Nutritional Diagnosis of Preschool Children in the Municipality of Teresina, Piauí

Diagnóstico Nutricional de Pré-escolares no Município de Teresina, Piauí

Diagnóstico Nutricional de Preescolares en el Municipio de Teresina, Piauí

RESUMO

INTRODUÇÃO: As deficiências de micronutrientes acometem aproximadamente um terço da população mundial. OBJETIVO: O estudo visou avaliar o estado nutricional em pré-escolares da rede Pública e Privada de Teresina-PI e sua relação com a prevalência da anemia. **MÉTODOS:** Trata-se de um estudo descritivo e analítico realizado entre o período de março/2014 a março/ 2015 com 2016 pré-escolares, de 2 a 6 anos de idade matriculados na Rede Municipal e em uma Escola Privada de referência da Cidade de Teresina-PI. Para dimensionar-se o tamanho amostral, considerou-se uma prevalência em torno de 10% de anemia e 10% de excesso de peso e obesidade, obtidas em estudo anterior. A aferição antropométrica foi realizada segundo o IMC para a idade. A hemoglobina foi dosada pelo método da cianometahemoglobina. Na análise estatística, foi aplicado o *Bartlett's test*, o teste do *Chi*-quadrado e *t* de *Student*. **RESULTADOS:** Foram pesquisadas 2016 crianças. Destas, 1210 eram de escolas públicas e 806 de escolas privadas. O resultado mostrou porcentagens próximas em relação ao sexo das crianças, o mesmo acontecendo no tocante à idade. Observou-se que em escolas públicas, 95,3% das crianças estavam eutróficas e 4,7% apresentaram excesso de peso. Nas das instituições privadas, 71,2% apresentaram eutrofismo, 23,6% excesso de peso e 5,2% obesidade. Verificou-se que 26,3% dos menores das escolas públicas estavam anêmicos. **CONCLUSÃO:** Observou-se que, nas escolas públicas além do eutrofismo havia em grande porcentagem presença do excesso de peso e a prevalência da anemia foi moderada.

PALAVRAS-CHAVES: estado nutricional, pré-escolares, eutrofismo, obesidade, anemia, micronutrientes.

ABSTRACT

BACKGROUND: Micronutrient deficiencies affect approximately one-third of the world population. OBJECTIVE: The study aimed to evaluate the nutritional status of preschool children in the Public and Private network of Teresina-PI and its relation to the prevalence of anemia. **METHODS:** This is a descriptive and analytical study carried out between March/ 2014 to March/ 2015 with 2016 preschoolers 2-6 years old enrolled in the Municipal Network and a reference Private School City Teresina-PI. To scale up the sample size, a prevalence around 10% anemia and 10% of overweight and obesity obtained in a previous study. The anthropometric assessment was carried out according to BMI for age. Hemoglobin was measured by the method of cyanmethaemoglobin. In the statistical analysis, the Bartlett's test was applied, the test Chi-square and Student's t. **RESULTS:** We studied 2016 children. Of these, 1210 were from public schools and 806 private schools. The result showed percentages coming toward sex of the child, the same is true with regard to age. It was observed that in public schools, 95.3% of children were normal weight and 4.7% were overweight. In private institutions, 71.2% had eutrophic, 23.6% overweight and 5.2% obese. It was found that 26.3% of children in public schools were anemic. **CONCLUSION:** It was observed that, in public schools beyond eutrophic had a large presence percentage of overweight and the prevalence of anemia was moderate.

KEYWORDS: nutritional status, preschool, eutrophic, obesity, anemia, micronutrients.

RESUMEN

INTRODUCCIÓN: Las deficiencias de micronutrientes afectan aproximadamente a un tercio de la población mundial. **OBJETIVO:** El estudio tuvo como objetivo evaluar el estado nutricional de preescolares de la red pública y privada de Teresina-PI y su relación con la prevalencia de anemia. **MÉTODOS:** Se trata de un estudio descriptivo y analítico realizado entre marzo de 2014 y marzo de 2015, con 2016 niños preescolares de 2 a 6 años de edad matriculados en la red municipal y en una escuela privada de referencia en la ciudad de Teresina-PI. Para dimensionar el tamaño de la muestra, se consideró una prevalencia aproximada del 10% de anemia y del 10% de sobrepeso y obesidad, obtenida en un estudio anterior. La evaluación antropométrica se

