Appetite 52 (2009) 735–739

Contents lists available at ScienceDirect

Appetite

journal homepage: www.elsevier.com/locate/appet

Research report

Meal consumption patterns and anthropometric measurements in adolescents from a low socioeconomic neighborhood in the metropolitan area of Rio de Janeiro, Brazil

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ARTICLE INFO

Article history:
Received 22 September 2008
Received in revised form 30 March 2009
Accepted 30 March 2009

Keywords:
Meal consumption
Adolescents
Nutritional status
Body mass index
Waist circumference
Waist-to-hip ratio

ABSTRACT

We investigated the association between meal consumption and anthropometric measurements in a probabilistic sample of 528 12–18-year-old adolescents assessed in a population-based cross-sectional study developed in the Rio de Janeiro Metropolitan Area, Brazil. A score ranging from zero to nine according to the frequency of meal consumption (breakfast, lunch and dinner) assessed meal patterns which were defined as satisfactory or unsatisfactory. Nutritional status was defined by the sex- and age-specific body mass index cut-offs. Underweight was observed in 5.7% of the adolescents (8.6% boys, 2.5% girls) and overweight in 20.9%. The omission of breakfast was observed in 4.5% of the boys and 12.4% of the girls. Unsatisfactory meal consumption pattern was more frequent among girls (38.7% vs. 29.2%), and among teenagers over 15 years of age (40.0% vs. 25.4%). Boys with unsatisfactory patterns of meal consumption presented higher means of BMI and of waist and hip circumferences than the ones with satisfactory patterns. The higher values of anthropometric measurement observed among adolescents with an unsatisfactory meal pattern indicate that they may be at risk for overweight or obesity.

Introduction

Healthy eating habits play a fundamental role in growth and development during adolescence. However, throughout this age range, inadequate eating habits are very frequently observed and characterized by a low intake of dairy products, fruits, green vegetables, protein, and iron, in addition to a high consumption of sugar, soft drinks, sodium, and high energetic density items (Bull, 1992; Kazapi, Di Pietro, Avancini, Freitas, & Tramonte, 2001; Keski-Rahkonen, Kaprio, Rissanen, Virkkunen, & Rose, 2003). Inadequate dietary patterns have also been associated with an increasing prevalence of overweight among adolescents (Nicklas, Baranowski, Cullen, & Berenson, 2001). In the United States, between 1971 and 1994, the prevalence of overweight among adolescents increased from 16.8% to 27.3% (Wang, Monteiro, & Popkin, 2002). During the same period, in Brazil, the prevalence of overweight in adolescents increased from 2.6% to 11.8% for boys and from 5.8% to 15.3% for girls (Veiga, Cunha, & Sichieri, 2004). Moreover, there is evidence that the prevalence of adolescent overweight has continued to climb in both countries (IBGE, 2006; Ogden et al., 2006).

It is believed that breakfast omission promotes an inadequate energy and nutrient intake, especially of calcium, whose main sources, such as milk and dairy, are usually consumed in this meal. Additionally, having breakfast has been associated with better eating choices and improvements in the quality of teenagers' diet (Barton et al., 2005). The absence of breakfast has also been associated with a decreased intellectual performance and a nutritionally unbalanced diet (Nicklas, O'Neil, & Berenson, 1998).

Irregular meal consumption is a common practice among teenagers and the most neglected meal is breakfast. According to Nicklas, O'Neil, and Myers (2004), the habit of having breakfast has decreased among North American teenagers since 1980. In Brazil, the omission of breakfast has been observed in about 10–15% of adolescents surveyed in studies carried out in different regions of the country (Bismarck-Nasr, Frutuoso, & Gambardella, 2006; Feijó et al., 1997; Fonseca, Sichieri, & Veiga, 1998; Garcia, Gambardella, & Frutuoso, 2003; Santos et al., 2005; Vieira, Priore, Ribeiro, & Franceschini, 2005).

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doi:10.1016/j.appet.2009.03.017

Longitudinal studies in the United States demonstrated that adolescents who did not have breakfast regularly presented higher body weight and body mass index than the ones that have this meal on a regular basis (Affenito et al., 2005; Berkey, Rockett, Gillman, Field, & Colditz, 2003). However, Nicklas et al. (2004) did not find an association between meal consumption and overweight in American teenagers. In Brazil, it has been described that teenagers commonly substitute lunch and particularly dinner for snacks (Feijó et al., 1997; Vieira et al., 2005). Nevertheless, the association between meal consumption and the teenagers' nutritional status has not been investigated.

Considering the importance of understanding the factors involved in the increasing prevalence of overweight in Brazilian adolescents (Barría & Amigo, 2006; IBGE, 2006; Veiga et al., 2004; Wang et al., 2002) it is crucial to determine the patterns of meal consumption and its association with anthropometric measurements indicative of gains in body fat. This study aims to evaluate the frequency of meal consumption and its association with nutritional status among adolescents living in a low socioeconomic neighborhood in the metropolitan area of Rio de Janeiro in Brazil.

