

URBAN-RURAL DIFFERENCES AMONG ELEMENTARY SCHOOL AGED PUPILS OF DIFFERENT NUTRITIONAL STATUSES

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Abstract

The rate of overweight occurrence among children has rapidly increased in the last few years all over the world and represents one of the most important international health challenges (Wang & Lobstein, 2006). The purpose of this study was to determine the urban-rural differences among elementary school aged pupils of different nutritional statuses. Regarding this objective, it can be concluded that there are some statistically significant urban-rural differences in the nutritional status among elementary school aged pupils, but the urban-rural differences are evident in body height and body weight. The data obtained by this study will provide teachers of physical and health education a direct insight into the nutritional status situation among pupils in the urban-rural areas as well as offer some intervention options during physical and health education classes. The findings of this research may be indirectly used in the process of planning and programming of the physical and health education teaching.

Key words: pupils, nutritional status, urban-rural differences

Introduction

The wide-spread physical inactivity has become a major risk factor for developing the most frequent modern diseases. There are no doubts that all the characteristics of the way of living and working in the modern society carry a special weight when the youngest are concerned. The children are the ones who are most deeply affected by the processes and changes accompanying the civilisation development. The rate of overweight occurrence among children has rapidly increased in the last few years all over the world and represents one of the most important international health challenges. (Wang & Lobstein, 2006). The health consequences of obesity among children also include a distorted self-image, orthopaedic complications, gastrointestinal disturbances and atypical cardiovascular risk factor profiles. (Wabitsch, 2000). Namely, various influences to which the youngest are daily and intensively exposed e.g. a child's inappropriate way of living and working, inadequate daily schedules, especially the lack of play and movement, a lack of sensibility regarding parents' expectations in comparison to children's abilities (Hrabal, 1989; Findak, 1991; Heimer et al., 2004) have a strong impact on the outcomes which are now not only warning, but have become disturbing (Findak et al., 1996; Tokmakidis & Kasambalis, 2006). Namely, based on the above mentioned studies, it can be deduced that the children's skills are increasingly lagging behind their physical development (Kuznjecova, 1985; Findak et al., 1996; Tokmakidis and Kasambalis, 2006). These data should be understood and accepted even more seriously if we state that, in spite of the fact that children are born with a relatively strong motor potential of genetic origin.

That potentially gets lost during the years under the influence of exogenous factors (Kuznjecova, 1985; Findak, 1995; Findak et al, 1996), primarily for the hypokinesia as a synonym for the modern way of living (Findak, 1989; Findak, 1995; Uthman & Aremu, 2008). It has been confirmed by the research outcomes according to which there is a generational trend of increasing ballast body mass and of real decrease of muscle mass, of lower functional skills, of increase in various mental disorders, which are direct indicators of ill-health already in the early childhood and which occurs, among other things, because of lack of physical movement (Hrabal, 1989; Mraković, 1994; Findak et al., 1996; Uthman & Aremu, 2008).

Aim

The main purpose of this study was to determine the urban-rural differences among elementary school aged pupils of different nutritional status. The purpose can be divided into following partial goals with the corresponding expected hypotheses: To determine the urban-rural differences among elementary school aged pupils regarding the nutritional statuses. H1: There is a statistically significant urban-rural difference among elementary school aged pupils regarding the nutritional statuses. And 2. To determine the urban-rural differences in body height and body weight among elementary school aged pupils of various nutritional statuses. H2: There is a statistically significant urban-rural difference in body height and body weight among elementary school aged pupils.

Methods

The sample of subjects consisted of a total of 1017 elementary school pupils (from 5th to 8th grade). The subjects were divided according to settlement size into urban and rural areas as well as by chronological age. The sample of pupils in the urban settlement was formed in the Kralj Tomislav Elementary School in Zagreb, whereas the sample of pupils in the rural area was formed in the elementary schools in the Municipality of Marčana: Vladimir Nazor in Krnica, Divšići in Divšići and Marčana in Marčana. The sub-samples consisted of 314 fifth grade pupils (134 in the urban and 180 in the rural area), 251 sixth grade pupils (98 in the urban and 153 in the rural area), 210 seventh grade pupils (125 in the urban and 185 in the rural area) and 242 eighth grade pupils (102 in the urban and 140 in the rural area). They were healthy and participated in the regular school classes during the measurements. The measurements were conducted at the same time of day (± 2 hours). The variable sample consists of the values of three morphological features (body height, body weight and body mass index). All the variables were measured for each participant and every variable was measured three times alternately. In the clinical and epidemiological approach, for the purpose of estimating obesity, the body mass index is most frequently used - it has also been accepted by the International Obesity Task Force (IOTF) as a valid, reliable and practically applicable method of determining adiposity in children (Cole et al., 2000).