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realizó según el IMC para la edad. La hemoglobina se midió mediante el método de cianometahemoglobina. En el análisis estadístico se aplicaron la prueba de Bartlett, la prueba de Chi-cuadrado y la t de Student. **RESULTADOS:** Se estudiaron 2016 niños. De estos, 1210 eran de escuelas públicas y 806 de escuelas privadas. Los resultados mostraron porcentajes similares en relación con el sexo de los niños, lo mismo con respecto a la edad. Se observó que en las escuelas públicas, el 95,3% de los niños estaban eutróficos y el 4,7% presentaban sobrepeso. En las instituciones privadas, el 71,2% estaban eutróficos, el 23,6% tenían sobrepeso y el 5,2% obesidad. Se constató que el 26,3% de los niños de las escuelas públicas presentaban anemia. **CONCLUSIÓN:** Se observó que en las escuelas públicas, además del eutrofismo, había un alto porcentaje de sobrepeso y la prevalencia de anemia fue moderada.
PALABRAS CLAVE: estado nutricional, preescolares, eutrofismo, obesidad, anemia, micronutrientes.

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INTRODUCTION

The nutritional status of a population, especially that of children, is an excellent indicator of quality of life, reflecting the development model of a given society. [1] Micronutrient deficiencies affect approximately one third of the world's population, causing harm to individuals' health and population development. [2]

The World Health Organization (WHO) defines obesity as a disease in which excess body fat has accumulated to such an extent that health can be affected. [3] It is believed that the main determinants of the growth of obesity in the world are changes in eating behavior and sedentary lifestyle habits acting on susceptibility genes. [4]

Iron deficiency anemia affects people from all social classes, and is closely related to poverty, low educational levels and precarious social conditions, due to low intake or lack of access to iron-rich foods. [5]

In 2008, a national survey carried out by the Ministry of Health (2008) estimated a prevalence of 20.9% of anemia among children under five years of age. [6]

Studies such as those by Rocha (2012) [7] have drawn attention to the advantages of analyzing the nutritional status of children based on the space/institution they attend, such as daycare centers and schools. Thus, intervention programs to control iron deficiency that aim to increase the supply of the mineral must be comprehensive to serve the entire population. [8]

Given the above, the present study aimed to evaluate the nutritional status of preschool children and its relationship with anemia.

MATERIAL AND METHODS

The study was developed with preschoolers enrolled in the Municipal Network (Municipal Early Childhood Education Centers (CMEIS)) and in a Private School of reference in the City of Teresina, Capital of Piauí.

This is a descriptive and analytical study carried out between March/2014 and March/2015, in order to respond to the objectives of the study. To determine the sample size, a prevalence of around 10% of anemia was considered, obtained in a previous study carried out in Teresina, PI, by Landim, 2013 [9], and 10% overweight and obesity, obtained

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in a study cited by Silva (2010). [10] To calculate the sample size of public institutions, an estimate of the proportion "p" of anemia in the population was considered, = 10% = 0.1, and an estimate of the proportion "q" of those free from obesity in the population = 90% = 0.9. The desired precision around the prevalence = 1.80 (95% confidence interval, which is equivalent to two standard errors around the prevalence). Therefore, the standard error represented half of this value: The standard error "E" = 0.9% = 0.09 (0.9/100=0.009), totaling 1,111 children. For the private institution, the sample calculation for estimating the proportions was 10% with regard to anemia: "p" prevalence in the population = 10% = 0.1; "q" free from the disease in the population = 90% = 0.9. It can be seen that p + q = 100%. The desired accuracy of the prevalence = 3%. Therefore, the standard error represented half of this value: "E" = 1.5% = 0.015, totaling 800 children.

The selection of public daycare institutions was made using a spreadsheet provided by the Early Childhood Education Department of the Municipal Department of Education, with a list of all Municipal Early Childhood Education Centers (CMEIs). A random draw was carried out for the four regions, with two CMEIs selected per region. Of the total of 1,226 students enrolled in municipal daycare centers, 1,210 were surveyed, representing 98.6% of children enrolled in the CMEIs selected. The private school was selected intentionally. This school is a reference for the state of Piauí, and is considered by the Ministry of Education to be one of the best in Brazil, in addition to having students from all areas and neighborhoods of Teresina-Piauí.

