DOI: 10.1590/1980-5497201600020019

ORIGINAL ARTICLE / *ARTIGO ORIGINAL*

Linear growth of children attending public daycare centers in the municipality of Campina Grande, Paraíba, Brazil

Crescimento linear das crianças assistidas em creches públicas do município de Campina Grande, Paraíba

Dixis Figueroa Pedraza[I]

ABSTRACT: ***Objective:*** To identify variables predictors of linear growth in preschool children attending public child day care centers of Campina Grande, Paraíba. ***Methods:*** A cross-sectional study on a probabilistic sample of 335 children attending child day care centers. Were obtained information about socioeconomic, maternal and children's characteristics. The height/age (*Z*-score) was analyzed as continuous dependent variable. Anthropometric data were obtained in compliance with the recommendations of the World Health Organization. The Multicentre Growth Reference Study was used as the reference population. The data were subjected to multiple linear regression analysis using the hierarchical model. ***Results:*** Children who slept in rooms with at least two people, households without garbage collection, households with no refrigerator, rural zone, illiterate mothers, mothers of short stature, low birth weight and stay in child day care center at part time were the conditions associated with worse height/age of children. ***Conclusion:*** There is a clear difference in linear growth with multicausal characteristic in which the low birth weight, as an expression of adverse history, and the socioeconomic conditions, as an expression of health inequities, profiling the genetic potential of growth.

Keywords: Child day care centers. Child, preschool. Body height. Growth. Nutritional status. Anthropometry.

[I] *Universidade Estadual da Paraíba* – Campina Grande (PB), Brazil.

Corresponding author: Dixis Figueroa Pedraza. Universidade Estadual da Paraíba. Avenida das Baraúnas, 351, *Campus* Universitário, Bodocongó, CEP: 58109-753, Campina Grande, PB, Brasil. E-mail: dixisfigueroa@gmail.com

Conflict of interests: nothing to declare – **Financial support:** *Universidade Estadual da Paraíba* (Process 022/2011).

RESUMO: ***Objetivos:*** Identificar variáveis preditoras do crescimento linear em crianças pré-escolares assistidas nas creches públicas do município de Campina Grande, Paraíba. ***Métodos:*** Estudo transversal em amostra probabilística de 335 crianças assistidas em creches. Foram contempladas informações socioeconômicas, maternas e das crianças. A estatura/idade (escore-Z) foi analisada como variável contínua dependente. Os dados antropométricos foram obtidos obedecendo às recomendações da Organização Mundial da Saúde (OMS). Utilizou-se como população de referência a do *Multicentre Growth Reference Study*. Os dados foram submetidos à análise de regressão linear múltipla utilizando-se o modelo hierarquizado. ***Resultados:*** Crianças que dormiam em cômodos com no mínimo mais duas pessoas, domicílios sem coleta de lixo, domicílios sem geladeira, zona rural, mães não alfabetizadas, mães de baixa estatura, baixo peso ao nascer e permanência na creche em tempo parcial foram as condições que se associaram a pior condição de estatura/idade das crianças. ***Conclusão:*** Existe um claro diferencial de crescimento linear com configuração multicausal no qual o baixo peso ao nascer, como expressão de antecedentes adversos, e as condições socioeconômicas, como expressão de iniquidades em saúde, diagramam o potencial genético de crescimento.

Palavras-chave: Creches. Pré-escolar. Estatura. Crescimento. Estado nutricional. Antropometria.

INTRODUCTION

Child malnutrition, including height deficit, is associated with higher morbidity and mortality[1,2]. Children with growth delay present more risk of severe diarrheic episodes and infectious diseases, including paludism, meningitis, and pneumonia[1,3]. Most of the deaths of children under five years old happens through a limited number of conditions, such as neonatal causes and presence of diseases (pneumonia, diarrhea, malaria, measles, HIV/AIDS), and about one-third of these deaths are associated with malnutrition[4]. All degrees of malnutrition contribute to child mortality in an increasing relation according to the severity of the anthropometric deficit[3].

Growth damage also develop other undesirable consequences, like compromise of psychomotor and mental development, lower school improvement, lower schooling level and productive capacity in the adult age, higher occurrence of non-transmittable chronic diseases and illnesses, and higher risk of obesity in the adult age[1-3,5-7]. If the effects of child chronic malnutrition are not corrected until the second year of life, they can become permanent and irreparable[8,9]. In female cases, childhood growth delay determines adult women of low height subject to a higher risk of generating children with low birth weight. These children will have a higher risk of presenting growth delay and producing low-weight newborns, which characterizes the intergeneration effect of malnutrition[5].

