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original article

Physical growth and nutritional status of schoolchildren from Valley of the Jequitinhonha, Minas Gerais, Brazil

Crescimento físico e estado nutricional de escolares do Vale do Jequitinhonha, Minas Gerais, Brasil

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Abstract – The study analyzed physical growth and nutritional status in a representative sample of schoolchildren from the Jequitinhonha Valley region, Minas Gerais, Brazil. A total of 5100 subjects (2730 girls and 2370 boys) aged 6 to 18 years were included in the study. Nutritional status of the under-10 group was assessed by z < -2 for weight-for-height and height-for-age (undernutrition) and by z > +2 for weight-for-height (overweight). For children over 10, the 5th and 85th percentiles of weight for age were used to assess underweight and overweight respectively, according to World Health Organization recommendations. Prevalence rates of overweight and obesity according to the International Obesity Task Force criteria were also calculated. The data showed a prevalence of undernutrition below the expected level for the reference population (girls, 1.2%; boys, 3.9%). The prevalence of overweight was approximately 13% for girls and 6% for boys, and obesity was 2% for both sexes. In short, the results indicated a low prevalence of undernutrition and a high prevalence of overnutrition. This shows an urgent need for implementation of educational intervention programs geared to the improvement of physical activity and appropriate dietary habits in this population.

Key words: Adolescents; Anthropometry; Children; Obesity; Overweight; Undernutrition.

Resumo – *O estudo analisou o crescimento físico e o estado nutricional em amostra representativa da população escolar do Vale do Jequitinhonha, Minas Gerais, Brasil. A amostra foi constituída por 5100 sujeitos (2730 moças e 2370 rapazes), com idades entre 6 e 18 anos. O estado nutricional dos escolares menores de 10 anos de idade foi identificado pelos escores z < -2 (desnutrição) para os índices massa corporal para estatura e estatura para idade, e pelos escores z > +2 para o índice massa corporal para estatura (sobrepeso). Para os maiores de 10 anos, foi empregado o índice de massa corporal em relação à distribuição de percentis para sexo e idade para diagnóstico de baixo peso corporal (< P5) e sobrepeso (> P85) de acordo com proposta apresentada pela Organização Mundial da Saúde. Foi estimada, também, a prevalência de sobrepeso e obesidade de acordo com pontos-de-corte sugeridos pela International Obesity Task Force. Os dados mostraram prevalência de desnutrição menor (moças 1,2% e rapazes 3,9%) do que o esperado para a referência. A prevalência de sobrepeso se aproximou de 13% e 6% entre as moças e os rapazes, respectivamente, e a de obesidade em torno de 2% em ambos os sexos. Em sendo assim, os resultados encontrados indicaram baixa prevalência de desnutrição e prevalência de sobrepeso em proporções preocupantes. Portanto, mostra que existe urgente necessidade quanto à implementação de programas de intervenção educacional direcionados à promoção da prática de atividade física e de hábitos dietéticos adequados.*

Palavras-chave: *Adolescentes; Antropometria; Crianças; Desnutrição; Obesidade; Sobrepeso.*

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INTRODUCTION

Information on the physical growth of young populations has been extensively presented and discussed in the literature[1]. This concern is justified, as monitoring of physical growth is consensually accepted as a sensitive tool for measurement and follow-up of health conditions in specific populations, in view of its contribution to the diagnosis of potential dietary deficiencies, particularly protein-energy malnutrition and overweight and obesity[2].

Some researchers believe indicators of physical growth can be considered one of the most important markers of quality of life in populations worldwide, or an extension of existing distortions among the various subgroups within a single population[3]. This view is based on the assumption that potential within- and between-population variations in physical growth indicators may be at least partly justified by genetic background. However, environmental attributes play an essential role. Among the environmental factors most likely to contribute to variation in physical growth, two are particularly significant: adequate nutrition and meeting of basic public health care needs[4].