This study is an excerpt from the thematic project entitled: " Use of Cookies Made from Cowpea Flour (Vigna unguiculata(L.) Walp), Rich in Iron, by Preschool Children to Control Iron Deficiency Anemia (in the original language, *Utilização de Biscoito à Base de Farinha de Feijão- Caupi(Vigna unguiculata(L.)Walp), Rico em Ferro, por Pré-Escolares para Controle da Anemia Ferropriva)"*, authorized by the Municipal Secretary of Education and by the directors of the Private Schools, through the signing of the Institutional Consent Form. The study was approved by the Ethics Committee for Research with Human Beings of the Federal University of Piauí-UFPI, under Opinion No. 94.772.

All children aged 2 to 6 years old, of both genders, who attended the CMEIs and the Private School of Teresina-PI and whose guardians signed the Free and Informed Consent Form (FICF) were included.

Data collection was carried out by undergraduate students in Nutrition and master's students in the Postgraduate Program in Food and Nutrition. The first stage involved providing information to the principal and teachers about the procedures that were carried out and the objectives of the study. In the second stage, the parents of the students were invited to a meeting to be informed about the research, at which time they signed the Free and Informed Consent Form (FICF). The third stage involved collecting data from the children whose parents had signed the Consent Form.

Hemoglobin was measured by the spectrophotometric method [11,12] through finger puncture, 20 µL samples of blood were obtained from the students, collected in a Sahli pipette and homogenized in 5 mL of Drabkin solution. The blood was properly stored (under refrigeration at a temperature of 8ºC) to be taken to the UFPI laboratory, where the reading was performed as soon as possible after collection. The reading was performed in triplicate, in a spectrophotometer, model E-210D, whose precision varies to three decimal places (in absorbance), with a wavelength of 540 nanometers and properly calibrated.

The standard sample was read (20 µL of hemoglobin standard in 5 mL of Drabkin's solution) and then the samples were collected. At each reading, the three absorbances were recorded for later calculation of hemoglobin, and after every 10 sample readings, the standard was read again. For the calculation, the calibration factor (CF) was as follows: CF = 10/average absorbance of the standard sample. Then, the Hb value in g/dL was obtained by multiplying the average absorbance of the sample collected by the CF. The cutoff points used to diagnose iron deficiency anemia were Hb = <11.0 g/dL for children under 5 years of age and from 5 years of age Hb = 11.5 g/dL (UNICEF, 1999). [12]

Anthropometric measurements followed standardized norms. The variables height and weight were measured using a platform-type scale (up to 150 kilograms and precision of 0.1 kg) previously calibrated, with an anthropometric ruler with a 2 m aluminum scale. Only one previously trained measurer was used for each variable. Three consecutive measurements were taken and an average of these were calculated to ensure greater data reliability. A note-taker was responsible for recording them on a specific form for each child.

Weighing and measurements were performed simultaneously. The child was barefoot, wearing the school or CMEI uniform, with no objects in their hands or pockets. The children's heels were touching the anthropometric ruler and their heads were held with the nape of the neck against the molar region, and the hand of the person taking the measurement was used to hold the child in place by applying bilateral pressure to the molar region. Any ornaments (buckles, elastic bands) on the child's head were removed.

To determine nutritional status, the criteria of the World Health Organization and those provided by the Brazilian Ministry of Health were used [13] represented by BMI for Age using the

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Anthropometric Program ANTHRO, 2011, a program developed by the World Health Organization (WHO).

As for associated diseases, these were investigated through the responses of guardians in the research questionnaires as possible diseases that the child had before or at the time of the study. For statistical analysis, a database was created in the Statistical Package for the Social Sciences, version 17.0. The data were presented in Tables and Figures.

In order to verify the homogeneity of the population, the Bartlett's test was applied, in order to test the association, the Chi-square test was used and the Student's t-test was used to verify the difference between means. The Pearson Correlation Coefficient was used between overweight and obesity in relation to age and income. Odds were also used to know the size of the risk in relation to the disease and the stratified variables of age and income. To finalize the analysis of the results, the Population Attributable Risk (PAR) was used and demonstrated in a figure, which compared the prevalence applied in the sample calculation and the result found. To consider statistical significance, an alpha error of 0.05% was adopted. [14]

RESULTS

2016 children were surveyed. Of these, 1210 (60%) were from public schools and 806 (40%) from private schools in the Municipality of Teresina-PI.

