

FOOD SOURCES OF IRON AND VITAMIN C CONSUMED AMONG INFANTS IN PRIMARY HEALTHCARE

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ABSTRACT: Objective: to evaluate the consumption of food sources of iron and vitamin C among children from 0 to 24 months. **Methods:** This cross-sectional study was carried out with 357 children during the vaccination campaign in November 2014 in Montes Claros, Minas Gerais, Brazil. The consumption of food sources of iron and vitamin C was evaluated using a food frequency questionnaire. A simple descriptive analysis was performed. **Results:** Breastfeeding was verified in 140 (93%) children younger than 6 months. Regarding the supplementary feeding of iron source foods, the consumption of cooked/ground meat was frequent in 80 (38.2%) children and the consumption of offal was low or absent in 147 (70.6%). All the children moderately or frequently consumed beans. Frequent consumption of oranges was reported in 74 (35.5%) children. **Conclusion:** The consumption of food sources of iron and vitamin C by children in Primary Healthcare presented a low-frequency, with a risk for iron deficiency anemia.

KEYWORDS: Iron deficiency anemia; Food consumption; Primary Healthcare; Infant.

ALIMENTOS FONTES DE FERRO E VITAMINA C CONSUMIDOS ENTRE LACTENTES DA ATENÇÃO PRIMÁRIA À SAÚDE

RESUMO: Objetivo: avaliar o consumo de alimentos fontes de ferro e vitamina C entre crianças de 0 a 24 meses. **Métodos:** trata-se de estudo transversal realizado com 357 crianças durante campanha de vacinação em novembro de 2014 em Montes Claros, MG. O consumo de alimentos fontes de ferro e vitamina C foi avaliado com questionário de frequência alimentar. Realizou-se análise descritiva simples. **Resultados:** a amamentação foi verificada em 140 (93%) crianças menores de seis meses. Na alimentação complementar entre os alimentos fontes de ferro, o consumo de carne cozida/moída foi frequente em 80 (38,2%) e de vísceras foi baixo ou ausente em 147 (70,6%). Todas as crianças consumiam feijão moderadamente ou frequentemente. O consumo frequente de laranja foi relatado em 74 (35,5%). **Conclusão:** o consumo de alimentos fontes de ferro e vitamina C das crianças na Atenção Primária à Saúde é de baixa frequência, apresentando risco para anemia ferropriva.

DESCRIPTORES: Anemia ferropriva; Consumo alimentar; Atenção primária à saúde; lactente.

ALIMENTOS QUE SON FUENTES DE HIERRO Y VITAMINA C CONSUMIDOS ENTRE LACTENTES DE LA ATENCIÓN BÁSICA A LA SALUD

RESUMEN: Objetivo: evaluar el consumo de alimentos que son fuentes de hierro y vitamina C entre niños de 0 a 24 meses. **Métodos:** estudio transversal realizado con 357 niños durante campaña de vacunación en noviembre de 2014 en Montes Claros, MG. Se evaluó el consumo de alimentos ricos en hierro y vitamina C por medio de cuestionario de frecuencia alimentar. Se realizó análisis descriptivo simple. **Resultados:** se verificó amamantamiento en 140 (93%) niños con menos de seis meses. En la alimentación complementar entre los alimentos ricos en hierro, el consumo de carne cocida/molida fue frecuente en 80 (38,2%) y de vísceras fue bajo o inexistente en 147 (70,6%). Todos los niños consumían frijol de forma moderada o frecuente. El consumo a menudo de naranja fue apuntado en 74 (35,5%). **Conclusión:** el consumo de alimentos ricos en hierro y vitamina C de los niños en la Atención Básica a la Salud tiene baja frecuencia y presenta riesgo para anemia ferropriva.

DESCRIPTORES: Anemia ferropriva; Consumo alimentar; Atención básica a la salud; lactente.

