Nutritional Status and Lipid Profile of Young Children in Brazil

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Summary

Objective: To evaluate the nutritional status and lipid profile of young children from an urban Brazilian region.

Methods: Cross-sectional study involving a representative sample of 472 children aged 5–8 years from Jundiaí city. The nutritional status was assessed by the body mass index for age. Total cholesterol and fractions (low-density lipoprotein cholesterol, high density lipoprotein cholesterol) and triglycerides concentrations were determined by automated enzymatic methods. The results were analyzed by the student t-test and Fisher exact test.

Results: Overweight/obesity was observed in 22% of the children and thinness in 3.2%. Girls presented a higher prevalence of overweight/obesity (24.0%) and lower levels of high-density lipoprotein cholesterol (22.8%) compared with boys (19.7% and 10.6%), respectively (p < 0.001). The prevalence of children with elevated and borderline total cholesterol was 32.8% and 26.7%, respectively, although 82.8% had desirable levels of high-density lipoprotein cholesterol.

Conclusion: The prevalence of overweight/obesity and dyslipidaemia observed in these children is a matter of concern considering the age group evaluated.

Key words: overweight, obesity, dyslipidaemia, children.

Introduction

Nutritional status assessment is important for all age groups, and it represents the cornerstone of health interventions during childhood. Monitoring the growth and development of children is fundamental for the early identification of health problems and risks of morbidity and mortality rate [1], especially when considering the increasing prevalence of overweight/obesity in Brazil and in the world [2]. Nutritional disorders at birth [3–6] or in childhood and the emergence of risk factors for cardiovascular diseases during childhood [5, 6] are a public health challenge in developing countries. The early identification of these disorders permits the adoption of adequate preventive and curative measures.

Dyslipidaemia, apparently, starts in childhood and is associated with wall thickening of the medial and intimal layer of the arteries, insulin resistance and reduced arterial elasticity, influencing the onset of atherosclerosis [5].
Studies have shown an association between anthropometric measurements, elevated low-density lipoprotein cholesterol (LDL-c) and reduced serum concentrations of high-density lipoprotein cholesterol (HDL-c) in childhood [2, 7], and coronary artery diseases in adulthood. Routine serum measurement of triglycerides (TG) is also recommended because of their frequent association with atherosclerotic cardiovascular disease and other metabolic disorders [8].

In Brazil, assessment of lipid disorders in childhood is rarely performed, a fact that increases the number of unidentified or undertreated subjects who continue to have an unfavourable lipid profile. Therefore, studies investigating the prevalence of dyslipidaemias in this age group are required in view of the need for effective and early interventions to prevent cardiovascular diseases.

The objective of the present study was to assess the nutritional status and lipid profile of young children from an urban region in Brazil.

Methods

This study is part of a cohort that involved low-income pregnant women attended by the Brazilian National Health System in all health services and hospitals of Jundiaí city and followed up between 1997 and 2000 until the birth of their children. Further details about the study are published elsewhere [9].

The present prospective cohort study conducted between November 2004 and December 2006 consisted of three phases, involving the women from the previous cohort study and their respective children. The results of the first two phases are reported here.

During the first phase of the study conducted between November 2004 and December 2005, 649 mother–infant pairs responded to a questionnaire regarding socio-economic and demographic data. The second phase comprised the period between January and September 2006 and involved 506 children for nutritional status and lipid profile assessment.

The nutritional status of the children was evaluated by the body mass index (BMI), and it was classified according to the World Health Organization [10], which defines BMI percentiles for age and gender. According to this classification, being overweight was defined as a BMI > 85th and <=97th percentile, and obesity was defined as a BMI > 97th percentile. Weight and height of the children were determined according to the methods of Cameron [11] and Jelliffe and Jelliffe [12].

Assays for total cholesterol (TC) and HDL-c were performed by a colorimetric enzymatic method, using the Bayer ADVIA 1200 clinical chemistry system (Pittsburgh, PA, USA). The concentrations of LDL-c were determined by the Friedewald [13] formula. TG concentrations were determined photometrically after an enzymatic reaction, using the Bayer ADVIA 1200 clinical chemistry system. TC and fractions and TG concentrations were classified in accordance with the recommendations of the First Guidelines for the Prevention of Atherosclerosis during Childhood and Adolescence [14]. The reference values for the paediatric population are as follows: TC < 150 mg/dl, LDL-c < 100 mg/dl, HDL-c ≥ 45 mg/dl and TG < 100 mg/dl [14].

Descriptive analysis of the data was performed using the STATA 9.0 software (College Station, TX, USA). A 95% confidence interval and a level of significance of 5% (p < 0.05) were adopted for all tests. Fisher exact test was used to compare the percentage of children with abnormal values of BMI and biochemical parameters according to gender.

The study was conducted according to the World Medical Association’s Declaration of Helsinki and was approved by the Ethics Committee of the School of Public Health, University of São Paulo, Brazil.

Results

According to Table 1, the sample consisted of 472 children, the majority (53.8%) were girls. The mean age of the children was 78.77 ± 0.36 months, and the mean per capita income was R$ 331.04 ± 277.3 (R$ 350.00 = ~US$ 77.00).

The prevalence of children with overweight and obesity was 22.04%, with a higher prevalence of overweight and obesity in girls (24.02%) compared with boys (19.72%), although the difference was not statistically significant (p = 0.07) (Table 2).