Children's lineal growth delay is the result of multiple circumstances and several determiners, including malnutrition before intrauterine and postnatal conception[6]. In order to have a great growth, children need the intake of energy and nutrients in proper amounts, of disease absence and proper care[2]. Poor nourishment and/or recurrent infections (especially

respiratory and gastrointestinal diseases), which happen more frequently combined, stand-out as immediate causes of growth delay[3,8].

Therefore, a wide range of social and economic conditions is inserted in this context, which makes children's chronic malnutrition a phenomenon of multifactor origin[8]. These conditions comprise a series of factors that are strictly associated with general life conditions and with the capacity of people to supply their basic needs, such as food, housing, and sanitary assistance[3]. Factors such as food insecurity and family nutrition, low educational level, lack of access to health public services of quality, and non-healthy environments are the main determiners of height deficit, in which the most damaging effect of poverty is seen in the lineal growth rather than in the body weight[2]. In Brazil, this complexity has been seen by analyzing the expressive decrease in height deficits, which is explained by the increase of acquisitive power of the most vulnerable families, the improvement of mother's schooling level, and the expansion of basic health care and of the basic sanitation public network[2,3,10].

Thus, children attending public day care centers are benefited from the offer of food and care in these institutions, but they are similarly vulnerable to the acquisition of infectious processes that can negatively influence their nutritional status[10-14]. In addition, these children are exposed to low height, which is conditioned by the socioeconomic condition of the benefited families, as well as the consequence of problems in the care provided to children, which includes privation/non-satisfaction to specific rules associated with the quality of food provided, with the structure of the kitchens, and with the safe management of food[10,11,15].

The present study aimed at identifying variable predictors of linear growth in preschool children attending public child day care centers of Campina Grande, Paraíba, Brazil.

METHODS

This is a cross-sectional study that is part of the project *"Saúde e nutrição das crianças assistidas em creches públicas do município de Campina Grande, Paraíba* [Health and nutrition of children attended at public day care centers in the city of Campina Grande, Paraíba, Brazil]." Data collection happened in the period from October to November 2011, in public day care centers in the city of Campina Grande, Paraíba, Brazil, belonging to the Department of Education. A total of 25 day care centers were working in different neighborhoods of the city at data collection, and they were generally located in areas of low socioeconomic level. According to the location, 23 day care centers were in the urban area and 2, in the rural area. Based on the age range, 8 day care centers provided care in nurseries (children aged 4–20 months) and 93% of the children were 24-month old or older.

The study comprised 2,749 children that were duly registered and attended the day care centers, distributed into 2,473 in the urban area and 276 in the rural area; and 199 children were cared in a nursery. The eligible population included all children, except twins, adopted, of mothers aged under 18 years old, and those with physical problems that would make the anthropometric evaluation difficult. In the case of children who were siblings, one of them was randomly selected for the study.

The calculation to estimate the sample size was based on the procedure for proportion description[16]. The following were considered: an estimated prevalence (p) of height deficit in children under the age of 5 years 7.0%[17], a sampling error (d) of 3%, and a 95% confidence level ($Z\alpha^2 = 1.96^2$), using the formula

$$n = \frac{N * Z\alpha^2 * p * q}{d^2 * (N - 1) + Z\alpha^2 * p * q}$$

in which *N* is the population total amount, $Z\alpha^2 = 1.96^2$ (if there is a 95% confidence), p is the expected proportion, q = 1 - p, d is the arbitrary precision (estimation error). The calculated value (252) was added in 10% for losses and refusals, with a 1.2 effect of sampling outline, thus totaling a sample of 335 subjects. Proportional sampling sizes were considered for the study of children according to the location area of the day care center (urban, rural), the child's age (below two years, two years, or older), and the day care center size (small sized: 60 – 79 children, medium-sized: 80 – 99 children, and large-sized: 100 or more children).

For the sample selection, 14 day care centers were chosen by simple random selection, in which 1 was chosen among those institutions located in the rural area and 2 among those with nursery. Subsequently, after the list of children attended in the day care centers was at hand, 15 children aged 24 months or older were systematically chosen by small-sized day care center (3 day care centers), 20 by medium-sized day care center (3 day care centers), 25 by large-sized day care center (5 day care centers), and 35 in the selected day care center in the rural area. In each of the 2 chosen day care centers with nursery, 35 children under the age of 2 years were chosen.

