doi: http://dx.doi.org/10.11606/issn.1679-9836.v99i2p182-188 Rev Med (São Paulo). 2020 March-April;99(2):182-8.

Nutritional status of resident children and adolescents in the northeast region of Brazil: a literature review

Estado nutricional de crianças e adolescentes residentes na região nordeste do Brasil: uma revisão de literatura

Marcelo de Maio Nascimento[1], Mateus de Sousa Rodrigues[2]

Nascimento MM, Rodrigues MS. *Nutritional status of resident children and adolescents in the northeast region of Brazil: a literature review /* Estado nutricional de crianças e adolescentes residentes na região nordeste do Brasil: uma revisão de literatura / Rev Med (São Paulo). 2020 March-April;99(2):182-8.

ABSTRACT: The prevalence of overweight and obesity among children and adolescents has increased in recent decades, becoming a global public health problem. In the case of malnutrition, its rates have decreased considerably, however, it has not yet been totally overcome, especially in the states of the Northeast region of Brazil. The objective of this study was to review studies on the nutritional status of children and adolescents living in the Northeast region of Brazil. For this, a review of the bibliography published on the BIREME and Google Academic platforms, in Portuguese and English, was carried out in 2009-2018, using the descriptors: obesity and childhood, overweight and childhood, malnutrition and childhood. At the end, 22 studies containing information on 50,778 children and adolescents (0-14 years old) met the eligibility criteria. There was an average of malnutrition, overweight and obesity of 1.9%, 12.5% and 7.4%, respectively. According to the studies analyzed, the panorama of the nutritional status of children and adolescents in the Northeast region has corroborated with the national trend, which has been indicating, since past decades, the decrease in the rate of malnutrition, followed by the increase in overweight.

Keywords: Nutritional status; Epidemiology; Child; Adolescent; Brazil.

RESUMO: A prevalência do excesso de peso e da obesidade entre crianças e adolescentes tem aumentando nas últimas décadas, configurando-se como um problema de saúde pública global. No caso da desnutrição, suas taxas têm diminuído consideravelmente, contudo, ela ainda não foi totalmente superada, em especial, nos Estados da região Nordeste do Brasil. O objetivo deste estudo foi revisar estudos sobre o estado nutricional de crianças e adolescentes, residentes na região Nordeste do Brasil. Para isso, foi realizada uma revisão da bibliografia publicada nas plataformas BIREME e Google Acadêmico, em português e inglês, no período de 2009-2018, com uso dos descritores: obesidade e infância, sobrepeso e infância, desnutrição e infância. Ao final 22 estudos contendo informações de 50.778 crianças e adolescentes (0-14 anos) preencheram os critérios de elegibilidade. Verificou-se média de desnutrição, sobrepeso e obesidade de 1,9%, 12,5% e 7,4%, respectivamente. Conforme os estudos analisados, o panorama do estado nutricional de crianças e adolescentes da região Nordeste corroborou com a tendência nacional, que vem apontando, desde décadas passadas, a diminuição da taxa de desnutrição, seguida pelo aumento do sobrepeso.

Descritores: Estado nutricional; Epidemiologia; Criança; Adolescente; Brasil.

1. Federal University of the São Francisco Valley (UNIVASF). ORCID: https://orcid.org/0000-0002-3577-3439. Email: marcelo.nascimento@univasf.edu.br.
2. 2. Federal University of the São Francisco Valley (UNIVASF) and Intensive Care Unit (ICU) of NEUROCARDIO Hospital. ORCID: 0000-0003-4664-2351. Email: mateuserem@gmail.com.

Correspondence: Mateus de Sousa Rodrigues. Av. José de Sá Maniçoba, S/N – Centro. Petrolina, PE. CEP: 56304-917.

INTRODUCTION

In recent years, studies have pointed out that Brazil is going through a process of nutritional transition, marked by characteristics with different stages[1,2]. Thus, the population presents a tendency to increase the prevalence of overweight and obesity, regardless of age group. In addition, it is also observed that malnutrition has not yet been totally overcome, especially in the Northeastern states[2,3].

According to the Family Budget Survey (POF)[4], conducted from 2008 to 2009 in Brazil, the rate of children with stunting (0-5 years old) was 6.8%. According to the survey, there was a tendency to decrease the prevalence of weight and height deficit with the increase in income. This implies the determination of family income over the risk of malnutrition. The survey also revealed an excess prevalence of 25% to 30% in the North and Northeast regions, and 32% to 40% in the Southeast, South, and Center-West. It was also found that comparatively overweight was more frequent in urban areas, especially in the North, Northeast, and Center-West[4].