Hence, some experts have advocated the use of information on physical growth as a biological manifestation a book reflects the level of technological and socioeconomic development of specific communities[5,6]. In this context, there has long been an emphasis on the need to conduct studies of physical growth indicators in underdeveloped and developing countries[7].

Given the importance of this topic and its contribution to measurement of population-wide living conditions, it has prompted substantial interest among Brazilian researchers in the field[8-11]. However, with few exceptions[12,13], there has been very little research on indicators of physical growth among children and adolescents living in the less socioeconomically and culturally developed regions of Brazil. The objective of this study was to analyze physical growth and nutritional status among schoolchildren living in the Jequitinhonha Valley region, state of Minas Gerais, Brazil.

METHODS

This study is part of a larger cross-sectional, population-base descriptive survey of anthropometric and sociodemographic indicators among schoolchildren living in the Jequitinhonha Valley of Minas Gerais. Data collection took place from August to November 2007. All study protocols were approved by the Universidade Estadual de Montes Claros –Research Ethics Committee (judgment no. 529/2006) and followed Brazilian National Health Council Resolution 196/96 guidelines on human subject research.

The Jequitinhonha Valley, located in northeast Minas Gerais and the setting of this investigation, is notoriously one of the poorest regions in Brazil. Its municipalities exhibit some of the worst socioeconomic indica-

tors in the country; 58.8% have Human Development Indices (2007 data) in the 0.57–0.65 range, which corresponds to only 74–85% of the national average. Analysis of the infant mortality rate, another textbook indicator of regional development, shows that 51% of municipalities in the Valley have a rate of >40 deaths per 1000 live births[14].

Sample and subject selection

The reference population for the study included all children and adolescents, both male and female, between the ages of 6 and 18 years, who were enrolled in public and private schools in the Jequitinhonha Valley region as of 2007. Sample size was established for a confidence interval of 95%, a sampling error rate of 3%, and a sampling loss of 10%. Subject selection was based on a cluster (probability) sampling strategy, as described in detail elsewhere in the literature[15,16]. In view of the use of cluster sampling, design effect (*deff*) was defined as 1.5, which established the minimum initial sample size as 4800 children. The final sample used for data treatment and analysis comprised 5100 schoolchildren (2730 girls and 2370 boys).

Data collection

Chronological age in years and months was calculated by comparing date of birth and date of data collection. Physical growth and nutritional status were expressed by anthropometric parameters: namely, body mass (weight), height, and body mass index (BMI). Body mass was measured with a balance beam scale (accurate to the nearest 10 g, checked after every 10 weightings) and height was measured with an aluminium stadiometer (resolution 1 mm) according to World Health Organization-recommended procedures[7]. BMI was calculated as the ratio between body mass in kilograms and height in meters squared (kg/m^2).

Measurements were obtained by a team of three trained raters with ample experience in anthropometry. Regarding data quality assurance, body mass and height measurements were checked in duplicate after every 10 subjects. The technical error of measurement ranged from 20 g to 50 g for body mass and 2 to 5 mm for height.

Different indicators were used for identification of nutritional abnormality prevalence rates in different age ranges. In children under the age of 10, weight-for-age and height-for-age z scores, according to the World Health Organization growth curves, was used for detection of undernutrition and overnutrition[17]. In these children, malnutrition was defined by wasting (weight-for-age z scores < -2) or stunting (height-for-age z scores < -2), whereas overweight was defined as a weight-for-age z score of > +2. In those aged 10 or older, BMI-for-age and BMI-for-gender were used for diagnosis: values below the 5th percentile were defined as underweight, and those above the 85th percentile, as overweight.

In view of the difficulty of reaching an international consensus on the most adequate anthropometric criteria for diagnosis of overweight and obesity in adolescence, and in an attempt to facilitate future comparison

of our results to those of previous studies that used other criteria for the diagnosis, we took into account the prevalence of subjects with BMI-for-age and BMI-for-gender values above the 95th percentile as well as International Obesity Task Force (IOTF) cutoff points[18]. For the purposes of the study, the prevalence of overweight and obesity was calculated for three age subgroups: ≤9 years, 10–14 years, and ≥15 years.