The Bartlett's test was applied and it found a homogeneous population in each group with p = 0.764. The result showed that the percentages were very close in relation to sex, the same happening with regard to age. Regarding the education of the parents of the children enrolled in private schools, the percentage was 100% with higher education. In public schools, among the mothers of the children, 50.7% had completed high school and 73.1% of the fathers had completed elementary school.

There was no association between the nutritional status of the preschoolers and the education of the parents. Regarding family income in minimum wages (ms), the data showed that 100% of those responsible for the children in the private school had an income above five minimum wages and an average of 5 people in the family. The predominant family income stratum was between 1 and 2 minimum wages, representing 61.5% of the total. The average number of people in the family was 04 people. The Bartlett's test Chi-square showed a significant difference (p<0.05), while Student's t-test showed no statistically significant difference between the means.

Regarding nutritional status, of the total of 2,016 children studied, the majority were eutrophic, with 85.7% (1,727), the percentage of overweight minors was 12.3% (247), while obesity was present in 2.1%. Of the total of 2,016 children studied, 490 (24.3%) presented some type of pathology.

In the children from private institutions, 71.2% presented normal nutritional status, with 23.6% being overweight and 5.2% being obese minors. The Chi-square test showed a significant difference (p<0.001) between the variables analyzed (Table 01).

Table 01. Number and percentage of children enrolled in educational institutions according to nutritional status.

Nutritional Status (BMI)	Children enrolled in schools:				Total	
	Public		Private			
	N°	%	N°	%	No	%
Eutrophic	1153	95,3	574	71,2	1727	85,7
Overweight	57	4,7	190	23,6	247	12,2
Obesity	-	-	42	5,2	42	2,1
Total	1210	100,0	806	100,0	2016	100,0

$\chi^2 = 236,2$ p = < 0,001

d a significant difference (p<0.001) between the variables analyzed (Table 01).

Regarding the presence of anemia, 662 children were probabilistically selected, representing 54.7% of the total of 1,210 children surveyed in public schools. The result showed that 26.3% (174) of the children were anemic. The Chi-square test showed a significant difference between the proportions (p<0.0001). When the presence of the above pathology was confirmed, it was observed that the hemoglobin concentration among the anemic children was 10.7 mg.

Regarding the income ranges, there was a higher prevalence of children with anemia, representing 56.3%, in families that earned between 1 and 2 minimum wages (mw).

It was observed in Table 02 that the frequency of overweight was 12.3% in boys and 12.2% in girls, while the prevalence of obesity was among men, with 2.1%, and among women, with 2.0%. There was no significant difference (p= 0.971) between sex and nutritional status.