In 2010, the Brazilian Institute of Geography and Statistics (IBGE)[4] reported that the obesity rate among Brazilian schoolchildren was 18.3%. According to a note released in 2017 by the Ministry of Health[5], since 2010, these rates have grown by about 60%. Systematic review studies[6,7] and meta-analysis[8,9] highlighted the consequences of overweight and obesity for health, especially when associated with the set of comorbidities, such as hypertension, diabetes, metabolic syndrome, dyslipidemias, coronary artery disease.

The nutritional state directly influences the perception of an individual's quality of life[10]. Thus, both malnutrition, overweight and obesity affect risk factors for the development of physical, motor and cognitive abilities of the young population[11]. Obesity, for instance, predisposes to osteoporosis and osteoarthritis in the long term, especially in the knee and hip joints[12]. In a study carried out with 80 elementary school students (12 to 14 years old), De Oliveira et al.[13] observed, among schoolchildren, overweight, high rates of physical disability and dissatisfaction with body image. According to Lopes et al.[14], children in a state of malnutrition and excess body fat are predisposed to cognitive deficit.

In comparison with the South, Southeast and Center-West regions of Brazil, the specialized literature is lacking studies that address the nutritional status of children and adolescents living in the Northeast region. Leal et al.[15] developed a literature review study on the nutritional status of children and adolescents checking 12 national investigations for the period between 2000 and 2010. Of these, 75% were developed with school children living in the South, Southeast and Central West regions. Given the above, this study aimed to review studies on the nutritional status of children and adolescents living in the Northeast region of Brazil.

METHODS

This is an exploratory, review-type study of the literature on studies of malnutrition, overweight, and obesity of children and adolescents in the Northeast region of Brazil. The databases consulted were BIREME and Google Scholar, based on the following descriptors: obesity and childhood, overweight and childhood and malnutrition and childhood. The inclusion criteria adopted were: i) studies conducted in the Northeast region with an epidemiological approach; ii) studies that used at least one of the following criteria to classify the nutritional status: World Health Organization (WHO), Centers for Disease Control and Prevention (CDC); International Obesity Task Force (IOTF); iii) studies conducted in the period 2009-2018; iv) age between 0-14 years old and v) Portuguese and English language. Studies excluded were: i) literature review; ii) case report; iii) dissertation.

RESULTS

Based on the chosen descriptors, 85,189 articles were initially identified, of which 73 studies met the inclusion criteria. After the exclusion of duplicates, 38 were considered eligible for a full examination. At the end, 22 studies met the eligibility criteria to be included in this literature review (Figure 1).

Table 1 shows the classification of the studies analyzed, according to the year of publication, the type of methodological and quantitative design of the subjects involved, and the criteria adopted for BMI classification. It can be observed that 90% (20/22) of the studies presented cross-sectional type design, 5% (1/22) were time-series and 5% (1/22), cohort. Regarding BMI classification, 95% (21/22) of the studies used the WHO criterion, 1% (2/22) applied the CDC criterion and 0.4% (1/22) the IOTF criterion.

Table 2 shows the social context in which the studies were conducted, as well as the state of the Federation and criteria for classifying nutritional status (primary outcome). In the states of the Federation, 22% (5/22) were carried out in Bahia - BA, 22% (5/22) in Paraiba - PB, 18% (4/22) in Alagoas-AL, 13% (3/22) in Pernambuco - PE and 4% (1/22) in Ceará - CE. The detailing of nutritional status was presented by the BMI classification, according to Z-scores: overweight (Z-scores ≥2 and <3), obesity (Z-scores >3) and malnutrition (Z-scores<-2). Considering the outcomes, it was found that 81% (18/22) of the studies identified percentages of obesity, 68% (15/22) of overweight, while 27% (6/22) indicated malnutrition.

