

Association between Socioeconomic Status and Obesity in Children

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ABSTRACT

The perception of obesity among people has not changed significantly regardless numerous public educational programs. Reasons for obesity pandemics are numerous and complex, but can be mostly resumed to life-style changes. The aim of this research was to determine connection between socioeconomic factors and obesity with children of our region. Study included pupils aged 7–8 from 19 first grades in 8 primary schools in Osijek-Baranya County. Body height and weight were measured and socioeconomic data status were collected. Socioeconomic status included data on marital status, educational level, employment, number of children in the family, kindergarten attendance and urban/rural location and also smoking habits of parents. BMI was calculated as a parameter for obesity assessment according to Croatian reference values. Total of 372 children were measured. There were 6.5% of overweight children (BMI between 90th and 97th percentile) and 2.4% of obese children (BMI above 97th percentile). The prevalence of obese children in our research was 8.9%. Obesity is not influenced by rural/urban residence, marital status of parents, number of children in the family, mother's education, or by parents' smoking habits. Positive correlation between obesity and father's education and parents' unemployment was found. Available literature data, same as our study, did not show consistent association between socioeconomic factors and obesity with children. Contradictory results of different studies can be a result of a small sample, difference in study design and different criteria for defining categories within investigated socioeconomic factor.

Key words: socioeconomic status, school children, overweight, obesity, BMI, body height, body weight, measures

Introduction

Perception of obesity among people has not changed significantly regardless numerous public educational programs. Obesity is still for most people aesthetic problem rather than health problem that causes various complications.

Reasons for obesity pandemics are numerous and complex, but can be majorly attributed to life-style changes. These changes are characterized by reduction of physical activity and an increased intake of fast, tasty, cheap and highly energetic food. This life-style is also characterized by constant lack of time, i.e. living and working in »dead-line« and high competition, which results in greater exposure to stress. Influence of these external factors on behavior, dietary habits, physical activity and mental state in combination with internal factors, i.e. genetics, has caused increase in obesity pandemics¹.

Modern life-style resulted also in secular trend regarding children's growth. All values of percentile curves for body height and weight are higher than in previous measurements².

Studies on families showed that the heritage influences body mass index (BMI) from 30 to 50%. It is not clear whether the mother or the father has greater influence. However, incidence of obesity in the family is observed throughout three generations which means that obesity with grandparents is associated with obesity with grandchildren. Certain studies showed that obesity in the family is a result of certain behavioral models, where common dietary habits or physical activity determine nutritional status of family members^{3,4}.

There is also an imitation phenomenon regarding food intake. People, even more, children, imitate for ex-

ample their parents regarding dietary habits and amounts of food eaten. For that reason obesity is described as »socially contagious«. These studies showed that dietary habits and eating itself are not solely conscious acts, they also comprise irrational component³.

It is known that overweight and obesity with children can be linked to different parental socioeconomic factors. In Western European developed countries, the association of childhood overweight and obesity and parental socioeconomic status shows a negative gradient. Ambiguous results have been obtained regarding the association between socioeconomic factors and childhood overweight and obesity in different countries and over different period of time⁵.

Study conducted in Argentina failed to determine association between place of residence (rural/urban) and obesity with children⁶. Marital status of parents, higher parents' education and larger number of children in the family are considered as protecting factors in obesity development and creation of correct dietary habits^{7,8}. However, study conducted in Croatia showed that higher number of obese children had parents with higher education⁹. Literature data showed association of obesity with mother's employment, especially with girls, and with parents' smoking^{10,11}. Study conducted in Germany showed protecting role of kindergarten attendance¹².

The aim of this study was to determine connection between socioeconomic factors and obesity with children of our region.

Subjects and Methods

Study included pupils aged 7–8 from 19 first grades in 8 primary schools in Osijek-Baranya County. As a part of systematic examination at the end of the first grade, body height and weight were measured and data on socioeconomic status and smoking habits of parents were collected. Measurement results and data were taken from children medical charts, and data were obtained from parents present at the systematic examination.

Socioeconomic status included data on marital status, educational level, employment of parents, number of children in the family, kindergarten attendance and urban/rural location. Smoking habits of parents were also collected. BMI was calculated as a parameter for obesity assessment according to Croatian reference values¹³.