Data collection counted with the participation of a trained team comprising teachers and students from health undergraduation courses or related areas. With regard to this study, in addition to children's height, data regarding the socioeconomic conditions (sanitary drainage; garbage collection; presence of bathroom; water supply; treatment of drinking water; possession of durable goods — TV, DVD player, refrigerator, washing machine, car; number of people in the domicile; number of people sleeping together in the same room as the child; social program benefit; household location); maternal characteristics (work outside home, literacy, number of prenatal appointments, height); and children's profile (age, gender, birth weight, mother's perception on health, staying period in day care center) were included.

Children under 2 years had their lengths measured through wooden child anthropometer (Alturexata®) with a 130-cm amplitude and 0.1-cm subdivisions. Children aged 2 years or older had their heights measured through the stadiometer (WCS®) with 200-cm amplitude and 0.1-cm subdivisions. Measurements were conducted according to standardized technical rules following the procedures recommended by the World Health Organization (WHO)[18]. For taking measurements, the child was positioned in the center of the instrument with bare feet that together formed a straight angle with their legs; with their knees slightly pressed downward to be extended; shoulders, buttocks, and heels in contact with the surface; arms extended throughout the body; head without decorations strongly supported in the fixed

part of the equipment, with straight neck and chin deviated of the chest. Measurements were performed in duplicate, considering a maximum variation of 0.3 mm, and the final measurement was the result of the average estimation of two measurements.

The *Z*-scores of children's height/age were calculated using the program WHO Anthro 2009. The population from the Multicentre Growth Reference Study was used as a reference, in compliance with the WHO current recommendations[19].

Information regarding socioeconomic condition, maternal data, and mothers' perception on children's health was obtained using a structured questionnaire applied to the children's mothers. Birth date, gender, and birth weight of children were removed from the child's health notebook. The child's age was calculated in months, based on the difference between the interview date and birth date. Time of children's stay in the day care center was a piece of information known in the sampling stage, when the professionals from the day care centers indicated if the children stood in the day care centers during a part-time or full-time period. Literacy of mothers was considered as the ability of reading, writing, and making written accounts. The mother's height was obtained following the same conditions and procedures described for children. The low maternal height was established through the cut point of 155.0 cm that corresponds to the 5th percentile of the height-to-age relation, considering the age of 20 years or older[20].

With the aim of ensuring typing validation, data were typed with double entrance through the Excel program (Microsoft Inc., United States). After finishing typing, the two databases were crossed with the use of the Validate app of the Epi-Info program, version 6.04b (WHO/CDC, Atlanta, United States), thus enabling the verification of data consistency and creation of the final database that was used for statistical analysis. The statistical analyses were carried out through the program R, version 2.10.0. In order to test the assumption of variable normality involved in the study, the Shapiro-Wilk's test was applied.

The height/age (*Z*-score) was analyzed as a dependent continuous variable. The Student's *t*-test was applied to indicate the differences among means in the bivariate analyses. All variables with p-value ≤ 0.25 in the bivariate analyses were chosen for the initial inclusion in the analysis of regression. Before multiple lineal regression, in order to analyze the existence of multicollinearity among the independent variables, a matrix was built and the level of correlation was determined through Spearman's correlation test, in an attempt to exclude collinear variables ($r > 0.80$) in a way that the correlation matrix could not find multicollinearity. Furthermore, through the χ^2 test, possible differences in the socioeconomic variables were found between the group of children that stood at part-time day care centers and those that stood at full-time periods. The groups were not different, which indicates the absence of a plausible confusion if the permanence for a longer time in the day care center were among children with the worst socioeconomic conditions.

The multiple lineal regression analysis ($y = \beta 0 + \beta 1 * x1 .... \beta n * xn$, where $\beta 0$ is the mean coefficient in the period and $\beta 1$ is the mean increase or decrease for each variable under analysis) was carried out using the hierarchical model based on the logical and theoretical relations of the causality network. For these purposes, the variables were grouped into three blocks:

1. children variables — proximal level (age, gender, birth weight, mother's perception on health, day care center staying period)
2. maternal variables — intermediary level (work outside home, literacy, number of prenatal appointments, height/age)
3. socioeconomic variables — distal level (sanitary drainage; garbage collection; presence of bathroom; water supply; treatment of drinking water; possession of durables goods — TV, DVD player, refrigerator, washing machine, car; number of people in the domicile; number of people sleeping together in the same room as the child; social program benefit; household location).

All independent variables were dichotomic, and the categories that were taken as reference were codified with value zero, whereas the risk categories were codified with value one.