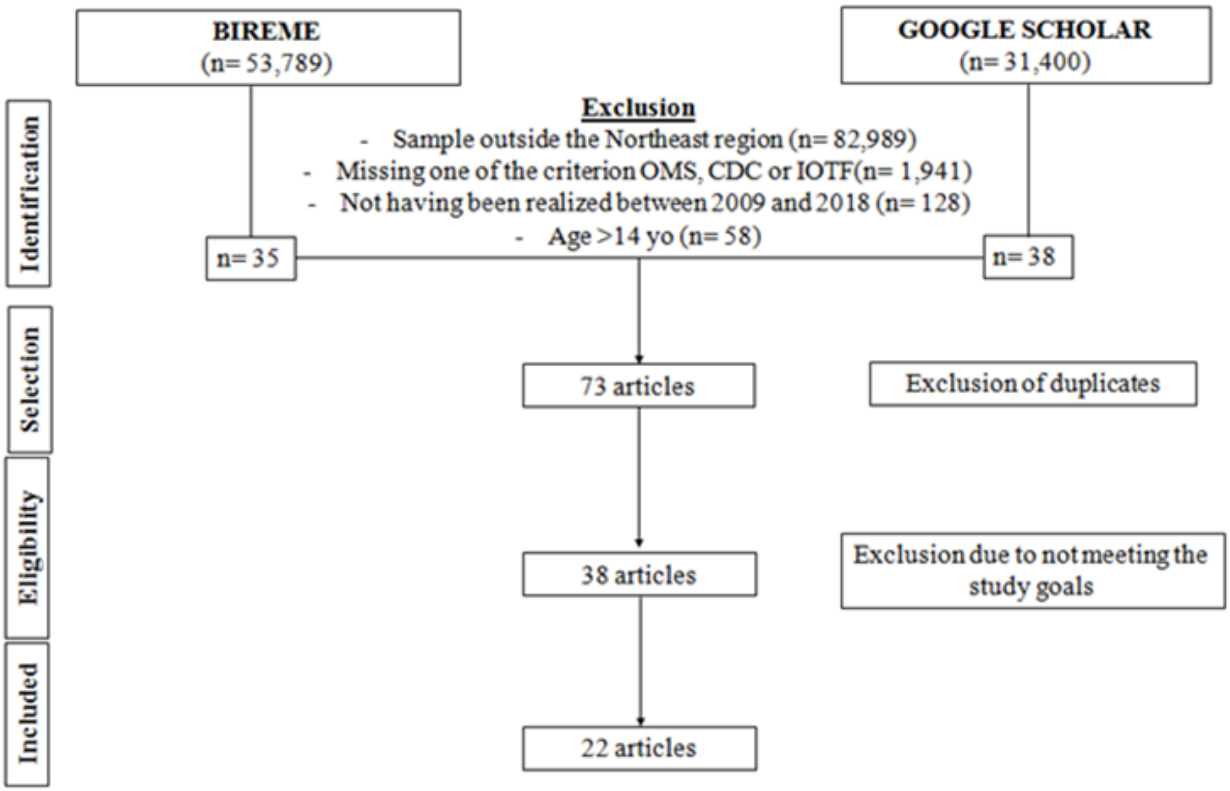

Figure 1. Literature review citations selection flowchart

Table 1 – Characterization of selected studies, according to year, study design, sample, and criteria to the BMI classification

Author	Year	Study Design	Subjects	Criteria (BMI)
Macêdo et al.[16]	2009	Cross-sectional	n=727(6-11 yo)	WHO
Alves et al.[17]	2009	Cross-sectional	n=733(7-10 yo)	CDC
Souza et al.[18]	2010	Cross-sectional	n=694 (12-14 yo)	WHO
Queiroz et al.[19]	2010	Cross-sectional	n=750 (6-9 yo)	WHO
Saldiva et al.[20]	2010	Cross-sectional	n=189 (0-5 yo)	WHO
Matos et al.[21]	2011	Cross-sectional	n=1,056 (0-5 yo)	WHO
Moreira et al.[22]	2012	Cross-sectional	n=963(0-5 yo)	WHO
Ribeiro et al.[23]	2013	Cross-sectional	n=100(7-9 yo)	CDC
Ferreira et al.[24]	2013	Cross-sectional	n=31,488 (9-11 yo)	WHO
Leite et al.[25]	2013	Cross-sectional	n=724 (1-5 yo)	WHO
Carvalho et al.[26]	2014	Cross-sectional	n=1,378 (0-5 yo)	WHO
Mendes et al.[27]	2014	Cross-sectional	n=22 (6-24 months)	WHO
Correia et al.[28]	2014	Time-series	n=6,046 (0-36 months)	WHO
Moreira et al.[29]	2014	Cross-sectional	n=1,023 (0-5 yo)	WHO
Gonçalves et al.[30]	2014	Cross-sectional	n=167 (6-96 months)	WHO
Santos et al.[31]	2014	Cross-sectional	n=1,247 (6-12 yo)	WHO
Portela et al.[32]	2015	Cohort	n=672 (0-6 yo)	WHO
Lander et al.[33]	2015	Cross-sectional	n=376 (3-6 yo)	WHO
Ferreira et al.[34]	2015	Cross-sectional	n=1,400 (9-11 yo)	WHO
Nascimento et al.[35]	2016	Cross-sectional	n=50 (8- 9 yo)	OMS, CDC e IOTF
Barreto et al.[36]	2016	Cross-sectional	n=177 (6-10 yo)	WHO
Nascimento et al.[10]	2018	Cross-sectional	n=796 (7-13 yo)	WHO

Key: BMI: Body Mass Index; WHO: World Health Organization; CDC: Centers for Disease Control and Prevention; IOTF: International Obesity Task Force.

