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Dependence Between Maternal Weight Gain During Pregnancy and Some Newborns Anthropometrical Sizes

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The aim of our study is to determine the relationship between the maternal weight gain during pregnancy and some anthropometric parameters of newborns.

During 2001 a total of 219 (110 boys and 109 girls) clinically healthy, fullterm neonates born in Sofia (38 to 42 weeks of gestation, with body weight of more than 2500 g) were examined.

The maternal prepregnancy body weight and weight gain during pregnancy exert a significant influence of the newborns body dimensions. Mothers with higher body weight before pregnancy gain less. Women who gain weight during pregnancy more than 20.0 kg give birth to heavy babies. Newborns whose mothers gain during pregnancy more than 20.0 kg have values of the anthropometrical features above the means. Infants born by mothers who gain less than 20.0 kg have values of the anthropometrical features around and below the means.

Key words: newborn infants, maternal weight gain, pregnancy, anthropometrical sizes.

Introduction

The physical development of newborn infants is influenced by a complex of exogenous and endogenous factors. The impact of environment on foetal growth is mediated by the mother through her womb (i.e. the function of the placenta, uterine blood flow and central uterine circulation, placental and umbilical circulation). Some authors consider that the maternal factor, characterized meanly by age, weight and stature of mother, birth order and etc. is most important for the foetus [5]. (Kaliszewska-Drozdowska, 1996).

During pregnancy and in postnatal period, nutrition, socioeconomic status, diseases and other factors significantly influenced growth [1, 2]. Nutritional status of the mother before and at the time of pregnancy, as well as pregnancy weight gain are important for foetal growth [3] and also affect perinatal mortality, postnatal morbidity and postnatal growth of children [4]. It is considered that poor nutritional status and low weight gain of mother during pregnancy are associated with low body weight at birth [6]. According to some authors, the women who gain more than 18 kg during pregnancy

give birth to heavy babies two times more frequently than these who gain weight within the recommended levels (11.5-16.0 kg).

The study of inheritable and environmental factors on the physical development of newborns, as well as on the growth and development during early childhood could help to detect some genetic abnormalities.

The aim of the study is to determine the relationship between the maternal weight gain during pregnancy and some anthropometric parameters of newborns.

Material and Methods

During 2001 a total of 219 (110 boys and 109 girls) clinically healthy, fullterm neonates born in Sofia (38 to 42 weeks of gestation, with body weight of more than 2500 g) were examined. The babies were studied within 24 hours after birth in the Department of Neonatology at II Hospital of Obstetrics and Gynaecology "Sheynovo". The gestational age was determined according to the date of mother's last regular menstruation. The anthropometrical measurements were realized by Martin – Saller's classical methods [7], in lying position of the child, from the right side of the body.

From a total of 38 directly measured anthropometrical features in the analysis 19 of them are included and grouped according to their morphofunctional identity and biological information, which they provide.

Mathematical and statistical data processing was realized using statistical software for Windows – SPSS 13.0, using the following analysis:

– Z – score transformation – to standardize the values of the compared features, regardless of their measure units. Using was the formulae:

$$Z \text{ score} = (Xi - \bar{X}) / SD$$

where Xi – is the individual value of an anthropometrical feature, $\bar{X}$ – is the mean values of this features in the sample and SD – standard deviation of the trait in the sample. After standardizing $\bar{X} = 0$, SD = 1 for the given feature.

– One-way ANOVA analyses – to establish the relation between mean anthropometrical characteristics of neonates and maternal weight gain during pregnancy.

According to the factor pregnancy weight gain were formed 5 groups: Group I – mothers who gained 5 to 10 kg; II gr. – mothers who gained 11 to 15 kg.; III gr – mothers who gained 16 to 20 kg.; IV gr. – mothers who gained 21 to 25 kg and V gr. – mothers who gained more than 25 kg.

– Post hoc Tukey Honestly Significant Difference Test (HSD-test for unequal N) – to establish the inter-group differences.

– T – test of Student – for assessment of the statistically significant gender differences ($P \leq 0.05$).

