

RISK FACTORS OF OBESE CZECH CHILDREN

Pavel Bláha

Abstract

At present the problem of childhood obesity is of major interest. Obesity is characterized above all by excessive body weight associated with cumulation of body fat. This is associated with a number of risk factors some of which are manifested already in childhood.

Keywords

Body composition, childhood, obesity, body height, body weight, blood pressure, risk factors.

INTRODUCTION

The prevalence of obesity is rising steadily in advanced countries as well as in some developing countries (WHO, 1997). This trend is manifested already in children (Klish, 1995). It is assumed that the cause is the disbalance between the energy intake and energy output, however, this relationship is only deceptive. Obesity is a multifactorial disease where in addition to the influence of the external environment a decisive part is played by genetic disposition. In recent years in conjunction with the control of the sensation of hunger and satiety attention is drawn to the importance of leptin, a proteohormone secreted by adipose tissue (Zhang, Proenca, Maffei, 1994).

Childhood obesity is a worldwide problem - the percentage of obese subjects is increasing in developed countries as well as in a number of developing countries. It is a comprehensive pathological entity - a multifactorial disease in the majority of cases associated with a combination of several risk factors. Contemporary sources report, based on recent methods, a genetic predisposition of obesity as high as 50%. Socio-economic status and life style of family as well as education is an important.

Prevention of obesity is important, in particular in childhood. The prognosis of obesity is uncertain. Treatment of obese children is, contrary to adults

problematical (medicamentous therapy cannot be used). Despite this it is important to recommend weight reduction in children, in particular by modification of lifestyle, adequate motivation, collaboration with the childrens family. In the treatment participates the paediatrician, endocrinologist, physiotherapist, psychologist, dietitian and if necessary other specialists.

Risks factors are:

1. mechanical (arthritis, osteoporosis, degenerative diseases of the joints and bones, muscular hypotrophy, respiratory deficiency, varicosities of the lower extremities - children may develop thrombophlebitis, orthopaedic complications - flat feet, hyperlordosis and kyphosis , later degenerative arthritis)
2. metabolic (hypercholesterolaemia -high total cholesterol, LDL and VLDL cholesterol - high triglyceride levels, altered glycoregulation, hyperuricaemia, hyperinsulinaemia)
3. Hypertension and other cardiovascular disorders
4. Mental disorders

In children these conditions are frequently associated with cholelithiasis. In adult age the

majority of obese subjects suffers from at least two of these associated diseases.

MATERIAL

A total of 6879 Czech obese children aged 6 – 18 years (2584 boys and 4295 girls) were measured. Basic anthropometric characteristics , selected anamnestic, clinical and biochemical data were assessed.

Another group: 1949 obese probands (720 boys and 1229 girls) complete anthropometric examination at the beginning and after termination of a six-weeks stay in a spa Poděbrady was done . Selected clinical and biochemical data were assessed.

METHODS

For the anthropometric examination the Martin and Saller technique was used, the skinfold thickness was assessed by means of a Best caliper (the Harpenden caliper has a span of 40 mm only - which is not sufficient for the obese population). Age categories, as recommended by WHO, were used. For clinical and biochemical examinations standard methods were applied.

RESULTS

We present measured values of body height, body weight, BMI index, blood pressure, cholesterol, birth weight and birth length. We found out age at which excessive body weight was assessed in probands.

Body height

As apparent from tables 1 and 2, the mean height of obese probands of the younger age groups is above average as compared with the reference population (this applies to both sexes but is more marked in boys). Gradually this difference is levelled out as apparent from the table . Roughly from the age of 14 years the mean height of the obese sub-population of obese children is equal to that of the reference population. This means that the growth and development of obese children in the younger age groups is accelerated.

Body weight

As apparent from tables 1 and 2, the mean body weight values are as compared with reference values by approximately 3 to 4.5 standard deviations higher. This trend is even more marked in the BMI index, in particular in boys.

The mean body weight in the groups of boys at the beginning of the spa treatment is 69.44 kg, of girls 69.42 kg. During the stay in the spa a decline of body weight was recorded : in boys on average by 8.58 kg, i.e 12.35%, in girls by 7.71 kg, i.e. by 11.10%. The differences of mean values between different grades of obesity are statistically highly significant ($p=0.01$).

BMI

The BMI index declined in boys on average by 3.45 units, in girls by 3.12.

