



GROWTH AND NUTRITIONAL STATUS IN CHILDREN UNDER 5 YEARS OLD BASED ON ANTHROPOMETRIC INDICES

CRESCIMENTO E ESTADO NUTRICIONAL EM CRIANÇAS MENORES DE 5 ANOS COM BASE EM ÍNDICES ANTROPOMÉTRICOS

CRECIMIENTO Y ESTADO NUTRICIONAL EN NIÑOS MENORES DE 5 AÑOS CON BASE EN ÍNDICES ANTROPOMÉTRICOS

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ABSTRACT

Objective: to evaluate the growth and nutritional status of children under five years old treated in a clinic-school and to identify associated factors. **Method:** descriptive, transversal study conducted with 353 children attending the clinic-school. The growth and nutritional status were evaluated by the indexes height/age, weight/age, weight/height and BMI/age. Socioeconomic and health data were collected from questionnaires. Relations between variables were tested by chi-square and Pearson's correlation. This study was approved by the Research Ethics Committee, CAAE: 15722813.8.0000.5210. **Results:** short height was found in 6.8% of children. Overweight was present in 3.6%, 15.2% and 15% of boys and 4.6%, 13.7% and 14.8% of girls according to weight/age, weight/height and BMI/age respectively. There was a statistically significant association between nutritional status and gender, age, frequency of prenatal care and hospitalization for pneumonia. Diarrhea, pneumonia and frequent diseases showed statistically significant correlation with age. **Conclusion:** the inadequacy of growth and nutritional status found here consisted mainly of high prevalence of obesity, which was associated with biological factors and health. **Descriptors:** Growth; Nutritional Assessment; Anthropometry.

RESUMO

Objetivo: avaliar o crescimento e o estado nutricional de crianças menores de cinco anos atendidas em uma clínica-escola e identificar fatores associados. **Método:** estudo descritivo, transversal, realizado com 353 crianças atendidas em clínica-escola. O crescimento e estado nutricional foram avaliados pelos índices estatura/idade, peso/idade, peso/estatura e IMC/idade. Dados socioeconômicos e de saúde foram coletados em questionários. Relações entre variáveis foram testadas pelo qui-quadrado e Correlação de Pearson. Este estudo foi aprovado pelo Comitê de Ética em Pesquisa, CAAE: 15722813.8.0000.5210. **Resultados:** baixa estatura foi encontrada em 6,8% das crianças. Excesso de peso estava presente em 3,6%, 15,2% e 15% dos meninos e em 4,6%, 13,7% e 14,8% das meninas segundo peso/idade, peso/estatura e IMC/idade, respectivamente. Houve associação estatisticamente significativa entre estado nutricional e sexo, idade, frequência ao pré-natal e internação por pneumonia. Diarreia, pneumonia e doenças intercorrentes apresentaram correlação estatisticamente significativa com idade. **Conclusão:** a inadequação do crescimento e do estado nutricional aqui encontrada consistiu principalmente em elevada prevalência de obesidade, que estava associada a fatores biológicos e de saúde. **Descritores:** Crescimento; Avaliação Nutricional; Antropometria.

RESUMEN

Objetivo: evaluar el crecimiento y el estado nutricional de niños menores de cinco años atendidas en una clínica-escuela, e identificar factores asociados. **Método:** estudio descriptivo, transversal realizado con 353 niños atendidos en clínica-escuela. El crecimiento y estado nutricional fueron evaluados por los índices estatura/edad, peso/edad, peso/estatura e IMC/edad. Datos socioeconómicos y de salud fueron recogidos en cuestionarios. Relaciones entre variables fueron testadas por el Chi-cuadrado y Correlación de Pearson. Este estudio fue aprobado por el Comité de Ética en Investigación, CAAE: 15722813.8.0000.5210. **Resultados:** baja estatura fue encontrada en 6,8% de los niños. Exceso de peso estaba presente en 3,6%, 15,2% y 15% de los niños y en 4,6%, 13,7% y 14,8% de las niñas según peso/edad, peso/estatura e IMC/edad, respectivamente. Hubo asociación estadísticamente significativa entre estado nutricional y sexo, edad, frecuencia al pre-natal e internación por neumonía. Diarrea, neumonía y enfermedades intercorrentes presentaron correlación estadísticamente significativa con edad. **Conclusión:** la inadecuación del crecimiento y del estado nutricional aquí encontrada consistió principalmente en elevada prevalencia de obesidad, que estaba asociada a factores biológicos y de salud. **Palabras clave:** Crecimiento; Evaluación Nutricional; Antropometría.

