

ASSOCIATION OF BIRTH WEIGHT AND TIME OF BREASTFEEDING WITH CURRENT NUTRITIONAL STATUS OF CHILDREN

Relação entre o peso ao nascer e o tempo de aleitamento materno com o estado nutricional atual de crianças

Relación del peso al nacer y el tiempo de lactancia materna con el estado nutricional actual de niños

Original Article

ABSTRACT

Objective: To analyze the association of birth weight (BW) and the time of breastfeeding (BF) with the current nutritional status of children aged two to six years old. **Methods:** Quantitative observational cross-sectional study conducted with children of both genders aged two to six years enrolled in seven public early childhood schools of a municipality in the countryside of Rio Grande do Sul (RS) in the period from June to August 2014. A total of 353 children participated and had their weight and height measured after parents had answered a questionnaire on Birth Weight (BW) and time of Breastfeeding. **Results:** The average duration of exclusive breastfeeding was 3.47 ± 2.81 months. Most children (50.7%, $n=179$) were at risk for overweight or overweight for the age according to the Body Mass Index (BMI). The BW was positively correlated to current height ($r=0.164$, $p=0.002$) and current weight ($r=0.180$, $p=0.001$). The BW was significantly higher among boys ($p=0.003$) and the time of BF associated with complementary feeding was significantly higher among girls ($p=0.024$). **Conclusion:** The results suggest that birth weight influences weight gain in the first six months of life, particularly among boys; and the time of breastfeeding associated with complementary feeding was significantly higher among girls.

Descriptors: Breastfeeding; Nutritional Status; Birth Weight.

RESUMO

Objetivo: Analisar a relação entre o peso ao nascer (PN) e o tempo de aleitamento materno (AM) com o atual estado nutricional de crianças de dois a seis anos de idade. **Métodos:** Estudo observacional, quantitativo e do tipo transversal, realizado com crianças, independentemente do sexo, com idades entre dois a seis anos, matriculadas em sete escolas de educação infantil da rede municipal de um município do interior do Rio Grande do Sul (RS), no período de junho a agosto de 2014. Participaram 353 crianças, aferindo-se peso e altura, após os pais terem respondido a um questionário de Peso ao Nascer (PN) e tempo de aleitamento materno. **Resultados:** A média de aleitamento materno exclusivo foi de $3,47 \pm 2,81$ meses. A maioria das crianças (50,7%, $n=179$) encontrou-se em risco de sobrepeso ou sobrepeso para a idade, conforme o Índice de Massa Corporal (IMC). O PN apresentou correlação positiva com a altura atual ($r=0,164$, $p=0,002$) e com o peso atual ($r=0,180$, $p=0,001$). O PN foi significativamente maior entre os meninos ($p=0,003$), e o tempo de AM associado à alimentação complementar foi significativamente maior entre as meninas ($p=0,024$). **Conclusão:** Os resultados sugerem que o peso ao nascer influencia o ganho de peso nos seis primeiros anos de vida, com maior destaque para os meninos; e o tempo de amamentação associado à alimentação complementar foi maior entre as meninas.

Descritores: Aleitamento Materno; Estado Nutricional; Peso ao Nascer.

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RESUMEN

Objetivo: Analizar la relación del peso al nacer (PN) y el tiempo de lactancia materna (LM) con el actual estado nutricional de niños entre dos y seis años de edad. **Métodos:** Estudio observacional, cuantitativo y transversal realizado con niños independiente del sexo y con edades entre dos y seis años, matriculados en siete escuelas de educación infantil de la red municipal de un municipio del interior de Río Grande del Sur (RS) en el período entre junio y agosto de 2014. Participaron 353 niños verificándose el peso y la altura tras la contestación de los padres a un cuestionario sobre el Peso al Nacer (PN) y el tiempo de lactancia materna. **Resultados:** La media de lactancia materna exclusiva fue de $3,47 \pm 2,81$ meses. La mayoría de los niños (50,7%, $n=179$) tenía el riesgo de sobrepeso o sobrepeso para la edad según el Índice de Masa Corporal (IMC). El PN presentó correlación positiva con la altura ($r=0,164$, $p=0,002$) y el peso actual ($r=0,180$, $p=0,001$). El PN fue significativamente mayor para los niños ($p=0,003$) y el tiempo de LM asociado a la alimentación complementaria fue significativamente mayor para las niñas ($p=0,024$). **Conclusión:** Los resultados sugieren que el peso al nacer influye en la ganancia de peso en los seis primeros años de vida de los niños y el tiempo de lactancia asociado a la alimentación complementaria fue mayor para las niñas.

