

ORIGINAL ARTICLE

Overweight and obesity: prevalence in children and adolescents in Northern Brazil

Edson dos Santos Farias^{1,2}, Katia Fernanda Alves Moreira^{1,2}, Josivana Pontes dos Santos^{1,2}, Ivanice Fernandes Barcellos Gemelli^{1,2}, Gean Magalhães da Costa¹, Orivaldo Florêncio de Souza³



¹Universidade Federal de Rondônia (UNIR) - Porto Velho (RO), Brazil.

²Centro de Estudos de Pesquisa em Saúde Coletiva (CEPESCO-UNIR) - Porto Velho (RO), Brazil.

³Centro de Ciências da Saúde e Desporto (CCSD-UFAC) - Rio Branco (AC), Brazil.

Corresponding author

esfarias@bol.com.br

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Abstract

Introduction: Obesity is a chronic disease with a multifactorial etiology, brought about by a set of genetic, environmental and psychological factors. This may generate comorbidities that affect the quality of life and involve other risks to health.

Objective: To describe the prevalence of overweight and obesity in school children and adolescents in Porto Velho - Rondônia, Brazil in the period 2013-2016.

Methods: This study included 4165 schoolchildren aged 9 to 18 years. The students were classified as overweight and obese, according to the z score of the body mass index (BMI) for age and calculated according the WHO AnthroPlus program. Subsequently, BMI for age was categorized according to the criteria proposed by the World Health Organization (WHO, 2007): overweight (\geq score $z + 1 \leq z + 2$) and obese (\geq score $z + 2$). Prevalence calculations were performed using the SPSS version 20.0 program.

Results: Overall, the prevalence of overweight was 27.1%, being overweight 18.8% and obese 8.3%, in private schools 21.4% and 9.8%, public schools 17.0% and 7.2% respectively. The east zone predominated in both education networks 18.8% and 8.3% respectively. In males, the highest prevalence was at nine years old, 30.7% and 23.0%, and female, 24.3% and 13.8%.

Conclusion: The magnitude of the prevalence of overweight and obesity was high and worrying among schoolchildren and adolescents in the city of Porto Velho, which demonstrates the need for public health actions aimed at the family unit, regardless of the social segment.

Keywords: overweight, obesity, schoolchildren.

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Authors summary

Why was this study done?

In Brazil, overweight and obesity, among children and adolescents is a serious public health problem which has been increasing in all social strata of the population. Preventing childhood obesity means reducing, in a rational and less costly way, the incidence of chronic-degenerative diseases. The school is an important place where this preventive work can be carried out. This means that a consistent obesity prevention policy must comprise not only educational and informational actions, tax, training and recycling health professionals, measures to support the production and sale of healthy foods and even measures related to urban planning. Based on the aforementioned, the idea of building the article was to show the prevalence of overweight and obesity in public and private schools of children and adolescents aged between nine and 18 years of age in the city of Porto Velho, Rondônia. The relevance of the study is also to show that the epidemic of overweight (overweight + obesity) has affected all Brazilian regions and schools, regardless of social background. Based on the conclusion of the article itself, the needs for public health actions aimed at school networks and the family unit are recommended, regardless of the social segment.

What did the researchers do and find?

First, we carried out a survey of this nutritional status in public and private schools with students aged between nine (9) and 18 years old, constituting a very relevant sample of 4165 subjects among children and adolescents. The measurements of body mass and body height were performed as a basis, using the ZBMI/age recommended by the WHO for the diagnosis of overweight and obesity as an evaluation parameter. The diagnostic calculation was performed using the WHO Anthro Plus program. The data were presented through the prevalence by sex and age, using the statistical software SPSS/20.0 for analysis. The prevalence were calculated using the chi-square test.

What do these findings mean?

Our findings suggest that susceptibility to prevention, control and intervention of overweight (overweight and obesity) from a young age, should be made in conjunction with parents or guardians with their children and school, highlighting the importance of a culture of more healthy eating habits. healthy with the inclusion of fruits and vegetables in the domestic menu, associated with a habitual practice of physical activity, as a means of controlling and monitoring the increase in body fat. The significance of this discovery in the study of high prevalence of overweight and obesity in the capital of Porto Velho, RO, indicates the need for public policies aimed at families and schools to promote the health of these young people, so that they avoid serious disorders to the Unified Health System. Health (SUS) with the proliferation of diseases and No communicable Diseases (DANT) in adulthood.