Results

The maternal body weight varied from 40.0 kg to 100.0 kg and the mothers were divided into three groups: weighing less than 60.0 kg; from 61.0 to 70.0 kg and weighing over 70.0 kg.

The mothers with body weight between 61.0 and 70.0 kg gain most during pregnancy – an average of 18.0 kg. Mothers with body weight less than 60.0 kg gain weight an average of 17.0 kg and those weighing over 70.0 kg gain least of all – between 10.0 and 15.0 kg (Fig. 1).

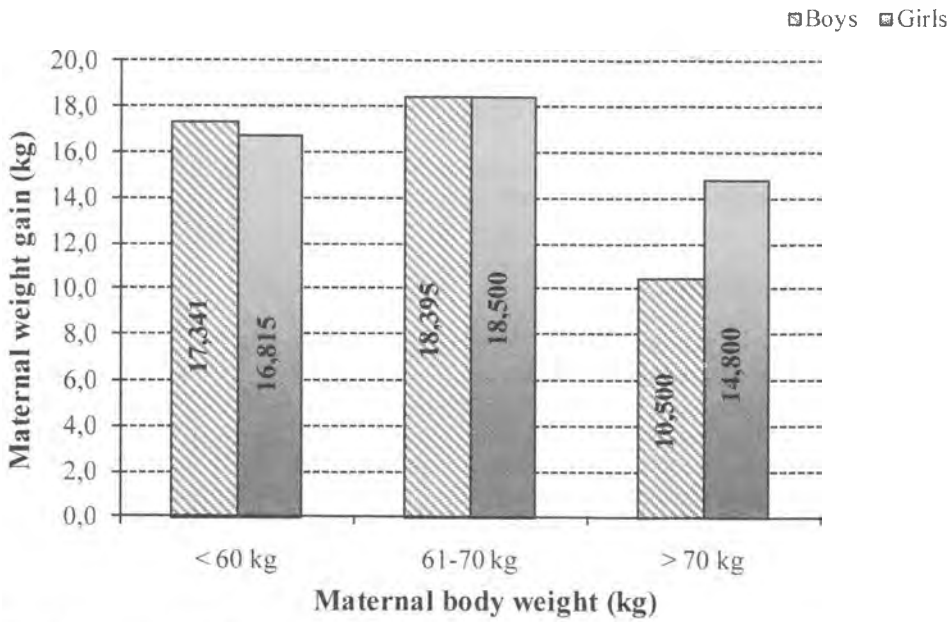


Fig. 1. Pregnancy weight gain, according to the maternal body weight

Figure 2 shows the distribution of pregnancy weight gain (5-kg groups) in the three maternal body weight groups. The highest percentage of mothers (28.0%) of newborn boys, weighing less than 60.0 kg gain weight during pregnancy from 10.0 to 15.0 kg, and only 8.0% of women gained more than 25.0 kg. Most of the mothers (27.0%) in the second group, with body weight between 61.0 and 70.0 kg, gain weight from 15.0 to 25.0 kg. Twenty five percents of the mothers with body weight over 70.0 kg before pregnancy gain weight from 5.0 to 10.0 kg.

In the group of mothers of newborn girls weighing less than 60.0 kg the tendency of pregnancy weight gain are similar to this in the group of the boys' mothers. The highest is the frequency of the women who gain weight during pregnancy from 10.0 to 15.0 kg (36.0%) and the mothers gained over 25.0 kg are only 9.3%. Forty three percents of women weighing between 61.0 and 70.0 kg gain from 10.0 to 15.0 kg. Only 9.5% of women gain between 15.0 kg and 20.0 kg and also 9.5% – over 25.0 kg. Most of the mothers (33.3%) weighing over 70.0 kg gain between 15.0 and 20.0 kg, and only 8.3% of women in the same group gain between 20.0 -25.0 kg.