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INTRODUCTION

Growth is a dynamic and ongoing process that occurs from conception to the end of life and it is expressed by increasing the body size.¹ It is an important element for estimation of the health conditions of children and the quality of life of a country.² Thus, a new view at the health of the child is necessary because there are causalities between early events and future outcomes in the growth process. Therefore, it is the importance of monitoring the child's growth, since childcare has a preventive potential to impact on interventional strategies to the binomial health-disease.³

The biggest increase body weight and length affect the first two years of life, adolescence and pregnancy, periods considered critical, when epigenome has an exacerbated plasticity.⁴ The strong influence of the environment on genetic factors, generating memory mobile and intergenerational adaptive response are now proposed to explain some health problems that characterize the nutritional transition and subsequent childhood obesity observed today.⁵

In the nutritional status in childhood, the Family Expenditure Research conducted by IBGE (Brazilian Institute of Geography and Statistics) showed that, overweight and obesity are showing increasing frequency among children, almost tripled in the last 20 years. Between five and nine years old, overweight increased from 10.9% to 34.8% in boys and from 8.6% to 32% in girls. However, for the age group of children under five there are few studies in Brazil, especially to factors association as the existing regional differences in the country.⁶

The assumption that problems changing the adequacy growth in early life (programming) can lead to permanent modifications and long-term in the structure or function of the organism⁷, led to the hypothesis that factors such as age, gender, frequency of prenatal, birth weight, classification of the newborn in gestational age, frequency of diarrhea, pneumonia and other continuous illnesses, hospitalizations and socioeconomic status, could influence in a significant way the nutritional status and child growth. In this sense, this study aims to evaluate the growth and nutritional status through anthropometric indexes of

children under five years old treated in a Health Integrated Center of a capital in northeastern Brazil, and to investigate the factors associated with them.

METHOD

Observational, descriptive study with quantitative, transversal approach, carried out with children under five years old treated in a Health Integrated Center of an Institution of Higher Education in the city of Teresina, in the period from July to October 2013.

The sample size was calculated considering an error margin of 4.68%, and 95% confidence level based on finite population of 1800 children (N) and the minimum estimated ratio $r = 50\%$, resulting in size sample of 353 children (n), with free demand sampling. Anthropometric measures of body weight and length or height were performed by trained health professional, in a private office environment using standard tools and techniques.⁸ The instrument used to collect data related with health aspects was a structured questionnaire to obtain information about age, gender, frequency of mothers in prenatal care, birth weight, classification of the newborn as gestational age, diarrhea frequency, pneumonia and other continuous diseases and history of hospitalizations. To assess the socioeconomic conditions, the questionnaire and criteria of Economic Classification of Brazil were used from the Brazilian Association of Research Companies (ABEP, 2013).⁹

The body weight measures were performed using scale with 16 kg capacity, minimum weight of 200 g and variation of 100 g for weighing babies, and for older children, there was a scale with capacity of 150 kg, minimum weight of 2.5 kg and variation of 100 g. Vertical stadiometer was used for height measurement in children older than 24 months and horizontal stadiometer to measure length of children under 24 months old.

All children attending the integrated clinic that had less than five years old were included in the study, answering by spontaneous demand during the period July to October 2013, and whose parents or caregivers agreed to participate in the study through signing the Consent Term. Exclusion criteria were considered the existence of physical deformities that prevented the

anthropometric measurements, the concomitant presence of endocrine, metabolic disorders or other that could directly affect the adequacy of growth, or use of drugs that induce weight gain or interfere linear growth.

The anthropometric classification was performed using Anthro-2007 software from the World Health Organization (WHO),¹⁰ children classified by the indices height/age (H/A), weight/age (W/A), weight/height (W/H) and body mass index /age (BMI/age), expressed in scores Z. The standard of infant growth related to nutritional status used as reference for classification of weight and height measures was the World Health Organization (WHO)¹¹, which is adopted by the Ministry of Health in Children Handbook. Cutoffs for categorization of results: severe thinness: < -3 Z scores; Thinness: -3 Z scores to < -2 Z scores; Appropriate: -2 Z score to ≤+1 Z scores; Overweight risk: > +1 Z scores to ≤ +2 Z scores; Overweight: > +2 Z scores to ≤ +3 Z scores; Obesity: > +3 scores Z.