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● INTRODUCTION

Food plays an important role in the process of childhood growth and development^(1,2,3). Eating habits are formed in the first years of life and can affect health conditions throughout life⁽⁴⁾. Inadequacies in food consumption may result in the genesis of major public health nutritional disorders during childhood⁽²⁾. Micronutrient intake by children has been shown to be inadequate, especially in relation to iron, in the international⁽⁵⁻⁸⁾ and national^(2,4) scenarios. This nutrient is considered to be a marker of poor diet and incorrect dietary practices^(2,4).

Iron deficiency consists of the insufficient quantity of this nutrient in the body for the maintenance of the normal physiological functions. It results from an inadequate absorption of this mineral and its absorption facilitators, such as Vitamin C⁽⁹⁾. Iron deficiency anemia, a disease caused by a lack of iron, has affected many infants^(1,5-7,10,11). This anemia is commonly related to early termination of breastfeeding and inadequate complementary feeding^(3,10,12). It mainly affects people in developing countries, with restricted access to balanced nutrition, health services and basic sanitation systems⁽¹⁰⁾.

The implications of this condition range from impairment of psychomotor development, increased susceptibility to infections, decreased ability to exercise, and irreversible damage to the nervous system^(1,5,9,10) with repercussions in adulthood. This condition can generate social and economic consequences in society^(1,9,10). Although anemia is widely discussed in the scientific community, there is still a high prevalence of this disease in the Brazilian population, with regional and age-specific particularities⁽¹⁰⁾. The evaluation of infant food consumption is an essential strategy for the prevention of iron deficiency anemia and for the promotion of health, especially in at-risk populations⁽¹³⁾, such as infants monitored in Primary Healthcare (PHC). Thus, the present study aimed to evaluate the consumption of natural food sources of iron and vitamin C among children aged from 0 to 24 months.

● METHOD

This cross-sectional, quantitative study was carried out with children under 24 months of age during the vaccination campaign of November 2014 in the city of Montes Claros, Minas Gerais, Brazil. The study population was composed of children in the 0 to 24 months age group vaccinated during the vaccination campaign carried out in the PHC. The sample size was calculated considering the prevalence of 24% for childhood anemia, with a 95% confidence interval and a accuracy level of 5%. A correction factor was adopted for the design effect (*deff*) equal to 1.2 and a non-response rate of 10%. The need for 357 children to participate in the study was estimated. Sampling units were chosen, using probabilistic sampling by conglomerate, in two stages. In the first stage, the primary health units (PHUs) were selected and in the second stage the children in each PHU were systematically selected.

Data collection was carried out by duly trained professionals and students of the nursing and nutrition area, with the parents or guardians of children younger than 24 months, in August 2014. For this, a standardized instrument was used that contemplated sociodemographic variables (sex, age, mother's education level, type of residence and participation in social programs). For the evaluation of the infant feeding, the food consumption markers form adopted by the Food and Nutrition Surveillance System (SISVAN), recommended by the Ministry of Health, was used⁽¹⁴⁾. For the breastfeeding issues, the introduction of complementary feeding and the food intake of the previous day were investigated.

The consumption of food sources of iron and vitamin C was evaluated by means of a Food Frequency Questionnaire (FFQ), composed of food sources of these nutrients. The FFQ considered the amount and frequency of food sources of iron and vitamin C consumed. Food frequency was classified as never consumed, low consumption (less than once/month to three times/month); moderate consumption (once/week to four times/week) and frequent consumption (once/day to two or more times/day).

A descriptive analysis of the data was performed using absolute and relative frequencies. For the statistical processing, the Statistical Package for the Social Sciences (SPSS®), version 19.0 for Windows, statistical software was used. The study was approved by the Research Ethics Committee (CEP) of the *Faculdades Unidas do Norte de Minas – FUNORTE* under authorization No. 418.216/13. All participants of the study signing the consent form.

● RESULTS

A total of 357 children between 0 and 24 months of age participated in the study, of which 202 (57%) were female, 207 (58%) aged between 6 and 24 months and 167 (47%) in economic class C. Considering the characteristics of the mothers, approximately half of the sample, 170 (48%), was less than 30 years of age, 184 (52%) had only one child and 188 (53%) were recipients of government social programs. Regarding education, 200 (56%) mothers had eight years or less of schooling (Table 01).

