

CORRELATIONS AMONG PARENTAL AND NEONATAL ANTHROPOMETRIC PARAMETERS, FEEDING PRACTICES AND INFANT OBESITY

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Abstract

Background and aims. Infant and adult obesity is becoming a real public health concern in Romania, similar to other countries of the European Union. Maternal obesity and excessive weight gain during pregnancy are proven risk factors for the obesity of the child. The protective role of the breastfeeding against obesity has also been demonstrated. The most important issue is whether the choice of a milk formula with the right protein composition could or not protect the newborn from becoming a future obese infant and child.

Our study aims to describe the characteristics of a group of macrosomic newborns, in relation to the mothers' weight gain during pregnancy, mode of delivery, birth weight, complications at birth, time of first feeding and type of feeding during maternity stay.

Patients and methods. we conducted a retrospective study on 179 newborns with birth weights >4000 grams, born over a period of three months (March-May) in 6 large maternity hospitals in Romania.

Results. the newborns had a mean gestational age of 39.5 weeks and a mean birth weight of 4195 grams. Male newborns were prevalent (74%). More than half were born by Cesarean section and had Apgar scores with a median of 9. Macrosomes are prone to complications at birth and in our study those were mainly hypoglycemia and birth trauma. Time at first feeding was 95 minutes (mean), with a high percentage of formula/mixed feeding (68%).

Conclusion. Macrosomia itself attracts the risk of birth by cesarean section (54% of study group), birth trauma and a low rate of exclusive breast milk feeding (32% of study group) at discharge.

Keywords: newborn, infant, macrosome, obesity, feeding.

Background and aims

The poor nutritional status of the mother has well known and documented effects. On the other hand, in developed countries, diets based on fast-food, as well as the lack of exercise are two of the factors that lead to increased obesity among both children and adults.

Obesity in pregnant women is associated with an increased risk of gestational diabetes, hypertension, which lead to preeclampsia and intra- and postpartum complications. Cesarean section rates are higher in obese women, one of the indications being macrosomia. The consequences on the newborn nutrition are inherent, because, following Caesarean section, chances to breastfeed are lower. Choosing a formula with a high protein content may sometimes continue this scenario, which finally results in infant excessive weight gain.

Recent data provided by the European Bureau of Statistics in 2008 show that in Romania 40% of children are overweight and 17% are obese. Adult population data show that 60% of adults are overweight and 30% are obese. The percentage of obese men is 27% and women 29%. Obesity is a risk factor in about 75% of modern diseases. One Romanian in three is overweight and one in four is obese. In Romania there are over 3.5 million obese people. Only 10% of them go to have a medical examination and only 1% are included in the national education program against obesity.

The study performed over 10 years (1993-2002) by the „Alfred Rusescu” Institute of Mother and Child Care in Bucharest showed that the prevalence of overweight in children aged 0-4 years is 6.4% in girls and 5.5% in boys.

There is increasing evidence that early nutritional interventions have a role in preventing adult obesity. School age children who were breastfed during their first year of life are at 20% lower risk of obesity compared to those who were formula fed. This protective effect of breast milk seems to be explained by the slower pace of growth in breastfed children, compared to those fed with formula. Differences in the rate of weight gain seem to be due to the differences in the composition of breast milk and standard formula. A current hypothesis is that there is a causal relationship between increased protein content of formulas and the accelerated weight gain in the first months of life, namely the risk of obesity.

Although most of the formulas used in EU countries and Romania are in accordance with the European Directives, there are relatively wide limits in terms of composition and certain proteins and carbohydrates may contain either factors of protection, or risk for child obesity.

It is known that formula-fed infants have more weight gain during the first months of life than breastfed infants and that this contributes to an increased risk of

childhood obesity. When birth weight exceeds 4000 g, it can be assumed that breastfeeding maintains a protective role against obesity, or formula with a suitable composition could be beneficial.