Statistical analysis

Statistical treatment of collected data was performed in the Statistical Package for the Social Science (SPSS) 17.0 software environment. Data were initially compared to the normal distribution curve using the Kolmogorov–Smirnov test. Body mass and height measurements were all normally distributed. The study sample was characterized using descriptive statistics (median, mean, and standard deviation) and two-way analysis of variance (ANOVA) with interaction using two criteria for classification: gender and chronological age. Scheffé's method for multiple comparisons was used to identify specific differences.

Analysis of physical growth in the study sample was performed by graphical comparison of median height-for-age against two sets of reference values: (a) corresponding values for the overall Brazilian youth population[19] and (b) the World Health Organization height-for-age reference curve[17]. The prevalence rates of overweight and obesity were calculated according to the frequencies of these conditions, as determined by predefined cutoff values, and their respective 95% confidence intervals.

RESULTS

Table 1 shows statistical measures corresponding to the body mass and height measurements that characterize the study sample. Body mass and height were similar in both genders until approximately the age of 14, with boys becoming heavier and taller than girls thereafter. In girls, height plateaued around the age of 14 or 15, whereas in boys, as expected, the height plateau was reached approximately 2 years later (age 16 to 17). There was no well-defined plateau effect for body mass, which increased progressively in both genders.

Comparison of median height and body mass in the study sample to 2007 WHO reference curves[17] and to those of the overall Brazilian youth population[19] revealed remarkable similarities in the upward trend of all three curves. However, at older ages in both genders, there were differences in the magnitude of median values, confirming the hypothesis that the progression of physical growth can be considered universal, but individual genetic potential and environmental stimuli, as well as the interaction between these factors, can have an impact on its magnitude (Figure 1).

Table 1. Medians, means, and standard deviations (SD) of height and body mass measurements among school children living in the Jequitinhonha Valley, Minas Gerais, Brazil, 2007.

Females							
Age		Height (cm)			Body mass (kg)		
(years)	n	Median	Mean	DP	Median	Mean	DP
6	197	117.84	118.13	5.49	21.15	21.72	3.20
7	217	121.37	121.48	6.14	22.87	23.55	5.92
8	237	126.81	126.42	6.41	24.51	25.79	5.26
9	220	131.25	131.78	6.38	27.34	28.42	5.14
10	218	137.70	138.65	7.62	30.96	32.53	6.89
11	223	146.78	145.53	8.07	35.97	37.58	8.35
12	221	151.13	150.90	7.63	41.11	42.39	8.49
13	215	154.87	154.47	6.44	45.26	46.56	7.93
14	225	157.12	156.62	7.05	48.23	49.51	7.63
15	212	157.23	156.69	5.76	49.16	50.47	7.37
16	198	157.29	157.32	6.73	51.72	52.57	7.30
17	175	158.45	158.37	6.41	52.28	53.12	8.22
18	172	158.65	158.39	6.67	53.84	53.87	7.70
Males							
Age		Height (cm)			Body mass (kg)		
(years)	n	Median	Mean	DP	Median	Mean	DP
6	179	117.08	117.57	7.39	21.64	22.16	3.64
7	190	122.11	122.58	5.31	22.95	23.34	3.42
8	188	126.34	127.17	5.46	24.82	25.89	4.67
9	194	132.09	131.37	6.34	28.04	28.18	4.51
10	190	136.36	136.36	6.98	29.75	31.10	6.78
11	196	143.58	143.49	6.78	34.09	35.28	6.92
12	197	147.94	149.62	9.03	38.22	40.47	9.76
13	187	154.35	154.94	8.71	43.97	44.49	8.76
14	185	161.10	161.02	8.89	48.15	48.97	8.99
15	176	167.83	167.85[a]	7.71	56.07	56.77[a]	8.28
16	169	170.38	169.61[b]	6.34	57.82	58.13[b]	8.97
17	164	170.92	170.67[b]	8.02	58.34	59.69[b]	8.78
18	155	171.03	171.84[b]	7.42	61.86	62.96[b]	9.07
F_{Idade}			2362.27 ($p < 0.001$)			1131.64 ($p < 0.001$)	
F_{Sexo}			364.31 ($p < 0.001$)			55.70 ($p < 0.001$)	
$F_{Idade * Sexo}$			78.77 ($p < 0.001$)			23.89 ($p < 0.001$)	

