DOI: 10.1590/1980-5497201500020014

ARTIGO ORIGINAL / *ORIGINAL ARTICLE*

Prevalence of underweight, overweight and obesity in poor children from Mato Grosso do Sul

Prevalência de baixo peso, sobrepeso e obesidade em crianças pobres do Mato Grosso do Sul

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ABSTRACT: ***Objective:*** To estimate the prevalence of underweight, overweight, and obesity among children who were beneficiaries of the Brazil's conditional cash transfer program Bolsa Família during 2010, according to gender and health in the state of Mato Grosso do Sul, Brazil. ***Methods:*** Descriptive epidemiological study was conducted with a secondary database of Datasus/Sisvan. The data from 19,289 children (9,451 girls and 9,838 boys), aged 5 to 10 years, who benefited from the program Bolsa Família in the state of Mato Grosso do Sul in 2010 were collected. The variables were body weight and height. Body mass index was analyzed with Z-scores of normative tables from the World Health Organization. ***Results:*** The prevalence of underweight was 4.8% among female and 5.6% among male participants. The prevalence of overweight and obesity was, respectively, 14.8 and 9.1% for female participants and 16.1 and 11.9% for male participants. The prevalence of underweight and obesity was lower in cities/towns with a lower Human Development Index, for female and male individuals. The prevalence of overweight in cities/towns with a lower Human Development Index was lower among female participants and higher among male participants. ***Conclusions:*** The higher prevalence of overweight among individuals of lower socioeconomic status indicates the need for understanding macro-factors that can influence the children's nutritional status.

Keywords: Nutritional status. Child. Poverty. Anthropometry. Risk factors. Prevalence.

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Conflict of interests: nothing to declare – **Financial support:** none.

RESUMO: ***Objetivo:*** Estimar a prevalência de baixo peso, sobrepeso e obesidade em crianças de cinco a dez anos de idade que vivem na condição de pobreza e extrema pobreza, de acordo com o sexo e com as mesorregiões geográficas, no estado de Mato Grosso do Sul. ***Métodos:*** Estudo epidemiológico descritivo construído com base em banco de dados secundário, proveniente do Sisvan Bolsa Família/Datasus. A amostra consistiu de 19.289 crianças (9.451 do sexo feminino e 9.838 do masculino), de cinco a dez anos de idade, do estado de Mato Grosso do Sul, beneficiárias do Programa Bolsa Família no ano de 2010. Para classificar o estado nutricional das crianças, utilizou-se escore Z do Índice de Massa Corporal, e, como referência, os pontos de corte do World Health Organization. ***Resultados:*** A prevalência de baixo peso foi presente em 4,8% do sexo feminino e 5,6% do sexo masculino. O sobrepeso e a obesidade tiveram prevalência, respectivamente, de 14,8 e 9,1% para o sexo feminino e de 16,1 e 11,9% para o sexo masculino. As prevalências de baixo peso e obesidade foram menores em municípios com menor desigualdade de distribuição de renda, para ambos os sexos. Quanto ao sobrepeso no sexo feminino, foi menor nos municípios de menor desigualdade, e no sexo masculino, a maior prevalência foi encontrada nos municípios de menor desigualdade em distribuição de renda. ***Conclusão:*** A alta prevalência de excesso de peso em indivíduos de baixo nível socioeconômico aponta para a necessidade da compreensão de fatores macroestruturais que podem influenciar o estado nutricional de crianças.

Palavras-chave: Estado Nutricional. Criança. Pobreza. Antropometria. Fatores de risco. Prevalência.

INTRODUCTION

Changes in the Brazilian historical and socioeconomic context led to changes in the population's behavior, which, in turn, resulted in processes of demographic, epidemiological, and nutritional transition[1]. According to a survey from the Ministry of Health, in Brazilian capitals, from 2006 to 2009, the proportion of people with excess weight increased from 42.7 to 46.6%, and the percentage of obese people increased from 11.4 to 13.9% in the same period[2].

The analysis of nutritional status among children aged from 5 to 9 years old can be observed by comparing the data from the National Study on Family Expenses – ENDEF (1974 – 1975), the National Survey on Health and Nutrition (PNSN) (1989), and the Household Budget Survey – POF (2008 – 2009). The data from ENDEF showed the prevalence of underweight to be 5.7% for male and 5.4% for female participants; PNSN presented 2.2% for the male and 1.5% for the female gender; and POF showed the same to be 4.3% for male and 3.9% for female individuals[3-5].