Birthweight

The birthweight was reported in a total of 2145 boys and 3592 girls. The mean birthweight of obese boys is 3528.6 g. This is significantly higher than the birthweight recorded in the Nationwide Anthropological Survey in 1991 (3410 g). The mean birthweight of obese girls is 3402.6 g which is also significantly higher (Nationwide Anthrpological survey 1995: 1991 - 3260 g). A birthweight lower than 2500 g was recorded in 5.1% boys and 7.6% obese girls. The percentage of children with a birthweight lower than 2500 in the Nationwide Survey 1991 is 6.9% for boys and 7.6% for girls.

Age at which excessive body weight was assessed in probands

This information was provided for 2152 boys and 3565 girls. Up to the age of one year it was 765 boys(35.5%) and 1322 girls (37.1%). Between the age of 2 and 6 years it was 977 boys (45.4%) and 1535 (43.1%) girls . Between the age of 7 and 10 years it was 351 boys (16.3%) and 547 (15.3%) girls. above the age of 10 years only 59 boys (2.8%) and 161 girls (4.5%). In obese children who had an elevated body weight already during their first year the mean birthweight and breastfeeding period were assessed.

Table 1: Basic body parameters – sample of Czech obese boys (n=2584)

BOYS		Body height (cm)			Body weight (kg)			BMI (kg/m ²)		
Age (years)	n	\bar{x}	SD	Z-sc.	\bar{x}	SD	Z-sc.	\bar{x}	SD	Z-sc.
5.00-7.99	71	127.7	8.73	1.85	41.8	8.10	4.31	25.5	2.95	5.50
8.00-8.99	91	138.0	6.22	1.01	49.6	8.42	4.49	25.9	3.31	4.80
9.00-9.99	169	143.9	6.35	1.06	54.9	9.73	4.17	26.4	3.72	4.24
10.00-10.99	315	148.5	7.09	0.81	59.3	10.05	3.70	26.8	3.15	3.64
11.00-11.99	465	153.6	7.02	0.74	65.0	11.12	3.34	27.4	3.38	3.57
12.00-12.99	519	157.8	7.91	0.57	69.8	12.16	3.48	27.9	3.55	3.56
13.00-13.99	533	163.7	7.71	0.33	77.5	12.43	2.98	28.8	3.50	3.54
14.00-14.99	279	168.0	8.02	0.01	84.8	15.55	2.79	29.9	4.32	3.90
15.00-15.99	50	170.8	7.04	-0.30	91.6	19.02	3.33	31.2	5.04	4.26
16.00-18.99	47	177.1	9.90	0.08	105.6	19.23	3.98	33.5	4.90	4.44

Z – score calculated in relation to reference values of normal Czech child population of corresponding age groups (Bláha et al., 1986, Lhotská et al., 1993)

Table 2: Basic body parameters – sample of Czech obese girls (n=4295)

GIRLS		Body height (cm)			Body weight (kg)			BMI (kg/m ²)		
Age (years)	n	\bar{x}	SD	Z-sc.	\bar{x}	SD	Z-sc.	\bar{x}	SD	Z-sc.
5.00-7.99	149	129.1	7.51	0.98	41.0	8.07	4.26	24.5	3.52	4.86
8.00-8.99	143	138.4	7.62	1.07	48.1	9.56	4.33	24.9	3.14	3.83
9.00-9.99	277	142.7	6.75	0.86	52.4	8.95	3.40	25.6	3.13	3.63
10.00-10.99	395	148.2	7.05	0.72	57.3	9.83	3.38	26.0	3.22	3.44
11.00-11.99	622	153.6	7.04	0.46	63.6	11.22	2.91	26.8	3.51	3.39
12.00-12.99	703	158.7	7.05	0.38	71.3	11.61	3.25	28.2	3.69	3.32
13.00-13.99	901	162.1	6.44	0.34	77.2	12.14	3.62	29.3	3.78	3.47
14.00-14.99	682	163.5	6.72	0.20	80.3	13.21	3.62	30.0	4.27	4.00
15.00-15.99	176	164.2	7.03	0.17	81.8	14.16	4.10	30.2	4.35	4.10
16.00-18.99	158	165.0	7.75	0.05	85.6	15.20	4.01	31.4	5.07	3.96

Z – score calculated in relation to reference values of normal Czech child population of corresponding age groups (Bláha et al., 1986, Lhotská et al., 1993)

Up to the age of 12 weeks only 81.1% boys and 82.8% girls were breastfed. The mean birth weight of 695 boys , where excessive body weight before the age of one year was assessed is 3654 g, in 1216 girls it is 3519 g. These mean

birthweights are highly significantly higher as compared with birth weights of the normal population (Fifth Nationwide Anthropological Survey 1991) but also as compared with the birthweights of the investigated obese subjects.