Superscript letters denote statistically significant between-gender differences:
[a] $p < 0.05$; [b] $p < 0.01$

Among children under the age of 10, the prevalence of stunting (height-for-age deficit) was 1.2% in girls and 3.9% in boys (Table 2). Both rates were lower than expected in view of the reference population. This confirms the similarity in distribution of linear growth between the schoolchildren analyzed in the study and the reference U.S. population in this age range (Figure 1), and shows that stunting is not an issue among schoolchildren living in the Jequitinhonha Valley, Minas Gerais.

Likewise, the prevalence of wasting (weight-for-age deficit) was within the expected range in view of z score distributions in the reference popu-

lation, that is, below 1%: 0.5% among girls and 0.8% among boys in the 6-to-9-year age range. However, the prevalence of overweight was 6.7% among girls and 5.8% among boys. These prevalence rates increased with age, climbing as high as 9.2% among girls and 7.9% among boys at age 9.

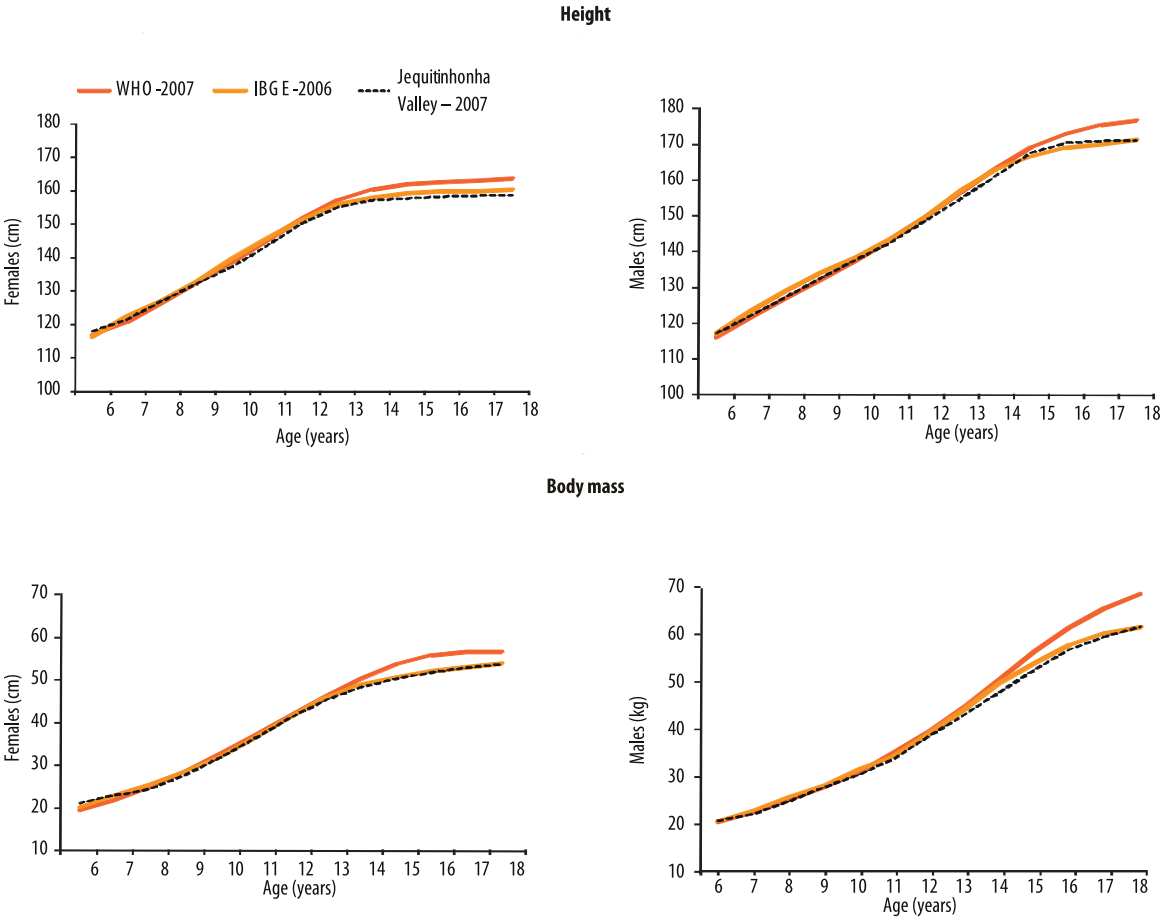

Figure 1. Graphical representation of median height and body mass (weight) for age among schoolchildren living in the Jequitinhonha Valley, Minas Gerais, Brazil, as compared to the overall Brazilian youth population (IBGE, 2006) and WHO reference curves (WHO, 2007).

Table 2. Percent prevalence of malnutrition (stunting or wasting) and overweight in schoolchildren under the age of 10, Jequitinhonha Valley, Minas Gerais, Brazil, 2007.

	Females				Males			
Age		E/I	MC/E			E/I	MC/E	
(Years)	n	z < -2	z < -2	z > +2	n	z < -2	z < -2	z > +2
6	197	4.6	0.4	3.4	179	6.3	0.5	3.1