Patients and methods

We aimed to carry out a prospective study on newborns weighing more than 4000 grams at birth during a minimum period of three months, to record the anthropometric parameters of the parents, including mother's weight gain during pregnancy, comorbidity (diabetes, hypertension), newborn anthropometric parameters, mode of delivery, type of feeding and formula in the mixed or artificial feeding. Our study population was selected from six maternity hospitals in Romania: Bucharest, Cluj-Napoca, Iasi, Targu-Mures, Sibiu and Oradea. All infants weighing more than 4000 grams at birth, born in these hospitals after February 2014, were enrolled.

Results

Our study group was made up of 179 neonates, born on a period of three months (March-May 2014) in six large maternity hospitals from Romania. Their distribution according to the place of birth is shown in Figure 1. The highest number of macrosomic infants was registered in Cluj-Napoca (n=55), followed by Iasi. The smallest number of enrolled infants was in Sibiu (n=5).

Distribution of cases

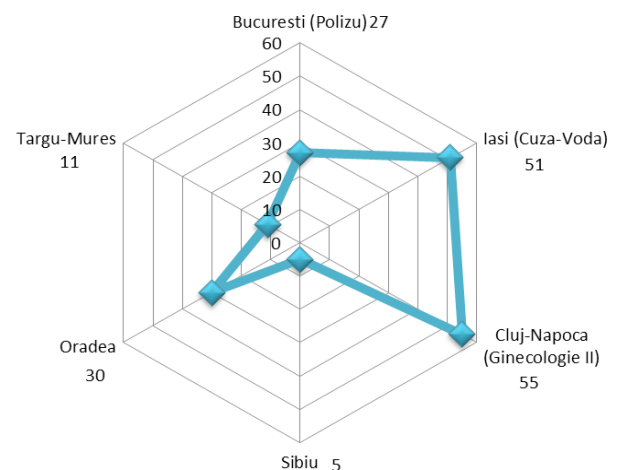


Figure 1. Distribution of infants according to the place of birth

According to gender, there was a high prevalence of males in our study group (74%) (Figure 2). According to the mode of delivery, there was a high incidence of cesarian section (54%), mainly due to fetal-pelvic disproportion.

The mothers of macrosomic infants gained a mean weight of 16.8 kg during pregnancy; 5.9% gained less than 5 kg, 33.9% had a weight gain between 16 and 20 kg and there were 6.8% of women who gained more than 25 kg (Figure 3).

Gender and mode of delivery

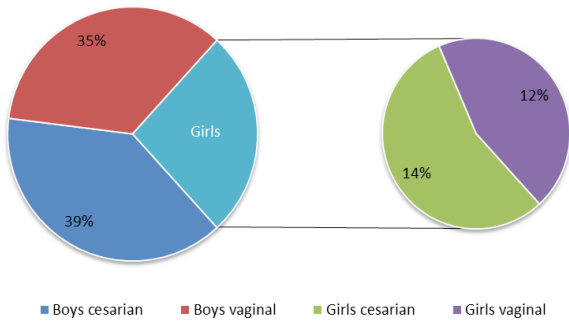


Figure 2. Gender of newborns and mode of delivery

Mother's weight gain during pregnancy

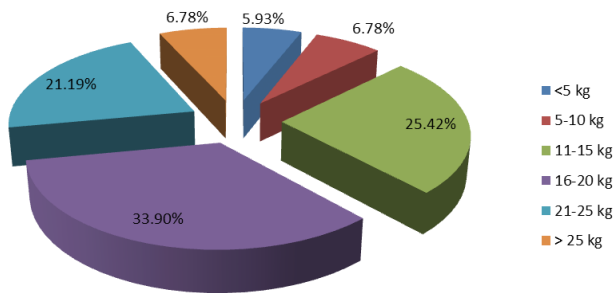


Figure 3. Mother's weight gain during pregnancy

The newborns had a mean gestational age of 39.5 weeks +/- 1 SD (min. 37 weeks, max. 43 weeks) and a mean birth weight of 4195 grams +/- 225 SD (min. 4000 g, max. 5300 g). Most of the newborns included (71%) had birth weights between 4000 and 4200 grams, and less than 2% had birth weights of more than 5000 g (Figure 4).

