

.....

# Nutrition and Physical Activity of the Population in Serbia

*Mirjana Pavlović<sup>a</sup>, Vera Grujić<sup>b</sup>, Arne Oshaug<sup>c</sup>*

<sup>a</sup>Public Health Institute, Nutrition Department, Subotica, and <sup>b</sup>Public Health Institute, Novi Sad, Serbia & Montenegro; <sup>c</sup>Akershus University College, Akershus, Norway

Diet and lifestyle has been known to play a key role as a risk factor for non-communicable chronic diseases (NCDs) for many years [1]. Intake of total energy and some nutrients have a considerable impact on the development of NCD linked to unbalanced diets and sedentary lifestyles caused by industrialization, urbanization, and economic change. These changes have led to increased intake of energy-dense diets high in fat, particularly saturated fat, and sugar, and low in complex carbohydrates. When this is combined with a decline in energy expenditure caused by a sedentary lifestyle, the risk for NCDs increases significantly [2]. Globally, NCDs contribute to an ever-increasing proportion of Disability Adjusted Life Years (DALYs). This confirms the importance of nutrition and active lifestyles as important factors in preventing NCD [3]. Previous studies of dietary quality and nutritional status in Serbia show that nutritional risk factors can be related to inadequate diet and lifestyle [4–8]. Physical activity contributes to physical, mental and social health and improves the quality of life of people of all ages and reduces social and health care costs. Therefore, physical activity with nutrition should be considered an essential element of preventing chronic disease, as well as a central part of a healthy lifestyle [3]. The purpose of this study was to assess the nutrition situation related to physical activity in Serbia.

## Methods

A representative sample of 863 schoolchildren (435 boys; 428 girls) aged 10–18 in North Backa Region, and a representative sample of an adult population (20 years and above, 9,432–4,458 males and 4,974 females) in Serbia were included in cross-sectional surveys

**Table 1.** Relations between BMI and lifestyle in schoolchildren (n = 863)

Lifestyle		BMI				
		underweight % (n = 55)	Moderately underweight % (n = 119)	Normal body weight % (n = 571)	Over- weight % (n = 83)	Obesity % (n = 35)
Watching TV	Sometimes	6.4	13.2	65.0	11.8	3.7
	Almost every day	5.7	12.1	68.6	8.5	5.1
	Every day	7.0	15.6	65.0	8.8	3.6
Listening to music**	Sometimes	8.0	17.6	59.3	10.6	4.6
	Almost every day	5.3	10.5	70.6	8.5	5.1
	Every day	3.5	7.8	78.5	8.4	1.8
Physical activity	1/ week, rarely, never	6.3	13.1	66.3	9.7	4.7
	4–7/week	6.4	14.0	66.1	9.6	3.9
Sport activity/ week*	>7 h/week	4.9	11.2	73.4	8.2	2.2
	4–6 h	8.6	10.6	69.3	7.8	3.8
	2–3 h	6.4	13.0	70.0	7.6	3.0
	1 h/week	6.0	17.1	58.0	12.9	6.1

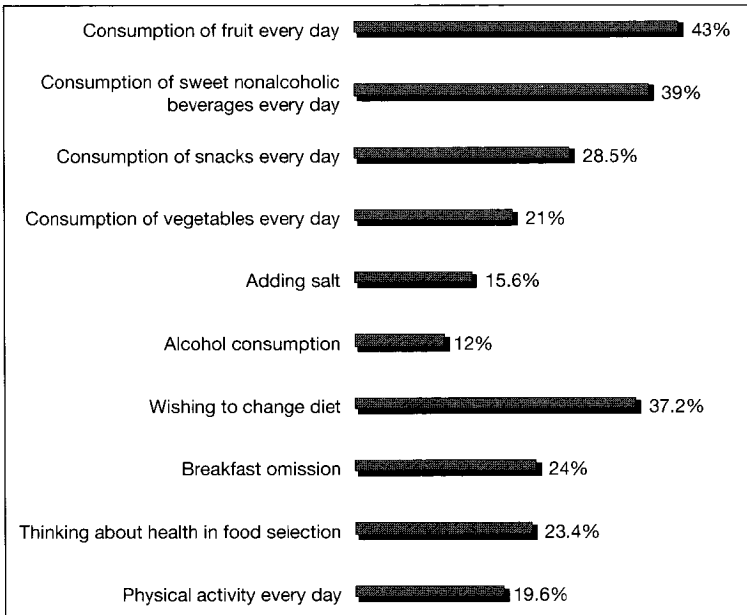
\*p < 0.05; \*\*p < 0.01.

covering dietary assessment and nutritional status measured by anthropometry, and lifestyle including physical activity. The sample size was determined by an estimated frequency questionnaire. Statistical analysis, including stepwise regression analysis and testing significant differences were done using SPSS/PC. NHANES I was used as reference values [9].