Several multivariate models were rolled by beginning with the explanatory variables that belong to the distal level, in which one by one were introduced (forward method), and variables that were statistically associated with height/age remained, with a 10% significance level. The same step was repeated for the subsequent levels (intermediary and proximal). The 5% significance level was considered to indicate an association.

The Research Ethics Committee of *Universidade Estadual de Paraíba* approved the project under number 0050.0133.000-11. All mothers whose children were assessed and the principals of the day care centers signed the free informed consent. Results were published in the relevant instances through meetings with the Department of Education of the city and personal contacts with the children's parents or responsible ones. Disclosure comprised the city diagnosis, per day care center and children, as well as adequate nutritional and health guidance to the detected problems.

RESULTS

Of the 2,749 children, 2,633 were considered eligible for the study; 60 children were excluded because they were twins, 38 because they were adopted, 8 for being mothers younger than 18 years, and 10 for presenting physical problems that would compromise the anthropometric evaluation. In 14 cases, the selected children did not go to the day care center or were not with their mothers in the day of data collection, 13 mothers refused in taking part of the investigation and it was impossible to perform the anthropometric evaluation in 9 children, totaling 299 children.

As seen in Table 1, in the group of child variables, birth weight and day care center stay presented statistically significant differences in the *Z*-score means of the height/age index, in which the highest means were associated with proper birth weight and full-time stay in the day care center. With regard to the *Z*-score related to the maternal variables, a statistically significant decrease was seen in the means of height/age, in cases of illiterate mothers and when the mothers were diagnosed with low height.

Table 1. Height/age index (Z-score) of preschool children according to child, mother, and socioeconomic variables. Campina Grande, PB, Brazil, 2011.

Variables	n	%	Height/age			p-value
			Mean	SD	95%CI	
Child – proximal level						
Age (months)						
≥ 24	251	83.95	-0.44	1.05	-3.51 – 2.06	0.8595
< 24	48	16.05	-0.49	0.87	-2.06 – 0.66	
Gender						
Male	164	54.85	-0.43	1.03	-3.01 – 2.06	0.8281
Female	135	45.15	-0.46	1.05	-3.51 – 1.50	
Birth weight (g)						
≥ 2.500	269	93.4	-0.40	1.04	-3.51 – 2.06	0.0452
< 2.500	19	6.6	-0.94	1.06	-3.08 – 1.13	
Mother's perception on health						
Very good/good	187	62.54	-0.38	1.05	-3.51 – 1.84	0.1381
Regular/poor	112	37.46	-0.56	1.02	-3.16 – 2.06	
Staying period at day care centers						
Full-time	151	50.50	-0.21	1.03	-3.08 – 2.06	< 0.0001
Part-time	148	49.50	-0.69	0.99	-3.51 – 1.47	
Mother – intermediary level						
Work outside home						
No	160	53.51	-0.52	1.09	-3.33 – 2.06	0.1935
Yes	139	46.49	-0.36	0.98	-3.51 – 1.78	
Literate						
Yes	182	60.87	-0.30	1.00	-3.33 – 2.06	0.0026
No	117	39.13	-0.67	1.06	-3.51 – 1.84	
Number of prenatal appointments						
≥ 6	239	82.41	-0.43	1.04	-3.51 – 2.06	0.8217
< 6	51	17.59	-0.47	1.10	-3.01 – 1.74	
Height/age (cm)						
≥ 155.0	178	59.5	-0.23	0.99	-3.33 – 2.06	< 0.0001
< 155.0	121	40.5	-0.76	1.04	-3.51 – 1.84	
Socioeconomic – distal level						
Sanitary drainage						
Sewage service	203	67.89	-0.46	1.04	-3.51 – 2.06	0.7254
Others	96	32.11	-0.41	1.05	-3.16 – 1.84	
Garbage collection						
Yes	273	91.30	-0.39	1.03	-3.51 – 2.06	0.0096
No	26	8.7	-0.99	1.04	-3.16 – 1.33	

Table 1. Continuation.

