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NUTRITIONAL STATUS OF SCHOOL CHILDREN FROM THE LOW AMAZON RIVER

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ABSTRACT

To investigate the nutritional status of children (3-19 years) of both sexes of Parintins, AM. This is a cross-sectional epidemiological survey conducted in 2013 in public schools linked to the School Health Program (PSE). The nutritional status of children was assessed by body mass indicators, height and BMI adequate for age, according to the growth curves of the World Health Organization. Descriptive measures and comparison between proportions were adopted, with 5 % significance level. The prevalence of nutritional inadequacy according to indicator of low height for age highlighted the prevalence of stunting, which proportions are different between boys (16.2 %) and girls (83.9 %) in all age groups. Stunting among girls warns for the need for preventive measure to avoid malnutrition and growth deficits.

Keywords: anthropometry, body growth, child health, adolescent health, Height-age.

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INTRODUCTION

Different studies have shown the nutritional transition process occurred in Brazil in recent years. In less than two decades, the nutritional status of the general population changed from a continuing decline in malnutrition cases[1-5] to a growing prevalence of excess weight in the forms of overweight and obesity[2,5].

Poor nutrition has been the main responsible for the occurrence of nutritional disorders, growth deficit and anemia in schoolchildren[7-8]. Health in childhood and adolescence has been compromised by the different practices of urban life, in which behavioral changes, especially related to food habits, have been observed. In the case of urgent risks, it is believed that nutritional problems identified in childhood and adolescence can trigger potential risk factors predisposing to cardiovascular diseases in later stages of life[8].

Anthropometric measurements of weight, height, age and sex are the most widely used elements to produce indicators to evaluate nutritional status9. The increase in the prevalence of nutritional inadequacy, especially in relation to overweight in childhood and adolescence, has caused extensive discussion in recent years and it is considered a public health problem worldwide[9-10] and deserves special attention in developing countries like Brazil.

Despite the recognition of this global change in body patterns, there are economic, cultural and lifestyle differences in Brazil that directly influence the nutritional status of the population. Among the states of Northern and Northeastern regions, there is evidence of a double burden of problems associated with nutritional inadequacy8,11, with a tendency to be more significant in rural areas and traditional populations12-13.

Government programs have been proposed in order to monitor health conditions and identify regions of higher risk still at early ages. Among national public policies for monitoring and promotion of health in children and adolescents in Brazil, the School Health Program (PSE) stands out, which is a partnership between Ministries of Health and Education14. The PSE has been the main intersectoral strategy to promote continuous actions of health education and longitudinal evaluation of the health conditions in schoolchildren[14].

The implementation of PSE in public schools favors the monitoring of the nutritional status of children and adolescents, and promotes health interventions directed to the main risk factors identified among students. Therefore, this study aims to investigate the nutritional status of children (3-19 years) of public schools, linked to the PSE, in the city of Parintins, AM. Analyses will be carried out comparing sexes at different ages.

METHOD

This is an epidemiological cross-sectional study conducted in 2013 in public schools linked to the School Health Program (PSE) of Parintins, Amazonas. The study was approved by the Ethics Committee on Human Research of the Federal University of Amazonas (UFAM) under protocol No. 860 883. The principal of each school signed the free and informed consent form (ICF) authorizing the study, as well as the legal guardians of students for their participation.

Parintins is located in the Lower Amazon river, eastern state of Amazonas. This equatorial zone has hot and humid climate and was populated by Indians, mainly from SateréMawé ethnicity, and by Japanese colonies that came to Brazil during the Second World War. According to the Brazilian Institute of Geography and Statistics, the city's population is approximately 111,575 inhabitants[15].

According to documentary sources from the Department of Health, eight schools are linked to the PSE. The population consisted of students enrolled in kindergartens, elementary and high schools and six of these schools are located in equidistant regions in the municipality. Schools eligible to participate in the study should, in addition to being linked to the PSE, present the schedule of participation in educational and health evaluation actions held during the School Health Week in June 2013.

A school census was held, which included students who met the following criteria: i) maximum age of 19 years; ii) enrolled in schools linked to the PSE in the school year 2013; iii) ICF signed by legal guardians. Students who did not meet the age criteria were evaluated, but data were not considered in the analyses.

Data collection team consisted of 19 undergraduate students from the Physical Education course and a supervisor. In the two weeks prior to the survey, undergraduate students were recruited and submitted to training lasting an average of four hours for implementation and standardization of the anthropometric measurements and completion of procedures. During this period, schools were informed about the visit schedule and data collection and parents and / or guardians were informed in advance about the assessment and proper clothing that students should wear to perform the anthropometric measurements. The measurements were performed in the last week of June, lasting five days, during school hours.