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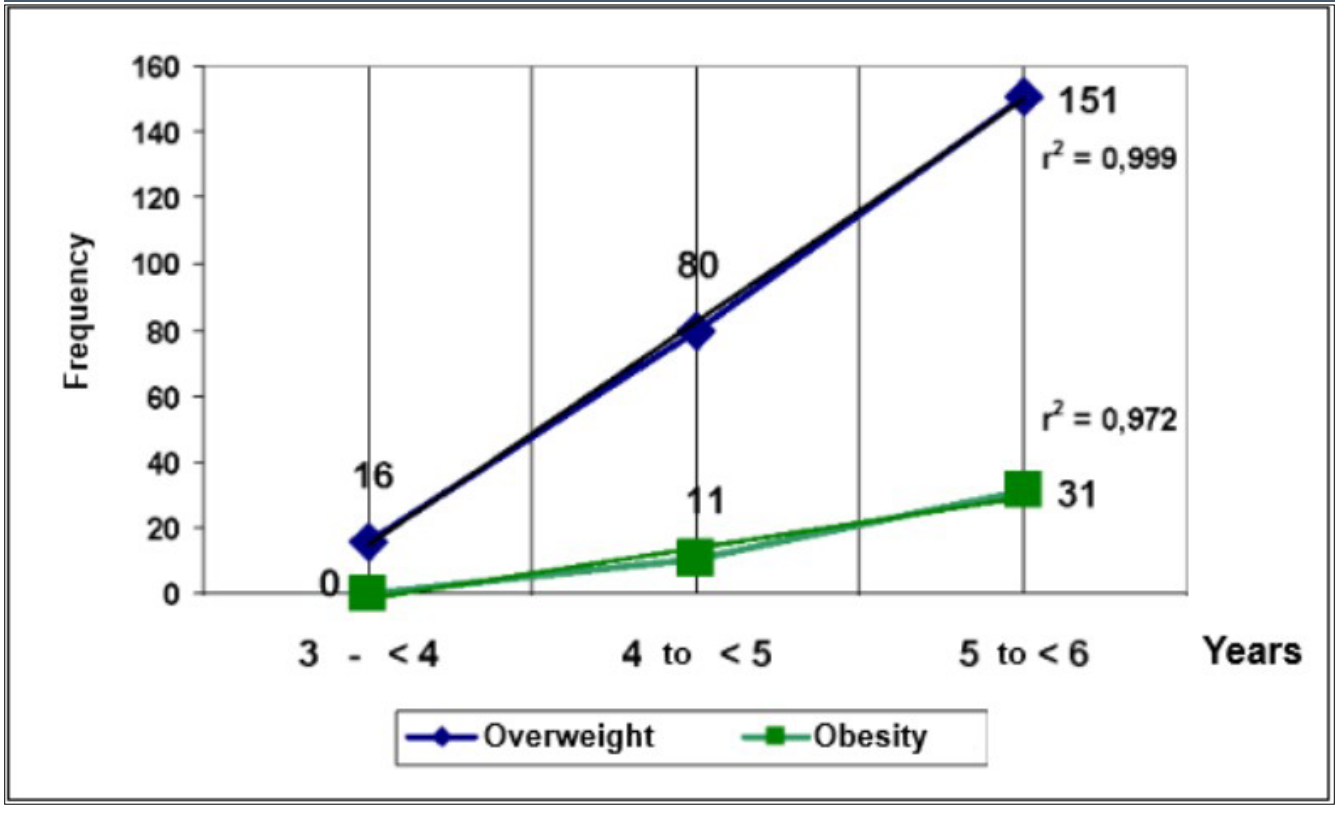
Table 02. Children enrolled in educational institutions according to sex and nutritional status (BMI).

Nutritional Status (BMI)	Sex				Total	
	Male		Female			
	N°	%	N°	%	N°	%
Eutrophic	872	85,6	855	85,8	1727	85,7
Overweight	125	12,3	122	12,2	247	12,2
Obesity	22	2,1	20	2.0	42	2,1
Total	1019	100,0	997	100,0	2016	100,0

$\chi^2 = 0,59$ p = < 0,971

Regarding the presence of anemia associated with nutritional status, it was observed that among anemic children, 95.9% were eutrophic, the same occurring among non-anemic children (94.7%). In addition, it was observed that the percentage of children with excess weight was also similar between the groups with and without anemia (Figure 02).

Figure 02. Pearson correlation between overweight and obesity in relation to age in years.



The results showed that there was a strong correlation between increased income and excess weight; r2 = 0.887 and obesity r2 = 0.995 (Figure 01). In both situations, there was a statistically significant difference.

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Figure 01. Pearson correlation between overweight and obesity in relation to family income in minimum wages (MW).

