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Fujimori, Elizabeth; Sayuri Sato, Ana Paula; Marchiori Antunes Araújo, Claudia Regina; Teruya Uchimura, Taqueco; da Silva Porto, Edirene; Soares Brunken, Gisela; Vilela Borges, Ana Luiza; Cornbluth Szarfarc, Sophia
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Anemia in pregnant women from two cities in the South and Mid-West regions of Brazil*

ANEMIA EM GESTANTES DE MUNICÍPIOS DAS REGIÕES SUL E CENTRO-OESTE DO BRASIL

ANEMIA EN MUJERES EMBARAZADAS DE CIUDADES DE REGIONES SUR Y CENTRO-OESTE DE BRASIL

Elizabeth Fujimori[1], Ana Paula Sayuri Sato[2], Claudia Regina Marchiori Antunes Araújo[3], Taqueco Teruya Uchimura[4], Edirene da Silva Porto[5], Gisela Soares Brunken[6], Ana Luiza Vilela Borges[7], Sophia Cornbluth Szarfarc[8]

ABSTRACT

We aimed to analyze anemia distribution in pregnant women who were attending health services in two cities in the South and Mid-West Regions in Brazil. This is a retrospective cross-sectional study developed from 954 and 781 medical records data in Cuiabá-MT and Maringá-PR. We collected data of social and demographic features as well as pre-natal care. Women who presented hemoglobin lower then 11g/dL were considered having anemia. Social inequity between the two cities was evident. Pregnant women from Cuiabá-MT were significantly poorer then those from Maringá-PR. Anemia prevalence was higher and means of hemoglobin were lower in Cuiabá-MT, apart from gestational age. We found that the age, marital status, number of previous pregnancies, nutritional status and gestational trimester were associated with the level of hemoglobin. Regional differences in the occurrence of anemia are social determined and should be considered in the proposal of interventions in the public health field.

KEY WORDS

Anemia.
Pregnancy.
Prenatal care.
Women's health.
Social conditions.

RESUMO

Objetivou-se analisar a distribuição da anemia em gestantes da rede básica de saúde de dois municípios, na região Sul e Centro-Oeste do Brasil. Estudo transversal retrospectivo e descritivo desenvolvido a partir de dados de prontuários de 954 e 781 gestantes em Cuiabá-MT e Maringá-PR, respectivamente. Coletaram-se dados de caracterização sociodemográfica, de pré-natal e indicadores sociais. Foram consideradas anêmicas, as mulheres com hemoglobina inferior a 11g/dL. A desigualdade social existente entre os municípios foi evidente. Gestantes atendidas em Cuiabá-MT apresentavam características sociodemográficas significativamente mais precárias. A prevalência de anemia era significativamente maior e valores médios de hemoglobina menores em Cuiabá-MT, independentemente da idade gestacional. Encontrou-se associação dos níveis de hemoglobina com a idade, situação conjugal, número de gestações anteriores, estado nutricional e trimestre gestacional. As diferenças regionais na ocorrência da anemia gestacional são socialmente determinadas, o que deve ser considerado nas propostas de intervenção em saúde coletiva.

DESCRITORES

Anemia.
Gravidez.
Cuidado pré-natal.
Saúde da mulher.
Condições sociais.

RESUMEN

Se analizó la distribución de anemia en mujeres embarazadas asistidas en servicios básicos de salud de dos ciudades de las regiones Sur y Centro-Oeste de Brasil. Estudio transversal retrospectivo y descriptivo. Se usó datos de registros médicos de 954 y 781 embarazadas de Cuiabá-MT y Maringá-PR, respectivamente. Se recopilaron datos sobre características sociodemográficas, atención prenatal e indicadores sociales. Hemoglobina-Hb<11g/dL definió anemia. La desigualdad entre las ciudades fue evidente. Embarazadas de Cuiabá-MT tenían características socio-demográficas más precarias. Prevalencia de anemia fue significativamente más alta y la media de Hb más baja en Cuiabá-MT, independiente del tiempo de embarazo. Se encontró asociación entre niveles de Hb y características sociodemográficas y de prenatal con la edad, estado civil, embarazos previos, estado nutricional y trimestre de embarazo. Diferencias regionales fueron importantes en la incidencia de anemia, en especial los indicadores sociales, facto a considerar en las propuestas de intervención en salud pública.

DESCRIPTORES

Anemia.
Embarazo.
Atención prenatal.
Salud de la mujer.
Condiciones sociales.