Regarding overweight, data from ENDEF showed the prevalence to be 10.9% for male and 8.6% for female individuals; PNSN, 15% for male and 11.9% for female participants; and POF, 34.8% for male and 32% for female individuals[3-5]. For obesity, the data from ENDEF presented the prevalence of 2.9% for male and 1.8% for female gender; PNSN, of 4.1% for male and 2.4% for female individuals; and POF, 16.6% for

male and 11.8% for female participants[3-5]. It is worth to mention that the Center-West region had the highest level of variation of boys with excess 8 in 10 years, from 13.8%, in 1989, to 37.9%, in 2008 – 2009[4,5].

The concern with overweight and obesity is owed to the fact that these are commonly associated with comorbidities such as type 2 diabetes mellitus, dyslipidemia, systemic arterial hypertension, cardiovascular diseases, osteoarthritis, and liver changes, and patients who are overweight or obese are more prone to developing psychosocial problems[6]. Being underweight also causes serious health conditions, such as the appearance of infectious diseases due to the low immunity originated from the lack of nutrients, increasing rates of children's mortality, delayed growth and psychomotor development, difficulties in school performance, and reduced productive capacity in adulthood[7].

Brazil is one of the most unfair countries in the world when it comes to the social division of the produced wealth. However, a recent report from the Brazilian Institute of Geography and Statistics has shown that unequal socioeconomic conditions between regions and income strata do not play the same role they did in the past concerning geographic and social distribution, because malnutrition was seen in the poorest strata whereas obesity was a characteristic of the richest[8].

Overweight and obesity were found among children who live in conditions of poverty and extreme poverty, benefitting from the cash transfer program Bolsa Família (PBF) in the state of Sergipe, Brazil; higher prevalence was found in cities with lower Human Development Index (HDI)[9]. Other studies with people living in poverty and extreme poverty benefitting from PBF are rare in Brazil; therefore, it is not possible to infer if people living in poverty and extreme poverty are more underweight, overweight, or obese.

This study aimed at estimating the prevalence of underweight, overweight, and obesity among children aged from five to ten years old, living in conditions of poverty and extreme poverty according to gender and geographic mesoregions of the state of Mato Grosso do Sul, Brazil.

METHODS

This descriptive epidemiological analysis was based on a secondary database from Sisvan Bolsa Família / Datasus, public domain, which can be accessed by the internet[10]. Because of no direct implications for human beings, there was no need to consult with ethics committees.

Datasus is the Computer Department of the Unified Health System (SUS), from the Executive Secretariat of the Ministry of Health, in Brazil. Among other responsibilities, it aims at promoting, regulating, and assessing the actions to computerize SUS[10]. Sisvan (Nutritional Surveillance System) corresponds to an information system that aims at promoting continuous information about the nutritional conditions of the population and the factors that influence it. This information is the base for the decisions made by administrators

of programs related to the improvement of dietary patterns and nutritional status of the population assisted by SUS[11].

Sisvan Bolsa Família records the nutritional status of the beneficiaries of the PBF. The software TabNet enables the access to information regarding the nutritional status of the beneficiaries of the PBF, whose data are recorded in the system and sent by the internet at the end of the validity of the program[11,12].

Data about children aged from 5 to 10 years old in the state of Mato Grosso do Sul, PBF beneficiaries in 2010, were collected for this study. In that year, information was available of about 19,289 children aged from 5 to 10 years old, being 9,415 girls and 9,838 boys.

Mato Grosso do Sul is one of the 27 federating units of Brazil. It has high HDI, of 0.802, gross domestic product (GDP) of R$ 43,514,000, life expectancy of 74 years, illiteracy rate of 8.1%, and mean Gini coefficient of 0.43. Mato Grosso do Sul has 27 cities with high Municipal Human Development Index[13]. It is in the south of the Center-West region and borders the states of Goiás, Minas Gerais, Mato Grosso, Paraná, and São Paulo, besides Bolivia and Paraguay. Its area is of 357,124,962 km^2. In 2012, its estimated population was of 2,505,088 inhabitants. It has 79 cities, distributed into 4 mesoregions:

1. Center-North (formed by 16 cities);
2. East (formed by 17 cities);
3. Southeast (formed by 38 cities); and 4) *Pantanais Sul-Mato-Grossenses* (formed by 7 cities).