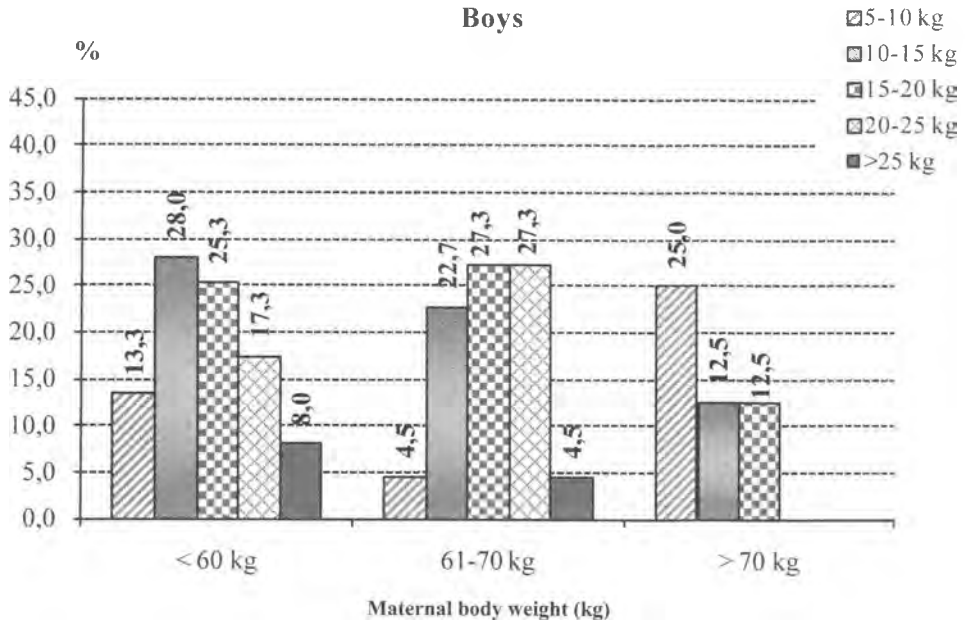
The maternal weight gain during pregnancy strongly affects the infants birth weight (Fig. 3).

The mean birth weight of boys is 3.390 kg, as the newborns of mothers who gain weight during pregnancy above 25.0 kg are heaviest (3.661 kg) and those whose mothers gain from 5 to 10 kg are lighter (3.169 kg).

The newborn girls have mean birth weight of 3.290 kg, as those whose mothers gain weight from 21.0 to 25.0 kg are heaviest (3.625 kg). The newborn girls of mothers increasing their weight during pregnancy with 11.0 to 15.0 kg are lightest.

Figure 4 illustrates a marked positive dependence between pregnancy weight gain and body sizes of newborn infants.

The specificity of anthropometrical status of newborn boys and girls depending on the pregnancy weight gain of their mothers is similar. With pregnancy weight gain over



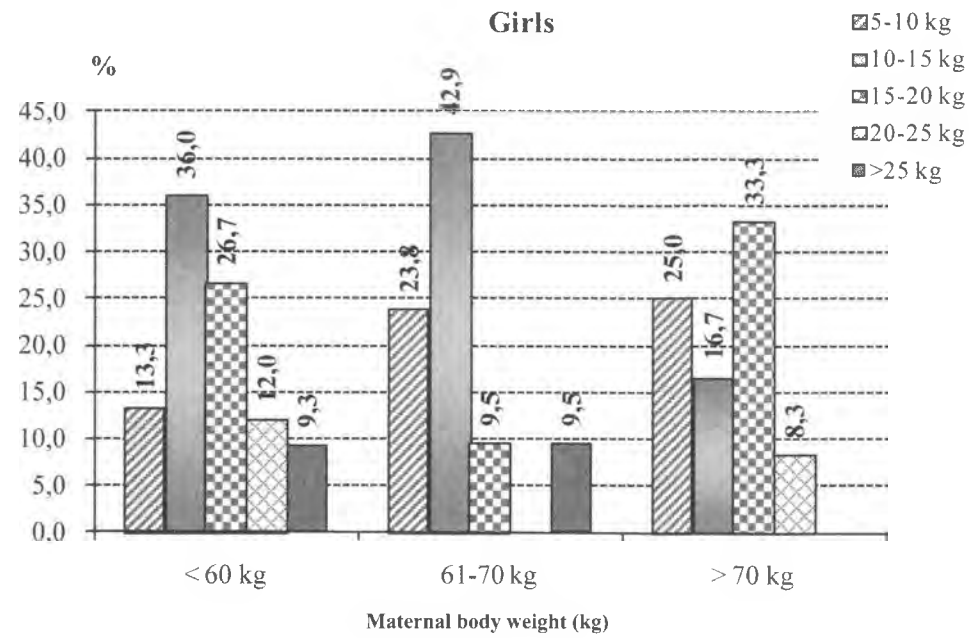


Fig. 2. The distribution of pregnancy weight gain, in three groups, according to the maternal body weight