7	216	1.1	1.1	4.7	190	4.6	0.6	5.3
8	238	1.1	0.8	8.6	188	3.7	0.8	5.9
9	220	0.7	0.2	9.2	194	2.1	0.9	7.9
6 – 9	871	1.2	0.5	6.7	751	3.9	0.8	5.8

In children and adolescents aged 10 or older, the prevalence of underweight was 6.7% among girls and 5.3% among boys, whereas the expected

rate, in view of the chosen cutoff point (BMI-for-age <5th percentile of the reference population), would be 5%. The prevalence of underweight broadly followed a downward trend with increasing age. The prevalence of overweight (BMI-for-age >85th percentile of the reference population) was 13.0% among girls and 6.1% among boys. Overall, 2.3% of girls and 1.4% of boys were above the 95th percentile for the reference population (Table 3).

On the other hand, according to IOFT criteria, the prevalence of overweight in the overall sample (children and adolescents between the ages of 6 and 18) was 13.5% among girls and 6.6% among boys; the rate of obesity was 1.3% in both genders. In girls and boys alike, the prevalence of overweight and obesity followed a downward trend with increasing age. Consolidated overweight among children and adolescents aged 10 or older was 12.6% and 5.6% in females and males respectively, and obesity, 1.2% and 1.1% in females and males respectively. Among children under the age of 10, the consolidated rate of overweight was 15.0% and 8.8% in females and males respectively, and that of obesity, 1.5% and 1.7% in females and males respectively (Table 4).

Table 3. Percent prevalence of underweight and overweight in schoolchildren and adolescents over the age of 10, Jequitinhonha Valley, Minas Gerais, Brazil, 2007.