## Results

The nutritional status of schoolchildren was assessed by body mass index BMI (kg/m<sup>2</sup>), and about 6% of the children were underweight (4.9% girls and 7.8% boys), 14% moderate underweight (11.5% boys and 16.2% girls), 66% normal weight (66.9% boys and 65.4% girls), 10% overweight (9.0% boys and 10.2% girls) and 4% obese (4.8% boys, and 3.3% girls) (data not shown).

Table 1 shows that lifestyle factors such as listening to music and involved in sport activities were linked to BMI, while physical activity in general and watching TV were not associated with BMI in this study. Only about 20 percent of the children had some form of physical activity every day (fig. 1), while about 20% 4–6 times weekly, about 40% 2–3 times weekly, once weekly 12 or never about 21% of children. Boys were almost twice as active as girls, and



**Fig. 1.** Eating behavior and lifestyle risk factors in schoolchildren age 10–18 (n = 863).

children from urban areas were more physically active than those from rural areas. Less than 20% of the children were engaged in active sports more than 7 h weekly, and boys were more active (25%) than girls (10%), and children from urban areas more active (20%) than children from rural areas (14%). Most of the children had classes with physical activity in schools two times weekly (93%), and about 17% of the children estimated their physical condition as excellent, 29% as very good, 32% good, 17% moderately good and 4% as bad. During free time almost 40% watch TV and/or video every day, and 19% listen to music daily (data not shown). Figure 1 shows that about 40% of all of the children reported to consume fruit every day, while only about 20% consumed vegetables each day. The consumption of snacks was higher than vegetables, and as many as almost 40% of the children reported to consume sweetened nonalcoholic drinks daily. Not many children were preoccupied with health when choosing food (about 23%), while as many as 24% did not have breakfast daily. About 37% of the children said they wanted to change their dietary habits, of whom the majority were girls ( $p < 0.01$ ). The awareness about nutrition increased with age (data not shown).

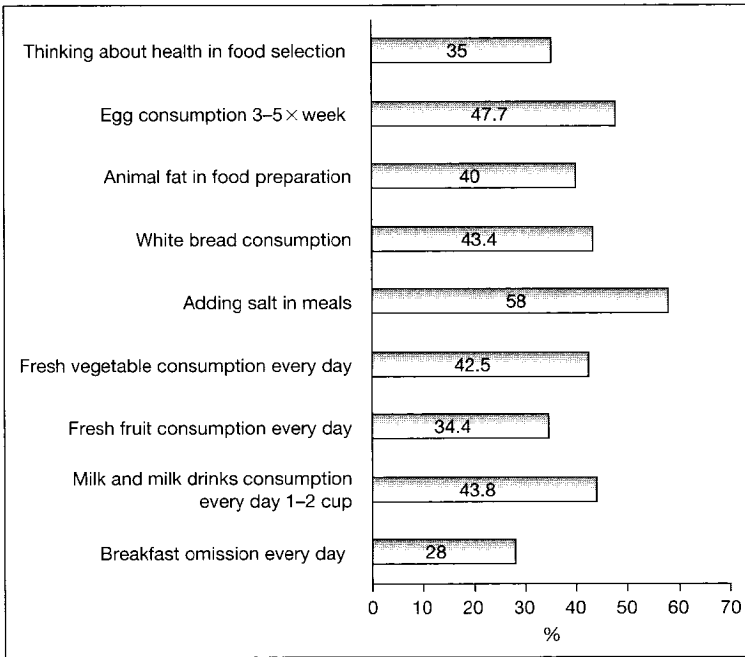
Table 2 indicates that there were differences between the groups in meal pattern, and those with obesity problems said they had fewer meals than the