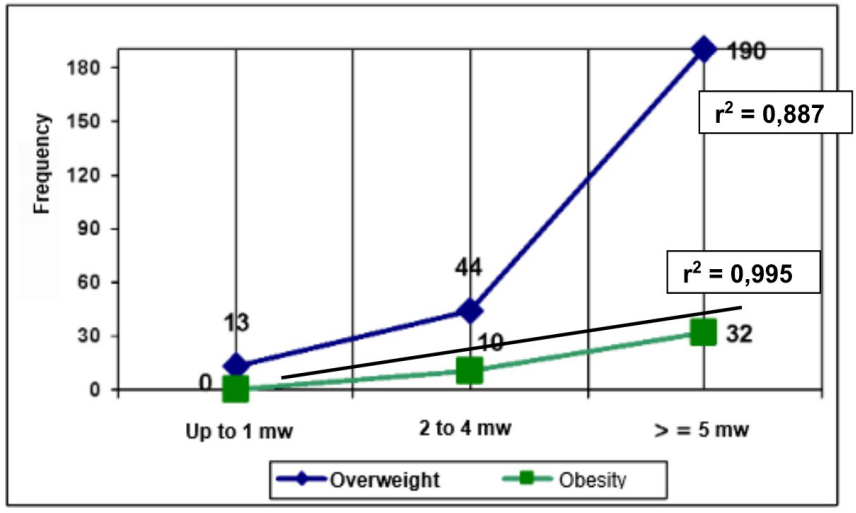
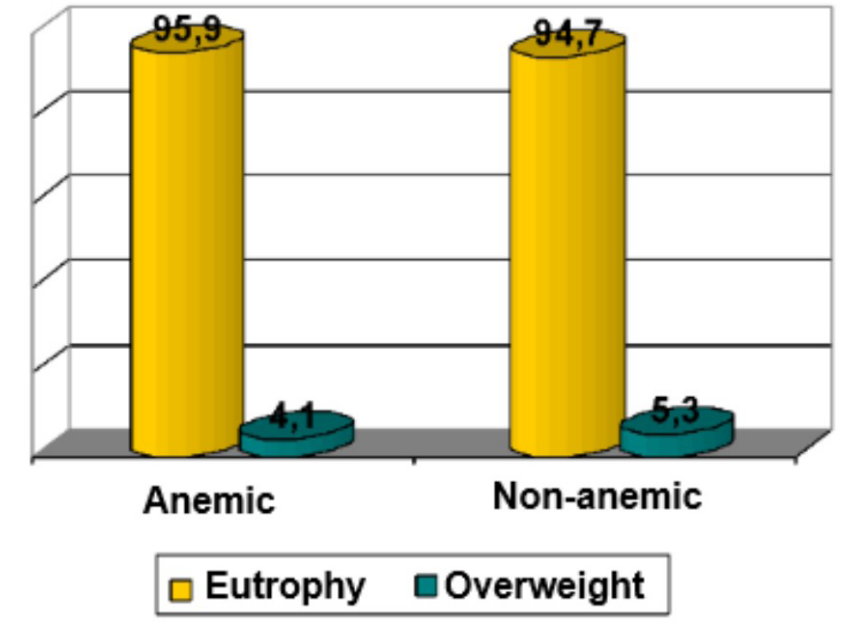


Figura 01. Correlação de Pearson entre excesso de peso e obesidade em relação à renda familiar em salários mínimos (SM).



DISCUSSION

Different data from the present study were obtained in the study by Neto et al. (2014), [16] in which there was a predominance of male children (53.84%). Another study carried out by SUZIN et al., 2012 [17], in Cascavel-PR, with 488 children, presented 48.9% of the sample being male and 51.1% being female, in line with the results obtained in the present study, in which there was no statistically significant difference.

Regarding sex and age in relation to the educational institutions of the children surveyed, Suzin et al., (2012) [17] researched children aged 60 to 72 months, and obtained results with a predominance of preschool children of approximately 54 months, different from the present study. Landim et al., (2013) [9] in a study with preschoolers, carried out in the city of Teresina- PI, both sexes had the same number of individuals, and the average age in the male sex was 60.7 months, while in the female group the average was 57.2 months, approaching the reality of the present study, regarding age, whose averages were close.

Ribeiro and Sigulem (2008) [18] found in a study with preschoolers that there was an association between the increase in preschoolers' excess weight and the increase in their mother's level of education, which was a good predictor of the variable and indicated that the chance of excess weight in these children increased 1.07 times for each year of their mother's education. In the present study, there was no association between the nutritional status of preschoolers and their parents' level of education.

In a study conducted by Andrade et al. (2012) [19] with preschoolers from public schools in Minas Gerais, most families had an income between one and three minimum wages 19, approaching the reality verified in the present study. These results corroborate those of Zöllner and Fisberg (2006) [20] where the average income of families in their work was 3.7 minimum wages, with 34.5% of children belonging to families with an income of less than 0.5 minimum wages and 11.8% of families having an income of less than one minimum wage.

Study carried out by Martino et al. (2010) [21], in which they evaluated 151 children from public schools, they found that the sanitary conditions of their homes were healthy, and 100% of them had treated water, a sewage

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system and regular garbage collection, different from the result obtained in the present study.