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS), version 14.0. The age and gender of the children, frequency of mothers in prenatal care, birth weight,

classification of newborns according to gestational age, frequency of diarrhea, pneumonia, other continuous illnesses and hospitalizations of children, as well as socioeconomic status of families, were presented as absolute and relative frequency. Relations between variables were tested by applying the chi-square test and Pearson's correlation using a significance level of p<0.05. The study was approved by the Ethics Committee in Research of the University Center UNINOVAFAPI (CAAE: 15722813.8.0000.5210) before conducting the study. All responsible for the participants signed the Informed Consent Term that followed the model recommended by Resolution 466/12. There were no refusals to participate in the study.

RESULTS

The sampling distribution in 353 children surveyed shows a predominance of females (53.8%). Table 1 shows that in the education level of the family head, more than half of the surveyed (57.78%), was incomplete high school. It was also noted that 80.74% of the study group come from families classes C1, C2 and D/E, whose family average gross income ranges from R\$ 1,685.00 to R\$ 776.00.

Table 1. Socioeconomic profile of the families of children under five years old treated in clinic-school for children. Teresina - PI, 2013.

Variables		n	%
Education level of the family head	Illiterate / Elementary I incomplete	10	2,83
	Elementary I complete/ Elementary II incomplete	65	18,41
	Elementary II complete/High school incomplete	129	36,54
	High school complete/Higher education incomplete	118	33,43
	Higher education complete	31	8,78
	Total	353	100
Economy class/ Brasil criteria	A1	1	0,28
	A2	4	1,13
	B1	14	3,97
	B2	49	13,88
	C1	190	53,82
	C2	353	100
	D/E	84	23,80
Total		353	100

The birth weight of children was analyzed in the range of 2.5 to 3.9 kg in 82.44% of cases, when the percentage of newborns classified as born on term was 87.25% and prenatal follow-up was reported by 98.86% of mothers of children participating in the study (Table 2).

The nutritional status classification presented in Figure 1 shows an eutrophic predominance of females in the four anthropometric indices used. When considering the weight/age, it was observed a high weight in 3.6% of boys and 4.6% of girls. However, if added the percentage of overweight risk, overweight and obesity for

males obtained by the weight/height and BMI/age, there were values of 15.2% and 15%, respectively. Similar results were observed in women, with values of 13.7% compared to the weight/height and 14.8% compared to BMI.

Table 2. Factors related to the health conditions of children under five years old treated in a clinic-school for children. Teresina - PI, 2013.

Variables		n	%
Birth weight (kg)	Less than 2,5	40	11,33
	2,5 ---- 4	291	82,44
	4 or more	22	6,23
	Total	353	100
Newborn classification according to gestational age	Pre-term	41	11,61
	Term	308	87,25
	Post-term	4	1,13
	Total	353	100
Prenatal follow-up realization	Yes	349	98,86
	No	4	1,14
	Total	353	100
Gender	Male	163	46,18
	Female	190	53,82
	Total	353	100

Descriptive statistical analysis of frequency.

The results presented in Figure 1 also shows low weight for age and very low weight for age in 5.1% of children. Severe thinness and thinness appear at 6.8% on the

results of weight/height and in 8.22% according to BMI/age. The cases of short height and very short height for the height/age were index were around 6.8%.