INTRODUCTION

Overweight and obesity in children and adolescents are a global concern in several countries around the world, regardless of social class, and influenced by the exacerbated advance of technology (social networks), sedentary and industrialized foods^{1,2}.

In developed countries, the prevalence of overweight and obesity in children and adolescents has increased by two to five times during the decades of 1980s, 1990s and 2000^{2,3}. This phenomenon occurs not only in developed countries but also in developing countries^{3,4}. Numerous scientific publications have reported overweight during childhood and adolescence and its adverse health-related factors³⁻⁵.

In Brazil, overweight and obesity among children and adolescents in the school phase are worrisome, becoming a concern of public health. The data reported from the National Health Survey (IBGE)⁶, National Student Health Survey (PeNSE)⁷, Risk and Protection Factors Surveillance System for Chronic Diseases (VIGITEL)⁷, Brazilian Association for the Study of Obesity and Metabolic Syndrome (ABESO)⁸, and more recently the Study of Cardiovascular Risks in Adolescents (ERICA) revealed that overweight and obesity increased by 239% in 20 years, 15% of Brazilian population between 6 and 18 years old with overweight and 5% with obesity, these rates continue to increase Blochi *et al.*⁹.

The hypothesis of Han *et al.*¹⁰ postulates that the state of health at the beginning of life can program it in later stages. In this sense, international investigations have shown that children diagnosed as obese have a higher risk of obesity in adolescence and adulthood⁹. Obesity is associated with dyslipidemia, diabetes mellitus, coronary artery disease, respiratory disorders, degenerative

arthropathy, high blood pressure and an increased risk of some types of cancer¹¹.

Given this, it is necessary to prevent excess weight from childhood and adolescence. Because the child remains in school for a long time, this can be considered an important environment in the choice of behaviors and lifestyle. Thus, eating habits and physical activity acquired during school years, in addition to family characteristics, can influence overweight. Thus, the objective of this study is to analyze the prevalence of overweight and obesity in children and adolescents of elementary and high education in public and private schools in the city of Porto Velho, Rondônia, north of Brazil.

METHODS

This is a cross-sectional school-based study, carried out between 2013 and 2016, in the city of Porto Velho, Rondônia, located in the northern region of Brazil. According to data provided by the Statistics Department of the State Education Secretariat (SEDUC), the estimated population of students from Porto Velho, Rondônia, Brazil, in public schools was 52,465 and in private schools 13,682, distributed in 231 public and 25 private, aged between 9 and 18, of both sexes. A stratified sampling technique proportional to city areas was used, identifying the code (ID) of each school.

The calculation of the sample size was based on an estimated prevalence of 50% of overweight and obesity, a sampling error of two percentage points, a 95% confidence level. The sample represented 2296 (52,9%) public schools and 2042 (47,1%) private schools, with simple randomization paired between public and private schools by lot, the losses and refusals was 4% (173) ending

with 4,165 students. Nineteen schools were selected, twelve public and seven private, the second moment was the drawing of classes and grades, where the entire class selected participated in the study. This sampling process allowed each student to have an equal chance of being drawn.

The students were classified as overweight and obese, according to the z score of the body mass index (zBMI) for age and calculated using the WHO AnthroPlus program. The zBMI for age was categorized according to the criteria proposed by the World Health Organization (WHO)¹²: Overweight (S) (\geq score $z + 1 \leq z + 2$) and Obese (O) (\geq score $z + 2$). The Chi-square test (χ^2) was used to calculate the prevalence of overweight and obesity by school system and city areas, with the help of IBM SPSS

software (Statistical Package for the Social Sciences) version 20.0.

The study was approved by the Human Research Ethics Committee of the Federal University of Rondônia (CAAE: 14190113.30000.5300).

RESULTS

Figure 1 shows the prevalence (%) by representation of the geographical location by overweight areas: north 21.9%, east 20.2%, central 17.8% and south 16.6%; obesity: zero north, east 9.7%, central 7.1% and south 6.7, respectively. Figure 2 shows the general prevalence of overweight 18.8% (n = 785) and obesity 8.3% (n = 345) in the city of Porto Velho, Rondônia, Brazil.