Histogram of birth weights

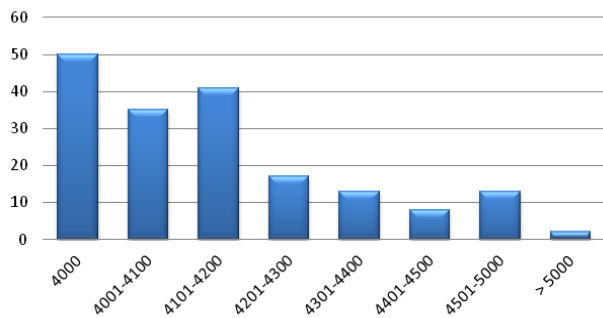


Figure 4. Distribution of newborns by birth weight

Apgar scores of macrosomic infants were above 8 in 91.2% of cases (Figure 5), with a median value of 9. Complications at birth included difficult adaptation to the extrauterine environment in 10 cases, neonatal

hypoglycemia (n=21) and birth trauma, such as clavicle fractures, swelling of the scalp or face bruising in 45 cases (Figure 6).

Infants were usually fed in the first two hours after birth, in order to prevent hypoglycemia. In our study, a small percentage of infants (1.63%) were fed during the first 30 minutes, 63% were fed during the second hour after birth. Only 5.6% needed postponing of the first feeding for more than two hours, due to various conditions that required intensive care (Figure 7).

Only 32% of the macrosomic newborns were breastfed at discharge, 18% were formula-fed and 50% received mixed feeding (both breast milk and formula), due to the inadequate lactation of their mothers (Figure 8).

Discussion

Pregnancy itself is considered a risk factor for maternal obesity, especially if the mother has no weight loss during pregnancy. Also, the risk of weight gain increases with each new pregnancy [1].

The body mass index (BMI) of parents is one of the determinants of the offspring's BMI [2]. The mechanisms that control obesity should involve not only the influence of genetic factors and dietary habits in the family, but also the early influences resulting from mother-child interaction.