Descriptores: Lactancia Materna; Estado Nutricional; Peso al Nacer.

INTRODUCTION

The Ministry of Health recommends exclusive breastfeeding (EBF) up to the first six months of life with continued breastfeeding (BF) up to two years of age or older. Despite the increased prevalence in recent years, breastfeeding is still far from achieving the recommended time⁽¹⁾. Accordingly, ensuring EBF from the first hour of extra-uterine life is the most safe, effective and complete way to achieve the adequate growth and development of children⁽²⁾.

Annually, exclusive breastfeeding helps to prevent more than six million deaths of children under one year of age, ensuring the child's health in the short and long term⁽³⁾. Breastfeeding, particularly the EBF, has a protective effect against diseases in children with low birth weight ($<2.500\text{g}$)⁽⁴⁾ and establishes the emotional bond between mother and child, helping in the development of the child⁽⁵⁾. Breastfeeding also protects against overweight and obesity throughout childhood, regardless of the child's age, family income, nutritional status and parental education⁽⁶⁾. However, complementary feeding started at the wrong time can result in the abandonment of breastfeeding; noteworthy, nutrition in the first years of life is critical to the growth and weight gain in childhood⁽⁷⁾.

Weight gain during the first years of life is a determining factor for the nutritional status in childhood and adolescence. The prevalence of overweight and obesity in children and adults has been observed worldwide, and excessive weight gain in childhood may represent a risk for chronic diseases such as type II diabetes, hypertension and dyslipidemia⁽⁸⁾. High birth weight ($>3500\text{g}$)⁽⁹⁻¹¹⁾, family history of overweight and obesity, dietary pattern, physical activity level and education level can also be risk factors for childhood obesity⁽¹²⁾.

Another factor that has gained particular attention is birth weight, given its positive correlation to the interference in the health of an individual in the future. This scenario indicates the hypothesis of fetal origins of adult disease, in which the individual develops an early "programming" for the predisposition of chronic diseases, which can occur in childhood, adolescence or adulthood⁽¹³⁾. Epidemiological and experimental studies provide strong evidence that the effects of such programming interfere in the genesis of diseases in adulthood. For this reason, health policies should intensify their efforts to develop measures to promote adequate intrauterine weight gain and postnatal nutrition, encouraging the practice of breastfeeding⁽¹⁴⁾.

In this sense, the present study aimed to analyze the association of birth weight and the time of breastfeeding with the current nutritional status of children aged two to six years old.

METHODS

This is a quantitative observational cross-sectional study conducted with children of both genders aged two to six years enrolled in seven public early childhood schools of a municipality in the countryside of Rio Grande do Sul, RS, in the period from June to August 2014.

The sample was determined using secondary data provided by the Municipal Education Secretariat, which indicated the existence of 23 early childhood schools with 2,000 children enrolled aged between 2 and 6 years. Based on this information, we calculated the sample size of 334 children, considering the total number of children in the age group of interest who were regularly enrolled in public schools and adopting a significance level of 5%.

Schools were selected by drawing each one at a time. All the children within the age group were invited to participate, and the draws took place until we reached the sample size. Thus, seven schools were selected at random and 353 children were assessed.

Prior to the start of the research, a free informed consent (IC) form was sent to parents/guardians who should return them with their signatures. They also received a questionnaire

previously identified with the personal information of each student, where they should inform about the child's birth weight, the duration of exclusive breastfeeding, and the duration of breastfeeding with complementary feeding. The study did not include the children whose parents/guardians did not sign the consent form or not completely filled out the questionnaire sent, as well as those who were not comfortable performing the anthropometric measurements.