Results

Total of 372 children were measured, 191 males (M) and 181 females (F). There were 6.5% (24) of overweight children (BMI between 90th and 97th percentile) and 2.4% (9) of obese children (BMI above 97th percentile).

There were more obese children in rural area than in urban area (3.6% vs. 1.7%). Difference was not statistically significant at $p=0.428$. Number of overweight children was similar in rural and urban area (6.5% vs. 6.4%). There were more overweight girls (9.4%) among urban children and more obese girls among rural children (4.0%), but the difference was not significant ($p=0.387$) (Table 1).

Parents' marital status was classified in 5 categories: married, divorced, widow/er, cohabitation relationships and single. Among those whose parents are married, there were 2.5% of obese children, and with divorced parents there were 2.8% of obese. The difference was not significant $p=0.900$. In the rest of the categories number of children was too small to make valid assumptions.

According to educational level, parents were categorised in groups: non-qualified worker, qualified worker, secondary education, higher education, university degree and unknown. Adipose children were most prevalent in families where fathers have the lowest education (11.8% of overweight, of which 5.9% of obese children) and highest education (10.9% of overweight and non obese). Difference is significant for obese ($c^2=11.113$, $df=4$, $p=0.025$) regardless gender and for boys ($c^2=11.000$, $df=4$, $p=0.027$), while there is no significant difference for girls in relation to fathers' education ($p=0.448$). With regard

TABLE 1
DISTRIBUTION OF PUPILS ACCORDING TO BMI AND PLACE OF RESIDENCE

Residence	Gender	BMI < 90 percentile		BMI 90–97 percentile		BMI > 97 percentile	
		N	%	N	%	N	%
Urban	M	119	93.7	5	3.9	3	2.4
	F	95	89.6	10	9.4	1	0.9
	Total	214	91.8	15	6.4	4	1.7
Rural	M	58	90.6	4	6.3	2	3.1
	F	67	89.3	5	6.7	3	4.0
	Total	125	89.9	9	6.5	5	3.6
Total	M	177	92.7	9	4.7	5	2.6
	F	162	89.5	15	8.3	4	2.2
	Total	339	91.1	24	6.5	9	2.4

M – males, F – females, BMI – body mass index

to mothers' education, there is no significant difference in children's obesity ($p=0.775$), (Table 2).

Employment of parents was defined with regard to status at the time of measurement. Unemployed mother was found in 6.2% of overweight children and 6.2% of obese children, and unemployed father was found in 10.7% of overweight children and none obese child. Difference in number of obese children with regard to mothers' employment was found in all subjects ($c^2=4.262$, $df=1$, $p=0.039$) and in girls ($c^2=4.019$, $df=1$, $p=0.045$), (Table 3).

Smoking was found among 32.5% of mothers and 43.5% of fathers. There was no significant difference between obese children with regard to parents' smoking (fathers smoke $p=0.965$, mothers smoke $p=0.689$).

Out of all children, 14.3% are the only child in the family, and of those 9.5% are adipose (overweight and obese). In families with more than one child there are 8.8% of adipose children. The difference was not significant ($p=0.834$).

Out of all children, 73.7% went to kindergarten before school. There are 8.8% of obese children who went to kindergarten and 9.1% of those who did not. The difference was not significant ($p=1.000$).

Discussion

Obesity in everyday practice can be identified simply and objectively by measuring body height and weight and calculating BMI. BMI depends on gender and age, therefore absolute BMI is not appropriate indicator of overweight and obesity in children and youth. Hence, relative BMI or use of percentiles is a better indicator of obesity. European expert group for obesity with children suggested how to assess obesity; children with BMI between 90th and 97th percentile are overweight and those with BMI above 97th percentile are obese. According to USA research, overweight was defined as BMI above 85th percentile and obese as BMI above 95th percentile¹⁴. In our