**Table 2.** Relations between BMI and eating patterns in schoolchildren (n = 863)

Eating patterns		BMI				
		Underweight %	Moderate underweight %	Normal body weight %	Over weight %	Obesi %
Meals/day**	Two	3.1	2.7	65.1	19.3	9.8
	Three	5.8	12.0	66.8	11.1	4.4
	More than three	7.9	18.5	65.4	5.8	2.5
Milk drinks consumption frequency	Never		25.1	74.9		
	Sometimes	7.5	10.8	68.0	9.0	4.7
	One cup a day	6.3	15.9	62.2	11.4	4.2
	Two or more cups a day	5.0	14.6	68.9	8.3	3.2
Fruit consumption frequency*	Rarely	8.5	19.3	51.6	10.9	9.8
	Once a week	4.5	12.5	71.2	10.8	1.0
	2–3 times a week	9.3	10.5	67.6	7.8	4.9
	Every day	3.9	16.3	65.7	10.6	3.4
Vegetable consumption frequency	Rarely	6.4	13.4	66.5	9.9	3.8
	Once a week	10.3	13.4	60.2	14.4	1.7
	2–3 times per week	5.1	13.0	68.6	8.4	4.9
	Every day	6.3	16.2	64.7	8.6	4.2
Consumption frequency of meat and products	Rarely	5.5	10.2	70.1	10.7	3.6
	Once a week	6.1	8.6	69.3	12.7	3.3
	2–3 times a week	6.6	13.5	65.2	10.8	4.0
	Every day	6.3	16.1	66.3	6.7	4.5
Consumption frequency of sweet beverage	Almost every day	6.1	14.1	66.8	9.3	3.8
	Sometimes	6.8	13.7	65.3	10.1	4.1
	Never		9.7	79.9		10.3
Consumption frequency of snacks	Almost every day	6.5	13.8	69.5	6.9	3.3
	Sometimes	6.6	14.1	64.1	10.8	4.4
	Never		3.6	88.3	4.1	4.1
Alcohol consumption**	Never	7.2	15.4	62.9	9.6	4.9
	Sometimes	2.2	6.0	81.8	10.0	
	Every day	n.a.	n.a.	100.0	n.a.	n.a.

\*p &lt; 0.05; \*\*p &lt; 0.01.

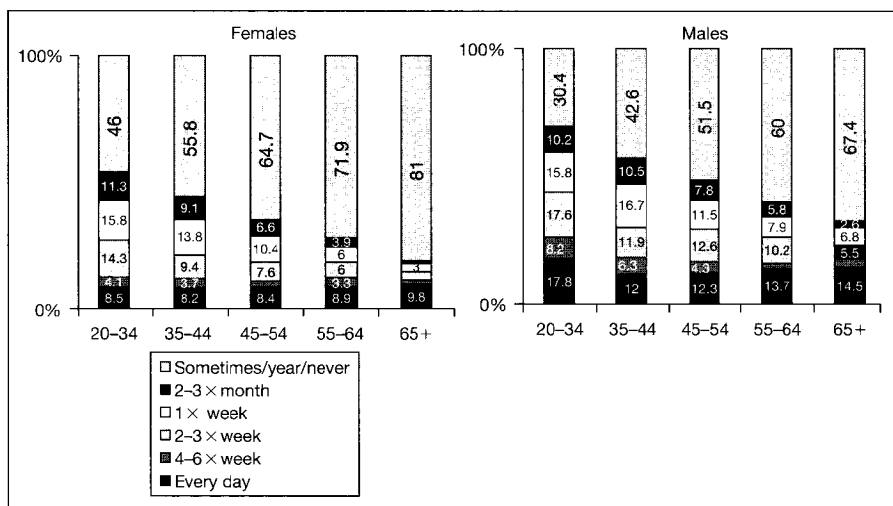
other groups. Almost a quarter of the children said they did not eat breakfast. Boys said they were drinking more milk than girls and ate more in general. The younger children ate very little fruit, while they ate snacks frequently (data not shown). Table 2 also indicates that fewer of the obese children ate fruits frequently. There seems to be no differences between the various groups (based on BMI) in consumption of meat, sweet beverages, and snacks.



**Fig. 2.** Dietary patterns in adult population in Serbia (n = 9,432; 4,458 male; 4,974 female).

A regression model with BMI as a dependent variable, with the model: wishing to change diet, alcohol consumption, number of meals/day, thinking about health when selecting food, snacking, and desire for changing own weight gave  $R = 0.508$  and  $R^2 = 0.258$ , a significant association indicating the importance of the independent variables for children's BMI (data not shown).