* Extracted from Sub-project of research "Impacto da fortificação das farinhas de trigo e de milho com ferro e ácido fólico na concentração de hemoglobina de gestantes atendidas em serviços de saúde na rede pública", 2006.

[1] Associate Professsor. Department of Collective Health Nursing - School of Nursing at University of São Paulo. São Paulo, SP, Brazil.efujimor@usp.br [2] Student of the Master Program in Nursing. School of Nursing at University of São Paulo. Holder of a CNPq grant. São Paulo, SP, Brazil. aps_sato@yahoo.com.br [3] Master in Nursing by Maringá State University. Student of the Doctorate Program in Nursing. School of Nursing at University of São Paulo. São Paulo, SP, Brazil.claudia_marchiori@hotmail.com [4] Associate Professor. Department of Nursing, Maringá State University. Maringá, PR, Brazil. ttuchimura@uem.br [5] Master in Collective Health by Federal University of Mato Grosso. Cuiabá, MT, Brazil. edirene.porto@caixa.gov.br [6] Adjunct Professsor. Department of Collective Health, Federal University of Mato Grosso. Cuiabá, MT, Brazil. gisa@ufmt.br [7] Ph.D. Professsor. Department of Collective Health Nursing, School of Nursing at University of São Paulo. São Paulo, SP, Brazil. alvilela@usp.br [8] Associate Professor. Department of Nutrition - School of Public Health at University of São Paulo. São Paulo, SP, Brazil. scfarc@usp.br

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INTRODUCTION

Iron-deficiency anemia has been recognized as being the most prevalent nutritional deficiency in the world, *behaving as an endemic disease with a cosmopolitan character occurring in every continent, geoeconomic block, and social group*[1]. Despite this trans-social and pan-geographic trait attributed to iron-deficiency anemia, its occurrence is associated to inadequate socio-environmental conditions. Therefore, the prevalence of anemia estimated for pregnant women in developed countries is 23%, while in developing countries over half of this group (52%) is affected[2].

In Brazil, although there are no national studies with consistent data, it has been referred that this problem affects about 30-40% of the pregnant women[1]. In women of reproductive age (15 to 49 years), the National Demographics and Health Research (PNDS, abbreviation in Portuguese)[3] found prevalence of 30%, with significant regional differences.

Anemia control is relevant considering the magnitude of its deleterious effects to the health of the pregnant woman and the fetus, because its occurrence during pregnancy has been associated with higher maternal and perinatal mortality rates; increased risk of premature birth and low birth weight; and newborns with less than normal iron reserves and, therefore, with higher risk of developing anemia in their first months of life[2].

Anemia control is relevant considering the magnitude of its deleterious effects to the health of the pregnant woman and the fetus.

OBJECTIVE

This study analyzes the distribution of anemia among pregnant women attending the public primary health care services in two cities: one located in Southern Brazil and the other in the Center-West region, based on the concept that deficiency anemia is a biological response of the body to historically and socially determined structural conditions[4].

METHOD

This cross-sectional study is part of a broader investigation named *Impact of wheat and corn flour fortification with iron and folic acid on hemoglobin concentration in pregnant women attending public health services*, approved by the Research Ethics Committee at the School of Nursing at University of São Paulo (Register number 521/2006).

Data was obtained from the medical records of pregnant women attending prenatal care services in the municipalities of Cuiabá, Mato Grosso state (MT) and Maringá, Paraná state (PR), Brazil. In those locations the sample was stratified to represent the pregnant women attending the public primary health care services. In Cuiabá-MT, the data was obtained from 18 of the 31 Family Health Program units existing in 2007. In Maringá-PR, the data was obtained from 22 of 23 primary health care services. In both cities, every primary health care service that was in activity before the implementation of fortification of wheat and corn flour with iron and folic acid in June 2004 was included.

The minimum sample size was calculated based on the equation: $n = z\alpha^2 pq/e^2$, where n = size of minimum sample; z = confidence coefficient, with a value of 1.96 for an alpha (α) of 0.05; p = prevalence of the studied phenomenon; q = complement of the prevalence (q = 1-p); e = maximum error in absolute value. Considering that there are no consistent estimates of prevalence of anemia in pregnant women, a value of p = 0.50 was adopted, which is equal to the greatest relationship between p and q and the desired precision of e = 5%. Therefore, a value of n = 1.962 x 0.50 x 0.50/0.052 = 384. In the total, 954 and 781 pregnant women from Cuiabá and Maringá were included, respectively. The women were selected based on the proportional stratification of the primary health care service, in a way that the calculation of the sample per health service was proportional to the number of pregnant women attending the service during the period of the study.