Table 2 – Characterization of studies, according to age group, social context, and nutritional status classification

Author	Social context	Region	Overweight (%/ absolute n) (score z ≥2 and<3)	Obesity (%/ absolute n) (score z>3)	Malnutrition (score z<-2)
Alves et al.[17]	Slum residents	Pernambuco	12.60% (92/733)	2.60% (19/733)	------
Macêdo et al.[16]	School students	Ceará	15.30% (111/727)	6.60% (48/727)	------
Queiroz et al.[19]	School students	Paraíba	10.53% (79/750)	10.67% (80/750)	------
Saldiva et al.[20]	Infants and preschool students beneficiaries of the Bolsa Família Program	Rio Grande do Norte	14.00% (26/189)	------	0.53% (1/189)
Souza et al.[18]	School students and preteens	Bahia	11.80% (82/694)	4.50% (31/694)	------
Matos et al.[21]	School students and preteens	Bahia	15.25% (161/1056)	------	------
Moreira et al.[22]	Infants and preschool students	Alagoas	6.50% (63/963)	2.10% (20/963)	2.30% (22/963)
Ferreira et al.[24]	Infants and preschool students	Alagoas	------	9.30% (129/1384)	------
Leite et al.[25]	Children from quilombola communities	Alagoas	------	6.00% (40/670)	1.30% (9/670)
Ribeiro et al.[23]	School students	Bahia	16.00% (16/100)	7.00% (7/100)	------
Carvalho et al.[26]	Infants and preschool students	Alagoas, Paraíba, Rio Grande do Norte	8.17% (112/1378)	-	1.43% (20/1378)
Correia et al.[28]	Infants and preschool students	Ceará	------	------	4.7% (72/1533)
Moreira et al.[29]	Infants and preschool students	Alagoas	23.90% (266/1115)	7.80% (87/1115)	------
Gonçalves et al.[30]	School students	Pernambuco	------	------	14.6% (24/167)
Mendes et al.[27]	Infants in a Basic Health Unit	Rio Grande do Norte	13.63% (3/22)	9.10% (2/22)	------
Santos et al.[31]	School students	Bahia	10.20% (127/1247)	7.10% (89/1247)	------
Ferreira et al.[34]	School students	Sergipe	------	13.38% (179/1338)	------
Lander et al.[33]	Preschool students in charitable daycare	Bahia	11.00% (40/364)	3.30% (12/364)	2.50% (9/364)
Portela et al.[32]	Infants and preschool students	Bahia	15.60% (107/684)	12.90% (88/684)	------
Barreto et al.[36]	School students	Paraíba	------	10.1% (28/277)	------
Nascimento et al.[35]	School students	Pernambuco	8.00% (4/50)	-------	------
Nascimento et al.[10]	School students	Pernambuco	12.30% (98/796)	2.90% (23/796)	2.80% (22/796)

Key: BMI: Body Mass Index; WHO: World Health Organization; CDC: Centers for Disease Control and Prevention; IOTF: International Obesity Task Force.

DISCUSSÃO

The present review verified the scientific production for the period between 2009 to 2018 regarding the prevalence of overweight and malnutrition in children and adolescents living in the Northeast region of Brazil. Among the 22 selected studies, 50,778 individuals were evaluated. According to the results, a mean of malnutrition, overweight, and obesity of 1.9%, 12.5%, and 7.4%, respectively, were observed. The findings reinforced the trend toward a decrease in the rate of malnutrition in the Northeast region, followed by an increase in overweight[37]. According to Villa et al.[38], the nutritional transition may be related to social phenomena that have occurred in recent years, such as the increased income of low-income families and the migration of the rural population to urban centers.

Another issue focuses on the preference of young people for high-calorie food, followed by sedentarism[39,40].

Of the nine states that make up the Northeast region of Brazil, studies were not found only for the states of Maranhão - MA, and Piauí - PI. In this sense, there was a prevalence of studies in the state of Bahia - BA (22%), Paraiba - PB (18%) and Alagoas - AL (13%). The values reflect the regional distribution of study groups involved in the health of children and adolescents, according to the state of the Northeast region. The most used criterion for BMI classification was the one suggested by WHO. A possible explanation for this is that this guideline is the most widely disseminated[41]. Regarding the type of study design, the predominance of the cross-sectional method was verified. The lack of longitudinal studies on the nutritional status of children and adolescents in the Northeast region limits the monitoring of the nutritional evolution of this population. The fact may also reflect obstacles faced by researchers in financing research procedures.