For nutritional assessment, we used a Plenna® digital scale with capacity of 150 kg to check the weight and an Avanutri® portable stadiometer of 210 cm to measure the height. At the time of the measurements, the children were accompanied by their teachers, wore pants and shirt to determine weight and stood on the stadiometer with barefoot and arms extended by the side to measure the height⁽¹⁵⁾.

To estimate nutritional status, the following indexes were used: I. Weight-for-age (W/A), in which a value below the 0.1 percentile indicates very low weight for age; above or equal to the 0.1 percentile and below the 3rd percentile indicates low weight for age; above or equal to the 3rd percentile and below or equal to the 97th percentile indicates adequate weight for age; above the 97th percentile indicates high weight for age; II. Height-for-age (H/A), in which the 0.1 percentile indicates very low height for age; above or equal to the 0.1 percentile and below the 3rd percentile indicates low height for age; and above or equal to the 3rd percentile indicates adequate height for age; and III. Weight for Height (W/H), in which the 0.1 percentile indicates severe thinness; above or equal to the 0.1 percentile and below the 3rd percentile indicates thinness; above or equal to the 3rd percentile and less than or equal to the 85th percentile indicates eutrophic values; above the 85th percentile and less than or equal to the 97th percentile indicates risk of overweight; above the 97th percentile and less than or equal to the 99.9 percentile indicates overweight; and above the 99.9 percentile indicates obesity (the W/H indicator has not been used for children over the age of five)⁽¹⁵⁾.

The following cut-off values for body mass index for age (BMI/A) were used: percentile less than 0.1: severe thinness; percentile greater than or equal to 0.1 and less than 3: thinness; percentile greater than or equal to 3 and less than or equal to 85: eutrophic (for children aged 0 to 10 years); percentile greater than 85 and less than or equal to 97: risk of overweight (for children aged 0 to 5 years) and overweight (for children 5 to 10 years); percentile greater than 97 and less than or equal to 99.9: overweight (for children aged 0 to 5 years) and obesity (for children aged 5 to 10 years); and percentile greater than 99.9: obesity (for children aged 0 to 5 years) and severe obesity (for children 5 to 10 years)⁽¹⁵⁾.

Children under the age of 5 were assessed according to the World Health Organization table⁽¹⁶⁾, and children between 5 and 10 years old were assessed according to the table recommended by the World Health Organization (WHO)⁽¹⁷⁾. For classification between genders we grouped "thinness" with "sharp thinness" and "risk of overweight" with "overweight".

BW was classified as macrosomia when the weight was higher than 4,000g; normal weight: 2,500g to 3,999g; low weight: less than 2,500g at birth; very low weight: less than 1,500g at birth; extremely low weight: less than 1,000g at birth; and micropreterm: less than 800g at birth⁽¹⁸⁾.

Data were analyzed using the SPSS software, version 20.0. The significance level was set at 5% ($p < 0.05$). Univariate (mean, standard deviation and frequency) and bivariate (chi-square test of association, Pearson's and Spearman's correlation coefficients, t-test and Mann-Whitney U test) descriptive statistics were used. We used the Kolmogorov-Smirnov test to assess whether the continuous variables followed a normal distribution. The chi-square test was used to assess the association of nutritional status (BMI/age, weight/age, weight/height and height/age) with gender and birth weight. Pearson's and Spearman's correlation tests were used to analyze the association between continuous variables: birth weight, current weight, body mass index (BMI), duration of exclusive breastfeeding and duration of breastfeeding associated with complementary feeding. The Mann-Whitney U test was used to compare the aforementioned continuous variables between genders.

The project was approved by the Research Ethics Committee of the Science and Health Center of the *Centro Universitário Univates* (Univates University Center) of Lajeado, RS, under Opinion No. 510,378.

RESULTS

In all, 353 children were assessed, with a mean age of 45.70 ± 13.49 months; 50.1% ($n=177$) were males. There was a mean duration time of 3.47 ± 2.81 months of EBF and 10.42 ± 9.63 months of BF with complementary feeding. The mean BW was 3.26 ± 0.54 Kg.