Data collection was performed in 2006-2007 and only women with low-risk pregnancies were included, with medical records that included at least the following information: date of birth, date of first appointment, date of last menstrual period, concentration of hemoglobin (Hb) and date of the blood test for hemoglobin analysis. Furthermore, each locality should collect the socio-economic and demographic data of the pregnant women in addition to their gynecological-obstetrical and prenatal history available on the medical records. The variables included in the instrument were: education, marital status, weight and height in the first appointment, number of previous pregnancies and abortions (making no distinction for spontaneous or induced abortions).

The data regarding Hb level refer to the exam requested on the first prenatal appointment. Hemoglobin levels lower than 11g/dL were used to define anemia[2] and their nutritional status was classified according to the recommendations of the Ministry of Health[5].

Data from the Applied Economics Research Institute[6] was used to characterize the studied municipalities. Human development indexes (HDI) were obtained, as well poverty and income rates:

- HDI- obtained by the simple arithmetic mean of three sub-indexes referring to dimensions of Longevity (HDI-Longevity), Education (HDI-Education) and Income (HDI-Income);

- Ratio between income of the richer 10% and poorer 40% - which measured the degree of inequality among in-

dividuals according to the per capita household income. It compares the mean income of individuals from the richer 10% with that of individuals from the poorer 40% of the same distribution;

• % of poor people – referring to the percentage of people with a per capita household income less than R$75.50, equivalent to 1/2 the minimum salary in Brazil in August 2000;

• % of indigents – referring to the percentage of people with per capita household income less than R$37.75, equivalent to 1/4 the minimum salary in Brazil in August 2000;

• Theil L index- measures the inequality in the distribution of people according to the per capita household income;

• % of women as head of household, with no spouse and with children younger than 15 years.

The Statistical Package for Social Sciences version 11.0 was used for data analysis. The data were described as absolute values, proportions, means, standard-deviations, confidence interval (CI) and odds ratio (OR) and analyzed using Chi-square test, student's t test and analysis of variance. The level of significance of the tests was 5%.

RESULTS

Chart 1 presents indicators of human development, poverty and income of the studied municipalities. It is observed that thought the municipalities have a similar HDI, the social inequality between them is very clear.

Chart 1 – Indicators of human development, poverty and income according to the city, Maringá-PR and Cuiabá-MT - 2000

Indicator	Maringá	Cuiabá
Human Development Index - Municipal HDI	0.841	0.821
Ratio between the income of the richer 10% and the poorer 40%	17.39	30.04
Poverty – poorer people (%)	8.35	18.81
Poverty – indigent people(%)	2.82	6.61
Income – inequality – Theil L index	0.541	0.748
Women head of household. without spouse and with children younger than 15 years (%)	4.22	6.21

Source: Applied Economics Research Institute[6]

It is observed, in Table 1, that there was no difference in age group of the pregnant women between the municipalities, neither regarding the proportion of pregnant women that initiated prenatal care in the first, second and third trimester. However, pregnant women from Cuiabá-MT presented significantly more precarious socio-demographic characteristics: greater proportion without spouse, with only primary education, with more than two pregnancies and previous abortions (p<0.001). In Maringá-PR, there was a higher proportion of overweight/obese pregnant women (p<0.001).

Table 1 - Pregnant women according to their socio-demographic and prenatal characteristics, by city, Cuiabá-MT and Maringá-PR - 2007

Characteristics	Maringá N (%)	Cuiabá N (%)	p-value*
Age (years)			
<20	143(17.7)	199(20.9)	0.203
≥ 20	637(82.3)	755(79.1)	
Marital status			
No partner	230(30.7)	193(43.1)	<0.001
With partner	518(69.3)	255(56.9)	
Education			
Fundamental education	186(26.0)	148(57.1)	<0.001
Secondary and superior education	529(74.0)	111(42.9)	
Previous pregnancies			
≤2	669(88.6)	571(65.6)	<0.001
>2	86(11.4)	300(34.4)	
Previous abortion			
Yes	88(12.4)	168(20.5)	<0.001
No	621(87.6)	651(79.5)	
Nutritional status			
Low weight	137(20.8)	191(26.4)	<0.001
Adequate weight	310(47.0)	382(52.8)	
Overweight/Obesity	212(32.2)	150(20.8)	
Pregnancy trimester in the beginning of prenatal care			
I	611(78.2)	740(77.6)	0.145
II	143(18.3)	194(20.3)	
III	27(3.5)	20(2.1)	