An interesting finding was the proportion of the number of studies found, according to the classification of nutritional status. Three times more studies were found for overweight and obesity than for malnutrition. This result reflects the context of the transition of the nutritional status of the Northeastern region, which concerning past decades is no longer characterized by malnutrition and currently presents the condition of overweight. The highest rate of overweight was 23.9%, observed by Moreira et al.[29] with children aged 0-5 years old (n=1,023), living in Alagoas - AL. While the lowest rate was 6.5% observed by Moreira et al.[22], also in the state of Alagoas - AL, with children aged 0-5 years old (n=963). Ferreira et al.[34] reported the highest rate of obesity, 13.6%, for school children in Sergipe - SE (9-11 years old; n=31,488). The lowest rate of overweight found was 2.1%, in the study of Moreira et al.[22] with children aged 0-5 years old (n=963), living in Alagoas-AL. According to the Family Budget Survey (POF) conducted between 2008 and 2009, there has been an increase in the prevalence of overweight since the 1974-1975 surveys. Thus, the results of this study corroborated the trend observed in 35 years (1974-2009), which showed continuous growth in the prevalence of overweight six times more for males (3.7% to 21.7%) and almost three times more for females (7.6% to 19.4%).

These data show the increase in nutrient consumption, among children and adolescents, associated with the deficit in energy expenditure. From this perspective, it can be observed that in recent decades public policies have managed to offer a better standard of nutrition to children and adolescents from Brazilian families with low purchasing power; however, they are not being efficient in controlling the balance between the quality of food consumed and caloric expenditure[42,43]. In a study developed in the interior of the state of Pernambuco by Nascimento and Rodrigues[10] (n=796, 7-13 years old), the authors highlighted that the increase in BMI values was associated with changes in school children's eating patterns (consumption of food with high energy value), followed by a sedentary lifestyle. This means little practice of physical exercises. In recent years, different studies have shown the reflexes of the sedentary lifestyle of young people both for the health condition[44], and the levels of physical fitness[2,45]. In a systematic review study, Guerra et al.[46] pointed out for Brazilian children and adolescents of both sexes an association between sedentary behavior and high BMI. It is important to highlight that both obesity and thinness can generate dissatisfaction at the level of self-image, surviving bulimia, and nevertheless, cases of bullying[13].

In the case of malnutrition, the highest rate observed was 2.8%, reported by Nascimento et al.[10] among school children (7-13 years old; n=796), living in the hinterland of Pernambuco - PE. While the lowest rate of thinness was 0.5% presented by Saldiva et al.[20], in a study developed with children aged 0-5 years old (n=189), beneficiaries of the Bolsa Família Program, in the state of Rio Grande do Norte - RN. Leite et al.[25] evaluated the percentage of malnutrition in quilombola children (n=724, 1-5 years old), showing a rate of 1.3%. In Ceará, Correia et al.[28] compared children (n=6,046, 0-36 months) classified with child malnutrition between the years of 1987 and 2007, observing a significant decrease from 27.0% (1987) to 13.0% (2007). In Alagoas, Ferreira et al.[24] compared the percentage of malnutrition between 1992 (n=1,228) and 2005 (n=1,384), the authors found a significant reduction of the thinness rate from 22.5% to 11.4%.

In general, the results found in the 22 studies for malnutrition do not allow direct comparisons between them, since they presented differences in age group, social context, and criteria used in the BMI examination. However, it is possible to compare their data with the with the results of the POF[4] (2008-2009). Thus, it was observed that the malnutrition rates of the 22 studies analyzed remained low, since the POF showed an average malnutrition rate of 3.4%. According to POF[4], the comparison between the rates of malnutrition developed in the years 1974-1975 and 2008-2009 showed for males (5-9 years old) a decrease in the prevalence of stature deficit from 29.3% to 7.2%, while females (5-9 years old) showed a reduction from 26.7% to 6.3%. So, we can conclude that the data from the present study corroborated with the POF[4], which indicated a progressive reduction of child malnutrition in Brazil in the last decades.

CONCLUSION

The analysis of the selected studies showed low levels of malnutrition and increased overweight in the Northeast region, among children and adolescents, a fact observed throughout Brazil in recent decades among individuals of the same age by the Family Budget Survey.

The most widely applied BMI classification was that of the WHO. Considering the predominance of cross-sectional studies in the articles evaluated, it is advisable to conduct investigations with longitudinal approaches, allowing the monitoring of the chronological sequence of events.

Acknowledgments: To Ministry of Education (MCE) and National Education Development Fund (FNDE).
Author's participation: *Marcelo de Maio Nascimento*: has participated in all phases of the article. *Mateus de Sousa Rodrigues*: has participated in all phases of the article.