Regarding the presence of pathologies, there were 212 (43.3%) in private schools and 278 (56.7%) in public schools. Oliveira (2009) [22], In a study with preschoolers in a municipal daycare center in São Paulo, a constant increase in the incidence of chronic diseases such as heart disease, diabetes, asthma, bronchitis, hypertension and obesity itself was observed. This result coincides with that of the present study, in which preschoolers in public institutions had a higher percentage of pathologies. It can be inferred, therefore, that the lower income of their families and the worse housing facilities can lead to a decrease in immunity, triggering a worse state of health.

In the present study, anemia was studied only in the group of preschoolers in public institutions due to the resistance obtained in private schools. Queiróz (2007) [23] in a study conducted with the preschool population of the municipality of São Bernardo do Campo, a low prevalence of anemia (5.71%) was reported, compatible with the present study, and this result is justifiable in view of the increase in iron intake due to the food offered in school meals. Landim (2013) [9] observed in an interventional study carried out with preschoolers in the city of Teresina- PI, where there was ingestion of biofortified bean biscuits to improve the anemic condition, that after biscuit supplementation, the prevalence of anemia decreased, having previously had a prevalence of 12.2%, becoming 10.0.

In the study by Assunção et al. (2007) [24] with preschoolers in the city of Pelotas, there was a statistically significant association between the presence of anemia and the mother's and father's education and family income. Most of the children who did not have their hemoglobin measured were children of mothers and fathers with more than five years of education and approximately 40% came from families with an income higher than six minimum wages. Capillary hemoglobin values ranged from 5.9 to 16.7 g/dL, with an average of 11.3 g/dL and a standard deviation of 2.8 g/dL, higher than the values in the study.

Regarding the nutritional status of the children studied, the majority were eutrophic, with 85.7% (1,727). In public schools, 95.3% were eutrophic and 4.7% were overweight.

Among children from private institutions, 71.2% were eutrophic, with 23.6% being overweight and 5.2% being obese minors. Nascimento et al., (2011) [25], in their study, with children aged 2 to 6 years from two sets of preschools (private and philanthropic) in the metropolitan region of Greater São Paulo, they observed that the prevalence of risk of excess weight was high in both groups. Pessoa et al., (2014) [26] in a study carried out with preschool children in the city of Teresina-PI, it was observed that in all public daycare centers the predominance was of eutrophic children, followed by lower frequencies of risk of weight and excess weight, while the lowest frequencies were with a nutritional diagnosis of thinness. This result is similar to that of the present study, regarding the high percentage of children with a eutrophic state.

Study carried out with preschoolers in private and public schools in São Paulo, Balaban and Silva. (2004) [27] When considering the prevalence of obesity or excess weight, they stated that no significant difference ($p<0.05$) was observed between the sexes as age increased. According to the authors, this may indicate that in the age group of 2 to 6 years, the process of establishing weight changes is stable, and may undergo changes later on, in school-age children and in adolescence, consistent with the present study, in which there was no significant difference between sex and nutritional status.

The results showed that there was a strong correlation between increased income and excess weight. In developing countries, such as Brazil, families with greater purchasing power are more likely to be overweight, when compared to less affluent families (GOMES et al, 2009) [28] and in less developed regions or states, the proportion of obese people increases as income increases.

Almeida et al., (2004) [29] In a study carried out with preschool children, where factors associated with iron deficiency anemia were analyzed, no influence of nutritional status on hemoglobin levels was observed, compatible with the result obtained in the present study, with no significant difference.

The data from the present study showed that the prevalence attributed for the sample calculation, of 10%, in relation to anemia, according to the study by LANDIM (2013) [9], and the prevalence obtained in the study (26.3%) showed an increase, with a significant difference ($p < 0.001$).

CONCLUSION

The parents of children enrolled in public and private schools, in terms of socioeconomic and cultural status, had different incomes and levels of education, but despite this, there was no influence on the nutritional status of the children.

It was observed that, in addition to eutrophic children, a large percentage of children in public schools were overweight, unlike the results observed in private schools, where there was also obesity in addition to overweight.

The prevalence of anemia, although present in children in public schools, was moderate at 26.3%, and among the anemic children, the majority were found to be eutrophic in terms of nutritional status.

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