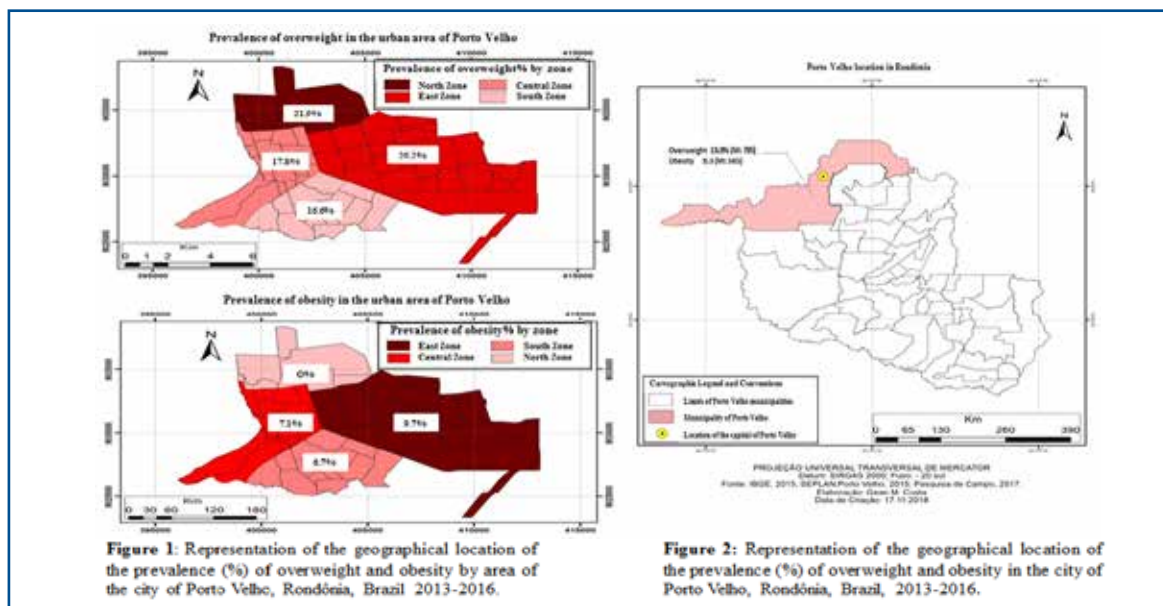


Figure 1: Representation of the geographical location of the prevalence (%) of overweight and obesity by area of the city of Porto Velho, Rondônia, Brazil 2013-2016.

Figure 2: Representation of the geographical location of the prevalence (%) of overweight and obesity in the city of Porto Velho, Rondônia, Brazil, 2013-2016.

In the private network, the general prevalence of overweight and obesity was 21.9% and 9.8%, with 22.2% and 12.4% predominating in the east. In the public health

system, overweight and obesity were 17.0% and 7.2%, with overweight in the northern zone predominating 21.9% and obesity in the central zone 7.5% (Table 1).

Table 1: Prevalence (%) of overweight and obesity in children and adolescents by area in public and private schools in the city of Porto Velho, Rondônia, Brazil. 2013-2015. n = 4165

Schools/zones	Total (n)	Overweight		Obesity	
		n	%	n	%
Privates					
Zones					
East	943	209	22.2	117	12.4
Central	805	135	20.5	54	6.7
South	0	0	0	0	0
North	0	0	0	0	0
Total	1748	374	21.4	171	9.8
Public					
Zones					
East	1049	193	18.4	77	7.3
Central	950	147	15.5	71	7.5
South	386	64	16.6	26	6.7
North	32	7	21.9	0	0
Total	2417	411	17.0	174	7.2

Continuation - Table 1: Prevalence (%) of overweight and obesity in children and adolescents by area in public and private schools in the city of Porto Velho, Rondônia, Brazil. 2013-2015. n = 4165

Schools/zones	Total (n)	Overweight		Obesity	
		n	%	n	%
Both/schools					
Zones					
East	1992	402	20.2	194	9.7
Central	1755	312	17.8	125	7.1
South	386	64	16.6	26	6.7
North	32	7	21.9	0	0
Total	4165	785	18.8	345	8.3

Table 2 shows the data by age and sex, the highest prevalences were found in overweight men 20.2% (n = 397) and obesity 10.2% (n = 200) compared to women 17.6% (n = 388) and 6.6% (n = 145). The male gender

at nine years old had a higher prevalence of overweight 30.7% and obesity 23.0% (Figure 3). In females, the highest prevalence occurred at 10 years of age, overweight 24.3% and obesity 13.8% (Figure 4).

