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Applied nutritional investigation

Fiber intake, constipation, and overweight among adolescents living in Sao Paulo city

Érica Bloes de Carvalho, M.S.[a], Márcia Regina Vitolo, Ph.D.[b], Cíntia Mendes Gama, Ph.D.[b], Fabio Ancona Lopez, M.D., Ph.D.[c], José Augusto C. Taddei, M.D., Ph.D.[c], and Mauro Batista de Morais, M.D., Ph.D.[d,*]

[a] *Postgraduate Course of Nutrition, Federal University of Sao Paulo, Sao Paulo, Brazil*
[b] *Public Health Department, Federal Foundation Faculty of Medical Sciences, Porto Alegre, Brazil*
[c] *Nutrition and Metabolism Division, Federal University of Sao Paulo, Sao Paulo, Brazil*
[d] *Pediatric Gastroenterology Division, Federal University of Sao Paulo, Sao Paulo, Brazil*

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Abstract

Objective: This study evaluated the dietary fiber intake of adolescents in the metropolitan area of Sao Paulo city and any association between low dietary fiber intake with constipation and overweight.

Methods: In total, 716 adolescents were included within the study, of whom 314 attended private school and 402 attended public school. Evaluation of fiber intake was based on a 24-h daily intake record and a frequency questionnaire. Data concerning bowel movements and height and weight measurements were also taken.

Results: Fiber consumption, below that recommended ("age + 5"), was found in 61.8% and 41.4% ($P = 0.000$) of girls attending private and public schools, respectively, and in 44.1% and 25.6% of boys ($P = 0.001$). Adolescents who did not eat beans on more than 4 d/wk presented a higher risk of fiber intake below that recommended (age + 5; $P < 0.05$), with odds ratios ranging from 10.4 to 14.2 according gender and private or public schooling. Dietary fiber intake below that recommended was associated with a greater risk ($P < 0.05$) toward overweight in students attending public schooling (odds ratios 2.84 and 2.95 for males and females, respectively). Low dietary fiber intake was not associated with constipation.

Conclusion: Intake of beans more than four times per week is associated with the appropriate level of fiber intake. Dietary fiber intake below the recommendation was not associated with constipation but was associated with being overweight among those students attending public schooling.

Keywords: Dietary fiber; Teen health; Constipation; Overweight

Introduction

Dietary fiber has been considered an important nutrient that can provide a beneficial effect to health [1,2]. Dietary fiber may be used in the treatment and prevention of many diseases such as obesity, cardiovascular disease, type 2 diabetes, colonic diverticulosis, and constipation [2].

Adolescence is considered a risky period in which to adopt feeding habits that constitute a diet with high energy density and an insufficient intake of specific nutrients, including dietary fiber [3–5]. According to studies conducted concerning the eating habits within a typical Brazilian family, fiber intake was neither included [6] nor studied [7,8] among teenagers. In general Brazilian studies analyzed themselves towards analyzing the relation between dietary fiber intake and intestinal chronic constipation [9–11]. Dietary fiber intake by adolescents has been assessed in some countries [12–14], but in Brazil this subject has not previously been studied.

Taking into consideration that obesity has been described for Brazilian adolescents [15,16] and the possible existence

* Corresponding author. Tel./fax: +55-11-5579-5834.
E-mail address: mbmorais@osite.com.br (M.B. de Morais).

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of a relation between low dietary fiber intake and constipation [11,17] and overweight [18], this study evaluates low dietary fiber intake by adolescents within private and public schools in Sao Paulo and its association with constipation and overweight.

Materials and methods

Subjects

This study analyzed the information obtained from a project that evaluated the prevalence of obesity in adolescent students enrolled at three different schools (one private and two public schools) in the district of Vila Mariana, in the southeast area of Sao Paulo city [19]. The sample included 716 adolescents. In the private school, 314 were included in the study from among 2581 adolescents (56.6% females and 43.4% males). The adolescent sample from the public schools consisted of 402 of 2062 adolescents (58.2% females and 41.8% males). The students were randomly selected using a computer program that considered the number within each grade. The sample was adequate for an expectation of 40% of adolescents to have a dietary fiber intake lower than that recommended ("age + 5"). According to the Stacalc module of Epi-info 6.4, considering a power of 80.0% and an α value of 5.0%, from the total population of the public and private schools (4643 adolescents), and using an oscillation of 4% in the proportion of adolescents with fiber intake lower than that recommended, the number of students should be 513. Consequently, the number of adolescents ($n = 713$) included in this study was larger than necessary for this project's aim.

The study was approved by the ethics committee of the Federal University of Sao Paulo (UNIFESP)/Paulista School of Medicine. Signed consent forms were obtained from parents, guardians, and/or adolescents.

Methods

Food intake evaluation

The 24-h daily record intake [20] was used as a food-intake quantitative method. The technique consisted of asking for the amounts and types of foods consumed during the 24 h of the previous day, starting at breakfast. The types of foods or preparations regularly consumed more than four times a week were also requested. This qualitative analysis of food consumption or specific food groups was determined by means of a frequency questionnaire [21]. This strategy enabled the classification of adolescents into those with or without low dietary fiber intake according to their food frequency consumption of different types of foods or food groups. The denomination "non-daily consumption" was used when the food was consumed fewer than four times a week.

Fiber intake evaluation

Total dietary fiber intake was defined by using a table based on the Association of Official Analytical Chemists (AOAC) [22], a method used to determine dietary fiber (soluble + insoluble) content in foods.

Dietary fiber intake was considered low when consumption was lower than the minimum recommended by the American Health Foundation for age (age in years + 5) [23]. Results were also expressed according to fiber amount per 1000 cal [24] in the diet (fiber density). Dietary fiber density was calculated by dividing fiber intake (grams) by total energy intake (kilocalories) multiplied by 1000. The energy value of the diet was obtained with Sistema de Apoio à Nutrição 2.5 (Nutrition Support System 2.5) from the Health Informatics Center of the UNIFESP/Paulista School of Medicine.

Evaluation of intestinal habit

Evaluation of intestinal habit was based on answers to questions regarding defecation frequency, consistency and shape of feces, and pain during defecation. The occurrence of fewer than three bowel movements per week or evacuation of hard, scybalous, pebble-like, or cylindrically cracked form associated with pain during evacuation was considered indicative of intestinal constipation [25,26].

Definition of overweight

Weight and height measurements were taken as recommended previously [27]. Weight was determined by means of a digital balance with the adolescents wearing light clothes and being barefoot. The height measurement was taken using a stadiometer with millimeter accuracy (Microtoise-Stanley-Mabo Ltd., Poissy, France) and a 2-m extension with a plastic sight glass for readouts and a cross-staff attached to both ends.

Classification of nutritional status was based on body mass index (BMI; weight in kilograms divided by height in meters squared) as recommended by the World Health Organization [27]. The table prepared by Must et al. [28] was used as a reference in accordance with gender and age. The BMI of each adolescent was rated according to the following classification: underweight, BMI $<5\%$; normal weight, BMI between 5% and 85%; overweight, and BMI $\geq 85\%$,

Statistic analysis

The database was created with Epi-info 6.4 and statistical analysis was done with Jandel Sigma Stat for Windows (Systat Software Inc., Richmond, CA, USA). Odds ratios were calculated to evaluate the relation between "insufficient fiber consumption" with "excessive body weight" and "constipation" and were determined with Epi-info. A multiple logistic regression model (MULTLR program) was used to evaluate gender, type of schooling, and low dietary fiber intake as associated factors related to the consequences (constipation and overweight).