Table 3: Systolic blood-pressure

Age (years)	BOYS								GIRLS							
	to the 90th P		over the 90th P		to the 95th P		over the 95th P		to the 90th P		over the 90th P		to the 95th P		over the 95th P	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
5.00-7.99	44	67.7	21	32.3	51	78.5	14	21.5	83	59.7	56	40.3	113	81.3	26	18.7
8.00-8.99	55	64.7	30	35.3	66	77.6	19	22.4	95	72.5	36	27.5	104	79.4	27	20.6
9.00-9.99	101	63.1	59	36.9	119	74.4	41	25.6	181	68.8	82	31.2	210	79.8	53	20.2
10.00-10.99	222	73.0	82	27.0	222	73	82	27	265	70.5	111	29.5	265	70.5	111	29.5
11.00-11.99	253	56.6	194	43.4	363	81.2	84	18.8	373	63.8	212	36.2	491	83.9	94	16.1
12.00-12.99	266	53.2	234	46.8	380	76.0	120	24.0	376	55.3	304	44.7	539	79.3	141	20.7
13.00-13.99	361	70.2	153	29.8	403	78.4	111	21.6	634	74.5	217	25.5	688	80.8	163	19.2
14.00-14.99	179	68.3	83	31.7	180	68.7	82	31.3	485	74.3	168	25.7	524	80.2	129	19.8
15.00-15.99	35	66.0	18	34.0	43	81.1	10	18.9	116	69.0	52	31.0	137	81.5	31	18.5
16.00-18.99	28	60.9	18	39.1	28	60.9	18	39.1	99	63.5	57	36.5	100	64.1	56	35.9
Total	1544	63.4	892	36.6	1855	76.1	581	23.9	2707	67.6	1295	32.4	3171	79.2	831	20.8

to the 90th P.... children with blood pressure values to the 90th percentile

over the 95th P... children with blood pressure values over the 95th percentile

Blood pressure values for the 90th and 95th percentile by: Update on the 1987 task force on high blood pressure in children and adolescents: A working group report from the national high blood pressure education program. Pediatrics, 98, 1996, 4, 649 – 658.

Blood pressure

Blood pressure readings were recorded in 2436 boys and 4002 girls. In Table 3 and Table 4 are the frequencies and percentage ratios in relation to normal values of the 90th and 95th percentile in relation to age and sex are given. In the whole group of boys a systolic blood pressure

above the 90th percentile was recorded in 36.6% probands , higher than the 95th percentile in 23.9% probands. From the total group of girls a systolic blood pressure reading above the 90th percentile was recorded in 32.4%, a higher one than the 95th percentile in 20.8% A diastolic pressure higher than the normal values of the 90th percentile was recorded in 27.6% boys, a pressure

higher than the 95th percentile in 9.5%. In the group of girls the corresponding values are 25.6% and 11.4% resp. The relatively large groups make it possible to analyze the values in relation to age. In this respect marked differences are found. The largest percentage of probands with risk level of systolic pressure is found in the 11-and 12-year

old children of both sexes. As regards diastolic pressure - in the more advanced age groups of boys and partly also in girls. In the diastolic pressure greater intersexual differences are found.

As apparent from the results, the risk factor of a high blood pressure in the obese population is manifested already in childhood.

Table 4: Diastolic blood pressure

Age (years)	BOYS								GIRLS							
	to the 90th P		over the 90th P		to the 95th P		over the 95th P		to the 90th P		over the 90th P		to the 95th P		over the 95th P	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
5,00-7,99	59	90,8	6	9,2	62	95,4	3	4,6	119	85,6	20	14,4	119	85,6	20	14,4
8,00-8,99	66	77,6	19	22,4	73	85,9	12	14,1	109	83,2	22	16,8	117	89,3	14	10,7
9,00-9,99	118	73,8	42	26,3	128	80,0	32	20,0	215	81,7	48	18,3	228	86,7	35	13,3
10,00-10,99	248	81,6	56	18,4	292	96,1	12	3,9	274	72,9	102	27,1	315	83,8	61	16,2
11,00-11,99	339	75,8	108	24,2	418	93,5	29	6,5	470	80,3	115	19,7	470	80,3	115	19,7
12,00-12,99	376	75,2	124	24,8	464	92,8	36	7,2	513	75,4	167	24,6	632	92,9	48	7,1
13,00-13,99	359	69,8	155	30,2	470	91,4	44	8,6	590	69,4	260	30,6	779	91,6	71	8,4
14,00-14,99	145	55,3	117	44,7	223	85,1	39	14,9	444	68,0	209	32,0	600	91,9	53	8,1
15,00-15,99	29	54,7	24	45,3	45	84,9	8	15,1	108	64,3	60	35,7	150	89,3	18	10,7
16,00-18,99	25	54,3	21	45,7	30	65,2	16	34,8	133	85,3	23	14,7	133	85,3	23	14,7
Total	1764	72,4	672	27,6	2205	90,5	231	9,5	2975	74,4	1026	25,6	3543	88,6	458	11,4