Variables	n	%	Height/age			p-value
			Mean	SD	95%CI	
Domicile water supply						
Public service	252	84.28	-0.43	1.04	-3.51 – 2.06	0.4378
Others	47	15.72	-0.55	1.04	-2.69 – 1.84	
Treatment of drinking water						
Yes	245	81.93	-0.41	1.04	-3.51 – 2.06	0.2151
No	54	18.06	-0.6	1.03	-3.01 – 1.66	
Bathroom in the domicile						
Yes	230	79.59	-0.34	1.06	-3.51 – 2.06	0.0008
No	69	23.07	-0.79	0.91	-3.16 – 1.15	
TV						
Yes	294	98.33	-0.43	1.03	-3.51 – 2.06	0.2576
No	5	1.67	-1.26	1.39	-3.16 – 0.27	
DVD player						
Yes	271	90.64	-0.41	1.03	-3.51 – 2.06	0.0512
No	28	9.36	-0.84	1.07	-3.16 – 1.21	
Refrigerator						
Yes	263	87.96	-0.39	1.03	-3.51 – 2.06	0.0188
No	36	12.04	-0.85	1.06	-3.16 – 1.15	
Washing machine						
Yes	151	50.5	-0.32	1.04	-3.51 – 2.06	0.0281
No	148	49.5	-0.58	1.02	-3.16 – 2.05	
Car						
Yes	92	30.77	-0.26	1.09	-3.51 – 2.06	0.0457
No	207	69.33	-0.53		-3.33 – 2.05	
Number of people in the domicile						
< 6	213	71.23	-0.36	1.01	-3.33 – 2.06	0.0247
≥ 6	86	28.76	-0.67	1.09	-3.51 – 1.74	
Number of people that sleep together in the same room as the child						
< 3	123	41.13	-0.13	0.91	-2.83 – 2.06	< 0.0001
≥ 3	176	58.86	-0.67	1.07	-3.51 – 1.74	
Social program benefit						
Yes	221	73.91	-0.53	1.06	-3.51 – 2.06	0.0150
No	78	26.08	-0.21	0.96	-2.83 – 2.05	
Household location						
Urban	276	92.31	-0.48	1.03	-3.51 – 2.06	0.0960
Rural	23	7.69	-0.07	1.08	-1.78 – 1.84	

SD: standard deviation; p-value: Student's *t* test.

Given the socioeconomic variables, means of the height/age Z-score were lower in cases of children that lived in domiciles without garbage collection, without bathroom, living with six or more people and when three or more people slept together in the child's room. Possession of some durable goods also presented an association with height/age, and the most vulnerable children were from families that did not have a refrigerator, DVD player, washing machine, and car. Children of families that were benefitted from social programs were also negatively associated with height/age.

Analyses of the combined effects of explanatory variables regarding the height/age index are given in Table 2. Among the socioeconomic variables, children who slept in rooms with at least other two people and children whose domiciles did not have garbage collection, without refrigerator, and from the rural region remained statistically significant regarding the worst condition of height/age. Illiterate and low-height mothers also represented conditions

Table 2. Hierarchical lineal regression model of the determining factors of the height/age index (Z-score) from preschool children. Campina Grande, PB, Brazil, 2011.

Variables	Model 1 Distal		Model 2 Distal + intermediary		Model 3 Distal + intermediary + proximal	
	β	p-value	β	p-value	β	p-value
Socioeconomic						
Number of people sleeping together in the same room as the child						
≥ 3	-0.48	0.0000	-0.45	0.0002	-0.39	0.0012
Garbage collection						
No	-0.64	0.0022	-0.56	0.0089	-0.47	0.0284
Refrigerator						
No	-0.39	0.0266	-0.36	0.0381	-0.35	0.0457
Household location						
Rural	0.48	0.0287	0.52	0.0177	0.46	0.0375
Mother						
Literate						
No			-0.24	0.0522	-0.29	0.0180
Height/age (cm)						
< 155.0			-0.52	0.0002	-0.54	0.0002
Child						
Birth weight (g)						
< 2.500					0.40	0.0007
Staying period at day care centers						
Part-time					-0.49	0.0338

β: regression coefficient; Model 1: variables that were adjusted one by the other; Model 2: adjusted by Model 1 variables; Model 3: adjusted by Models 1 and 2 variables; result with significance in bold; R^2 (determination coefficient) = 16.4%.

that are negatively associated with height/age of their children. Low birth weight and child's part-time stay in the day care center also remained highly associated with increased negative deviations of height/age, in an adjusted model.

DISCUSSION

The present study results show that day care centers might be a positive option in the physical growth possibility of children belonging to low socioeconomic families. The longer stay in the day care center might favor access to proper nourishment that is provided in the institution, among children whose families cannot ensure food and nutritional safety. In literature, the relation between growth in height and day care center frequency had been previously documented in two review studies[21,22]. The first[21] included longitudinal studies and the second[22], observational studies. The present investigation results are an addition to these studies, and the associations found reflect the reality of children, whose staying period in the day care center was not indicated based on socioeconomic differences.