TABLE 2
DISTRIBUTION OF PUPILS ACCORDING TO BMI AND EDUCATIONAL LEVEL OF PARENTS

Educational level	Fathers' educational level						Mothers' educational level					
	BMI < 90 percentile		BMI 90–97 percentile		BMI > 97 percentile		BMI < 90 percentile		BMI 90–97 percentile		BMI > 97 percentile	
	N	%	N	%	N	%	N	%	N	%	N	%
NQW	15	88.2	1	5.9	1	5.9	18	94.7	0	0.0	1	11.1
QW	0	0.0	1	100.0	1	100.0	0	0.0	0	0.0	0	0.0
HQW	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Secondary education	243	92.4	15	5.7	5	1.9	210	91.3	14	6.1	6	2.6
Higher education	27	93.1	1	3.4	1	3.4	36	90.0	3	7.5	1	2.5
University degree	49	89.1	6	10.9	0	0.0	73	90.1	7	8.6	1	1.2
Unknown	5	71.4	1	14.3	1	14.3	2	100.0	0	0.0	0	0.0
Total	339	91.1	24	6.5	9	2.4	339	91.1	24	6.5	9	2.4
p- values	0.025						0.775					

BMI – body mass index, NQW – non-qualified worker, QW – qualified worker, HQW – highly-qualified worker

TABLE 3
DISTRIBUTION OF SUBJECTS ACCORDING TO BMI AND PARENTS' WORKING STATUS

Working status	Fathers' working status						Mothers' working status					
	BMI < 90 percentile		BMI 90–97 percentile		BMI > 97 percentile		BMI < 90 percentile		BMI 90–97 percentile		BMI > 97 percentile	
	N	%	N	%	N	%	N	%	N	%	N	%
Yes (employed)	308	91.7	20	6.0	8	2.4	266	92.0	19	6.6	4	1.4
No (unemployed)	25	89.3	3	10.7	0	0.0	71	87.7	5	6.2	5	6.2
Unknown	6	75.0	1	12.5	1	12.5	2	100.0	0	0.0	0	0.0
TOTAL	339	91.1	24	6.5	9	2.4	339	91.1	24	6.5	9	2.4
p- values	0.877						0.039					

BMI – body mass index

research we also used term adipose children when we discussed overweight and obese children together.

According to research conducted in the last 20 years in Croatia, incidence of obesity increased for 1.4 times with boys and 1.7 times with girls¹⁵. According to Croatian health-statistical annual for 2010 regarding nutritional status of school children aged 7 to 14 years, there were 13.2% of children with anthropometric index »body mass for body height« above 90th percentile. Data indicate increase in proportion of children with mentioned index above 90th percentile. This increase is not even and shows significant discrepancies between Croatia counties. Counties that show increase are Vukovar-Sirmium, Bjelovar-Bilogora, Varaždin County, Osijek-Baranya and Požega-Slavonia County. Counties in western and southern part of Croatia have lower proportion of obese children in comparison with Croatian average¹⁶.

Those results are similar to other worldwide studies^{17–19}.

In our study there were 8.9% of adipose children (all above 90th percentile). Prevalence found in our study is a result of application of new percentile curves according to Croatian referral values¹³ that took into consideration a secular trend present in Croatian children.

Obesity is difficult to prevent since it is a multiplex problem where genetics and raising are involved (children's obesity is often associated with parents' obesity²⁰), and also life-style, especially dietary habits and level of physical activity^{21,22} and social conditions.

Our study aimed to determine association between socioeconomic factors (urban/rural residence, marital status, educational level, employment, number of children in the family, kindergarten attendance) and smoking habits of parents and obesity with children.

Study conducted in Argentina did not confirm association between place of residence and obesity, but assumed that it is related to incorrect diet in rural areas⁶. Our results also showed similar number of overweight children in urban and rural areas, while the number of obese children is greater in rural areas, but not significantly.

Our study did not confirm association between marital status of parents and obesity with children, which is in accordance with study conducted in Spain⁷. Literature data often mention that educational level of parents influences development of correct dietary habits as a protecting factor for obesity. High parental education was associated with less frequent snacking and more frequent weekly physical activity, compared with lower categories, whereas high parental occupational category was associated with daily breakfast⁸. Jureša et al. conducted study throughout Croatia and reported contrary results where they found that overweight and obese group of children had lower number of children in the family and lower order of birth, higher education of parents, they ate less vegetables and fruits, exactly opposite to normal weight group⁹. These data are congruent with our results where we found association with education

level of father and obesity in boys. However, due to high number of categories there was dispersion of results to small numbers, therefore valid assumptions were difficult to make.

Children from low socioeconomic households are at greater risk for obesity^{7,10}. Our results confirmed association between parents' unemployment and increased number of adipose children. Association between mothers' working status and obesity with girls was determined, which is congruent with other studies¹⁰. Study conducted in Croatia showed that associations between mothers' and daughters' overweight/obesity were stronger than mothers' and sons'²⁰.

