calcium intake (74.4 vs 73.4 % DRI; p < 0.01) when compared to soft drinks consumers. In both living areas fast food consumption (kJ) correlated with BMI (p < 0.01). Milk and fruit juice were consumed more in the rural area (Table 3). Milk consumption (mL) correlated with age in the urban but not in the rural area (r = 0.33; p < 0.001). A total of 38.4 % and 53.4 % of the urban and the rural subjects, respectively, consumed coffee with milk for breakfast and was consumed significantly more often in the rural area (1.6 vs 0.8 times per week; p < 0.001). Chocolate was consumed in higher amount in the urban than the rural area (18.1 vs 1.4 g; p < 0.001).

A higher percent of the urban than the rural adolescent girls reported alcohol consumption (39.4 vs 30.4 %). Adolescent boys in both living areas reported similar alcohol consumption (73.1 and 74.4 % of the urban and the rural adolescent boys, respectively). When

Table 2 Daily intake of vitamins and minerals ($\bar{x} \pm SD$)

Parameters	Urban area	Rural area	p
Vitamin A (% RDA)	95.5 ± 36.90	102.3 ± 38.77	/
Vitamin D (% DRI)	39.2 ± 17.90	39.9 ± 18.72	/
Vitamin E (% RDA)	100.5 ± 29.25	100.4 ± 34.54	**
Vitamin C (% RDA)	256.6 ± 124.44	275.5 ± 125.52	/
Thiamin (% DRI)	210.6 ± 59.62	198.0 ± 84.74	***
Riboflavin (% DRI)	201.5 ± 58.33	190.6 ± 86.08	***
Niacin (% DRI)	226.6 ± 62.35	211.6 ± 100.76	***
Vitamin B_6 (% DRI)	322.3 ± 160.33	346.5 ± 210.28	***
Folate (% DRI)	48.3 ± 21.88	50.2 ± 26.93	***
Vitamin B_{12} (% DRI)	233.7 ± 97.82	223.9 ± 141.08	***
Calcium (% DRI)	73.6 ± 25.42	71.9 ± 31.28	***
Phosphorus (% DRI)	116.6 ± 46.48	123.3 ± 78.14	***
Magnesium (% DRI)	104.1 ± 38.79	107.9 ± 68.71	***
Iron (% RDA)	156.5 ± 51.98	120.7 ± 41.77	***
Zinc (% RDA)	102.3 ± 26.72	81.5 ± 27.80	/
Selenium (% RDA)	56.7 ± 24.42	53.8 ± 28.35	*

* p < 0.05; ** p < 0.01; *** p < 0.001

Table 3 Consumption of different foods and food groups ($\bar{x} \pm SD$)

Parameters	Urban area	Rural area	p
Cereal products (% kJ)	32.6 ± 9.3	19.9 ± 5.6	***
Milk and dairy products (% kJ)	14.3 ± 5.6	13.8 ± 5.5	/
Milk (mL)	258.0 ± 194.5	269.8 ± 137.9	***
Meat and products (% kJ)	10.1 ± 3.2	9.7 ± 3.3	/
Fish (% kJ)	1.2 ± 1.3	1.7 ± 1.4	*
Eggs (% kJ)	1.4 ± 1.1	1.9 ± 1.5	***
Fats and products (% kJ)	2.8 ± 1.6	3.1 ± 2.1	***
Vegetables (% kJ)	7.4 ± 3.7	12.4 ± 5.0	***
Fruit (% kJ)	6.7 ± 3.8	6.4 ± 3.5	/
Confectionery (% kJ)	18.3 ± 9.0	23.9 ± 8.8	/
Fast food (kJ)	802.3 ± 1034.7	142.8 ± 249.4	***
Fast food (% kJ)	8.3 ± 10.3	1.9 ± 3.3	***
Soft drinks (mL)	81.2 ± 107.0	51.00 ± 89.2	**

* p < 0.05; ** p < 0.01; *** p < 0.001

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the amount of alcoholic beverages consumed between urban and rural areas was considered, no significant difference was observed among adolescent boys (6.9 and 7.0 g of ethanol in the urban and the rural area, respectively), but adolescent urban girls consumed significantly more alcohol than rural (4.4 vs 2.1 g of ethanol). In both living areas, alcohol was consumed by the largest number of subjects 1–2 times per week and mostly during weekends. A comparison was made in grams of ethanol instead of in milliliters of wine, beer or some strong alcoholic beverage because of different alcohol content. Alcohol consumption in the urban but not in the rural area correlated with consumption of fast food (kJ) ($r = 0.24$; $p < 0.01$).

In the urban area, 17.1 % of subjects were defined as overweight, 5.7 % as obese and 3.5 % as underweight. In the rural area 16.6 % of subjects were defined as overweight, 3.7 % as obese and 1.8 % as underweight. A significant difference for some anthropometric data was observed among the urban and the rural sample (Table 4).