The Center-North mesoregion of Mato Grosso do Sul gathers two microregions (Alto Taquari and Campo Grande), with HDI of 0.752, GDP of R$ 2,867,682.69, and mean Gini coefficient of 0.43[13]. The Eastern mesoregion of Mato Grosso do Sul groups four microregions (Cassilândia, Nova Andradina, Paranaíba, and Três Lagoas), with HDI of 0.756, GDP of R$ 411,161.84, and mean Gini coefficient of 9.43[13]. The Southeast mesoregion of Mato Grosso do Sul groups three microregions (Bodoquena, Dourados, and Iguatemi), with HDI of 0.730, GDP of R$ 286,645.76, and mean Gini coefficient of 0.43[13]. The mesoregion of *Pantanais Sul-Mato-Grossenses* gathers two microregions (Aquidauana and Baixo Pantanal), with HDI of 0.734, GDP of R$ 635,563.36, and mean Gini coefficient of 0.46[13].

Body mass index (BMI) was used to classify the nutritional status of children who were beneficiaries of PBF, calculated by dividing body mass (kg) by the square height (m). References were the cutoff points from the World Health Organization[14,15], which have been used by Sisvan since 2008. Anthropometric measurements were collected and registered according to the standards from Sisvan[16]. Body mass is measured with a calibrated scale, both mechanical and digital electronic ones. Height is assessed with a vertical anthropometer or with an anthropometric tape on the wall. Basic care health professionals, in charge of data collection, are given the manual and they should follow the procedures in the document[16]. BMI cutoff points range according to age and can be classified based on percentage and/or Z-score. For this study, information about

the Z-scores was used because they were calculated by Sisvan. Six cutoff points were established for BMI, based on the Z-score (15):

a. accented thinness (Z-score -3);
b. thinness (> Z-score -3 and < Z-score -2);
c. eutrophy (> Z-score -2 and < Z-score +1);
d. overweight (> Z-score +1 and < Z-score +2);
e. obesity (> Z-score +2 and < Z-score +3); and
f. severe obesity (Z-score +3).

For this study, the categories described by letters (a) and (b) were grouped as "underweight"; (c) was grouped as eutrophy; (d) remained as the "overweight" category, and letters (e) and (f) were grouped as "obesity."

For statistical treatment, the TabWin software was used to download the data from the Datasus website and to analyze the information descriptively (absolute and relative frequencies). The software MedCalc was used to calculate the χ^2 test to identify differences between proportions. In all the analyses, a 5% significance level was adopted. To analyze the prevalence of underweight, eutrophy, overweight, and obesity according to the income distribution of the cities in Mato Grosso do Sul, the Gini coefficient of each one of the 79 cities was analyzed. The Gini coefficient is a commonly used measurement of inequality to calculate the unequal income distribution. It consists of a number between 0 and 1, in which 0 corresponds to complete income equality (everyone has the same income) and 1 corresponds to complete inequality (one person has higher income, and the rest have nothing)[17]. The Gini coefficient was divided into tertiles: the first one corresponded to cities whose Gini coefficient was up to 0.43, known for its "low inequality" (n = 25 cities); the second tertile was formed by cities whose Gini coefficient was 0.43 to 0.44, called "medium inequality" (n = 34 cities); and the third tertile was formed by cities with Gini coefficient higher than 0.44, being called "high inequality" (n = 20 cities).

RESULTS

The prevalence of underweight, overweight, and obesity among the investigated children is given in Table 1. Regarding the female gender, the prevalence of underweight was 4.8% whereas that of overweight and obesity was, respectively, 14.8% and 9.1%. Besides, there was statistical difference ($p < 0.05$) in the analysis of underweight, overweight, and obesity according to the mesoregions of the state of Mato Grosso do Sul. The mesoregion of *Pantanais* presented higher prevalence of underweight (5.5%), overweight (16.4%), and obesity (11.2%), when compared to the other mesoregions ($p < 0.01$).

For the male gender, the prevalence of underweight, overweight, and obesity was, respectively, 5.6, 16.1, and 11.9% (Table 1). By comparing the prevalence of underweight

between the mesoregions of the state of Mato Grosso do Sul, the highest prevalence was found in the mesoregion of *Pantanais* (6.5%). The prevalence of overweight and obesity also presented differences between the mesoregions ($p < 0.01$). The highest prevalence of overweight (18.2%) was found in the Southeastern mesoregion, and the highest prevalence of obesity (12.2%) was found in the Center-North mesoregion. Besides, by comparing the prevalence between genders, there was a difference between boys and girls only for obesity, which indicates that obesity was higher among boys than among girls ($p < 0.05$).