Studies in Germany showed association between parents' smoking and obesity. Especially as an increase in body weight in children whose mothers smoked during pregnancy, but also there is correlation between fathers' smoking and children's obesity¹¹. In our study, more fathers smoked in comparison to mothers. No association between obesity in children and parents' smoking was found.

According to literature data, greater number of children in the family is a protecting factor for obesity development^{7,9}, which was not confirmed in our study. Similar number of obese was found in families with a single child and with more than one child.

In our study three quarters of children went to kindergarten. No association between institutional upbringing in early age and obesity in children was found. Study conducted in Germany determined positive influence on obesity prevention in children attending kindergarten¹².

Treatment of obesity with only recommendations about changing dietary habits and increased physical activity gives poor results in the long term. Children's habits regarding diet and physical activity are under influence of life setting, majorly family home. Social and economic development, as well as development plans for agriculture, traffic, environment, urban planning, education and production, distribution and food marketing, influence formation of children's dietary habits and awareness of importance of physical activity. If those factors are not healthy and correct, promotion of unhealthy dietary habits and increased possibility for children's obesity development are imminent. It is necessary to create preventive programs that will encompass above mentioned and will be directed not only to individuals, but also to families and community, and that will be conducted continuously. Therefore, in creating preventive program the approach must be broad and long term with national platform. This kind of program needs to be created and implemented as soon as possible, since waiting only enlarges the problem.

Conclusions

Prevalence of obesity among children is constantly rising and is becoming significant public health problem, especially influencing quality of life in adulthood. Preva-

lence of obesity among children in our study is lower than prevalence found in recent studies of Osijek-Baranya County and Croatia^{15,16}. Obesity is not influenced by rural/urban residence, marital status of parents, number of children in the family, mother's education, or by parents' smoking habits. Positive correlation between obesity and father's education and parents' unemployment was found.

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POVEZANOST SOCIOEKONOMSKOG STATUSA I DEBLJINE KOD DJECE

SAŽETAK

Percepcija se debljine u pučanstvu, unatoč brojnim javnim programima i edukacijama, nije značajno promijenila. Uzroci pandemije debljine su brojni i kompleksni, ali se dobrim dijelom mogu svesti na promjene u stilu života. Cilj ove studije bio je utvrditi povezanost socioekonomskih čimbenika i debljine kod djece. Studija je uključila učenike dobi od 7–8 godina u 19 prvih razreda u 8 osnovnih škola u Osječko-baranjskoj županiji. Mjerena je tjelesna težina i tjelesna visina, te su uzeti socioekonomski podaci koji su uključivali informaciju o bračnom statusu roditelja, stručnoj spremi roditelja, zaposlenosti roditelja, broj djece u obitelji, pohađanje vrtića, mjesto stanovanja grad/selo i navike pušena roditelja. Izračunat je parametar za procjenu pretilosti BMI (prema hrvatskim referentnim vrijednostima indeksa tjelesne mase). Mjerenjima je obuhvaćeno ukupno 372 djece. U našoj studiji prevalencija debele djece (ukupni broj djece iznad 90. centile) iznosila je 8.9%. Ne postoji statistički značajna razlika u udjelu pretile djece s obzirom na mjesto stanovanja, bračni status roditelja, pušačke navike roditelja, broj članova u obitelji i pohađanje vrtića u predškolskoj dobi. Udio pretile djece statistički je značajno viši kod očeva s najnižim i najvišim stupnjem obrazovanja u odnosu na djecu očeva sa srednjim stupnjem obrazovanja. Promatrano prema stručnoj spremi majke nema statistički značajne razlike u udjelu pretile djece. Udio pretile djece statistički je značajno viši kod nezaposlenih majki, što je posebno izraženo kod djevojčica, dok zaposlenje oca ne utječe na stanje pretilosti u djece. Pregledom dostupne literature jednako kao

i u našoj studiji nije uočena dosljedna povezanost određenog socioekonomskog čimbenika i debljine kod djece. Kontradiktornost rezultata raznih studija može biti posljedica premalog uzorka, različitog dizajna studija te različitosti kriterija definiranja kategorija unutar ispitivanog socioekonomskog parametra.