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Overnutrition in Adolescents Born Preterm

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Abstract

Introduction: Children born preterm are at higher risk of overnutrition in adolescence, which is manifested by increased body mass index-for-age (BMI-for-age) and increased abdominal fat mass leading to the risk of non-communicable chronic diseases.

Objectives: The aim of this research was to study how prematurity influences overnutrition in a cohort of adolescents born preterm.

Methods: The study included 91 adolescents born preterm (ABP) from a cohort and a control group of 91 adolescents born at term (ABT). Body mass index and fat mass were determined for all the subjects.

Results: The follow-up of BMI-for-age of the children born preterm showed that the highest proportion of overnutrition was found in the first year (65%) and in adolescence (33%). At this age, no differences were found between the ABP and ABT. Body fat of the ABP was higher than for the ABT ($p \leq 0.01$). Both groups' waist circumference was higher than the normal value at this age. The ratio between BMI and the percentage of fat between ABT and ABP boys was significant at p=0.003.

Conclusions: Both ABP and ABT groups had excess weight, which could be due to the fact they grew up in the same environment that promotes unhealthy lifestyles. The ABP boys had excess fat mass leading to the risk of non-communicable chronic diseases in adulthood.

Keywords: Adolescent born preterm; Overnutrition; Abdominal fat; Waist circumference

Introduction

Studies of children born preterm have followed up postnatal growth of weight and height up to adulthood and related this growth to subsequent size and adiposity measures in adolescence and early adulthood. Findings have shown increased total body fat and higher abdominal adiposity, hypertension, arteriosclerosis, cardiovascular diseases, and resistance to insulin [1]. The trend of overnutrition in adults born preterm is greater in men, who have exhibited increased and altered fat mass distribution [2]. Adverse results associated with those born preterm can be extended to the next generation, that is, children of parents born preterm are at higher risk of increased abdominal adiposity although they are born at term [3].

Recent cohort studies of children born preterm have reported that adults with extremely low birth weight exhibit catch-up growth in childhood and adolescence although the disadvantages in height persist as compared to born at term controls [4]. Other authors report that this pattern can increase the risk of insulin resistance and coronary heart disease [5]. The aim of this research was to study how prematurity influences overnutrition in a cohort of adolescents born preterm.

Patients and Methods

A cohort of children born preterm (1995-1996) and residing in the Province of Ñuble, Chile, was followed up from birth to the age of 15-16. The present study included 91 adolescents born preterm (ABP) and a control group of 91 adolescents born at term (ABT) residing in the urban areas of Chillán and San Carlos [6]. Each group consisted of 56 girls and 35 boys. The following anthropometric measures were performed: weight, height, waist circumference, skinfolds, and blood pressure. Body mass index-for-age (BMI-for-age) and gender were compared to the WHO (2007) reference to assess nutritional status.

Data analysis was performed with the STATA 12.0 software. The following tests were used for the association of variables: Chi-square, Fisher's exact test, Student's t-test for independent samples, and Spearman's correlation analysis. The normal distribution was evaluated by the Shapiro-Wilks test at a significance level of $\alpha<0.05$.

Results

The follow-up of the nutritional status of the children shows that 65% exhibited overnutrition at age 1, which decreased to 30.5% at age 2 and increased to 35.6% at age 3 and 36.1% at age 4. This decreased from age 5 (32.8%) to age 9-10 (21.2%). However, there was a substantial increase to 33% in adolescence at age 15-16 (Figure 1).

When overnutrition was compared in adolescence, no significant differences were found between ABP and ABT. According to gender, ABP girls had 33.5 ± 4.0% body fat and boys 34.4 ± 5.7% whereas ABT girls had 32.9 ± 5.3% and boy's 29.0 ± 8.4% ($p \leq 0.01$). Waist circumference for ABP girls was 77.7 ± 6.7 cm and 103.8 ± 6.7 for boys. A significant correlation was found between BMI and the percentage of fat mass of overnourished ABT and ABP boys (r=0.66; p=0.003). This correlation was not detected in adolescent girls. When comparing ABP boys and girls, a correlation was found in those who were overnourished (r=0.58; p=0.005).

Discussion

The number of children born preterm who were obese in the first year was high but gradually decreased to adolescence; however, those who were overweight significantly increased between prepuberty and adolescence. This contrasts with the results found by Vasylyeva et al.

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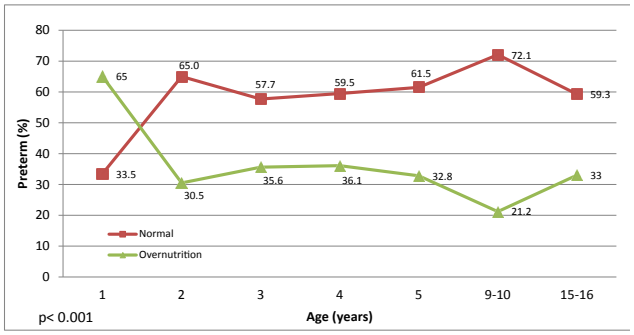

Figure 1: Overnutrition behavior in ABP from 1 to 15-16 years of age.

[7], who observed an increase with age. It draws our attention that 65% of the children exhibited excessive weight gain in the first year, which means a higher probability of being obese in adulthood and suffering cardiovascular diseases and diabetes [8].

Overnutrition in the control group was similar to the experimental group for both ABP and ABT; this situation is comparable to the results found in the last Chilean National Health Survey (ENS). This is a matter of great concern as a risk factor for non-communicable chronic diseases. Moreover, adolescents who are obese at 11.5-16 years of age have a probability of 40.0% to 59.9% of being obese in adulthood, and this value is more than 60% between the ages of 16 and 20 [9].

Waist circumference increased in both groups of adolescents, demonstrating an excess of abdominal fat that is directly related to the changes in the lipid profile, increase in blood pressure, and hyperinsulinemia, which are considered as risk factors in the development of chronic diseases such as type 2 diabetes mellitus and cardiovascular diseases [10]. These results are similar to those determined by Mathai et al. [11] where the preterm-born group had more total fat tissue due to increased internal abdominal fat and no increase in non-abdominal fat tissues; furthermore, boys had higher total fat tissue compared to girls.

Among the limitations of the present study, we can point out that overnutrition is measured by BMI, which is considered as a body mass indicator, although the formula is a substitute measurement of body fat and measures excess weight instead of excess fat. Furthermore, it does not allow assessing body fat distribution; it is therefore not possible to analyze the individual's cardiovascular risk, which is higher when fat is located around the abdomen. It is important to consider height and sexual maturity in adolescents because these factors influence the amount of body fat.

It is concluded that both groups of adolescents had a high percentage of excess weight, which could be due the fact they grew up in the same environment that promotes unhealthy lifestyles; these unhealthy lifestyles characterize the current context of the Chilean population. Adolescents also had excess fat mass, higher in ABP boys, which could lead to cardiovascular risk in adulthood. Therefore, strategies to prevent the development of obesity should establish early childhood intervention programs, which need to be maintained throughout childhood.

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