Discussion

The living area appears to be an important factor influencing nutritional intake [19]. Urban or rural residence is one important predictor of children's dietary intake patterns in adolescence [20]. Differences in dietary habits and growth between the urban and the rural area have been reported in some studies, but not in others [21–25]. Cultures and age groups studied are inadequate for comparison with examined population of the urban and the rural Croatian schoolchildren, so we compared our population with general studies of schoolchildren's dietary behavior. Also we could not compare our results with pre-war urban-rural dietary patterns in schoolchildren because there is a gap in literature regarding that kind of data, especially comparisons of the urban and the rural populations. There is one Croatian study from the late 1980s that showed much better overall nutrient intakes and anthropometric status in the urban children, aged 1–14 years, compared to the rural children [7].

Energy intake was inadequate in the rural area, and in high percentage of the rural subjects energy intake was under 75 % RDA. The number of undernourished subjects was under 5 % in both living areas and was higher in the urban than in the rural area, so these results are not a sign of an unbalanced energy intake, especially when findings that the 1989 RDA for energy is set higher than children's actual energy needs are considered [26]. Energy intake under 100 % RDA has also been reported in Swiss teenagers [27].

The high protein intake as observed in this study, especially in the urban area, is often reported [4]. High protein intake can have adverse affect: increase in renal excretion of calcium [28]. Protein intake in this study was mostly of animal origin as in the diet of Western European adolescents in both living areas, which was more pronounced in the rural area, and opposite to similar studies [29, 30].

Macronutrient intake was unbalanced, and especially fat intake was high but still not above 35 % kJ as observed in children's and adolescents' diet in Spain, Greece and Belgium [31–34]. In this study, urban subjects had significantly higher protein (% RDA) and fat intake (% kJ) which was also observed among Sicilian urban and rural population [35]. The precise percentage of dietary fat intake to support normal growth and development while still reducing the risk of atherosclerosis is not known; however, the American Academy of Pediatrics Committee on nutrition recommends the following pattern: saturated fatty acids should be less than 10 % of total energy; total fat over several days should be no more than 30 % of total energy and no less than 20 % of total energy, and dietary cholesterol should be less than 300 mg per day or less than 100 mg/4187 kJ [36].

In this study the rural sample followed a healthier diet regarding the above mentioned recommendations. The urban population in some studies showed higher preferences for confectionery and sweets which was not observed in this study for confectionery but was for chocolate [37, 23].

Table 4 Anthropometric characteristics of subjects ($\bar{x} \pm sd$)

Parameters	Urban area (n = 315)				Rural area (n = 163)			
	8–9 years (n = 149)		15–16 years (n = 166)		8–9 years (n = 78)		15–16 years (n = 85)	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Number (n)	79	70	67	99	39	39	39	46
Age (years)	9.0±0.70	8.9±0.62	15.9±0.74	15.7±0.64	8.9±0.83	8.6±0.85	16.3±0.64	16.0±0.63
Body weight (kg)	35.2±7.50*	34.6±7.55	68.4±10.32	59.2±8.69	31.9±5.17*	32.7±7.07	72.3±9.77	60.6±7.84
Body height (cm)	140.0±6.89	139.4±6.97	178.9±7.47*	167.6±6.77	136.3±6.83	137.5±8.26	179.0±5.14*	166.0±6.77
BMI (kg/m^2)	17.9±2.98**	17.6±2.86	21.4±3.05	21.1±2.74*	17.1±1.81**	17.2±2.54	22.6±2.89	21.9±2.18*

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.000$

Average intake of most vitamins and minerals in two to eleven years old Americans exceeds 100 % of the RDA, but after age eleven, there is an increase in the percentage of youth and adolescents who do not meet the RDAs [38]. Similar trends were observed in this study but were more expressed in the rural area.

Milk intake at a younger age may contribute to similar habits of milk intake later in life [39]. In this study, an increase in milk intake by age was noted in the urban but not in the rural area. Failure to meet calcium requirements in youth can impede the achievement of maximal skeletal growth and bone mineralization, increasing the risk of developing osteoporosis later in life [40]. Some studies reported a decline in milk intake and a substantial increase in soft drink consumption, and also energy intake to be positively associated with consumption of soft drinks [41]. In this study, energy intake correlated with soft drink consumption in both living areas, but an inverse correlation between milk and soft drinks consumption was only observed in the urban area.

Coffee consumed for breakfast has no effect on working memory, but improves encoding of new information [42]. Coffee with milk as a breakfast item was more consumed in the rural than in the urban area.

Alcohol consumption differed more with regard to gender than to living area, and was reported in a higher percent of subjects when compared with Belgian adolescents [32]. A higher prevalence of alcohol consumption in boys than girls, and in the urban than the rural area, as observed in this study, was also reported for Australian adolescents [43].

Some researchers reported different anthropometric measures among the urban and the rural area, but some did not [44, 45]. According to our results more rural than urban subjects were defined as having normal weight.

The findings of the present study demonstrate that a) the urban sample had more adequate energy and nutrient intakes which is consistent with pre-war findings, b) consumption of fast food, soft drinks and alcohol (which beside energy do not provide much micronutrients) was more prevalent and more linked with dietary behavior in the urban than in the rural area, which can be explained by higher availability of those items in the urban area, and c) food choices were more adequate among the rural sample.

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