REFERENCES

1. Machado Z, Krebs RJ, Prestes JD, et al. Crescimento físico e estado nutricional de escolares: Estudo comparativo - 1997 e 2009. Rev Bras Cineantropom Desempenho Hum. 2011;13(3):216-22. doi: 10.5007/1980-0037.2011v13n3p216.
2. Reis MDS, Amud GOT, Soares S de S, Silva CDC da, Corrêa L da S. Indicadores de saúde em escolares: uma análise do estado nutricional e aptidão física relacionada à saúde. Saúde (Santa Maria). 2018;44(1):1-6. doi: 10.5902/2236583421734.
3. Ramires EKN, De Menezes RCE, Oliveira JS, Oliveira MAA, Temoteo TL, Longo-Silva G, Leal VS AL. Estado nutricional de crianças e adolescentes de um município do semiárido do Nordeste brasileiro. Rev Paul Pediatr. 2014;32(3):200-07. http://dx.doi.org/10.1590/0103-0582201432309.
4. Instituto Brasileiro de Geografia e Estatística (IBGE). Pesquisa de orçamentos familiares 2008-2009: antropometria e Estado nutricional de crianças, adolescentes e adultos do Brasil. Rio de Janeiro: IBGE; 2010. Disponível em: https://biblioteca.ibge.gov.br/visualizacao/livros/liv45419.pdf.
5. Brasil. Ministério da Saúde. Em dez anos, obesidade cresce 60% no Brasil e colabora para maior prevalência de hipertensão e diabetes [citado 28 abr. 2019]. Disponível em: http://www.saude.gov.br/noticias/agencia-saude/28108-em-dez-anos-obesidade-cresce-60-no-brasil-e-colabora-para-maior-prevalencia-de-hipertensao-e-diabetes.
6. Borfe L, Rech DC, Benelli TES, Paiva DN, Pohl HH BM. Associação entre a obesidade infantil e a capacidade cardiorrespiratória: revisão sistemática. Rev Bras Promoção Saúde. 2017;30(1):118-24. doi: 10.5020/18061230.2017.p118.
7. Dill A, Heinzmann-filho JP, Borges R, Severo J, Taís C, Zanatta B. Efeitos da obesidade sobre os volumes e as capacidades pulmonares em crianc¸as e adolescentes : uma revisão sistemática. Rev Paul Pediatr. 2016;34(4):510-7. doi: 10.1016/j.rpped.2016.02.008.
8. Gasser CE, Mensah FK, Russel M, Dunn SE WM. Confectionery consumption and overweight, obesity, and related outcomes in children and adolescents: a systematic review and meta-analysis. Am J Clin Nutr. 2016;103(5):1344-56. doi: 10.3945/ajcn.115.119883.
9. Aiello AM, Marques de Mello L, Souza Nunes M, Soares da Silva A, Nunes A. Prevalence of obesity in children and adolescents in Brazil: a meta-analysis of cross-sectional studies. Curr Pediatr Rev. 2015;11(1):36-42. doi: 10.2174/1573396311666150501003250.
10. Nascimento MM, Rodrigues MS. Distribuição dos valores do IMC de brasileiros estudantes de uma escola pública da rede municipal de Petrolina-PE. Rev CPAQV Centro Pesqui Avançadas Qual Vida. 2018;10(3):1-8. Disponível em: http://www.cpaqv.org/revista/CPAQV/ojs-2.3.7/index.php?journal=CPAQV&page=article&op=view&path%5B%5D=266&path%5B%5D=194.
11. Da Silva JP, Silva VR, Almeida PCD, Pinasco GC, Bernardes TP, Sasso JGRJ, Spalenza NS, Leone C, Lamounier JA. Crescimento e estado nutricional de adolescentes da rede pública estadual de ensino. J Hum Growth Dev. 2017;27(1):42-8. doi: https://doi.org/10.7322/jhgd.127651
12. Sartori-Cintra AR, Aikawa P CD. Obesidade versus osteoartrite: muito além da sobrecarga mecânica. Einstein. 2014;12(3):374-9. doi: 10.1590/S1679-45082014RB2912.
13. De Oliveira VM, Brasil MR, Gruppi DC DSS. A (in) satisfação da imagem corporal e aptidão física em escolares do primeiro ciclo estudantil. Rev Bras Qual Vida. 2017;9(1):80-100. doi: 10.3895/rbqv.v9n2.5257.
14. Lopes L, Santos R, Moreira C, Pereira B LV. Sensitivity and specificity of different measures of adiposity to distinguish between low/high motor coordination. J Pediatr (Rio J). 2015;91(1):44-51. doi: 10.1016/j.jped.2014.05.005.
15. Leal AS, De Lira PIC, Menezes RCE, Oliveira JS, Costa EM DAS. Desnutrição e excesso de peso em crianças e adolescentes : uma revisão de estudos brasileiros. Rev Paul Pediatr. 2012;30(3):415-22. doi: 10.1590/S0103-05822012000300017.
16. Macêdo SF, Damasceno MMC, Lima ACS, Lima AKG, Vasconcelos HCA, Araújo MFM. Sobrepeso e obesidade em crianças de escolas públicas de Fortaleza: um estudo exploratório. Braz J Nursing. 2009;8(2):32. Disponível em: http://www.objnursing.uff.br/index.php/nursing/rt/printerFriendly/j.1676-4285.2009.2335/499.
17. Alves JG, Siqueira PP, Figueiroa JN. Overweight and physical inactivity in children living in favelas in the metropolitan region of Recife, Brazil. J Pediatr (Rio J). 2009;85(1):67-71. doi; 10.2223/JPED.1860.
18. Souza CO, Silva RC, Assis AM, Fiaccone RL, Pinto E J, Moraes LT. Association between physical inactivity and overweight among adolescents in Salvador, Bahia--Brazil. Rev Bras Epidemiol. 2010;13(3):468-75. doi: 10.1590/s1415-790x2010000300010.
19. Queiroz VM, Moreira PV, Vasconcelos TH, Toledo Vianna RP. Prevalence and anthropometric predictors of high blood pressure in schoolchildren from João Pessoa - PB, Brazil. Arq Bras Cardiol. 2010;95(5):629-34. doi: 10.1590/S0066-782X2010001500011.
20. Saldiva SRDM, Silva LFF SP. Avaliação antropométrica e consumo alimentar em crianças menores de cinco anos residentes em um município da região do semiárido nordestino com cobertura parcial do programa bolsa família. Rev Nutr. 2010;23(2):221-229. doi: 10.1590/S1415-52732010000200005.
21. Matos SM, Jesus SR, Saldiva SR, Prado Mda S, D'Innocenzo S, Assis AM, Rodrigues LC, Barreto ML. Weight gain rate in early childhood and overweight in children 5-11 years old in Salvador, Bahia State, Brazil. Cad Saude Publica. 2011;27(4):714-22. doi: 10.1590/S0102-311X2011000400010.