Based on body mass index calculations and the tables recommended by the International Obesity Task Force (Cole et al., 2000), the participants were divided into three groups according to their nutritional status:

1. **normal body weight** participants (all the participants with the body mass index below 20.20 kg/m² for the fifth grade, 20.89 kg/m² for the sixth grade, 21.54 kg/m² for the seventh grade and 22.27 kg/m² for the eighth grade, values recommended by Cole et al., corresponding to body mass index of 25 kg/m² in adults).
2. **overweight** participants (all the participants with the body mass index between 20.20-24.57 kg/m² for the fifth grade, 20.89-25.58 kg/m² for the sixth grade, kg/m², 21.56-26.43 kg/m² for the seventh grade and 22.27-27.25 kg/m² for the eighth grade, values recommended by Cole et al., corresponding to body mass index between 25 and 30 kg/m² adults),
3. **obese** participants (all the participants with the body mass index above 24.57 kg/m² for the fifth grade, 25.58 kg/m² for the sixth grade, 26.43 kg/m² for the seventh grade and 27.25 kg/m² for the eighth grade, values recommended by Cole et al., corresponding to body mass index of 30 kg/m² in adults) (Cole et al., 2000). The data were analyzed using Statistica for Windows (data analysis software system), version 8.0., StatSoft, Inc. (2008). Descriptive statistics was used to present means and standard deviations for each variable. To analyse the differences between each category, one-way analysis of variance (ANOVA) was used. Statistical significance was set to $p < .05$.

Results

Table 1. Urban-rural differences among elementary school aged pupils regarding the body mass index.

	5 TH GRADE (n=314)	6 TH GRADE (n=251)	7 TH GRADE (n=210)	8 TH GRADE (n=242)
URBAN	19,2 \pm 3,4 (n=134)	19,3 \pm 4,0 (n=98)	20,9 \pm 3,8 (n=125)	21,6 \pm 3,0 (n=102)
RURAL	18,7 \pm 3,5 (n=180)#	18,8 \pm 3,3 (n=153)#	20,6 \pm 3,9 (n=85)#	20,7 \pm 3,1 (n=140)#
# statistically significant differences between pupils from urban and rural areas regarding the nutritional statuses on the $p < .05$ significance level				

Table 2. Urban-rural differences among elementary school aged pupils of various nutritional statuses regarding body height and body weight.

ATV=a ATT=b	5 TH GRADE (n=314)		6 TH GRADE (n=251)		7 TH GRADE (n=210)		8 TH GRADE (n=242)	
URBAN	>20,20	1a) 146,1 \pm 7,3 1b) 37,3 \pm 5,6	>20,89	1a) 155,3 \pm 6,3 1b) 44,2 \pm 5,1	>21,56	1a) 160,2 \pm 7,2 1b) 47,3 \pm 6,3	>22,27	1a) 167,2 \pm 7,3 1b) 53,4 \pm 7,6
	20,20-24,57	2a) 153,2 \pm 6,7 2b) 53,3 \pm 5,4	20,89-25,58	2a) 157,3 \pm 7,2 2b) 59,4 \pm 5,3	21,56-26,43	2a) 163,4 \pm 8,4 2b) 62,3 \pm 9,4	22,27-27,25	2a) 168,2 \pm 10,1 2b) 71,3 \pm 10,5
	<24,57	3a) 152,3 \pm 12,8 3b) 69,4 \pm 11,4	< 25,58	3a) 157,4 \pm 2,1 3b) 74,5 \pm 3,1	< 26,43	3a) 160,5 \pm 11,1 3b) 77,4 \pm 10,1	<27,25	3a) 178,5 \pm 8,3 3b) 86,4 \pm 7,2
RURAL	>20,20	1a) 146,2 \pm 6,4 1b) 36,4 \pm 5,3#	>20,89	1a) 152,3 \pm 8,2# 1b) 39,2 \pm 6,4#	>21,56	1a) 158,4 \pm 10,2 1b) 46,6 \pm 11,2	>22,27	1a) 165,4 \pm 10,1# 1b) 50,3 \pm 9,9#
	20,20-24,57	2a) 152,4 \pm 8,6 2b) 49,8 \pm 8,3#	20,89-25,58	2a) 159,3 \pm 9,1# 2b) 56,4 \pm 11,2#	21,56-26,43	2a) 169,3 \pm 12,1# 2b) 67,5 \pm 10,5#	22,27-27,25	2a) 172,3 \pm 7,4# 2b) 67,3 \pm 7,6#
	<24,57	3a) 157,4 \pm 10,3# 3b) 65,2 \pm 10,2#	<25,58	3a) 156,5 \pm 9,1 3b) 69,5 \pm 9,1#	<26,43	3a) 167,4 \pm 11,3# 3b) 80,3 \pm 12,1#	<27,25	3a) 170,3 \pm 7,8# 3b) 79,7 \pm 8,3#
1= normal body weight; 2= overweight; 3= obesity, # statistically significant differences between pupils from urban and rural areas regarding the nutritional statuses on the $p < .05$ significance level								

Table 3. Urban-rural differences among elementary school aged pupils regarding various nutritional statuses.