Body mass was measured with AccumedBalmac digital scale with accuracy of 0.1 kg and height with a tape measure with accuracy of 0.1 cm fixed to the wall on a flat surface with the aid of support placed on the head of individuals against the wall, according to standard procedures16. Based on these measurements, body mass index (BMI) was calculated by dividing body weight by the squared height.

The study outcome, nutritional status, was assessed using three indicators: body mass and proper height for age and BMI. The classification criteria adopted were the growth curves of the World Health Organization[17-18]. The independent variables were age, calculated from the date of birth and evaluation and sex (male and female).

Data were analyzed using descriptive statistics (mean, standard deviation, absolute and relative frequency). According to the Kolmogorov-Smirnov normality test, data did not present normal distribution and the averages in each age group between sexes were tested by the Mann-Whitney U-test. To test differences between proportions of outcomes between sexes in each age group, the chi-square test was used. Analyses were performed using the SPSS v.15.0 software and the significance level for all analyses was 5 %.

RESULTS

Overall, 1,349 children (50.4 % boys) aged 3-19 years, mean age of 11.3 (SD = 4.28) participated in the study. Of anthropometric data, height was the main variable that showed differences in the comparison between sexes: at ages of 4 and from 15 to 19 years, values were significantly higher for boys and at 12 years for girls (Table 1).

Body weight showed differences for ages of 4, 12, 13, 17, 18 and 19. At 4 years and from 17 to

19 years of age, boys had higher values than girls and at 12 and 13 years, girls were heavier than boys. BMI showed differences only for the age of 18, with higher values for boys (Table 1).

Age	M	F	Height (m)			Body mass (kg)			BMI (kg/m^2)		
			Boys	Girls		Boys	Girls		Boys	Girls	
	n	n	Mean (sd)	Mean (sd)	p*	Mean (sd)	Mean (sd)	p*	Mean (sd)	Mean (sd)	p*
3	12	13	0.95 (0.03)	0.97 (0.04)	0.40	14.2 (1.64)	14.2 (2.77)	0.68	15.8 (1.36)	15.0 (1.78)	0.23
4	46	53	1.00 (0.05)	0.97 (0.05)	< **0.01**	15.7 (3.11)	14.4 (1.63)	**0.02**	15.5 (1.78)	15.2 (1.49)	0.69
5	44	36	1.06 (0.04)	1.05 (0.05)	0.12	17.1 (1.75)	16.4 (1.81)	0.07	15.1 (1.49)	14.8 (1.17)	0.55
6	55	51	1.12 (0.06)	1.11 (0.06)	0.21	19.1 (3.04)	18.6 (3.00)	0.26	15.1 (1.54)	15.1 (2.01)	0.58
7	14	07	1.21 (0.04)	1.19 (0.05)	0.45	22.3 (4.73)	19.6 (1.90)	0.09	15.4 (3.19)	13.8 (0.79)	0.08
8	23	14	1.23 (0.04)	1.23 (0.07)	0.99	22.7 (2.58)	24.5 (6.71)	0.65	15.1 (1.34)	15.9 (2.57)	0.50
9	15	22	1.30 (0.07)	1.30 (0.08)	0.95	26.6 (4.85)	26.6 (6.87)	0.60	15.7 (1.75)	15.5 (2.77)	0.40
10	39	28	1.34 (0.07)	1.36 (0.06)	0.21	29.5 (7.61)	30.0 (6.36)	0.71	16.3 (2.73)	16.3 (2.92)	0.79
11	45	50	1.38 (0.06)	1.39 (0.09)	0.32	32.9 (7.50)	33.1 (6.61)	0.60	17.1 (2.79)	17.2 (3.80)	0.69
12	61	78	1.40 (0.08)	1.44 (0.08)	< **0.01**	34.5 (6.00)	37.1 (7.24)	**0.03**	17.6 (2.57)	17.8 (2.76)	0.46
13	78	91	1.48 (0.11)	1.49 (0.09)	0.27	40.3 (8.18)	42.0 (7.31)	**0.04**	18.4 (3.21)	18.9 (3.08)	0.14
14	68	71	1.54 (0.09)	1.52 (0.09)	0.15	45.3 (9.33)	44.8 (7.40)	0.96	19.1 (3.28)	19.4 (3.03)	0.41
15	50	64	1.61 (1.00)	1.55 (0.08)	< **0.01**	50.2 (9.34)	47.9 (10.18)	0.16	19.3 (2.59)	20.0 (4.16)	0.33
16	52	40	1.63 (0.09)	1.57 (0.06)	< **0.01**	52.6 (11.01)	50.0 (7.63)	0.31	19.7 (3.12)	20.4 (2.99)	0.19
17	42	26	1.63 (0.06)	1.55 (0.05)	< **0.01**	53.5 (8.65)	49.3 (7.43)	**0.04**	20.3 (3.51)	20.4 (2.69)	0.58
18	19	19	1.68 (0.07)	1.57 (0.07)	< **0.01**	58.8 (7.99)	47.2 (9.05)	< **0.01**	20.9 (2.78)	19.1 (2.90)	**0.05**
19	17	06	1.66 (0.09)	1.53 (0.07)	**0.01**	58.6 (12.76)	47.2 (6.08)	**0.05**	21.2 (3.10)	20.2 (1.72)	0.62