Age	Female				Males			
(Years)	n	< P5	> P85	> P95	n	< P5	> P85	> P95
10	218	7.0	15.2	3.1	190	6.2	7.2	2.3
11	223	6.8	15.7	2.7	196	5.3	6.8	2.1
12	221	6.6	15.5	2.8	197	5.2	6.2	2.1
13	215	6.1	15.3	2.7	187	5.6	5.4	1.7
14	225	6.3	13.3	2.6	185	5.6	5.7	1.4
15	212	6.6	13.1	2.4	175	4.9	5.3	1.1
16	198	5.4	10.8	2.1	170	4.5	4.8	0.9
17	175	4.7	8.3	1.3	164	4.2	4.7	0.7
18	172	4.8	7.7	1.4	155	3.5	4.4	0.4
10 – 18	1859	6.7	13.0	2.3	1619	5.3	6.1	1.4

Table 4. Percent prevalence of overweight and obesity by International Obesity Task Force (IOFT) criteria in schoolchildren and adolescents, Jequitinhonha Valley, Minas Gerais, Brazil, 2007.

Age	Females			Males		
(Years)	n	Overweight	Obesity	n	Overweight	Obesity
≤ 9	871	15.0	1.5	751	8.8	1.7
10 – 14	1102	14.3	1.3	955	6.7	1.2
≥ 15	757	10.9	1.1	664	4.5	1.0
6 – 18	2730	13.5	1.3	2370	6.6	1.3

DISCUSSION

As the study design source to recruit a representative probability sample of the population of interest, our results provide strong evidence of the physical growth and nutritional status characteristics of school-aged children

and adolescents enrolled in the public and private school systems of the Jequitinhonha Valley region of Minas Gerais. Furthermore, as these two networks of educational facilities provide wide coverage across Brazil, serving, on average, approximately 94% of the 7-to-14 population[20], these findings may provide, with reasonable approximation, the first-ever assessment of physical growth and nutritional status in the entire young population of this region. However, it bears stressing that the Jequitinhonha Valley region is one of the least industrialized areas in Brazil, with municipalities exhibiting the lowest Human Development Indices in the country.

Regarding physical growth, the progression of growth curves reflecting median height-for-age and weight-for-age in the study sample was extremely similar to those of the WHO reference curves[17] and curves constructed using IBGE data[19]. However, with advancing age, the major differences in magnitude were observed.

Regarding height, these curves practically overlapped until the ages of 13 to 14 (earlier in girls). However, the WHO reference curve[17] followed a progressively superior course thereafter, for girls and boys alike, with discrepancies been most pronounced at the age of 18. The median height disadvantage of adolescents living in the Jequitinhonha Valley was no greater than 1 cm around the age of 13 to 14; however, by the age of 18, girls and boys in the study sample were already 4 to 6 cm shorter than the reference curve.

Comparison of the median height measurements of Jequitinhonha Valley girls to those of the overall population[19] showed a minor, temporary advantage in favor of the latter between the ages of 14 and 16. No such difference was found in boys; the median height curve for boys living in the Jequitinhonha Valley practically overlapped with the growth curve for the overall Brazilian youth population. The differences observed in median height of female adolescents, specifically between the ages of 14 and 16, may be attributable to variation in the age of peak biological maturation, as the median height of Jequitinhonha Valley girls was again practically similar to that of the overall age-matched population by age 18, at which point most subjects were likely to be very close to their adult height.

Median body mass measurements followed a trend similar to that of height measurements. However, differences between the WHO reference curve[17] and data collected from our sample of Jequitinhonha Valley children and adolescents were greater, particularly at more advanced ages, which confirms the greater sensitivity of body mass to environmental factors. At the age range immediately preceding the expected peak of biological maturation, body mass ranged from 0.5–1.0 kg below the WHO reference[17] in girls to 0.6–2.5 kg below the WHO reference in boys. With advancing age, this difference became progressively greater in girls and boys alike; by age 18, girls and boys in our sample were approximately 3 kg and 6 kg below the WHO reference weight respectively.

Throughout the study age range, body mass curves constructed from median values for the overall Brazilian youth population were consistently located between the curve constructed from Jequitinhonha Valley data and the WHO reference curve[17]. However, the difference between the two Brazilian curves was much smaller. Among boys and girls alike, the greatest difference was never greater than 2 kg around age 14-15, closing in to <0.5 kg at age 18.