*p-value refers to the Chi-square test

The prevalence of anemia evaluated by Hb < 11.0g/dL was 10.6% (CI95%: 8.4-12.8) in Maringá-PR and 25.5% (CI95%: 22.7-28.3) in Cuiabá-MT, and OR=2.9 (CI95%: 2.2-3.8; p<0.001), with Maringá-PR as reference. It is observed, in Table 2, that the prevalence of anemia was significantly higher in Cuiabá-MT, regardless of the gestational age.

Table 2 - Anemia prevalence according to pregnancy trimester, by municipality, Cuiabá-MT and Maringá-PR - 2007

Pregnancy trimester	Presence of anemia		p-value*
	Maringá	Cuiabá	
I	9.0	22.2	<0.001
II	18.2	38.1	<0.001
III	7.4	25.0	<0.001
Total	10.6	25.5	<0.001

*p-value refers to the Chi-square test

The pregnant women from Cuiabá-MT also presented significantly lower hemoglobin values in every pregnancy trimester, as shown in Table 3.

Table 3 - Means of hemoglobin levels according to pregnancy trimester, by municipality, Cuiabá-MT and Maringá-PR - 2007

Pregnancy trimester	Means of Hb levels (x ± DP)		p-value*
	Maringá	Cuiabá	
I	12.4(1.1)	11.8(1.1)	<0.001
II	11.8(1.0)	11.2(1.2)	<0.001
III	12.4(1.0)	11.5(1.4)	0.019
Total	12.3(1.1)	11.7(1.2)	<0.001

*p-value refers to student's t test.

Table 4 shows the differences in Hb levels according to socio-demographic and prenatal characteristics. It is observed that, in general, the Hb levels of pregnant women attending public health services in Maringá-PR are greater than the women attending services in Cuiabá-MT. In Maringá-PR, the Hb levels were statistically different due to the marital status, previous pregnancies and pregnancy trimester, while in Cuiabá-MT that difference can be observed in the age, number of previous pregnancies, nutritional status and pregnancy trimester.

Table 4 - Mean hemoglobin levels according to socio-demographic and prenatal characteristics, by city, Cuiabá-MT and Maringá-PR - 2007

Characteristics	Maringá			Cuiabá		
	N	Hb(SD)	p*	N	Hb(SD)	p*
Age (years)						
<20	143	12.23(1.13)	0.424	199	11.52(1.10)	0.011
≥20	637	12.31(1.07)		755	11.74(1.18)	
Marital status						
No partner	230	12.14(1.15)	0.013	193	11.70(1.15)	0.106
With partner	518	12.36(1.04)		255	11.88(1.23)	
Education						
Fundamental education	186	12.22(1.12)	0.356	148	11.71(1.15)	0.066
Secondary and superior education	529	12.31(1.08)		111	11.99(1.24)	
Previous pregnancies						
<2	669	12.34(1.09)	0.006	571	11.79(1.15)	0.020
≥2	86	12.01(1.03)		300	11.59(1.21)	
Previous abortion						
Yes	88	12.39(1.10)	0.391	168	11.63(1.20)	0.275
No	621	12.29(1.06)		651	11.74(1.18)	
Nutritional status						
Low weight	137	12.17(1.15)	0.085**	191	11.59(1.19)	0.039**
Adequate weight	310	12.28(1.10)		382	11.67(1.15)	
Overweight/Obesity	212	12.42(0.98)		150	11.90(1.13)	
Pregnancy trimester in the beginning of prenatal care						
I	611	12.42(1.06)	<0.001**	740	11.82(1.12)	<0.001**
II	143	11.78(1.01)		194	11.25(1.18)	
III	27	12.41(1.04)		20	11.49(1.41)	

*p-value refers to student's t test. **p-valor refers to analysis of variance

DISCUSSION

This study analyzed the prevalence of anemia in pregnant women attending the public health care services of two municipalities that, despite having similar HDI, present significant differences regarding their social and economic conditions. Data collection was performed using the medical records of the pregnant women who received prenatal care, which is one of the limitations of the study considering the quality of the information, but, on the other hand, it permitted to include a large sample of cases. It should be stressed that in Maringá-PR, it was possible to recover any data referring to hemoglobin test from the central laboratory where the blood tests were analyzed. In Cuiabá-MT, it was not possible to recover hemoglobin test results that were not included in the medical records; however, the health centers had implemented the Family Health Strategy, so the medical records were more thorough in the information.

