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Prevalence of extreme anthropometric measurements in children from Alagoas, Northeastern Brazil

ABSTRACT

The objective of the study was to estimate the prevalence of extreme anthropometric measurements in children indicative of their nutritional status. A cross-sectional study was conducted in a random sample of 1,386 children under five in the state of Alagoas, northeastern Brazil. The prevalence of deficits ($z < -2$; WHO-2006 standard) for weight-for-age (underweight), weight-for-height (wasting) and height-for-age (stunting) were 2.9% ($n = 40$), 1.2% ($n = 17$), and 10.3% ($n = 144$), respectively. Excess of weight-for-height (overweight) was seen in 135 children (9.7%). In conclusion, the prevalences of underweight and wasting are epidemiologically irrelevant and stunting and overweight have a similar prevalence.

DESCRIPTORS: Child. Body Weights and Measures. Growth. Child Development. Nutritional Transition. Cross-Sectional Studies.

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INTRODUCTION

Brazil has been undergoing a nutritional transition process characterized by marked reduction in the prevalence of malnutrition and increased frequency of obesity. Although this transition occurs across all population segments, it varies in intensity and over time in different epidemiological environments.³ The northeastern state of Alagoas is the poorest in Brazil and its approximately 3 million inhabitants have the lowest social indicators.^a

Given the scarcity of data on the nutritional status of children under five in the state of Alagoas and its importance to proper planning and evaluation of public policies, the objective of the present study was to estimate the prevalence of extreme anthropometric measurements indicative of the nutritional status of children in Alagoas.

METHODS

The study is part of a project entitled "Diagnosis of maternal-infant health in the state of Alagoas,"^b a cross-sectional household survey with children under five conducted in Alagoas from September 2005 to February 2006.

The calculation of the sample size was based on a prevalence of low height-for-age of 9.5%,² margin of sampling error of 1.5% with 95% confidence interval and an estimated population of 308,000 children. The sample size estimated using "StatCalc" in Epi Info was 1,461 children.

A multistage sampling procedure was performing according to three steps. First, 20 cities were randomly selected by systematic sampling with probability proportional to size (PPS) (the state capital Maceió has one-third of the state's population and was drawn six times). In the second step, eight census tracts were drawn within each city, following the proportion between urban and rural areas. In the third step, a starting point within each area was drawn, from which nine households were visited in a row. All children under five living in these households were eligible for the study. We excluded those children with anatomical or pathological conditions that prevented their evaluation.

To reduce sample loss, there was a second visit to the households where child was absent in during data collection. When there was refusal of the mother or legal guardian to participate in the study, a second contact was made by the field supervisor, accompanied by a health provider, usually a local health worker.

As a result of sample loss ($n = 75, 5.1\%$) due to refusal or children not found at home, the final sample comprised 1,386 children, of which 991 (71.5%) were living in urban areas and 395 (28.5%) in rural areas. The losses were relatively homogeneous between these strata, as well as according to different age groups with no statistically significant differences. Data on weight, height, age and gender were collected by trained interviewers who were properly supervised. Body weight was obtained using a portable electronic scale, with a capacity of 180 kg and sensitivity of 100 g (Mars PP180®, Brazil). For height measurements, children older than 24 months old were measured in standing position in a vertical stadiometer while those under two were measured in supine position using a (horizontal) pediatric stadiometer. Both devices were equipped with an inextensible measuring tape with sensitivity of 0.1 cm. All measurements were obtained according to the recommendations of the Brazilian Ministry of Health.^c

Data were tabulated using Anthro application provided by the World Health Organization (WHO),^d and was converted into anthropometric indices according to the WHO 2006 standards. Based on these indices, the following indicators were produced: underweight (weight-for-age z-score < -2), wasting (weight-for-height z-score < -2), stunting (height-for-age z-score < -2) and overweight (weight-for-height z-score > 2).

The prevalence of nutritional conditions were compared by geographical location of the household (urban or rural, state capital, metropolitan area or inner state) using the chi-square test at a 5% significance level.

The study was approved by the Research Ethics Committee of *Universidade Federal de Alagoas*.

RESULTS

The Table shows the rates of underweight (2.9%) and wasting (1.2%) were not epidemiologically significant because they were similar to those of anthropometric

^a Urani A. Um diagnóstico socioeconômico do Estado de Alagoas a partir de uma leitura dos dados da Pesquisa Nacional por Amostra de Domicílios do IBGE (1992-2004). Maceió: Instituto de Estudos do Trabalho e Sociedade; 2005 [cited 2008 Jan 18]. Available from: http://www.iets.org.br/biblioteca/Um_diagnostico_socioeconomico_do_estado_de_alagoas.pdf

^b Study developed by Ferreira HS at Universidade Federal de Alagoas in 2005/2006 supported by the Foundation for Research Support of the State of Alagoas (process no. 2003.31029448-0) and the Brazilian Ministry of Health (process no. 011/2004 PPSUS/AL).

^c Fagundes AA, Barros DC, Duar HA, Sardinha LMV, Pereira MM, Leão MM. Vigilância Alimentar e Nutricional - SISVAN: orientações básicas para a coleta, processamento, análise de dados e informação em serviços de saúde. Brasília: Ministério da Saúde; 2004 [cited 2007 Sep 16]. Available from: http://dtr2004.saude.gov.br/nutricao/documentos/orientacoes_basicas_sisvan.pdf

^d World Health Organization. WHO Anthro (version 3, April 2009) and macros. Geneva; 2009 [cited 2008 Feb 5]. Available from: <http://www.who.int/childgrowth/software/en/>

standards (2.3%).^a The prevalence of stunting (10.4%) and overweight (9.7%) were high and of similar magnitude since a 1.5% sampling error was allowed in the study.