Admitting the WHO growth curves[17] as an international reference designed for the purpose of physical growth monitoring, the median height and body mass measurements of school-aged children and adolescents living in the Jequitinhonha Valley of Minas Gerais, Brazil, confirmed that the strongest indicators of physical growth impairment were found among boys and in late adolescence. A review of the literature showed that differences similar in magnitude to those observed in the present study have also been reported in comparative studies of ethnically distinct youth populations[21]. The controversial nature of the subject notwithstanding, one may speculate as to the feasibility of attributing these differences to genetic aspects. However, the genetic difference hypothesis does not appear to be applicable in this case, as, in the early ages preceding the expected peak of biological maturation, the median height and weight of Jequitinhonha Valley school children were manifestly similar to the WHO reference curve[17].

Therefore, the evidence may suggest that differences in height and body mass found in schoolchildren of both genders in this study after the start of the peak period of biological maturation could be associated with environmental factors that, when interacting with individual genetic potential, leads to inhibition of adequate physical growth. Indeed, this transitional period features highly significant nutritional demands associated with physical growth, and does requires a balanced provision of energy, amino acids, vitamins, and minerals, which play a central role in the secretion of a wide range of endogenous substances. Furthermore, the improved catch-up of height and body mass in girls as compared to boys confirms that physical growth of the female body may be more resistant to adverse environmental influences, although the reasons and mechanisms underlying this phenomenon are still unknown[22].

The potential impairment of physical growth identified at more advanced ages may be associated with the dietary history of the study participants. Dietary assistance programs currently made available to certain segments of the population in underdeveloped Brazilian regions may have contributed to a superior physical growth profile among younger schoolchildren as compared to older adolescents, as one decade ago, when these adolescents were themselves young children, practically no such programs were in place. Similar phenomena have been reported in youth populations of other underdeveloped and developing countries, leading to positive changes in the physical growth trends of children and adolescents[23].

Confirming this trend in nutritional status, our results show that malnutrition was moderate relevant issue among schoolchildren under the age of 10 living in the Jequitinhonha Valley, Minas Gerais. In this population, the prevalence of wasting was less than 1% in both genders, and the prevalence of stunting, 1.2% and 3.9% in girls and boys respectively. These results corroborate the findings of previous population-based studies representative of the Brazilian youth population, which have shown a reduction in malnutrition and a positive trend in height over time among children and adolescents[24,25].

Conversely, excess body weight has arisen as a major nutritional issue that warrants attention in the school-aged population assessed in this study, confirming the strong upward trend in prevalence of overweight and obesity found on comparative analysis of dietary surveys conducted in highly industrialized Brazilian regions over the last few decades[19]. Using this same method of analysis, the prevalence of overweight among Jequitinhonha Valley children under the age of 10 in this study (6.7% among girls and 5.8% among boys) was quite similar to that reported by Anjos et al.[8] in age-matched schoolchildren from the city of Rio de Janeiro (6.3% among girls and 7.7% among boys).

Regarding the prevalence of overweight and obesity, the absence of unanimously defined anthropometric criteria for diagnosis of these conditions in young populations constitutes the greatest obstacle to comparison between information from Brazilian studies and international data. Therefore, in an attempt to facilitate comparison of the findings of this study and those of previous investigations, we chose to define overweight and obesity in our sample according to two different set of parameters: the WHO criteria[17] and the IOFT cutoff points[18]. Analysis of our findings showed no major differences in prevalence rates of overweight calculated using these two different methods among children and adolescents over the age of 10. The prevalence of overweight was 13% and 6.1% among girls and boys respectively using the WHO criteria versus 12.6% and 5.6% respectively using the IOFT cutoff points. For obesity, however, the WHO criteria[17] yielded a prevalence rate of 2.3% and 1.4% in girls and boys respectively, whereas the IOFT criteria[18] yielded a prevalence rate of 1.3% for both genders.