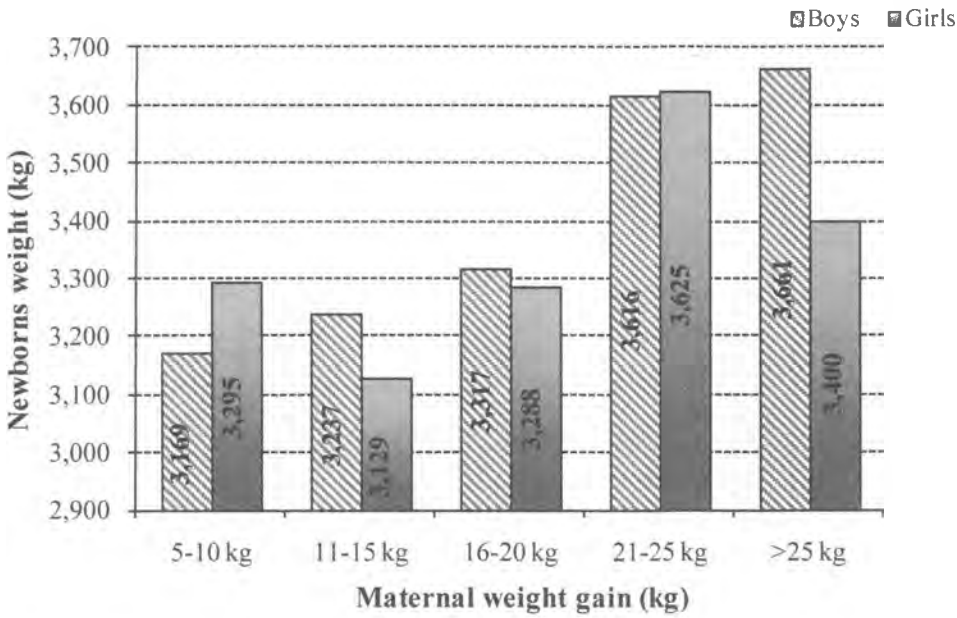


Fig. 3. The newborns birth weight, according to the maternal weight gain during pregnancy

20.0 kg a manifest increase of body sizes is observed in both genders. In girls the three features make exception: stature, upper extremities length and lower extremities length. Its values are around and below the means for the group.

Boys born by mothers who gain weight during pregnancy from 5.0 to 20.0 kg have values for most anthropometrical features below or close to means.

Girls born by mothers increasing their weight up to 15.0 kg during pregnancy have the smallest body dimensions and those whose mothers gain weight from 16.0 to 20.0 kg have values of studied anthropometrical features close to means.