The present study results emphasize that height deficit is favored in environments with worse socioeconomic and environmental conditions.[23]. The associations of several negative conditions of the studied children's socioeconomic situation with low height also recommend the need of advancing with improvements in the acquisitive power of the family, in the mother's schooling level, in health care, and sanitation to obtain gains in the malnutrition decline[1,2,5]. Hence, if we also consider the benefit for children's physical growth that stay longer at day care centers, we suggest that good infrastructure and assistance conditions in these institutions might ease the negative influence of socioeconomic conditions.

We also verified the significant impact that birth weight, mother's height, and residence area had on the height/age index variation. The interference that birth weight has on physical growth has been continuously seen in literature, thus showing an inverse relation between the two factors[12,23-27]. In this casuistic, low birth weight reflects the restriction of intrauterine growth and makes children more vulnerable to postnatal factors that might result in the development of diseases[28]. A systematic review approaching such large literature indicated a higher risk of preterm birth and low weight among mothers of single births with low gestational weight gain[29]. Hence, it is worth mentioning that the consequences of low birth weight and height deficit in childhood can go beyond due to the negative repercussions on health at long term[30-32].

The association of mother's height deficit with the child's, explained by sharing genetic, socioeconomic, and environmental conditions[26,27], was also seen in other recent studies[3,5,27,33-35]. Birth weight is seen as an important factor in this relation, because low-height women are more subjected to getting pregnant of children with low birth weight, who, in turn, might have higher risks of growth delay[5]. This has been considered one of the main dilemmas of the contemporary public health[27].

The rural area as an environment of exposure to the lack of height due to analyses of the present study converges with the results of population-based studies. In the Brazilian

National Survey of Demography and Health (PNDS), growth delay was more frequent in the rural area (7.6%) than in the urban area (6.9%)[17]. Data from Pernambuco State indicated that living in rural areas is another factor associated with height deficit[5]. These results are important to show that, although Brazil became a country of predominant rural society for an urbanized country[36], there are still some necessary interventions that should consider specific problems.

Although no statistical association between the number of prenatal appointments and the height/age index was found in this study, the importance of prenatal care for growth is known. The prenatal adjustment seems important in the mother–child health and in the prevention of fetus complications during intrauterine growth and newborn welfare[37,38]. The early beginning of prenatal care prevents premature growth and low weight, as well as it promotes the good practice of breastfeeding[36]. Protection of prenatal adjustment against low birth weights has been inclusively pointed out in systematic review studies[39,40]. Thus, it is important to emphasize the importance of orientation to the mother and family since prenatal care in order to prevent low birth weight[41].

We could not indicate the number of premature children in this study, which could lead to different results, since this study involves children aged under two years old who could not have recovered their growth potential, especially children that are small for their gestational age and evolve with catch up failure[42]. Hence, we should observe the importance of studies regarding such a situation, since the period until the age of two years should represent the target of nutritional interventions to prevent the growth deficit without health damage[7]. Another limitation could be the intrinsic difficulty of cross-sectional outlines to comprehend dynamic, continuous, and quick growth change processes[43]. Nonetheless, in order to overcome these limitations, the control performed for confounding variables enables the achievement of legitimate associations and conclusions.

The author reports no conflicts of interest regarding the positions presented herein, therefore there are no connections with institutions of performance or regulation related to day care centers.

CONCLUSION

There is a clear difference in linear growth that favors children with better socioeconomic condition, from the urban area, without mother's history of height deficit, of proper birth weight, and with longer stay at day care centers. The present study results did not allow establishing the order of importance and form of articulation of these factors, but it seems there is a multicausal characteristic in which low birth weight, as an expression of adverse history, and socioeconomic conditions, as an expression of health inequities, profile the genetic potential of growth. Based on these conditions, we also emphasize the need of improvements in the distribution of goods and care, considering special care to children with low birth weight, as well as the care provided in the first years of life.