In the figures 2 and 3 data on the adult population are presented. The results indicate that lunch is the most frequent meal (93%, not shown), but as many as 28% said they did not eat breakfast (fig. 2). This was more usual among women compared to men ( $p < 0.001$ ), younger people compared to older ( $p < 0.001$ ), higher-educated people compared to those with less education ( $p < 0.001$ ) and in urban areas compared to rural ( $p < 0.001$ ) (data not shown). About 42% of adults ate fresh vegetables 6-7 times per week, while about 30% ate vegetables 3-5 times weekly. About 34% said they ate fresh fruits 6-7 times weekly, while 27% only 3-5 times per week. Every day intake of fresh fruit and vegetable were higher among females, younger age groups and higher-educated persons. Consumption of potatoes, especially fried potatoes, was very high (87%), while rice and pasta were eaten 1-2 times per week



**Fig. 3.** Physical activity in leisure time in adult population in Serbia by age and gender (n = 9,432; 4,458 male; 4,974 female).

by 71% of the sample. White bread was widely used (43%) as well as use of animal fat in food preparation (40%). Use of animal fat is especially widespread among people with less education (53.7%) and in rural areas (62.0%) where traditional use of fat in the preparation of food prevails. About 35% (41% of females and 31% of males) said they thought about their health when selecting foods, but people from urban areas and with a higher education thought more about it (fig. 2).

Few of those participating in the survey had much physical activity. About 63% of the adult population spends their leisure time mostly sitting, while only 23% said they were physically active. The physically active were mainly males ( $p < 0.001$ ) and the younger compared to the elderly ( $p < 0.001$ ). Only about 10% were physically active every day, about 4% 4–6 times weekly, 9% 2–3 times a week, 8% 1–4 times monthly, and about 60% sometimes during a year or never due to disability or diseases (fig. 3). According to their own opinion, about 60% consider their physical activity as good, and almost 90% of them had a positive attitude about physical activity. Their occupational activity level was moderate-to-heavy according to 38% of the adults, and more than 25% reported having light-sedentary occupation without activity in leisure time (data not shown).

This dietary pattern and low physical activity was reflected in their nutritional status assessed by BMI. The average BMI in the sample was 26. About 39% had a normal nutritional status (BMI 20–24.5), about 37% were overweight (BMI 25–29.9, 43% males; 31% females), about 16% were in obesity

classes I and II (BMI 30–39.9, 14% males; 18% females), while only 1% were classified in obesity class III (BMI  $\geq$  40). It is interesting that 29% of obese females and 34% of obese males consider themselves as being normal weight (data not shown).

## Discussion

Obesity is a rapidly growing epidemic, now affecting about 30% of the adult population of the WHO European Region. Overweight levels in Europe range from 9 to 41% of women and 10 to 50% of men [2, 3]; in this survey 37% of the adult population were overweight, and 10% of the schoolchildren. The prevalence of overweight and obesity among children in Europe is rising significantly, with up to 27% affected in some regions. In this survey a lower level was found. Based on IOTF on average, the prevalence of childhood overweight and obesity is approximately 10–20% in Europe region, which is much higher than that in the Africa, Asia Pacific, south and central America regions; and it is higher than the Eastern Mediterranean and Middle East Region; but lower than North America. The highest prevalence of overweight and obesity ( $>20\%$ ) is observed in eastern and southern European countries, which was not confirmed in this survey of schoolchildren. Italy probably has the highest prevalence, where a recent survey found that 36% of the 9 years old were overweight or obese. In Greece, the prevalence was 27% in boys and 22% for girls aged 6–17 years. In Spain, over 20% of children and adolescents were overweight or obese. Northern European countries tend to have lower prevalence (approximately 10–20%), for example, in the UK, where about 10–15% of children and adolescents were overweight or obese. In Sweden, the prevalence was about 20% for boys and 10% for girls [10].

Inadequate nutrition habits and lifestyle are mostly acquired in childhood and settled in adolescence. A WHO study among 123,227 schoolchildren (11, 13 and 15 years of age) from 28 countries showed that a majority of the children consumed fruit every day in Portugal (92–93%), Poland (82–85%), Czech Republic (81–85%), but rarely in Greenland (31–38%) and Belgium (46–48%). Snacks were consumed every day by children in North Ireland (41–51%), Scotland (36–44%) and the least in Norway (1–3%) and Sweden (2–3%). Regarding the consumption of sweet non-alcoholic beverages, it was most frequent consumed in North Ireland (75–79%), Israel (65–76%), and the least frequently in Finland (9–19%) and Sweden (15–28%). The level of physical activity in the same study was found to be progressively less, as they grow older. This is the same as found in this study. The proportion of 15-year-olds who reported taking part in sports outside school at least twice a week ranged

from 37 to 66% in girls and from 60 to 90% in boys [11]. This is far higher than found in this survey.