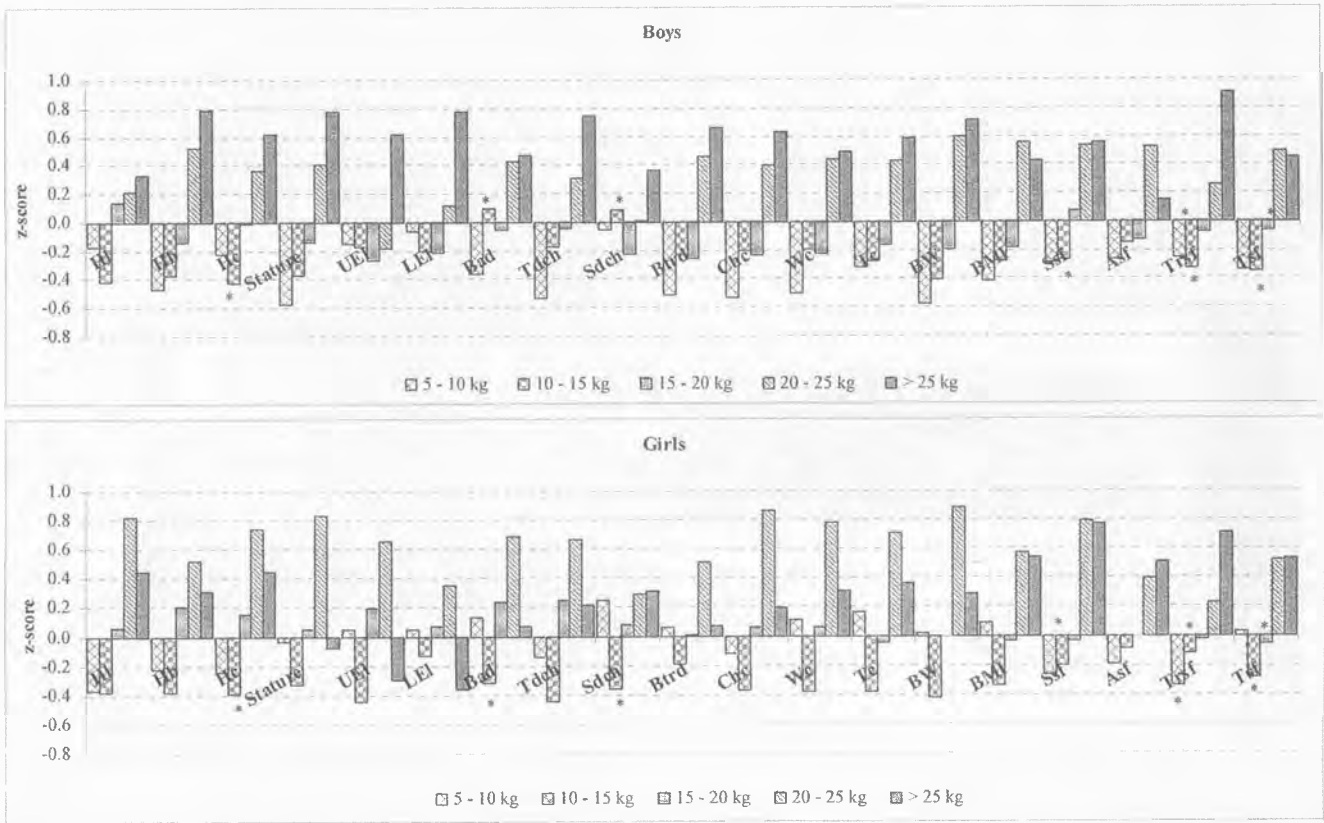
Conclusions

We can conclude that the maternal prepregnancy body weight and weight gain during pregnancy significantly influence the anthropometrical characteristics of newborns.

- Mothers with higher body weight gain less during pregnancy.
- Mothers who gain weight during pregnancy more than 20.0 kg give birth to heavy babies.
- There exists a positive dependence between the weight gain of the mothers and the body sizes of their babies:

– Infants born by mothers who gain during pregnancy more than 20.0 kg have values of the anthropometrical features above the means.

– Infants born by mothers who gain less than 20.0 kg have values of the anthropometrical features around and below the means.



Hl-head lenght, **Hb**-head breadth, **Hc**-head circumference, **UEl**-upper extr. lenght, **LEl**-lower extr. lenght, **Bad**-biacromial diameter, **Tdch**-transversal diameter of chest, **Sdch**-sagital diameter of chest, **Btrd**-bitrohanterial diameter, **Chc**-chest circumference, **Wc**-waist circumference, **Tc**-thigh circumference, **BW**-body weight, **BMI**-body mass index, **Ssf**-subscapular skinfold, **Asf**-abdominal skinfold, **Trsf**-triceps skinfold, **Tsf**-thigh skinfold

Fig. 4. Anthropometrical characterization of the newborn infants, according to the maternal weight gain during pregnancy

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