Table 1 - Distribution of children according to sociodemographic characteristics. Montes Claros, MG, Brazil, 2014

Variables	N	%
Sex of the Child		
Male	155	43
Female	202	57
Maternal Age (years)		
≤ 30	170	48
30 to 40	133	37
40 to 50	54	15
Age of the child (months)		
<1 month	15	04
1 to 6	135	38
6 to 24	207	58
Social Programs		
<i>Bolsa Família</i>	99	28
<i>Leite Pela Vida</i>	25	07
<i>Bolsa Família and Leite pela Vida</i>	64	18
<i>Did not receive</i>	169	47
Supplements		
Vitamin A	50	24
Ferrous Sulphate	126	61
Vitamin A and Ferrous Sulphate	31	15
Residence Condition		
Rented	212	59
Allocated	34	10
Owned	68	19
Did not respond	43	12
Order of children		
First	184	52
Second	109	31
Third	46	13
Forth/more	18	04
Brazilian Economic Classification		
Class A	29	08
Class B1	161	45
Class C	167	47

Source: The authors (2014)

Regarding infant feeding, it was observed that 140 (93%) of the children under six months of age had been breastfed the day prior to data collection, 44 (29%) had used infant formula and 32 (21%) had consumed water. Among children older than six months, 93 (45%) consumed breast milk the day prior to data collection. In the analysis of complementary feeding, the consumption of food sources of iron and vitamin C among children aged six to 24 months was investigated (Table 2). In relation to the meat group, cooked/ground meat was consumed by 80 (38.2%) children at least once a day. It was observed that 147 (70.6%) children never consumed or had a low frequency of consuming offal (beef liver/chicken kidneys) and moderate and frequent consumption of chicken meat.

Among the vegetables, it was verified that the majority did not consume leafy vegetables, such as lettuce, chard, cabbage, spinach and kale. Among those vegetables with a consumption classification of frequent, carrots and pumpkin, 74 (35%), were the most cited items. Regarding other vegetables, moderate consumption prevailed (Table 2). The fruits frequently consumed by children were bananas, 87 (41.5%), and oranges, 74 (35.5%). Approximately half of the children never consumed melon, watermelon, mango, strawberries, grapes and guava. The use of natural juices was observed in 122 (58.5%) of the children studied, who consumed them frequently (Table 2). The consumption of beans was present in the diet of all the children at a moderate or frequent level (Table 2).

Table 2 - Percentage of frequency of fruit and vegetable consumption according to the group of children who had started complementary feeding ($n=209$). Montes Claros, MG, Brazil, 2014. (continues)

Food	Frequency of consumption							
	Never		Low		Moderate		Frequent	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Vegetables								
Lettuce	116	55.5	25	11.9	50	23.8	18	8.8
Chard/cabbage/spinach/kale	145	69.5	0		58	27.6	6	2.9
Cauliflower	166	79.4	12	5.9	25	11.8	6	2.9
Beetroot	63	30.1	6	2.9	105	50.3	35	16.7
Carrot	43	20.5	6	2.9	86	41.3	74	35.3
Tomato	86	41.2	6	2.9	55	26.5	61	29.4
Pumpkin	18	8.8	12	5.9	105	50.1	74	35.2
Fruits								
Banana	12	5.9	0	0	110	52.6	87	41.5
Orange	18	8.8	12	5.9	104	49.8	74	35.5
Apple/pear	12	5.9	24	11.7	104	49.8	68	32.6
Papaya	74	35.3	25	11.8	74	35.3	37	17.6
Melon/watermelon	85	40.8	37	17.7	74	35.6	12	5.9
Mango	91	43.7	50	23.8	43	20.7	25	11.8
Strawberry	86	41.2	74	35.3	31	14.7	18	8.8
Grape	92	44.1	74	35.3	37	17.7	6	2.9
Guava	110	52.9	62	29.5	31	14.7	6	2.9
Natural fruit juice	12	5.9	12	5.9	62	29.7	122	58.5
Legumes								
Beans	0	0	0	0	43	20.6	166	79.4