Another major limitation of many Brazilian studies, which hinders comparison of the prevalence rates of overweight and obesity in different Brazilian regions, concerns study design. The vast majority of such studies use nonrepresentative samples of the population of interest. Furthermore, very few Brazilian studies have analyzed children and adolescents as a single population, and there is no consensus as to the age ranges that should be used for stratification of data. Therefore, we chose to compare our findings solely to the data of two prior Brazilian surveys, the Family Budget Survey (*Pesquisa de Orçamentos Familiares*, POF), conducted on data collected in 2002 in 2003 from a representative sample of youths aged

10 to 19 across Brazil[19], and the Living Standards Survey (*Pesquisa de Padrão de Vida*, PPV), conducted in 1996 and 1997 in the youth population of metropolitan areas in Northeast and Southeast Brazil, which are home to approximately 70% of the country's population[26]. The POF defined overweight and obesity according to World Health Organization criteria, whereas the PPV identified overweight and obesity using specific IOFT-recommended cutoff points[18].

Regarding the overall prevalence of overweight, the rate detected among children and adolescents in the Jequitinhonha Valley was markedly lower than those reported in the POF (9.5% versus 16.7%) and PPV (9.7% versus 13.9%). The prevalence of obesity was also somewhat lower than reported in the POF (1.7% versus 2.3%) and PPV (1.3% versus 1.9%).

Comparison of our findings against international data published since the year 2000 showed that, regardless of the criteria used to define excess body weight, the prevalence rates of overweight and obesity detected in this study were lower than those reported in the young populations of North American countries, but higher than those reported in similar populations of Asian and African nations[26].

In this study sample, the prevalence of overweight and obesity was not equally distributed between genders and among age ranges. Girls had higher rates of overweight and obesity than boys, whereas older children and adolescents had lower rates of overweight and obesity as compared to their younger peers. These findings are consistent with those of previous studies, although this phenomenon has yet to be fully explained[28]. The higher prevalence of excess body weight among females is believed to be at least partly attributable to the greater vulnerability of the female body to fat buildup during puberty, due to sex hormone levels. Differences in physical activity habits may also contribute to gender differences in prevalence of overweight and obesity. School-aged boys are consistently more physically active than their female peers, with the difference becoming even greater during adolescence[27].

The fact that overweight and obesity were more prevalent among younger children and adolescents provides further evidence of the need for reconsideration of dietary assistance programs that have recently been implemented in the most underprivileged regions of Brazil, including the Jequitinhonha Valley in Minas Gerais. If, on the one hand, these programs may be addressing a major, widespread nutritional issue—stunting and wasting—that was once highly prevalent in the youth population of these Brazilian regions, it may also be triggering another condition of nutritional origin that is equally deserving of attention: excess body weight. In addition to the notorious impact of overweight and obesity on health and their association with leading causes of morbidity and mortality[29], the literature suggests that children with a high BMI tend to carry this characteristic into adulthood[30]. Hence, the importance of implementing educational activities designed to prevent overweight in childhood and adolescence, as

this stage of life is essential to the construction of health-related behaviors, stances, and habits.

CONCLUSION

The findings reported herein show that, as first nutritional status was concerned, undernutrition (stunting and wasting) was not a relevant issue. Conversely, excess body weight (overweight and obesity) was identified as a noteworthy nutritional imbalance among school children and adolescents living in the Jequitinhonha Valley region of Minas Gerais, Brazil. Pooled data from epidemiological studies showed higher prevalence rates of overweight and obesity in developed as compared to developing regions, an association that can only be changed by cultural modifications and by access to information on weight management and to the health services. Therefore, dietary assistance programs that have recently been implemented in underdeveloped Brazilian regions—increasing the availability of food the population without, however, providing information or public health policies that could protect against excess increases in body weight—may explain the surprising prevalences of overweight and obesity found in this study. Furthermore, an identical phenomenon may be occurring in other communities across Brazil and Latin America, thus contributing to the epidemic of overweight and obesity that is affecting the continent.

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