ITM	5 th GRADE (n=314)	6 th GRADE (n=251)	7 th GRADE (n=210)	8 th GRADE (n=242)				
URBAN	>20,20	1) 17,03±1,65	>20,89	1) 17,78±1,61	>21,56	1) 18,92±1,66	>22,27	1) 19,33±1,81
	20,20-24,57	2) 22,28±1,23	20,89-25,58	2) 23,04±3,80	21,56-26,43	2) 24,45±1,23	22,27-27,25	2) 25,00±1,82
	< 24,57	3) 29,20±0,64	< 25,58	3) 30,06±1,32	< 26,43	3) 30,08 ±0,68	< 27,25	3) 30,09 ±0,88
RURAL	>20,20	1) 16,92±1,50#	>20,89	1) 17,13±1,86#	>21,56	1) 18,52± 0,45#	>22,27	1) 19,21± 1,61#
	20,20-24,57	2) 22,07±1,22 #	20,89-25,58	2) 22,60±1,60 #	21,56-26,43	2) 24,25±0,67#	22,27-27,25	2) 24,81±1,34#
	< 24,57	3) 27,07±2,41 #	< 25,58	3) 28,73±1,62 #	< 26,43	3) 29,45±1,23 #	< 27,25	3) 29,99±1,13 #
1= normal body weight; 2= overweight; 3= obesity; # statistically significant differences between pupils from urban and rural areas regarding the nutritional statuses on the p < .05 significance level								

The results of this study indicated a statistically significantly higher nutritional status among pupils of all grades of elementary school age in urban areas. (Table1). The greatest differences according to nutritional status are present among eighth grade pupils in favour of the pupils from urban areas (21,6 - 20,7), whereas the smallest differences were noticed among seventh grade pupils, also in favour of the pupils from urban areas (20,9 - 20,6). The results in the table 2 indicate that pupils of all grades from urban areas with a normal body weight are still heavier in comparison to their coevals in rural areas. Also, pupils with overweight from urban areas have higher body weight that their coevals of almost all grades, which is also true for obese pupils. Statistically significant urban-rural differences among elementary school aged pupils of different nutritional statuses are present in all grades with the exception of malnourished pupils. The results also indicate that pupils from urban and rural areas of different nutritional statuses have approximately same body weight values. In the table 3 it is important to point out that the nutritional status among elementary school aged pupils, who were divided into categories according to their body mass index values, is significantly lower among pupils from rural areas in comparison to their coevals who live in a markedly urban area.

Discussion and conclusion

This study analyses the phenomenon of overweight and obesity among elementary school aged children in the Republic of Croatia, defined on the basis of international standards for overweight and obesity, with the aim of contributing to the existing Croatian database. Compared with other European countries who applied the same methods for defining overweight and obesity, the occurrence rates in this study are higher, which is in accordance with the occurrence rates in the majority of Mediterranean countries (De Vito et al., 1999; Lissau et al., 2004; Padez et al., 2004; Zellner, Jaeger, Kromeyer - Hauschild, 2004; Sur et al., 2005; Wang & Lobstein, 2006). However, it must be pointed out that the comparison of overweight outcomes from various studies should be taken with caution.

Outcomes could be imprecise due to possible methodological differences such as use of different weight and height indexes, the application of different limit values, significant differences between reference populations and different periods of collecting data (Valerio et al., 2003). Although obesity has a very strong genetic basis (Bouchard, 1990), environmental factors as well as factors regarding life-style such as physical activity and diet rules (Leung & Robson, 1990), which have a complex influence inside a country as well as between countries (International Life Science Institute Europe, 2000) are considered important. Therefore, the rising trend of overweight and obesity rates among Croatian children can be attributed to the quick and comprehensive change of life-style in Croatia during the last two decades which resulted in changes of the traditional health profile and in the adoption of Western habits, all combined with bad eating habits and sedentary behaviour. In comparison with their coevals from other countries, Croatian children do show a higher occurrence of reduced physical activity (Findak, 1995), increased inactivity due to time spent in front of a screen (Findak, 1995), but also the intake of similar amounts of energy (Uthman & Aremu, 2008). What is more, similar studies conducted in Greece (Koutedakis et al., 2005; Mamalakis et al., 2000; Manios et al., 2004) and elsewhere (Rocandio, Ansotegui & Arroyo, 2001; Sur et al., 2005) indicate that the positive energy balance, causing overweight in childhood, is not the consequence of an increased intake of energy and fat, but of a lower energy consumption (or low levels of physical activity). Nevertheless, the studies about the role of either the physical activity status or the intake of energy in the aetiology of childhood have ambiguous results (Astrup, 1999; Salbe et al., 2002; Stunkard et al., 2004; Koutedakis et al., 2005) and therefore should be taken into account with caution since their findings could have been influenced by methodological problems (e.g. social desirability, false report of excessive physical activity or underestimation of energy intake), particularly when the obese are concerned. It would be reasonable to presume that either physical activity or energy intake significantly contribute to obesity occurrence in childhood.