M: male; F: female; sd: standard deviation; **p* value of U Mann-Whitney test.

The proportions of low height for girls were significantly higher for all age groups compared to boys (Figure 1). The overall proportions of indicators were different between sexes only for height for age. All girls had low (83.9 %) or very low stature (16.1 %) for age and in boys, the percentage was 16.2 % and 3.4 % for low to very low stature (p <0.01). The prevalence of low weight for age was 12.5 % for boys and 8.5 % for girls, and for the “high” classification, the prevalence was 3.2 % for boys and 2.2 % for girls (p = 0.279). According to BMI, low weight was present in 9.3 % of boys and 9.1 % of girls, while the proportion of overweight was 12.6 % and 11.7 %, respectively (p = 846) (data not shown).

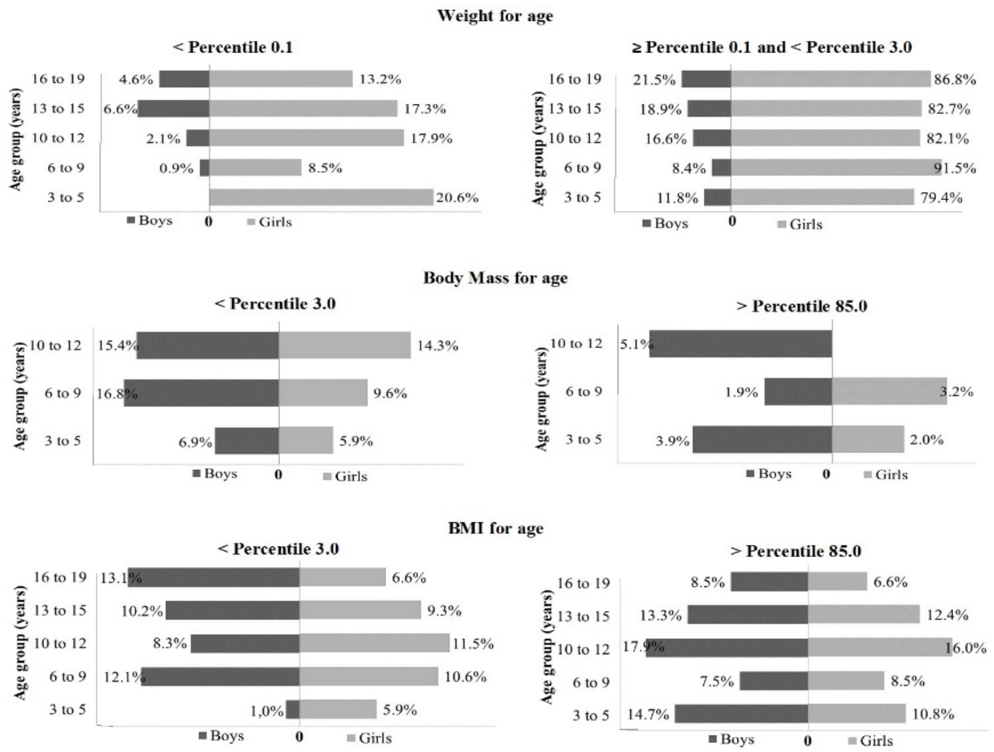

Figure 1. Proportion of poor nutritional status of schoolchildren by sex according to age groups. Parintins, AM, 2013.

DISCUSSION

The main findings of this study showed that boys are taller than girls at ages of 4 and from 15 to19 years, heavier at 4 and from 17 to 19 years and have higher BMI at the age of 18. On the other hand, girls are taller than boys at the age of 12 years and heavier from 12 to 13 years. Regarding proportions, girls had higher proportions of height deficit in all age groups.

The results observed when comparing the average height values between sexes in each age group corroborate data from literature[19-20] and were lower than those observed in indigenous children from Canada aged 8-14 years[21]. Nationwide survey found similar results for high stature of boys aged 15-17 and for girls at the age of 12 years[20].