Methods

A population-based cross-sectional study was carried out in Campos Elíseos, a neighborhood located in a municipality from the metropolitan area of Rio de Janeiro (Duque de Caxias), which is approximately 27 km (17 miles) far from the state capital, encompasses an area of 4683 km^2 (292.7 sq. miles) and has 842,890 inhabitants. This study used a probabilistic cluster sample selected in three stages: in the first one 75 census sectors were selected from the existing 322 in the study area; in the second stage, 1125 households were drawn (15 residences per sector); finally, in the third stage, one adolescent was randomly selected from the households where there was more than one individual in the required age range. Information was collected from 1085 households (96.4%), of which 540 had at least one teenager who matched the eligibility criteria (age between 12 and 19 years, non-pregnant), and it was possible to obtain data from 528 adolescents.

The data were collected by a team of 16 well-trained interviewers and six nutritionists between May and December, 2005. The interviewers attended three training sessions regarding the questionnaire and anthropometric measuring procedures, according to Habicht (1974). After training, the precision and accuracy of the anthropometric measurements were evaluated.

Weight was measured by means of an electronic scale with 100 g variation; stature was measured using a portable stadiometer with 0.1 cm variation. Waist circumference (WC) was measured in the narrowest part of the torso between the ribs and iliac crest, and hip circumference (HC) was measured in the largest circumference in the gluteus region, both by means of non-stretching measuring tape with 0.1 cm variation. Stature, WC and HC were measured twice, and the average was considered in the analysis. Body mass index (BMI = weight/height^2) and the waist-to-hip ratio (WHR) were calculated. Anthropometric measurements were taken with the subjects wearing light clothing and no shoes.

Age- and gender-specific BMI cut-offs were utilized for the overweight and obesity classification, according to the criteria set by the International Obesity Task Force (Cole, Bellizzi, Flegal, & Dietz, 2000). The World Health Organization (WHO, 1995) criterion was applied for the underweight classification.

The frequency of consumption of the main meals (breakfast, lunch, and dinner) was ascertained by the application of self-administered, closed-ended questions. The questionnaire specifically asked the frequency of consuming lunch or dinner as a 'meal' and the frequency of having lunch or dinner 'replaced by snacks'. It was assumed that the 'meals' were constituted according to the traditional Brazilian lunch or dinner habits, which are composed by staple foods such as rice and beans accompanied by meat and vegetables (Assis, Nahas, Bellisle, & Kupek, 2003; Sichieri, 2002). Conversely, it was also assumed that snacks consumed by adolescents, in general, are of poor nutritional quality and are composed by high energy density items, including sugar added beverages (Doyle & Feldman, 1997; Schneider, 2000). So, for computing the meal pattern score, only 'meals' were considered as a proper lunch and/or dinner.

For each meal, the following options of consumption frequency were available: "daily", "three to six times a week", "once or twice a week", and "never or hardly ever". A score was elaborated assigning values to each answer according to the frequency of consumption, in such a way that the value "zero" was attributed to the "daily" frequency, and the value "three" to the "never or hardly ever" frequency. Thus, the score ranged from zero to nine (the sum of the points assigned to the consumption of breakfast, lunch, and dinner). For the purpose of our study, a satisfactory pattern of meal consumption was considered to be that in which the score had a value equal to zero or one. The frequency (and respective 95% confidence intervals – 95% CI) of underweight, overweight, and satisfactory/unsatisfactory meal consumption patterns was estimated. The association of these variables with sex and age strata (from 12 to 14.9 and from 15 to 18.9 years of age) was assessed by the chi-square test.

Differences in anthropometric variable means according to meal consumption pattern were compared utilizing the Student's *t*-test. Crude and BMI-adjusted means of WC, HC and WHC for the groups with satisfactory and unsatisfactory meal patterns were compared. Analyses were made taking into account the effect of the study design and data were expanded for the study population. A *p*-value less than 0.05 was considered to be a statistically significant difference.

The research protocol was approved by the Institutional Review Board of the Rio de Janeiro State University. Prior to signing an informed consent to allow their children to participate in the survey, parents or guardians received a complete description of the investigation objectives and the procedures used to collect data. Additionally, the confidentiality regarding personal data and the right to remove the consent at anytime were also provided.

Results

The study sample was composed of 265 male (50.2%) and 263 female (49.8%) participants. Body weight, stature, and waist-to-hip ratio means were higher for the boys, but BMI and hip circumference means were greater for the girls (Table 1).

The prevalence of underweight was 5.7% (boys: 8.6%; girls: 2.5%; $p = 0.02$), and the prevalence of overweight was 20.9% without significant difference between boys and girls (Table 2).

The habit of having breakfast on a daily basis was observed in 77.1% of the adolescents. Boys ate breakfast regularly more often

Table 1
Means and 95% confidence interval (95% CI) of age and anthropometric measurements of adolescents living in Campos Elíseos, Duque de Caxias, Rio de Janeiro, Brazil, 2005.

	Boys ($n = 265$)		Girls ($n = 263$)	
	Mean	95% CI	Mean	95% CI
Age (years)	15.4	15.1–15.7	15.5	15.2–15.9
Body weight (kg)	56.8	54.5–59.0	54.0	52.0–55.9
Height (cm)	165.0	163.3–166.6	158.1	157.2–159.0
Body mass index (kg/m^2)	20.6	20.1–21.2	21.5	20.9–22.2
Waist circumference (cm)	70.5	69.0– 72.2	68.7	67.3–70.2
Hip circumference (cm)	86.6	84.2–89.0	90.7	88.8–92.7
Waist-to-hip ratio	0.82	0.81–0.82	0.75	0.74–0.77