Meat and eggs								
Beef liver/chicken kidneys	86	41.2	61	29.4	61	29.4	0	0
Cooked meat/ground meat	43	20.6	12	5.9	74	35.3	80	38.2
Beef	80	38.2	25	11.8	74	35.3	31	14.7
Cooked/roasted/grilled/fried chicken	49	23.5	12	5.9	117	55.9	31	14.7
Cooked/fried fish	153	73.5	31	14.7	25	11.8	0	0
Fried/scrambled/boiled eggs	92	44.1	37	17.6	80	38.2	0	0

Source: The authors (2014)

In the analysis of iron and vitamin A supplements, it was found that 127 (61%) of the children older than 6 months were receiving supplements of both micronutrients, while, 31 (15%) received only vitamin A and 50 (24 %) received only ferrous sulphate.

● DISCUSSION

This study evaluated the consumption of food sources of iron and vitamin C among children up to 24 months of age. In this study, there was a considerable practice of breastfeeding for the children in the first six months of life, which is a protective factor for the prevention of iron deficiency anemia⁽¹⁵⁾. Among the children in the 6 to 24 months age group, there was a low frequency of consumption of iron sources and foods that facilitate its absorption, considered as a risk factor for the deficiency of this micronutrient in the body⁽²⁾.

In the analysis of national studies conducted from 1975 to 2008 in Brazil, a significant increase in the median duration of breastfeeding was observed⁽¹⁶⁾. Adherence to breastfeeding in this study was similar to that found in the city of Diadema, São Paulo, in which the prevalence of 80.9% of breastfeeding was observed in children under 6 months and of 44.4% in children aged 6 to 23 months⁽¹⁷⁾.

The consumption of infant formula observed in this study, in one third of the children, was lower than the prevalence of approximately 50% of use found in the aforementioned study⁽¹⁷⁾. In the absence of exclusive breastfeeding, the consumption of infant formula should be the first choice for infant feeding. Natural cow milk is discouraged during this stage, due to nutritional inadequacies and the risk of iron deficiency anemia⁽¹⁷⁾. Considering also that the consumption of water and infant formula among the children under 6 months of the present study may reflect the possible compromise of the practice of exclusive breastfeeding recommended in this age group. From 6 months on, breast milk consumption was observed in almost half of the children studied, as reported by other authors⁽¹⁷⁾. At this stage, although breast milk does not meet the necessary nutritional demands, it is a complementary source of iron in infant feeding and should be consumed up to 24 months of age⁽⁹⁾.

The feeding of the children aged 6 to 24 months studied was deficient in food sources of iron and vitamin C. Food practices are related to the presence of iron deficiency anemia in childhood. At this stage, the requirement for iron needs to be met by means of a varied complementary diet and in adequate amounts that will allow the appropriate supply of this nutrient⁽¹⁸⁾. Early childhood is a period of increased vulnerability to the development of iron deficiency anemia, as it is the stage of life with the highest growth rate and therefore leads to increased nutritional needs⁽¹⁻³⁾.

The consumption of meat in this study presented frequencies concordant to that verified in a national survey of children in the same age group⁽³⁾. This result suggests that children do not consume sufficiently food sources of iron, since meats are foods with a high amount of this mineral⁽²⁾. Inadequate consumption of meat in this stage of the life cycle can be justified by the difficulty of acceptance in relation to its consistency or even due to the high cost⁽²⁾. It should be noted that, in addition to red meat, offal is a good sources of iron⁽⁹⁾. In this study, the majority of the children were not in the habit of consuming this. At the stage of introduction of complementary feeding, the children reflect the dietary practices of the family and, considering that in the country there is insufficient consumption of offal in the adult phase, this pattern may be reflected in the habit of the child⁽¹⁹⁾.

Regarding the group of vegetables, a low consumption of leafy vegetables was observed. These findings are in line with the reality of children assisted in the Family Health Service in the state of Acre, where 53.4% of children aged 6 to 24 months did not consume vegetables in the main meals⁽²⁰⁾. This result can be related to the fact that the majority of the Brazilian population consumes vegetables below the nutritional recommendations⁽¹⁹⁾. It should be noted that dark green leafy vegetables are a reasonable sources of iron in the diet⁽⁹⁾.

