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The Effect of High Birth Weight (4000 g or More) on the Weight and Height of Adult Men and Women

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A B S T R A C T

Three hundred and twenty eight examined adult men and 346 examined adult women were macrosomic at birth (4000 g or over). The control group consisted of 564 adult men and 749 adult women with birth weights of 2500 to 3999 g. Both male and female macrosomic babies achieve greater weights and heights in adulthood than those in the control group. There are more overweight and obese men in the macrosomic group than in the control group and the same is true of the women ($p < 0.001$). The mean values of the BMI (body mass index) for the macrosomic adults are greater than those for the control group ($p < 0.001$). Fetal macrosomia is a good predictor of the weight and height of adult men and women.

Introduction

A newborn with a high birth weight (macrosomic) is a baby weighing more than 4000 g or greater[1–3]) or 4500 g or more[4,5] regardless of gestational age. Some[6,7] include as macrosomic those newborns with a birth weight above the 90th percentile for the gestational age according to the growth curve for a particular population.

The frequency of macrosomia (birth weight over 4000 g) is between 4.0%[8] and 10.0%[9] whilst Mikulandra et al.[3] found a frequency of 20.3%, which is the highest frequency published so far in the literature.

Many factors (genetic, maternal, paternal, placental, fetal, environmental) influence the growth and development of the fetus. This is also true of macrosomia[10–12]. The frequency of overweight and obese adolescents (males)[12–15] is linked to

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an increased birth weight and length or high birth weight with a normal length for the gestational age, and also to greater weight and height in adult men and women[16,17]. We find a high percentage of overweight adults in the group of overweight children[18].

Methods

From 15th July 1992 to 31st December 1998 we examined 328 adult men and 346 adult women who were macrosomic at birth (more than 4000 g). The control group consisted of 564 adult men and 749 adult women who had birth weights of 2500 to 3999 g. All the subjects were local people and born at Šibenik General Hospital. The gestational age, birth weight and length were obtained from the subjects or from their birth records.

The body mass index (BMI) was determined according to Nahum et al.[19]. BMI values for adults are obtained by dividing their weight (kg) by their height (m^2). A BMI up to 19.9 kg/m^2 is low (a thin person), between 20.0 and 24.9 kg/m^2 normal (ideal weight), from 25.0 to 29.9 kg/m^2 high (overweight) and over 30 kg/m^2 very high (very overweight, obese).

Statistical analysis was carried out using the t-test, arithmetic median, standard deviation (SD) and percentages.

Results

There is no difference in the length of gestation between the macrosomic newborns and the control group ($p > 0.05$). Both male and female macrosomic newborns were heavier at birth than newborns from the control group ($p < 0.001$). There is no difference in middle age be-

TABLE 1
THE GESTATIONAL AGE, BIRTH WEIGHT AND LENGTH OF MACROSOMIC BABIES AND THE CONTROL GROUP, THEN THE WEIGHT AND HEIGHT OF ADULTS IN MIDDLE AGE BY SEX

	Macrosomic X + SD	Control group X + SD	t-test	p
Gestational age (weeks)				
Male	39.4+2.3	38.5+2.0	1.26	n.s.
Female	39.5+2.1	38.3+2.2	1.56	n.s.
Birth weight (g)				
Male	4460.4+545.4	3451.2+524.2	26.98	< 0.001
Female	4362.2+564.2	3398.8+550.8	26.46	< 0.001
Birth length (cm)				
Male	53.3+2.8	50.4+2.6	4.08	< 0.001
Female	52.2+2.4	50.3+2.2	4.01	< 0.001
Age of adults (years)				
Male	31.4+10.8	30.8+10.2	0.96	n.s.
Female	26.9+8.3	27.1+7.6	0.38	n.s.
Weight of adults (kg)				
Male	85.7+11.9	78.5+11.8	7.66	< 0.001
Female	68.5+12.2	62.1+10.4	8.34	< 0.001
Height of adults (cm)				
Male	185.2+12.2	178.7+11.6	7.64	< 0.001
Female	171.3+11.4	167.5+11.2	5.21	< 0.001