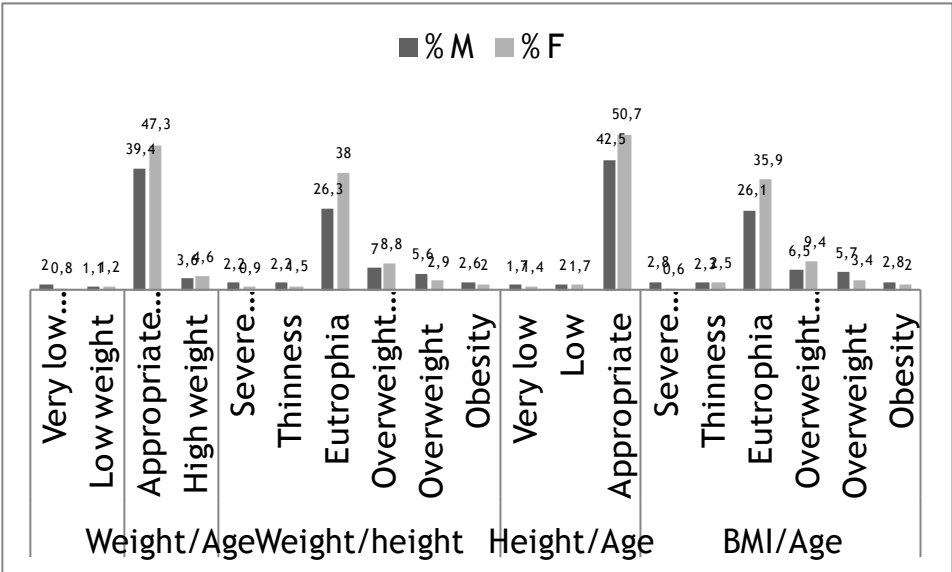


Figure 1. Nutritional status of children under five years old treated in a clinic school, according to anthropometric and gender indices. Teresina/PI, 2013.

BMI- Body Mass Index

The gender variable was significantly associated ($p<0.05$) to weight/height and BMI/age, and age was associated ($p=0.02$) with height/age. It was verified a relation

($p=0.02$) between the number of prenatal consultations and BMI/age, being dependent variables with statistically significant association (Table 3).

Table 3. Association between weight/age, weight/height, height/age and BMI/age of children under five, according to biological variables and other characteristics. Teresina, PI, 2013.

Variables	Weight/Ag e	Weight/he ight	Height/Ag e	BMI /Age
	p-value	p-value	p-value	p-value
Gender	0,43	0,01	0,42	0,04
Age	0,3	0,44	0,02	0,34
Birth weight	0,02**	0,04**	0,26	0,06**
Newborn classification*	0,003**	0,16**	0,31**	0,12**
N° of prenatal consultations	0,72**	0,10**	0**	0,02

BMI - Body mass index; *Newborn classification according to gestational age; ** Existence of cells containing fewer than five elements .

The other factors analyzed here, including socioeconomic status, newborn classification according to gestational age, birth weight and the level of education of the family head were not significantly

associated with anthropometric indices tested.

The level of linear relationship of numerical variables was analyzed by Pearson correlation (Table 4). It was observed that age had weak positive correlation with number of hospitalizations

for diarrhea (p=0.003) and pneumonia (p=0.014) and the frequency of diarrhea, pneumonia and other causes of continuous illnesses (p=0.000). It was evidenced weak negative correlation between age and BMI (p=0.001). These data were not reported in the table.

Table 4. Pearson correlation between age and body mass index (BMI) of children under five years old frequent in prenatal care, previous diseases with and without hospitalization. Teresina PI-2013

Variables	Age (months)		BMI (kg/m ²)	
	r	p	r	P
Hospitalization for diarrhea	0,159	0,003**	-0,087	0,102
Hospitalization for Pneumonia	0,130	0,014*	-0,106	0,046*
Hospitalization for other causes	0,059	0,273	-0,043	0,42
Freq. of diarrhea without hosp.	0,392	0,000**	0,044	0,409
Freq. of Pneumonia without hosp.	0,543	0,000**	-0,04	0,456
Freq. of other causes without hosp.	0,201	0,000**	-0,027	0,608
Nº of prenatal consultations	0,052	0,332	-0,025	0,646

* p<0,05; ** p<0,01; r: coefficient of Pearson´s correlation. Freq. = frequency; hosp. = hospitalization.

The analysis of Table 4 shows that BMI had statistically weak negative correlation with the number of hospitalizations for pneumonia (r = - 0.106 and p = 0.046).

DISCUSSION

It was initially considered that the distribution of the sample population stratum described corresponded to the most found in the Northeast, with the vast majority of families grouped in economic classes C1, C2 and D/E, and low level of education of the family head.

In this research, such socioeconomic factors were not associated with the growth and nutritional status of children under five, different than reported in a study that assessed the prevalence and factors associated with overweight in preschool children 4-6 years old in two states of southern Brazil¹² and in a study in Holland.¹³ In the northeast region, the SCAALA study concluded that the socioeconomic conditions of families determine eating patterns of children, which influence child growth.¹⁴

On the other hand, a study conducted in Brazilian cities showed that the actions developed by the Family Health Program were associated with the reduction in child malnutrition rates in the country, besides other determinants of the problem,¹⁵ showing that the analysis of a single factor, such as socioeconomic factors described above, may not reflect a reliable picture of their influence, since their interpretation expresses the complementary character across a wide range of other extrinsic

factors that has its concomitant performance.¹⁶

When analyzing the nutritional status, normal weight predominated in females in all anthropometric indices studied. The variable gender was associated with nutritional status for weight/height and BMI/age. These data are consistent with the National Demographic and Health Survey (PNDS),¹⁷ in which the prevalence of height-for-age deficits estimated for the group of children below five years old was higher for boys (8.1 %) than girls (5.8%). The occurrence of excess weight-for-height was found in 6.6% of Brazilian children under five years old. These percentages are lower than those found in this study in which considering the weight/height index, cases of overweight risk, combined overweight and obesity were nearly a third of the sample. Even they are only considered overweight/obesity, percentages found here configure values that correspond to twice the national average.