But, (Stubbs and Lee, 2004) the lack of information on physical activity and nutrition regarding the sample of this study does not allow us to draw firm conclusions regarding basic environmental influences. These data are consistent with the studies conducted among school aged children which indicate that overweight and obesity are in an inverse relationship with several components of the pupils' anthropological status, with those concerning motor skills (Klein et al., 2004; Pongprapai, Mosuwan & Leelasamran, 1994) and functional skills respectively (Mamalakis et al., 2000; Deforche et al., 2003; Klein et al., 2004; Sur et al., 2005). A lower level of functional skills combined with excess body fat, which relates with sedentary life-style, are significant predictors of the development of coronary heart diseases (Katzmarzyk et al., 2001). There is also some firm evidence that a poor cardio-respiratory preparedness as a consequence can have a higher risk for future obesity among growing children at puberty (Johnson et al., 2000). This can be explained with the fact that low levels of cardio-respiratory preparedness reduce the ability of muscles to oxidize fats, which can lower the tolerance of nutritional fats and increase body weight (Astrup, 1999). These data confirm the importance of improving and maintenance of functional skills as an intervention aiming to prevent the development of obesity among children. Finally, these data reveal a high rate of overweight and obesity occurrence, recorded among elementary school aged children included in this research. Overweight and obesity indicate a more unfavourable body condition profile, but the shift from one nutritional status level (obesity) to

the middle (normal body weight) may be accompanied with significant improvements in body condition. Given that obesity and a poor cardio-respiratory preparedness are considered to be substantial risk factors for a future coronary heart disease prediction, these data indicate that interventions aiming to improve children's health in an ideal case should include measures which would simultaneously improve the level of functional skills and lower the obesity level and which should be implemented already in the lower grades of the elementary school. The purpose of this study was to determine the urban-rural differences among elementary school aged pupils of different nutritional statuses.

According to this and based on the conducted study, the following conclusions can be deduced: 1. The results of this study confirm the first hypothesis since a statistically significant urban-rural difference among elementary school aged pupils regarding the nutritional status has been found, and 2. The results of this study confirm the second hypothesis since statistically significant urban-rural differences among elementary school aged pupils of different nutritional statuses regarding body height and body weight have been found. The data obtained with this research will provide teachers of physical and health education a direct insight into the nutritional status situation among pupils from settlements of various sizes and offer some possibilities for intervention during physical and health education classes. The findings of this research may be indirectly used in the process of planning and programming of the physical and health education teaching.

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URBANO-RURALNE RAZLIKE MEĐU PUČKOŠKOLCIMA RAZLIČITOG NUTRICIONISTIČKOG STATUSA

Sažetak

Postotak pojave pretilosti kod djece proteklih je godina velikom brzinom porastao diljem svijeta i predstavlja jedan od najbitnijih međunarodnih zdravstvenih izazova (Wang i Lobstein, 2006). Ovo je istraživanje imalo za cilj utvrditi urbano-ruralne razlike između učenika osnovnoškolske dobi različitih stupnjeva uhranjenosti. S obzirom na taj cilj, može se konstatirati kako postoji statistički značajna urbano-ruralna razlika između učenika osnovnoškolske dobi prema stupnju uhranjenosti, no urbano-ruralna razlika je očigledna u tjelesnoj visini i tjelesnoj težini. Podatci dobiveni ovim istraživanjem izravno će omogućiti nastavnicima tjelesne i zdravstvene kulture uvid u stanje uhranjenosti učenika urbano-ruralnih prostora kao i na mogućnost djelovanja na njih putem nastave tjelesne i zdravstvene kulture. Neizravno se rezultati ovog istraživanja mogu koristiti u postupcima planiranja i programiranja nastave tjelesne i zdravstvene kulture.

Ključne riječi: učenici, stupanj uhranjenosti, urbano-ruralne razlike