Table 2: Prevalence (%) of overweight and obesity in school children and adolescents by sex and age in the city of Porto Velho, Rondônia, Brazil. 2013 - 2015.

Age / years	Total (n)	Male				Female				
		Overweight	%	Obesity	%	Total (n)	Overweight	%	Obesity	%
9	13	4	30.7	3	23.0	17	4	23.5	0	0
10	115	19	16.5	24	20.8	123	30	24.3	17	13.8
11	133	34	25.5	26	19.5	135	28	20.7	12	8.9
12	144	35	24.3	27	18.7	131	28	21.3	5	3.8
13	122	28	22.9	15	12.3	127	22	17.3	13	10.2
14	166	42	25.3	11	6.6	159	35	22.0	13	8.1
15	338	67	19.8	26	7.7	419	62	14.7	23	5.4
16	378	88	23.2	26	6.8	465	65	13.9	27	5.8
17	401	57	14.2	30	7.4	449	73	16.2	29	6.4
18	156	23	14.7	12	7.7	174	41	23.5	6	3.4
Total	1966	397	20.2	200	10.2	2199	388	17.6	145	6.6

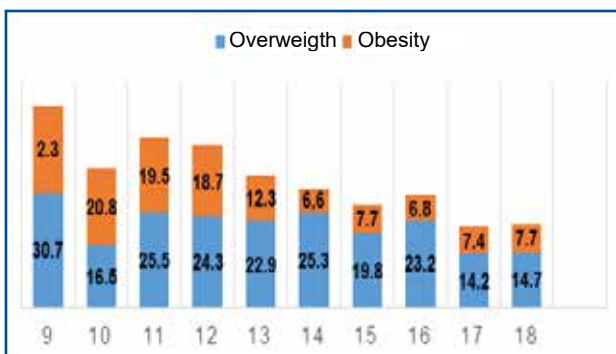


Figure 3: Representation of the prevalence (%) of male overweight and obesity by age (years).

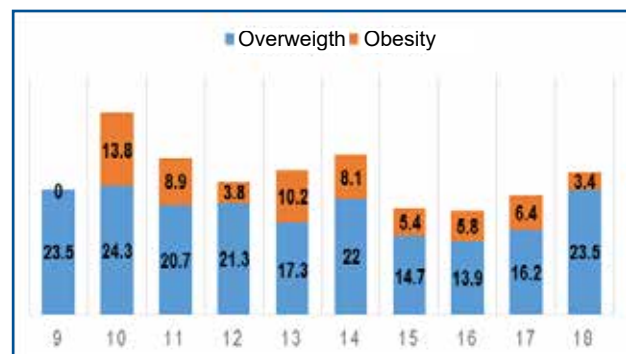


Figure 4: Representation of the prevalence (%) of female overweight and obesity by age (years).

DISCUSSION

This is one of the first studies carried out in the city of Porto Velho in the state of Rondônia located in the north of Brazil that used the WHO standard of 2007 to identify the prevalence of overweight and obesity in students of elementary and high education from public and private schools. It was found a high general prevalence of overweight of 27.1%, overweight 18.8% and obesity 8.3% in the age group of 9 to 18 years old, in both sexes, indicating an emerging public health problem associated with sedentary lifestyle.

A systematic analysis study at a global level showed that the prevalence of overweight (overweight and obesity) in children and adolescents in developed and developing countries has been gradually increasing every decade^{2,4,13}.

In Brazil, data from the Family Budget Survey (POF) 2008-2009 showed that the prevalence of overweight in adolescents was 21.7% and 19.4% in males and females, respectively, values of concern due to major problems associated with excess body adiposity¹⁴.

The development of obesity from an early age is a strong predictor of the persistence of this disease in adulthood and a risk factor for the development of other chronic non-communicable diseases such as cardiovascular diseases, dyslipidemia, high blood pressure, type 2 diabetes and some types of neoplasms⁹. There are several factors associated with the development of excess weight (S + O) in childhood and adolescence, among them: perinatal factors; inadequate eating habits; physical inactivity; screen time; relationship with peers; socioeconomic level; social context in which it is inserted; maternal schooling and parents' nutritional status^{9,15}.