REFERENCES

1. Lima AL, Silva AC, Konno SC, Conde WL, Benicio MH, Monteiro CA. Causes of the accelerated decline in child undernutrition in Northeastern Brazil (1986–1996–2006). Rev Saúde Pública 2010; 44(1): 17-27.
2. Monteiro CA, Benicio MH, Conde WL, Konno S, Lovadino AL, Barros AJD, et al. Narrowing socioeconomic inequality in child stunting: the Brazilian experience, 1974–2007. Bull World Health Organ 2010; 88: 305-11.
3. de Onis M, Frongillo EA, Blössner M. Is malnutrition declining? An analysis of changes in levels of child malnutrition since 1980. Bull World Health Organ 2000; 78(10): 1222-33.
4. Barros FC, Victora CG, Scherpbier R, Gwatkin D. Socioeconomic inequities in the health and nutrition of children in low/middle income countries. Rev Saúde Pública 2010; 44(1): 1-16.
5. Leal VL, Lira PIC, Menezes RCI, Oliveira JS, Sequeira SLA, Andrade SLS, et al. Fatores associados ao declínio do déficit estatural em crianças e adolescentes em Pernambuco. Rev Saúde Pública 2012; 46(2): 234-41.
6. Onis M, Blössner M, Borghi E. Prevalence and trends of stunting among pre-school children, 1990–2020. Pub Health Nut 2012; 15(1): 142-8.
7. Victora C. Los mil días de oportunidad para intervenciones nutricionales. De la concepción a los dos años de vida. Arch Argent Pediatr 2012; 110(4): 311-7.
8. Sánchez-Abanto J. Evolución de la desnutrición crónica en menores de cinco años en el Perú. Rev Peru Med Exp Salud Publica 2012; 29(3): 402-5.
9. Victora C, Adair L, Fall C, Hallal P, Martorell R, Richter L, et al. Maternal and child undernutrition: consequences for adult health and human capital. Lancet 2008; 371(9609): 340-57.
10. Bogus CM, Nogueira-Martins MCF, Moraes DEB, Taddei JAA. Cuidados oferecidos pelas creches: percepções de mães e educadoras. Rev Nutr 2007; 20(5): 499-514.
11. Figueroa Pedraza D, Queiroz D, Sales MC. Doenças infecciosas em crianças pré-escolares brasileiras assistidas em creches. Ciênc Saúde Coletiva 2014; 19(2): 501-18.
12. Oliveira JS, Lira PIC, Carvalho AGC, Barros MFA, Lima MC. Fatores associados ao estado nutricional em crianças de creches públicas do município de Recife, PE, Brasil. Rev Bras Epidemiol 2013; 16(2): 502-12.
13. Goulart RMM, Banduk MLS, Taddei JAAC. Uma revisão das ações de nutrição e do papel do nutricionista em creches. Rev Nutr 2010; 23(4): 655-65.
14. Biscegli TS, Romera J, Candido AB, Santos JM, Candido ECA, Binotto AL. Estado nutricional e prevalência de enteroparasitoses em crianças matriculadas em creche. Rev Paul Pediatr 2009; 27(3): 289-95.
15. Vasconcelos RM, Tancredi RCP, Marin VA. Políticas e normativas aplicadas às creches municipais do Rio de Janeiro. Ciênc Saúde Colet 2013; 18(11): 3281-90.
16. Figueroa Pedraza D, Queiroz D, Menezes TN. Segurança alimentar em famílias com crianças matriculadas em creches públicas do estado da Paraíba, Brasil. Rev Nut 2013; 26(5): 517-27.
17. Brasil. Ministério da Saúde. Pesquisa nacional sobre demografia e saúde da criança e da mulher. Brasília: Ministério da Saúde; 2008.
18. World Health Organization (WHO). Physical status: the use and interpretation of anthropometry. Geneva: WHO; 1995. (WHO - Technical Report Series, 854).
19. World Health Organization (WHO). WHO Child Growth Standards. Length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age. Methods and development. Geneva: World Health Organization; 2006.
20. National Center for Health Statistic. Growth Curves; 2000. Disponível em: http://www.cdc.gov/growthchards. (Acessado em 31 de julho de 2014).
21. Pereira AS, Lanzillotti HS, Soares EA. Frequência à creche e estado nutricional de pré-escolares: uma revisão sistemática. Rev Paul Pediatr 2010; 28(4): 366-72.
22. Figueroa Pedraza D, Souza MM, Rocha ACD. Fatores associados ao estado nutricional de crianças pré-escolares brasileiras assistidas em creches públicas: uma revisão sistemática. Rev Nutr 2015; 28(4): 451-64.
23. Figueiroa JN, Alves JGB, Lira PIC, Batista Filho M. Evolução intergeracional da estatura no Estado de Pernambuco, Brasil, entre 1945 e 2006. 2 – aspectos analíticos. Cad Saúde Pública 2012; 28(8): 1468-78.
24. Dallabona A, Cabral SCh, Hõfelman DA. Variáveis infantis e maternas associadas à presença de sobrepeso em crianças de creches. Rev Paul Pediatr 2010 28(4): 304-13.
25. Toloni MH, Kontantyner T, Taddei JAAC. Fatores de risco para perda ponderal de crianças freqüentadoras de berçários em creches do município de São Paulo. Rev Paul Pediatr 2009; 27(1): 53-9.
26. Sousa CPC, Sousa MPC, Rocha ACD, Figueroa Pedraza. Perfil epidemiológico do estado nutricional de crianças assistidas em creches no Estado da Paraíba. Nutrire 2011; 36(1): 111-26.