Fruits, a sources of vitamin C, are considered as facilitators of iron absorption and their consumption is indispensable⁽⁹⁾. In this study, the daily consumption of a variety of fruits was low in the 6 to 24 months age group, which compromised the quality of the diet. The literature shows more critical data for this population, in which 48.2% of the children do not ingest any fruit⁽²⁰⁾. Considering that food practices are related to food availability, cultural characteristics and choice⁽²¹⁾, in this study, typical fruits of the region were never consumed by an significant portion of the children studied, which also suggests exposure to inadequate family food habits. The common consumption of beans in the children of this study reflects the dietary habits of the Brazilian population^(21,22) and constitutes a protective factor for childhood anemia⁽²⁾.

The use of iron and vitamin A supplements, recommended by the Ministry of Health, was insufficient in the study population. The use of nutritional iron supplements in the first two years of life is the first and most traditional strategy for the prevention and treatment of iron deficiency anemia recommended in the Brazilian National Health System⁽⁹⁾, since the nutrient requirements of this age group are high and difficult to achieve in the diet. Associated with these supplements, vitamin A at adequate levels in the body can contribute to elevate organic iron in the population⁽²³⁾. In agreement with the data obtained in this study, the National Health Survey showed that supplements with ferrous sulfate were reported for more than half of the children aged between 6 and 23 months, higher than previous studies conducted in the country. This increase in the frequency of childhood supplements can be explained due to improvements in access to the mineral supplement in Primary Healthcare in Brazil⁽³⁾.

The Family Health Service (FHS) plays an important role in promoting healthy eating habits in childhood⁽¹⁸⁾. The success in the promotion of breastfeeding performed by family health teams, especially regarding the work of nurses, can be noted⁽²⁴⁾. However, there is a need to improve the guidelines on complementary feeding, particularly with regards to sources of iron and vitamin C for the prevention of iron deficiency anemia⁽⁹⁾. Therefore, it is essential to perform individual or collective educational activities related to feeding practices in the prevention of iron deficiency anemia, during childcare consultations or in the educational groups carried out in the PHC, potentially by the nursing professional. It is essential that these educational guidelines consider the level of maternal education or of the person responsible and the financial condition of the family - in this study shown to be low - which can contribute to the concepts learned being applied in their reality. Nurses need to consider the sociocultural context of each nursing woman for better adherence to the recommendations provided^(24,25).

The FHS, when developing actions in a known geographical area, allows healthcare professionals the proximity to identify their client's life contexts, which is a favorable factor for changes in practice. Health actions that consider the context in which food choices occur can support effective intervention proposals for the promotion of healthy eating in this populational group, with nurses being protagonists in the development of these actions in primary healthcare^(24,25).

A limitation of this study was the information of the dietary habit being based on the report of the mothers or those responsible. However, the literature indicates that the food consumption frequency questionnaire is an adequate instrument to evaluate eating habits in epidemiological studies. The results of this study may support strategies to reduce and combat anemia, considering that these strategies should be based on analysis of local data⁽⁸⁾.

● CONCLUSIONS

There is a low frequency of the consumption of foods sources of iron and vitamin C for children aged 0 to 24 months in primary healthcare, which may favor the development of iron deficiency anemia in this population. It is hoped that this study will contribute to the reflection of health professionals and managers on the importance of encouraging adequate food consumption in childhood with regard to sources of iron and vitamin C for the prevention of iron deficiency anemia. This highlights the importance

of the practice of food monitoring, especially by PHC nurses, with emphasis on the consumption of these nutrients. In addition, health promotion measures should be implemented, involving health education strategies related to this theme during child care consultations and operational groups that include the family and the community. The results of this study may support the implementation of more effective health policies for the promotion of healthy eating habits and the prevention of nutritional diseases and harm, in order to promote adequate childhood growth and development. Further studies are suggested that quantitatively investigate the consumption of iron and vitamin C and also their relationship with the nutritional status of children.

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