Table 2 shows the prevalence of underweight, overweight, and obesity according to the unequal income distribution in the cities of Mato Grosso do Sul (Gini

Table 1. Prevalence rates of underweight, overweight, and obesity among poor children from Mato Grosso do Sul, Brazil, according to mesoregion.

Mesoregion	Underweight		Normal weight		Overweight		Obesity	
	Female	Male	Female	Male	Female	Male	Female	Male
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Center-North	146 (4.7)	178 (6.0)	1482 (73.1)	1510 (68.0)	332 (15.3)	356 (13.8)	190 (6.9)	317 (12.2)
East	62 (4.6)	78 (5.3)	1006 (72.4)	983 (68.0)	210 (12.8)	223 (15.3)	184 (10.2)	235 (11.4)
Southeast	214 (4.3)	221 (4.7)	3126 (73.1)	2838 (65.1)	668 (14.5)	832 (18.2)	395 (8.1)	568 (12.0)
Pantanais	75 (5.5)	93 (6.5)	964 (66.9)	966 (64.4)	245 (16.4)	261 (17.1)	152 (11.2)	179 (12.0)
	$p < 0.01$		$p < 0.01$		$p < 0.01$		$p < 0.01$	
Total	497 (4.8)	570 (5.6)	6578 (71.4)	6297 (66.4)	1455 (14.8)	1672 (16.1)	921 (9.1)	1299 (11.9)*

*$p \leq 0.05$ – χ^2 test – comparison between genders.

Table 2. Prevalence rates of underweight, normal weight, overweight, and obesity in poor children according to inequality in income distribution in municipalities from Mato Grosso do Sul, Brazil.

Inequality	Underweight		Normal weight		Overweight		Obesity	
	Female	Male	Female	Male	Female	Male	Female	Male
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Low	48 (3.9)	54 (3.9)	951 (74.6)	878 (67.4)	162 (14.4)	238 (18.2)	98 (7.1)	133 (10.5)
Medium	148 (4.5)	172 (5.5)	2185 (73.3)	2092 (66.9)	426 (13.2)	548 (15.7)	282 (9.0)	398 (11.9)
High	301 (5.7)	343 (5.9)	3437 (67.7)	3324 (64.6)	866 (16.4)	885 (15.8)	541 (10.2)	767 (13.7)
	$p < 0.01$		$p < 0.01$		$p < 0.01$		$p < 0.01$	

coefficient). Statistical differences were observed between nutritional status and the unequal income distribution for both genders ($p < 0.05$). Among girls, cities with low income inequality presented lower prevalence of underweight (3.9%), overweight (14.4%), and obesity (7.1%) in comparison to cities with medium and high inequality in income distribution ($p < 0.01$). For boys, the prevalence of underweight and obesity was lower in cities with fewer inequalities in income distribution when compared to cities with higher inequality ($p < 0.01$). Also, a difference was observed for overweight among boys, and the highest prevalence was found in cities with less unequal income distribution.

DISCUSSION

This study observed that underweight, overweight, and obesity had been present among children who are beneficiaries of the PBF in the state of Mato Grosso do Sul. Besides, for the female gender, the highest prevalence of underweight, overweight, and obesity was observed in the mesoregions with higher income distribution inequalities. However, for the male gender, the prevalence of overweight was higher in places with less uneven income distribution, whereas the prevalence of underweight and obesity was more common in the mesoregions with higher income distribution inequalities. Besides, the boys presented higher prevalence of obesity than the girls.

International studies carried out in middle- to low-income countries pointed out that the problem of malnutrition and underweight is clearer in places with lower socioeconomic index. A study conducted among 1,599 children and teenagers aged from 5 to 18 years old in 4 urban cities to the south of Nigeria found the prevalence of underweight to be 13.0%[18]. Another study verified the prevalence of underweight to be 50.9% among children aged from 1 to 6 years old living in forest reserves in Malaysia[19]. In the study conducted by Nguyen et al.[20] among students aged from 6 to 19 years old, in Ethiopia, the prevalence of underweight was found to be 20.8%.