The prevalence of anemia in Maringá-PR was much lower to the ratio of 30 to 40% estimated for pregnant women in Brazil[1], whereas in Cuiabá-MT the percentage was significantly higher, but still lower than the estimated to Country. Certainly, it should be considered that in Cuiabá-MT there was a high percentage of pregnant adolescents, with low weight, previous abortions and more than two previous pregnancies. These characteristics affect the picture of anemia.

According to the categories proposed by WHO to characterize the magnitude of anemia as a public health issue, Maringá-PR is rated as a mild level (when the prevalence

of anemia varies from 5 to 20%), while Cuiabá-MT would be in the moderate level category (when the prevalence of anemia varies from 20 to 40%)[2]. It is possible to conjecture that, in addition to better life conditions, pregnant women from Maringá-PR had access to better health care services.

The occurrence of anemia, which represents the final demonstration of a deficiency that exhausted all the iron organic reserves, is tied by social and economical conditions, characteristics of social class situations, which determine inadequate eating, in terms of quality and quantity, and the spoliation caused by intestinal parasitic diseases, which are more common in areas with precarious sanitation[4].

In developing countries, feeding behaviors do not include an appropriate amount of bioavailable iron due to the high costs of red meat, which are the best source of heme iron, the most absorbed. In Brazil, the population's standard meat consumption behavior is determined by the level of income, urbanization, woman's education, and family composition[7]. A study evaluated the daily eating profile among families in an insecurity food situation and found that families in the referred situation have a monotone diet, basically consisting of energetic foods that include only cereals, oil, sugar and beans, and spend about 68% of the family income with food expenses[8].

Therefore, it is supposed that most women of reproductive age do not have an iron reserve to supply the high demand of the mineral during pregnancy, which is above 1000mg[9]. An investigation with pregnant teenagers showed that one third had iron reserves lower than 300mg and two thirds lower than 500mg of iron[10].

A study with women of reproductive age developed in the urban area of Pelotas, Rio Grande do Sul state, did not find differences in prevalence of anemia among the categories for family income, education, ethnicity and age group; however, the prevalence differed significantly between the social classes analyzed: increased from 14% in A and B classes to 35% in D and E classes[11]. Evaluation of how childhood anemia is related to the family's forms of social reproduction showed that prevalence of anemia was higher among lower social strata (46.2%-lower; 40.6%-intermediate; 13.2%-higher), but with no statistically significant difference[12].

Governmental actions to prevent and control nutritional anemia during the pregnancy-puerperal cycle include the medical supplementation of iron since the 20th gestational week in all pregnant women, since the 1980's. Nevertheless, the referred group still presents the highest anemia indexes, which implies questioning the effectiveness of the action on controlling anemia. More recently, the fortification of wheat and corn flours with iron and folic acid became mandatory[13], which will permit women of reproductive age to become pregnant with better iron reserves[14], but there is still no evidence of its impact[15-16]. Only one study has proved improvement in pregnant women[17].

Nutritional deficiencies are intimately associated with the structural condition of poverty, therefore its complete eradication depends on the eradication of economic and social contrasts created by the process of production and distribution of goods and services[4]. Nevertheless, the health sector can contribute to changing this situation[18]. Special attention should be given to the need to improve women's health care and prenatal quality[19], with a view to improve the iron reserves of women in general and especially of pregnant women.

FINAL CONSIDERATIONS

It is understood that the larger access to quality food is one of the most important factors to achieve the expected results in the prevention and control of anemia. This implies the need for measures capable of improving the socioeconomic conditions of poorer populations. While this does not happen, the strategies to combat anemia have provided only palliative solutions for the problem. However, health care professionals should make efforts in seeking alternatives for interventions that can effectively contribute to reducing iron deficiency problems, which can be obtained by encouraging compliance to iron supplementation and orientations of healthy eating habits.

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Correspondence addressed to: Elizabeth Fujimori
Av. Dr. Enéas de Carvalho Aguiar, 419 - Cerqueira César
CEP 05403-000 - São Paulo, SP, Brazil