This situation is a process that has been occurring in several regions of Brazil, with overweight prevalence in children increasing from 17% to 20.9% in a study that evaluated the secular trend of growth in preschool children in the city of Taubaté (SP).¹⁸ In another study in the municipal school of Maringá (PR), between 1997 and 2007, overweight was found in 24.1% of children.¹⁹

Inadequate infant growth described here is far less evident when considering only the weight/age, where the vast majority of children had adequate weight for the age, highlighting the importance of using anthropometric measurements as

recommended by the Food and Nutrition Surveillance of the Ministry of Health.⁸ This fact brings to the Childcare responsibility for detecting factors associated with child growth, whose potential risks to the emergence of adult diseases, should trigger planned and implemented from early childhood interventions.

On the other hand, low-weight ratios and very low weight for age, severe thinness and thinness, and short height and very short height reported here are similar to national decline of malnutrition data, especially in the northeastern of Brazil, where there was demonstrated a decrease from 22% to 5.9% in height deficiencies.²⁰ Accordingly in another study conducted in Pernambuco, the prevalence of height deficit presented a significant reduction of 43% among children five years old (16.9% in 1997 to 9.6% in 2006).²¹ When comparing the results of local research with data from regional and national studies, it is possible to point out the differences in anthropometric indices and try to relate them to the characteristics of the study populations.

With regard to birth weight, almost all surveyed had birth weight in the normal range,²² However, birth weight was identified as a risk factor for height deficit in a “baseline” study examining 2,040 children under 5 years old in 18 cities in the state of Pernambuco.²³ It is also important to consider the combination of socioeconomic factors of the pregnant woman with the weight of the newborn, reported that low income (less than minimum wage) and single marital status favored low birth weight in a study conducted in Piauí²⁴

Extrinsic factors surveyed over the last years lead to the hypothesis that the scope of their relationship begin very early in the child's world in order to change genetically programmed features, reflecting on the adequacy of growth and contributing to the emergence of diseases in adulthood.²⁵

In this study, it was observed negative correlation between BMI and number of hospitalizations for pneumonia. Relationship between nutritional status and hospitalization was also found in a study conducted in a university hospital in Rio de Janeiro, revealing that the nutritional status diagnosed with low-weight in hospitalization was increased determining factor in the

length of hospitalization in children aged 0 to 10 years old.²⁶

A peculiar result in this study was the association between the number of consultations in prenatal and BMI of the children surveyed. Over the past 20 years, gestational and perinatal events may affect individual health in the medium and long term.²⁷ The intrauterine period is of prime importance for human beings, because potential foreign diseases as infectious agents, poor maternal nutrition, smoking and the use of other drugs, insufficient placental irrigation, maternal diseases, among others, may spread widely and for life. Monitoring this process with preventive actions can be done by prenatal.²⁸

The demographic and epidemiological transition process associated with the nutritional transition, characterized by the reduction of the prevalence of malnutrition and high percentage of obesity in childhood,²⁹ also observed in this study, reinforces the importance of carrying out the monitoring of children's growth and seek to identify factors that may be associated with nutritional deficiencies.

This study has limitations due to the fact that the cross-sectional design prevents the fulfillment of the assumption of temporality and does not allow to elaborate a relation of cause and effect.³⁰ The results of the research can be used as a reference for policies geared to local realities, not forgetting the trends observed today and results from epidemiological reflection with a view to applying the results to clinical practice.

CONCLUSION

Inadequate growth observed in children under five years old in the study showed a high proportion of obesity associated with gender, age, frequency of prenatal care and hospitalizations for pneumonia. The classic factors associated with child growth in other studies, for which no relationship was found in this study require a better understanding of the different structures of interdependencies that can be evaluated in future studies.

Given the above, it is emphasized the importance of generating an alert to the health service studied, resulting in the establishment of interventions and health promotion activities. This reinforces the need for a vigilant attitude to child growth

in general, in order to diagnose diseases and perform preventive interventions affecting health.

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