The comparison of the prevalence of overweight and obesity in the students of the present study with national and international investigations is made difficult by the use of different references^{5,16}. These references differ in terms of the statistical methods applied and in the choice of cutoff points for the diagnosis of overweight (overweight and obesity). However, considering the immigration currents that occurred throughout the formation of the population of Rondônia, the WHO 2007 framework was chosen because it comes from a representative multiethnic sample from several countries, including Brazil.

The zBMI is a sensitive and specific indicator of overweight among children and adolescents. Overweight is defined as a zBMI between z score greater than or equal to + 1 (85th percentile) and obesity greater than z score +2 (95th percentile) for age and sex¹³. There may be differences in normal BMI reference standards among different countries, but the standards of International Obesity Task Force (IOTF) are recommended for general use¹⁷.

Although there are several investigations in the literature on the prevalence of overweight and obesity in school children and adolescents, similar research conducted in Porto Velho, Rondônia, Brazil, is scarce. The overall prevalence of overweight was 27.1%, overweight 18.8% and obesity 8.3%, in the present study (n = 4165), were similar in contrast to the magnitude of overweight in Brazilian adolescents aged between 10 and 19 years old

(20.5%), as evidenced in the 2008-09¹⁴ Household Budget Survey, which also applies the 2007 WHO framework¹².

National studies carried out by the Cardiovascular Risk Study in Adolescents (ERICA) project initiated in 2008 found a prevalence of overweight by northern regions of 16.8%, northeast 16.2%, midwest 17.4%, southeast 18.7 % and south of 17.4 - 20.0%; obesity north 7.4%, northeast 7.4%, central-west 8.6%, southeast 11.1% and south 10.0 - 12.3% respectively⁹, in contrast, international studies from South American countries¹⁷⁻¹⁹, Asia¹⁹ and the United States (31,7%)²⁰ the rates of overweight and obesity were higher than those found in national studies.

The representations in table 1 and figures 1 and 2, indicate that the highest prevalences were in males as follows, for overweight 20.2% in males and females 17.6%, for obesity 10.6% in males and 6.6% in females. The highest prevalence of overweight occurred in the male group at 9 years old (30.7%) and obese at 10 years old (20.8%) (Figure 1). A survey by the Brazilian Institute of Geography and Statistics (IBGE)²¹ carried out in 2015 with students aged 13 to 17, from the 5th grade of elementary school to the 3rd grade of high school, revealed that 7.8% of young people were obese. The problem affects 1 million teenagers, among the students with obesity 8,3% were male and 7.3% female. Out of more than 3 million of adolescents interviewed, 23.7% of them were overweight. The highest rate of obesity (10.2%) was registered in the South Region. In the South, 28.2% of young people were overweight (PeNSE)⁷.

International studies conducted in countries with an emerging economy showed a prevalence similar to that of the present study, as observed in India²², where the prevalence of overweight and obesity was 19.8% and 9.5%, respectively, whereas, in developed countries, the prevalence overweight has been above 30% in adolescents²³. We used the criteria of WHO¹² to verify possible influences of cutoff points to classify the nutritional status of adolescents. The application of these criteria revealed a prevalence of 27.1%, this value is very close to that found by the Centers for Disease Control and Prevention (CDC) National Center for Health Statistics (NCHS) which was 26.9%. The prevalence of overweight in the present study was higher in boys 30.8% (overweight 20.2% and Obesity 10.6%) whereas in girls was 24.2% (overweight 17.6% and Obesity 6.6%).

Data from the survey carried out by the IBGE¹⁴ showed that the proportion of boys aged 10 to 19 years old with excess weight went from 3.7% (1974-75) to 21.7% (2008-09), among girls, the growth of overweight went from 7.6% to 19.4%. Other studies have also found a higher prevalence of overweight among male adolescents^{13,15}. A study carried out in the United Kingdom²⁴ indicated that overweight is common in both male and female adolescents, however, in Italy, Finland and Austria, the prevalence is higher in males; in England and Spain, opposite results were verified²⁵.

In the present study, the prevalence of overweight (30.7%) and obesity (20.8) was higher in boys at nine and ten years of age. In girls, overweight (24.3%) and obesity (13.8%) were higher at 10 years of age. The prevalences in overweight boys were more accentuated in the ages of

nine to 16 years, in the other ages there was a fall, the greatest obesity occurred in the ages of nine to 13 years. The prevalence among girls were differentiated in relation to boys observed in figure 2, the highest was at 10 years old (23.4%) and maintained a linearity until 14 years old, occurring a decrease at 15 and 16 years old, and again increase at 18 years old, the prevalence (23.4%) becomes identical to that one at ages of 9 and 10 years old.