<table>
<thead>
<tr>
<th>Variables</th>
<th>n (%)</th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>218</td>
<td>(46.2)</td>
</tr>
<tr>
<td>Female</td>
<td>254</td>
<td>(53.8)</td>
</tr>
<tr>
<td>Age (months)</td>
<td></td>
<td>78.77 (0.36)</td>
</tr>
<tr>
<td>64–74</td>
<td>146</td>
<td>(30.9)</td>
</tr>
<tr>
<td>75–85</td>
<td>213</td>
<td>(45.1)</td>
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<tr>
<td>86–97</td>
<td>113</td>
<td>(24.0)</td>
</tr>
<tr>
<td>Per capita income (MBW)a</td>
<td>331.04 (277.3)</td>
<td></td>
</tr>
<tr>
<td>&lt;1</td>
<td>316</td>
<td>(66.8)</td>
</tr>
<tr>
<td>1–3</td>
<td>146</td>
<td>(30.9)</td>
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<tr>
<td>3.1–5</td>
<td>7</td>
<td>(1.5)</td>
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<tr>
<td>&gt;5</td>
<td>4</td>
<td>(0.8)</td>
</tr>
<tr>
<td>BMIb</td>
<td>15.94 (2.33)</td>
<td></td>
</tr>
<tr>
<td>Thinness</td>
<td>15</td>
<td>(3.18)</td>
</tr>
<tr>
<td>Normal</td>
<td>353</td>
<td>(74.79)</td>
</tr>
<tr>
<td>Overweight</td>
<td>63</td>
<td>(13.35)</td>
</tr>
<tr>
<td>Obesity</td>
<td>41</td>
<td>(8.69)</td>
</tr>
<tr>
<td>Total</td>
<td>472</td>
<td>(100.00)</td>
</tr>
</tbody>
</table>

aBrazilian Minimum Wage (R$350.00 = ~ US$ 77).

bBMI [10]; <P3 = thinness, ≥P3 and ≤P85 = normal range, >P85 and ≤P97 = overweight, >P97 = obesity.
With respect to the biochemical parameters, Table 3 shows the existence of higher lipid profile values when compared with the reference values [14] for TC and HDL-c (reference value: TC < 150 mg/dl and HDL-c ≥ 45 mg/dl) and lower values for TG and LDL-c (reference value: TG < 100 mg/dl and LDL-c < 100 mg/dl). The prevalence of children with elevated levels of TC (≥170 mg/dl) and borderline TC (150–169 mg/dl) was 32.8% and 26.7%, respectively. Of these, 29.45% and 15.26% presented elevated levels of LDL-c and borderline TG, respectively, and 17.16% presented reduced levels of HDL-c (<45.0 mg/dl). A significant difference between genders (p = 0.001) was only observed for HDL-c levels.

**Discussion**

The present study assessed the nutritional status and lipid profile of a representative sample of children from a Brazilian city. According to World Health Organization [10] BMI percentile reference, there was a higher prevalence of overweight (13.35%) and obesity (8.69%) among these children than thinness (3.18%). Similar results have been reported in other studies carried out in Brazil, with the observation of an accelerated decline in malnutrition among children and adults and a concomitant increase in the prevalence of overweight and obesity [15–18].

The results of studies conducted during the past 3 decades is indicative of an antagonism of temporal tendencies between malnutrition and obesity, defining one of the characteristics of the process of nutritional transition that occurs in the country [16, 19–21].

Data from the National Health and Nutrition Examination Survey indicate a prevalence of 24.4% of excess weight (BMI between the 85th and 94th percentile) and obesity (BMI > 95th percentile) in the age group of 2–5 years, and the data report a significant increase in the prevalence of...
obesity among children of all age groups since the 1980s [22].

In Brazil, recent studies have reported a prevalence of overweight in the paediatric population ranging from 10.8% to 33.8% according to region, with this percentage progressively replacing the indices of malnutrition [16, 23].

Serum lipid and lipoprotein concentrations undergo marked changes during growth and development, with the observation of two phases of an expressive increase in these levels: up to the second year of life and during sexual maturation [17, 20, 23, 24]. The children involved in this study presented higher mean TC levels than the reference values proposed for the age range of 2–19 years, although higher mean HDL-c values than the reference values were observed for most children of the sample. In the present study, 32.8% of the children presented elevated levels of TC (≥170 mg/dl). This prevalence of dyslipidaemia was high considering the age group studied, and it represents a risk factor for atherosclerosis.

Mean lipid concentrations vary among different studies. A study conducted in northeastern Brazil on 180 adolescents aged 14–17 years found mean TC, HDL-c, TG and LDL-c levels of 123 ± 28, 33 ± 6, 109 ± 22 and 54 ± 24 mg/dl, respectively [23]. These levels are lower than those observed in the present investigation, except for mean TG.

The elevated levels of TC, LDL-c and TG observed in the present study were higher among girls. The lower concentrations of HDL-c observed in girls compared with boys may indicate a higher risk of this population to develop cardiovascular diseases. These findings agree with important national and international epidemiological studies showing elevated concentrations of all lipoproteins and lipids in female subjects, irrespective of age or race [2, 4, 17, 25].

The National Cholesterol Education Program [26] recognizes changes in plasma lipid levels of the general population to be one of the traditional risk markers for coronary atherosclerosis. Cardiovascular disease is currently one of the most serious public health problems, even in Brazil [23], a developing country. Gerber and Zielinski [20], studying 1501 children aged 6–16 years, found that risk factors for cardiovascular diseases can be present since childhood. Even if risk levels persist until adulthood in only a small percentage of these subjects, this represents a significant number of children in risk for cardiovascular diseases that are identified early.

An association between dyslipidaemia and obesity has been reported in various studies [23–28]. This finding demonstrates that dyslipidaemias and overweight/obesity are a matter of concern in childhood and require further investigations regarding family eating habits and lifestyle.

The results of this study suggest the need for nutritional intervention programmes and programmes addressing early lifestyle changes to reduce the risk of metabolic disorders and/or vascular diseases for these children in adolescence and adult life.

References