The highest prevalence of overweight (12.6%) was found in children aged 6.1 to 12 months, whereas stunting (14.1%) was most prevalent among those aged 24 to 36 months.

There was no statistically significant difference between the prevalence of obesity according to place of residence: 10.6% in the capital city, 11.9% in the metropolitan region excluding Maceió, and 9.2% in inner state cities. Although the prevalence of obesity in the urban area was higher than in rural areas, this difference was not significant (10.4% vs. 8.1%, $p=0.23$). Moreover, the prevalence of malnutrition was significantly higher among rural children (9.0% vs. 13.9%, $p = 0.008$).

The proportion of children with stunting in the capital city (6.2%) was significantly lower than in the metropolitan area (13.8%, $p=0.001$) and inner state (12.2%, $p=0.001$), but the difference between the prevalences in the metropolitan area and inner state was not significant ($p=0.61$).

DISCUSSION

The data obtained from the National Survey on Nutrition and Health (PNSN), conducted about 20 years ago (1989), showed that the prevalence of children with stunting in Alagoas was 33.2%.³ A study carried out by the United Nations Children's Fund (UNICEF) in 1993^b found this prevalence to be around 18.4%, showing a reduction of 44.6% in just four years. The present study found a prevalence of stunting of 10.3%. However, using the anthropometric reference of the National Center for Health Statistics (NCHS, 1977), the same one used in PNSN and UNICEF studies, the prevalence of stunting decreased to 7.8%, further increasing the difference with the findings of previous studies. An investigation conducted in 2006 specifically involving children from the semi-arid region of the state ($n = 2,164$ children under five) also used the NCHS-1977 reference and found a prevalence of 9.5%,² which corroborates our results.

As noted, the proportion of malnourished children in Maceió was lower than in the rest of the state, probably due to higher socioeconomic condition and greater access to public services for children living in the capital. Also, lower rates of malnutrition were seen among children in urban compared to rural areas.

In addition to the accelerated decline in malnutrition, there was an increase of overweight in this population. However, it was not possible to analyze this trend as data on excess body weight from previous studies (PNSN-1989, UNICEF-1993) was not available, probably because it was not a relevant public health problem at the time. However, assuming that the prevalence of overweight in Alagoas is similar to that reported for the Northeast region in the PNSN in 1989 (2.4%), it can be noted that the prevalence of overweight in children has alarmingly increased in the state, indicating a need for urgent measures for its prevention and control.

This increase has occurred both in urban and rural areas. This contradicts the argument that the nutrition transition is due to, among other factors, increased access to processed food that accompanies the process of urbanization, coupled with the decline in physical activity level of individuals.³

In Alagoas there were significant socioeconomic, demographic, and infrastructure changes of public services, which may explain the findings of the present study. Carvalho¹ reported that, in 2004, Alagoas had the second lowest human development index in Brazil according to a study of the Institute of Applied Economic Research and the United Nations Development Program (UNDP). Nevertheless, in the 1990s, Alagoas was the Brazilian state that had the most significant advances in terms of education (31%) and health (16%), with a positive variation of approximately 20% compared to other states.¹ Improved management of social investments, especially in elementary school and public health programs, was the main reason for this growth.

It is noteworthy the potential impact on local economy of federal resources in recent years. In 2007, the Family Grant Program benefited around 342,000 families with a total of 22 million reais a month.¹

With regard to the increased prevalence of overweight, Uauy & Kain⁴ claim that malnutrition prevention programs need regular assessments. Its beneficiaries must be clearly defined because of potential effects of obesity, since such programs can promote positive energy balance in individuals not suffering from hunger and malnutrition.

While still showing the lowest social indicators in the country, investments in infrastructure and public services, particularly in health care and education, in addition to large amounts of federal funds injected into Alagoas through income transfer programs, seem to explain at least in part the reduction in the prevalence of child malnutrition. In contrast, the prevalence of overweight has increased steadily to the point that today

^a World Health Organization. WHO Anthro (version 3, April 2009) and macros. Geneva; 2009[cited 2008 Feb 5]. Available from: <http://www.who.int/childgrowth/software/en/>

^b Fundo das Nações Unidas para a Infância. Crianças e adolescentes em Alagoas: saúde, educação e trabalho. Maceió: Governo do Estado de Alagoas; 1993.

Table. Prevalence of extreme anthropometric measurements in children under five years. State of Alagoas, Northeastern Brazil, 2006.

Age (months)	n	Underweight ^a (%)	Wasting ^b (%)	Stunting ^c (%)	Overweight ^d (%)
≤ 6	202	2.0	2.5	7.4	9.9
6.1 to 12	175	5.1	0.0	10.3	12.6
12.1 to 24	330	3.0	1.5	12.1	11.5
24.1 to 36	276	2.2	0.4	14.1	8.3
36.1 to 48	242	2.1	1.2	7.9	9.5
48.1 to 60	161	3.7	1.9	8.1	5.6
Total	1,386	2.9	1.2	10.4	9.7

^a Weight-for-age z-score < - 2

^b Weight-for-height z-score < - 2

^c Height-for-age z-score < - 2

^d Weight-for-height z-score > 2

the two conditions are equally prevalent, emphasizing the importance of maintaining actions for malnutrition control. It is necessary to expand the measures to prevent overweight, considering that both malnutrition and overweight are health problems associated

with serious impact in the short and long term. This is another aspect to be considered by of public policy managers, because it indicates that access to food must be accompanied by an educational process to adequate nutritional consumption and health promotion.

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