TABLE 2
THE BODY MASS INDEX (kg/m^2), MEDIAN INDEX VALUES AND SEX OF ADULTS FROM THE MACROSOMIC AND CONTROL GROUPS

BMI of adults (kg/m^2)	Macrosomic group (%)	Control group (%)	t-test	p
Men				
–19.9	0.6	7.6	5.88	< 0.001
20.0–24.9	53.1	69.5	4.88	< 0.001
25.0–29.9	40.6	22.5	5.61	< 0.001
30	5.8	0.4	4.15	< 0.001
Median values	25.8+5.2	23.37+5.80	20.32	< 0.001
Women				
–19.9	5.2	23.2	9.15	< 0.001
20.0–24.9	63.6	66.1	0.97	n.s.
25.0–29.9	28.9	10.1	7.23	< 0.001
30	2.3	0.5	0.72	n.s.
Median values	23.97+6.25	22.13+5.8	11.72	< 0.001

tween adult men and women from the macrosomic or control groups ($p > 0.0$). Adult males from the macrosomic group reach higher average weights than men from the control group (85.7 11.9 : 78.5 11.8 kg; $t = 7.66$, $p < 0.001$) and the same is true for height (185.2 12.2 : 178.7 11.6 cm; $t = 7.64$, $p < 0.001$). Adult women from the macrosomic group reach greater average weight than women from the control group (68.5 12.2 : 62.1 10.4 kg; $t = 8.34$, $p < 0.001$) and the same applies to height (171.3 11.4 : 167.5 11.2 cm; $t = 5.21$, $p < 0.001$) (Table 1).

There are more adult males in the macrosomic group with high (40.6%: 22.5%; $t = 5.61$, $p < 0.001$) or very high (5.8%:0.4%; $t = 4.15$, $p < 0.001$) body mass index (BMI) than in the control group ($p < 0.001$). Median values of BMI in women from the macrosomic group are higher than in the control group (23.97 6.25 : 22.13 5.80 kg/m^2; $t = 1.72$, $p < 0.001$). There are more women from the macrosomic group with high BMI than in the control group (28.9%:10.1%; $t = 7.23$, $p < 0.001$) (Table 2).

Discussion

Most work investigating the connection between birth weight and length and weight and height later relates to the children or early or late adolescence[13–15]. There have been very few tests made on the adults[16,17].

High birth weight and above average length and high birth weight with normal length for the gestational age represent a risk factor for obesity in adolescence[12–14] although some earlier research did not find this connection[20]. Our earlier research[16,17] confirmed the connection between birth weight and length and the weight and height of adults. Male macrosomic babies, when they achieve adulthood, reach greater weights by on average 7.2 kg and heights 6.5 cm greater than those in the control group. Female macrosomic babies become women on average 6.4 kg heavier and 3.8 cm taller in relation to women in the control group.

Greater birth weight is also linked to higher BMI values in adolescence[13–15] and in adulthood[16,17]. There are signifi-

cantly more overweight (BMI 25.0–29.9 kg/m^2) or obese (BMI 30.0 kg/m^2) males in the macrosomic group than in the control group, and there are significantly more overweight women in the macrosomic group than in the control group.

There is a positive connection between fetal macrosomia and the weight and height of adult men and women. Fetal macrosomia (over 4000 g) is a good predictor of the weight and height of the adult.

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UČINAK VISOKE POROĐAJNE TEŽINE (4000 g I VIŠE) NA TEŽINU I VISINU ODRASLIH MUŠKARACA I ŽENA

SAŽETAK

Ispitano je 328 odraslih muškaraca i 346 odraslih žena koji su pri rođenju bili makrosomi (4000 g). Kontrolne skupine bile su 564 odrasla muškarca i 749 odraslih žena s porodnom težinom od 2500 do 3999 g. Makrosomi i muški i ženski u odrasloj životnoj dobi postižu veću težinu i visinu u odnosu na kontrolnu skupinu. Iz skupine makrosoma više je debelih i vrlo debelih muškaraca nego iz kontrolne skupine, a isto tako više je i debelih žena ($p < 0.001$). Srednje vrijednosti indeksa tjelesne mase u odraslih iz makrosomne skupine veće su nego u kontrolnoj skupini ($p < 0.001$). Fetalna makrosomija dobar je pokazatelj težine i visine odraslog muškarca i žene.