to the 90th P... children with blood pressure values to the 90th percentile

over the 95th ... children with blood pressure values over the 95th percentile

Blood pressure values for the 90th and 95th percentile by: Update on the 1987 task force on high blood pressure in children and adolescents: A working group report from the national high blood pressure education program. Pediatrics, 98, 1996, 4, 649 – 658.

Cholesterol

Cholesterol levels at the onset of the stay in the spa were recorded in 2303 boys and 3847 girls. As regards cholesterol, several methods of evaluation

are used (Urbanová et al., 1998). Therefore we applied several criteria also in the group of obese children. In addition to data recorded in table 5 we present also the percentage of probands with

cholesterol values higher than 5.2 (18.4% boys and 14.8% girls). A cholesterol value higher than 6.0 was recorded in 6.8% boys and 3.4% girls. Values above 4.2 (WHO recommendation) were recorded in 56.8% boys and 52.8% girls.

With regard to obesity no statistically significant differences were revealed. These percentages should be a warning and confirm high cholesterol values as one of the risk factor of obesity already in child age.

Table 5: Values of cholesterol (mmol/l)

	BOYS		GIRLS	
	n	%	n	%
to 4.4	1253	54.4	2218	57.7
4.4 – 4.8	271	11.8	479	12.5
over 4.8	779	33.8	1150	29.8
Total	2303	100.0	3847	100.0

CONCLUSION

The body build and ontogenetic development of the Czech child and adolescent obese sub-population differs markedly. The development of obese subjects is accelerated in younger age.

The birthweight of the investigated groups of obese subjects was significantly higher as compared with the reference population.

In more than one third of obese subjects excessive body weight was recorded already during the first year of life, between the age of 2 and 6 years excessive body weight was recorded in another 44% of the children in the investigated group.

The tendency to develop obesity is manifested in the majority of children already during the first six years of life.

As apparent from the results, the risk factor of a high blood pressure in the obese population is manifested in childhood.

Values of cholesterol should be a warning and confirm high cholesterol values as one of the risk factors of obesity already in child age.

This research is supported by the Grant Agency of the MofH, CR, grants no. 5158 – 3 and 6597 – 3 and by EuroMise –Kardio LN 00B107.

REFERENCES

- Bláha, P., Lisá, L., Šrajfer, J., Raková, R. (1998). Možnosti využití antropologických metod při hodnocení redukčního procesu obézních dětí. *Sborník lékařský* 99. s. 267 – 272.
- Klish, W. J. (1995). Childhood obesity: pathophysiology and treatment. *Acta Paediatrica Japonica* 37: 1-6.
- Lhotská, L., Bláha, P., Vignerová, J., Roth, Z., Prokopec, M. (1995). *V. celostátní antropologický výzkum dětí a mládeže 1991 (České země), Zpracování dotazníku pro rodiče*. Státní zdravotní ústav: Praha.
- Update on the 1987 task force on high blood pressure in children and adolescents: A working group report from the national high blood pressure education program. (1996). *Pediatrics* 98: 649 – 658.
- Urbanová, Z., Šamánek, M., Češka, R., Cífková, R., Poledne et al. (1998) Doporučení pro diagnostiku a léčbu hyperlipoproteinémií v dětství a v dospívání vypracované výborem české společnosti pro aterosklerózu. *Časopis lékařů českých* 137. s. 89-92.
- World Health Organization. Obesity: preventing and managing the global epidemic. *Report of a WHO Consultation presented at: the World Health*

Organization; June 3-5 1997. (1997). Geneva, Switzerland. Publication WHO/NUT/NCD/98.1.

Zhang, Y., Proenca R., Maffei, M. (1994). Positional cloning of the mouse obese gene and its human homologue. *Nature* 372: s. 425-432.

CONTACT

RNDr. Pavel Bláha, CSc.
College of PE and Sport PALESTRA
Pilska 9, 190 00 Prague
Czech Republic
Tel.:+00420/281 932 013
E-mail: blaha@palestra.cz