22. Moreira MA, Cabral PC, Ferreira HS DLP. Overweight and associated factors in children from northeasten Brazil. J Pediatr (Rio J). 2012;88(4):347-52. doi: 10.2223/JPED.2203.

23. Ribeiro G, Lopes ERN, Magalhães JC, Andrade MAS. Prevalência de sobrepeso e obesidade em crianças da rede pública de ensino da cidade de Cruz das Almas, Bahia. Rev Baiana Saúde Pública. 37(1)2013:9-19. doi: https://doi.org/10.22278/2318-2660.2013.v37.n1.a781.

24. Ferreira HS, Lúcio GMA, Assunção ML, Silva BCV, Florência TMMT, Geraldes AAR HB. High Blood Pressure among Students in Public and Private Schools in Maceió, Brazil. PLoS One. 2015;(20110818):1-10. doi: 10.1371/journal.pone.0142982.

25. Leite FMB, Ferreira HS, Bezerra MK, Se Assunção ML HB. Consumo alimentar e estado nutricional de pré-escolares das comunidades remanescentes dos quilombos do estado de Alagoas. Rev Paul Pediatr. 2013;31(4):444-51. doi: 10.1590/S0103-05822013000400005.

26. Carvalho AT, Almeida ER, Nilson EAF, Ubarana JA, Coutinho JG, Vianna RPT, Lima FEL. Nutritional situation of children under five years old in Brazil's northeastern cities. J Hum Growth Dev. 2014;24(2):221-7. Available from: http://pepsic.bvsalud.org/scielo.php?script=sci_arttext&pid=S0104-12822014000200016.

27. Mendes ACL, Queiroz DJM, Melo ANL, Sureira TM, Pequeno NPF. Food and nutritional profile of infants treated in basic health unit in Rio Grande do Norte. J Hum Growth Dev. 2014;24(1):16-23. Available from: http://pepsic.bvsalud.org/scielo.php?script=sci_arttext&pid=S0104-12822014000100003&lng=pt&tlng=en.

28. Correia LL, Silva AC, Campos JS, Andrade FMO, Machado MMT, Lindsay AC, Leite AJM, Rocha HAL DCA. Prevalence and determinants of child undernutrition and stunting in semiarid region of Brazil. Rev Saúde Pública. 2014;48(1):19-28. doi: 10.1590/S0034-8910.2014048004828.

29. Moreira MA, Coelho Cabral P, Da Silva Ferreira H, Cabral de Lira PI. Prevalence and factors associated with overweight and obesity in children under five in Alagoas, Northeast of Brazil; a population-based study. Nutr Hosp. 2014;29(6):1320-6. doi: 10.3305/nh.2014.29.6.7303.

30. Gonçalves FC, Amorim RJ, Eickmann SH, Lira PI, Lima MC. The influence of low birth weight body proportionality 189 and postnatal weight gain on anthropometric measures of 8- year-old children: a cohort study in Northeast Brazil. Eur J Clin Nutr. 2014;68(8):876-81. doi: 10.1038/ejcn.2014.68.

31. Santos NH, Fiaccone RL, Barreto ML, Silva LA, Silva RCR. Association between eating patterns and body mass index in a sample of children and adolescents in Northeastern Brazil. Cad Saude Publica. 2014;30(10):2235-45. doi: 10.1590/0102-311X00178613.