Apgar scores

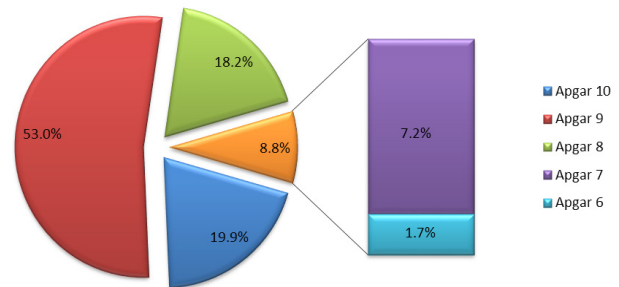


Figure 5. Apgar scores in the studied group

Neonatal conditions

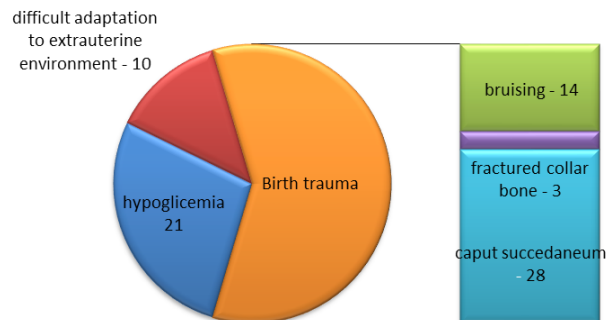


Figure 6. Neonatal conditions at birth

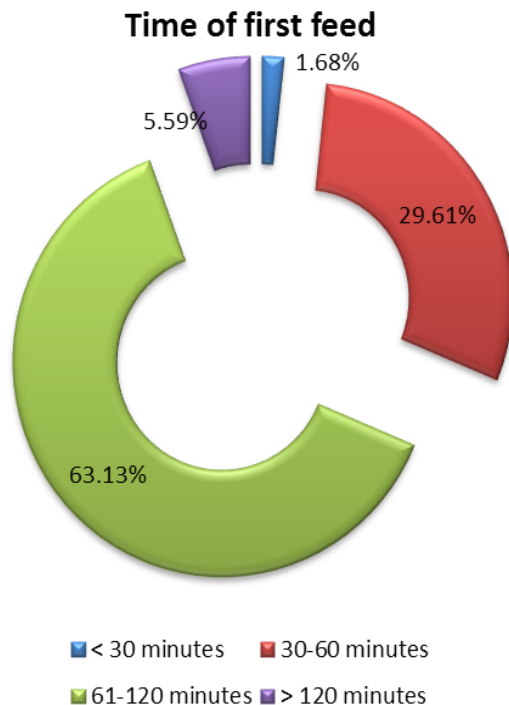


Figure 7. Time of first feed

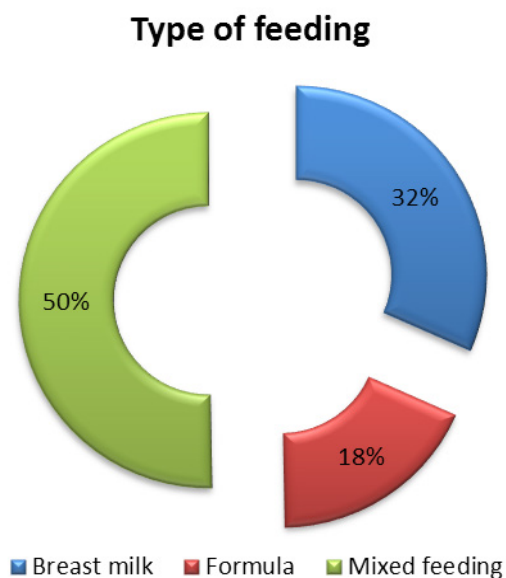


Figure 8. Type of feeding

Data from various studies that have examined the influence of parents' weight on the newborn's weight proved to be discordant [3-6].

Maternal obesity has been linked to higher blood pressure values in offsprings [7].

The mother's excessive weight gain was correlated with higher birth weight and the rising incidence of

macrosomia [8].

Macrosomia is a key concern for both the obstetrician and neonatologist. Besides affecting the mother, a child who weighs more than 4000 grams at birth, regardless of gestational age, involves risks, such as intrauterine death, hypertrophic cardiomyopathy, shoulder dystocia, fracture of the clavicle and humerus, brachial plexus injury, meconium aspiration, hypoglycemia, increased risk for need of neonatal resuscitation. Even if they overcome these perinatal complications, the risk of obesity in infancy, childhood and adulthood still remains.

Once these problems are known and reported, the question is how we can intervene through diet, to make sure infants with macrosomia do not become overweight or obese adults [9].

Regarding the mother's diet, it has been shown that food quality matters more than the quantity of maternal diet and the glycemic index of the various types of food increases the risk of macrosomia [10].

When choosing the type of formula for the macrosomic newborn, its composition is assumed to play an important role in the weight gain, mostly during first year of life, but also further on. Increased protein intake during the first year of life has a tremendous influence on the future development of overweight and obese children by providing rapid cellular growth and leaving the infant prone to frequently occurring associated metabolic conditions.

Conclusions

Macrosomia itself attracts the risk of birth by cesarean section risk (54% of study group) and a low rate of exclusive breast milk feeding (32% of study group) at discharge.

Cesarean section reduces the incidence of breastfeeding, but nor had vaginal delivery a positive influence on breastfeeding in our study.

In our study group, 22.3% of the fathers and 11.7% of the mothers had had large birth weights, which does not confirm the hypothesis that macrosomia engenders macrosomia.

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