27. Figueroa Pedraza D, Rocha ACD, Sousa CPC. Crescimento e deficiências de micronutrientes: perfil das crianças assistidas no núcleo de creches do governo da Paraíba, Brasil. Ciênc Saúde Coletiva 2013; 18(11): 3379-90.
28. Motta MEFA, Silva GAP, Araújo OC, Lira PIC, Lima MC. O peso ao nascer influência o estado nutricional ao final do primeiro ano de vida? J Pediatr 2005; 81(5): 377-82.
29. Han Z, Lutsiv O, Mulla S, Rosen A, Beyene R, Mcdonald S. Low gestational weight gain and the risk of preterm birth and low birthweight: a systematic review and meta-analyses. Acta Obstet Gynecolog Scand 2011; 90: 935-54.
30. Figueroa Pedraza D. Evidências do impacto da suplementação múltipla com micronutrientes no crescimento de pré-escolares. Rev Bras Saude Matern Infant 2014; 14(1): 17-37.
31. Bismarck-Nasr EM, Frutuoso MFP, Gamabardella AMD. Efeitos tardios do baixo peso ao nascer. Rev Bras Crescimento Desenvolv Hum 2008; 18(1): 98-103.
32. Barros JWO, Almeida MB, Santos MAM, Santana PR, Campos FA, Leandro CG. Pode o peso ao nascer influenciar o estado nutricional, os níveis de atividade física e a aptidão física relacionada à saúde de crianças e jovens? Rev Nutr 2011; 24(5): 777-84.
33. Silveira KBR, Alves JRF, Ferreira HS, Sawaya AL, Florencio TMMT. Association between malnutrition in children living in favelas, maternal nutritional status, and environmental factors. J Pediatr 2010; 86(3): 215-20.
34. Menezes RCE, Lira PIC, Leal VS, Oliveira JS, Santana SCS, Sequeira LAS et al. Determinantes do déficit estatural em menores de cinco anos no Estado de Pernambuco. Rev Saúde Pública 2011; 45(6): 1079-87.
35. Felisbino-Mendes MS, Villamor E, Velasquez-Melendez G. Association of Maternal and Child Nutritional Status in Brazil: A Population Based Cross-Sectional Study. PloS ONE 2014; 9(1): e87486.
36. Victora CG, Aquino EML, Leal MC, Monteiro CA, Barros FC, Szwarcwald CL. Saúde no Brasil 2. Saúde de mães e crianças no Brasil: progressos e desafios. Disponível em: http://portal.saude.gov.br/portal/arquivos/pdf/revista_the_lancet.pdf. (Acesso em 23 de setembro de 2014).
37. Silva EP, Lima RT, Costa MJC, Batista Filho M. Desenvolvimento e aplicação de um novo índice para avaliação do pré-natal. Rev Panam Salud Publica 2013; 33(5): 356-62.
38. Paris GF, Pelloso SM, Martins PM. Qualidade da assistência pré-natal nos serviços públicos e privados. Rev Bras Ginecol Obstet 2013; 35(10): 447-52.
39. Silveira DS, Santos IS. Adequação do pré-natal e peso ao nascer: uma revisão sistemática. Cad Saúde Pública 2004; 20(5): 1160-8.
40. Pedraza DF, Souza MM, Cristóvão FS, França ISX. Baixo peso ao nascer no Brasil: revisão sistemática de estudos baseados no sistema de informações sobre nascidos vivos. Pediatria Moderna 2014; 50(2): 51-64.
41. Figueroa Pedraza D, Rocha ACD, Cardoso MV. Assistência pré-natal e peso ao nascer: uma análise no contexto de unidades básicas de saúde da família. Rev Bras Ginecol Obstet 2013; 35(8): 349-56.
42. Cardoso-Demartini AA, Bagatin AC, Silva RP, Boguszewski MCS. Crescimento de crianças nascidas prematuras. Arq Bras Endocrinol Metab 2011; 55(8): 534-40.
43. Figueroa Pedraza D, Rocha ACD, Sales MC. Deficiência de micronutrientes e crescimento linear: revisão sistemática de estudos observacionais. Ciênc Saúde Coletiva 2013; 18(11): 3333-47.

Received on: 10/21/2014
Final version presented on: 05/22/2015
Accepted on: 07/14/2015