In Maceió (Alagoas), a study conducted among children (aged from 4 months to 6 years old), living in slums showed the prevalence of moderate and severe malnutrition to be 8.6%[21]. The Ministry of Health assessed the nourishment program with a sample composed of four cities in the Northeast, and the prevalence of underweight/height was 16.6%[22]. By comparing the data from the Northeast for the prevalence of underweight (8.6 and 16.6%) with that from this study (4.8% among female and 5.6% among male participants), the values of the latter were found to be lower. The prevalence of underweight can vary in the different regions of Brazil. Therefore, the prevalence of underweight found in this study can be justified by the high HDI in the state of Mato Grosso do Sul (0.802 – 8º best in the country), which results in more access to public health and education services, as well as by the possible increase in the families' purchasing power, triggered by income transfer programs such as the PBF.

The findings in this study showed the prevalence of overweight to be three times higher than that of underweight, whereas the prevalence of obesity was found to be the double of that of underweight. These data confirm the tendency of nutritional transition that has been happening since 1980, with reduced levels of malnutrition and underweight and increasing levels of overweight and obesity[3-5]. Although the reduction in malnutrition and underweight can be justified by the improved life conditions, the higher coverage of health, and the reduced fecundity, the evolution of excess weight was mainly caused by urbanization and its impact on dietary patterns and physical activities[23]. A study conducted by Silveira et al.[21] found the prevalence of overweight and obesity in 11.3% of the residents of slums in Maceió. A study by Silva[9], including 32,351 children aged from 5 to 10 years old, PBF beneficiaries in the state of Sergipe, 2010, found the prevalence of overweight to be 13.1% among girls and 13.3% among boys, and the prevalence of obesity to be 11.2% among girls and 14.5% among boys; in this study, the prevalence of overweight was 14.8% among girls and 16.1% among boys. Concerning the prevalence of obesity, there was a difference between genders, being higher among boys (11.2%) than among girls (9.1%).

Other studies presented data on obesity, with higher prevalence among male than among female participants[5,24]. In the study by Pereira et al.[24], conducted among 871 children (aged from 0 to 10 years old) from Santa Catarina, obesity was prevalent in 1% of the girls and 3.9% of the boys, but there was no difference ($p = 0.182$). Data presented in POF 2008 – 2009 indicated the prevalence of obesity in children aged from 5 to 9 years old being 11.8% for female and 16.6% for male participants[5]. However, a study conducted by Pelegrini et al.[25] showed inconsistencies in literature regarding the prevalence of obesity between genders.

Obesity has a multifactorial etiology; however, this study did not aim at investigating the factors that may be associated with obesity. Some studies indicated that its highest prevalence can be associated with low maternal schooling, children of obese parents, heavy weight at birth, early wean, and inadequate habits[26]. It is suggested that new studies with PBF beneficiaries should be conducted and analyze such factors.

The high prevalence of excess weight has been reported in individuals with low purchasing power, both in developing and in developed countries[9,27]. By analyzing the data presented in this study, it was observed that, among girls, overweight and obesity were more prevalent in regions with more unequal income distribution. However, among boys, the prevalence of overweight was higher in regions with less uneven income distribution.

A report from the Brazilian Institute of Social and Economic Analyses about the repercussions of PBF on dietary and nutrition safety of the beneficiaries showed that, in general, families use the benefit on foods that present higher caloric density and lower nutritional value, which contributes with the increasing prevalence of overweight and obesity[28]. It is possible to assume that the low socioeconomic status can limit the access to healthy foods, both for its high cost and availability and for the choices made by the holders of the benefit since they are not prepared for this task, besides opportunities to practice safe physical activities and the lack of orientation, motivation, and favorable environment[29].

Because the data in this study belong to secondary databases, the researcher cannot control possible typing and record errors, which is a limitation of this study.

CONCLUSION

With these results, lower prevalence of underweight was observed in relation to the prevalence of overweight and obesity, even in poorer populations, showing that the socioeconomic status has influenced the overweight and obesity status of children. The prevalence of obesity was higher among boys than among girls. Besides, the higher prevalence of underweight and obesity was found in regions with higher income inequalities for both genders; however, higher prevalence of overweight was found in regions with less uneven income among boys and in regions of higher inequality among girls.

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Received on: 03/13/2014
Final version presented on: 10/14/2014
Accepted on: 11/07/2014