Although there seems to be a pattern on a global scale, which suggests that the prevalence of overweight and obesity is lower in children than in adolescents, there has been an increase in overweight and obesity rates in young children^{2,3}. In the present study, there was also a higher prevalence of overweight and obesity in the age group of children between the ages of 9 and 10 years, which raises important health concerns, as it means that the prevalence of overweight and obesity will increase in the future and the repercussions of this pathology will tend to occur increasingly earlier.

The Childhood Obesity Surveillance Initiative (COSI) - Portugal 2008/2009, promoted by the Platform Against Obesity of the General Directorate of Health, which covered 3,847 children aged 6-10 years, constituting a national representative sample, based on the CDC 2000 criteria, reported an overall prevalence of overweight of 18.1% and obesity of 13.9%. As for the distribution by sex, the prevalence of obesity and overweight was found to be 18.1 and 13.9% for females and 18.1 and 14.9% for males. This study is part of a WHO strategy - European Obesity Surveillance Initiative, which is the first European Child Nutrition Surveillance System²⁶. Comparing the data from the COSI - Portugal research with current study and taking into account only the data corresponding to the

same age groups, as shown in Table 1 and Figures 1 and 2, the estimated prevalences in our study are approximate, especially related to boys.

This study has limitations. The level of sexual maturation of adolescents has not been assessed, and it is known that it affects the accumulation and distribution of body fat in both boys and girls²⁷. In addition, because the evaluation used only the zBMI that measures overall value of fat and lean mass and may present false positives. It should be noted the recommendation made by Farias *et al.*²⁸ that the two indicators, zBMI and fat percentage are identification tools of overweight and obesity in order to avoid false positives.

Thus, it is suggested that fat percentage be included in studies to track obesity in children and adolescents. Despite this, BMI is also considered a reasonable alternative, although its limitation in discriminating fat mass from fat-free mass should be taken into account, which restricts the identification of cases of subcutaneous fat.

CONCLUSION

The magnitude of the prevalence of overweight and obesity in children and adolescents from public and private schools in the city of Porto Velho, Rondônia State, Brazil reveals a priority of public health actions aimed at schools and the family unit, regardless of the social segment.

The prevalence of overweight and obesity in both sexes in central and eastern areas where most private schools are located is a concern, showing high peaks among boys aged 9 years and girls of ten years old.

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Resumo

Introdução: A obesidade é uma doença crônica com etiologia multifatorial, provocada por um conjunto de aspectos genéticos, ambientais e psicológicos. Esta pode gerar comorbidades que afetam a qualidade de vida e implicam em outros riscos à saúde.

Objetivo: Descrever a prevalência de sobrepeso e obesidade em crianças e adolescentes escolares em Porto Velho – RO, Brasil. 2013-2016.

Método: Este estudo incluiu 4165 escolares de 9 a 18 anos. Os escolares foram classificados como sobrepeso e obeso, de acordo com o escore z do índice de massa corporal (IMC) para idade e calculado com auxílio do programa WHO AnthroPlus. Posteriormente, o IMC para idade foi categorizado conforme os critérios propostos pela Organização Mundial da Saúde (OMS, 2007): sobrepeso (\geq escore z +1 \leq z + 2) e obeso (\geq escore z +2). Os cálculos de prevalências foram feitos com o auxílio do programa SPSS versão 20.0.

Resultados: As prevalências de excesso de peso foram elevadas de 27,1%, sobrepeso 18,8% e obeso 8,3%, escolas particulares 21,4% e 9,8%, públicas 17,0% e 7,2% respectivamente. A zona leste predominou em ambas as redes de ensino 18,8% e 8,3% respectivamente. No sexo masculino a maior prevalência foi aos nove anos 30,7% e 23,0% e feminino 24,3% e 13,8%.

Conclusão: A magnitude da prevalência de sobrepeso e obeso foi elevada e preocupante em escolares da cidade de Porto Velho, o que demonstra a necessidade de ações de saúde pública voltadas à unidade familiar, independentemente do segmento social.

Palavras-chave: sobrepeso, obesidade, escolares.

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