A survey of adults in the EU shows that levels of physical activity are low. An average 32% were not engaged in physical activity in their leisure time in a typical week. In general, southern EU countries had lower levels of physical activity than northern and western countries [12]. In this study, only about 10% of the sample were engaged in physical activity every day during leisure time.

## Conclusions

The pattern of diet and physical activity shown in this survey raise concern. Unless something is done to change this pattern, it is likely that situation of NCD will worsen in the years to come. The level of physical activity among both children and adults is too low. The diet and eating patterns are leading to a high level of obesity, and will increase the risk for NCD. Therefore, primary prevention programs are needed, including an effective high-risk strategy in parallel with nutrition and healthy lifestyle promotion programs. Achievement of population goals for nutrition and lifestyle and implementation as specified in the WHO Global Strategy of NCDs Prevention should be placed at the forefront of public health policies and programs, also in Serbia.

## References

- 1 WHO Technical Report Series 916: Diet, nutrition and the prevention of chronic diseases. Report of the Joint WHO, FAO Expert Consultation. Geneva, Switzerland, 2003.
- 2 The World Health Report 2002: Reducing Risks, Promoting Healthy Life. Geneva, World Health Organization, 2002.
- 3 Food and Health in Europe: A new basis for action, WHO Regional Publications, European Series, No. 96, 2004.
- 4 Pavlović M, Grujić V: Nutritive risk factors within population; in Dragan Škorić (ed): Proceedings 1st International Symposium 'Food in the 21st Century' 14–17 November 2001, Subotica, Yugoslavia, Institute for Agriculture and Vegetables, Novi Sad, pp 474–481.
- 5 Pavlović M, Đokić D, Legetić B, Jakovljević Đ: Nutrition and nutritional status in schoolchildren aged 10–18 from North Bačka Region in Yugoslavia, Book of Abstracts the 8th European Nutrition Conference, Lillehammer, 1999. Scand J Nutr 1999;2S(suppl 34):78.
- 6 Grujić V: Health status, health needs and usage of the health care in adult population in Republic of Serbia. J Inst Publ Health Serbia 2002;1–2:39–51.
- 7 Pavlović M, Grujić V: Dietary Patterns, Lifestyle and Obesity in Adolescents in Serbia, 9th European Nutrition Conference. Ann Nutr Metab Abstracts, October 1–4, 2003, Rome, 2003, vol 47, p 51.
- 8 Pavlović M: Strategy and model of prevention from atherosclerosis. Acta Biol Med Exp 2000;27:37–39.
- 9 Must A, Dallal GE, Dietz WH: Reference data for obesity: 85th and 95th percentiles of body mass index (w/ht<sup>2</sup>) and triceps skinfold thickness. Am J Clin Nutr 1991;53:839–846.

- 10 Lobstein T: Childhood Obesity in Europe: The New Crisis in Public Health. London, International Obesity Task Force, 2003.
- 11 Currie C (ed): Health and health behavior among young people: International report (<http://www.euro.who.int/document/e67880.pdf>). Copenhagen, WHO Regional Office for Europe, 2000 Health Policy for Children and Adolescents Series, No.1.
- 12 Kafatos AG, Codrington CA (eds): EURODIET Reports and Proceedings. Public Health Nutrition, 2001, vol 4 (2A).



[www.srbnutrition.info](http://www.srbnutrition.info)

**University of Belgrade  
Institute for Medical Research  
Department of Nutritional Research**

**Mirjana Gurinovic MD.PhD. RPHNutr.  
Associate Research Professor  
PhD Nutrition  
FAO Expert consultant**

**Office:**

*Institute for Medical Research  
University of Belgrade  
Department of Nutritional Research  
Tadeusa Kosciuskog 1  
PO BOX 102  
11000 Belgrade, Serbia  
Phone: +381 11 3031997  
Fax: +381 11 2030169*

**Home:**

*Trnska street 3/3  
11000 Belgrade, Serbia  
Phone:+381 11 3442591  
Mobile:+381 63 502 465  
e-mail:  
mirjana.gurinovic@gmail.com  
mirasu@eunet.yu*

**WWW.SRBNUTRITION.INFO**

**<http://agrowebcee.net/subnetwork/ncdn>**