In relation to body mass for age, in Xavante children[22], the proportion reached 16.5% of those with less than five years and 9.4 % in those younger than 10 years. Among adolescents from different regions of the country, it was found that girls are heavier at the age of 12 and boys are heavier than girls from the age of 14; however, the latter differs from data of the present survey, as higher weight values for boys were only observed from age of 17 years[20].

Differences found between boys and girls for height and body mass for age can be explained by the growth spurt and maturation, stages of physical development that girls experience at the age of 12 or 13 years. This phase is characterized by an increase in body weight and development of secondary sexual characteristics, a process that only occurs about two years later in boys[19].

All the girls showed height deficit, and in the comparison of proportions by age group, they differed from boys. The results of study conducted in Northern Brazil indicate the clear presence of malnutrition and show a reality devoid of public and private actions to change this profile[8,11,23-24].

In the capital of Amazonas, Manaus, significant changes in the growth curve were found both in the height / age ratio as in the weight / age ratio, where 16.1 % of children and adolescents showed sharp growth deficits[25]. At the age group of 7-10 years, research in other states of the Northern region of Brazil indicate prevalence of low weight for height of 11 % in Porto Velho[23] and 16.6 % in Belém[24]. The above results are lower than the prevalence of low weight for height found in this study.

Data from the National Survey of Demography and Health of Children and Women, in 2006[12], showed height deficits for age among children under five years, being higher for boys compared to girls, unlike results observed in this study. The survey also highlighted the growth delay of children from rural areas of Brazil (7.6 %), being more significant in the Northern region (14.9 %).

Differences in the nutritional status of children and adolescents are even more severe when residents of Indigenous villages are assessed. Research carried out with children from Xavante indigenous population also found that boys and girls are lower than children from the reference population. In children under five years, the prevalence of stunting was 31.7 % and 21.6 % in those younger than 10 years. When considering the adequacy of the weight / height ratio, the prevalence of low weight is significantly lower (0.9 %)[22].

The low stature for age among children under five years of Guarani indigenous villages located in southeastern Brazil reached prevalence of 52.4 % for boys and 48.4 % for girls[26]. In TiGuarita indigenous children of the same age group, the prevalence of stunting was 34.7 %, with higher prevalence for boys[27], and in Surui indigenous younger than 5 years, the prevalence was 31.4 %[7].

Among children under 10 years of different Brazilian ethnic groups, prevalence of low height for age of 11.1 and 46.3 % was observed[13], while in Pakaanóva indigenous children from Rondônia, 45.8 % of children aged 2-10 years had height deficit28. Among Suruichildren from Amazonas, the prevalence of low height for age was 25.4 %[7]. The stunting prevalence found among the indigenous population is higher than in the Brazilian population and values found in this study.

Physical growth is influenced by genetic, physiological compensatory mechanisms caused by malnutrition, as well as by social and environmental conditions[29-30]. Height, specifically, is linked to genetic inheritance from parents; however, environmental factors are the most influential, especially in social issues related to diseases and nutrition[30-31].

When low stature is of genetic origin, it is related to family features, i.e., children grow up below the 3rd percentile and with normal growth rate, but parents (one or both) have low stature. In such cases, there is no delay or damage to growth and these children may remain with low stature in adulthood. However, when the source is environmental conditions, interference occurs at the end of physical growth rate and on stature[25,32].

The process leading to low stature occurs in the first three years of life[33], which is considered chronic malnutrition if diagnosed up to this age, and after, past malnutrition[32]. In Brazil, one of the common causes of short stature is chronic malnutrition, regardless of whether the event occurs in the pre- or post-natal periods[32].

The results found in this study favor the improvement of the scenario of low number of publications on the nutritional status of schoolchildren from the northern region of Brazil, in particular the inner state of Amazonas. Moreover, it has the potential to contribute to the existing scientific advance about the nutritional conditions of children and adolescents in this region since the PSE performs continuous monitoring of the health of schoolchildren. However, there are some limitations such as the choice of school units, since only those linked to the PSE and those who participated in the School Health Week were selected, which does not allow knowing the nutritional status of schoolchildren from other schools that are not linked to the PSE. Despite these limitations, to the best of our knowledge, this is the first work analyzing the nutritional status indicators of schoolchildren in the lower Amazon River.

CONCLUSIONS

The assessment of nutritional status of schoolchildren in the lower Amazon River monitored by PSE showed inadequacy for the indicator height for age in all girls, while in boys, the proportion was approximately two out of 10 evaluated. The results found should be used to consolidate and expand the participation of schools in the PSE health monitoring activities as well as measures to prevent child malnutrition, growth deficits and overweight, which when initiated at school age and continued through adolescence, are more effective. In addition, further studies aimed at investigating growth trends and nutritional status of this population through PSE actions and the joint work between municipal administration and the university should be carried out.

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