Most children were at risk of overweight or overweight according to the BMI for age (50.7%, $n=179$). However, according to the weight-for-height index, the majority of the sample was eutrophic (52.7%, $n=158$) (Table I).

Birth weight was positively correlated to current height ($r=0.164$, $p=0.002$) and current weight ($r=0.180$, $p=0.001$). However, there was no correlation of EBF and BF + complementary feeding to current weight, BMI and height (Table II).

Table I - Nutritional characteristics and birth weight of children enrolled in early childhood schools. Lajeado, RS, 2014. (n=353)

Categorical Variables	n	%
BMI/Age		
Thinness	1	0.3
Eutrophic	166	47.0
Risk of overweight	112	31.7
Overweight	67	19.0
Obesity	7	2.0
Weight/Age		
Normal weight	309	87.5
High weight	44	12.5
Weight/Height		
Thinness	1	0.3
Eutrophic	158	52.7
Risk of overweight	90	30.0
Overweight	49	16.3
Obesity	2	0.7
Height/Age		
Low height	5	1.4
Normal height	348	98.6
Birth weight		
Macrosomia ($\geq 4,000$ g)	23	6.5
Normal (2,500g to 3,999g)	308	87.3
Low (<2,500g)	19	5.4
Very low (<1,500g)	1	0.3
Extremely low (<1,000g)	1	0.3
Micropreterm BW (<800g)	1	0.3

BMI: Body Mass Index, BW: Birth Weight.

Table II - Correlation between nutritional status and birth weight, duration of exclusive breastfeeding and duration of breastfeeding with complementary feeding of children enrolled in early childhood schools. Lajeado, RS, 2014.

Anthropometric Variables	Birth weight		EBF		BF + Complementary feeding	
	r	p	r	p	r	p
Current weight (kg)	0.180	0.001	-0.079	0.137	-0.078	0.146
BMI (Kg/m ²)	0.063	0.236	-0.044	0.409	-0.069	0.194
Current height (cm)	0.164	0.002	-0.076	0.152	-0.078	0.146

r=Correlation coefficient; EBF=Exclusive Breastfeeding; BF=Breastfeeding; Body Mass Index (BMI)=weight in Kg divided by the height in meters squared; Pearson's Correlation Test (parametric variables) or Spearman's Correlation (non-parametric variables) for the correlation between variables, with significant values set at $p < 0.05$ (5%).

BW was significantly higher among boys ($p=0.003$), and the duration time of BF with complementary feeding was significantly higher among girls ($p=0.024$) (Table III).

Significant association was found between gender and nutritional status classified according to the BMI/A,

with a direct correlation between male gender and risk for overweight or overweight, and between female gender and eutrophic weight ($p=0.042$). There were no significant associations between other variables (Table IV).

Table III - Comparison of anthropometric parameters and duration of breastfeeding according to the gender of children enrolled in early childhood schools. Lajeado, RS, 2014.

Variables	Gender		p-value
	Male	Female	
	Mean ± SD	Mean ± SD	
Current Weight (kg)	18.22 ± 4.42	17.67 ± 4.52	0.184
BMI (Kg/m ²)	17.43 ± 1.72	17.41 ± 2.21	0.300
Height (cm)	101.81 ± 10.49	100.27 ± 9.14	0.282
Birth Weight	3.33 ± 0.59	3.19 ± 0.48	0.003*
EBF	3.18 ± 2.20	3.76 ± 3.30	0.097
BF + Complementary Feeding	9.55 ± 9.75	11.31 ± 9.46	0.024*

SD=Standard Deviation; EBF=Exclusive Breastfeeding; BF=Breastfeeding; Body Mass Index (BMI)=weight in Kg divided by the height in meters squared; t-test and Mann-Whitney U test for the comparison between the categories, *with significant values set at p<0.05 (5%).

Table IV - Comparison of the nutritional status between the genders of children enrolled in early childhood schools. Lajeado, RS, 2014.