32. Portela DS, Vieira TO, Matos SM, de Oliveira NF, Vieira GO. Maternal obesity, environmental factors, cesarean delivery and breastfeeding as determinants of overweight and obesity in children: results from a cohort. BMC Pregnancy Childbirth. 2015;15:94. doi: 10.1186/s12884- 015-0518-z.

33. Lander RL, Williams SM, Costa-Ribeiro H, Mattos AP, Barreto DL, Houghton LA, Bailey KB, Lander AG, Gibson RS. Understanding the complex determinants of height and adiposity in disadvantaged daycare preschoolers in Salvador, NE Brazil through structural equation modelling. BMC Public Health. 2015;15:1086. doi: 10.1186/s12889- 015- 2406-x.

34. Ferreira HS, Cesar JA, De Assumção ML HB. Tendência temporal (1992-2005) da desnutrição e da obesidade em menores de cinco anos no Estado de Alagoas, Brasil. Cad Saúde Pública. 2013;29(4):793-800. doi: 10.1590/S0102-311X2013000400016.

35. Nascimento MM, Nunes LM, Minoda AM. Concordância entre pontos de corte do IMC de crianças, 8 e 9 anos, residentes em Petrolina/PE, Brasil. R Bras Qual Vida. 2016;8(4):257-69. doi: 10.3895/rbqv.v8n4.4843.

36. Barreto CCM, Pereira LKM, Medeiros LCM, Guaré RO, Freire TRSC. Obesidade infantil: análise comparativa entre crianças integradas na rede pública e privada de educação. Temas Saúde. 2016;16(4):167-79. http://temasemsaude.com/wp-content/uploads/2017/01/16412.pdf.

37. Caravalho TS, Pellanda LC DP. Stillbirth prevalence in Brazil: an exploration of regional differences. J Pediatr (Rio J). 2018;94(2):200-06. doi: 10.1016/j.jped.2017.05.006.

38. Villa JKD, Silva ARE, Santos TSS, Ribeiro AQ, Pessoa MC, Sant'Ana LFDR. Padrões alimentares de crianças e determinantes socioeconômicos, comportamentais e maternos. Rev Paul Pediatr 2015; 33(3):302-309. doi: 10.1016/j.rpped.2015.05.001.

39. Da Cruz SH, Piccinini CA, Matijasevich A, Santos IS. Problemas de comportamento e excesso de peso em pré-escolares do sul do Brasil. J Bras Psiquiatr. 2017;66(1):29-37. doi: 10.1590/0047-2085000000147.

40. Melo ME, Almeida MS, Dalamaria T, Pinto WDJ, Cunha MDA, Souza OF De. Sobrepeso e obesidade em escolares das séries iniciais do ensino fundamental de Rio Branco, Acre: uma comparação entre referenciais. J Hum Growth Dev. 2016;26(3):341-4. doi:10.7322/jhgd.122817.

41. De Oliveira PM, Da Silva FA, Oliveira RMS, Mendes LL, Netto MP CA. Associação entre índice de massa de gordura e índice de massa livre de gordura e risco cardiovascular em adolescentes. Rev Paul Pediatr. 2016;34(1):30-7. doi: 10.1016/j.rpped.2015.06.003.

42. Monteiro AR, Dumith SC, Gonçalves TS, Cesar JA. Excesso de peso entre jovens de um município do semiárido brasileiro: estudo de base populacional. Cien Saude Coletiva. 2016;21(4):1157-64. doi: 10.1590/1413-81232015214.15282015.

43. Barros KCDS, Hipólito TLB, Bezerra MGDS, Rocha CVDO, Oliveira ESD SL et al. Perfil Socioeconômico e Nutricional de Escolares em (In)Segurança Alimentar de uma Região do Semiárido Nordestino. Rev Bras Ciên Saúde. 2016;20(1):5-10. doi: 10.4034/RBCS.2016.20.01.01.

44. Reis MS, Amud GOT, Soares SS, Silva CDC, Corrêa LS. Indicadores de saúde em escolares: uma análise do estado nutricional e aptidão física relacionada à saúde. Saúde St Maria. 2018;44(1):1-6. doi: 10.5902/2236583421734.

45. Montoro APPN. Leite CR. Espíndola JA. Alexandre JM, Reis MS, Capistrano R, Lisboa T, Beltrame TS. Aptidão física relacionada à saúde de escolares com idade de 7 a 10 anos. ABCS Heal Sci. 2015;41(1):29-33. doi: 10.7322/abcshs.v40i2.736.

46. Guerra PH, Farias Júnior JC de, Florindo AA. Comportamento sedentário em crianças e adolescentes brasileiros: revisão sistemática. Rev Saude Publica. 2016;50(0):1-15. doi: 10.1590/S1518-8787.2016050006307.

Received: May 18, 2019
Accepted: September 23, 2019