Nutritional Status	Gender		p-value
	Female n (%)	Male n (%)	
BMI/Age			
Severe Thinnes or Thinnes	1 (0.28)	0 (0.00)	0.042*
Eutrophic	93 (26.34)	73 (20.68)	
Risk of Overweight or Overweight	77 (21.81)	102 (28.89)	
Obesity	5 (1.42)	2 (0.57)	

BMI=Body Mass Index. Frequencies described in percentages (%). Chi-square test for the comparison between variables, *with significant values set at p<0.05 (5%).

DISCUSSION

More than half of the children were classified as being at risk of overweight and overweight, and the mean duration time of EBF was less than 6 months; therefore, there is a need to implement health promotion actions to raise the population's awareness of the importance of EBF and a healthy diet in the prevention of overweight and obesity.

In the present study, the mean duration time of EBF was 3.47 months, a time that is shorter than those of other studies that have presented a mean of 4.2 months⁽¹⁹⁾ and 4.0 months⁽²⁰⁾; however, all these results are different from those recommended by the WHO, which is six months⁽²¹⁾. Knowing that breastfeeding is a natural process and is influenced by biological, demographic, cultural and socioeconomic factors, which can interfere with the breastfeeding success⁽²²⁾, it is important to remember that the introduction of complementary foods before 6 months of age can induce early weaning⁽²³⁾. In this study, girls were significantly associated with an increased duration of breastfeeding and complementary feeding, showing a greater protection of this gender against early weaning.

No significant difference was found when comparing the current nutritional status with the duration time of

BF; however, another study⁽²⁴⁾ showed evidence that longer exclusive breastfeeding is associated with a lower prevalence of obesity and a lower BMI. In addition, other studies point to the possibility of a protective effect of breast milk against obesity^(9-11,25,26).

Weight gain during childhood is a determining factor for the nutritional status in adulthood⁽⁷⁾. The prevalence of childhood pre-obesity and obesity continues to increase significantly worldwide and has become a major public health concern⁽²⁷⁾. In the present study, 52.69% (n=186) of the children presented risk of overweight, overweight or obesity, a result that is worrisome as it is known that there is a 25% risk of remaining in this condition in adulthood⁽²⁸⁾. Other studies showed results below those of the present study: 30.7% (n=92) of individuals with excess weight⁽²⁷⁾ and 38.38% of overweight and obese people⁽²⁹⁾.

In addition to the high percentage of children with excess weight the present study, we also found that boys had significantly higher levels of overweight and overweight risk, and girls had a higher prevalence of eutrophic weight. The same has been found in two studies^(30,31), in which the prevalence of excess weight was higher among boys than girls.

BW is a strong marker of the baby's intrauterine conditions. Thus, the low BW is an important predictor of growth deficit in childhood⁽³²⁾; however, both low and high BW may be risk factors for childhood obesity⁽⁹⁾. In this study, most children were born with a normal weight, a result that is similar to that of another study⁽³³⁾ that confirms the positive correlation found in the present study between the BW and the current height and weight of the child.

There was a direct and significant association between BW and current weight in the present study, i.e., the higher the BW, the higher the current weight. Such finding corroborates those of two studies^(34,35) that have found that children born weighing more than 4,000g have greater chances of presenting excess weight than children born weighing less than 3,000g. Another study⁽³⁶⁾ showed a positive association between birth weight and obesity in individuals at the age of 18, and the literature also shows that the prevalence ratio of overweight was proportional to the increase in BW, but the association was not statistically significant⁽³⁷⁾. These results suggest a relationship to the onset in the medium and long term of obesity, coronary artery disease, hypertension, type 2 diabetes and dyslipidemia, which together characterize the metabolic syndrome⁽¹³⁾.

The limitations of the present study may be related to the information collected, as they come from a questionnaire administered to parents that may be susceptible to response errors. Additionally, the following information was absent: family history of obesity and associated diseases, eating routine of children and physical exercises.

CONCLUSION

The results suggest that the birth weight influences weight gain in the first six years of life, particularly among boys. Additionally, the duration of breastfeeding associated with complementary feeding was higher among girls.

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